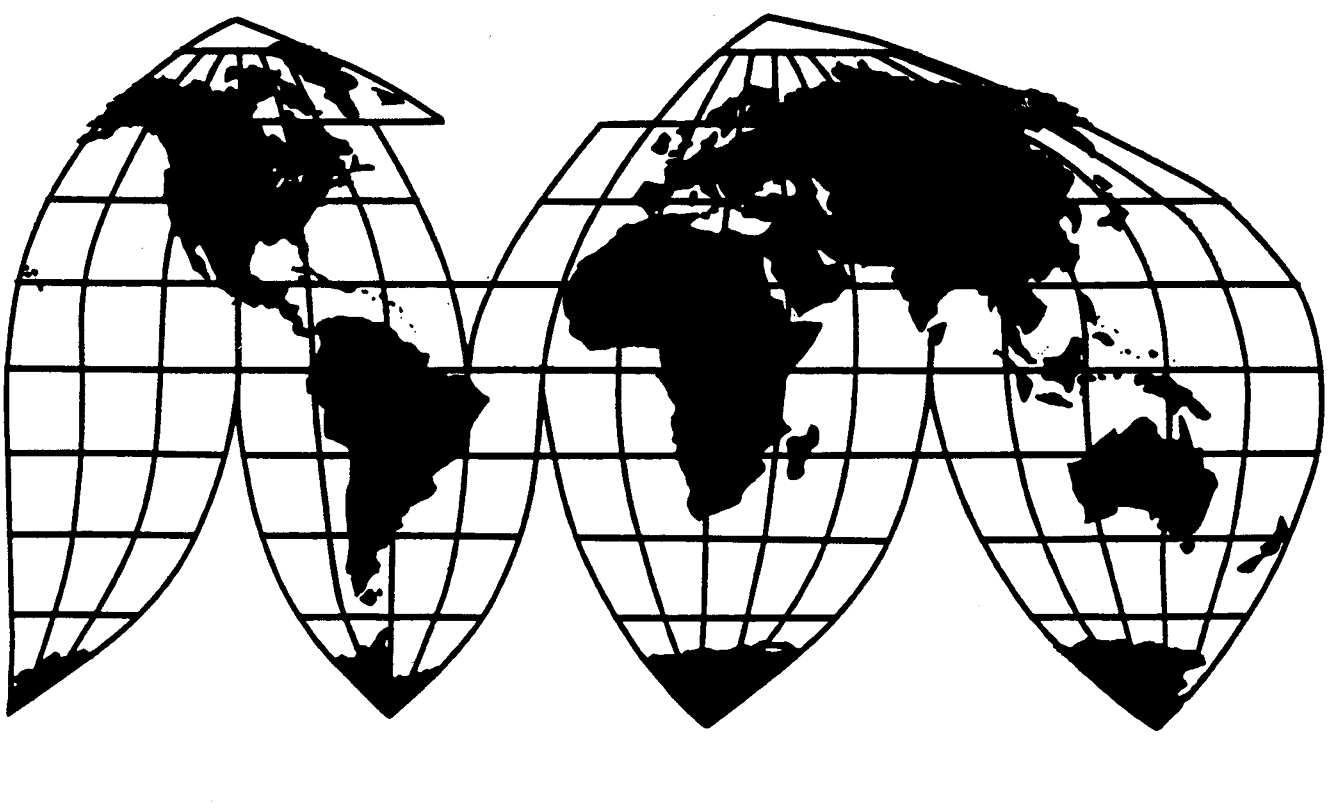
In the Matter of

Certain Anti-Theft Deactivatable Resonant Tags and Components Thereof

Investigation No. 337-TA-347

Publication 2811 **September 1994**

U.S. International Trade Commission



Washington, DC 20436

U.S. International Trade Commission

Address all communications to
Secretary to the Commission
United States International Trade Commission
Washington, DC 20436

U.S. International Trade Commission

Washington, DC 20436

In the Matter of

Certain Anti-Theft Deactivatable Resonant Tags and Components Thereof

Publication 2811

September 1994

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C. 20436

In the Matter of CERTAIN ANTI-THEFT DEACTIVATABLE RESONANT TAGS AND COMPONENTS THEREOF	)	Investigation No. 337-TA-347

NOTICE OF COMMISSION DETERMINATION NOT TO REVIEW AN INITIAL DETERMINATION FINDING NO VIOLATION OF SECTION 337 OF THE TARFIFF ACT OF 1930

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined not to review the final initial determination (ID) issued by the presiding administrative law judge (ALJ) in the above-captioned investigation. The ID found no violation of section 337 of the Tariff Act of 1930.

FOR FURTHER INFORMATION CONTACT: Andrea C. Casson, Esq., Office of the General Counsel, U.S. International Trade Commission, telephone 202-205-3105.
SUPPLEMENTARY INFORMATION: On March 10, 1993, the Commission instituted an investigation of a complaint filed by Checkpoint Systems Inc. (Checkpoint) under section 337 of the Tariff Act of 1930. The complaint, as amended, alleged that six respondents imported, sold for importation, or sold in the United States after importation certain anti-theft deactivatable resonant tags and components thereof that infringed claims 1, 2, 4, 6, 9, 10, 20, 21, 23, and 25 of U.S. Letters Patent 4,498,076 (the '076 patent) and claims 1, 2, 4, 6, 9, 10, 19, 20, 22, 24, 25, 26, and 27 of U.S. Letters Patent 4,567,473 (the '473 patent). On March 10, 1993, the Commission instituted an investigation of Checkpoint's complaint.

The Commission's notice of investigation named six respondents, each of whom was alleged to have committed one or more unfair acts in the importation or sale of components or finished tags that infringe the asserted patent claims. Those respondents are: (1) Actron AG (Actron); (2) Tokai Denshi Co., Ltd. (Tokai); (3) ADT, Limited (ADT); (4) All Tag Security AG (All Tag); (5) Toyo Aluminum Co, Ltd. (Toyo); and (6) Custom Security Industries, Inc. (CSI). Respondent CSI was found to be in default and to have waived its right to appear, to be served with documents, and to contest the allegations at issue in the investigation. _See_ 58 Fed. Reg. 52523 (Oct. 17, 1993).

On December 1, 1993, the Commission issued notice that it would follow a modified procedure for considering the final ID in this investigation. 58 Fed. Reg. 63391. The notice set out a schedule for the parties to file petitions for review of the ID, responses to the petitions for review, and replies to the responses. The notice also indicated that the Commission might later issue a notice requesting written submissions from the parties, other federal agencies, and interested members of the public on the issues of remedy, the public interest, and bonding, and/or requiring the parties to file supplemental briefs on violation issues selected by the Commission.

The ALJ conducted an evidentiary hearing in August and September, 1994, and issued his final ID on December 9, 1993. He found that: (1) there is a domestic industry involving each of the asserted claims of the '076 and '473 patents; (2) none of the asserted claims of these patents are infringed by respondents' tags; (3) the asserted claims are invalid under 35 U.S.C. § 102(g); and (4) the asserted claims are not invalid under 35 U.S.C. §§ 102, 103, or 112. Based upon his findings of invalidity and non-infringement, the ALJ concluded that there was no violation of section 337.

Complainant Checkpoint filed a petition for review of the ALJ's findings on both infringement and validity; respondents and the Commission investigative attorney (IA) filed responses to the petition for review, and all parties filed reply submissions.

On January 21, 1994, the Commission issued a notice requesting the parties, interested government agencies, and other interested persons to file submissions addressing the issues of remedy, the public interest, and bonding. 59 Fed. Reg. 3867 (January 27, 1994). The Commission noted that it had not yet completed its review of the record in the investigation and had made no determinations with respect to the ID or complainant's petition for review, but that it was requesting submissions on the issues of remedy, the public interest, and bonding for use in the event that it ultimately determined that a violation of section 337 had been established. All parties filed submissions on these issues, but no agency or public submissions were received.

Having considered the record in this investigation, including the ID and all submissions filed on review, the Commission determined not to review any portion of the ID. The Commission also determined that issuance of a remedy as to defaulting respondent CSI is precluded by public interest factors.

This action constitutes the Commission's final disposition of this investigation.

This action is taken under the authority of section 337 of the Tariff Act of 1930, 19 U.S.C. § 1337, and section 210.53 of the Commission's Interim Rules of Practice and Procedure, 19 C.F.R. § 210.53.

Copies of the non-confidential version of the ID and all other nonconfidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street S.W., Washington, D.C. 20436, telephone 202-205-3000. Hearing-impaired persons are advised that information on the matter can be obtained by contacting the Commission's TDD terminal on 202-205-1810.

By order of the Commission.

Donna R. Koehnke

Donna R. Koehnke
Secretary

Issued: **March 10, 1994**

PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of CERTAIN ANTI-THEFT DEACTIVATABLE RESONANT TAGS AND COMPONENTS THEREOF	Investigation No. 337-TA-347

Initial Determination

Paul J. Luckern, Administrative Law Judge

Pursuant to the Notice of Investigation (58 Fed. Reg. 13277-28 (March 10, 1993)), this is the administrative law judge's final initial determination, under Commission interim rule 210.53 (19 C.F.R. § 210.53).[1] The administrative law judge hereby determines, after a review of the record developed, that there is no violation of subsection (a)(1)(B)(i) of the Tariff Act of 1930, as amended (19 U.S.C. § 1337), in the importation into the United States, the sale for importation, or the sale within the United States after importation, of certain anti-theft deactivatable resonant tags and components thereof.

[1] See notice of Commission dated November 22, 1993, to apply a modified procedure pertaining to consideration by the Commission of this final initial determination.

APPEARANCES

FOR COMPLAINANT CHECKPOINT SYSTEMS, INC.:

Susan Wing, Esq.
James R. Laramie, Esq.
Michael L. Whitener, Esq.
Joanne L. Leasure, Esq.
HOGAN & HARTSON
555 13th Street, N.W.
Washington, D.C. 20004

Paul J. Hayes, Esq.
Dean G. Bostock, Esq.
WEINGARTEN, SCHURGIN, GAGNEBIN & HAYES
Ten Post Office Square
Boston, MA 02109

FOR RESPONDENTS ALL-TAG SECURITY AG; TOYO ALUMINIUM K.K.:

Laurence R. Brown, Esq.
LAURENCE BROWN & ASSOCIATES, P.C.
2001 Jefferson Davis Highway
Suite 408
Arlington, VA 22202

Donald W. Marks, Esq.
Law Office - Suite 200
542 South 23rd Street
Arlington, Virginia 22202-2518

FOR RESPONDENTS ALL-TAG SECURITY AG:

A. W. Breiner, Esq.
Theodore A. Breiner, Esq.
BREINER & BREINER
115 North Henry Street
Alexandria, VA 22314

APPEARANCES cont'd

FOR RESPONDENTS ACTRON AG; ADT LIMITED; TOKAI DENSHI CO., LTD.:

Lavanya S. Ratnum, Esq.
Roger D. Taylor, Esq.
Michael K. Kirschner, Esq.
FINNEGAN, HENDERSON, FARABOW,
GARRETT & DUNNER
1300 I Street, N.W.
Washington, D.C. 20005-3315

Tom M. Schaumberg, Esq.
David M. Guth, Esq.
ADDUCI, MASTRIANI, SCHAUMBERG & SCHILL
1400 Connecticut Avenue, N.W.
Suite 250
Washington, D.C. 20036

Margaret M. Ayres, Esq.
Michael P. Carroll, Esq.
Joel M. Cohen, Esq.
DAVIS POLK & WARDWELL
1300 I Street, N.W.
Washington, D.C. 20005-3315

THE STAFF

Jeffrey R. Whieldon, Esq.

TABLE OF CONTENTS

ABBREVIATIONS

CB	Complainant's Brief
CBR	Complainant's Reply Brief
CPX	Complainant's Physical Exhibit
CRX	Complainant's Rebuttal Exhibit
CX	Complainant's Documentary Exhibit
FF	Findings of Fact
RAB	Brief of Actron Respondents
RABR	Reply Brief of Actron Respondents
RAX	Documentary Exhibit of the Actron Respondents Including Rebuttal Exhibits
RAPX	Physical Exhibit of the Actron Respondents Including Rebuttal Exhibits
RATB	Brief of All-Tag Respondents
RTBR	Reply Brief of All-Tag Respondents
RTPX	Physical Exhibit of the All-Tag Respondents Including Rebuttal Exhibits
RTX	Documentary Exhibit of the All-Tag Respondents Including Rebuttal Exhibits
SB	Staff's Brief
SBR	Staff's Reply Brief
SPH	Staff's Prehearing Statement
SPX	Staff's Physical Exhibit
SX	Staff's Documentary Exhibit
TB	Brief of Toyo
Tr	Transcript of Hearing and of Oral Closing Arguments

PROCEDURAL HISTORY

By notice dated March 4, 1993, the Commission instituted an investigation, pursuant to subsection (b) of section 337 of the Tariff Act of 1930, as amended, to determine whether there is a violation of subsection (a)(1)(B)(i) in the importation into the United States, the sale for importation, or the sale within the United States after importation of certain anti-theft deactivatable resonant tags and components thereof by reason of alleged infringement of claims 1, 2, 4, 6, 9, 10, 20, 21, 23 or 25 of U.S. Letters Patent No. 4,498,076 (the '076 patent) or claims 1, 2, 4, 6, 9, 10, 19, 20, 22, 24, 25, 26 or 27 of U. S. Letters Patent No. 4,567,473 (the '473 patent), and whether there exists an industry in the United States as required by subsection (a) (2) of section 337.

The matter is now ready for a final initial determination by the administrative law judge.

The initial determination is based on the entire record compiled at the hearing and the exhibits admitted into evidence. The administrative law judge has also taken into account his observation of the witnesses who appeared before him during the hearing. Proposed findings submitted by the parties participating in the hearing not herein adopted, in the form submitted or in substance, are rejected either as not supported by the evidence or as involving immaterial matters. The findings of fact of this initial determination include references to supporting evidentiary items in the record. Such references are intended to serve as guides to the testimony and exhibits supporting the findings of fact of the administrative law judge. They do not necessarily represent complete summaries of the evidence supporting said findings.

JURISDICTION

The Commission has in rem and subject matter jurisdiction.

Toyo has argued that the Commission does not have jurisdiction over it because the evidence does not show importation, sale for importation, or sale after importation into the United States by Toyo of infringing products. Complainant and the staff argued that the Commission does have jurisdiction over Toyo in this investigation.

Toyo's contention is rejected. In Amgen Inc. v. U.S.I.T.C., 902 F.2d 1532, 14 USPQ2d 1734, 1736-37 (Fed. Cir. 1990) (Amgen) the Federal Circuit has stated that:

> As is very common in situations where a tribunal's subject matter jurisdiction is based on the same statute which gives rise to the federal right, the jurisdictional requirements of section 337 mesh with the factual requirements necessary to prevail on the merits. In such a situation the Supreme Court has held that the tribunal should assume jurisdiction and treat (and dismiss on, if necessary) the merits of the case.

Id at 1737-38, citing Bell v. Hood, 327 U.S. 678, 682 (1946); Jackson Transit Authority v. Local Division 1285, Amalgamated Transit Union, AFL-CIO-CLC, 457 U.S. 15, 21 (1982); Do-Well Machine Shop v. United States, 870 F.2d 637, 639-49 (Fed. Cir. 1989) (footnotes omitted). Accordingly, the Court reversed the Commission's determination, and held that the Commission should have "assumed jurisdiction, and, if the facts indicate that Amgen cannot obtain relief . . . the Commission should have dismissed on the merits." Id at 1739. The two exceptions to this general rule, where the claim is "immaterial and is brought solely for the purpose of obtaining jurisdiction in a particular forum" and where the claim is "wholly insubstantial and frivolous," were found not to exist in that case. Id at 1738.

The allegations of complainant in the complaint regarding Toyo's importation are found to be neither "immaterial" nor brought solely to obtain jurisdiction in the Commission, nor to be "wholly insubstantial and frivolous." Thus, there is substantial support in the record for complainant's allegations. For example, Toyo supplies laminated circuit patterns exclusively to All-Tag (FF 783, 796). Also Toyo knew prior to institution of this investigation that All-Tag used the material supplied by Toyo for manufacture of deactivatable resonant tags (FF 782), and Toyo knew, at least as of February 1993, that All-Tag intended to import such deactivatable tags into the United States (FF 785). Toyo has continued to provided All-Tag with laminated circuit material for manufacture into deactivatable resonant tags (FF 785) and All-Tag has imported deactivatable resonant tags into the United States (FF 68).

PARTIES

Incorporated by reference are FF 3 to 13 which identify the parties and their respective status. The respondents that appeared at the hearing were (1) Actron AG, ADT Limited and Tokai Denshi Co., Ltd. (Tokai) (Actron respondents), and (2) All-Tag Security AG and Toyo Aluminum K. K. (Toyo) (All-Tag respondents).

OPINION ON VIOLATION

The products in issue relate to certain anti-theft deactivatable resonant tags and components thereof. Incorporated by reference are FF 14 to 18 which describe in detail said products.

I. Importation and Sale

Incorporated by reference are FF 57 to 74 which relate to the importation and sale of the accused products. The administrative law judge finds that there has been importation and sale of the accused tags.

II. Domestic Industry

At closing argument the administrative law judge stated that his understanding was that no party had challenged the assertion that complainant uses the inventions in issue in an existing domestic industry. Counsel for each of the Actron and All-Tag respondents agreed with that understanding (Tr. at 3654-55). The administrative law judge finds that there exists a domestic industry involving the claimed subject matter. See FF 19 to 56.

III. Interrelationship of the '076 and '473 Patents In Issue

As seen from col. 1 of the '473 patent (CX-10), the '076 patent (CX-9) and the '473 patent are related in that the '473 patent application was a continuation application of the application for the '076 patent. Hence the specifications of the two patents in issue are substantially identical in substance as confirmed by a comparison of the specifications.

IV. Embodiments of the Claimed Subject Matter In Issue

The claimed subject matter in issue includes at least two embodiments, only one of which is in issue. Illustrating with generic claims 1 of the '076 patent and the '473 patent in issue (FF 188, 224), each of those claims cover at least two embodiments as admitted by all of the parties, viz. (1) the open circuit or burn out mode for deactivating a resonant tag and (2) the short circuit mode for deactivating a resonant tag (FF 214). In the open circuit or burn out mode, one actually opens the circuit by destroying all of the conductive area at one particular spot, i.e. a portion of the circuit is broken to create an open circuit by an arc that is created through the substrate between opposing areas of metallization and that arc is triggered by the voltage in the circuit (FF 112, 113). In contrast whether one burns out all the metal at a particular spot in the short circuit mode is not relevant because in the short circuit mode one is establishing a short circuit between two separate metallizations that had not previously been connected and changing the circuit by that means (FF 121, 122). The named inventor Lichtblau has described the short circuit mode of the patents in issue as inducing a short circuit at one or more indentations in the capacitor, and the open circuit mode of the patents in issue as the burning out a conductive lead by placing an indent where that lead joins the capacitor (FF 115). For the open circuit mode to work in the patents in issues, the spark discharge acts as a short circuit in the capacitor such that so much current flows that the resist of heating in the connecting lead is very high with the connecting lead portion burning out thereby forming an open circuit (FF 117).

It is uncontroverted that complainant's tag in issue relates only to the short circuit mode and that complainant has accused respondents of infringing the claims in issue only through an alleged practice of the short circuit mode.[1] Accordingly the parties have concentrated for the most part in this investigation on the short circuit mode. Moreover there is no evidence that the open circuit mode was ever successfully commercialized.[2]

---

1 The '076 patent discloses deactivation of single frequency tags and dual frequency tags also. However, only the single frequency tag relating to the short circuit mode is in issue (FF 94).

2 The application for the '076 patent was filed on May 10, 1982 (FF 89). When the named inventor Lichtblau was asked why in an April 1981 draft application he described the open circuit mode which he did not successfully make instead of the successful short circuit mode which he found surprisingly easy, he testified that he did so because the open circuit mode was what he started with and although the short circuit mode was a much better way, when he writes patents he tries to cover everything he has done in every way he can think of (FF 323).

With respect to the short circuit mode an arc discharge results in a permanent short circuit of melted aluminum from the electrodes, thus short circuiting the capacitor. Figure 8 of the patents in issue illustrates the short circuit mode for the single frequency tag, and Figure 9 represents the short circuit mode for the dual frequency tag (FF 121). In the embodiments of Figures 8 and 9, an indentation is made on one or both of the capacitor plates to reduce the thickness of the dielectric film at this indentation and thereby reduce the voltage required to cause an arc between the capacitor plates. Upon application of energy at the resonant frequency of the tag of sufficient magnitude, electrical breakdown occurs through the dielectric film at the indentation and since energy is being applied to the tag, the arc tends to be sustained and forms a plasma between the capacitor plates. By reason of the Quality Factor (Q) (FF 172) of the resonant circuit, very little energy is dissipated in the resonant circuit itself and the energy is dissipated in the arc formed between the plates. It is the energy of the arc which rapidly heats the plasma and causes vaporization of the metal of the capacitor plates and it is the vaporized metal which causes the arc to become conductive and short circuit the capacitor plates, thus temporarily destroying the resonant properties of the circuit and causing the current through the arc and voltage across the arc to rapidly collapse. The arc thereafter cools and causes deposition of the previously vaporized metal between the capacitor plates. If a short circuit is formed, the tag is permanently destroyed. If a short circuit is not formed, the voltage again builds up across the capacitor plates in response to the applied energy, and the process is repeated. Since the plastic film has already been ruptured and weakened at the breakdown point, the arc will normally form again at the same point and additional metal will be vaporized and deposited until a permanent short circuit occurs (FF 122).

In the '076 patent the short circuit mode is not described starting at least with column 3, line 12 and continuing to column 5, line 36 (FF 114). The drawings of the patents in issue that illustrate the open circuit mode for a single frequency tag include Figures 1, 3 and 4. For the dual frequency tag, the open circuit mode includes Figures 2, 5 and 6. Figure 1 in the patents in issue is described as a schematic diagram of a resonant tag embodying the invention while Figures 3 and 4 are said to be pictorial views of respective sides of the resonant tag circuit of Figure 1. Figure 2 is described in the patents in issue as a schematic diagram of a dual frequency resonant tag circuit embodying the invention while Figures 5 and 6 are said to be pictorial views of respective sides of the resonant tag circuit of Figure 2 (FF 118).

Claim 2 of the '076 patent dependent on claim 1 relates to both the open circuit and short circuit modes (FF 215). Claim 4 of the '076 patent, dependent on claim 1, relates only to the short circuit mode (FF 216). Each of independent claims 6, 9, 10, 20 of the '076 patent relates to both the open circuit and the short circuit modes of deactivation (FF 217 to 220). Claim 21 of the '076 patent, which is dependent upon claim 20, relates to the open circuit and the short circuit modes of deactivation (FF 221). Claim 23 of the '076 patent, which is dependent on claim 20, relates only to the short circuit mode of deactivation (FF 221). Independent claim 25 of the '076 patent relates to both the open circuit and short circuit modes of deactivation (FF 223).

Referring to the claims of the '473 patent in issue, claim 2 dependent on claim 1, relates to the open circuit and the short circuit modes of deactivation (FF 255). Claim 4, dependent on claim 1, relates only to the short circuit mode (FF 256). Independent claims 6, 9, 10, 19 and 24 relate to both modes (FF 257 to 260). Claim 20, dependent on claim 19, relates to both modes (FF 261). Claim 22, dependent on claim 19, relates only to the short circuit mode of deactivation (FF 262). Independent claim 24 relates to both modes of deactivation (FF 263).

There is expert testimony that the indentation formed in the embodiments of Figures 8 and 9 has reduced the distance between the two capacitor plates and caused the dielectric material to be thin at the indentations and therefore when sufficient energy is coupled to the resonant circuit and the voltage on the tag reaches a threshold level, an arcing will occur through the dielectric between the capacitor plates at the breakdown or burnout point that short circuit the capacitor (FF 124). There is also expert testimony that the mechanism of breaking down through an indentation that thins the dielectric, such as shown in the embodiments of the short circuit modes of Figures 8 and 9, is identical for the open circuit mode although the arc discharge in the open circuit mode vaporizes metal in the vicinity of the breakdown region to destroy the conductive path thereby permanently destroying the resonant characteristics of the tag circuit (FF 125).

V. Claim Construction

Complainant has alleged that each of the respondents infringe certain claims of the '076 and the '473 patents. The Actron respondents and the All-Tag respondents, as well as the staff, have alleged that the asserted claims are invalid. Any analysis of infringement initially requires a proper construction of the claims to determine their scope. Palumbo v. Don-Joy Co., 762 F.2d 969, 974, 226 USPQ 5 (Fed. Cir. 1985). Like an analysis for patent infringement, an analysis for patent validity also requires interpretation of the claims in issue. In addition a claim must be given the same meaning for the purposes of analyzing each of the validity and infringement issues. White v. Dunbar, 119 U.S. 47, 51 (1886); Senmed Inc. v. Richard-Allen Medical Industries, Inc., 888 F.2d 813, 818 n.7, 12 USPQ 2d 1508, 1511 (Fed. Cir. 1989); W. L. Gore & Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983). cert. denied, 469 U. S. 851 (1984).

Claims must be construed to uphold their validity, if possible. Lewmar Marine, Inc. v. Barient, Inc. 827 F.2d 744, 749, 3 USPQ2d 1766, 1770 (Fed. Cir. 1987), cert. denied, 484 U.S. 1007 (1988). The words of a claim are given their ordinary and accustomed meaning unless it appears from the specification and prosecution history that the inventor intended differently. Smithkline Diagnostics, Inc. v. Helena Laboratories Corp., 859 F.2d 878, 882, 8 USPQ2d 1468, 1471 (Fed. Cir. 1988); Envirotech Corp. v. Al George, Inc., 730 F.2d 753, 759, 221 USPQ 473, 477 (Fed. Cir. 1984). A claim should be construed as it would be by one skilled in the art. Loctite Corp. v. Ultraseal Ltd., 781 F.2d 861, 867, 228 USPQ 90, 93 (Fed. Cir. 1985). When an inventor chooses to give terms of a claim uncommon meanings, those uncommon definitions must be explained within the patent disclosure and without regard to the accused device. See Intellicall, Inc. v. Phonometrics, Inc., 952 F.2d 1384, 1388, 21 USPQ2d 1383, 1386 (Fed. Cir. 1992); SRI Int'l v. Matsushita Elec. Corp. of Am., 775 F.2d 1107, 1118, 227 USPQ 577, 583 (Fed. Cir. 1985).

If parties dispute the meaning of critical claim language, a court may rely on extrinsic evidence, including testimony of witnesses as well as the specification, the prosecution history,[3] prior art, and other claims. Tandon Corp. v. United States Int'l Trade Comm'n, 831 F.2d 1017, 1021, 4 USPQ2d 1283, 1286 (Fed. Cir. 1987) (Tandon). The specification may be used to interpret what the patentee meant by words or phrases in claims, but the claims, not the specification, determine the scope of the invention. E. I. duPont de Nemours & Co. v. Phillips Petroleum Co., 849 F.2d 1430, 1433, 7 USPQ2d 1129, 1131 (Fed. Cir. 1988) (du Pont).

Claims may be written in a means plus function form. 35 U.S.C. §112 ¶6. In construing a "means plus function" claim, a number of factors, including the language of the claim, the patent specification, the prosecution history of the patent, other claims in the patent, and expert testimony may be considered. Durango Associates, Inc. v. Reflange, Inc., 843 F.2d 1349, 1356, 6 USPQ2d 1290, 1294 (Fed. Cir. 1988). It is error to read a "means plus function" claim as limited to a particular means set forth in the specification because section 112 directs that such claims include equivalents of such means. DMI, Inc. v. Deere & Co., 755 F.2d 1570, 1574, 225 USPQ 236, 238 (Fed. Cir. 1985). Reference to a preferred embodiment in a specification is not a claim limitation. Laitram Corp. v. Cambridge Wire Cloth Co., 863 F.2d 855, 865, 9 USPQ2d 1289, 1299 (Fed. Cir. 1988), cert. denied, 490 U.S. 1068 (1989).

Under the doctrine of claim differentiation, the presence of an express limitation in one claim negates an intent to limit similarly by implication a claim in which the limitation is not expressed. Kalman v. Kimberly-Clark Corp., 713 F.2d 760, 770, 218 USPQ 781, 788 (Fed. Cir. 1983), cert. denied.

---

[3] The prosecution history of the patents in issue was minimal (FF 264 to 266).

465 U.S, 1026 (1984). It is improper to read into an independent claim a limitation that another dependent claim sets forth explicitly. Whittaker Corp. v. UNR Industries, Inc., 911 F.2d 709. 712, 15 USPQ2d 1742, 1744 (Fed. Cir. 1990).

In issue are the following means plus function claims of the '076 patent: independent claim 1, dependent claims 2 and 4 (each dependent on claim 1), independent claims 6, 9, and 10, independent claim 20, dependent claims 21 and 23 (each dependent on claim 20) and independent claim 25. In issue are the following means plus function claims of the '473 patent: independent claim 1, dependent claims 2 and 4 (each dependent on claim 1) independent claims 6, 9, 10 and 19, dependent claims 20 and 22 each dependent on claim 19, and independent claim 24.[4] Illustrative independent claim 1 of the '076 patent reads:

> 1. For use in an electronic security system which includes means for providing in a controlled area an electromagnetic field of a frequency which is swept within a predetermined range and means for detecting the presence of a resonant tag circuit having a resonant frequency within said range, a resonant tag circuit comprising:
>
> (1)[5] a planar substrate of dielectric material;
>
> (2) a tuned circuit on said substrate in planar circuit configuration and resonant at said frequency;
>
> (3) said tuned circuit having a pair of conductive areas in alignment on respective opposite surfaces of the substrate to define a capacitor of the tuned circuit;

---

4 For the relationship of the various means claims in issue, see FF 189 to 213 and 227 to 245.

5 The numbers (1), (2), (3) and (4), although not in claim 1, have been used by the parties to refer to the first, second, third and fourth clauses of claim 1.

(4) means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit. [FF 189]

There is no dispute with respect to the meaning of the preamble of claim 1. As the '076 patent discloses, electronic security systems to which the preamble relates are known for detecting the unauthorized removal of articles from an area under detection with such systems having been employed especially for use in retail stores to prevent the theft of articles from store and for use in libraries to prevent the theft of books (FF 98, 126).

The first clause of claim 1 has the term "planar." The All-Tag respondents argued that "planar" means generally flat and within a plane. (RTB at 21). The staff argued that the term "planar" should be interpreted to mean that the dimensions of length and width are much greater than the dimensions of thickness and that the presence of an indentation should not serve to make the substrate "non-planar" because it would make the claim inherently contradictory (SB at 51). Complainant argued that the term "planar," as used in the first clause of claim 1 and elsewhere in the '076 and '473 patents, means "generally flat" with dimensions of length and width that are "greater than the dimensions of thickness" and includes that portion of the capacitor plate indented to enable deactivation (CBR at 5). The Actron respondents have argued that the term "planar" means generally flat or substantially flat (Tr. at 3497).

There is no indication in the '076 patent that the term "planar" should have an uncommon meaning, although the '076 patent teaches for example that an indentation may be made on one or both of the capacitor plates (FF 138). Webster's Seventh New Collegiate Dictionary defines "planar" as relating to a plane and "plane" as a flat or level surface. Hence, consistent with the dictionary definition and the disclosure of the '076 patent, the term "planar" is interpreted as generally flat with the exception of an indentation or its equivalent being made in a capacitor plate.

There is no dispute with respect to the second clause of claim 1. As Rhoads testified, the clause refers to a substrate on which a circuit is created, and where the circuit will be resonant within the ranges of the frequencies the electronic security system is designed to detect (FF 190).

The third clause of claim 1 adds that the tuned circuit is going to have in part an area which will function as a capacitor and which will be constructed by having conductive areas on the two sides of the substrate in alignment (FF 191). The administrative law judge rejects the argument of the Actron respondents that "conductive areas . . . on respective opposite surfaces of the substrate to define a capacitor of the tuned circuit" means that a claimed capacitor is defined by only those areas having the primary function of generating capacitance for the tuned circuit (RAB at 10). While under the heading "Detailed Description of the Invention" of the '076 patent, the patent in describing the resonant tag circuit of Figure 1 discloses that the "conductive area 50 serves as the capacitor plate 12 and thus capacitor C1 is provided by the confronting conductive areas 46 and 50" (FF 157), the '076 patent does not require that the capacitor plates should be the only conductive areas in the claimed resonant tag and/or so limit the plates.

There is a dispute with respect to the meaning in the fourth clause of claim 1 of the phrase "between the conductive areas and through the substrate." Complainant argued that the fourth clause merely teaches that the capacitor plates should be moved closer together to achieve deactivatability.

(Tr. at 3726-27). However all words in a claim must be considered. See In re Wilson, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). Moreover the words of a claim, when read in light of the specification, must reasonably apprise those skilled in the art of the scope of the invention so that competitors will clearly understand what would constitute infringement. See Amgen, Inc. v. Chugai Pharmaceutical Co., 927 F.2d 1200, 1217, 18 USPQ2d 1016, 1030 (Fed. Cir.), cert. denied 112 S.Ct. 169 (1991) (Chugai).

Complainant also argued, as well as the staff, that the phrase "between the conductive areas and through the substrate" identifies the location where occurrence of an arc discharge is made more likely to occur and does not relate to the material through which the arc discharge will pass. Complainant argued that its Rhoads gave an example of how one could form a structure that would create a preferred path between conductive areas that would stay on a single surface of the tag. Accordingly complainant argued that, to eliminate any confusion, the directional or locational phrase "through the substrate" is used (Tr. at 3701-02).

The Actron and All-Tag respondents argued that the fourth clause of claim 1 refers to a path where the arc discharge propagates directly through the plastic film substrate, i.e. the disclosed electrical breakdown must take place through the polymer or through whatever the equivalent structural supporting material is (Tr. at 3716-17). Thus they argued that the phrase "through the substrate" means that the arc has to go through the plastic and ruptured it before one gets a short circuit (Tr. at 3729).

The Actron and All-Tag respondents also argued that the argument of complainant and the staff, to the effect that "between the conductive areas and through the substrate" identifies only a location, is "completely contrary" to elementary patent law. Relying on certain texts, they argued that the definite article "the" in a claim is used to refer to an element which has been introduced earlier in the claim, i.e. whenever an element or part of an element is referred to a second time in a claim the definite article "the" or more formalistically the term "said" precedes the recitation of the element for the second time; that under elementary claim interpretation, the term "conductive areas" recited in the fourth clause of claim 1 refers to the term "conductive areas" referred to in the third clause of claim 1; and that there is in the third clause of claim 1 the language "a pair of conductive areas [on said substrate] in alignment on respective opposite surfaces of the substrate to define a capacitor." Hence it is argued that the recitation in the fourth clause of claim 1 that the arc goes "between the conductive areas" distinguishes over what Rhoads "speculated about."

It was further argued by the Actron and All-Tag respondents that if complainant's and the staff's position is accepted, then the terms in the fourth clause "between the conductive areas" and "through the substrate" mean the same thing and would be redundant; that under the law of claim interpretation, one should not find language of a claim to be redundant or superfluous; and that in reality the language in the fourth clause is not redundant because the specification teaches that "through the substrate" defines a path wherein the arc discharge propagates directly through the substrate (Tr. at 3469-71, 3703-04, 3708-10).

In "Mechanics of Patent Claim Drafting," under the subheading "Section 20-Antecedents-Indefiniteness," it is stated that the first time an element, or part, is mentioned in a claim the indefinite article "a" or "an" should be used, such as "a container," and that when said element or part is referred to again, the definite article should be used as "the container." Also the word "said" is said to be used rather than "the" to refer back to previously recited elements. Appendix E states that the definite article "the" or "said" is used to refer to an element which has been introduced earlier in a claim. J. Landis, Mechanics of Patent Drafting 29 (2d ed. 1974).

In another text under the subheading "Antecedent Basis Must Be Present" in section 14.06 it is stated that an ambiguity would exist in a claim if an element were preceded by the definite article "the" when first mentioned in a claim; that accordingly a foundation or antecedent basis must be laid for each element recited and this can be done by introducing each element with the indefinite article "a" or "an"; that subsequent mention of the element is to be modified by the definite article "the" or by "said" or by "the said" thereby making later mention(s) of the element unequivocally referable to its earlier recitation. P. Rosenberg, Patent Law Fundamentals §14.06 (2d ed. rev. 1993). The importance in having an antecedent basis in a claim for a claimed phrase such as "said collar" to remove any ambiguity was recognized by a federal district court in Slimfold Mfg. Co. v. Kinkead Properties, Inc., 626 F.Supp. 493, 495, 229 USPQ 298, 299 (N.D. Ga. 1985) cited by Rosenberg.

In yet a third text it is stated that whenever an element or a part of an element is referred to a second time in a claim, it is preceded by the definite article "the" or more formalistically, by the term "said"; and that whenever an element or part of an element is recited in a claim utilizing either "the element" or "said element", it is necessary that there exists antecedent basis for that element in the claim, i.e. the element must have already been introduced in the claim. Patent Practice, Vol. 2 at 10-18 (I. Kayton & K. Kayton, 5th ed.)

Based on the above authority, the administrative law judge finds that the fourth clause of claim 1 of the '076 patent refers to a path where the arc discharge propagates directly through the planar substrate of dielectric material. This finding is supported by the specification of the '076 patent which teaches that "through the substrate" defines a path where the arc discharge propagates directly through the substrate (FF 163, 164).[6]

The Actron respondents further argued that the "means" of the fourth clause encompasses only a small point indentation, and its equivalent, such as multiple small indentations in the aluminum or small bumps in the aluminum, within a defined capacitor plate because only a small indentation or such equivalent will preserve the original capacitance of the resonant tag and not degrade the quality factor (Q) of the resonant circuit (FF 132, 133, 172) as required by the patent (RAB at 13-16; Tr. at 3659). The Actron respondents argued that the difference between the prior art '219 patent, which is referred to in the '076 specification (FF 147 to 149), and the '076 patent is in the deactivation mechanism and that the '076 specification teaches that

---

[6] The Actron respondents argued that the "means" of the fourth clause is in the metal of the conductive areas in that an alteration is made in the metallic capacitor plate, not the substrate, which it is alleged results in defining the preferred path for breakdown and is the only thing disclosed in the '076 patent (RAB at 11-12; Tr. at 3695). However the Actron respondents admitted that while the structural element of the "means" in the fourth clause of claim 1 is in the change in the metal of the capacitor plates, such as an indentation in the metal, if said change is made there is a thinning of the substrate as a result of making a physical alteration in the conductive material. Hence the substrate has been affected (Tr. at 3698-99). Thus the administrative law judge rejects the argument that the "means" of the fourth clause refers only to the metal of the conductive areas and finds that the "means" of the fourth clause can affect the substrate.

The All Tag respondents also argued that "substrate" as used in claim 1 is limited to a "rigid" polymer (RTB at 24). The administrative law judge can find nothing in the '076 patent which limits the substrate to a "rigid" polymer.

whatever the deactivation mechanism recited in the means plus function fourth clause of claim 1 it should not effect the Q of the tag. Accordingly, it was argued that any deactivation mechanism, including an indentation, of the claimed tag must be limited by the requirement in the '076 specification that the Q not be affected (Tr. at 3670-71).

Complainant argued that the specification of the '076 patent, as it relates to the Q of the circuit, is merely "historical background" (CBR at 7). The '076 patent however teaches otherwise. Thus the patent, under the heading "Summary of the Invention," states that the resonant tag circuit of the invention is electrically deactivated by a breakdown mechanism operative within the resonant structure of the tag without need for a fusible link and without affect or reduction in the Q of the resonant circuit (FF 127).[7] The administrative law judge finds that the phrase "without affect or reduction in the Q of the resonant circuit" relates to the invention in issue and is not limited to historical background and thus must be considered in interpreting the claims in issue. In addition the '076 patent, under the subheading "Detailed Description of the Invention," disclose that the resonant circuits of FIGS. 1 and 2 do not require the use of a small narrow fuse and that there is, thus, no additional resistance placed in series with the inductor and capacitor elements of the circuit and therefore, no degradation of the Q of

---

7 Although complainant argued that the claims in issue do not require that the deactivation structure have no affect on the tag's Q, reference may be made to the specification for claim interpretation when the meaning of key terms of claims is disputed. Tandon 831 F.2d at 1021, 4 USPQ2d at 1286. In contrast to a situation relating an extraneous limitation appearing in the specification, i.e. a limitation from the specification wholly apart from any need to interpret what the patentee meant by particular words or phrases in the claim, where a specification requires a limitation with respect to meaning of words or phrases in the claim, that limitation should be read into the claim. See duPont, 849 F.2d at 1433, 7 USPQ2d at 1131.

the resonant circuit (FF 128). Unrefuted is expert testimony that in order not to affect the Q of the resonant circuit, as stated for example in the summary of the invention section of the '076 patent, one would have to make any indentation a relatively small part of the capacitor (FF 130).[8]

Complainant argued that the named inventor Lichtblau at the hearing in 1993 testified that one would get a Q of 75 to 100 versus a Q of 35 to 50 by varying certain parameters (FF at 129). The administrative law judge, however, cannot find that teaching in the '076 patent, which issued in 1985 (FF 89). Lichtblau further admitted that there is no description in the '076 patent that a Q of 75 to 100 is desirable (FF at 129). Moreover while the fourth clause in issue is in "means plus function" format, which are subject to the last paragraph of 35 USC §112,[9] a means clause does not cover every means for performing the specified function. Rather the last paragraph of

---

8 Complainant, at closing argument referenced the Imaichi U. S. Patent No. 5,108,822 (Imaichi patent) which issued on April 28, 1992 and on its face is assigned to respondent Tokai Electronics Co., Ltd., of Japan (Tokai) (RAX-82), and alleged a contradiction between the position taken by Tokai in the Imaichi patent and the present position of the Actron respondents (which includes Tokai) with respect to the Q factor (Tr. at 3671). The validity of the Imaichi patent is not in issue in this investigation. Moreover complainant has not objected to the administrative law judge taking judicial notice of a disclaimer of the Imaichi patent under 35 U.S.C. §253 dated August 13, 1993 and filed in the U. S. Patent and Trademark Office. By the disclaimer Tokai disclaimed and dedicated to the public the entire term of the Imaichi patent. In contrast, in this investigation complainant has alleged infringement of certain claims of the '076 patent by the Actron respondents and has requested issuance of a exclusion order because of said infringement.

9 That paragraph of 35 U.S.C. §112 reads:

> An element in a claim for a combination may be expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof, and such claim shall be construed to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.

section 112 rules out the possibility that any and every means which performs the function specified in the claim literally satisfies that limitation. While encompassing equivalents of those means disclosed in the specification, the provision acts as a restriction on the literal satisfaction of a claim limitation. Laitram Corp. v. Rexnord Inc., 939 F.2d 1533, 1536, 19 USPQ2d 1367, 1570 (Fed. Cir. 1991) (Laitram). In the context of section 112, an equivalent results from an insubstantial change which adds nothing of significance to the structure. Indeed the last paragraph of section 112 "operates more like the reverse doctrine of equivalents than the doctrine of equivalents because it restricts the coverage of literal claim language." Valmont Indus., Inc. v. Reinke Mfg. Co., 983 F.2d 1039, 1043, 25 USPQ2d 1451, 1454 (Fed. Cir. 1993).

Accordingly, based on unchallenged expert testimony (FF 130) and the disclosure of the specification of the '076 patent, the fourth clause of illustrative claim 1 of the '076 patent is found to cover only a small point indentation, and its equivalent such as multiple, small indentations in metal or small burnings in the metal, within a defined capacitor plate because only a small indentation or such equivalent will preserve the original capacitance of the resonant tag and not degrade the quality factor (Q) of the resonant circuit.

VI. Validity of the Claims In Issue

35 U.S.C. §282 creates a presumption that a United States patent is valid. Invalidity must be proven by clear and convincing evidence. Hewlett-Packard Co. v. Bausch & Lomb, Inc., 909 F.2d 1464, 1467, 15 USPQ2d 1515, 1527 (Fed. Cir. 1990).

(a) Claims 1, 2, 4, 6, 9, 10, 20, 21, 23 or 25 of the '076 Patent and Claims 1, 2, 4, 6, 9, 10, 19, 20, 22 and 24 of the '473 Patent (Means Claims) Are Not Invalid Under 35 U.S.C. §103

Respondents and the staff argued that the means claims are obvious under 35 U.S.C. §103. Complainant argued that respondents and the staff have failed to construe properly the prior art.

The leading authority on obviousness is that of the Supreme Court in Graham v. John Deere Co., 383 U.S. 1 (1966) (Graham) which sets forth four factors which must be considered: (1) the scope and content of the prior art; (2) the differences between the prior art and the claimed inventions; (3) the level of ordinary skill in the pertinent art; and (4) objective evidence of non-obviousness (the so-called "secondary considerations"). Obviousness is measured by considering whether a hypothetical person, having all of the prior art at hand, would have found the same solution when addressing himself to the same problem. _Chisum, Patents §5.04[1] (1993); Republic Indus.,Inc. v. Schlage Lock Co., 592 F.2d 963, 975, 200 USPQ 769, 781 (7th Cir. 1979). When prior art is being combined in an effort to prove obviousness, the prior art must contain some teaching, suggestion, or incentive to make the combination made by the inventor. Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934, 15 USPQ2d 1321, 1323 (Fed. Cir.) cert denied, 498 U.S. 920 (1990).

To constitute analogous art, "the reference must either be in the field of the applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." In re Oetiker, 977 F.2d 1443, 1447, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). Accord In re Clay 966 F.2d 656, 659, 23 USPQ2d 1058, 1061 (Fed. Cir. 1992).

The Actron respondents argued that the means claims are obvious over a '219 patent in view of a Northeved patent and a Blythe reference; the '219 patent in view of Northeved or a Smith patent in view of a Welsh patent and further in view of the Blythe reference or a Lawson reference; the '219 patent in view of the Smith patent or Welsh patent or a Northeved patent and further in view of Blythe or Lawson and further in view of a Otley reference or a Stumpe patent; the '219 patent in view of the Northeved or Smith or Welsh patents and further in view of certain alleged Lichtblau's admissions; the '219 patent in view of Northeved and certain testimony of Zahn; a Vandebult patent in view of Northeved; or Vandebult in view of Northeved and certain alleged admissions of Lichtblau.[10]

The All-Tag respondents adopted the position of the Actron respondents on the obviousness of the means claims and in addition argued that they are obvious over Northeved or Smith in view of the '219 patent and a Harari patent; the Northeved or Smith patents in view of the '219 patent and Blythe; Northeved or Smith in view of the '219 patent and Lawson; Northeved or Smith in view of the '219 patent and certain admission of Lichtblau; or Northeved or Smith in view of the '219 patent and certain alleged admission of complainant's Rhoads.

The staff's position is that the means claims are obvious over the '219 patent taken with Smith and Blythe; the '219 patent taken with the Smith and Lawson; or the '219 patent taken with Smith and certain testimony of Lichtblau.

---

10 The administrative law judge found the written posthearing submissions of the Actron and All-Tag respondents and the staff confusing as to the precise art and its application on which they were relying in their arguments that the means claims in issue were obvious. Accordingly before the lunch break on the day of closing oral arguments, he requested the parties to set forth specifically, after the lunch break, the specific art being relied upon to make the means claims in issue obvious and also to state how that art was being applied.

At the outset the record establishes that a person of ordinary skill in the art would have a bachelor's degree in the physical sciences, preferably physics or electrical engineering and have about two years experience in resonant circuits or with inductor/capacitor circuits (FF 416 to 418).

As argued at closing argument, a primary reference relied on by the respondents and the staff is the '219 patent (FF 439 to 462). Graham requires that the differences between the '219 patent and the claimed invention in issue be looked at. For a number of years prior to the invention in issue complainant had been manufacturing and selling resonant tags which were deactivatable manually and were manufactured in accordance with Lichtblau's '219 patent, which expired in October 1992. Such tags were of the same general construction as the tags in issue with the exception that the '219 tags lacked the fourth means clause of illustrative claim 1 of the '076 patent (FF 188, 440).

The '219 patent, referenced in the '076 patent (FF 147), discloses a fabrication process for a dual-frequency deactivatable resonant tag which is deactivated by means of a "fusible link" (FF 443). The fusible link is a relatively narrow conductive path located on the lower capacitor plate. During operation of the electronic security system, the tag's frequency is applied to the tag circuit to cause the fusible link to be destroyed, thereby altering the resonant properties of the tag (FF 444). The fusible link tags however required a lot of power to deactivate the tag, put resistance into the circuit, and made the tag more difficult to detect (FF 451).

In developing the claimed invention in issue there was a desire to find a method of deactivation of a resonant tag circuit that could be accomplished with low power and which was commercially practicable (FF 452). The '219 patent does not tell one skilled in the art how to solve the problem of finding an alternative method to the fusible link mechanism which will permit deactivation at lower energy levels (FF 442). Thus the '219 patent neither describes indenting the capacitor to bring the capacitor plates closer together (449), nor deactivation by causing a short circuit to occur permanently between the capacitor plates nor a means for creating an arc discharge between the capacitor plates (FF 441).

With respect to the Northeved and Smith patents, relied on as either primary and/or secondary references, Northeved (FF 427 to 438) does disclose an electronic marking circuit that can be used as an electronic anti-theft device and refers to a capacitor that "is specially constructed and dimensioned in such a manner that it is short-circuited" (427, 436), but does not disclose how to short circuit the capacitor and how to create a permanent short circuit (FF 432 to 436). Smith (FF 463 to 483) discloses a merchandise mark sensing system using resonant frequency (L-C) circuits for the automatic reading of prices and stock keeping units (FF 463). The methods in Smith by which devices, such as L-C circuits, can be destroyed involve shorting the capacitor or opening the inductor (FF 467). A P-N junction diode element permits deactivation of a circuit (FF 471). The P-N junction diode taught by Smith would be prohibitive in cost with no commercially feasible application to disposable resonant tags (FF 473). There is also no disclosure in Smith of indenting any part of a capacitor to cause the circuit to break down at a preferred location to deactivate a tag (FF 476). There is further no explanation in Smith of how to create a short circuit or open circuit by any means other than an over-voltage (FF 478). Moreover the capacitors described in Smith are not constructed so that one plate of the capacitor can be indented towards the other plate of the capacitor (FF 481). In addition, Smith discloses nothing about deforming a capacitor to bring it closer to another capacitor to enhance the likelihood of deactivation (FF 482). To the contrary, Smith discloses, as one of its alternatives, destroying the resonant properties on the tag by opening the inductor which is taught in the '219 patent (FF 483).

The Vandebult patent (FF 406 to 415), relied on by the Actron respondents as a primary reference, is for a process for fabricating resonant tag circuit constructions (FF 406). It teaches fabrication of the substrate, as described in the '219 patent, where an extruder having a die emits a continuous web of polyethylene onto a metal plate (FF 409) and thus like the '219 patent teaches constructing a tag having each of the first three elements of the means claims in issue of the '076 and '473 patents (FF 410). It further discloses applying heat and pressure to the resonant tag to control the thickness of the dielectric between the capacitor plates to tune the resonant frequency of the tag. The thinning adjusts the capacitance and may be effected over the entire width of the web, or simply in the region of the capacitor plates (FF 408). The administrative law judge however finds nothing in the Vandebult patent which suggests a small point indentation or its equivalent in the capacitor plates. Moreover the administrative law judge can find no suggestion in Vandebult of obtaining a structure wherein a permanent short circuit is created. To the contrary, Tokai's Matsumoto performed tests which showed that when in the Vandebult process overall heat-pressing (heat seal) is performed, deactivation does not occur unless pressing jigs and conditions are selected carefully and unless the shorting area is fastened temporarily in advance, and concluded that a resonant tag and deactivator "cannot be manufactured" following Vandebult (FF 751).

Prior to the invention in issue, it was known that (1) if one shorted out the capacitor plates of a resonant circuit the resonant properties of that circuit would be destroyed (FF 421) and (2) one could cause an arc discharge at a preferential point between two capacitor plates by bringing the plates together at that point more closely than the plates were at other points (FF 422). The claimed invention in issue, however, results in a permanent short circuit being formed for deactivating a resonant tag for use in a security system (FF 164). The administrative law judge can find nothing in Northeved, the '219 patent, Smith or Vandebult relied upon by the Actron, the All-Tag respondents and/or the staff which suggests how a permanent short circuit can be obtained in a resonant tag for deactivation.

There were motivations in the early 1980s to solve the problems of the fusible link tags disclosed in the '219 patent because when the high power necessary to destroy the fusible link was generated, other equipment as may be in the area of a retail establishment was adversely affected. In addition the dual frequency aspect of the fusible link tag required two capacitors with large plates making the tag too large and costly to manufacture (FF 460). Such motivations however are found not to teach how to create a permanent short circuit is a resonant tag for deactivation.

Essential to the positions taken by the Actron respondents, the All-Tag respondents and/or the staff are the Blythe reference, the Lawson reference the Harari patent, certain alleged admissions of Lichtblau and/or of Rhoads, a Welsh patent, an Otley reference, a Stumpe reference and/or certain testimony of Zahn.

The Blythe reference (FF 484 to 509) is a chapter of a textbook entitled

"Electrical Properties of Polymers" (FF 484). In the introductory portion of the reference it discloses that what is briefly discussed in the chapter is the principal mechanism of electrical breakdown in solid polymers and some of the consequences for the use of polymers as dielectric materials (FF 485). In a later section, titled "Electronic breakdown," Blythe referring to a Figure 6.4, discloses that as intimated in the introduction, it is arguable whether truly intrinsic breakdown has ever been observed in polymers, and in this sense an intrinsic breakdown strength must represent an upper limit to any value than can ever be realized experimentally; that the most reliable measurements which were obtained have been made with recessed specimens, illustrated in Figure 6.4, with evaporated aluminum electrodes; that the recess design neatly places the high stress just where it is required across a thin layer, whilst at the same time avoiding excessive stresses in the medium surrounding the edges; and that results for polyethylene (referring to the Lawson reference) shown in Figure 6.4, definitely indicate a fall in dielectric strength with temperature (FF 497). Thus the recess in Figure 6.4, relied on by the active respondents and the staff and to which they equate, for example, the indentation in the capacitor plates of the claimed subject matter, relates merely to a test method for obtaining reliable measurements for determining electronic breakdown in polymers (FF 497).

While Figure 6.4 shows the variation of the electric strength of polyethylene with temperature and the insert diagram in Figure 6.4 shows the type of recess specimen used and illustrates a shape that resembles an indent, it is not an indent pushed into a capacitor plate or into a resonant tag (FF 493, 497). Moreover the Figure 6.4 shows the measured breakdown strength of polyethylene as being between 550 and 600 megavolts per meter (FF 487). Zahn, the expert of the Actron respondents, testified that Figure 6.4 shows the breakdown strength for polyethylene at room temperature of approximately 575 volts per micron (FF 489).

Actron's expert Zahn, while presumably admitting that Figure 6.4 does not show the low voltage breakdown of the tags in issue, testified that certain language from the Blythe reference found in the introductory section, the section on "Electronic breakdown" and the section titled "Breakdown caused by gas discharges" would teach a person with ordinary skill in the art that the voltage required to reach the electrical breakdown strength of polyethylene depicted in Figure 6.4 could be reduced by a factor of 10 to 1,000 depending on the shape of the electrodes used (FF 506).[11] Zahn however is not a mere ordinary man skilled in the art. See FF 77. Thus while certain portions of the Blythe reference may suggest to Zahn that the voltage required to reach the breakdown strength of polyethylene depicted in Figure 6.4 can be reduced by a factor of 10 to 1,000 the administrative law judge does not find that said portions would teach a person of ordinary skill in the art, as already defined, such a reduction. Moreover even assuming those portions had such a teaching to a person of ordinary skill in the art those portions do not relate in any way to a capacitor. To the contrary, Blythe in a later section titled "6.6 Examples of high-voltage design" under the sub section "Thin-film capacitors" discloses that to withstand a high field the film must be of very high quality, and "fortunately" the situation is alleviated to some extent "by a self-healing mechanism inherent in this type of capacitor" (FF 498). A self-healing mechanism would not be looked at as a reference when attempting

---

11 Zahn however also admitted that the "best evidence" that Blythe is suggesting an indentation is found in its Figure 6.4 (FF 501).

to design a permanently deactivatable tag (FF 499). Thus because the administrative law judge finds that Blythe does not suggest creating a permanent short in any type of a capacitor, it does not cure the deficiencies of the primary references. Likewise the administrative law judge finds that Lawson (FF 510 to 528), which is referenced in Blythe (FF 512) does not cure the deficiencies of the primary references.

Certain alleged admissions of complainant's Lichtblau and Rhodes and testimony of Zahn have been relied on by the Actron respondents, the All-Tag respondents and/or the staff in an attempt to cure the deficiencies of the primary references. The administrative law judge does not find in any of the alleged admissions (FF 420, 421) an acknowledgement that it was known prior to the invention in issue that a permanent short can be formed in the manner claimed and in issue in the '076 and '473 patents, nor does he find the testimony of Zahn relevant (FF 438).

The administrative law judge finds that the remaining Welsh, Harari, Otley and Stumpe references, do not cure the deficiencies of the other references already commented on. Thus all of the tags in Welsh (FF 529 to 536) use non-linear capacitors, not linear capacitors as disclosed in the patents in issue (FF 532). There is no suggestion in Welsh of deactivating any planar tag having an inductor and a capacitor in a tuned circuit on the tag by indenting any portion of the capacitor (FF 534). Harari (FF 537 to 547) concerns semiconductor circuits which have a propensity to breakdown unexpectedly (FF 538) and is aimed at developing a mechanism to prevent the undesirable breakdown of a semiconductor circuit and, in particular, to a gate protection device for metal oxide semiconductors (FF 539). The voltages described in Harari, i.e. 50 to 100 volts, are far too high for use in a commercially feasible deactivatable resonant tags and Harari further teaches a breakdown method which does not lead to permanent disabling (FF 542). In addition the invention described in Harari relies on self-healing properties of thin metal films which is the opposite of what is described in the patents in the means claims in issue of the patents in issue where the short circuit must not be self-healing (FF 543). Also Harari is irrelevant because planar resonant anti-theft tags are not manufactured using vapor deposition techniques as disclosed in Harari (FF 544). While the Otley reference (FF 548 to 555) teaches a permanent short circuit in a capacitor (FF 550), it does not suggest putting an indent in a capacitor to cause a permanent short to occur at that location (FF 552). The reference also does not relate to or discuss resonant tags (FF 553). The Otley reference further refers to repeated breakdowns of one switch and discusses reopening the broken down switch and nondestructive breakdowns. Thus the switches disclosed in the Otley reference would not be relevant in the art of designing anti-theft resonant tags that are permanently deactivatable (FF 554). While the Stumpe patent (FF 556 to 565) describes an electrical protection device wherein a permanent short circuit is formed (FF 561), the structure and operation of the breakdown protector in Stumpe involves a semiconductor arrangement suspended between electrodes by a spring assembly of conductive material (FF 563). The use of semiconductor junction devices is entirely different from the inventions in issue (FF 561). The Stumpe patent has no disclosure of indenting a plate in the capacitor to cause a short to occur at that location (FF 559). The breakdown protector in Stumpe is not made of mechanically delicate components and is used at voltage levels of 42 volts. Thus the device would not be used in anti-theft resonant tags which deactivate typically at a fraction of 42 volts (FF 562).

35 U.S.C. §103 requires that obviousness be determined with respect to the invention as a whole. See Jones v. Hardy, 727 F.2d 1524, 1528, 220 USPQ 1021, 1024 (Fed. Cir. 1984). This is essential for combination inventions, for generally all combinations are of known elements. Environmental Designs, Ltd. v. Union Oil Co. of California, 713 F.2d 693, 698, 218 USPQ 865, 870 (Fed. Cir. 1983), cert. denied, 104 S.Ct. 709, 224 USPQ 520 (1984). When prior art references requires selective combination by the court to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gleaned from the invention itself. ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577 n.14, 221 USPQ 929, 933 n.14 (Fed. Cir. 1984). Thus there must be "something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination." Lindemann Maschinenfabrik GmbH v. American Hoist and Derrick Co., 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984). Critical to any analysis is an understanding of the particular results achieved by the combination in issue. Interconnect Planning Corp. v. Feil 774 F.2d 1132, 1143, 227 USPQ 543, 551 (Fed. Cir. 1985). In this investigation the administrative law judge concludes that the arguments of the Actron respondents, All-Tag respondents and the staff for combinations which are alleged to show an anti theft resonant tag wherein a permanent short circuit can be found through indentation for deactivating the tag is based soley on hindsight gleaned from the claimed invention in issue. Accordingly the administrative law judge finds that it has not been established by clear and convincing evidence that the means claims in issue are not valid.

(b) **Claims 25, 26 and 27 of the '473 Patent Are Not Anticipated By Vandebult or the '219 Patent**

The Actron respondents argued that claims 25 to 27 of the '473 patent, drafted as improvement claims in Jepson format, are anticipated by the Vandebult patent while the All-Tag respondents argued that those claims are anticipated by either the Vandebult patent or the '219 patent.

Complainant argued that respondents fail to recognize that claims 25 to 27 must be read in light of the specification, and the specification demonstrates that the resonant tag constructed according to those claims is intended to be deactivatable.

A reference anticipates a patent claim if it discloses each element of the claim. Tyler Refrigeration v. Kysor Indus. Corp., 777 F.2d 687, 689, 227 USPQ 845, 846-47 (Fed. Cir. 1985). Respondents argued that in drafting a Jepson claim, a patentee admits that the preamble recites prior art and that the claimed invention resides only in the improvement, citing Sjolund v. Musland, 847 F.2d 1573, 1577, 6 USPQ2d 2020, 2023 (Fed. Cir. 1988) (Sjolund). Sjolund states however that the preamble of a Jepson claim is only "impliedly admitted to be prior art" citing Pentec, Inc. v. Graphic Controls Corp., 776 F.2d 309, 315, 227 USPQ 766, 770 (Fed. Cir. 1985) (Pentec) and moreover, added the condition that "the specification confirms this implied admission." Id. In Pentec moreover, the Court qualified any implied admission with the phrase "unless the preamble is the inventor's own work." In addition referring to the Manual of Patent Examining Procedure (MPFP) 608.01(m) (5th ed. 1983), the court stated that even with a Jepson claim the claimed invention consists of the preamble in combination with the improvement. Id.[12] Accordingly, reading claims 25, 26 and 27, in light of the specification of the '473 patent, the administrative law judge finds that the claimed invention of claims 25, 26 and 27 includes the indentation or its equivalent in a capacitor plate. Neither Vandebult nor the '219 patent discloses such feature (FF 440, 751). Thus the administrative law judge finds that it has not been shown by clear and convincing evidence that claims 25, 26 and 27 of the '473 patent are anticipated by either Vandebult or the '219 patent.

(c) Best Mode

Respondent All-Tag argued that the patents in issue disclosed no mode for making the indentation to reduce thickness of the dielectric substrate, much less the best mode required by the last paragraph of 35 U.S.C. § 112. It was also argued that the "preferred method of using heat and pressure to make an indent" was not disclosed by Lichtblau in the patents in issue (RTB at 50).

Complainant argued that, as a threshold matter, the so-called best mode" about which All-Tag is arguing is not within the scope of the invention claimed in the '076 and '473 patents. Thus it is argued that the invention disclosed in the patents at issue is a deactivatable anti-theft resonant tag; that the best mode of practicing the invention is the use of an indentation in

---

12 Section 608.01(m) of the MPEP, with a revision date of May 8, 1988, states in pertinent part:

> The form of claim required in 37 CFR 1.75(e) is particularly adapted for the description of improvement type inventions. It is to be considered a combination claim. The preamble of this form of claim is considered to positively and clearly include all the elements or steps relied therein as a part of the claimed combination.

the capacitor plate to make the tag deactivatable at low power; and that disclosure of that mode is set forth in detail in the patents in issue. It is argued that the method of producing the indentation is not claimed as part of the invention but rather is a manufacturing consideration that may depend on the design of the commercial product. Complainant also argued that even if the means of forming an indentation in the capacitor plate of a resonant tag were a "mode of carrying out" the invention, All-Tag has failed to meet its burden of proving that Lichtblau concealed a preferred method of forming such an indentation known to him at the time he filed the patent applications in issue.

The staff argued that the claimed inventions in issue are not invalid for any failure to disclose the best mode. It is argued that Lichtblau testified that the inventions in issue consists of putting the indent in the tag, not the method of making the indent, and that he did not know before he filed his patent applications which of cold pressure or heat and pressure worked better.

It is the concealment of the best mode of practicing the claimed invention that 35 U.S.C. §112 § is designed to prohibit. Randomex Inc. v. Scopus Corp., 849 F.2d 585, 588, 7 USPQ2d 1050, 1053 (Fed. Cir. 1988). However in Spectra-Physics, Inc.v. Coherent, Inc., 827 F.2d 1524, 1536, 3 USPQ2d 1737, 1745 (Fed. Cir. 1987), the Court held that a failure to disclose a specific braze cycle constituting a preferred means of attachment violated best mode, even though no particular attachment means was claimed. Also in Dana Corp. v. IPC Limited Partnership, 860 F.2d 415, 419, 8 USPQ2d 1692, 1695 (Fed. Cir. 1988) the Court held that a failure to disclose unclaimed fluoride surface treatment that was necessary for satisfactory performance of claimed seal violated best mode. A patent specification however should not be a detailed production schedule. Moreover, a requirement for routine details to be disclosed because they were selected as the "best" for manufacturing would lay a trap for patentees whenever a device has been made prior to the filing for the patent. See Wahl Instruments, Inc. v. Acvious, Inc., 950 F.2d 1575, 1581, 21 USPQ2d 1123, 1128 (Fed. Cir. 1991).

Complainant admits that the use of an indentation or its equivalent is necessary for satisfactory performance of the claimed tag. The evidence demonstrates that various tools can be used to create the Checkpoint dimpled tag made pursuant to the claimed invention (FF 569). Significantly Lichtblau also testified that he did not know at the time of making the invention, and does not know even today, the best mode of creating an indentation in the capacitor plate of a planar resonant tag (FF 167).

In addition, the patents in issue refer to the earlier '219 patent that describes how to make resonant tag materials and that patent specifically teaches that heated or cold pressure may be used to form the crimp connection in the corner of the tag (FF 166). Accordingly the administrative law judge, assuming that heat and pressure is the best mode for forming an indentation, finds, based on the disclosure of the '219 patent, that using heat and pressure to create an area of thinner substrate between the capacitor plates would have been obvious to one skilled in the art at the time the applications for the patents in issue were filed.

Based on the foregoing it is found that All-Tag has not established that complainant is not in compliance with the best mode requirement of 35 U.S.C. §112 ¶6.

(d) Indefiniteness Under 35 U.S.C. §112

The Actron and All-Tag respondents argued that all the asserted claims are invalid under the second paragraph of 35 U.S.C. §112 for indefiniteness because the "sufficient energy" limitation in the means-plus-function claims is improper and "substantially thinner" in claims 25-27 of the '473 patent lacks definition. In addition the All-Tag respondents argued that the "one localized region" in claims 25-27 of the '473 patent is invalid under 35 U.S.C. §112 for indefiniteness.

Each of complainant and the staff argued that the Actron and All-Tag respondents have failed to establish that the asserted claims are invalid under the second paragraph of 35 U.S.C. §112.

The claims, when read in light of the specifications, must reasonably apprise those skilled in the art both of the utilization and scope of the invention, and if the language is as precise as the subject matter permits, the courts can demand no more. Chugai, 927 F.2d at 1217, 18 USPQ2d at 1030; Shatterproof Glass Corp. v. Libbey-Owens Ford Co., 758 F.2d 613, 624, 225 USPQ 634, 641 (Fed. Cir.), cert. dismissed, 474 U.S. 976 (1985).

In issue are the language "sufficient energy" of the fourth clause of illustrative claim 1 of the '076 patent and the language "one localized region" and "substratially thinner" of independent claim 25 of the '473 patent.

(i) "Sufficient Energy"

The Actron and All-Tag respondents argued that the patents in issue neither limit the amount of energy nor the frequency that one can expose to the claimed tags in issue. As the claims in issue disclose, the claimed tags are for use in an electronic security system. The specifications of the patents in issue teach that such systems are employed for use in retail stores to prevent the theft of articles from the store and in libraries to prevent the theft of books (FF 126). As the All-Tag respondents admitted in their proposed rebuttal finding 275, the administrative law judge finds that, in view of the intended use of the claimed tag, one of ordinary skill in the art in 1980 would know that a commercial tag can not require power so high for deactivation as to effect surrounding cash registers and the like and would know that the energy required to short circuit should be within the FCC regulations which are referenced in the specifications (FF 126, 138). Moreover, unlike the Q factor which the '076 specification requires not to be affected, the '076 specification does not place a specific limitation on the language "sufficient energy" and the administrative law judge finds that it would be known that the precise amount of energy would depend upon the dimensions and construction of a particular tag (FF 143). Accordingly, the administrative law judge finds that the Actron and All-Tag respondents have not established that the asserted claims in issue are invalid under of 35 U.S.C. §112 ¶2 because of the mere recitation of "sufficient energy."

(ii) "One Localized Region" and "Substantially Thinner"

Independent claim 25 of the '473 patent in issue states that the improvement is where "at least one localized region of said substrate is substantially thinner than others" (FF 246). The administrative law judge in section VI (b) , supra, found that claim 25 of the '473 patent should be read with its preamble and that the "means" of the fourth clause in light of the language of the specification encompasses only a small point indentation, and its equivalent, such as multiple small indentations or small bumps in the metal that defines the capacitor plate(s). Accordingly the administrative law judge rejects the argument that the "one localized region" could comprise 99 per cent of the substrate (<u>see</u> e.g. RTB at 56) and finds that the active respondents have not established that claims 25 to 27 are not valid under the second paragraph of 35 U.S.C. §112 ¶ 2 because of the mere recitations of "one localized region" and "substantially thinner."

(e) Inventorship

35 U.S.C. §102(g) provides that a person is entitled to a patent unless:

> before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

The Actron and All-Tag respondents argued that clear and convincing evidence establishes that George Kaltner made the short circuit deactivation mode invention well before Lichtblau's filing date for the '076 patent of May 10, 1982 (FF 89) and first invented the short circuit deactivation mode invention by November 17, 1981 because of Kaltner's laboratory notebook, contemporously corroborated by Cary and further corroborated by the testimony of Cary, and because Kaltner's short circuit deactivation mode invention was pursued and ultimately commercialized. It is argued further that Kaltner's prior invention of the short circuit deactivation mode invalidates the patents in issue because (a) Lichtblau has no corroborated evidence of an actual reduction to practice of the short circuit deactivation mode, (b) Lichtblau has no corroborated evidence of prior conception of the short circuit deactivation mode because Lichtblau's testimony at the hearing is inadequate to prove conception of the short circuit deactivation mode and the evidence, at most, shows that Lichtblau has prior conception of only the open circuit deactivation mode,[13] and (c) Lichtblau has no corroborated evidence of diligence for the six month period between November 17, 1981 and May 10, 1982. It is further argued that even if Lichtblau were diligent as to the open circuit deactivation mode, the all of the patent claims in issue, each of which cover the short circuit deactivation mode, are invalid in view of Kaltner's prior invention of the short circuit mode. It is also argued that Lichtblau derived the concept of the short circuit mode of the claims in issue from Kaltner.

The All-Tag respondents further argued that the patents in issue are not valid under 35 U.S.C. §102(f) which states that a person shall not be entitled to a patent if that person "did not himself invent the subject matter sought to be patented."[14]

Complainant argued that Lichtblau conceived the short circuit deactivation mode invention and reduced it to practice before Kaltner began working at Checkpoint; that Kaltner developed only the equipment to deactivate Lichtblau's deactivatable tags; and that Kaltner did not claim inventorship until after leaving Checkpoint.

While more commonly applied to interferences in the Patent and Trademark Office, section 102(g) is applicable to prior invention situations other than

---

13 See section IV, supra, for a discussion of the open circuit and short circuit deactivation modes of the claimed subject matter in issue.

14 In order to prevail under section 102(f), "a party must demonstrate that the named inventor in the patent acquired knowledge of a claimed invention from another, or at least so much of the claimed invention as would have made it obvious to one of ordinary skill in the art." New England Braiding Co. v. A. W. Chesterson Co., 970 F.2d 878, 883, 23 USPQ2d 1622, 1626 (Fed. Cir. 1992). The administrative law judge finds that the evidence establishes that Kaltner invented the short circuit mode independent of Lichtblau and that it has not been established that Lichtblau's comments in a December 11, 1981 draft were derived from Kaltner (FF 404, 405).

in the context of an interference proceeding. Thus the dates of any conception and reduction to practice of the short circuit mode of deactivation by Kaltner can be relevant in determining whether Kaltner's inventive activity was prior to and therefore invalidates any of the claims in issue.

Under the first-to-invent system in U.S. Patent Law, it is well established that the party first to conceive and first to reduce to practice, whether constructively through the filing of a patent application or actually, prevails. New Idea Farm Equipment Corp. v Sperry Corp., 916 F.2d 1561, 1566, 1567, 16 USPQ2d 1424 (Fed. Cir. 1990). Diligence may be significant but only where one party was the first to conceive, and the last to reduce to practice, whether constructively, through the filing of a patent application or actually and then diligence is important only during the interval beginning just prior to the rival's conception and ending with the party's own reduction to practice.

To establish diligence, an inventor must provide specific details as to what was done during the critical period. Further, the testimony of the inventor as to his activity must be corroborated. Gould v. Schawlow, 363 F.2d 808, 150 USPQ 634 (CCPA 1966). General testimony by the inventor and corroborating witnesses that the inventor "worked continuously on the development of his idea" is not sufficient. Kendall v. Searles, 173 F.2d 986, 993, 81 USPQ 363 (CCPA 1949). In Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 231 USPQ 81, 89 Fed. Cir. 1986), cert. denied, 480 U.S. 947 (1987), the Court found that the laboratory notebooks, alone, are enough to show clear error in the findings of the district court that underlie the holding that the invention was not conceived before a certain date and that the fact that some of the notebooks were not witnessed until a few months to one year after their writing did not make them incredible or necessarily of little corroborative value. In Hughes Aircraft Co. v. General Instrument Corp., 374 F. Supp. 1166, 1177, 182 USPQ 11, 19 (D. Del. 1974) (Hughes), the court found that there was no significant effort at reducing a concept to practice for a period of four to five months when the party was charged with diligence and that because that party cannot prove any diligence for a substantial period, it failed to make the necessary showing of reasonable diligence. An inventor is chargeable with his attorney's lack of diligence in filing a patent application although an attorney's backlog of work may inure to the benefit of his client, See Rines v. Morgan, 250 F.2d 365, 116 USPQ 145 (CCPA 1958) (an attorney who took up his client's application in chronological order acted diligently).

The law does not require extraordinary diligence but rather only ordinary or reasonable diligence and the question of diligence is considered in light of all the circumstances. Hybritech, Inc. v. Abbott Labs., 4 USPQ 1001, 1006 (C.D.Cal. 1987), aff'd, 849 F.2d 446, 7 USPQ2d 1191 (Fed. Cir. 1988). Diligence need not involve uninterrupted effort, nor the concentration of all of the applicant's energies upon the reduction of the invention in question to practice. Dickinson v. Swinehart, 263 Fed. 474 (D.C. Cir. 1920).

To prove a reduction to practice a party must show that his experimental device performed the function for which it was designed. Schnick v. Fenn, 277 F.2d 935, 125 USPQ 567 (CCPA 1960). However a reduction to practice need not demonstrate that the invention operates as well as commercial devices. Hughes, 374 F.Supp at 1170, 182 USPQ at 13.

The three words "abandoned," "suppressed," and "concealed" in section 102(g) reflect a unitary concept, focusing on the failure of the person who was first to reduce the subject matter to practice to either apply for a patent or commercialize the invention or both. The concept is figuratively-speaking a "putting the invention" in a drawer and doing nothing with it, at least not until spurred into action by the appearance of a rival inventor. Chisum Patents $10.08[1] (1993). In Refac Electronics v. R. H. Macy, 9 USPQ2d 1497 (D.N.J. 1988), the district court granted defendant's motion for summary determination under 35 U.S.C. 102(g) on the ground that plaintiffs' patent was developed by others prior to the invention and/or filing of the patent application by the plaintiffs and found that a three year delay between the initial invention/reduction to practice and ultimate market distribution by defendant were in accord with reasonable business practices such that the presumption of any abandonment, concealment or suppression was effectively rebutted.

Lichtblau's draft application of March 22, 1981, sent to his outside patent counsel in Boston (FF 280), describes a method to deactivate a resonant tag without the use of an indented or modified area of the capacitor plates (FF 281, 300, 301, 305, 306, 313, 314, 321). Thus it describes a short circuit mode with no indentation. Moreover, it does not even describe an open circuit mode (FF 315). Lichtblau's draft application, dated April 5, 1981, does not describe the use of an indentation to create a location where breakdown would occur to form a short circuit and deactivate the tag but instead uses an indentation to deactivate by creating an open circuit (FF 285, 288, 298, 300, 301, 307, 308, 316, 321, 323). Significantly a third draft patent application of Lichtblau, dated October 17, 1981 directed to outside patent counsel stated that the circuits shown in the short circuit mode are identical to those illustrated for the open circuit mode except that in the short circuit mode there is no indentation made at burn-out, and thus there is no pre-selected point for the capacitors to breakdown when excess voltage is built up across the plates (FF 282, 286, 289, 290, 300, 301, 309 to 312, 317 to 321, 324). Hence in October 1981 Lichtblau stated to his outside patent counsel that there is no indentation or its equivalent in the short circuit mode.

In contrast to the March, April and October, 1981 Lichtblau draft applications to his outside patent counsel, the administrative law judge finds that Kaltner who joined Checkpoint in September 1981 (FF 340), and while working for Checkpoint under the supervision of Roderick G. Cary in New Jersey (FF 343), conceived and actually reduced to practice the short circuit mode of the claimed subject matter in issue at least by November 17, 1981 (FF 355, 356 to 362, 373, 374, 382 to 385, 387 to 394, 398, 404).[15]

---

[15] The evidence conclusively establishes that Kaltner did not invent the claimed open circuit mode for deactivating a resonant tag (FF 377, Tr. at 3756-58). The staff in its prehearing statement argued that even if Kaltner had a hand in the claimed invention, he assigned all rights in such invention and did not challenge the inventorship of the patent and "[t]hus, it is unlikely that a revision of the existing inventorship entity of the patents in issue . . . would alter the status quo of Checkpoint's exclusing rights or the rights and benefits of the purported co-inventors" (SPH at 21). With respect to that argument the administrative law judge finds that the evidence establishes that Kaltner had no obligation in 1981 to assign to Checkpoint the rights of any invention he then made (FF 399, 400) and further that Kaltner did challenge the inventorship issue (FF 402). In contrast complainant had exclusive rights to the patents in issue under arrangements with Lichtblau and Arthur D. Little (FF 85, 86, 87). In the posthearing submissions no party argued any joint inventorship of the patents in issue.

It was the administrative law judge, at closing arguments, who initially raised a possible joint inventorship issue and asked the parties why the joint inventorship issue was not argued in their post hearing submission (Tr. at 3753-54). The Actron respondents argued that the fact situation did not support a finding of any joint inventorship, although it was admitted that Kaltner did not invent any open circuit embodiment, and that Lichtblau conceived the open circuit embodiment; that claim 1 of the '076 patent covers both the short circuit embodiment in issue and the open circuit embodiment;
(continued...)

[15](...continued)
and that Lichtblau; although he was working for himself, was working for complainant and Kaltner was working for complainant (Tr. at 3756-58). The Actron respondents argued that "we" had some difficulty "when we had Mr. Lichtblau saying that he worked completely separate and he doesn't consider Mr. Kaltner a co-inventor; and then Mr. Kaltner is testifying he does not believe, with respect to the short circuit, that Mr. Lichtblau is an inventor" (Tr. at 3757). Complainant argued that the evidence amply supports a finding that Kaltner did not do anything "inventive" but the "absolute floor of all of this is that at most Mr. Kaltner is a joint inventor with Mr. Lichtblau" (Tr. at 3762).

Omission of an inventor from a patent can be corrected. See 35 U.S.C. § 256, which provides that where a person is omitted as an inventor in error and there is no deceptive intent on the part of any named inventor, the Commission of the Patent and Trademark Office (PTO) may, upon application of all the parties and assignees issue a certificate correcting such error. Significantly section 256 states that such omission does not invalidate a patent "if it can be corrected as provided in this section," and that a "court" may order correction of the patent upon notice and hearing of all concerned parties, whereupon the Commissioner of the PTO shall issue a certificate accordingly. 35 U.S.C. §256, ¶ 2. Thus a district court may order such correction upon motion of a party in an infringement action, Iowa State Univ. Research Found. v. Sperry Rand Corp., 444 F.2d 406, 170 USPQ 374 (4th Cir. 1971), or upon filing of a complaint solely to determine inventorship. MCV, Inc. v. King-Seeley Thermos Co., 870 F.2d 1568, 10 USPQ2d 1287 (Fed. Cir. 1989). No party in this investigation has moved for a determination of inventorship and correction of the patents at issue pursuant to section 256. Moreover no party has cited precedent which clearly demonstrates that the Commission has jurisdiction under section 256 of the Patent Act or under section 337 of the Tariff Act of 1930, as amended, to make such a correction. See e.g. Tandon, 931 F.2d at 1019, 4 USPQ2d at 1285 (Commission's primary responsibility is to administer the trade laws and not the patent laws); Lannom Mfg. Co. v. U.S.I.T.C., 799 F.2d 1572, 1577, 231 USPQ 32, 36 (Fed. Cir. 1986) (Commission may consider defenses relating to invalidity and unenforceability for purposes of determining whether there is a violation of section 337, but such determinations are not binding interpretations of U.S. patent law). On that point, in Certain Integrated Circuit Telecommunication Chips and Products Containing Same, Including Dialing Apparatus (Telecommunication Chips), Inv. No. 337-TA-337, this administrative law judge found a lack of utility in certain of the claims of one of the patents there at issue, and adopted a claim interpretation urged by respondents and the staff. Telecommunication Chips, ID at 30-31. On review, the Commission agreed with and adopted the construction of the claims set forth in the initial determination but, with respect to the finding regarding utility, the Commission stated that "[p]rior to the issuance of the ID, neither complainant nor respondents ... had presented arguments concerning whether the asserted claims would have utility under ... [complainant's] claim construction," and concluded that "[i]n view of the lack of development of the
(continued...)

Subsequent to Kaltner's conception and actual reduction to practice of the claimed short circuit mode, in a document dated December 11, 1981 and titled "Additional Notes," Lichtblau cancelled certain language in the October 17, 1981 draft application and substituted therefore the following:

> The circuits shown in Figure 6 and 7 are identical to those illustrated in Figure 1 and 2 except that the indentation may be made anyplace on the capacitor capacitor plate. The indentation serves to reduce the thickness of the plastic dielectric film and thus reduce the voltage required to arc across the capacitor plate.

(FF 283, 287). Thus the administrative law judge finds that it was not until December 11, 1981 that Lichtblau initially conceived the claimed short circuit mode which is the only mode in issue in this investigation. Accordingly he finds that Kaltner's invention in November 1981 of the claimed short circuit mode is prior art under 35 U.S.C. §102 (g).

While complainant's counsel has argued that there must be an indentation somewhere on the capacitor plate of the resonant tag for a permanent short circuit to form in the draft October 17, 1981 application, that draft patent application does not describe how to form the permanent short circuit. Even Lichtblau has testified that not only does the March 22, 1981 draft application not indicate an indent and that in the April 1981 draft application the indent

---

[15](...continued)
utility issue, and because we view the ALJ's contingent finding and analysis unnecessary to proper claim construction, we vacate the contingent finding and the supporting analysis." Telecommunication Chips, Commission Opinion at 14 (footnotes omitted).

Based on the foregoing, including the actions of the parties in this investigation, the administrative law judge makes no determination herein with respect to any possible issue of joint inventorship.

Lichtblau was referring to was in connection with the open circuit mode,[16] but also that there is no specific description of a short circuit mode with an indentation in the October 1981 draft application (FF 300, 301, 317, 318, 319, 320, 324). The administrative law judge finds such testimony in stark contrast to Lichtblau's testimony that he was very excited about discovering the short circuit mode which was a much better way to deactivate a resonant tag (FF 322).

Complainant would want the administrative law judge to find that although Lichtblau was very excited about developing the surprisingly easy short circuit mode and felt it was the best way to proceed as opposed to the open circuit mode (FF 323), the fact that Lichtblau did not specifically describe the short circuit mode in the October 17, 1981 draft application to his outside patent counsel but instead disclosed to outside counsel a short circuit mode with no indentation, and the fact that Lichtblau in his March and April 1981 draft applications to his outside patent counsel did not disclose the short circuit modes are all irrelevant. The administrative law judge will not make such a finding. He does find that there is clear and convincing evidence that Lichtblau did not specifically describe the short circuit modes in any of the October, April and March 1981 draft applications to his outside patent counsel because Lichtblau did not conceive the short circuit mode at least until after Kaltner independently conceived and reduced the short

---

16 Complainant argued that when Kaltner was shown Lichtblau's April 1981 draft, "he reluctantly admitted that Lichtblau's draft was the true source of the language and figures in the ['076] patent" (CB at 27). Kaltner's testimony however is that the April 1981 draft does not describe the use of an indentation to create a location where breakdown would occur to form a short circuit and permanently deactivate a tag but instead discloses an indentation to deactivate by creating an open circuit (FF 321).

circuit mode no later than November 17, 1981.[17]

Lichtblau testified at the hearing:

A ... While the first intention of this dimple in my mind was to cause a vertical arc from one capacitor plate to the other plate in the location of the connecting link. It turned out that after I placed the dimple and tried this a number of times, instead of burning out, the tag short it. [sic]

Now, frankly this was a great surprise. I didn't expect the tag to short. I really wanted it to burn out. And it shorted as you brought basically it's a coil of wire attached to a transmitter.

As you brought this crew deactivator closer to the tag, the tag would short instead of burn out. But if you bought it right at the tag and switched full power on, instead of shorting it would continue to burn and then burn out the connecting link.

So what happened we had literally accidentally discovered the shorting process, how you can make the two capacitors short together at relatively lower power.

It was not my intention in doing this experiment to make the capacitor short. It was quite accidental that I discovered this. But when I discovered it, I investigated and found I could repeat it. <u>That's what led me to write the first [March 22, 1981] draft of my patent application on the 076 patent</u>.

Q So when in time did you discovery the connection between the indentation and there resulting short?

A Oh, the whole thing was done at the same time. It's in the fourth quarter of 1980 because these things just happen. When you try burning them out if you start bringing a wand towards this thing, coupling power to it, it first shorts before it does anything.

---

[17] There is in evidence a sketch made by Stapler in 1984 (FF 327) who did not testify live at the hearing (FF 326) and which sketch post dated the time when complainant had exclusive rights to the claimed invention in issue in its agreements with Lichtblau and Arthur D. Little (FF 85, 86, 87). Such sketch, allegedly of Figure 4 of the '076 patent, is found to have no relevance to conception and reduction to practice of the short circuit mode in issue (FF 95, 118, 120, 297, 326 to 328).

> Then it's all over. [Tr. at 2745-46]
>
> * * *
>
> THE WITNESS: The principle has been known that if you reduce the thickness between capacitor plates, the amount of art [sic] required to arc between them will reduce. That's been known. It's standard physics.
>
> But there has been no prior art displayed anyplace to say why does he want to purposely make them stay shorter? Well, there's no art that teaches that. None. They all teach the opposite.
>
> You can't take the opposite teaching and say, well, it's obvious that if you use a thin piece of metal to prevent it for shorting, you use a thick piece of metal to make it short. That logic doesn't work. There is no direct path preventing it from shorting to purposely making it short.
>
> People are trying to make it say, well, it's obvious. But in fact, there is no teaching it anyplace. There's no logical path to go that route. After you see it works. I didn't know it worked. I found it out absolutely by accident. I was doing a different experiment. [Tr. at 2880] [Emphasis added]

If the above testimony was intended to establish that in Lichtblau's first draft of March 22, 1981, to outside patent counsel, Lichtblau even suggested the claimed short circuit mode in issue, the administrative law judge finds that testimony not credible. As has been pointed out *supra*, indentation is not even mentioned in the March 1981 draft for any mode, much less the short circuit mode which Lichtblau testified was superior to any open circuit mode (FF 322, 323) and as shown by the above testimony was found out absolutely by accident and defied certain logic. Moreover, Lichtblau's later April 1981 draft application to his outside patent counsel uses indentation to deactivate by creating an open circuit and Lichtblau's October 1981 draft to outside patent counsel states that there is *no* indentation for the short circuit mode. Complainant would want the administrative law judge to find that while

Lichtblau was the first inventor of the short circuit mode in issue which he was exited about and considered superior to the open circuit mode he found it unnecessary to describe the indentation for the claimed short circuit mode in his March 22, April and October 1981 drafts to his outside patent counsel. The administrative law judge will not so find because the evidence establishes that Lichtblau was not the first inventor of the claimed short circuit mode in issue.

Complainant argued that the evidence establishes that "deactivation equipment was Kaltner's central focus and primary achievement at Checkpoint" (Emphasis added) (CB at 24). The meanings of "primary" and "central" focus are subject to various interpretations. Regardless of what those terms mean, it is a fact, as Kaltner's 1981 notebook shows, that Kaltner, although while working under the supervision of Cary at Checkpoint, made the short circuit deactivation mode invention which is in issue in the claimed subject matter. While Wolf has testified that Lichtblau, not Kaltner, is the first inventor of the claimed short circuit mode in issue, Wolf is not a technical man (FF 3786). Moreover Kaltner was under the supervision of and worked with, Cary, not Wolf (FF 343). In addition, Wolf saw the Kaltner notebook for the first time only in connection with this investigation and then only glanced at it (FF 375). In addition Kaltner's salary increase form signed by Wolf in December 1981 describes Kaltner's job in part as "Design & Develop Various Electronic Products as assigned. First Assignment Remote Reactivation." Kaltner's understanding when he was hired in 1981 by Checkpoint and today is that the term "deactivation" was the entire remote deactivation capability for Checkpoint which meant any and everything involved in giving Checkpoint that capability (FF 369). Even Wolf agreed that it would not surprise him if

Checkpoint in 1981 used the term "deactivate" to relate to "deactivatability" (FF 368) and that Kaltner would have been encouraged to engage in research (FF 372). Hence the administrative law judge finds that Kaltner did not only work on equipment to deactivate deactivatable tags.[18]

Complainant further argued that Kaltner did not claim inventorship until after leaving Checkpoint. The administrative law judge finds that the evidence is to the contrary (FF 402).

Complainant has relied on testimony of Wolf that Lichtblau, not Kaltner, is the first inventor of the claimed short circuit mode in issue. Wolf, however, is not a technical man (FF 376). Moveover, Kaltner was under the supervision and worked with Cary not Wolf (FF 343). In addition Wolf saw the Kaltner notebook for the first time only in connection with this investigation and then only glanced at it (FF 375).

Complainant, at closing argument, argued that Kaltner abandoned any invention he may have made in November 1981 (Tr. at 3762). The evidence however does not show any abandonment (FF 396). Significantly when Cary, Kaltner's supervisor, approached Wolf about obtaining a patent on the dimpling of tags to make them deactivatable, Cary was told by Wolf that it was being taken care of (FF 402).

Complainant has referred to "Kaltner's admission under oath to the Patent and Trademark Office that George Lichtblau is the inventor of the deactivatable resonant tag described in the '076 and '473 patent" (CBR at 26).

---

[18] This finding is further supported by testimony of Cary and Kaltner that in 1981 at Checkpoint it was not known what deactivation would be and one could not possibly develop a deactivator until one defined what the deactivation is suppose to do (FF 369, 370).

The record does not support any such admission (FF 401, 402)[19]

The staff has argued that the evidence establishes that Lichtblau has priority of inventorship over Kaltner. The staff admits that the Lichtblau draft applications dated prior to November 17, 1981, do not support complainant's contention that Lichtblau conceived of the open circuit mode and the short circuit mode; that the corroborating evidence does not show that Lichtblau linked the indent structure to Lichtblau's short circuit mode until he prepared his last re-draft dated December 11, 1981; and that no indent appears on Lichtblau's earliest draft of the "short-circuit" mode on March 22, 1981; and that Lichtblau's drafts through and including the October 17, 1981 re-draft appear to distinguish between the open circuit mode with an indent and the short-circuit mode without an indent as alternative embodiments of the same invention. The staff, however, argued that the Lichtblau draft applications prepared prior to November 17, 1981, corroborate complainant's claim that Lichtblau conceived the invention "itself" before Kaltner did. Thus it is argued that the date of conception of the open circuit mode is as early as October 3, 1980, and as late as April 5, 1981; that the open circuit mode contained all of the elements of claim 1 of the '076 patent and all similar and related claims that have been asserted in this investigation; and that since the two possible dates of conception (October 3, 1980 or April 5, 1981) by Lichtblau pre-date Kaltner's purported discovery in November 1981, and since the evidence demonstrates that Lichtblau diligently reduced his

---

[19] Under 35 U.S.C. §115 an applicant must "make oath that he believes himself to be the original and first inventor of the process, machine, manufacture, or composition of matter, or improvement thereof, for which he solicits a patent; and shall state of what country he is a citizen." The oath does not require a patent applicant to attest to every statement set forth in a patent specification.

conception to practice by the preparation and filing of a patent application, Lichtblau has achieved priority of inventorship over Kaltner because Lichtblau conceived of a "complete" idea for a product, namely, the method of deactivating a resonant tag by means of an indentation, even though it related only to the open circuit mode, before Kaltner even arrived at Checkpoint.

In the ex parte patent prosecution, an applicant can antedate a prior art reference which anticipates the application claim by showing that the applicant had earlier invented the subject matter disclosed in the reference. See In re Stempel, 241 F.2d 755, 759-60, 113 USPQ 77, 79-81 (CCPA 1957). That principle was extended to antedating a prior art reference which anticipates the application claim by showing earlier invention of enough subject matter to render the reference disclosure obvious. See In re Clarke, 356 F.2d 987, 992, 148 USPQ 665, 669-70 (CCPA 1966). Hence any earlier invention, that does not render a later prior art reference obvious, would not antedate said reference.

The administrative law judge finds no evidence that the open circuit mode of the claimed invention conceived by Lichtblau makes the claimed short circuit mode in issue obvious. To the contrary he finds that there is testimony by Lichtblau that the open circuit mode would not render obvious the short circuit mode in issue (FF 322, 323).

Based on the foregoing the administrative law judge finds that the claims in issue are not valid under 35 U.S.C. §102(g) because Kaltner was the first to make the short circuit deactivation mode invention which was well before Lichtblau's May 10, 1982 filing date.[20]

---

[20] While it is admitted by the Actron respondents that Lichtblau conceived the open circuit deactivation mode invention before Kaltner made the short circuit deactivation mode invention (Tr. at 375-58) the evidence establishes that Lichtblau built no actual prototype hardware of the open circuit mode (FF (continued...)

VII. **Alleged Infringement Of The Claims In Issue**

Complainant has the burden of proving infringement of the claims in issue by a preponderance of the evidence. See Under Sea Industries, Inc. v. Dacor Corp., 833 F.2d 1551, 4 USPQ2d 1772, 1776 (Fed. Cir. 1987); Hughes Aircraft v. United States, 717 F.2d 1351, 1361, 219 USPQ 473, 480 (Fed. Cir. 1983). Moreover, "[t]o establish infringement of a patent, every limitation set forth in a claim must be found in an accused product exactly or by substantial equivalent." Corning Glass Works v. Sumitomo Elec. U.S.A., Inc., 868 F.2d 1251, 1259, 9 USPQ2d 1962, 1967 (Fed. Cir. 1989); Pennwalt Corp. v. Durand-Wayland, Inc., 833 F.2d 931, 4 USPQ2d 1737 (Fed. Cir. 1987) (en banc), cert. denied, 485 U.S. 961 (1988) (Pennwalt).

The initial question on the issue of infringement is whether the accused device falls within the scope of the literal language of the claims. Graver Tank & Mfg. Co. v. Linde Air Products Co., 339 U.S. 605, 607, 85 USPQ 328, 330 (1950) (Graver Tank). When claim limitations are written in "means-plus-function" form under 35 U.S.C. §112 ¶6, literal infringement occurs only if the accused device contains the same or equivalent structure to that disclosed in the specification and performs the identical function as that claimed. See Pennwalt, 833 F.2d at 934, 4 USPQ2d at 1739. Literal infringement of a means-plus-function claim does not occur merely because a different structure performs the same function as described in the claim. Laitram, 939 F.2d at 1538, 19 USPQ2d at 1372.

Under the doctrine of equivalents, infringement may be found when the

---

[20](...continued)
280) and that he had no corroborated evidence of diligence for the open circuit deactivation mode invention between November 17, 1981 and the '076 application filing date of May 10, 1982 (FF 284).

accused device performs substantially the same function, in substantially the same way, to yield substantially the same result as the claimed invention. Graver Tank, 339 U.S. at 608, 85 USPQ at 330. In determining whether an accused device is an equivalent, a court may not ignore meaningful structural and functional limitations of a claim on which the public is entitled to rely to avoid infringement. Perkin-Elmer Corp. v. Westinghouse Elec. Corp., 822 F.2d 1528, 1533, 3 USPQ2d, 1321, 1324-25 (Fed. Cir. 1987); Charles Greiner & Co., Inc. v. Mari-Med. Mfg., Inc., 962 F.2d 1031, 1036, 22 USPQ2d 1526, 1530 (Fed. Cir. 1992); London v. Carson Pirie Scott & Co., 946 F.2d 1534, 1538, 20 USPQ2d 1456, 1458-59 (Fed. Cir. 1991).

According to Lichtblau the '076 and '473 patents define a way to permanently short circuit a capacitor by bringing the plates closer together in a non-uniform manner by use of an intentional indent for the express purpose of making the tag deactivatable. He testified that the patents in issue relate to the combination, in an electrical sense, of an inductor and a capacitor which combination provides a tuned circuit operating similarly to tuned circuits that were available prior to said invention (Lichtblau, Tr. at 2829-30, 2954). Such definition ignores the claim language. Thus it is the language of the claims, when read in light of the specification, that circumscribe what is foreclosed from future enterprise and hence must be looked at. Otherwise a "zone of uncertainty which enterprise and experimentation may enter only at the risk of infringement claims would discourage invention only a little less than unequivocal foreclosure of the field." United Carbon Co. v. Binney Co. 317 U.S. 228, 236 (1942).

(a) **The Actron Respondents**

Complainant argued that the accused V-10 tag of the Actron respondents literally infringe the asserted claims in issue because it has each and every element of those claims. It also argued that the V-10 tag infringes the asserted claims under the doctrine of equivalents.[21]

Complainant, to satisfy its burden to prove infringement by a preponderance of the evidence, argued that the structure in the '076 patent that corresponds to the means clause (the fourth clause) of illustrative claim 1 is the indentation in the capacitor plates that brings the two plates closer together at the indentation and that in the accused V-10 tag that structure is the large, square dimple in a portion of one capacitor plate, which is created by a pressing operation during manufacturing; that an arc discharge occurs during deactivation of the V-10 tag between the capacitor plates at the large square dimple and forms a short circuit to deactivate the tag and as a result the V-10 tag has the same structure as the claimed structure, viz. an indentation in the capacitor plate and this structure performs the identical function as does the claimed tag, namely deactivation by permanently shorting the tag (CB at 50).[22]

The Actron respondents argued that their V-10 tag does not literally infringe claim 1 of the '076 patent because the path for an arc discharge in the V-10 tag is not defined by means within the conductive area because, inter

[21] The administrative law judge has rejected the arguments of the Actron and All-Tag respondents that there is any anticipation of claims 25, 26 and 27 of the '473 patent. See section VI (b), supra. For the reasons therein set forth, he is treating in the infringement section of his initial determination said claims in the same light as the remaining claims in issue.

[22] Checkpoint's proposed finding 605 states in part that all parties agree that the Checkpoint tag deactivates through polyethylene and not through air. At least that portion of the proposed finding was not challenged by any party and there is no evidence to the contrary. Hence it is found that Checkpoint tag of the domestic industry deactivates through the polyethylene.

alia (1) the V-10 tag has a large pressed area that changes the resonant frequency and lowers the Q of the tuned circuit, (2) the V-10 tag has means between the conductive areas and not within the conductive areas. It is further argued that there is no literal infringement because, inter alia, the path at which an arc discharge occurs in the V-10 tag is not "through the substrate" and the V-10 tag does not have a planar substrate of dielectric material.

It is argued by the Actron respondents that the V-10 tag does not infringe the asserted claims under the doctrine of equivalents because, inter alia, (1) the function of the pressed area formed by heating and pressing to render the V-10 tag deactivatable is substantially different from the function of the path defining the means recited in the asserted claims of the patents in issue and (2) the way by which the large pressed area of the V-10 tag renders the tag deactivatable is substantially different from the way covered by the claims of the patents in issue.

The staff argued that, if the asserted claims are found to be valid, complainant has shown by a preponderance of the evidence that the V-10 deactivatable resonant tag literally infringes all of said claim and further infringes said claims under the doctrine of equivalents.

The Actron respondents currently manufacture and sell two different tags of the accused V-10 type (FF 616). The V-10 tag comprises a polyethylene substrate and has a conductive metal film of aluminum etched in a pattern on each surface of the substrate (FF 624, 626). It includes a square-like spiral around the outside that forms the inductor, which is composed of a flat spiral of the 50 micron thick aluminum which begins at the outside perimeter of the tag and spirals in toward the smaller square capacitor electrode (FF 637, 639). It also includes a pair of conducting areas on either side of the polyethylene substrate that forms the capacitor, a connecting lead between the inductor and the capacitor on one plate, as well as a connecting lead on the opposite side and two connecting leads which are crimped together at the upper right corner (FF 637).

In the manufacturing process of the V-10 tag, the web moves underneath a heated die, stops moving, the heated die presses the web, the heated die is released and then the web moves again (FF 633). The pressing down of the heated die strikes the capacitor area and brings areas of the two capacitors closer together. Such pressing tunes the capacitor so that it resonates at 8.2 megahertz while before the pressing the tag would resonate at about 9.7 megahertz (FF 612). As a result of the pressing, a ridge is formed immediately outside of where the pressing tool contacts the electrode. That ridge is formed by heated polyethylene which flows from under the pressing tool as it is pressed into the electrode (FF 632). The average thickness of polyethylene between the capacitor plates before heating and pressing is twenty six (26) microns while the average thickness of polyethylene between the capacitor plates after the heating and pressing is eighteen (18) microns (FF 625). The aluminum layer on one side of the polyethylene substrate is twelve (12) microns thick on average while the aluminum layer on the opposite side of the polyethylene substrate is 50 microns thick on average (FF 627). The V-10 tag has a large pressed area in the center of the tag which for one design has a width of approximately 1.2 centimeters (FF 640). This large pressed area changes both the Q and the resonant frequency of the tuned circuit (FF 641, 643).

The V-10 manufacturing process forms a laminate of aluminum foil on the top and bottom of the polyethylene substrate film. The tuned circuit of each tag is formed by etching away some aluminum leaving only the inductor, capacitor electrodes and connecting leads. Then a corner of the tag is crimped so that the aluminum on the top and bottom surfaces touch such that one end of the inductor is electrically connected to the capacitor electrode lead on the opposite side of the substrate. In tuning the capacitor the electrode that is not on the inductor side is heated and pressed to thin the dielectric to the proper thickness for the correct capacitance to resonant at 8.2 MHz (FF 628).

Complainant, having the burden to establish infringement and in view of the claim interpretation, supra, must show by a preponderance of the evidence that in the accused tag of the Actron respondents any arc discharge to form a permanent short circuit must propagate directly through the polyethylene substrate, i.e. the disclosed electrical breakdown must take place through the polyethylene substrate. Complainant has argued that the arc discharge in the V-10 tag preferentially occurs at the path defined by the indentation, as confirmed by the "rubbing" tests of Rhoads (CB at 50). The rubbing tests (FF 566-580) may indicate the site of deactivation in the V-10 tag (FF 573). However, the rubbing tests do not indicate the internal structure of the accused tags (FF 566-580). Even Rhoads admitted that while any tag which interacts with complainant's deactivation pad and which deactivates upon it by means of some process which involves a "dimple", could well be infringing, there are certainly many other aspects to both the claims and the operations of the tag that should be investigated before an infringement opinion could be rendered one way or the other way (FF 578). Moreover while Rhoads used various means to create dimples in the accused tags (FF 576), the conditions employed varied (FF 574, 575, 576, 577) with no controls (FF 578). There is nothing in the record to establish that Rhoads' creation of dimples in the accused tags is even similar to the processes employed by the Actron and All-Tag respondents for creating and thinning. Also Rhoads admitted that he had not disassembled the accused tags and that the internal structure of the accused tags has been only revealed "as accurately as we could achieve by the sectioning" performed by Altschuler (FF 605) discussed infra.

Based on the foregoing, the administrative law judge finds that the rubbing tests do not establish by a preponderance of evidence that the V-10 tag has the means, referring to the fourth clause of illustrative claim 1 of the '076 patent, within the conductive areas or that the path at which an arc discharge occurs in the V-10 tag is through the substrate or that the V-10 tag has a planar substrate of dielectric material, as that the term "planar" has been construed,[23] or that the function of the pressed area to render the V-10 tag deactivatable is substantially the same as that function of the means in issue or that the way by which the large pressed area of the V-10 tag renders the tag deactivatable is substantially the same as the way covered by the means in issue.

Complainant has put into evidence study of Altschuler[24] to establish by a preponderance of evidence that the accused V-10 tag as well as the accused All-Tag tag infringe the asserted claims (FF 581). The administrative law judge however gives no weight to the Altschuler study (FF 583 to 606). For example Rhoads neglected to ensure that the tags examined by Altschuler were

---

23 Claims 19, 20 and 22 of the 473 patent do not require "planar substrate" but merely recite a "substrate of dielectric material."

24 Altschuler did not testify at the hearing (FF 582).

all deactivatable (FF 584). The measurement results of cross sections that Altschuler obtained were inconsistent with known dimensions of the accused tags (FF 595, 597, 598, 604).[25] When the results of a testing are bad, the methodology is bad (FF 598). Altschuler was unable to locate any hole in the accused All-Tag tag. Rhoads testified that "apparently on one of the grinding steps it was overshot" and because of the limited time, the attempt was not repeated on any further specimens" (FF 606).

Accordingly the administrative law judge finds that complainant has not established that the accused V-10 tag infringes the asserted claims by a preponderance of evidence either literally or through the doctrine of equivalents.

In addition, while unnecessary for his determination of non-infringement, the administrative law judge finds that there is evidence, in the form of tests which indicates that the accused V-10 tag does not infringe the asserted claims either literally or through the doctrine of equivalents [26]

---

[25] Rhoads' deposition testimony even pointed out the difficulty in making cross-sections of the accused tags without altering the original tag geometry (FF 601).

[26] Tests further confirm the conclusion that the structure and breakdown strengths of the accused tag of the Actron respondents and complainant's tag (continued...)

The administrative law judge further finds, as an independent ground of non-infringement, that there is evidence which establishes that as a result of the pressing in the V-10 manufacturing process, the Q of the accused resonant circuit is lowered (FF 641, 643, 644).

The administrative law judge also finds, as yet another independent ground of non-infringement, that, complainant has not established by a preponderance of evidence, that the V-10 tag infringes the asserted claims, with the exception of those claims that do not recite a "planar" substrate, viz. claims 19, 20 and 22 of the '473 patent, in view of the evidence that establishes that the thickness of the substrate in a V-10 tag at around the large pressed location varies significantly from the thickness of the remaining substrate (FF 632, 645).

(b) The All-Tag Respondents

Complainant argued that the accused tag of the All-Tag respondents infringes the asserted claims either literally or through the doctrine of equivalents.

Complainant, to satisfy its burden of proof regarding infringement of illustrative claim 1 of the '076 patent, by a preponderance of the evidence, argued that the structure disclosed in the '076 patent that corresponds to the fourth means clause of claim 1 is the indentation in the capacitor plate that brings the two plates closer together at that location; that in the All-Tag tag that structure is a small rough round indentation or "dimple" that is created by All-Tag during manufacturing and brings the capacitor plates closer

---

[26](...continued)
are probably entirely different (FF 648 to 654).

together at the location of the indent; that an arc discharge occurs during deactivation of the All-Tag tag between the two plates of the All-Tag capacitor at the indentation and forms a short circuit to deactivate the tag; and that as a result the All-Tag tag has the same structure, i.e. an indentation in the capacitor plate, as the claimed tag, and the structure of the All-Tag tag performs the identical function as the claimed tag, viz. deactivation by shorting the tag.

All-Tag represented that, as agreed among the parties, claim 1 of the '076 patent is representative of each of the means claims in issue.[27] All-Tag also represented that for purposes of this investigation, All-Tag does not contend that its accused tag does not include the elements of said claim 1 preceding the fourth means clause (RTB at 59. 60). All-Tag argued that the All-Tag tag does not literally include the fourth means clause because the All-Tag tag does not deactivate through the plastic substrate; that the deactivation structure of the All-Tag tag is a different kind of structure, viz. an air capacitor, and not an indentation partly through the substrate thickness; and consequently that the method of deactivation is different and the benefits or the results of the deactivation are different.

The staff argued that, if the asserted claims are found valid, complainant has shown, by a preponderance of the evidence, that the accused All-Tag tag either literally infringes or infringes under the doctrine of equivalents the asserted claims.

The accused All-Tag deactivatable resonant tag is manufactured according

---

[27] In view of the administrative law judge's finding that claims 25, 26 and 27 in issue of the '473 patent are not anticipated, he considers claim 1 of the '076 to be representative of all the claims in issue.

to a process described in U. S. Letters Patent 5,187,466 (the '466 patent) to Pichl which issued on February 16, 1993 (FF 752). The accused tag structure generally comprises a laminated composite of a ten micron aluminum foil layer, a twenty micron polymer film layer of polypropylene and a 50 micron aluminum foil layer. A desired tuned circuit structure in aluminum has been printed on the tag and through an etching process unwanted aluminum is removed. The final resonant tag includes on one side of the twenty micron polypropylene film the ten micron aluminum capacitor plate and on the other side of the polypropylene film the fifty micron capacitor plate and the inductor coil of aluminum foil. All-Tag selected polypropylene for its intermediate layer because of its superior mechanical properties such as better form stability and heat resistance (FF 763).

Pictures shown at the hearing indicate the presence of a crater in a 10-micron thick aluminum upper capacitor plate and a much larger hole through a 20-micron thick polypropylene substrate between that plate and a fifty micron thick lower capacitor plate FF 755). It is such a hole that Altschuler was not able to locate in his testing of the All-Tag accused tag because in Altschuler's work it was overshot in the grinding steps (FF 606).

The All-Tag process for making the accused tag, which process is not disputed, comprises the steps of deforming a local area of the dielectric layer of polypropylene to place the capacitor surfaces closer together at the local area to induce a short circuit between the surfaces by moving a heated metal rod against a first capacitor surface at the local area to displace thermally the dielectric layer and make a conductive contact with the other capacitor surface and passing an electric current between the capacitor surfaces in conductive contact of enough magnitude to permanently deform the materials around the local area and leave a gap between the surfaces so that the deactivating system can melt the capacitor surface together at the local area to form a permanent short circuit (FF 764). Said process has been characterized as involving two phases. In the first phase the capacitor surfaces contact each other and/or are crimped to each other and in the second phase a current/voltage source is connected to the now short circuited capacitor and the crimping burnt off by an electrical overload. By an appropriate adjusting of the ampere/volts ratio the thinner surface of the capacitor burns off in such a manner that the distance between the edge of the burnt out hole and the second surface corresponds to the deactivatable distance (FF 764).

Figure 4 of the '466 patent illustrates the cut-out of the capacitor in accordance with the second phase. In Figure 4 the crimping has been removed by an electrical overload which occurs by a burning like procedure during which a crater shaped irregular hole or a plurality of such holes are formed in the thinner surface of the capacitor. At the same time the dielectric polypropylene burns within the area of the edge of the hole between the two surfaces of the capacitor thereby generating an air gap having a width of about 1.5 to 3 microns. The hole in Figure 4 has a diameter of about 70 microns. A part of the aluminum which has been melted away is thereby piled up at the edge of the hole and form said crater. Said Figure 4 depicts further that the air gap extends behind the edge of the crater and specifically beyond that area where the lower edge of the crater is at distance of three microns from the second surface of the capacitor which guarantees that the deactivating occurs always by a metal thread (FF 765). While there are no process claims in issue, contrasting the All-Tag process where there is intentionally formed air gaps in the accused tag, which complainant's Altschuler in his study was not able to even identify (FF 606),[28] the process for making the claimed tag in issue does not involve the creation of air gaps in the tag (FF 166, 574).[29]

Complainant has argued that the structure disclosed in the '076 patent that corresponds to the fourth means clause of illustrative claim 1 of the '076 patent is the indentation in the capacitor that brings the two capacitor plates closer together at that location. While that may be the structure disclosed, the fourth clause of said claim 1 requires that that structure be within the conductive areas and define a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur which language has been interpreted as requiring that in the accused All-Tag tag any arc discharge to form a permanent short circuit must propagate through the polypropylene substrate, i.e. the disclosed electrical breakdown must take place through the polypropylene substrate of the accused tag. Accordingly complainant has the been of establishing by a preponderance of the evidence that such occurs in the accused All-Tag tag.

Complainant to satisfy its burden relies on certain rubbing tests (FF 568 to 580) and the Altschuler study (FF 581). As the administrative law judge has found, supra, in connection with the alleged infringement of the V-10 tag, while the rubbing tests may indicate the site of deactivation in the

---

28 Rhoads believed that it would he possible to get a section through the hole of the accused All-Tag tag but it is a "little bit like shooting in the dark" (FF 606).

29 Those of ordinary skill in the art believed at least in the early 1980's that it was undesirable for gaps of air to be present in the solid plastic substrate or resonant tags (FF 109).

accused All-Tag tag, he finds that the rubbing tests do not establish by a preponderance of the evidence that in the accused All-Tag tag any arc discharge propagates directly through the polypropylene substrate. Also he has given no weight to the Altschuler report, see supra. Accordingly the administrative law judge finds that complainant has not established, by a preponderance of the evidence, that the accused All-Tag tag infringes the asserted claims either (1) through the doctrine of equivalents because it has not been shown that the function of the air capacitor to render the accused All-Tag tag deactivatable is substantially the same as the function of the means clause in issue and because it has not been shown that the way by which the air capacitor renders the accused All-Tag tag deactivatable is substantially the same as the way covered by the means clause in issue, or (2) literally.

In addition, while not critical to his finding that complainant has not met its burden in establishing infringement, he further finds that there is evidence, in the form of expert testimony and tests performed by the All-Tag respondents which indicates that the accused All-Tag tag does not infringe the asserted claims either literally or through the doctrine of equivalents. See FF 766, 768 to 775, 779, 780. For example, as seen in FF 775, the All-Tag respondents in measuring the hole of the polypropylene substrate in the accused tag found it to be more than three times larger than that of the hole in the top aluminum layer.

(c) **Toyo**

Complainant alleged that Toyo contributorily infringes the patents in issue under 35 U.S.C. §271(c)[30] because (1) Toyo has supplied laminated circuit to All-Tag on a monthly basis since early 1991, which laminated circuit is a material component of the deactivatable resonant tags manufactured by All-Tag, requiring only certain "finishing" operations, including addition of a deactivation mechanism, to create the accused product; (2) Toyo has known since the beginning of its relationship with All-Tag that its product is used to manufacture deactivatable resonant tags, having specifically designed its laminated circuit material to facilitate All-Tag's manufacture of deactivatable tags; and (3) Toyo was aware of All-Tag's manufacture of deactivatable tags through its correspondence with All-Tag, through its own testing of All-Tag's products and through the visit of Toyo's Nakatou to All-Tag's headquarters in Switzerland (CB at 70-72).

Complainant argued that the probe point connection pad on the Toyo laminated circuit serves no other purpose than to assist All-Tag in adding the deactivation mechanism to its tag and further degrades the performance and compromises the manufacturability of non-deactivatable tags; that the Toyo laminated circuit material is not a staple article capable of substantial noninfringing use; and that there is no commercially significant non-infringing use for Toyo's laminated circuit material (CB at 72-74).

---

30 35 U.S.C. § 271(c) provides as follows:

> (c) Whoever sells a component of a patented machine, manufacture, combination or composition, or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use, shall be liable as a contributory infringer.

35 U.S.C. § 271(c).

Complainant also argued, citing Preemption Devices v. Minnesota Min. and Mfg. Co., 630 F. Supp. 463, 471 n.10, 229 USPQ 255, 216 n.10 (E.D. Pa. 1985), aff'd in relevant part and vacated in part, 803 F.2d 1170, 231 USPQ 297 (Fed. Cir. 1986) (Preemption Devices), Polysius Corp. v. Fuller Co., 709 F. Supp. 560, 576, 10 USPQ2d 1417, 1429 (E.D. Pa.), aff'd without opinion, 889 F.2d 1100 (Fed. Cir. 1989) (Polysius), and Sony Corp. v. Universal City Studios, Inc., 464 U.S. 417, 442 (1984) (Sony) that even if there is a substantial noninfringing use for a component, there is contributory infringement if the component was specially designed for use in an infringing product.

Toyo argued that the laminated circuit material sold to All-Tag by Toyo is used in large quantities for non-infringing, non-deactivatable tags manufactured and sold by All-Tag (TB at 2). A staple article of commerce is one that was not designed for use with a patented process and has substantial, efficient, and feasible uses outside the patent. Polysius, 709 F.Supp at 576, 10 USPQ2d at 1429.

The staff argued that Checkpoint has not established, by a preponderance of the evidence, that Toyo has contributorily infringed the patents at issue. The staff, in support, argued that the web supplied by Toyo to All-Tag resonates at 16 MHz and cannot be used by itself as either a deactivatable or non-deactivatable resonant tag because it cannot be detected; that while All-Tag designed and developed its tags, with suggestions from Toyo as to types of plastics to use Toyo had no input into All-Tag's decision to make deactivatable or non-deactivatable tags from the Toyo web material.

All-Tag has put on the record evidence of a sale of some 100,000 non-deactivatable resonant tags to a U.S. company in Deerfield, Florida (Sen Tech Corporation). This sale was made in April of 1993 (FF 810).

The administrative law judge finds Preemption, Devices, and Sony not controlling. In Sony the Supreme Court stated that the line of cases on contributory infringement deny the patentee any right to control the distribution of unpatented articles "unless they are 'unsuited for any commercial noninfringing use," citing Dawson Chemical Co. v. Rohm & Haas Co., 448 U.S. 176, 198 (1980), and "[u]nless a commodity 'has no use except through practice of the patented method,' the patentee has no right to claim that its distribution constitutes contributory infringement." See Sony at 440-41 and also C.R. Bard, 15 USPQ2d at 1544. The circuit material of Toyo in issue has a substantial noninfringing use.

The Polysius case is distinguishable because the court there specifically found that there was no use for the accused component other than the patented use Polysius 709 F.Supp at 576, 10 USPQ2d at 1428-29. Likewise, Preemption is distinguishable because the court there, as in Polysius, explicitly found that there was no substantial noninfringing use for the component there at issue, and that any alternative use was an aberrant use Preemption, 630 F.Supp. at 4771 n.10, 229 USPQ 261, n.10.

The administrative law judge finds that the record through the sale of some 100,000 non-deactivatable resonant tags to Sun Tech Corporation which is located in the United States establishes that there is a substantial noninfringing use of Toyo's accused laminated circuit material. Accordingly, assuming complainant had established direct infringement by a preponderance of the evidence, it is found that complainant has not met its burden in establishing contributory infringement by Toyo.

FINDINGS OF FACT

I. JURISDICTION

1. All respondents were served with the complaint and notice of investigation.

2. The Actron respondents and the All-Tag respondents filed entries of appearance pursuant to Commission interim rule 201.11, responded to the complaint, and participated in discovery.

II. PARTIES

3. Complainant Checkpoint is a Pennsylvania Corporation with headquarters at 550 Grove Road, Thorofare N.J. 08086. Checkpoint manufactures anti-theft deactivatable resonant tags in the United States and sells them worldwide for use in electronic article surveillance systems (Wolf, CX-1, Q. 4-11).

4. Checkpoint is the exclusive licensee of Arthur D. Little, Inc. (ADL) of the '076 patent (CX 9) and the '473 patent (CX-10) (CX 1, Wolf, Q. 21, 22). Arthur D. Little is the exclusive licensee of George J. Lichtblau, the person named as the inventor on the patents in suit (CX 1, Wolf, Q. 24).

5. Respondent All-Tag is a corporation organized under the laws of Switzerland and has a principal place of business at Industriestrasse 11, Rotkreuz/Zug, Switzerland (RTX 1, Pichl, Q. 2). All-Tag was established in April 1991 and is in the business of the manufacture and sale of electronically detectible tags (RTX 1, Pichl, Q. 5, 12).

6. Respondent Toyo is a corporation organized under the laws of Japan and has a principal place of business at Midosuji Daiwa Building, 6 - 8 Kyutarocho, 3-Chome Chuo-Ku, Osaka 541 Japan. Toyo does not sell any products in issue in this investigation. Rather, Toyo sells the web material to All-

Tag based on All-Tag's specifications and All-Tag uses the web material to make non-deactivatable and deactivatable resonant tags (RTX 1, Pichl, Q. 118 - 126).

7. Respondent ADT Limited is a Bermuda corporation having its principal place of business at Cedar House, 41 Cedar Avenue, Hamilton, Bermuda (Amended Complaint, ¶6, uncontested).

8. Respondent Actron AG is a Swiss company having its principal place of business at Lettenstrasse 8, CH-6343 Rotkreuz, Switzerland (Amended Complaint, ¶4, uncontested).

9. Actron AG is a wholly-owned subsidiary of ADT Limited (Amended Complaint, ¶6, uncontested).

10. Actron AG owns 33% of the outstanding common stock of Tokai Denshi (Amended Complaint, ¶7).

11. Respondent Tokai Denshi Co., Ltd. (Tokai) is a Japanese company having its principal place of business at 1071 Yahata, Chigasaki-shi, Kanagawa Prefecture, Japan (Amended Complaint, ¶7, uncontested).

12. Tokai manufactures in Japan and sells to Actron AG deactivatable resonant tags (Matsumoto, Tr. at 1065).

13. Respondent Custom Security Industries Inc. (CSI) is a distributor of All-Tag's infringing resonant tags to the U.S. market. CSI is a corporation established under the laws of Canada. Its address is 19 Ruggles Avenue, Unit 5, Thorn Hill, Ontario, Canada. CSI is the parent corporation of Customs Aswarby, Sleaford, Lincolnshire, United Kingdom NG34 8SG. From both of these locations, CSI sells and distributes All-Tag's resonant tags, including exports of the infringing resonant tags to the United States (Complaint at 6-7). In an initial detemination (Order No. 58), the administrative law judge found, pursuant to Commission interim rule 210.25, that CSI has waived its right to appear, to

be served with documents and to contest the allegations in issue in this investigation. On October 1, 1993, the Commission issued a notice in which it stated that it had determined not to review the initial determination.

III. PRODUCTS AT ISSUE

14. The products at issue are anti theft disposable deactivatable resonant tags for use in electronic article surveillance (EAS) systems. Such tags consist of a flat passive resonant circuit that may be covered with a paper label containing a printed message or bar code. The tags are intended to be attached to or embedded in retail merchandise and other articles to prevent theft. The circuit or tag is caused to resonate when it passes through a detector, generally located at a building or store exit, that generates an electromagnetic field of certain frequency. The resonating circuit interrupts the electromagnetic field, thereby triggering an alarm. With the products in issue, when the merchandise is paid for, the clerk at the store will deactivate the tag by means of a "deactivator", e.g. CPX 3, which applies energy to the tag to short circuit the tag to destroy the resonance in the tag. If the tag is not deactivated and the merchandise is taken from the store, the resonance of the tag will be detected by a "detection" device, e.g. CPX 1, and will sound an alarm (Wolf, CX-1, Q. 12; CX-6; CX-7; CX-44; Pichl, RTX-1, Q.6).

15. The deactivatable resonant tags at issue are used in EAS systems in conjunction with a sensor that detects the tag, and a deactivator that deactivates the tag. The detection equipment is a gate that contains a transmitter and a receiver. When an active resonant tag passes through the gate, it interrupts the transmitter's signal, causing an alarm. EAS systems also include deactivation equipment -- a pad that remotely detects and then deactivates the resonant tag at the point of sale. This is done by applying a

strong electromagnetic field to the tag sufficient to destroy or disable the circuit. Once the resonant tag is deactivated, it can pass through the detection equipment without causing an alarm (Wolf, CX-1, Q. 13-16; CX-3 at 23; CX-6; Farestad, Tr. 511-23; CPX-1; CPX-3).

16. Components of anti-theft deactivatable resonant tags include partially completed tags, circuit boards for the tags, sheets of assembled resonant tag electronic circuitry, or unfinished tags requiring printing, cutting, or the application of adhesive (See, e.g., CPX-9; CPX-10).

17. Complainant Checkpoint's deactivatable resonant tags, typified by the 410 tag, are manufactured in a variety of shapes, including square, rectangular, and elongated oval shapes. The tags all contain a flat metal spiral inductor that surrounds a capacitor to form a resonant circuit. (CX-44, CX-50, CRPX-9.)

18. The technology involved in this investigation generally comprises three items, namely, (1) a resonant tag having a specified resonant frequency; (2) a detection system capable of detecting the tag at the specified resonant frequency; and (3) a deactivation system to deactivate the tag once the consumer has paid for the merchandise or otherwise properly obtained the items (CX-9, Col. 1, lines 12 - 27).

IV. DOMESTIC INDUSTRY

19. Checkpoint obtained exclusive rights to the patents in issue through a series of agreements in which George J. Lichtblau granted ADL the exclusive right to license the '076 and '473 patents and ADL granted Checkpoint an exclusive license to the patents. Checkpoint has never granted a sublicense to the '076 and '473 patents (Wolf, CX-1, Q. 21-31; Lichtblau, CX-2, Q. 164-168; CX-11; CX-12; CX-13; CX-14; CX-15).

20. In 1992, Checkpoint paid over $1.25 million in royalties to ADL. Lichtblau receives a majority percentage of those royalties from ADL (CX-1 at Q.32; CX-11).

21. In 1982, Checkpoint introduced a resonant tag known as the "Sticker". (Wolf Tr. at 2676-2677; also see RAPX-35 (video tape)).

22. The "Sticker" was "possibly the most successful product that Checkpoint ever had" (Wolf, Tr. at 2677).

23. The "Sticker" tag was covered by Lichtblau's prior patents (Wolf, Tr. at 2678).

24. Originally, the "Sticker" tag was a non-deactivatable resonant tag with no indent (Wolf, Tr. at 2679).

25. The "Sticker" could be deactivated by applying a detuner to the tag as previously described (Wolf, Tr. at 2678).

26. The steep increase in sales commencing in 1982 shown in CX-16, three years before introduction of the indent method of deactivation, was attributable to the success of the "Sticker" tag (CX-16; Wolf, Tr. at 2680-2681).

27. During the time period 1982-1984, Checkpoint's manufacturing facility in Ponce, Puerto Rico, devoted between 50 and 90 percent of its capacity to the manufacture of non-deactivatable "Sticker" tags (Wolf, Tr. at 2681-2682).

28. After 1985, the "Sticker" tag became deactivatable using the indentation means covered by the patents at issue (Wolf, Tr. at 2693).

29. Checkpoint's commercial disposable deactivatable tags, as typified by the 410 tags, practice claim 1 of the '076 patent. The Checkpoint tags are suitable for use in an electronic security system as defined in the preamble of claim 1. In addition, they contain a resonant circuit that comprises a planar substrate of dielectric material and a tuned circuit in planar circuit

configuration. The tags are tuned to resonate at 8.2 MHz. The tuned circuit of the Checkpoint tags has a pair of conductive areas in alignment on opposite sides of the surfaces of the substrate that define the capacitor. Finally the Checkpoint tags have means within the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at 8.2 MHz of sufficient energy and operative to destroy the resonant properties of the tag (Rhoads, CX-4, Q. 40-55). No evidence has been submitted to dispute this point.

30. All parties agree that the Checkpoint tag deactivates through polyethylene, and not through air.

31. Checkpoint's deactivatable tags practice claim 2 of the '076 patent in that the conductive areas include an indented portion that provides spacing between the conductive areas that is less than the spacing between the conductive areas outside the indented portion; that indented portion establishes the preferred path for the arc discharge to occur (Rhoads, CX-4, Q. 66-67). No evidence has been submitted to dispute this point.

32. Checkpoint's deactivatable tags practice claims 4, 6, 9, 10, 20, 21, 23, and 25 of the '076 patent (Rhoads, CX-4, Q. 71, 76, 78, 80, 82, 84, 86). No evidence has been submitted to dispute this point.

33. Checkpoint's deactivatable tags practice claims 1, 2, 4, 6, 9, 10, 19, 20, 22, 24, 25, 26, 27 of the '473 patent (Rhoads, CX-4, Q. 90). No evidence has been submitted to dispute this point.

34. Checkpoint manufactures all of its disposable deactivatable resonant tags at a manufacturing facility in Ponce, Puerto Rico. Checkpoint constructed the facility beginning in 1989 and developed custom equipment for manufacturing the disposable, deactivatable circuits. Checkpoint invested more than $15

million in the Ponce plant and equipment (Wolf, CX-1, Q. 49-50; Farestad, CX-3, Q. 10-11; CX-17).

35.

All of the manufacturing steps for Checkpoint's deactivatable resonant tags are performed at the Ponce facility (Farestad, CX-3, Q. 13; Wolf, CX-1, Q. 50).

36. Checkpoint has a total of 1200 employees worldwide. Three quarters of those employees are in the United States, including Puerto Rico. Checkpoint estimates the total salaries and benefits for its U.S. employees in 1993 will be more than $20 million. More than 50 percent of Checkpoint's U.S. workers are directly involved in deactivatable tag production and marketing (Wolf, CX-1, Q. 51-52).

37. Checkpoint's research and development relates to the concept of electronic article merchandising and source tagging and includes efforts to make tags smaller, to increase the range of detection for tags, to improve point-of-sale deactivation of tags, and to design ways to activate tags on conveyor lines. In 1989, 1990, and 1991, Checkpoint spent approximately $2.2 million, $2.7 million, and $3.3 million, respectively, on research and development. In 1992, Checkpoint spent $4.5 million on research and development and the company expects to spend close to $6 million on research and development in 1993 (Wolf, CX-1, Q. 53-54).

38. Complainant has established, and respondents have not challenged, that a domestic industry exists which practices the patents at issue by virtue of Checkpoint's substantial investment in plant and equipment, labor and capital,

and research and development involving anti-theft resonant tags covered by the asserted claims of the patents at issue (See Complaint, ¶¶ 43-51, pp. 19-21).

39. Checkpoint sells deactivatable and non-deactivatable resonant tags. (CX-5).

40. The Checkpoint deactivatable and non-deactivatable resonant tags may be detected on the same detection device such as shown in CPX-3 (CX-5; Wolf, Tr. at 331 - 332).

41. The Checkpoint non-deactivatable and deactivatable tags each use the general manufacturing process described in the Lichtblau '219 patent, although this patent does not disclose the deactivation structure used in the Checkpoint commercial tags (Wolf, Tr. at 332). In other words, the Checkpoint deactivatable and non-deactivatable tags are of an extruded laminate structure of a first aluminum layer of about 9 microns, a polyethylene layer of about 25 microns and a second aluminum layer of about 50 microns (CRX-44).

42. The Checkpoint commercial deactivatable tags are essentially the same as the Checkpoint commercial nondeactivatable tags sold since about 1978 to the present with the exception of the addition of the deactivation structure (Wolf, Tr. at 322, 2664).

43. The deactivation structure of the Checkpoint tag is referred to by Checkpoint as a "dimple" and is made by a "dimpling" process (E.g., CX-3, Farestad, Q. 29). Mr. Mazoki, Checkpoint's Manager of Process Development refers to the deactivation structure in the Checkpoint tag as "imperfections" created in the tag (RTX-23, p. 115 - 116).

44. The Checkpoint deactivatable tags which are asserted to be made under the patents in issue are shown in RTX-20 and CX-6.

45.

46. As seen in Figure 8 of RTX-22, the deactivation structure of the Checkpoint tag can include a sharp point at the corners of the "dimple" or "imperfection". This is where deactivation will occur (Rhoads, Tr. at 897 - 898).

47. A deactivator that Checkpoint sells commercially (CPX-3) generates approximately 200 volts at the surface of the pad. A resonant tag laying on the surface of the pad would have approximately 200 volts across its capacitor (Farestad, Tr. at 588-89).

48. The EAS industry is highly competitive, employing a variety of technologies. Checkpoint competes against magnetic, acousto-magnetic and microwave technologies for the same kind of article surveillance applications. (Wolf, CX-1, Q. 56).

49. Two of Checkpoint's competitors are larger than Checkpoint in the article surveillance area. These companies are Sensormatic and Knogo. Other large companies such as 3M, ADT, and Esselte Meto are also competitors. (Wolf, CX-1, Q. 55.)

50. Knogo uses radio-frequency technology, but only in a reusable tag. Knogo does, however, sell disposable tags of a magnetic type in competition with Checkpoint (Wolf, CX-1, Q. 56).

51. 3M sells tags using magnetic technology, and has a deactivation system to deactivate magnetic strips (Wolf, CX-1, Q. 56).

52. The "remote deactivation" concept, known at Checkpoint as "Electronic Article Merchandising" (EAM), is a way for retailers to present their theft-prone products to shoppers in a much more open manner (Wolf, CX-1 at 5 Q15).

53. With EAM, merchandisers can display their products openly rather than protect them from theft by hiding them behind counters or in stock rooms, thus allowing shoppers to engage in "impulse purchases" of products that are immediately accessible to them (Wolf, CX-1 at 5-6 Q15).

54. With remote electronic deactivation, there is no need for the check-out clerk to locate or physically remove or manipulate the tag itself; thus, the tag may be inside the product or packaging, or integrated into normal price or bar code information on the package, which means that the circuit is less subject to tampering (Wolf, CX-1 at 6 Q16).

55. Detuners are offered by Checkpoint free of charge to many of its retail customers in order to deal with the so-called "FTD" (failure to deactivate) problem (Farestad, Tr. at 594:12-17, 595:18-597:4).

56. Approximately one percent of all tags experience an FTD problem (Farestad, Tr. at 597:17-598:7).

V. IMPORTATION AND SALE

57.

58.

59.

60.

61.

62.

63.

64.

65.

66.

67.

68. All-Tag has sent and/or delivered its deactivatable resonant tags from Switzerland to businesses in the United States, including the following:

(a) All-Tag sent without charge to Sensormatic Electronics Corporation in Deerfield Beach, Florida, a sample quantity of deactivatable resonant tags consisting of one roll of tags (at least 200 tags) on or about September 7, 1992, and a sample quantity of approximately 100 deactivatable resonant tags on or about February 24, 1993;

(b) All-Tag sent without charge a sample quantity of deactivatable resonant tags to SenTech Corporation in Deerfield Beach, Florida in or about February 1993, and an additional sample of deactivatable resonant tags of unknown quantity on or about March 17, 1993;

(c) All-Tag sent without charge to 3M Safety and Security Systems in St. Paul, Minnesota a sample quantity of about 100 units of deactivatable resonant tags on or about March 3, 1993, and provided additional units of deactivatable resonant tags to 3M on or about May 11, 1993. All-Tag also delivered to 3M in New York, New York without charge samples of deactivatable resonant tags on or about January 17, 1993; and

(d) All-Tag sent without charge a sample quantity of five or fewer deactivatable resonant tags to Rume in Farming Daily, New York, on or about April 8, 1993.

(Stipulation, CX-57).

69. In January 1993, at the National Retail Federation show in New York, New York, Olivier Boels, who is All-Tag's Director of International Sales, brought with him from Switzerland All-Tag deactivatable resonant tags and showed a sample of the tag to Kevin P. Dowd, Checkpoint's Executive Vice President (Stipulation, CX-57).

70. In August 1993, Checkpoint placed an order through Custom Securities Industries, Inc. (CSI) located in Canada for 23,000 deactivatable resonant tags from All-Tag in Switzerland. CSI obtained the accused product from All-Tag and CSI filled Checkpoint's order by importing into the United States 23,000 All-Tag deactivatable resonant tags on or about August 19, 1992 (Stipulation, CX-57; CX-21).

71. All-Tag has discussed with certain U.S. companies the possibility of those companies serving as distributors in the United States of All-Tag deactivatable resonant tags, including Ketec, Inc., Sensormatic Electronics Corporation, 3M Safety and Security Systems Division, ID Systems US, Esselte Meto International, and Rume (Stipulation, CX-57).

72. Since approximately March 1991, Toyo has been the exclusive supplier to All-Tag of laminated circuit materials used by All-Tag to manufacture anti-theft resonant tags, including the accused products (Pichl, CX-142 at 47; Nakatou, CX-140 at 78-79).

73. Complainant and respondents Actron, ADT and Tokai have stipulated to facts which show that said Respondents have engaged in the importation, the sale for importation, or the sale after importation of products which are alleged to infringe the patents at issue (CX-56).

74. Complainant and respondent All-Tag have stipulated to facts which show that said respondent has engaged in the importation, the sale for importation, or the sale after importation of products which are alleged to infringe the patents at issue (CX-57).

VI. EXPERTS AT HEARING

75. Kevin G. Rhoads, Ph.D., testified on Checkpoint's behalf. He was accepted as an expert witness in his areas of specialization: the design and behavior of electrical circuits, dielectric behavior and failure, the initiation of electrical breakdown in dielectrics, and physics; and in his areas of sub-specialization: electrodynamics, electrostatics, magnetostatics, electromechanics, continuum mechanics, continuum electromechanics and power electronics (Rhoads, Tr. 656-657).

76. Dr. Markus Zahn testified on behalf of the Actron respondents. He was accepted as an expert witness with the following areas of expertise: electrical fields; electrical circuitry; characteristics, operation and breakdown of dielectric materials; characteristics, operation and discharge of capacitors; and the disclosures of the patents in issue (Tr. 2193).

77. Zahn received in June 1968 a BSEE and a MSEE, in June 1969 a degree of Electrical Engineer and in Sept. 1970 a Doctor of Science from the Massachusetts Institute of Technology (MIT). Zahn's doctoral thesis title was "Space Charge Dynamics of Liquids." His principle fields of interest have been electrodynamics, continuum electromechanics, electrohydrodynamics and ferrohydrodynamics and dielectric and magnetic physics. He has held the title of Professor of Electrical Engineering at MMIT since July 1992. From 1980 to July 1992 Zahn was an associate professor of electrical engineering at MIT. From 1970 to 1980 he was teaching electrical engineering at the University of

Florida as professor, associate professor and assistant professor. In 1971 he received Sigma Tau-Tau Beta Pi Award for excellence in undergraduate engineering teaching from the University of Florida. In 1972, 1973 he attained IEEE (student branch) excellence in teaching awards from the University of Florida. In 1982 he received a ferrofluidics advanced study fellowship. In 1987 Prof. Zahn was the winner of the Great MIT Image Making Contest for videotape "Kerr Electro-optic Field Mapping of Electron Beam Penetration into Plexiglas". In 1989 Zahn received a MIT graduate student teaching award. Zahn has been associate editor of the IEEE Transactions on Electrical Insulation from 1977 to the present. He is also a member of the administrative committee (ADCOM), IEEE Dielectrics and Electrical Insulation Society and a member since 1989 of Ferrofluidics Corp. Scientific Advisory Committee (RAX-12). At MIT, Zahn teaches a number of courses in Electrical Engineering, specifically circuit theory, electronic devices, electromagnetic fields and waves, electromechanics and signals and systems. He testified that most recently he had a year long sabbatical at the French National Center for Scientific Research, Laboratory for Electrostatics and Dielectric Materials in Grenoble, France. He has written a textbook on electromagnetism published by John Wiley in 1979 and since 1987 republished by Krieger Publishing Co. entitled Electromagnetic Field Theory: A Problem Solving Approach. Zahn has published many journal and conference papers and made professional presentations on his experiments and mathematical, physical, and computational models of related electrical theory. Zahn has designed capacitors including designing spark gap pointed electrodes to create a preferred path for electrical breakdown research and for imaging displays and has worked with planar dielectric substrate materials with electrodes on each side of the substrate. He has consulted on this topic for such companies and government labs as the National Bureau of Standards, Exxon, Phillips, International Paper, Polaroid, AMAX, Foster Miller, Energy 4, Breakthrough Medical Corporation and Olin. He also has designed inductors for computer applications for a company named Pencept. Zahn teaches about inductance and capacitance, including material properties of conducting, dielectric and magnetic media and has co-authored a set of educational videotapes entitled "Demonstrations of Electromagnetic Fields and Energy" that includes those topics that have been prepared for MIT use and for use in other institutions. In inductor (L)-capacitor (C) resonant circuits, Zahn teaches the principles of resonance and circuit Quality Factor, Q. He has designed an LC circuit for a microwave oscillator power supply for Raytheon and has designed and built a thick film LC resonant circuit and a substrate for Microtex Electronics. He also has designed a resonant section of the high current power supply for generating linear traveling wave magnetic fields for CREARE. As of January 1, 1993, Zahn was elected to be a Fellow of the Institute of Electrical and Electronic Engineers for his contributions to understanding conduction and breakdown properties of dielectrics. To be a fellow in the Institute of Electrical and Electronic Engineers (IEEE) requires nomination and intensive scrutiny of credentials and Zahn believes that only one percent of the about 100,000 IEEE members can be selected as Fellows (RAX-11, QQ. 10 to 25).

78. Lichtblau is the named inventor of the '076 and '473 patents, in issue. He was accepted as an expert with respect to the design of resonant tags and related equipment for use in electric security systems to deter shoplifting, and with respect to the issues of infringement and validity of the two patents in issue (Lichtblau, Tr. at 2780, 2781; Lichtblau, CX-2, Q. 11-47).

79. Lichtblau holds a bachelor of science (magna cum laude) and a master of science in electrical engineering from Princeton University, and a master's degree in business from Harvard Business School (CX-22; Lichtblau, Tr. at 2861).

80. Arthur W. Holt testified as an expert witness on behalf of All-Tag and Toyo. Mr. Holt was accepted as an expert in the fields of physics and capacitor engineering as they relate to the resonant tag technology involved in this investigation (Holt, Tr. at 2533-34).

81. Dr. John D. Muzzy, Professor at Georgia Institute of Technology (RTX 2 and RTX 3A), was accepted as an expert for the All-Tag respondents in the fields of chemical engineering and engineering as they relate to the materials used in the All-Tag deactivatable resonant tag, the Checkpoint deactivatable tag, and the resonant tag referred to in the Lichtblau patents in suit, including the polymer dielectric material referred to in the Lichtblau patents in suit, the polypropylene material in the All-Tag tag, the air dielectric in the All-Tag tag and the use of polymer dielectric materials in capacitors (Muzzy, Tr. at 2347-48).

VII. **OWNERSHIP AND LICENSING OF THE '076 AND '473 PATENTS**

82. By agreement dated February 1, 1972, Lichtblau, the inventor of the patents at issue, granted ADL the exclusive right to license the manufacture, use and sale of inventions disclosed in a U.S. patent application Ser. No. 214,361 filed December 30, 1971, and improvements thereon (Wolf, CX-1 at 10, Q24, Q25); CX-11).

83. Under the terms of the February 1, 1972 agreement, Lichtblau retains the right to approve or "reasonably" withhold his approval of the terms of any proposed license (CX-11 at 2).

84. The February 1, 1972 agreement states that in any license granted thereunder by ADL, the licensee has the right to bring an action against alleged infringers to enjoin the infringing manufacture, use or sale, or to negotiate a settlement agreement. However, any such settlement may not be concluded unless the owner of the patent provides his approval (CX-11 at 7-8).

85. On February 21, 1973, ADL granted Checkpoint, under the name of Dyne Industries, Inc., the exclusive right to manufacture, sell, lease, and sublicense certain inventions pertaining to the technology at issue in this investigation, and improvements thereon. Dyne was subsequently merged into Checkpoint (Wolf, CX-1 at 10-11 Q26, Q27; CX-12 and CX-13).

86. In an October 26, 1983 addendum agreement among Lichtblau, ADL and Checkpoint, Checkpoint was expressly granted the exclusive right to make, use, and sell inventions covered by or resulting from the application referenced therein (Serial No. 376,777), and patents resulting from that application (the '076 and '473 patents) were expressly made a part of the license from ADL to Checkpoint (Wolf, CX-1 at 11 Q28; CX-12, Addendum Agreement at 2 and Schedule C; see CX-15).

87. A February 18, 1993, addendum agreement among Lichtblau, ADL and Checkpoint clarifies the intent of the aforesaid parties by expressly stating that the license agreement to ADL encompasses devices disclosed in the applications that matured into the '076 and '473 patents, and in those patents themselves, and grants ADL the exclusive right to license those particular patents (CX-1 at 11 Q29; CX-15).

VIII. THE '076 AND '473 PATENTS

88. The '076 and '473 patents are entitled "Resonant Tag and Deactivator for Use in an Electronic Security System" (CX-9; CX-10).

89. The '076 patent issued to Lichtblau on February 5, 1985, based on application Serial No. 376,777, filed on May 10, 1982 (CX-9).

90. The '473 patent issued to Lichtblau on January 28, 1986, based on application Serial No. 673,265 (a continuation of No. 376,777) filed on November 20, 1984 (CX-10).

91. Both patents at issue expire on February 5, 2002 (a terminal disclaimer having been filed with respect to the '473 patent) (CX-10).

92. The '076 patent has 25 claims, ten of which are asserted against the respondents, i.e., claims 1, 2, 4, 6, 9, 10, 20, 21, 23, and 25 (Complaint, ¶ 23, p. 10, ¶ 32, p. 14; CX-9). Six of those asserted claims (1, 6, 9, 10, 20, and 25) are independent (CX-9).

93. The '473 patent has 27 claims, 13 of which are asserted against the respondents, i.e., claims 1, 2, 4, 6, 9, 10, 19, 20, 22, and 24-27 (Complaint, ¶ 27, p. 12, ¶ 32, p. 14; CX-10). Seven of these asserted claims (claims 1, 6, 9, 10, 19, 24, and 25) are independent (CX-10).

94. The '076 patent relates to a deactivatable resonant tag and focuses on how the tag deactivates. The patent discloses deactivation of single frequency tags, e.g., Figures 1, 3, 4 and 8, and deactivation of dual frequency tags, e.g., Figures 2, 5, 6 and 9 (Rhoads, Tr. at 710 - 711). Only certain single frequency resonant tags are at issue in this case. Id.

95. The resonant tag circuit of Figure 1 is illustrated in typical construction in Figures 3 and 4, which respectively depict the opposite planar surfaces of the tag (CX-9, col. 4, ll. 48-50).

96. The '076 patent does not disclose any specific size, shape or depth of the indentation, for example whether it is pointed, round or square. Lichtblau testified that the figures in the drawing of the '076 patent are

schematics and are not intended to teach the specific size, shape or depth of the indent (Lichtblau, Tr. at 2829, 2848, 3015 - 3016).

97. Other than an "indent" partly through the substrate, there are no other means disclosed in the '076 patent for short circuiting the capacitor by reducing the thickness of the dielectric film to thereby reduce the voltage required to cause an arc through the substrate (CX 9 and CX 10; Muzzy, RTX 2 Q. 22, 23). Further, there is nothing in the '076 patent showing the indent other than part way through the substrate (Lichtblau, Tr. at 3041).

98. The '076 patent discloses that electronic security systems are intended to detect the unauthorized removal of articles from an area under detection. Such electronic security systems generally include an electromagnetic field that is provided in a controlled area, through which articles must pass in leaving the protected premises. The systems have been employed especially for use in retail stores to prevent the theft of articles, and in libraries to prevent the theft of books (CX-9, col. 1, lines 11-20).

99. A resonant tag circuit is used in electronic security systems for detecting the unauthorized removal of articles from an area under surveillance. The security systems transmit and receive an electromagnetic field in a controlled area, such as the exit from a store. A resonant tag circuit in the controlled area will absorb electromagnetic energy and trigger an alarm in the security system (CX-9, col. 1, lines 12-38).

100. The '076 patent discloses that frequency of the electromagnetic field is swept within a predetermined range (CX-9, col. 8, lines 37-38).

101. The '076 patent discloses that the detection frequency is usually chosen to be in one of the frequency bands allocated by the FCC for field

disturbance sensors and a detection frequency of 8.2 MHZ is typical (CX-9, col. 4, lines 2-5; Rhoads, Tr. at 761, 763).

102. The detection frequency can range as much as plus/minus 15 percent of the center detection frequency (CX-23, col. 3, lines 52-54, col. 4, lines 52-53 and col. 6, lines 33-37).

103. The '076 patent illustrates that a plastic film can serve as the dielectric of the parallel plate capacitor, as well as the supporting substrate for the circuit (CX-9, col. 4, lines 53-55).

104. In describing cyclical deactivation, the '076 and '473 patents state that since the plastic film has already been ruptured and weakened at the breakdown point, the arc will normally form again at the same point (CX-9 and CX-10, col. 7, lines 43-46).

105. The '076 patent under the heading "Detailed Description of the Invention" discloses that "[r]eferring to FIG. 3, the inductor L1 is formed as a flat spiral 40 on the surface of the thin plastic film substrate 42. The plastic film serves as the dielectric of the parallel plate capacitor as well as the supporting substrate for the circuit" (CX-9, col. 4, lines 51-55).

106. In the '076 patent, a film of plastic supports the aluminum (Lichtblau, Tr. at 2817).

107. The '076 and '473 patents do not teach the introduction of a different dielectric material having a lower dielectric strength than the dielectric strength of the plastic film (Rhoads, Tr. at 1416-1423; RAPX-21).

108. The '076 and '473 patents do not teach the creation of a preferred path for electrical breakdown to occur between the electrodes by introducing a region of dielectric material different from, and having a lower breakdown

strength than, the dielectric material used as the substrate of the tag (CX-9; CX-10; Rhoads, Tr. at 1422).

109. Those of ordinary skill in the art believed in the early 1980's that it was undesirable for large bubbles or gaps of air to be present in the solid plastic substrate of resonant tags (Rhoads, Tr. at 866-68, 1355).

110. The substrate in the '076 patent serves to separate the capacitor plates (Rhoads, Tr. at 870).

111. There are two different modes for deactivating a resonant tag disclosed in the '076 patent, viz. the open circuit mode and the short circuit mode (Zahn, Tr. at 1920).

112. In both the open circuit mode of the '076 patent and the fusible link mode of the '219 patent, one actually opens the circuit by destroying all of the conductive area at one particular spot. Whether one burns out all the metal at a particular spot would not be relevant in the short circuit mode because in that mode one is establishing a short circuit between two separate metallizations that had not previously been connected and changing the circuit by that means (Rhoads, Tr. at 829-30).

113. Rhoads, on the fusible link phenomenon and the open circuit phenomenon, testified:

> A In the fusible link phenomenon, a portion of the circuit is being broken to create an open circuit. That's the similarity with the open circuit mode here. The difference is how that is being accomplished.
>
> In the fusible link, that end is being accomplished by thermal heating due to currents within the fusible link themselves.
>
> In the open circuit mode of the '076 patent, that is being accomplished by the arc that is created through the substrate between opposing areas of metallization and that arc is triggered by the voltage in the circuit.

(Rhoads, Tr. at 1335-36).

114. The short circuit mode is <u>not</u> described starting with column 3, line 12 and continuing to column 5, line 36 of the '076 patent (Zahn, Tr. at 1945; Lichtblau, Tr. at 2905, 2906).

115. The '076 and '473 patents disclose the following two modes of operation: (1) inducing a short circuit at one or more indentations in the capacitor, and (2) burning out a conductive lead by placing an indent where that lead joins the capacitor (Lichtblau, CRX-2, Q. 78, 79).

116. A problem the '076 patent discloses with the fusible link tags is that the link runs on the surface of the substrate and therefore one has got materials on top of that surface which absorb some of the heat and make it more difficult for the burn-out mode of the link to occur (Rhoads, Tr. at 830).

117. For the open circuit mode to work, the spark discharge acts as a short circuit in the capacitor such that a large current flows and so much current flows that the resist of heating in the connecting lead is very high and that in the connecting lead portion it burns out thereby forming an open circuit (Zahn, Tr. at 1920).

118. The drawings in the '076 patent that illustrate the open circuit mode for a single frequency tag include Figures 1, 3 and 4. For the dual frequency tag, it includes Figures 2, 5 and 6 (Zahn, Tr. at 1921). Figure 1 is described in the '076 patent as a schematic diagram of a resonant tag circuit embodying the invention while Figures 3 and 4 are said to be pictorial views of respective sides of the resonant tag circuit of Figure 1. Figure 2 is described in the '076 patent as a schematic diagram of a dual frequency resonant tag circuit embodying the invention while Figures 5 and 6 are said to be pictorial

views of respective sides of the resonant tag circuit of Figure 2. (CX-9, col. 2, lines 52-59).

119. The '076 patent discloses that the "dual frequency tag circuit of FIG. 2 is shown in typical construction in FIGS. 5 and 6 which depict the respective opposite planar surfaces of the tag. The inductor L1 is formed by a flat spiral 60 on the surface of the plastic film 62, this spiral extending between conductive areas 64 and 66. The conductor L2 is formed by a flat spiral 68 on the film surface and which extends between conductive area 64 and conductive area 70" (CX-9, col. 5, lines 10-15).

120. Lichtblau testified that Figure 4 of the '076 patent relates to both the open circuit mode and the short circuit mode but later testified that "[t]here is no specific line in that ['076 patent] referring to that diagram [Figure 4] saying that is for the short circuit mode. It is quite clear that that is simply for illustrative purposes to describe the burnout mode, but where that is placed has clearly been described in the patent and reads on the patents to describe also the short circuit mode" (Lichtblau, Tr. at 2923). The administrative law judge finds the testimony "but where that is placed has clearly been described in the patent and reads on the patents to describe also the short circuit mode" ambiguous, unclear and in conflict with the specific wording of the '076 patent which ties Figure 4 to the resonant tag circuit of Figure 1 (CX-9, col. 2, lines 55-56).

121. In the short circuit made of the invention in issue, when there is an arc discharge, a permanent short circuit of melted aluminum from the electrodes results thus short circuiting the capacitor. Figure 8 of the '076 patent illustrates the short circuit mode for the single frequency tag and Figure 9 represents the short circuit mode for the dual frequency tag (Zahn,

Tr. at 1921). Figure 8 is described in the '076 patent as a schematic diagram of an alternative embodiment of a single frequency resonant tag circuit while Figure 9 is described as a schematic diagram of an alternative embodiment of a dual frequency resonant tag circuit (CX-9, col. 2, lines 63-65).

122. In the embodiments of Figures 8 and 9 an indentation is made at any selected point or multiple points on one or both of the capacitor plates to reduce the thickness of the dielectric film at this indentation and thereby reduce the voltage required to cause an arc across the capacitor plates. In the embodiment of Figure 8 the indentation is shown in the capacitor plate 12a. In the embodiment of Figure 9, the indentation is shown in the capacitor plate 24a. Upon application of energy at the resonant frequency of the tag of sufficient magnitude, electrical breakdown occurs through the dielectric film at the indentation point, and since energy is being applied to the tag, the arc tends to be sustained and forms a plasma between the capacitor plates. By reason of the Q of the resonant circuit, very little energy is dissipated in the resonant circuit itself and the energy is dissipated in the arc formed between the plates. The energy of the arc rapidly heats the plasma and causes vaporization of the metal which forms the capacitor plates. The vaporized metal causes the arc to become conductive and short circuit the capacitor plates, which temporarily destroys the resonant properties of the circuit and causes the current through the arc and voltage across the arc to rapidly collapse. The arc then cools and causes deposition of the previously vaporized metal between the capacitor plates. If a short circuit is formed, the tag is permanently destroyed. If a short circuit is not formed, the voltage again builds up across the capacitor plates in response to the applied energy, and the process is repeated. Since the plastic film has already been ruptured and weakened at the

breakdown point, the arc will normally form again at the same point, and additional metal will be vaporized and deposited until a permanent short circuit occurs (CX-9, col. 7, lines 11-47).

123. The '076 patent discloses that the "deactivation sequence is illustrated in FIGS. 10-12. In FIG. 10 there is shown the commencement of a voltage breakdown through the plastic film 110 and between the plates 112 and 114" (CX-9, col. 7, lines 48-51).

124. The indentation formed in the embodiments of Figures 8 and 9 reduces the distance between the two capacitor plates and causes the dielectric material to be thin at the indentations. Therefore when sufficient energy is coupled to the resonant circuit, and the voltage on the tag reaches a threshold level, an arcing will occur through the dielectric between the capacitor plates at the breakdown or burnout point that short circuits the capacitor (Zahn, RAX-11, Q. 54).

125. The mechanism of breaking down through an indentation that thins the dielectric, such as shown in the embodiments of the short circuit modes of Figures 8 and 9, is identical for the open circuit mode. However the arc discharge in the open circuit mode vaporizes metal in the vicinity of the breakdown region to destroy the conductive path thereby permanently destroying the resonant characteristics of the tag circuit (Zahn, RAX-11, Q 55).

126. Under the heading "Background of the Invention" the '076 patent, in referring to a system known for the electronic deactivation of a resonant circuit such that the deactivation circuit can remain on the article properly leaving the premises as set forth in U. S. Patent No. 3,642,631,
('631 patent), discloses that the system shown in the '631 patent has a fusible link in series with an inductor and is burned out by means of a high powered

radio frequency transmitter. It is disclosed that the resonant circuit is interrogated by a swept radio frequency. The presence of that circuit in the controlled area causes energy adsorption at the resonant frequency which is detected by a receiver for subsequent alarm actuation. Upon application of a swept frequency of higher energy than that employed for detection, the fusible link of the resonant circuit can be destroyed to deactivate the tuned circuit such that no detection is possible. It is stated that deactivation must be accomplished by a swept frequency transmitter operating at sufficiently low radiation levels to meet the requirements of the Federal Communications Commission, and thus, that the fusible link must be extremely small and made of a material to allow fusing at low power levels; that the small fusible link has a high resistance which appears in series with the inductor of the resonant circuit; that this series resistance reduces the Q of the resonant circuit and thus reduces the sensitivity of the circuit to be detected; that the current level at which the fusible link melts is determined by the geometry of the link as well as the heat conduction properties of the materials surrounding the fusible link and thus the fusing current is greatly affected by the material which covers and support the fusible link (CX-9, col. 1, lines 30-57).

127. Under the heading "Summary of the Invention" the '076 patent discloses that the resonant tag circuit is electronically deactivated by a breakdown mechanism operative within the resonant structure of the tag without need for a fusible link and without "affect or reduction in the Q of the resonant circuit" (CX-9, col. 2, lines 22-27).

128. Under the heading "Detailed Description of the Invention" the '076 patent discloses that the resonant circuits of FIGS. 1 and 2 do not require the use of a small narrow fuse and there is thus no additional resistance placed in

series with the inductor and capacitor elements of the circuit and there is therefore no degradation of the Q of the resonant circuit. It further discloses that in the embodiments of FIGS. 8 and 9 upon application of energy at the resonant frequency of the tag of sufficient magnitude, electrical breakdown occurs through the dielectric film at the indentation point, and since energy is being applied to the tag, the arc tends to be sustained and forms a plasma between the capacitor plates and by reason of the Q of the resonant circuit, very little energy is dissipated in the resonant circuit itself, and the energy is dissipated in the arc formed between the plates (CX-9, col. 4, lines 30-34, col. 7, lines 14-30).

129. Inventor Lichtblau testified:

> Q Is it true in your patent disclosures to ...
> your patent attorney, CX-8 through CX-41 that you
> mentioned a Q of 75 to 100 of the resonant tags circuit
> as important means for helping to rupture the capacitor
> substrate?
>
> A The high Q, yes.
>
> * * *
>
> Q How would you get a Q of 75 to 100 versus a Q of 35 to 50?
>
> A You try and maximize the size of the inductor. There are
> about 20 parameters. It involves a number of terms, thickness of
> the material, the spacing between the turns, the dielectric
> dissipation factor, the size of the capacitor plate and the
> material which it's manufactured of.
>
> It also depends on the strength capacity between all the various
> turns and all the various capacitors.
>
> Q Have you explained in you patent disclosure CX-9, the '076
> patent, that a Q of 75 to 100 is desirable?
>
> A The highest Q possible is desirable.
>
> * * *
>
> A The answer is no. The maximum Q that I could attain
> is desirable. That is dependent upon the size

of the tag and how it is manufactured.

BY MR. BROWN:

Q Was that statement made in this patent, '076?

A Which statement?

Q That you just made. The maximum Q you could get
  is desirable?

A No.

(Lichtblau, Tr. at 3099-3100).

130. To create a point indentation in a capacitor without effecting the Q of the resonant circuit to which the capacitor belongs one would have to make the indentation be a relatively small part of the capacitor (Zahn, RAX-11, Q. 52).

131. Rhoads testified:

Q But in the short circuit mode of the 076 patent where a short
  circuit goes through a capacitor, the short circuit is
  caused by raising the voltage across the capacitor, is that
  correct?

A Yes, sir.

* * *

Q If I were to hit a Checkpoint tag that practices
  the 076 patent with a frequency of 27.12
  megahertz, what voltage would occur across
  the capacitor plate of that tag?

* * *

A Well, that depends on the detail nature of the
  resonate character of the circuit. For a high Q
  resonance which I believe all these tags are, there's
  a fairly rapid drop off in response voltage.
  Perhaps I should just draw an example Q curve
  to show you what it looks like.

* * *

A Well, the response curve of resonant circuits,
  sometimes called a Q curve, is sort of

bell-shaped. It has a peak at resonance, and
it falls off fairly rapidly to moderately low levels and
then tails off much more slowly at those
variable levels.

The height versus width of the bell
is described by the Q of the circuit.

* * *

Q . . . What is Q in this context?

A Q is an electrical terminology, also referred to
as the quality factor, which is defined in any of several
ways, but basically it indicates the magnitude
of the height f the resonant peak over the
background at off resonant frequencies.

Q Why is Q important in the resonant tag arena?

A When you are coupling energy into or out of this
tag, the efficiency at which that coupling can be
built up within the tag are dependent upon the
Q factor.

So if you were not at a high Q resonance, you
would have to have a much stronger magnetic
field to couple energy in and a more sensitive and therefore
prone to noise detector to detect it.

(Rhoads, Tr. at 1306-08, 1334-35).

132. The "Q" value of a resonant circuit is a quality factor which measures the efficiency and magnitude with which energy can be built up in a resonant circuit. A resonant circuit with a relatively low "Q" value is hard to detect (Rhoads, Tr. at 1334-1335).

133. The "Q" value of a resonant circuit is dependent upon the resistance, inductance, and capacitance of the components of the circuit (Zahn, RAX-11 Q30; Zahn, Tr. at 1924).

134. The specification of the '076 patent explains that "[t]he resonant tag circuit is electronically deactivated by a breakdown mechanism operative within the resonant structure of the tag without need for a fusible link and

without affect or reduction in the Q of the resonant circuit" (CX-9 at col. 2, lines 22-26; CX-10 at col. 2, lines 23-27).

135. The specification of the '076 patent teaches that the resonant circuits of Figures 1 and 2 do not require the use of a small narrow fuse and there is thus no additional resistance placed in series with the inductor and capacitor elements of the circuits. Therefore, the resonant circuit does not have a degradation of its Q (CX-9 and CX-10 at col. 4, lines 30-34).

136. Figures 10, 11 and 12 of the '076 patent show the electric arc between the two conductive areas resulting in the short circuit (Zahn, Tr. at 1925). Those figures are diagrammatic representations of the electrical breakdown mechanism employed in the invention (CX-9, col. 2, lines 66-68).

137. Figure 10 of the '076 patent relates to the arc punching through the dielectric substrate 110. As to Figures 10, 11 and 12, '[t]his is my [Lichtblau] estimate, best guess, of how it works." Figures 10 and 12 are at the bottom of the indentation (Lichtblau, Tr. at 3007-08, 3011).

138. Each of Figures 1, 2, 8 and 9 of the '076 patent show an indentation that thins out the dielectric. In Figure 1 it is element 20. Electrical breakdown and arc discharges will essentially occur here (Zahn, Tr. at 1941). The '076 patent discusses dual frequency tags which are not at issue and single frequency tags and according to Rhoads, for single frequency tags the '076 patent says that the detection frequency is usually chosen to be in one of the frequency bands allocated for field disturbance sensors. When asked whether there are any limitations in the '076 patent to the predetermined range outside of which the patent cannot be infringed, Rhoads answered that there are given within the patent no hard numbers for frequency ranges which so limit the applicability of the '076 patent; that there are suggestions as to the ranges

by reference to the FCC regulations for field disturbance sensors; that most of those field disturbance sensors are designed to operate with about a ten percent variation around the center frequency; that the '076 patent is not talking about something that is going to operate at 100 megahertz with a sweep range from 1 hertz to 10 gigahertz; and that while there are no hard numbers in the '076 patent there is the suggestion of reasonable ranges by reference to the field disturbance sensors limitations (Rhoads, Tr. at 763-64).

139. There are no statements in the '076 patent that says above this frequency, the '076 patent does not apply. In the third clause of claim 1 of the '076 patent, which refers to said "tuned circuit", there is a teaching that one creates an inductor and a capacitor, and hook them together to make a tuned circuit, which teaching is applicable for frequency ranges where that is a good way to make a resonant circuit (Rhoads, Tr. at 769, 770).

140. The '076 and '473 patents do not define the phrase "sufficient energy" in numerical terms of power levels or of the voltage elicited in a tag by an electromagnetic field (Rhoads, Tr. at 799-800; CX-9; CX-10; RAX-11C at Q.53; Zahn, Tr. at 1942).

141. The '076 and '473 patents do not place an upper limit, by giving a specific numeric value, for voltage which would not be exceeded (Rhoads, Tr. at 801; CX-9; CX-10).

142. As far as the question of what is sufficient energy in the '076 patent, it is Rhoads' opinion that in the end it is the FCC limits which placed the limitation on whether or not an article would infringe the '076 patent (Rhoads, Tr. at 805).

143. The term "sufficient energy" as that term is used in the means element of the asserted claims of the patents at issue means energy that causes

the arc discharge to deactivate the tag. The precise amount of energy depends upon the dimensions and construction of the particular tag (Lichtblau, CRX-2 at 36 Q83); Lichtblau, Tr. at 2847-2853, 2997 to 2999, 3003).

144. Any level of energy falls within the scope of the claims so long as it is sufficient to destroy the resonant properties of the tag (Lichtblau, Tr. at 3105-3107).

145. The specification of the '076 patent disclose that when sufficient energy is coupled to the circuit at the deactivation frequency, the voltage increases across the capacitor plates 22 and 24 until the substrate film breaks down at the burnout point 32 (CX-9 and CX-10, col. 4, lines 13-16).

146. U.S. Patent No. 3,810,147, which issued to Lichtblau and is incorporated by reference in the '076 patent, describes an electronic security system in which a resonant circuit is employed having two distinct frequencies, one for detection and one for deactivation. A small fusible link is employed in the deactivation circuit which also includes a second capacitor to provide the distinct deactivation resonant frequency (CX-23, col. 1, lines 58-65; Rhoads, Tr. at 761).

147. Lichtblau U.S. Patent No. 3,913,219 patent, incorporated by reference in the '076 patent, indicates that the substrate is an electrically insulative material having a low dissipation factor at a frequency of interest and a stable dielectric constant (CX-26, col. 3, lines 39-48).

148. The '219 patent discloses that typically plastic materials such as polyethylene, polypropylene, Teflon and polyisobutylene are suitable for the substrate. Polyethylene is especially preferred by reason of its low cost and its easy bondability to aluminum foil, which is preferably employed for the

conductive surfaces by reason of its relatively low cost (CX-26, col. 3, ll. 39-48).

149. The '219 patent patents requires that the substrate be made of electrically insulative material, and teaches the preferential use of plastics (CX-26 at col. 3, lines 34-48).

150. None of the Lichtblau's patents referenced in the '076 patent have mentioned foamed or composite plastics directly in the text (Rhoads, Tr. at 869).

151. The '219 patent (CX-26) describes the fabrication process for the tags and the '147 patent (CX-23) describes the system and the tags in use in it. Both address the issue of fusible links. The examples given in the patents indicate a single fusible link within each resonant tag circuit and if there is only one fusible link, it clearly must be on a single surface. A fusible link is a circuit element that acts just like a house fuse because at a certain level it will burn out and open the circuity as does a standard house fuse (Rhoads, Tr. at 823-25).

152. The specification of the '076 patent references the '219 patent (RAX-22) for fabricating the planar resonant circuit (CX-9 and CX-10 at col. 5, lines 39-42).

153. The '076 patent states that the resonant tags described "herein" are similar to those of the '147 patent and that construction of the tag circuits is preferably according to the planar circuit fabrication process which is the subject of the '219 patent (CX-9, col. 5, lines 37-42).

154. According to Rhodes, a gas alone cannot be a substrate of the '076 patent because it is not a supporting material. There has to be some solid and a structure solely of air does not provide static support. The '076 patent

does not specifically mention the use of a honeycomb or waffle or anything like that with respect to the substrate. The primary function of a substrate is to provide mechanical support (Rhoads, Tr. at 835, 857-59, 871, 875).

155. Not all dielectric materials can be substrates and not all substrates can be dielectrics (Rhoads, Tr. at 875, 1345).

156. Under the heading "Summary of the Invention", the '076 patent discloses that the "present invention provides a resonant tag circuit having at least one resonant frequency and operative in an electronic security system in which the tag circuit is sensed and electronically deactivated to destroy or alter the resonant characteristics of the tag circuit at the detection frequency" (CX-9, col. 2, lines 17-23). This means that the tag after deactivation may not have any resonance at all or that the frequency one started with may shift out of the range in which one is looking for it (Lichtblau, Tr. at 2855).

157. The specification of the '076 patent designates the inner conductive area 46 as capacitor plate 10 and the conductive area 50 as capacitor plate 12. Capacitor plate 10 and capacitor plate 12 are depicted as substantially square areas that confront each other in the center of opposite sides of the substrate in Figures 3 and 4. The "conductive area 50 serves as the capacitor plate 12 and thus capacitor C1 is provided by the confronting conductive areas 46 and 50" (CX-9 and CX-10, col. 4, lines 57-64).

158. The conductive areas described in the specification of the '076 patent are preferably made of aluminum according to the teachings of the '219 patent (CX-9 and CX-10, col. 5, lines 39-42; RAX-22, col. 4, lines 3-6).

159. The indentation disclosed in the '076 specification is arranged so that the distance between its apex and the conductive area 46 is less than the

distance between the remainder of the conductive areas 46 and 50 in Figures 3 and 4 (CX-9 and CX-10, col. 5, lines 1-4; col. 8, lines 55-60).

160. Lichtblau testified that the worst way to make a dimple pursuant to his invention is a perfect sphere (Lichtblau, Tr. at 2872-73).

161. The '076 and '473 patents explain that the indentation formed in the capacitor plates reduces the thickness of the dielectric film at the indentation (CX-9 and CX-10, col. 7, lines 16-17).

162. All of the tags disclosed in the '473 patent are rendered deactivatable by indenting a portion of the capacitor to bring the plates of the capacitor closer together at that location (CX-10, Figs. 1, 3, 4, 8; col. 3, lines 29-40; col. 4, line 68 - col. 5, line 9; col. 7, lines 11-39).

163. The '076 patent (CX-9) discloses:

> Energy is coupled to the tag circuit at or near the resonant frequency to cause electrical breakdown through the substrate film between the capacitor plates ... [col. 2, lines 31-34]
>
> Alternately, the electrical breakdown through the substrate film can cause formation of a plasma and deposition of metal between the capacitor plates along the discharge path,. . . [col. 2, lines 41-44].
>
> * * *
>
> When sufficient energy is coupled to the circuit at the deactivation frequency, the voltage increases across the capacitor plates 22 and 24 until the substrate film breaks down at the burnout point 32. [col. 4, lines 13-17].
>
> * * *
>
> The plastic film serves as the dielectric of the parallel plate capacitor as well as the supporting substrate for the circuit. [col. 4, lines 53-55].
>
> * * *
>
> In the embodiments of FIGS. 8 and 9,

> an indentation is made at any selected point or multiple points on one or both of the capacitor plates to reduce the thickness of the dielectric film at this indentation, and thereby reduce the voltage to cause an arc across the capacitor plates.... [col. 7, lines 14-18]
>
> Upon application of energy at the resonant frequency of the tag of sufficient magnitude, electrical breakdown occurs through the dielectric film at the indentation point and since energy is being applied to the tag, the arc tends to be sustained and forms a plasma between the capacitor plates. [col. 7, lines 23-27].

164. The passages of the '076 patent, cited in finding 163, support the conclusion that the phrase "defining a path between the conductive areas and through the substrate" means that a path is defined by the indentation where the arc discharge propagates directly through the plastic film substrate (Zahn, Tr. at 1924 -29).

165. Under the heading "Detailed Description the Invention", the '076 patent discloses that the electric arc vaporizes metal in the vicinity of the breakdown region which destroys the conductive path, "thereby permanently destroying the resonant characteristics of the tag circuit" (CX 9, col. 3, line 42, 46). Moveover, under the heading "Summary of the Invention", there is formed "a permanent short circuit between the capacitor plates which destroys the resonant properties of the circuit" (CX-9, col. 2, lines 43-46).

166. The '076 patent, at col. 5, lines 39-42, specifically refer to the Lichtblau '219 patent. The '219 patent describes how to manufacture resonant tags, including through the use of heat and pressure to create a tuned circuit (CX-26, col. 6, lines 11-60). The '219 patent teaches that heated or cold pressure may be used to form a crimp in the corner of the tag. Thus, by reference to the '219 patent, the heat and pressure to create an indentation in

the capacitor plate of a resonant tag is disclosed in the '076 patent (CX-26; Lichtblau, Tr. 3103-04).

167. Lichtblau did not know of a best or preferred means to create an indentation, with reference to the short circuit mode in issue, at the time the application for the patents in issue were filed. Lichtblau further testified that today he still does not know the best means of making an indentation in a resonant tag (Lichtblau, Tr. at 2965, 2997, 3102). This finding is a proposed finding 557 of complainant. The Actron respondents did not challenge the proposed finding. The All-Tag respondents merely stated "Lichtblau testified that he had more than oridinary skill in the art" (Proposed Rebuttal Findings 557). The administrative law judge finds that the fact that Lichtblau had more than oridinary skill does not give Lichtblau knowledge of a best or preferred means to create the indentation.

IX. TECHNICAL CONCEPTS

168. A resonant tag is a tag that has a tuned circuit on it which resonates in an electromagnetic field having a particular frequency. At the resonant frequency, the current and voltage induced in the tag by the electromagnetic field is significantly larger than the current and voltage induced in the tag in electromagnetic fields of other frequencies (Zahn, RAX-11 at QQ.26-27).

169. The simplest resonant circuit is composed of a single inductor (L) and a single capacitor (C) and is known as an "LC circuit" (Zahn, RAX-11 at Q.28).

170. An LC resonant circuit is characterized by its quality factor (Q) and by its resonant frequency (Zahn, RAX-11 at Q.29).

171. The resonant frequency of a resonant circuit is expressed mathematically by the following:

172. The quality factor ("Q") of a series LC resonant circuit such as those at issue here is a function of the inductance, the capacitance, and the resistance of the circuit and is expressed mathematically as:

The Q is defined as the ratio of the time average energy stored per cycle in the circuit at resonance to the time average power dissipated in the circuit at resonance (Zahn, RAX-11 at Q.30).

173. An inductor generally consists of a coil of wire that stores magnetic energy due to current flowing through the wire (Zahn, RAX-11 at Q.31).

174. A capacitor consists of two conducting electrodes, generally metal, which are separated by a dielectric material, which is usually a highly insulative material (Zahn, RAX-11 at QQ.32-33).

175. A dielectric material is essentially a highly insulating material that separates two capacitor electrodes and is characterized by its dielectric constant and its breakdown strength (RAX-11 at QQ.32-34).

176. A conductive area is an area that is made of some conductive material that conducts electricity (Rhoads, Tr. at 914).

177. One characteristic of a dielectric material is its electrical breakdown strength, which is the value of the electric field in voltage per distance at which electrical breakdown first occurs (Zahn, RAX-11 at QQ.34, 36).

178. Electrical breakdown occurs when an arc discharge connects the two electrodes of the capacitor through the dielectric material, thereby forming a low resistance path and often an effective short circuit, so that significant current flows between the electrodes (Zahn, RAX-11 at Q.37).

179. An arc discharge is often accompanied by significant heat and light (Zahn, RAX-11 at Q.37).

180. An electric field is largest in corners of an undimpled tag having no misalignment of the capacitor electrodes or defects in the dielectric substrate (Zahn, RAX-11 at Q.124).

181. In a capacitor having a uniform dielectric material, breakdown will normally occur where the capacitor plates are closest together and the dielectric material is thinnest (Rhoads, Tr. at 1327, 1414; CPX-17).

182. Field disturbance sensors are designed to operate with about a ten percent variation around the center frequency (Rhoads, Tr. at 764).

183. In a generic sense, a dielectric material is an electrical insulator. In a more specific sense, a dielectric material is an electrical

insulator whose properties with regard to capacitance are of particular import (Rhoads, CX-4, Q. 43, p. 26).

184. Capacitance is defined as the ratio of the charge on an electrode to the voltage difference between the electrodes. In a parallel geometry it is a function of the dielectric constant of the dielectric, the area of the electrode and the spacing (Zahn, Tr. at 1940).

185. A capacitor is a physical element in a circuit and it has a numerical value which is called the capacitance (Zahn, Tr. at 1939-40).

186. The interconnection of the inductor and capacitor forms a tuned resonant L.C. circuit (Lichtblau, CX-2, Q. 114).

187. The primary function of a capacitor is to generate capacitance. (Rhoads, Tr. at 785-86).

X. THE CLAIMS OF THE '076 PATENT

188. Claim 1 of the '076 patent states:

> 1. For use in an electronic security system which includes means for providing in a controlled area an electromagnetic field of a frequency which is swept within a predetermined range and means for detecting the presence of a resonant tag circuit having a resonant frequency within said range, a resonant tag circuit comprising:
>
> a planar substrate of dielectric material;
>
> a tuned circuit on said substrate in planar circuit configuration and resonant at said frequency;
>
> said tuned circuit having a pair of conductive areas in alignment on respective opposite surfaces of the substrate to define a capacitor of the tuned circuit;
>
> means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(Cx-9, col. 8, lines 35-54).

189. The "means plus function" element of claim 1 is found in substantially the same form in asserted independent claims 6, 9, 10, 20, and 25 of the '076 patent, and asserted independent claims 1, 6, 9, and 10 of the '473 patent (CX-9, cols. 8 lines 48-54, 9 lines 23-29, 10 lines 35-41, 10 lines 58-64, 13 lines 36-42, 14 lines 41-46; CX-10 cols. 8 lines 48-54, 9 lines 23-29, 10 lines 35-41, 10 lines 58-64).

190. The phrase in the second clause that reads "a tuned circuit on said substrate" means that upon the substrate a circuit is created, and the circuit will be resonant within the range of frequencies it is designed to detect. This meaning is also evident by reference to the preamble of claim 1, which explains that the claimed device is intended for use in an electronic security system that detects the presence of resonant tags by electromagnetic fields that are swept over a given frequency range (Rhoads, CX-4, Q. 45).

191. The third clause reading "said tuned circuit having a pair of conductive areas in alignment on respective opposite surfaces of the substrate to define a capacitor of the tuned circuit" adds that the tuned circuit will contain an area that will function as a capacitor. That capacitor will be constructed by having conductive areas in alignment on the two sides of the substrate (Rhoads, CX-4, Q. 49).

192. The phrase "in alignment" means that the conductive areas that define the capacitor have corresponding boundaries or edges that may be substantially parallel and often of conforming shapes. It is not necessary that the conductive areas be of exactly the same size or that they be centered precisely with respect to each other (Rhoads, CX-4, Q. 49).

193. The language "at which an arc discharge will preferentially occur" in the fourth clause of illustrative claim 1 of the '076 patent requires that there be an arc discharge causing deactivation (Rhoads, Tr. at 904).

194. The language "and operative to destroy the resonant properties of the tuned circuit" in the fourth clause of claimm 1 of the '076 patent is defined in the patents in issue to mean to permanently destroy resonant properties which occurs in both the open circuit mode (e.g. CX-9, col. 3, lines 43 - 47) and in the short circuit mode to alter the resonant properties of the tuned circuit (CX-9, col. 7, lines 30 - 39; Lichtblau, Tr. at 3005 - 06).

195. The presence of an indentation should not serve to make the substrate "non-planar", since to do so would make certain claims in issue inherently contradictory (Lichtblau, Tr. at 2815-2816, 3024-3025).

196. Claim 2 of the '076 patent states:

> 2. The invention of claim 1 wherein said means includes an indented portion on at least one of the conductive areas providing a spacing between the conductive areas at the indented portion which is less than the spacing between the conductive areas outside of the indented portion.

(CX-9, col. 8, lines 55-60).

197. Claim 2 of the '076 and '473 patents, which specifies the indentation is formed on at least one of the conductive areas, does not limit in any way the nature, shape or size of the indentation (Lichtblau, Tr. at 2857).

198. Claim 4 of the '076 patent states:

> 4. The invention of claim 1 wherein the arc discharge causes a short circuit along the path between the conductive areas to destroy the resonant properties of the tuned circuit at said frequency.

(CX-9, col. 8, lines 65-68).

199. Claim 4 specifies that the arc discharge will destroy the tag's resonant properties "at said frequency" by shorting out the conductive areas between which said arc occurs (Rhoads, CX-4, Q. 70).

200. Claim 6 of the '076 patent states:

> 6. For use in an electronic security system which includes means for providing in a controlled area an electromagnetic field of a frequency which is swept within a predetermined range, means for detecting the presence of a resonant tag circuit having a resonant frequency within said range, and means for providing an electromagnetic field at said frequency within said range, a resonant tag circuit comprising:
>
> a planar substrate of dielectric material;
>
> a tuned circuit on said substrate in planar circuit configuration and resonant at said frequency;
>
> said tuned circuit having a pair of conductive areas in alignment on respective opposite surfaces of the substrate to define a capacitor of the tuned circuit;
>
> means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-9, col. 9, lines 9-29.)

201. Comparing the preamble of claim 6 with the preamble of claim 1, the preamble of claim 6 has the added language: "and means for providing an electromagnetic field at said frequency within said range," which qualifies the electronic security system in which the claimed tags may be used. Otherwise the claims are identical (Rhoads, CX-4, Q. 75).

202. Claim 9 of the '076 patent states:

> 9. For use in an electronic security system which includes means for providing in a controlled area an electromagnetic field of a frequency which is swept within a predetermined range and means for detecting the presence of a resonant tag circuit having a resonant frequency within said range, a resonant tag circuit comprising:

a planar substrate of electrically insulative material;

a first conductive path formed on a surface of said substrate in a configuration to define an inductor;

a pair of conductive areas on said substrate in alignment on respective opposite surface of said substrate to define a capacitor, the conductive areas being electrically connected to said paths at selected points to define a tuned circuit; and

means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-9, col. 10, lines 20-41).

203. Comparing claim 9 with claim 1, the preamble and the last clause are identical while the first three clauses after the preamble are somewhat different. The first clause has a minor difference: "electrically insulative material" is used rather than "dielectric material" for the substrate. The interpretation remains the same. The second clause has changes -- it requires an inductor, and does not define the entire tuned circuit. The third clause defines the tuned circuit. It also defines the capacitor, as did the third clause of claim 1 (Rhoads, CX-4, Q. 77).

204. Claim 10 of the '076 patent states:

10. For use in an electronic security system which includes means for providing in a controlled area an electromagnetic field of a frequency which is swept within a predetermined range, means for detecting the presence of a resonant tag circuit having a resonant frequency within said range, and means for providing an electromagnetic field at said frequency within said range, a resonant tag circuit comprising:

a planar substrate of electrically insulative material;

a first conductive path formed on a surface of said substrate in a configuration to define an inductor;

a pair of conductive areas on said substrate in alignment on respective opposite surface of said substrate to define a capacitor, the conductive areas being electrically connected to said paths at selected points to define a tuned circuit; and

means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-9, col. 10, lines 42-64.)

205. Comparing claim 10 with claim 9, the preamble of claim 10 adds "and means for providing an electromagnetic field at said frequency within said range," which qualifies the electronic security system in which these tags may be used. Otherwise, claim 10 is identical to claim 9 (Rhoads, CX-4, Q. 79).

206. Claim 20 of the '076 patent states:

20. A resonant tag circuit comprising:

a planar substrate of dielectric material;

a tuned circuit on said substrate in planar circuit configuration and resonant at a frequency within a predetermined range;

said tuned circuit having a pair of conductive areas in alignment on respective opposite surfaces of the substrate to define a capacitor of the tuned circuit;

means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-9, col. 13, lines 28-43.)

207. Comparing claim 20 with claim 1, claim 20 has no preamble beyond "[a] resonant tag circuit comprising." They are otherwise identical. Claim 20 is therefore broader than claim 1 (Rhoads, CX-4, Q. 81).

208. Claim 21 of the '076 patent states:

> 21. The invention of claim 20 wherein said means includes an indented portion on at least one of the conductive areas providing a spacing between the conductive areas at the indented portion which is less than the spacing between the conductive areas outside of the indented portion.

(CX-9, col. 13, line 44 - col. 14, line 2).

209. Comparing claim 21 with claim 2 claim 21 incorporates no preamble beyond "[a] resonant tag circuit comprising" in its reference to claim 20. It is otherwise identical to claim 2. Claim 21 is therefore broader than claim 2 (Rhoads, CX-4, Q. 83).

210. Claim 23 of the '076 patent states:

> 23. The invention of claim 20 wherein the arc discharge causes a short circuit along the path between the conductive areas to destroy the resonant properties of the tuned circuit at said frequency.

(CX-9, col. 14, lines 7-10.)

211. Comparing claim 23 with claim 4, claim 23 incorporates no preamble beyond "[a] resonant tag circuit comprising" in its reference to claim 20. It is otherwise identical to claim 4 (Rhoads, CX-4, Q. 85).

212. Claim 25 of the '076 patent states:

> 25. A resonant tag circuit comprising:
>
> a planar substrate of electrically insulative material;
>
> a first conductive path formed on a surface of said substrate in a configuration to define an inductor;
>
> a pair of conductive areas on said substrate in alignment on respective opposite surface of said substrate to define a capacitor, the conductive areas being electrically connected to said paths at selected points to define a tuned circuit; and
>
> means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-9, col. 14, lines 32-46.)

213. Comparing claim 25 with claim 9, claim 25 has no preamble beyond "[a] resonant tag circuit comprising." It is otherwise identical to claim 9. (Rhoads, CX-4, Q. 87).

214. Claim 1 of the '076 patent as well as claim 1 of the '473 patent are generic claims that cover both the burn out mode and the short circuit mode (Lichtblau, Tr. at 3019; CX-9 at col. 8, lines 35-54; CX-10 at col. 8, lines 35-54).

215. Claim 2 of the '076 patent is dependent upon claim 1 of the '076 patent and relates to both modes of deactivation disclosed in the specification (CX-9 at col. 8, lines 55-60).

216. Claim 4 of the '076 patent is dependent upon claim 1 of the '076 patent and relates to only the short circuit mode of deactivation disclosed in the specification (CX-9 at col. 8, lines 65-68).

217. Independent claim 6 of the '076 patent relates to both modes of deactivation disclosed in the specification (CX-9 at col. 9, lines 9-29).

218. Independent claim 9 of the '076 patent relates to both modes of deactivation disclosed in the specification (CX-9 at col. 10, lines 20-41).

219. Independent claim 10 of the '076 patent relates to both modes of deactivation disclosed in the specification (CX-9 at col. 10, lines 42-64).

220. Independent claim 20 of the '076 patent relates to both modes of deactivation disclosed in the specification (CX-9 at col. 13, lines 28-43).

221. Claim 21 of the '076 patent is dependent upon claim 20 of the '076 patent and relates to both modes of deactivation disclosed in the specification (CX-9 at col. 13, line 44 through col. 14, line 2).

222. Claim 23 of the '076 patent is dependent upon claim 20 of the '076 patent and relates to only the short circuit mode of deactivation disclosed in the specification (CX-9 at col. 14, lines 7-10).

223. Independent claim 25 of the '076 patent relates to both modes of deactivation disclosed in the specification (CX-9 at col. 14, lines 32-46). (Findings 214 to 223 correspond to proposed findings 111 to 120 of the Actron respondents, which were not contested).

XI. THE CLAIMS OF THE '473 PATENT

224. Claim 1 of the '473 patent states:

> 1. For use in an electronic security system which includes means for providing in a controlled area an electromagnetic field of a frequency which is swept within a predetermined range, and means for detecting the presence of a resonant tag circuit having a resonant frequency within said range, a resonant tag circuit comprising:
>
> a planar substrate of dielectric material;
>
> a tuned circuit on said substrate in circuit configuration and resonant at said frequency;
>
> said tuned circuit having a pair of conductive areas on respective opposite surfaces of the substrate to define a capacitor of the tuned circuit; and
>
> means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-10, col. 8, lines 35-54).

225. Comparing claim 1 of the '473 patent with claim 1 of the '076 patent, the preambles of both these claims are identical; the first clause is identical; in the second clause of the '473 patent the circuit is not required to be in "planar" circuit configuration; in the third clause of the '473 patent the

capacitor plates are not required to be "in alignment"; and the fourth clause is identical (Rhoads, CX-4, Q. 91).

226. In the specification of the '473 patent, the disclosed structure that corresponds to the "means within the conductive areas defining a path between the conductive areas and through the substrate in which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit" is the indented portion 20 shown in Figure 1, the indented portion 56 shown in Figure 4, the indented portion shown in the capacitor plate 12a in Figure 8, and their corresponding descriptions in the text of the specification (Rhoads, CX-4, Q. 93, col. 3, lines 29-47; col. 4, line 68-col. 5, line 9; col. 7, lines 11-39).

227. Claim 2 of the '473 patent states:

> 2. The invention of claim 1 wherein said means includes an indented portion near at least one of the conductive areas providing a spacing between the conductive areas at the indented portion which is less than the spacing between the conductive areas outside of the indented portion.

(CX-10, col. 8, lines 55-60).

228. Comparing claim 2 of the '473 patent with claim 2 of the '076 patent, each is dependent from the claim 1 of their respective patents, compared above, and the rest of those claims are identical (Rhoads, CX-4, Q. 94).

229. Claim 4 of the '473 patent states:

> 4. The invention of claim 1 wherein the arc discharge causes a short circuit along the path between the conductive areas to destroy the resonant properties of the tuned circuit at said frequency.

(CX-10, col. 8, lines 65-68).

230. Comparing claim 4 of the '473 patent with claim 4 of the '076 patent, each is dependent from the claim 1 of their respective patents, compared above, and the rest of these claims are identical (Rhoads, CX-4, Q. 96).

231. Claim 6 of the '473 patent states:

> 6. For use in an electronic security system which includes means for providing in a controlled area an electromagnetic field of a frequency which is swept within a predetermined range, means for detecting the presence of a resonant tag circuit having a resonant frequency within said range, and means for providing an electromagnetic field at said frequency within said range, a resonant tag circuit comprising:
>
> a planar substrate of dielectric material;
>
> a tuned circuit on said substrate in circuit configuration and resonant at said frequency;
>
> said tuned circuit having a pair of conductive areas on respective opposite surfaces of the substrate to define a capacitor of the tuned circuit; and
>
> means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-10, col. 9, line 9-29).

232. Comparing claim 6 of the '473 patent with claim 6 of the '076 patent, the preambles are identical; the first clauses are identical; in the second clause of the '473 patent, the circuit is not required to be in "planar" circuit configuration; in the third clause the capacitor plates are not required to be "in alignment"; and the fourth clauses are identical (Rhoads, CX-4, Q. 98).

233. Claim 9 of the '473 patent states:

> 9. For use in an electronic security system which includes means for providing in a controlled area an electromagnetic field of a frequency which is swept within a predetermined range, and means for detecting the presence of a resonant tag circuit having a resonant frequency within said range, a resonant tag circuit comprising:

a planar substrate of electrically insulative material;

a first conductive path formed on a surface of said substrate in a configuration to define an inductor;

a pair of conductive areas on said substrate on respective opposite surfaces of said substrate to define a capacitor, the conductive areas being electrically connected to said paths at selected points to define a tuned circuit; and

means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-10, col. 10, lines 20-41).

234. Comparing claim 9 of the '473 patent with claim 9 of the '076 patent, these claims are identical with a single exception -- in the '473 patent the capacitor plates are not required to be "in alignment" (Rhoads, CX-4, Q. 100).

235. Claim 10 of the '473 patent states:

10. For use in an electronic security system which includes means for providing in a controlled area an electromagnetic field of a frequency which is swept within a predetermined range, means for detecting the presence of a resonant tag circuit having a resonant frequency within said range, and means for providing an electromagnetic field at said frequency within said range, a resonant tag circuit comprising:

a planar substrate of electrically insulative material;

a first conductive path formed on a surface of said substrate in a configuration to define an inductor;

a pair of conductive areas on said substrate on respective opposite surfaces of said substrate to define a capacitor, the conductive areas being electrically connected to said paths at selected points to define a tuned circuit; and

means within the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will preferentially occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-10, col. 10, lines 42-64).

236. Comparing claim 10 of the '473 patent with claim 10 of the '076 patent, these claims are identical with the exception that the capacitor plates are not required to be "in alignment" under the '473 patent (Rhoads, CX-4, Q. 102).

237. Claim 19 of the '473 patent states:

> 19. A resonant tag circuit comprising:
>
> a substrate of dielectric material;
>
> a tuned circuit on said substrate in circuit configuration and resonant at a frequency within a predetermined range;
>
> said tuned circuit having a pair of conductive areas on respective opposite surfaces of the substrate to define a capacitor of the tuned circuit; and
>
> means in the region of the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will occur in response to an electromagnetic field at said frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-10, col. 12, lines 7-20).

238. Comparing claim 19 of the '473 patent with claim 20 of the '076 patent, those claims compare simmilarly to each other. The preambles are identical; in the first clauses of the '473 patent the substrate is not required to be "planar"; in the second clause of the '473 patent, the circuit is not required to be in "planar" circuit configuration; in the third clause the capacitor plates are not required to be "in alignment"; and the fourth clauses are similar, but the wording of the '473 patent defines the area in which the breakdown is intended to occur to encompass the "region of" the conductive areas (Rhoads, CX-4, Q. 104).

239. The word "preferentially" that appears in the phrase "at which an arc discharge will preferentially occur" in the means clause of claim 20 of the '076 patent does not appear in the corresponding phrase in the means clause of claim 19 of the '473 patent (Rhoads, Tr. 905, 907-908).

240. Claim 20 of the '473 patent states:

> 20. The invention of claim 19 wherein said means includes an indented portion on at least one of the conductive areas providing a spacing between the conductive areas at the indented portion which is less than the spacing between the conductive areas outside of the indented portion.

(CX-10, col. 12, lines 21-26).

241. Comparing claim 20 of the '473 patent with claim 21 of the '076 patent, each of these claims is dependent from the claim immediately preceding it. The differences between those preceding claims were discussed above. Otherwise claim 20 of the '473 patent is identical to claim 21 of the '076 patent (Rhoads, CX-4, Q. 106).

242. Claim 22 of the '473 patent states:

> 22. The invention of claim 19 wherein the arc discharge causes a short circuit along the path between the conductive areas to destroy the resonant properties of the tuned circuit at said frequency.

(CX-10, col. 12, lines 31-34).

243. Comparing claim 22 of the '473 patent with claim 23 of the '076 patent, claim 22 of the '473 patent depends from claim 19 of the '473 patent, while claim 23 of the '076 patent depends from claim 20 of the '076 patent. The differences between claim 19 of the '473 patent and claim 20 of the '076 patent were discussed above. Otherwise claim 22 of the '473 patent is identical to claim 23 of the '076 patent (Rhoads, CX-4, Q. 108).

244. Claim 24 of the '473 patent states:

> 24. A resonant tag circuit comprising:

> a planar substrate of electrically insulative material;
>
> a first conductive path formed on a surface of said substrate in a configuration to define an inductor;
>
> a pair of conductive areas on said substrate on respective opposite surfaces of said substrate to define a capacitor, the conductive areas being electrically connected to said paths at selected points to define a tuned circuit; and
>
> means in the region of the conductive areas defining a path between the conductive areas and through the substrate at which an arc discharge will occur in response to an electromagnetic field at a frequency of sufficient energy, and operative to destroy the resonant properties of the tuned circuit.

(CX-10, col. 12, line 56 - col. 13, line 4).

245. Comparing claim 24 of the '473 patent with claim 25 of the '076 patent, in the third clause of claim 24 of the '473 patent, the capacitor plates are not required to be "in alignment" and the word "preferentially," which appears in the phrase "at which an arc discharge will preferentially occur" in the means clause of claim 25 of the '076 patent does not appear in the corresponding phrase in the means clause of claim 24 of the '473 patent. (Rhoads, CX-4, Q. 110; Rhoads, Tr. at 912-913).

246. Claim 25 of the '473 patent states:

> 25. In a resonant tag which includes a substrate of dielectric material and electrically conductive material on both sides of said substrate in such configuration as to form a tuned circuit, the improvement wherein:
> at least one localized region of said substrate is substantially thinner than others.

(CX-10, col. 13, line 4 - col. 14, line 2).

247. Claim 25 of the '473 patent requires a resonant tag, built upon a substrate made of dielectric material, with a tuned circuit made of conductive

material on both sides of the substrate, with at least one localized region in which the substrate has been substantially thinned (Rhoads, CX-4, Q. 112).

248. Independent claim 25 of the '473 patent is written in Jepson format, and describes "the improvement wherein: at least one localized region of said substrate is substantially thinner than others" (CX-10 cols. 13:9-14:2).

249. Claim 26 of the '473 patent states:

> 26. The tag of claim 25 wherein there is conductive material on both sides of said substrate in said thinner localized region.

(CX-10, col. 14, lines 3-5).

250. Claim 26 is dependent from claim 25, and it requires further that there be conductive material on both sides of the substrate in said thinner, localized region (Rhoads, CX-4, Q. 114).

251. Claim 27 of the '473 patent states:

> 27. The tag of claim 26 wherein said thinner region is formed by a depression in at least one side of the substrate.

(CX-10, col. 14, lines 6-8).

252. Claim 27, which is dependent from claim 26, requires further that said thinner, localized region be formed by a depression in at least one side of the substrate (Rhoads, CX-4, Q. 116).

253. Claims 25 - 27 of the '473 patent, written in Jepson format, are directed toward an improvement in a resonant tag (CX-10, col. 2, lines 1-2).

254. The improvement of independent claim 25 is where "at least one localized region of said substrate is substantially thinner than others" (CX 10, col. 14, lines 1-2).

255. Claim 2 of the '473 patent, dependent upon claim 1 of the '473 patent, relates to both modes of deactivation disclosed in the specification (CX-10 at col. 8, lines 55-60).

256. Claim 4 of the '473 patent, dependent upon claim 1 of the '473 patent, relates to only the short circuit mode of deactivation disclosed in the specification (CX-10 at col. 8, lines 65-68).

257. Independent claim 6 of the '473 patent relates to both modes of deactivation disclosed in the specification (CX-10 at col. 9, lines 9-29).

258. Independent claim 9 of the '473 patent relates to both modes of deactivation disclosed in the specification (CX-10 at col. 10, lines 20-41).

259. Independent claim 10 of the '473 patent relates to both modes of deactivation disclosed in the specification (CX-10 at col. 10, lines 42-64).

260. Independent claim 19 of the '473 patent relates to both modes of deactivation disclosed in the specification (CX-10 at col. 12, lines 7-20).

261. Claim 20 of the '473 patent, dependent upon claim 19 of the '473 patent, relates to both modes of deactivation disclosed in the specification (CX-10 at col. 12, lines 21-26).

262. Claim 22 of the '473 patent, dependent upon claim 19 of the '473 patent, relates to only the short circuit mode of deactivation disclosed in the specification (CX-10 at col. 12, lines 31-34).

263. Independent claim 24 of the '473 patent relates to both modes of deactivation disclosed in the specification (CX-10 at col. 12, line 56 through col. 13, line 2). (Findings 255 to 263 correspond to proposed findings 121 to 129 of the proposed findings of the Actron respondents which wer not contested).

XII. PROSECUTION OF THE '076 AND '473 PATENTS

264. The Patent Office file history for the '076 patent indicates that there were no rejections of the claims by the Examiner and that the application was allowed substantially as filed. The Examiner cited five references, namely United States Patent No. 3,624,631, No. 3,810,147, No. 3,913,219, No. 3,938,044

and No. 3,967,161. The Examiner did not apply any of the references to the claims (CX-42).

265. During prosecution of the application that matured into the '473 patent, the Examiner asserted that changing 'within' to 'in the region of' did not define a patentable distinction over the '076 patent. According to the Examiner, "[t]hat which is claimed is identical in spite of the variation in terms describing it" (CX-43, Office Action mailed March 16, 1985 at p. 3).

266. During prosecution of the application that matured into the '473 patent, Lichtblau filed a terminal disclaimer to traverse a double patenting rejection and permit the '473 patent to issue (CX-43, Amendment dated June 13, 1985 at p.2; CX-43, Terminal Disclaimer received June 25, 1985).

XIII. INVENTORSHIP

267. In the early 1970s, Lichtblau designed a dual frequency deactivatable tag for which he received U.S. Pat. No. 3,967,161 (the '161 patent). The dual frequency tag had two interconnected resonant circuits and resonated at two frequencies. One frequency (5 MHz) was used to detect the tag and the second frequency (27.12 MHz) was used to deactivate the tag. The dual frequency tag included a fusible link made by narrowing a portion of the metallic trace that formed the circuit. The fusible link was designed to burn away during deactivation, causing an open circuit and deactivating the tag. The higher frequency, 27.12 MHz, was used for deactivation because at the time there were no FCC limitations on the amount of power that could be radiated at that frequency and a significant amount of power was required to deactivate the tags (Lichtblau, CX-2, Q. 60-61; CX-29).

268. As part of complainant's remote deactivation research and development, Lichtblau attempted to design a second type of dual frequency tag that was

deactivated by applying power at high frequency in a microwave oven to create an open circuit. The microwave tag was not successful. When the tag was attached to an object, the object absorbed most of the microwave energy and the tag did not deactivate. When the tag was attached to a plastic tape cassette, the tape caught fire in the microwave oven (Lichtblau, CX-2, Q. 79-81).

269. Lichtblau's original prospectus to Checkpoint was based upon a disposable circuit that would be electronically deactivated which would be used only once. The concept from the beginning envisioned flexible, cheap, disposable, detectable, electronic circuits that would be electronically deactivated (Wolf, CX-1, Q. 37).

270. When Checkpoint first began selling products covered by the Lichtblau technology, those products did not include electronic deactivation (Wolf, CX-1, Q. 38).

271. Reusable detectable tags, which had been attached to the outside of merchandise, had to be indestructible or impregnable, or relatively so, because they were visible and accessible to tampering by a potential criminal. A visible paper label is much easier to tamper with than a hard plastic label (Wolf, CX-1, Q. 39).

272. Complainant's concept was that once a paper label is inexpensive enough to be disposable, it can either be hidden in merchandise or disguised as something else. Remote electronic deactivation therefore was necessary to deactivate the tag at check-out to prevent an alarm (Wolf, CX-1, Q. 39; 41).

273. Lichtblau's initial remote deactivation concept was the fusible link tag (Lichtblau, CX-2, Q. 61-64; Wolf, CX-1, Q. 40).

274. Complainant field tested fusible link tags in the late 1970s (Wolf, Tr. at 2619; Wolf, CX-1, Q. 40).

275. Although the fusible link concept worked, the deactivator was too big, too expensive, and required too much power to be commercially viable (Wolf, Tr. at 2620; Wolf, CX-1, Q. 40).

276. The fusible link resonant tag was not commercially successful because it required very high power to deactivate. The fusible link itself greatly increased resistance in the circuit, and manufacturing technology was inadequate to produce such tags on a mass production basis (Lichtblau, CX-2, Q. 63-64; Zahn, Tr. at 1980-82).

277. The realization that the fusible link tag was not commercially viable was reached after six to nine months of field testing (Wolf, Tr. at 2620).

278. After the fusible link tests, Lichtblau unsuccessfully attempted to develop a microwave tag (Lichtblau, CX-2, Q. 79-81).

279. Approximately seven to eight years elapsed between the time that Checkpoint determined that the fusible link was not a success to the time Checkpoint began marketing resonant tags that embodied the claimed invention. (Wolf, Tr. at 2621-22).

280. As Lichtblau's March 22, 1981, letter stated, Stanley Schurgin is in the Boston firm of Weingarten, Maxham & Schurgin. The March 22 letter enclosed a check of $475 for Schurgin's patent search of flame spraying and road line painting. The letter also enclosed "my latest invention (I hope) for electronic deactivation of resonant circuits. The actual deactivation process has been tested and proven in my laboratory; however, no actual prototype hardware has been built (yet)." Schurgin, by the March 22, 1981 letter, was directed to send a copy of "this proposed invention to ADL and notify them of my [Lichtblau's] intention to have you prepare the papers for the US patent office" (CX-38).

281. Lichtblau stated in the March 1981 draft application that the parallel plate capacitor(s) is from aluminum foil separated by a thin plastic film which both supports the entire structure and acts as the dielectric; that the thin film is easily reptured by high voltage across the capacitor plates (typically less than 500 volts peak-to peak); that in addition, the aluminum is easily vaporized by an arc formed between the capacitor plates and forms a continuous conductor when deposited upon a plastic film; that in addition "the thickness of the aluminum foils is sufficient to allow partical [sic] vaporization of the capacitor plates without destruction of the area of the capacitor plates. This is in contrast with capacitors formed by depositing a thin metal layer on plastic by means of vacuum metallization. If the metal layer is extremely thin, the capacitor plates will be momentarily burned up at the point of the arc. . . . This will not deactivate a 'target'" (CX-38 at GL000997).

282. In the October 17, 1981 draft patent application, which is titled "Electronic Deactivation System For Resonant Circuits Used In An Electronic Security Systems" and has the heading "George Jay Lichtblau Amended October 17, 1981), Lichtblau made the following distinction between the open circuit mode and the short circuit mode:

> Figures 6 and 7 show an alternative resonant circuit design which can be "deactivated" by the same type of apparatus as shown previously. However, in this case the resonant properties are not destroyed by burning out a connecting link but by causing an electric arc to form between the capacitor plates, deposition metal between the capacitor plates, and thus shorting out one of the capacitors. This also destroys or significantly alters the resonant propertises of the circuit.
>
> The circuits shown in Figures 6 and 7 [the short-circuit mode] are identical to those illustrated in Figures 1 and 2 [the burn-out mode] except there is no indentation made at the burn-out point ((4) in Figures 1 and 2). Thus, there is no pre-selected point for the capacitors to breakdown when excess voltage is built up across the plates.

(CX-40 at p. GL001032, Emphasis in original).

283. The language of the second paragraph of the October 17, 1981 draft in the previous finding was revised by Lichtblau on December 11, 1981 in a document titled "Additional Notes" as follows: "The circuits shown in Figure 6 and 7 are identical to those illustrated in Figure 1 and 2 except that the indentation may be made anyplace on the capacitor plate. The indentation serves to reduce the thickness of the plastic dielectric film and thus reduce the voltage required to arc across the capacitor plates (CX-41)." (Emphasis in orginal)

284. The only documentary evidence of activity by Lichtblau relating to the '076 patent between Kaltner's November 17, 1981 invention until the filing in May 10, 1992, of the '076 patent application is Lichtblau's note dated December 11, 1981, (CX-41). There is no evidence of any activity from the time prior to November 17 up to December 11, 1981 and no evidence of any activity from December 11, 1981, up to the May 10, 1982 filing date.

285. Lichtblau, in a letter dated in April 1981 to Schurgin, enclosed "some additions to my original patent writeup concerning tag deactivation which was forwarded to you with my letter as of March 22, 1981" (CX-39).

286. There is no specific description of a short circuit mode with an indentation in the October 17, 1981 draft patent application (Lichtblau, Tr. at 2932).

287. Lichtblau sent his fourth and final patent application re-draft to his patent attorney on December 11, 1981 (CX-41) (Lichtblau, Tr. at 2754-2755; 2931-2932; CX-41).

288. The subject matter in the first paragraph of the second page of the April 1981 draft (CX-39) does not discuss the use of an indentation and does not discuss the use of heat and pressure (Kaltner, Tr. at 1595-96).

289. Lichtblau's draft patent application dated October 17, 1981, (CX-40) from page 14 to the end describes deactivation of a tag by breakdown, cooling, reapplying a field, and growing layers of metallization that eventually will create a short circuit somewhere in the capacitor plates (Kaltner, Tr. at 1602-03).

290. Figs. 6 and 7 in the October 17, 1981 draft (CX-40) do not depict the use of an indentation in a capacitor plate. Also Figs. 6 and 7 in the October 17, 1981 draft (CX-40) do not depict the tags that Kaltner worked with to accumulate the data set forth on his notebook page of November 17, 1981 in RAX-4 because Figs. 6 and 7 do not depict a preferred point of an indentation or any description whatsoever on how to create that indentation (Kaltner, Tr. at 1603, 1604).

291. Lichtblau's notebook could not be produced in this investigation because Lichtblau disposed of it around 1987 or 1988 (CX-2 at 12-13 (Lichtblau, Q.Q53-56; Lichtblau, Tr. at 2724-2725, 2733, 2894-2895).

292. Prior to its destruction, Lichtblau's laboratory notebook regarding dimpling of resonant tags was in his physical possession (Lichtblau, Tr. at 2724).

293. When Lichtblau documented his work on resonant tags before June of 1982, he was an employee of Checkpoint (Lichtblau, Tr. at 2727).

294. Lichtblau did not ask Checkpoint whether he should destroy his notebooks or keep them (Lichtblau, Tr. at 2733).

295. Lichtblau did not save any of the resonant tags that he experimented on in relation to the '076 and '473 patents (Lichtblau, Tr. at 2961).

296. Lichtblau would normally have disposed of an experimental tag once he was finished with it (Lichtblau, Tr. 2961).

297. The words that appear on CX-37, which is referenced in FF 326, 327 infra, are not the literal words that appeared in Lichtblau's notebook (Lichtblau, Tr. at 3171).

298. CX-39 consists solely of pages bearing Bates Nos. GL-001007 through GL-001012 with a cover letter. These pages constitute what Lichtblau sent to Mr. Schurgin in April, 1981 (Lichtblau, Tr. at 2929).

299. According to Lichtblau, a key feature of his invention was to be able to deactivate a resonant tag at low power or low voltage (Lichtblau, Tr. at 2934).

300. Nowhere in Lichtblau's draft March, April and October 1981 applications (CX-38 to CX-40) did he describe or define deactivation at low voltage (Lichtblau, Tr. at 2935-36).

301. Nowhere in Lichtblau's draft March, April and October 1981 applications (CX-39 to CX-40) did he describe or define deactivation at low power (Lichtblau, Tr. at 2936-37).

302. According to Lichtblau, low power or low voltage for deactivation was simply a lot lower than previously or less than 500 volts (Lichtblau, Tr. at 2937).

303. Lichtblau did not take measurements of the power that was required to short out the resonant tags that he was experimenting with in 1980 (Lichtblau, Tr. at 2962).

304. Lichtblau did not take measurements of deactivation so as to determine what sufficient energy might be before he filed his patent application (Lichtblau, Tr. at 2964-65).

305. Lichtblau's draft patent application of March 22, 1981 (CX-38) describes a method to deactivate a resonant tag without the use of an indented or modified area of the capacitor plates (Kaltner, Tr. at 1594-95).

306. Lichtblau's draft March 22, 1981, application (CX-38) does not describe the work recorded on page 8 of RAX-4, i.e. Kaltner's notebook page of November 17, 1981, because said draft does not indicate that anything was done to the tag to specifically create a short in an indented or modified area of the capacitor plates (Kaltner, Tr. 1594-95).

307. Lichtblau's draft patent application dated April 5, 1981 (CX-39) does not describe the use of an indentation to create a location where breakdown would occur to form a short circuit and deactivate the tag but instead uses an indentation to deactivate by creating an open circuit (Kaltner, Tr. at 1598-99; CX-39 GL001009).

308. Lichtblau's draft April 5, 1981 application (CX-39) does not describe the work that Kaltner performed on November 17, 1981 (Kaltner, Tr. at 1595-96).

309. Lichtblau's draft October 17, 1981 application (CX-40) does not discuss the use of an indentation in a capacitor plate to assist in the formation of a short circuit to deactivate a tag (Kaltner, Tr. at 1603).

310. With respect to a short circuit, CX-40 discloses that no indentation is used for deactivation by short circuit and that an arc may form anywhere between the capacitor plates (Kaltner, Tr. at 1626).

311. CX-40 shows no preferred point for the capacitor to breakdown, and that a short circuit is not necessarily created on the first arcing (Kaltner, Tr. at 1626; CX-40).

312. CX-40 does not describe what Kaltner did in November, 1981. (Kaltner, Tr. at 1626).

313. Lichtblau's draft March 22, 1981 application (CX-38) describes a short circuit mode of deactivation for a resonant tag having no indentation (Lichtblau, Tr. at 2927).

314. CX-38 does not indicate the use of an indentation with a short circuit mode of deactivation for a resonant tag (Lichtblau, Tr. at 2933).

315. CX-38 does not describe an open circuit mode of deactivation for a resonant tag (Lichtblau, Tr. at 2927).

316. Lichtblau's draft April 5, 1981 application (CX-39) describes an open circuit or burn out mode for deactivation of a resonant tag with an indentation (Lichtblau, Tr. at 2927, 2933).

317. Lichtblau's draft October 17, 1981 application (CX-40) describes a short circuit mode of deactivation for a resonant tag having no indentation (Lichtblau, Tr. at 2930).

318. CX-40 describes an open circuit or burn out mode of deactivation for a resonant tag having an indentation on the lead (Lichtblau, Tr. at 2930).

319. CX-40 does not describe a short circuit mode of deactivation for a resonant tag having an indentation (Lichtblau, Tr. at 2932).

320. Figures 6, 7, 8, 9, and 10 of CX-40 on pages GL-001040 and GL-001041 do not show any dimple in a resonant tag (Lichtblau, Tr. at 2990).

321. While Kaltner testified that there is language and a Figure in CX-39 that is substantially identical to language and Figure 8 of the '076 patent

(Tr. at 1523-25), he testified that the draft applications from March, April and October 1981 do not disclose a short circuit mode with an indentation or any process that was done to the tag to create specifically a short in an indented or modified area of the capacitor plates. To the contrary Kaltner testified that CX-39 talks about "trying to create a open circuit failure [sic] of the tag or non-resonant quality by destroying its continuity" (Kaltner, Tr. at 1598) and that CX-40 discusses a mode of deactivation that is not at some preferred point on the capacitor but rather anywhere on the capacitor plates (Kaltner, Tr. at 1592 to 1604).

322. Lichtblau has testified that he was very excited about putting an indentation to cause a short circuit and that he felt that it was the best way to go as opposed to the burn out mode (Tr. at 2932-33). Yet he testified that in CX-40 there is no specific description of a short circuit mode with an indentation (Tr. at 2932); that in CX-38 he did not indicate an indent and describes the short circuit mode with no indentation; and that in CX-39 while he indicated an indent he was referring to the burn out mode (Lichtblau, Tr. at 2927, 2933).

323. When Lichtblau was asked why in the April 1981 draft application did he describe a burn out mode which he did not successfully make instead of the successful short circuit mode he found surprisingly easy, Lichtblau testified that was because the burnout mode was what he started with and when he discovered the short circuit mode, he realized that it was a much better way, but when he writes patents he tries to cover everything he has done in every way he thinks he can do it and since he could deactivate with either way, he covered in the claims every possible way to be able to deactivate the tag (Lichtblau, Tr. at 2989-90).

324. Figures 1, 2, 3 and 4 of the draft October 17, 1981 application (CX-40), which is the third patent disclosure show the burn out mode. Also Figures 6, 7, 8. 9 and 10 of CX-40 do not show a dimple, although the figures form a short through the capacitor plates (Lichtblau, Tr. at 2990).

325. As to whether the burn out mode was ever successfully made, Lichtblau testified that "is not absolutely clear in my own mind" (Lichtblau, Tr. at 2990).

326. Alfred Stapler, who did not testify live at the hearing, in a 1984 meeting after reviewing Lichtblau's notebook which contained the disclosure of Lichtblau's invention, in a sketch allegedly made at the 1984 meeting described the indentation as a "small, sharp depression" (Lichtblau, Tr. at 2722; CX-37).

327. At the 1984 meeting between Stapler and Lichtblau, Stapler viewed Lichtblau's notebook and sketched into his own notes a copy of a drawing of the indentation that appeared in the notebook (Lichtblau, CX-2 at 11-12, 26-27 Q.Q50 98; CX-37; RAX-57). Lichtblau witnessed Stapler make the aforesaid sketch (Lichtblau, Tr. at 2742). On the sketch, Stapler wrote the date of the notebook entry as October 3, 1980 (Lichtblau, Tr. at 3019; CX-37; RAX-57). The sketch does not make any characterization that the drawing is the claimed short circuit mode in issue.

328. The numbers 54, 48, 56, and 50 on CX-37 (the sketch made by Stapler) were added by George Lichtblau at his deposition to correspond to Figure 4 of the '076 patent (Mernick, Tr. at 2741, 2921). The sketch made by Stapler, according to Lichtblau at the 1993 hearing was the first sketch made by Lichtblau of the dimple in a single frequency tag where the dimple was placed on the connecting link to the capacitor plate so that when the applied power to the tag it would arc and cut the connecting link (Tr. at 2722).

329. Lichtblau did not show any tags to Stapler at the 1984 meeting in New Jersey about which he testified (Lichtblau, Tr. at 2962).

330. Roderick Cary, an electrical engineer, joined Checkpoint in January 1981 (Cary, RAX-1 at QQ. 3, 8-9).

331. When he was hired, Cary was the Director of Product Engineering for Checkpoint (CRX-1 at Q. 3).

332. At the time Cary was hired by Checkpoint, Lichtblau, the named inventor of the patents in issue, was responsible for research and development and engineering within Checkpoint (CRX-1 at Q. 4). Checkpoint's Chairman, A.E. Wolf, testified that Lichtblau was spending too much time away from research and development, and that Cary was hired to allow Lichtblau to focus his efforts more on research and development (Wolf, Tr. at 2633).

333. Cary's duties included meeting with Mr. Lichtblau and communicating between Lichtblau and Checkpoint (Cary, RAX-1 at Q. 214).

334. Before joining Checkpoint, Cary had about twenty years of experience working with resonant circuits, although he did not then have experience working with resonant circuits as applied to electronic article surveillance products (Cary, RAX-1 at Q. 32).

335. Shortly after joining Checkpoint, Cary educated himself about Checkpoint's resonant tag products by visiting Lichtblau's laboratory in Connecticut (Cary, RAX-1 at Q. 37).

336. During the spring and summer of 1981, during his visits to Lichtblau's laboratory, Cary was shown deactivatable resonant tags (RAX-1, Q. 66). All of these deactivatable resonant tags were deactivated by fusing a fusible link within the tag. (Id.) This method of deactivation was abandoned

by Checkpoint in the late 1970's due to cost and other concerns (Wolf, Tr. at 2620).

337. In the summer of 1981, Cary requested, and Wolf approved, the hiring of another engineer (RAX-1 at Q. 106). The person ultimately hired for that spot was Kaltner (Wolf, RAX-1 at QQ. 105-08).

338. Kaltner was hired because Wolf was not satisfied with the progress being made with remote deactivation development (Wolf, Tr. at 2642-43; RAX-1 at Q. 106).

339. Wolf was not involved with the hiring of Kaltner (Wolf, Tr. 2642; RAX-1 at QQ. 107-08).

340. Kaltner joined Checkpoint in September, 1981, and worked at Checkpoint headquarters in Thorofare, New Jersey (Kaltner, RAX-126 at QQ. 8, 23).

341. When Kaltner joined Checkpoint he held a Bachelor of Science degree in electrical engineering from Drexel University (Kaltner, RAX-126 at Q. 2).

342. At the time Kaltner joined Checkpoint, he had significant experience working with resonant circuits (RAX-126 at Q. 27), but he did not have specific experience working with resonant anti-theft tags (Id. at Q. 30; Kaltner, Tr. at 1515).

343. Upon joining Checkpoint, Kaltner worked under the direction of and with Cary (Kaltner, RAX-126 at Q. 33-34; RAX 1).

344. Kaltner was hired by Checkpoint in September 1981 as a design engineer (Kaltner, RAX-126 at 2-3, QQ. 8, 17; Kaltner, Tr. at 1515).

345. Kaltner attempted to familiarize himself with resonant tags when he began working at Checkpoint (Kaltner, RAX-126, QQ. 33-35).

346. Kaltner accompanied Cary on a visit to Lichtblau's laboratory in Danbury, Connecticut, early in Kaltner's employment with Checkpoint. The evidence is uncontroverted that the visit occurred prior to November 15, 1981 (Kaltner, RAX-126, Q. 35-40; Kaltner, Tr. at 1576; Lichtblau, Tr. at 2785-86).

347. On or about November 15, 1981, Kaltner deactivated a resonant tag by creating an indentation in one of the capacitor plates with heat and pressure from a soldering iron (Kaltner, RAX-126 QQ. 58-62; Kaltner, Tr. at 1516, 1517).

348. Kaltner determined that the indentations caused a short circuit in the capacitor plates by measuring the tags with an ohmmeter and finding that the resistance across the capacitor plates had dropped to less than one-tenth of an ohm (Kaltner, RAX-126 Q. 64).

349. The capacitor would short out because it was over voltaged (Lichtblau, Tr. at 2938).

350. RAX-4 is Kaltner's first laboratory notebook that Kaltner compiled during his employment at Checkpoint (Kaltner, RAX-126 Q. 45).

351. Kaltner maintained a laboratory notebook as a convenient way to document experiments and data and recall what measurements were taken and to have a date and time to reexamine those measurements and data (Kaltner, RAX-126 at Q. 47).

352. Kaltner's practice was to make regular entries in his notebook, RAX-4, whenever he had data that he felt should be recorded (Kaltner, RAX-126, Q. 47).

353. Shortly after arriving at Checkpoint, Kaltner began experiments on a product known as the "Checkpoint 49 tags" (Kaltner, RAX-126 at QQ. 49-50).

354. These experiments occurred between November 6, 1981, and November 15, 1981 (RAX-4 at 2-6).

355. On Novemmber 17, 1981, Kaltner purposely recreated dramatically reducing the amount of power required to create a deactivation of the resonant tag by applying a soldering iron to the thicker aluminum side of the capacitor plate of the Checkpoint 49 tags (Kaltner, RAX-126 Q. 61; RAX-4 at 8). Kaltner then recorded that the "application of heat and pressure at a point causes capacitor short failure with relatively low RF current" (RAX-4 at 8).

356. The indented tags made and deactivated by Kaltner on November 17, 1981, deactivated at a reduction of 100 to 1 in current and 10,000 to one in power compared to the measurements made with unmodified tags on November 15, 1981 (RAX-1, Q. 155).

357. At the time Kaltner conducted the experiments referred to on page 8 of his notebook (RAX-4), he clearly understood that the ability to destroy the resonant property of the tag at significantly lower RF current levels was due to some voltage breakdown phenomenon in the capacitor plates of the indented tags. In effect the capacitors became a short circuit (RAX-126 Q. 78). Kaltner believed that the breakdown phenomenon witnessed in the indented tags was either a carbon arc or an actual metallic short between the capacitor plates (Kaltner, RAX-126 at Q. 79).

358. At the time of his experiments recorded on page 8 of his notebook (RAX-4) Kaltner believed that the lower breakdown voltage for the capacitors of the indented tags was a result of much less separation between the capacitor plates at the point of the indentation (Kaltner, RAX-126, Q. 81).

359. On or about November 17, 1981, Kaltner made a remotely deactivatable resonant tag that deactivated by means of a short circuit formed as the result of an arc discharge at relatively low power as the result of an indentation made in one of the capacitor plates of that tag (RAX-4 at 8).

360. At the hearing, Kaltner verified that his November 17, 1981 notebook entry constituted the conception and reduction to practice of the subject matter of the claims in issue (Kaltner, RAX-126, Q. 61-85; Kaltner, Tr. at 1611-12).

361. The tags Kaltner produced using heat and pressure to form indentations in the capacitor plates met the limitations of claims 1 and 4 of the '076 patent (Kaltner, RAX-126 QQ. 90-98).

362. The tags Kaltner produced using heat and pressure to form indentations in the capacitor plates met the limitations of claim 25 of the '473 patent (Kaltner, RAX-126 QQ. 101-104).

363. By December 18, 1981, Kaltner had only done some of the design work on a demonstration deactivator as well as some measurements and calculations of detection range and deactivation range (Kaltner, RAX-126 Q. 119).

364. Neither Cary nor Kaltner knew that there were heated separation negotiations between Lichtblau and Checkpoint after Lichtblau was fired by Checkpoint (Cary, Tr. at 1635; Kaltner, Tr. at 1503).

365. In 1986, Kaltner was singled out among all Checkpoint employees to receive the Peter Stern Award for his contribution to Checkpoint (RAPX-36).

366. Lichtblau testified that if in his experiments he took an unindented or undimpled tag and rammed as much power as he could through it, the tag would start shorting across the capacitor plates but the shorting would not stop and would continue. What would happen is that that tag would short completely and continuously on the periphery (edges) of the capacitor plate and as power is continued the tag would literally sizzle and the edges of the capacitor plate would start burning off. No short circuit would be formed and the tag would not be deactivated (Lichtblau, Tr. at 2747-48).

367. Cary is claiming to be a co-inventor of the phenomenon for deactivation that is described in the '076 patent because he repeated the tests that Lichtblau did and confirmed Lichtblau's results that fusible links did not seem to be reliable and then pursued shorting out the capacitor by inducing enough energy to cause the capacitor to break down and in so doing Cary found that in most cases the capacitor burnt around the perimeter and only one out of 10 times did Cary end up with a reliable short (Cary, Tr. at 1640).

368. Kaltner's salary increase form signed by Wolf on Dec. 21, 1981 describes Kaltner's job as "Design & Develop Various Electronic Products as assigned. First Assignment: Remote deactivation". It further stated that "George has discovered a phenomenon that will make our tags much more easy to deactivate. This should accelerate our development schedule and reduce the cost of the end product." While Wolf testified that deactivatability is one aspect of the challenge Checkpoint faced in the early '80s and deactivation is the other aspect and that Lichtblau had developed the deactivatability idea for a tag that could be deactivatable by a dimpling while Kaltner was hired to work on deactivation, i.e. the equipment that would deactivate the dimpled tag (CRX-1, Q. 13), Wolf also agreed that it would not surprise him that Checkpoint has used the term "deactivation" in the past to relate to "deactivatability" (Tr. at 2671).

369. It was Kaltner's understanding that he was hired to be part of the engineering group and assist in any way he could and that one assignment was deactivation. Kaltner's understanding at the time he was hired and today is that deactivation was the entire remote deactivation capability for Checkpoint which meant any and everything involved in giving Checkpoint that capability. At the time Kaltner was hired, according to Kaltner, it was not known what

deactivation would be and it could have been microwaves or infrared radiation or a chemical process. Also according to Kaltner, after he was hired he worked on the dual frequency resonant tag and did experiments on tags to find out what the fusing currents were and to find out whatever breakdown voltage was on the capacitor plates as they existed at the time and to find out where the tag might arc across the capacitor plates and such experiments preceded Kaltner's work on the deactivator. Kaltner testified that such experiments were before his work on the deactivator because before anyone could define the deactivator, somebody had to know what was the concept or what the system was that was going to be eventually the capability of remote deactivation and it was not defined at that time (Tr. at 1498-1500; RAX-4).

370. According to Cary, Kaltner was hired to focus his energies and time on the concept of deactivation and Checkpoint could not possibly develop a deactivator until one can define what it was suppose to do. For example if the deactivation concept was a chemical process then one would need a deactivator that performed that process and if it was an electrical process one had to define what that electrical process was before one could design a deactivator to carry on that process (Tr. at 1633).

371. Cary and Kaltner perceived their jobs to be development of all aspects of a deactivation system (Kaltner, Tr. at 1498; Cary, Tr. at 1632-33).

372. Mr. Wolf testified (Wolf, Tr. at 2636):

Q You have suggested that Mr. Lichtblau was the only one who was responsible for research at Checkpoint in the early 1980s, is that right?

A Yes directly responsible yes.

Q But that does not preclude other people from engaging in research at Checkpoint does it?

A No.

Q You do not discourage that do you?

A No.

Q In fact you encourage it is that not right?

A. Yes

373. In Kaltner's experiments at Checkpoint, as demonstrated at pages 6-8 of his notebook which are dated November 15 and 17, 1981, Kaltner applied heat and pressure with the tip of a soldering iron, to a resonant circuit, which caused indentation and thereby created a much lower breakdown voltage and a consistent deactivatability feature in a tag (Kaltner, Tr. at 1506, 1514; RAX-4).

374. Page 8 of Kaltner's notebook which is dated November 17, 1981 is when Kaltner purposely repeated an application of heat and pressure with a soldering iron tip to determine the repeatability. Kaltner believes he knew maybe the day earlier, or earlier that day, as shown on a couple of pages earlier in his notebook that he had pretty well recognized what was happening. However it was on November 17, 1981 that Kaltner purposely did it and was successful in recreating it a number of times without any problems or any difficulty (Kaltner, Tr. at 1516).

375. Wolf was not concerned with who developed the concept of the short circuit but just wanted the concept developed. While Wolf initially testified that he reviewed Kaltner's notebook, he later testified that he glanced at Kaltner's notebook only in relation to these proceedings, had not "reviewed" the Kaltner notebook before these proceedings and that the word "review" is a little heavy (Tr. at 2643, 2644).

376. Wolf also testified:

A. Well, I'm not a technician or an engineer. I can't describe it [the concept of feasible electronic deactivation of radio frequency tags] in scientific terms. . . . (RAPX 26 at 52);

* * *

Q. Do you have a technical understanding of the structure and operation of the All-Tag deactivatable tag?

A. Not a bad understanding for an English Literature major, but from the point of view of technology, I don't have a very good understanding (Wolf, Tr. at 330);

* * *

JUDGE LUCKERN: You are saying you did have personal knowledge [of Mr. Kaltner's activities]?

THE WITNESS: Yes but I did not know exactly technically what was going on (Wolf, Tr. at 2661).

377. Kaltner did not discover the phenomenon by which an electric arc is formed through the substrate film to cause vaporization of surrounding or adjacent conductive areas to thereby destroy the properties of the circuit (Kaltner, Tr. at 1513).

378. Page 1 of the Kaltner notebook has a schematic and a picture of a attempt at a dual resonance tag using 49 tag artwork. Kaltner can remember some measurements he took on the Q and the center frequency and the resonant second frequency and one can see on page 1 that it is 40 megahertz and 8 megahertz which was not what was desired but it still was only a starting point for the concept of dual resonance. The 49 tag was a single resonance tag and Kaltner was essentially trying to modify it to become a dual resonance tag and that is what was occurring on page 1 of his notebook. It appears on page 1 that Kaltner added a second capacitor and also added some turns to the capacitor side of the tag (Kaltner, RAX 126, QQ. 48, 49, 50).

379. With respect to page 2 of the Kaltner notebook, which has a date of October 15, 1981, Kaltner remembers it refers to a visit that Lichtblau made to New Jersey and, while Lichtblau was talking to Cary and Kaltner, Kaltner asked Lichtblau what were the other known ISM frequencies that Lichtblau was aware of and the two that he could think of were the 13.56 megahertz and 27.12 megahertz. Kaltner was essentially looking for any possibility that there was another ISM frequency somewhere at 35 or 40 megahertz to use the dual resonance experiments that Kaltner was showing some success with (Kaltner, RAX-126, Q. 51).

380. Page 3 of the Kaltner notebook is an impedance transformation formula used commonly in radio frequency circuits (Kaltner, RAX-126, Q. 52).

381. With respect to pages 4 and 5 of the Kaltner notebook, on page 4 Kaltner shows a matching network of a transmit amplifier exciting a single loop transmitting loop and also shows a 49 tag artwork matched to a 50 ohm cable and connected to a volt meter and Kaltner is getting some indications of what induced voltages he can get in the 49 tag relative to the particular field strengths generated in the single loop transmitter. On page 5 Kaltner decided to energize the tag directly by connecting wires right to the tag by matching down the power amplifier impedance and connecting to the tag and actually measuring the current flowing through the tag with a current probe. Kaltner recalls that on page 4 he did not appear to be able to induce enough current into the tag using a remote loop antenna and on page 5 Kaltner decided to connect directly to the tag and both pages 4 and 5 related to the same intended experiment. With respect to the resonant frequency of the signal emitted from the antenna shown on page 4, Kaltner believes he set and tuned the transmitter for 8.2 megahertz and he adjusted the 49 tag with an adjustable capacitor to

peak it to the same frequency. The "RF" on page 5 stands for radio frequency. With respect to the frequency of the signal that page 5 shows is outputted from the RF power amplifier, it was approximately 8 megahertz and Kaltner further believes he identified the tag further down at 8.0 megahertz (Kaltner, RAX-126, QQ. 53, 54, 55, 56, 57).

382. Referring to pages 6 and 8 of the Kaltner notebook, page 6, which is signed by Cary and dated November 15, 1981 and also signed by Kaltner, is an experiment where Kaltner is measuring the current through 49 tags made from raw web material and he is inducing current by directly connecting to a power amplifier which is excited by an 8.2 megahertz generator and is measuring the current directly with a current probe and he gradually increases the current until he measures a peak current at which the tag ceases to be a resonant circuit. At page 6 there are five samples and the peak current ranges were in the 4 to 4 and one half range when the tags become nonresonant, i.e. with the circuit he was using to make this measurement the current dropped dramatically because the tag was not resonant and the circuit was no longer matched and the current decreased. The dramatic decrease in current is the point at which the tag, as shown by page 6, lost resonance because there was a short developed on the capacitor plates. During the tests made on page 6 Kaltner had several of the tags give him data which was extremely non-consistent with the 4 ampere range because they shorted with much power current. At that time Kaltner recognized what was happening was that he was somehow modifying the tag when he was soldering connection wires to the plates of the capacitors. He recognized that that was a desirable effect because it dramatically reduced the amount of power required to create deactivation of the resonant tag. On page 8, which is signed by Cary and dated "11/17/81" and signed by Kaltner and dated "11/17," is

the first test where Kaltner tried purposely to recreate that effect and he did it by using a soldering iron being applied to the thicker aluminum side of the capacitor plate which side he referred to as the 2 mil side. To be consistent he used the weight of the iron itself. The WTCP on page 8 refers to a Weller soldering iron. He let the weight of the iron itself through its tip lay on the aluminum 2 mil side 2 mil for five seconds. Kaltner repeated that for what appears to be six samples on page 8 and then he remeasured the test exactly the same way that he did on page 6 and the data shows that the peak RF current where that capacitor had shorted and the tag becomes nonresonant is significantly less than the peak current on page 6 (Kaltner, RAX 126, QQ. 58, 59, 60, 61; RAX-4).

383. With respect to whether Kaltner saw any effect on the aluminum capacitor plates to which he applied the tip of the soldering iron on the six tags that are discussed on page 8 of his notebook, the application of heat and pressure at a point created a visible indentation in the capacitor plates which had the solder tip applied to it (Kaltner, RAX-126, Q. 62).

384. Concerning the language on page 8 of Kaltner's notebook "heat and pressure at a point causes capacitor short failure with relatively low RF currently," Kaltner is recognizing that this process of applying heat and pressure will cause the tag to have a breakdown voltage in its capacitor which also corresponds to a lower RF current with a relationship between RF current and the voltage on the capacitor. At the particular time Kaltner was making the test he was using as the variable RF current at which point the tag failed, so that is what is meant by the discussion of a capacitor short failure resulting in a lower RF current. All on page 8 was relative to the tests that were done on page 6 (Kaltner, RAX-126, Q. 63).

385. Kaltner determined that there was a short failure in the tags examined on page 8 of his notebook because he clearly recognized that the tags were no longer resonant and upon reexamining those tags which had failed after application of RF currents in the range of 50 to 60 milliamps, Kaltner could measure those tags with an Ohm meter and find that their resistance was less than a one-tenth of an Ohm, which indicated to Kaltner that the short circuit had occurred in the capacitor. He can't specifically remember measuring those exact six tags on page 8 but Kaltner knows that measurement was made in the time period to determine that that was what was happening (Kaltner, RAX-126, QQ. 64, 65).

386. The data on page 6 of the Kaltner notebook was done with tags that did not have soldered connections to the plates. To avoid having that problem the data on page 6 was taken with tags which had either clip leads or were soldered at a point away from the capacitor plates (Kaltner, RAX-126, Q. 66).

387. With respect to the language "capacitor short failure" on page 8 of the Kaltner notebook, Kaltner meant that the six tags developed an electrical short after the current was gradually increased and at that point where he no longer had a resonant circuit or he no longer had matching and lost power into the tag the way he was testing it. That is at the point where he stopped increasing the current and that current was the current at which the capacitor had shorted and that was the reason that the current was no longer matched and the actual measured current dropped dramatically. The RF current readings on page 8 of the Kaltner notebook indicated to Kaltner that there were electrical shorts between the capacitor plates of the tags (Kaltner, RAX-126, QQ. 67, 68).

388. As for the language on page 8 of the Kaltner notebook "gradually increased RF current until sudden drop indicated shorted capacitor," that

language was Kaltner's notation to describe how he was making the measurement and what it means is that Kaltner is gradually increasing the drive into the power amplifier and constantly looking at the power meter and the power meter should increase every time he increases the generator. If Kaltner increases in small increments and he eventually achieves a level at which the power meter decreases or drops dramatically, that is an indication to Kaltner that the tag circuit has lost its resonant property (Kaltner, RAX-126, Q. 69).

389. In the tests performed on page 8 of the Kaltner notebook, Kaltner was using the test circuit shown on page 5 of his notebook which he also used to measure the data on page 6 of his notebook (Kaltner, RAX-126, Q. 70).

390. With respect to the language "remeasure with good unmodified tag to get accurate current reading" on page 8 of the Kaltner notebook, such meant that when Kaltner saw the drop, he would then take his hand off of the drive level setting of the RF generator. To establish what the current was just prior to having the capacitor short, Kaltner would then put in another similar unmodified resonant current to actually measure that current because he could no longer measure it through the actual tag because that tag had failed, i.e. it was no longer a detectable resonant circuit. As for the language "good unmodified tag" the problem was that as Kaltner was increasing drive level, it was hard to tell exactly where the point was at which he lost resonance in the tag and what the drive level actually was, so the only accurate way he could think of was to leave the drive set in the position when he first noticed the decrease in power and then reinsert a similar resonant tag, i.e. a 49 tag without an indentation in the capacitor plate, and measure the RF current into that tag (Kaltner, RAX-126, QQ. 71, 72, 73, 74).

391. Referring to the term "REF meter" on page 5 of the Kaltner notebook, there are two power meters each in series and one is a forward power indicator and the other one is a reflected power indicator and as long as the tag maintained its resonant property, the forward meter would continue to increase as Kaltner turned in a higher drive level and the reflected meter would stay essentially zero. When the tag became nonresonant, the forward meter would drop and the reflected meter would rise significantly indicating that Kaltner was no longer matched into that tag circuit so the meters were the indication that the tag had changed its resonant property (Kaltner, RAX-126, Q. 75).

392. The power meters which are referred to on page 5 of the Kaltner notebook were both analog readout with a needle and a scale. The generator also had a analog readout and the actual measurements Kaltner took through were through the peak-to-peak measurements on the oscilloscope and a current probe and it was then that he would measure the peak-to-peak current (Kaltner, RAX-126, Q. 76).

393. When Kaltner first achieved a change in the resonant property he would leave the generator drive level exactly where it was and he would reinsert or replace the tag which had becomes nonresonant with another resonant (nonindented) 49 tag and then measure the current through the tag using the current probe and an oscilloscope and measure the peak-to-peak voltage indication on the oscilloscope and use that as his peak current indication which he recorded on page 8 and page 6 of his notebook (Kaltner, RAX-126, Q. 77).

394. The initial data that is taken on pages 6 and 8 of the Kaltner notebook is all relative and referenced to actual RF current but the RF current is exactly dependent on the voltage or can be equated to an equivalent voltage across the capacitor plates (Kaltner, RAX-126, Q. 80).

395. Each of such tags used for the experiments described on page 8 of the Kaltner notebook was a Checkpoint 49 tag which was the web material used for the manufacture of the 49 tags. The 49 tag was modified by Kaltner by placing an indentation with a hot soldering iron in one capacitor plate of the tag. The 49 tag which Kaltner indented would have met the requirements for "use in an electronic security system which includes means for providing in a controlled area an electromagnetic field of a frequency which is swept within a predetermined range and means for detecting the presence of a resonant tag circuit having a resonant frequency within said range." The planar substrate of dielectric material of the indented tag on page 8 was the 1 mil polyethylene layer and included a tuned circuit on said polyethylene in planar circuit configuration and resonant at said frequency, i.e. the nominal frequency of the 49 tag which was 8.2 megahertz. The indented tag on page 8 had two plates aligned across from each other which were the capacitor with the indentation on the heavier aluminum side of the capacitor. It was Kaltner's understanding on November 17, 1981 that at the time of the deactivation of the indented tags a short circuit was caused through the substrate and between the indentation in the thick aluminum capacitor plate and the other capacitor plate to destroy the resonant properties of the tuned circuit at said frequency (Kaltner, RAX-126, QQ. 88, 89, 90, 91, 92, 93, 94, 95, 96, 98).

396. With respect to the work done by Kaltner at Checkpoint subsequent to November 17, 1981 and as shown by his notebook, on page 11 there is a tester which Kaltner breadboarded which develops a voltage across the capacitor plate again by connecting right to a dimpled, indented, or processed tag being tested. There Kaltner was trying to use breakdown voltage as a indication of the deactivatability of that tag rather than RF current because it is easier to

measure and there is a circuit and Kaltner remembered that it was a better method of testing the tag. It still had the disadvantage of requiring actual connection to the tag terminals but at that point that is how the tags were tested from that point on which was December 2, 1981. On page 12 there is more data relating to the type of tip and the wattage of the iron and the heat and the length of time that the soldering iron was left on the tag. Kaltner was trying to get some indication that this process could be accelerated by applying more heat and more pressure and letting the dwell time decrease and the opage shows that he was getting successful even down to one second. Page 14 of the Kaltner notebook shows some measurements made to a proposed antenna for a demonstration of the product that would eventually become known as the deactivator. Page 15 is more data related to the antenna on page 14 and page 16 is another single loop antenna configuration for the same purpose. Page 18 is more antenna measurements and the bottom of page 18 is some indication of the peak capacitor volts versus distance that would be induced into the tag to try to get some feel for what level of height of the deactivation Kaltner could expect. Page 19 has more measurements on a two loop transmit antenna and they continue on page 20. Pages 19 and 20 were primarily related to designs for a demonstration piece which would eventually lead to the design of the deactivator. Page 21 which is dated Jan. 20, 1982 refers to a discussion Kaltner had with Cary and Lichtblau who had visited. At the bottom of the page 21 are two notes as to what would be considered design rules for the junction temperatures of transistors and the approximate derating of capacitors. Page 23 is some more measurements of the two loop transmit system which Kaltner intended to install in the demonstration deactivator unit and page 24 is more data with page 25, dated January 27, 1982, basically the same data with some different orientations. Page 26 was not data from the actual indented tag but rather this was a tag probe with the artwork and geometry of a 49 tag brought in proximity of the Quicksilver transmit antenna and then calculations to determine the equivalent peak voltage induced. Page 27 is a measurement of a larger group of tags processed with a soldering iron and ball point pen tip and the deactivation voltage range is somewhere in the 3 to 4 to 5 volts peak voltage. On page 28, which is dated January 29, 1982, Kaltner took thirty samples and measured the resistance of the capacitor after breakdown and they are all under 1 to 2 ohm range except for 2 units which had relatively high resistance (Kaltner, RAX-126, QQ. 105 to 110; RAX-4).

397. RAX-125 bears the letterhead of A. L. Miller and is dated January 4, 1982 and is a shipping list of some tools that Kaltner had ordered from Miller, Kaltner had asked him for tools which Kaltner wanted to use in experiments on creating the indentation with heat. The tools were received from Miller and Kaltner used them with the soldering iron to make indentations in resonant tags (Kaltner, RAX-126, QQ. 114, 115, 116).

398. According to Lichtblau, page 8 of the Kaltner notebook, shows short circuiting and it relates directly to the invention in the '076 patent and is in fact an embodiment of the invention disclosed in the '076 patent. (Lichtblau, Tr. at 2778-79).

399. While Checkpoint argued that it had an incentive to recognize Kaltner as the inventor of the dimple if that fact were true (Checkpoint proposed findings at 49) Checkpoint produced no signed agreement dated before January of 1984 by Cary or Kaltner with respect to assigning any patents that either developed to Checkpoint (Wolf, Tr. at 2646-47) and significantly Checkpoint did not have a document destruction policy (Wolf, Tr. at 2648). While Checkpoint

did produce an agreement dated October 26, 1981 between it and Cary with respect to assigning inventions to Checkpoint, the agreement was not signed by Cary (CRX-18). Kaltner did sign an agreement to assign inventions he made to Checkpoint starting in January 1984 but he knew of no such agreement covering a period before January 1984 (Kaltner, Tr. at 1528, CRX-11). Hence the administrative law judge finds that Kaltner was under no obligation to assign to Checkpoint any inventions he made before January 1984 and thus Checkpoint had no guarantee to exclusive rights to such inventions.

400. Kaltner does not recall signing any agreement with Checkpoint that would obligate him to assign his inventions prior to January, 1984 to Checkpoint (Kaltner, Tr. at 1528).

401. Kaltner filed a patent application for a "Security Tag Deactivation System" on January 10, 1986 which patent issued as U. S. Patent No. 4,728,938 on March 1, 1988 (the '938 patent) and is titled "Security Tag Deactivation System". The '938 patent covers the precursor to Checkpoint's current Counterpoint deactivator product. The attorney, agent or firm listed on the patent is "Alfred Stapler" (CRX-9; Kaltner, Tr. at 1527, 1543).

402. While the '938 patent under the subheading "Background of the Invention" states that "[i]t has previously been proposed to render . . . a tag inactive by a more 'elegant' technique than that of physical removal . . . . That improved technique is disclosed in . . . [the '076 patent] issued Feb. 5, 1985, in the name of George J. Lichtblau", it was not Kaltner but Stapler, who is listed on the '938 patent as attorney, agent or firm, who wrote the quoted language (Kaltner, Tr. 1561). Hence the administrative law judge finds that said quoted language in the '938 patent does not in any way discredit the claim of Kaltner that he invented the short circuit mode in issue on November 17,

1981. Moreover the administrative law judge finds that a Kaltner memo dated January 28, 1986 (CX-150) and admitted for impeachment purposes only (Kaltner, Tr. at 1566) does not in any way discredit the claim of Kaltner that he invented the short circuit mode in issue on November 17, 1981. Significant is the testimony of Kaltner when asked whether Kaltner told anybody that Lichtblau was unfairly being credited with the short circuit mode and that the short circuit mode was Kaltners that "I didn't use those words, but I told Mr. Stapler that I was the one who made the dimple and demonstrated that feasibility" (Kaltner, Tr. at 1544). Stapler, who is a lawyer (Cary, RAX-1, Q 211) did not testify live at the hearing and hence Stapler did not refute that statement. Moreover Kaltner's testimony is corroborated by the testimony of Lichtblau. Thus Lichtblau testified that he had a meeting with Stapler in 1984 of a maximum time of ten minutes and that the purpose of the meeting was that "Al Stapler called me [Lichtblau] because George Kaltner told Al Stapler that he invented the indent" (Lichtblau, Tr. at 2895-98). In addition when Wolf was asked whether Cary and Kaltner ever directly challenged Lichtblau's ownership of the patents in issue, Wolf testified: "They're obviously challenging it now. They must have done it to somebody. But they haven't done it to me [personally]" (Tr. at 2684). Accordingly, the administrative law judge rejects Wolf's testimony that Wolf is certain today that Kaltner never claimed inventorship of the deactivatable tag (Wolf, CRX-1, Q. 23). He also finds credible Cary's testimony that Cary approached Wolf and told Wolf that Checkpoint needed to obtain a patent on the dimpling of tags to make them deactivatable and was told by Wolf that it was being taken care of (Cary, RAX-1, Q. 206).

403. Lichtblau testified:

> Q You said between the fall or the last quarter of 1980 and the time you filed your patent

application in May of 1982, you did no further development work, is that right?

A There were things happening at Checkpoint after that. I started the end of '80, found this effect by accident, and started amongst my other work, which was very heavy, there was nobody else I think in research and development at Checkpoint at that time.

I was writing the patent. I was not working on trying to -- how to manufacture these tags yet. There was a lot of steps before you'd arrive at that point.

(Lichtblau at 2964).

404. Lichtblau admitted that the work of Kaltner which culminated in Kaltner's November 17, 1981 experiment "is an embodiment of my invention but he apparently did not realize I had done it" (Lichtblau, Tr. at 2779). Lichtblau also testified that he had almost nothing to do with Kaltner Id.; that Lichtblau was not aware of any work that Kaltner was doing (Tr. at 2782, 2783); that Kaltner was not aware of Lichtblau's draft applications (Tr. at 1785); and that it is very "probable" Lichtblau discussed his work regarding dimpling and indentation in Kaltner's presence prior to November 17, 1981 in response to a question from complainant's counsel whether such was "probable" (Tr. at 2787).

405. Lichtblau testified:

Q Just one last question in this area, at any point prior to December 11, 1981, did anyone whether Mr. Cary or Mr. Kaltner or anybody else tell you about any work that any other human being on the planet was doing with respect to identations or dimpling of resident tags?

A I did know that prior to that date that George Kaltner was doing tests on dimpling. I don't know exactly when or what. I did not see this notebook at this time or know what he was running. I did know he was running tests on it.

(Tr. at 2789, 2790).

XIV. THE VANDEBULT PATENT

406. U.S. Patent No. 4,369,557 (the '557 patent), which issued to Vandebult on January 25, 1983, from application Serial No. 176,061, filed on August 6, 1980, is for a process for fabricating resonant tag circuit constructions. The '557 patent serves as prior art to the '076 patent and the '473 patent under 35 U.S.C. § 102(e) (RAX-26).

407. Vandebult claims and teaches manufacturing methods for improving the yield of resonant tag circuits. In one embodiment, the '557 patent teaches producing a web of repetitive substrates initially having the conductive areas etched on one side. Individual substrates can then be cut away and folded in half to form a resonant tag with two-sided circuitry. The folded and sealed layer of insulative substrate between the circuitry serves as the dielectric of the capacitor (RAX-26, col. 9, line 9 to col. 11, line 26).

408. Vandebult discloses applying heat and pressure to the resonant tag to control the thickness of the dielectric between the capacitor plates to tune the resonant frequency of the tag. The thinning adjusts the capacitance and may be effected over the entire width of the web, or simply in the region of the capacitor plates (RAX-26, col. 10, lines 1-6).

409. Vandebult teaches fabrication of the substrate as described in the '219 patent, where an extruder having a die emits a continuous web of polyethylene onto a metal plate. The substrate film in the '557 patent has a typical thickness of 0.0005-0.002 inches (RAX-26, col. 7, lines 17-18, lines 28-32).

410. Vandebult teaches constructing a tag having each of the first three elements of the means-plus-function claims of the '076 and '473 patents. (Zahn, Tr. at 1973).

411. Vandebult teaches that the resonant frequency of a resonant tag, which includes a substrate of dielectric material and electrically conductive material on both sides of the substrate to form a tuned circuit, can be tuned by thinning dielectric substrate of the tag by applying heat and pressure. (Zahn, RAX-11 at Q.121; RAX-26, col. 9, line 64 to col. 10, line 33).

412. Vandebult (RAX-26), in Figure 8, indicates that the effective capacitor of the resonant tag is that area in which the conductive areas overlap or face each other on either side of the substrate (Zahn, Tr. at 1975).

413. Vandebult teaches that the region of the capacitor plates may be pressed to thin the dielectric material (Zahn, Tr. at 1976; RAX-26 at col. 10, lines 4-6).

414. Both sides of the polyethylene substrate in Vandebult have electrically conductive material at a thinner region of the substrate (Zahn, RAX-26, col. 9, lines 22-30 and col. 9, line 64 to col. 10, line 33; RAX-11 at Q.121; Zahn, Tr. at 1978).

415. The heating and pressing by Vandebult forms a depression in the substrate where there is conductive material on opposite sides (RAX-26, col. 10, lines 1-33).

XV. OBVIOUSNESS

416. Lichtblau opined that a person of ordinary skill in the art of resonant tag circuitry in or around 1980 should have had two years of experience working with planar resonant circuit tags, and probably the systems that work with them, and be familiar with resonant circuits. Instead of working in planar resonant circuits, the person could have a couple of years of experience with inductor/capacitor circuits in other electronic fields. Such a person would have a bachelor's degree in engineering, and have experience in manufacturing

or in dealing with planar resonant circuits although the person could have a degree in other technical disciplines, and accumulate sufficient on the job experience to qualify as one of ordinary skill in the art (Lichtblau, Tr. at 2858-60; CRX-2, 18).

417. Zahn opined that a person of ordinary skill in the art of developing or creating deactivatable resonant anti-theft tags in or around 1980 would have had a B.S.E.E. with a few years of experience, including some experience in manufacturing processes, or would have a background in science or engineering with basic courses in physics which would include capacitors and inductors (Zahn, Tr. at 1820-22, 1950-51).

418. Holt opined that the level of ordinary skill was that of a person with a bachelor's degree in the physical sciences, preferably physics or electrical engineering, and several years of experience with electrical components such as inductors and capacitors, but not necessarily with resonant tags during the pertinent time period (Holt, Tr. at 2562-2564).

419. In 1980, Checkpoint had been manufacturing and selling resonant tags for a number of years which were deactivatable manually by placing a "Thank You" sticker on the tag (Wolf, Tr. at 330 - 331). This resonant tag was manufactured in accordance with Lichtblau's '219 patent (RTX 31) which expired in October 1992. Those Checkpoint tags are of the same general construction as the tags disclosed in the patents in issue with the exception of the deactivation structure as set forth in the '076 patent at column 7 (Lichtblau, Tr. at 2972; Muzzy, RTX 3, Q. 7; Holt, RTX 3, Q. 27; Zahn, RAX 11, Q. 149 - 158; Wolf, Tr. at 330 - 331).

420. According to Lichtblau, a "real tag" is a tag that basically consists of a physical coil of wire and a discrete capacitor where the capacitor is

soldered to the two ends of the coil of wire. He testified that in the electrical sense a discrete capacitor functions similarly to a planar capacitor; that a planar inductor in the electrical sense is also functioning similarly to a discrete inductor; that the tuned circuit of the '076 invention operates similarly to tuned circuits that were available prior to the invention of the '076 patent; that prior to the invention of the '076 patent it was known that one could cause an arc discharge at a preferential point between two capacitor plates by bringing the plates together at that point more closely than the plates were at other points; that prior to the invention of the '076 patent it was known that if one shorted out the capacitor plates of a resonant circuit one could destroy the resonant properties of that circuit; and that if one shorts the capacitor one destroys the resonant circuit (Lichtblau, Tr. at 2954-56).

421. Rhoads testified:

> Q Isn't it obvious that if you have two capacitor plates separated by a homogeneous uniform dielectric where the dielectric is substantially thinner at one point than anywhere else that break down will occur at the point where the dielectric is substantially thinner?
>
> * * *
>
> THE WITNESS:
>
> We have here a dielectric which is presumably homogenous you said. So there's no material differences. And we're talking about uniform spacing except in one area which is substantially thinner.
>
> Then for people who are aware of the nature of electrical break down, I would say that in the ordinary sense of the word obvious, it is probably fairly obvious that somewhere in that region which is substantially thinner, break down is going to occur.

(Rhoads, Tr. at 917, 918).

422. Prior to Lichtblau's invention it was known that if one shorted out the capacitor plates of a resonant circuit the resonant properties of that circuit would be destroyed (Lichtblau, Tr. at 2955).

423. Prior to Lichtblau's invention it was known that one could cause an arc discharge at a preferential point between two capacitor plates by bringing the plates together at that point more closely than the plates were at other points (Lichtblau, Tr. at 2955).

424. Lichtblau's purpose in indenting the tag in his invention was to create a high [electrical] stress between the capacitor plates (Lichtblau, Tr. at 3084).

425. Lichtblau's patents in issue do not provide any limitation on the shape or size of the indentation formed on the capacitor plate (Lichtblau, Tr. at 2829).

426. Lichtblau's patents in issue do not show or describe any indentation that is made more than part way through the substrate (Lichtblau, Tr. at 3041).

Northeved Patent

427. U.S. Patent No. 3,780,368 to Northeved, which issued December 18, 1973 (RAX-19), teaches an electronic marking circuit that can be used as a security device (Lichtblau, Tr. at 2863).

428. Northeved at column 9, lines 50-62 teaches one of ordinary skill in the art in 1980 that Northeved's invention could be used as an electronic anti-theft device (Zahn, Tr. at 1957).

429. Northeved teaches at column 2, lines 47-54 that Northeved's invention can be made on such dielectric substrate materials as plastics in particular and that it can be built on a planar substrate (Zahn, Tr. 1956-57).

430. Northeved, column 10, lines 10-18, would teach one of ordinary skill in the art in 1980 that it would be desirable to deactivate such a tag, so that the customer could leave the store without setting off an alarm (Zahn, Tr. at 1957).

431. Northeved contains no description of placing an indent in the capacitor to cause it to short circuit (Lichtblau, CRX-2, Q. 49).

432. Northeved, column 14, lines 8-15, would teach one of ordinary skill in the art in 1980 that deactivation of a planar resonant anti-theft tag can be achieved by either changing or destroying one of the circuit elements in a tag (Zahn, Tr. at 1957-58).

433. When All-Tag's Holt was asked whether it is not true that Northeved teaches a person nothing about how specially to construct and dimension his circuit, Holt answered: "Northeved does not teach exactly how to do it" and when asked whether it is a fact that Northeved does not teach generally how to do it and does not say a word about it, Holt answered "[t]hat is correct" (Holt, Tr. at 2565-66).

434. Northeved does not describe a deactivatable planar tag that can be detected and deactivated by a single frequency. Thus all of the marking devices disclosed in Northeved are active devices except for the device illustrated in Figure 18. With respect to the passive device shown in Figure 18, the device has three distinct circuits, unlike the tags in the '076 and '473 patents which use only one circuit. As described in column 15 of Northeved, the device illustrated in Figure 18 has a receiving circuit, labeled 29, which has an inductor and two capacitors connected in series. The only purpose of the receiving circuit is to receive the electromagnetic filed generated by the system. The second circuit on the Northeved device is a rectifier circuit,

labeled 30, which has a diode and a capacitor. The rectifier circuit rectifies the voltage from the receiving circuit and feed it to the third circuit on the device. The third circuit, labeled 31, is the transmitting circuit which has an oscillator with two inductors, a transistor, a resistor and diodes as shown in Figure 18. It is the transmitting circuit that transmits the signal which is detected by the system. The Northeved device requires the three circuits to be able to be detected which is a major difference from the patents in issue (Lichtblau, CRX-2 Q. 49).

435. There is no description in Northeved of how the capacitor in the receiving circuit which may be built to cause it to short circuit to change the tuning of the circuit is to be constructed and dimensioned to cause it to short circuit. Northeved teaches nothing about the description of the capacitor. There is no description of placing an indent in the capacitor to cause it to short circuit. There is no description of what type of capacitor is being used in the receiving circuit of the Northeved device (Lichtblau, CRX-2 Q. 49).

436. Northeved teaches only a "sledge-hammer" approach. Northeved refers to being subjected to an electromagnetic field supplying input signals of so high a field strength that at least one of the components of at least one of the marking circuits is changed in a predetermined manner or destroyed by overloading. The only place that anything like a "weak-link" is referred to is at col. 15, line 30: "[o]ne, C2, of the tuning capacitors of the receiving circuit is specially constructed and dimensioned in such a manner that it is short-circuited." Northeved does not explain how to do this. No details, figures nor explanation of the special construction or the special dimensions

are given (Zahn, Tr. at 1845; Lichtblau, CRX-2, Q. 49). Northeved only teaches that, in theory, one can use a "weak-link" (Rhoads, CRX-4 Q. 15).

437. Northeved discloses that according to his invention, each marking circuit comprises at least one component which is so constructed and dimensioned as to be changed in a predetermined manner or destroyed through overloading when the marking circuit is struck by an electromagnetic field, the strength of which exceeds a predetermined value, thereby to change or permanently interrupt the function of the marking circuit (RAX-19, col. 14).

438. Zahn testified that to short circuit a capacitor or to make it easier to short circuit a capacitor with an indentation is a very common technique that is used in electrical engineering devices and that the critical aspect discovered by Lichtblau in the '076 patent is "obvious" (Tr. at 1852). He further testified that he thinks one of ordinary skill in the art in 1980 would know how to specially construct and dimension a capacitor as suggested by Northeved (Tr. at 1958). Zahn is not a lawyer and has no expertise in patent law. Moreover, the fact that an indentation may have been used in unspecified electrical engineering devices is found not to suggest using an indentation to create a permanent short for deactivation in an anti-theft resonant tag.

'219 Patent

439. U.S. Patent No. 3,913,219 to Lichtblau, which issued October 21, 1975 (CX-26), teaches how to build a planar resonant tuned tag for use in an electronic security system (Lichtblau, Tr. at 2862).

440. The '219 patent contains each element of claim 1 of the '076 and '473 patents except for the means plus function clause at the end of each claim (Zahn, Tr. at 1842, 1876-78, 1947-48; Lichtblau, Tr. at 2862-63, Zahn, RAX-11, Q158).

441. The '219 patent does not describe deactivation by causing a short circuit to occur between the plates of the capacitor and does not describe a means for creating an arc discharge between capacitor plates (Lichtblau, CRX-2, QQ. 24, 25, 26; Holt, Tr. at 2560-2561).

442. The '219 patent does not tell one of ordinary skill in the art how to solve the problem of finding an alternative deactivation method to the fusible link mechanism that will permit deactivation at lower energy (Zahn, Tr. at 1843).

443. The '219 patent discloses a fabrication process for a dual-frequency deactivatable resonant tag that is deactivated by means of a "fusible link" (CX-26, col. 3 line 7-21).

444. The "fusible link" is a relatively narrow conductive path on the side of the tag on which the lower capacitor plate is located (CX-26 col. 2, lines 41-47, Fig. 2 item 28, Fig. 3 item 28).

445. During operation of the electronic security system, a frequency is applied to the tag circuit to cause the "fusible link" to be destroyed, thereby altering the resonant properties of the tag (CX-26 cols. 2 lines 51-56, col. 3, lines 3-6).

446. The '219 patent describes a planar resonant tag. This patent covers deactivatable and non-deactivatable tags (Wolf, Tr. at 330-31). When sufficient energy is inducted in the tag, the fusible link is broken on one side of the tag and the tag is deactivated by an open circuit (Lichtblau, CRX-2, Q. 24).

447. The '219 patent disclosed that the layers of conductive material provided on both surfaces of the substrate web are preferably aluminum by reason of its good conductivity and relatively low cost and that as shown in Figure 5 of the patent, aluminum foil layer supplied from respective reels are laminated

to respective sides of a polyethylene web provided from another reel, with the dull side of the foil in contact with the substrate web, by means of heated pressure rolls, the laminated web then being wound on a storage roll (RAX-22, col. 4).

448. The '219 patent disclosed that to provide an electrical connection between the two conductive patterns of the planar resonant circuit, the conductive patterns on respective web surfaces are interconnected through the ink pattern and the substrate typically by welding of the confronting conductive surfaces (RAX-22, col. 6).

449. The '219 patent does not describe at all indenting the capacitor to bring the plates closer together (Lichtblau, CRX-2, Q. 24.)

450. The '219 patent essentially describes the problem for which Lichtblau was seeking a solution in 1980 (Zahn, Tr. at 1843).

451. The '076 patent represents an attempt to solve the problems of the '219 patent, which were that (1) fusible link tags require a lot of power to deactivate the tag, and (2) the fuse puts resistance into the circuit and makes the tags more difficult to detect (Lichtblau, CRX-2, Q. 25-26; Zahn, Tr. at 1980).

452. In developing the claimed invention of the patents in issue, the '076 patent was seeking to find a method of deactivation of a resonant tag circuit that could be accomplished with low power and that was commercially practicable (Rhoads, CRX-4, Q. 7).

453. Overcoming the problem delineated by the '219 patent meant finding a means of deactivating a tuned circuit with low power (Zahn, Tr. at 1843, 1948).

454. The '219 patent at col. 1, line 15 references two co-pending applications. One of those applications issued as the '147 patent and the other issued as the '244 patent (CX-25; CX-23; Rhoads, Tr. at 852-54).

455. The '219 patent does not teach using a gas as a substrate in the disclosed tags (Rhoads, Tr. at 854).

456. The '219 reference was cited by Lichtblau to the Examiner during the prosecution of the applications that led to the patents at issue (CX-9; CX-10).

457. The Lichtblau '219 patent does not say anything about what the necessary breakdown voltage is (Lichtblau, Tr. at 3107).

458. The "fusible link" deactivation means disclosed in the '219 patent required a great deal of power (Lichtblau, CRX-2, Q26).

459. The fusible link is destroyed by physical melting of the aluminum in the link, which requires it to become red hot (Lichtblau, Tr. at 3109-3110).

460. The fusible link melts the plastic substrate of the tag on which it sits, and is further affected by the adhesive that holds paper on the top and bottom of the tag, which also absorbs heat from the link (Lichtblau, Tr. at 3110-3111).

461. There was motivation in the early 1980s to solve the problem of the fusible link in the '219 patent, because when the high power necessary to destroy the fusible link was generated, other equipment in the area of the retail establishment such as cash registers were adversely affected (Lichtblau, Tr. at 3113). Another motivation in the early 1980s to solve the problem of the fusible link in the '219 reference stemmed from the dual frequency aspect of the tag which required two capacitors with large plates, making the tag too large and costly to manufacture (Lichtblau, Tr. at 3114). A person of ordinary skill in the art at Checkpoint in 1981 would have been aware of the aforesaid

motivations to solve the problem of the fusible link in the '219 reference (Lichtblau, Tr. at 3118).

462. There was a very strong motivation at Checkpoint to make a tag that was cheap, detectible, deactivatable, and disposable, comparable to the way razorblades are used (Lichtblau, Tr. at 3116-3117; also see Wolf CX-1 at 16-17, Q42).

Smith Patent

463. U.S. Patent No. 3,774,205 to Smith, which issued November 20, 1973 (RAX-18), discloses a "merchandise mark sensing system" using resonant frequency (L-C) circuits for the automatic reading of prices and stock keeping units (RAX-18 col. 1, lines 50-55).

464. Smith (RAX-18) is in the proper field for one of ordinary skill in the art searching for information at the time of the '076 invention (Lichtblau, Tr. at 2884).

465. Smith was not cited to the Examiner during the prosecution of the applications that led to the patents at issue (CX-9; CX-10).

466. The capacitors of the resonant circuits disclosed in Smith have no "means . . . defining a path between the conductive areas and through the substrate" at which an arc discharge would occur," as is claimed as an element of the patents at issue (Lichtblau, Tr. at 3119-3120).

467. Smith states:

> Two of the methods by which devices such as L-C circuits can be "destroyed" are by shorting the capacitor or opening the inductor. The label 10 is remotely encoded with information by overdriving selected responders 12 with an excitation pulse which induces an RF current in a selected resonating device larger than that which the device can carry, thereby "destroying" it such that it will [not] respond when interrogated by a signal of its own natural frequency.

(RAX-18, col. 3, lines 16-24).

468. Smith describes a microwave system for marking and monitoring merchandise and for preventing pilferage (RAX-18, Lichtblau, CRX-2, Q. 37; Zahn, Tr. at 1851).

469. Smith recites that a circuit can be rendered inoperable either by opening the circuit loop or shorting together the circuit nodes (Rhoads, CRX-4, Q. 10 at 7; RAX-18 col. 3, lines 16-24; Lichtblau, CRX-2, Q 38; Zahn, Tr. at 1851).

470. According to Smith, the system therein is characterized by the use of microwaves to remotely access digital information attached to the merchandise, and by achieving this result in a serial access frequency domain mode (RAX-18, col. 1).

471. Smith teaches the addition of a new circuit element, the P-N junction diode, that permits deactivation of a circuit (Rhoads, CRX-4, Q. 10 at 7).

472. The P-N junction diode taught by Smith requires a semiconductor substrate or the addition of a semiconductor element (Rhoads, CRX-4, Q. 10 at 7).

473. The P-N junction diode taught by Smith would be prohibitive in cost with no commercially feasible application to disposable resonant tags (Rhoads, CRX-4, Q. 10 at 7).

474. The P-N junction diode taught by Smith cannot be accomplished using only an aluminum and polyethylene tag because such semiconductor devices require the quantum mechanical band-gap conduction processes available in semiconductors. Such processes do not occur in plastics, such as polyethylene, or in metals, such as aluminum (Rhoads, CRX-4, Q. 10 at 7).

475. None of the tags described in Smith are planar tags having an inductor and capacitor mounted on opposite sides on the outside of the dielectric substrate (Lichtblau, CRX-2, Q. 37).

476. There is no disclosure in Smith of indenting any part of a capacitor to cause the circuit to break down at a preferred location to deactivate the tag (Lichtblau, CRX-2, Q. 37).

477. Smith does not contain any discussion of any particular type of capacitor that can be destroyed by overdriving. The patent only teaches what was already known (Lichtblau, CRX-2, Q. 38).

478. There is no explanation in Smith of how to create the short circuit or open circuit by any means other than an over-voltage (Lichtblau, CRX-2, Q. 73).

479. Smith only teaches that which was well known at that time, that a capacitor can be blown out if enough power is put through it (Lichtblau, CRX-2, Q. 73).

480. There is no suggestion in Smith of modifying the capacitor or the inductor to permit the short circuit to occur in a pre-determined location at a lower voltage (Lichtblau, CRX-2, Q. 73).

481. In Smith, the capacitors do not have two parallel plates one on top of the other separated by dielectric. Therefore, the capacitors described in the Smith patent are not constructed so that one plate of the capacitor can be indented towards the other plate of the capacitor described in '076 and '473 patents. They are different types of capacitors (Lichtblau, CRX-2, Q. 73).

482. Smith discloses nothing about deforming a capacitor in some manner to bring it closer to another capacitor to enhance the likelihood of deactivation (Zahn, Tr. 1851-52).

483. The Lichtblau '219 patent destroys the resonant properties of the tag by "opening the inductor", one of the two alternatives set forth in Smith (RAX-18 col. 3 lines 16-24).

Blythe Reference

484. The Blythe reference, Chapter 6 of a textbook entitled "Electrical Properties of Polymers", relates to electrical breakdown in solid polymers. (RAX-33, Zahn, Tr at 1841).

485. The Blythe reference commences with what is termed "6.1 Introduction." Under this section it is disclosed that if the voltage across a piece of dielectric material is steadily increased, there must come a point when any imperfections in the insulating properties of the material or its surroundings will become apparent and total breakdown will eventually ensue and characteristically, the final event is localized, sudden and catastrophic; that at the high voltage involved the quick release of so much electrical energy usually means that the material burns out in the breakdown region between the electrodes; that although dielectric breakdown is invariably connected with localized imperfections or weaknesses of some kind, "we" still try to define a relevant material property and thus the existence of a maximum voltage which an insulator will support for a long time without failing leads to the concept of a dielectric strength, defined as the breakdown voltage divided by the thickness of the insulator, i.e. a maximum electric field which the material can sustain indefinitely; that the intrinsic dielectric strength of a homogeneous solid is evidently very high and proves to be a very elusive fundamental property; that the reason for this is that a particular specimen may often more easily fail in many different ways which have more to do with its environment, its physical state and purity and the type of electrode used, than with its basic

constitution; that those alternative breakdown mechanisms are the ones which generally limit the effective strength of an insulator in a practical situation and they are difficult to avoid altogether; that the quest for an intrinsic strength has consequently become somewhat academic; that in this context, "we" must beware standard tests of dielectric strength of solids - they usually do not in fact measure an intrinsic value because they allow premature discharges to occur in the surrounding gaseous or liquid medium; that the main approach that has been adopted in industry for the necessary assessment of breakdown behavior of materials in exercises of product improvement and replacement has been to design special tests which simulate the conditions of the applications concerned and that in this context the aging or deterioration of the material during service, e.g. chemical degradation in strong sunlight and cracking under prolonged mechanical stress, is vitally important too, since changes brought about in this way almost always introduce electrical weaknesses; and that in the following sections "we" discuss briefly the principal mechanism of electrical breakdown in solid polymers and some of the consequences for the use of polymers as dielectric materials (RAX-33 at 140, 141).

486. In addition to the introduction, the Blythe Chapter 6 has the following sections: 6.2 Electronic breakdown, 6.3 Electromechanical breakdown, 6.4 Thermal breakdown, 6.5 Breakdown caused by gas discharge which section is divided into subsections "Internal discharges" (6.5.1) and "External discharges" (6.5.2), 6.6 Examples of high-voltage design which section is divided into subsections "Power cables" (6.6.1) and "Thin-film capacitors" (6.6.2) and 6.7 Further reading (RAX-33).

487. Figure 6.4 of Blythe (page 145) shows the measured breakdown strength of polyethylene as being between 550 and 600 megavolts per meter (i.e., 550-600 volts per micron) (Rhoads, CRX-4, Q. 10 at 5).

488. Zahn testified that the best evidence that Blythe is suggesting an indentation is found at Figure 6.4 of that reference (Zahn, Tr. at 2129).

489. Blythe teaches that the electric strength of polymer at room temperature in a uniform electric field is approximately 575 volts per micron (Zahn, Tr. at 1869-70).

490. Based upon the measured breakdown strength of polyethylene as shown in Blythe, the polyethylene layer of a resonant tag would have to be reduced to a thickness of approximately 0.01 micron (i.e., 100 angstroms) in order to break down at low voltages (5.5 to 6 volts) (Rhoads, CRX-4, Q. 10 at 5).

491. Reduction of polyethylene to a thickness of 0.01 micron cannot be achieved reliably and repeatedly in a factory setting (Rhoads, CRX-4, Q. 10 at 5-6).

492. Blythe teaches that, at commercially feasible thicknesses of polyethylene, the voltages needed for deactivation are as high or higher than those that were being used in Checkpoint's fusible-link field tests (Rhoads, CRX-4, Q. 10 at 6).

493. Blythe does not relate to anti-theft resonant tags in the marketplace and would not be considered by one of ordinary skill in the art to relate to such tags (Lichtblau, CRX-2, Q. 73).

494. Figure 6.4 and the accompanying text in Blythe is a discussion of testing the dielectric strength of polymers. This figure does not illustrate an indent pushed into a capacitor plate or into a resonant tag (Lichtblau, CRX-2, Q. 54).

495. The test results recorded and shown in Blythe indicate that it would take a very high voltage to break down a capacitor at ambient temperature in the range of 20 - 30 degrees C (Lichtblau, CRX-2, Q. 54).

496. Figure 6.4 of Blythe under the subsection 6.2 titled "Electronic breakdown" shows the variation of the electric strength of polyethylene with temperature and an insert diagram shows the type of recessed specimen used (RAX-33 at 145). Although the insert diagram illustrates a shape that resembles an indent, it is not an indent pushed into a capacitor plate or into a resonant tag (Lichtblau, CRX-2, Q. 54).

497. Blythe, in its section "6.2 Electronic breakdown," disclosed that as "we" intimated in the introduction, it is arguable whether truly intrinsic breakdown has ever been observed in polymers and in this sense an intrinsic breakdown strength must represent an upper limit to any value that can ever be realized experimentally; that the most reliable measurements judged by the large values which were obtained in comparison with those from other measurements, have been made with recessed specimens, illustrated in Blythe's Figure 6.4, with evaporated aluminum electrodes; that the recess design neatly places the high stress just where it is required across a thin layer, whilst at the same time avoiding excessive stresses in the air or other medium surrounding the edges; that results for polyethylene (referring to a Lawson 1966 reference), shown in Fig. 6.4, definitely indicate a fall in dielectric strength with temperature in accord with Frohlich's theory; that an extra steep fall at higher temperatures is probably not electronic in origin; that somewhat higher values still for the breakdown strength of low-loss polymers have been obtained with a more complicated arrangement, where the specimen is embedded in epoxy resin (referring to a McKeown 1965 reference) but there is some uncertainty as to

whether this is an experimental artefact or not; that in order to predict absolute dielectric strengths "we" should need to have more detailed information than is yet available about electronic states and mobilities in polymers and for the present "we" can only conclude that there is satisfactory agreement between the form of the theoretical results, based on a rather general electronic model, and the best experimental results; that to the extent that the model is a very reasonable one, "we" can say that "we" can understand intrinsic breakdown behavior; and that measurements of pre-breakdown currents, especially with pointed electrodes which impose regions of very high field strength at their tips when embedded in the material, suggests that electronic carrier injection from the electrodes (Schottky emission) or from impurities (Poole-Frenkel effect) may play a part in the breakdown process in some cases although more work is required before this can be fully understood (RAX-33 at 144 to 146).

498. Blythe, in its section "6.6 Examples of high-voltage design" under the sub section "Thin-film capacitors," disclosed that one of the chief requirements for capacitors is that they shall be very small which implies that a large capacitance-to-volume ratio is desirable; that high ratios are principally dependent on having a thin film; that for operation at a given voltage, the field across the dielectric will be inversely proportional to thickness so that breakdown characteristics become very important if advantage is to be taken of thin films; that many medium voltage polymeric film capacitors are essentially rolled-up parallel-plate arrangements, made from two tapes, each of which carries one metal electrode, referring to Figure 6.9 (which is said to be illustrations of high-voltage design (a) cross-section of a power cable and (b) a cross section of a thin-film capacitor, showing a small segment of one capacitive layer in the roll); that the metal electrodes are usually evaporated

on to the film and are very thin, about 0.1 micron (a micron is a unit of length equal to one-millionth of a meter <u>see</u> McGraw-Hill Dictionary of Scientific and Technical Terms 4th Ed. at 1190); that the polymeric films that are used, e.g. polypropylene, polycarbonate, polystyrene, can be made as thin as 10 microns or even less across which mains voltage (240 V) would produce a high field; that to withstand said high field the film must be of very high quality, i.e. free of voids and impurities and fortunately the situation is alleviated to some extent by a <u>self-healing</u> mechanism inherent in this type of capacitor; that breakdown across a small imperfection usually does nothing more than evaporate the electrode metal away from the infected area, and the breakdown is arrested; that each self-healing event incurs a small decrease in electrode area though, so that too many faults would soon lead to an intolerably large degradation in the value of the capacitance; that discharges are liable to start in any air trapped between the layers, and this becomes a serious problem when higher working voltages are needed; that a common remedy adopted in high-voltage capacitors made by interleaving metal foil electrodes with polymeric film is to displace the air by impregnation of the capacitor with a liquid having a high breakdown strength; that a high dielectric constant for the impregnant is also an advantage because this reduces the field in any cavity it fills; that in the past the most commonly used liquids for this purpose have been polychlorinated biphenyls, which have the advantages of low viscosity, high dielectric constant (in the range 5-6), high dielectric strength, and good fire resistance although unfortunately, those substances have been found to be very dangerous biochemically; that more acceptable substitutes, based on phthalate esters, for example, are presently being sought; and that overheating of a capacitor under AC conditions can occur if the dielectric has a high dielectric loss factor at the working frequency and this too must be taken into account if breakdown is to be avoided (RAX-33 at 153-155).

499. The capacitor device described in Blythe is self healing and would not be looked at as a reference when attempting to design a permanently deactivatable tag (Lichtblau, CRX-2, Q. 54).

500. Blythe refers to a substrate that has been recessed. Then, aluminum is deposited on the substrate surfaces by vapor deposition. Therefore, the aluminum electrodes are extremely thin. Because they are so thin, when the device breaks down there will be no permanent short circuit made between the two electrodes. Instead, a minute quantity of the aluminum will be evaporated during the breakdown and the device will self-heal (Lichtblau, CRX-2, Q. 73; RAX-33 at 154-155; CX-38 at GL000997; Lichtblau, Tr. at 2874-75).

501. Zahn testified that the best evidence that the Blythe reference is suggesting an indentation is found at Figure 6.4 (Zahn, Tr. 2129). Blythe teaches that very high power levels are required for the breakdown described in the previous finding to occur (Lichtblau, CRX-2, Q. 73).

502. Figure 6.4 of Blythe shows the breakdown strength for polyethylene at room temperature of approximately 575 volts per micron (Zahn, Tr. at 2130).

503. Figure 6.4 of Blythe does not contain a footnote or disclaimer indicating that the geometry of the recess depicted would result in a substantial reduction in the required breakdown voltage (Zahn, Tr. at 2130-31).

504. The text of Blythe describing Figure 6.4 does not indicate that the geometry of the recess depicted would result in a substantial reduction in the required breakdown voltage (Zahn, Tr. at 2131).

505. In the text that is describing Figure 6.4, there is no disclosure that as a result of the recess the values for breakdown strength of polyethylene

would be a fraction of the 575 volts per micron indicated on Figure 6.4 (Zahn, Tr, at 2130-31).

506. Zahn testified that the following language from the introductory and electronic breakdown sections of Blythe would teach a person with ordinary skill in the art that the voltage required to reach the electronic breakdown strength of polyethylene depicted in Figure 6.4 would be reduced by a factor of 10 to 1,000, depending on the shape of the electrodes used:

> The intrinsic dielectric strength of a homogeneous solid is evidently very high, usually in excess of 100 MVm-1, and proves to be a very elusive fundamental property. The reason for this is that a particular specimen may often more easily fail in many different ways which have more to do with the environment, its physical state and purity and the type of electrode used, than with its basic constitution. [Zahn, Tr. at 2134-35; RAX-33 at 140].
>
> * * *
>
> Measurement of pre-breakdown currents, especially with pointed electrodes which impose regions of very high field strength at their tips when embedded in the material, suggest that electronic carrier injection from the electrodes (Schottky emission) or from impurities (Poole-Frenkel effect) may play a part in the breakdown process in some cases. More work is required, however, before this can be fully understood [page 146, third paragraph] [Zahn, Tr. at 1860-61, 1867].

In his testimony regarding Blythe Zahn also identified as most relevant to the claims of the patents in issue (1) Figure 6.7 of the Blythe reference (p. 15), which is captioned "Photograph of electrical discharge channels in low-density polyethylene after application of 20 kV(rms) at 50 Hz for 200 min (Billings and Groves, 1974)," and (2) the following language from the Blythe reference (p. 150):

> In a similar fashion discharge trees grow from needle electrodes, probably from a small cavity near the tip where the field is very high, until a continuous path is built to the other electrode; complete breakdown then rapidly ensues.

(Zahn, Tr. at 1873-74; RAX 33 at 151).

507. The last quote in the previous finding is found in a "Breakdown caused by gas discharges" section.

508. Each of the three passages from Blythe that were cited by Zahn would have been so difficult to comprehend as to have no meaning to the person of ordinary skill in resonant tag construction in 1980 (Lichtblau, Tr. at 2874-76; Rhoads, Tr. at 3273-74).

509. Zahn acknowledged that Figure 6.4 of Blythe depicts a rounded, not a pointed, indentation (Zahn, Tr. at 2135-37).

Lawson Reference

510. The Lawson reference is an article that appeared in the PROC. IEE, Vol. 113, No. 1, January 1966 at 197 to 202 and is titled "Effects of temperature and techniques of measurement on the intrinsic electric strength of polytene" (RAX-34).

511. Lawson teaches that conventional recessed specimens are formed by heating a sphere of polyethylene to 140 degrees C and pressing into the dielectric the aluminum electrodes to form a hemispherical recess (Zahn, Tr. at 1961).

512. Lawson is the source for some of the data used in the Blythe reference, including Figure 6.4 on page 145 of the Blythe reference (RAX-34; RAX-33; Rhoads, CRX-4, Q. 10 at 5-6).

513. Lawson is the precursor of the Blythe reference (RAX-33 at p. 145; RAX-34).

514. The synopsis of Lawson discloses that the electric strength of polytene has been measured under intrinsic conditions in the temperature range of 20-85 degrees centigrade; that values are obtained using a new type of specimen developed by McKeown and also with the conventional "recessed"

specimen; that the McKeown specimen gives results which are greater at all temperatures than conventional values, and for those specimens, the temperature dependence of the intrinsic electric strength agrees with Frohlich's amorphous or high temperature theory of breakdown; that experiments ate described which show that this increase of electrical energy achieved with the McKeown specimens at room temperature is attributable to the presence of the solid epoxide resin in which the polytene and spherical electrodes are not, though the reason for the increase is, as yet, unknown (RAX-34).

515. The second sentence of the synopsis under the title, found on page 197 of the reference, refers to conventional recessed specimens. Those specimens are the same as the Blythe drawing shown in Figure 6.4. Examples of conventional recessed specimens are shown on page 198 of Lawson (Zahn, Tr. at 1960-61; RAX-34).

516. Lawson, in his experimental section, makes reference to working with recessed specimens and the McKeown specimens. Figure 3 is a graph showing the variation of intrinsic electric strength with temperature and comparing the results obtained with the "recessed" and McKeown specimens (RAX-34 at 200).

517. Figure 3 of Lawson as it relates to the conventional recessed specimens is the source for the data used in Figure 6.4 of the Blythe reference (RAX-33, RAX-34, Rhoads, CRX-4, Q 10).

518. Lawson expands upon some points contained in Blythe, but does not lead to a different conclusion (Rhoads, CRX-4, Q. 10).

519. In preparing the conventional recessed specimens the cathode material is aluminum (RAX-34 at 198).

520. Lawson does not relate to anti-theft resonant tags in the marketplace and would not be considered by one of ordinary skill in the art to relate to such tags (Lichtblau, CRX-2, Q. 73).

521. Lawson studied two methods of measuring the intrinsic dielectric strength of polyethylene (referred to in the article by the British term "polytene") (RAX-34 at 197).

522. One method studied in Lawson was the so-called "McKeown specimen", and the other was the so-called "conventional recessed specimen" (RAX-34 at 197 Synopsis).

523. The "conventional recessed specimen", according to the Lawson reference, was made from 1/16 inch thick disks of polyethylene by forming a recess in the center of the disk to a thickness of approximately 50 microns (RAX-34 at 197).

524. The recess was formed at a temperature of about 140°C by pressing a steel sphere of either 1/4 or 1/2 inch diameter into one side of the disk. Electrodes were then applied by vacuum deposition of aluminum on either side of the disk (RAX-34 at 197).

525. A diagram of the recessed specimen is shown in the Lawson reference in Figure 1(a) (RAX-34 at 198 (Figure 1(a)).

526. The recessed specimen depicted in Figure 6.4 of Blythe is the same as that shown in Figure 1(a) of Lawson (RAX-33 at 145 (Fig. 6.4), with RAX-34 at 198 (Fig. 1(a)).

527. Blythe and Lawson report a measured breakdown strength for polyethylene of between 550 and 600 megavolts per meter, which translates into 550 to 600 volts per micron (Rhoads, CRX-4 Q10).

528. Blythe and Lawson breakdown voltages for polyethylene are for D.C. and power line frequencies, which are at a relatively low frequency level of zero to 60 hertz (Rhoads, CRX-4 Q12).

Welsh Patent

529. Welsh U.S. Pat. No. 4,06,229 issued Dec. 13, 1977 on an application filed June 28, 1971 and is titled "Article Surveillance" (RAX-24).

530. The Welsh patent describes tags that have a semiconductor diode used as a non-linear capacitor, which is used in a microwave frequency system generating a fundamental frequency above 100 MHz and preferably at around 915 MHz. When the tag is put into the zone of the microwave radiation, the non-linear capacitor generates a second harmonic signal that is different from the microwave signal generated by the system. The system has a receiver to detect the second harmonic signal of the tag (RAX-24; Lichtblau, CRX-2, Q. 31).

531. A second type of tag described in the Welsh patent is shown in figures 15 and 16 of the Welsh patent. These tags use one loop which re-radiates at the fundamental frequency of the system (Lichtblau, CRX-2, Q. 31).

532. The Welsh patent also describes untuned or broadly tuned tags that have diodes that are destroyed. Other tags are described that have a fusible element that melts open for deactivation when excessive current is put through the fusible portion (Lichtblau, CRX-2, Q. 31).

533. All of the tags described in the Welsh patent use non-linear capacitors (Lichtblau, CRX-2, Q. 31). None of the tags in the '076 and '473 patents use non-linear capacitors (Lichtblau, CRX-2, Q. 31).

534. There is no suggestion in the Welsh patent of deactivating any planar tag having an inductor and a capacitor in a tuned circuit on the tag by indenting any portion of the capacitor (Lichtblau, CRX-2, Q. 32).

535. The Welsh patent describes deactivation of the tags disclosed in the patent as follows: for the tuned-loop tags, deactivation is by magnetic desaturation of the tag. For the untuned tags, the diode is destroyed or the fusible link element is blown by excessive current to open the circuit (Lichtblau, CRX-2, Q. 33).

536. The Welsh patent teaches the use of semiconductor diodes, saturable ferrites and magnetic switches as "weak links" (Rhoads, CRX-4, Q. 15).

Harari Patent

537. Harari U.S. Pat. No. 4,072,976 issued on Feb. 7, 1978 on an application filed Dec. 28, 1976 and is titled "Gate Protection Device For MOS Circuits" (RTX 30).

538. The Harari patent is dealing with semiconductor circuits which have a propensity to breakdown unexpectedly (RTX-30, Holt, Tr. at 2566).

539. The Harari patent is aimed at developing a mechanism to prevent the undesirable breakdown of a semiconductor circuit (RTX-30; Holt, Tr. 2566).

540. The Harari patent relates particularly to a gate protection device for metal oxide semiconductors (MOS's) (RTX 30, col. 1).

541. In general MOS devices have a very high input impedance which makes them sensitive to accumulation of static charges and such an accumulation of charges can cause a rupture of the gate dielectric which typically has a breakdown voltage of 50 to 100 volts with such a rupture causing a short circuit between the surface metallization and the substrate material. To prevent such

failures there is a need for effective protective devices at all MOPS array inputs (RTX 30, col. 1).

542. The voltages described in Harari, i.e. 50 to 100 volts, are far too high for use in commercially feasible deactivatable resonant tags. Harari teaches a breakdown method which does not lead to permanent disabling. Also the distances discussed by Harari, "100 to 300 Angstroms", (i.e. .01 to .03 microns) are much smaller than those in the invention of the '073 patent (Rhoads, CRX-4, Q 15).

543. The invention described in Harari relies on the self-healing properties of thin metal films which is the opposite of what is described in the '076 and '473 patents, where the short circuit must not be self-healing. (Lichtblau, CRX-2, Q. 36).

544. Harari is irrelevant because planar resonant anti-theft tags are not manufactured using vapor deposition techniques as disclosed in Harari (Lichtblau, CRX-2, Q. 36; RTX-30, cols. 1, 2).

545. If planar resonant anti-theft tags were manufactured using vapor deposition techniques, they would be too expensive and too fragile and would not permanently deactivate (Lichtblau, CRX-2, Q. 36; CX-38 at GL000997).

546. Vapor deposited aluminum electrodes were totally unsuitable for use as the plates of a capacitor on a resonant tag for commercial use. Vapor deposition was too expensive and was not sufficiently resilient for commercial tags (Lichtblau, CRX-2, Q. 61).

547. Breakdown of the vapor deposited electrode would not cause a permanent short-circuit (Lichtblau, CRX-2, Q. 61).

<u>Otley Reference</u>

548. The Otley reference is an article titled "A Voltage-Sensitive Switch" which appeared in Proceedings of the IRE at 1723 to 1730 (October 1958).

549. The subject matter of Otley is an investigation of the controlled dielectric breakdown of aluminum oxide films in the development of a voltage sensitive switch which may replace thyrathons and gas diodes in circuits which require single switching from a resistance in the kilomegohn range to one of the order of 1 ohm or less (RAX-32). The reference does teach a parallel plate capacitor. Unlike an electrolytic capacitor which is always operated below its breakdown voltage, the switch in Otley functions at the voltage at which the dielectric film breakdowns. The Otley reference teaches that the dielectric breakdown occurring in the films is not reversible and hence teaches a permanent short circuit in a capacitor. Unlike an electrolytic capacitor the wet paste medium has been removed. The Otley structure has capacitance in many ways similar to an electrolytic capacitor (Rhodes, Tr. at 3346, 3347).

550. Otley teaches a "weak-link" mechanism that is an electrochemically formed ceramic (Rhoads, CRX-4, Q. 10 at 8).

551. The mechanism taught by Otley has no application in disposable resonant tags because it is not manufacturable in quantity at a reasonable cost, and therefore is commercially unfeasible (Rhoads, CRX-4, Q. 10 at 8).

552. Otley does not disclose or describe putting an indent in a capacitor to cause a permanent short circuit to occur at that location (Lichtblau, CRX-2, Q. 73).

553. Otley does not relate to or discuss resonant tags (Lichtblau, CRX-2, Q. 73).

554. Page 1727 of Otley refers to "repeated breakdowns of one switch." Page 1728 of Otley discusses reopening the broken-down switch and nondestructive

breakdowns. Therefore, the switches disclosed in the Otley reference would not be relevant to one of ordinary skill in the art in designing deactivatable anti-theft resonant tags that are permanently deactivatable (Lichtblau, CRX-2, Q. 73).

555. Otley states:

> Field strengths of the order of 10^7 volts per centimeter [1000 volts per micron] exist in thin anodic oxide films. It is known that, even at lower filed strengths, avalanche breakdowns occur in localized spots within these films. Imperfections in the oxide layer are the most likely locations for such breakdowns which may set in at voltages well below the breakdown potentional of a perfect oxide film.

(RAX-32 at 1723)

<u>Stumpe Patent</u>

556. Stumpe U.S. Pat. No. 3,476,979 issued on November 4, 1969 on an application filed November 9, 1966 and is titled "Electrical Protection Device For Establishing A Short Circuit In Response To The Appearance Of A Low Level Overvoltage" (RAX-17).

557. Stumpe relates to protection against overvoltages (RAX-17; Lichtblau, CRX-2, Q. 48).

558. Stumpe teaches the use of air gaps and semiconductor junction breakdown devices (Rhoads, CRX-4, Q. 15 at 11).

559. There is no disclosure in Stumpe of indenting a plate in the capacitor to cause a short circuit to occur at that location (Lichtblau, CRX-2, Q. 48).

560. Stumpe discloses that according to one known form of construction for breakdown protectors used for creating a conductive connection, two flat disc-shaped main electrodes are each provided with at least one extremely flat face and are disposed with the two flat faces parallel to one another and

separated by a thin insulating layer having at least one hole extending between the electrodes, the electrodes and the insulating layer being firmly pressed together. When the voltage between the electrodes exceeds a predetermined value, at which the dielectric strength of the air in the hole, or holes, is exceeded, an arc is formed within each hole between the two electrodes. At the bases of each arc, the electrode metal is heated to the melting point and the molten metal bridges the gap between the electrodes so as to form a welded, highly conductive connection. This connection is then capable of supporting extremely high short-circuit currents while maintaining at a low value the voltage between the two components thus connected by the protector (RAX-17 at col. 1, 2). When Rhodes was asked whether this disclosure describes a parallel plate capacitor in which a permanent short circuit is formed, he stated that such representation is a little too strong; that the "thing" in Stumpe certainly has some capacitance but representing it as a capacitor is stretching it a bit and he would have some trouble calling "this" a capacitor. He did testify that "it" does teach that a permanent short circuit is formed. He further testified that said disclosure does not describe capacitors per se but that there is a disclosure of a breakdown protection device and such is similar to capacitors in a variety of ways (Rhoads, Tr. at 3347-49).

561. The use of semiconductor junction devices is entirely different from the inventions described in the patents in issue (Rhoads, CRX-4, Q. 15 at 12).

562. The breakdown protector in Stumpe is, as indicated in column 3, not to be made of mechanically delicate components and Stumpe further describes in column 3, that it is used at voltage levels of 42 volts. Thus the device would not be used in anti-theft resonant tags which deactivate typically at a fraction of that voltage (Lichtblau, CRX-2, Q. 48).

563. The structure and operation of the breakdown protector in Stumpe, as indicated in columns 3 and 4 of the patent, involves a semiconductor arrangement suspended between the electrodes by a spring assembly of conductive material (Lichtblau, CRX-2, Q. 48).

564. In the patents in issue, which describe a planar tag having a planar circuit deposited directly on a substrate, there is no semiconductor arrangement or spring assembly such as described in the Stumpe '979 patent (Lichtblau, CRX-2, Q. 48).

565. In Stumpe, when the voltage across the capacitor exceeds a certain value, a reverse current begins to flow through the semiconductor arrangement. The current flow results in melting of the semiconductor layers to cause material to flow out of the semiconductor arrangements into the gap between the electrodes of the capacitor to weld the capacitor together (Lichtblau, CRX-2, Q. 48).

XVII. INFRINGEMENT

566. Rhoads, when asked whether each of the parties' tags that he has examined short circuit by means of an arc discharge, testified that he believes that an arc discharge occurs in each type of commercially available tag from all three parties (Checkpoint, Actron respondents and All-Tag respondents) which he has examined; that he believes that such arc discharge is responsible for establishing the short circuits that he has measured because after any tag has been deactivated, there is a conducting connection, viz. a short, between the two metallizations comprising the capacitor plate as evidenced by the lack of resonance or activity to resonance detection which short can be broken by mechanical manipulation; that frequently, in the process of a reactivating the tag, Rhoads has heard the detector beep, then cease to beep, i.e. show activity indicating no short and then cease to show activity and thus indicating there is a short which indicates that the connection is being made and broken a number of times before it is broken permanently, which to Rhoads is highly consistent with a fairly small cross section, metallic conducting pathway (Rhoads, CX-4, Q. 74).

567. According to Rhoads, since no one has yet directly seen the permanent shorts of the accused tags and Checkpoint's tag, they must have very small cross sections, and yet their resistance is so low (always under 1.5 Ohms, and often under 1 Ohm), the "implication" is metallic conduction. To create such a metallic conducting pathway, according to Rhoads, one requires an arc discharge, because that's the kind of discharge that's necessary to remove any significant portion of material from the electrodes, but as no one has as yet managed to image directly the short itself, Rhoads's understanding

of it is based on the best indirect evidence "I have available to me at this time" (Rhoads, CX 4, Q 74).

568. Rhoads testified that he has conducted tests on commercially available resonant tags from Checkpoint, Actron and All-Tag and also conducted tests on tags from intermediate stages of manufacture from the same three sources; that Checkpoint had provided Rhoads with a hand-held unit called a "HandScan Portable Verifier" which is capable of detecting active tags at 8.2 MHz, at 9.5 MHz. and those that operate by some Impulse detection method; that when activity is detected, there is an audible tone and an LED indication on the front panel with a green color for 8.2 MHz, a yellow color for 9.5 MHz, and a red color for Impulse; that the HandScan unit is not intended to deactivate resonant tags as normally manufactured but only to sense or detect them; that Checkpoint also provided Rhoads with a Checkpoint unit for detection and deactivation of tags called a "Counterpoint II" unit which is intended to detect and deactivate tags having a resonant frequency of 8.2 MHz; and that when an active tag is brought slowly towards the countertop deactivation pad, an audible tone will be heard when the tag is detected and as the tag is brought closer to the pad, the audible tone will cease when the tag deactivates (Rhoads, CX 4, Q. 23).

569. As for the tests Rhoads conducted, one set of electrical experiments consisted of testing commercially available tags for activity with the HandScan unit, which will detect activity, but not deactivate a tag. Following the confirmation that the tag is, in fact, active and not a dud, Rhoads deactivated the tag by bringing it slowly down to the Counterpoint deactivation pad starting at approximately two feet in height and moving down at the rate of a few inches per seconds, hearing first the tone as it senses

activity, and the tone stopping when the tag deactivates and then Rhoads tested the tag for reactivatability by mechanical manipulation on the commercial tags at the dimples which is done by placing the deactivated tag at or near the HandScan unit so that the audible signal of activity can be determined as soon as the mechanical manipulation reactivates the tag. The mechanical manipulation has included bending the tag and pressing and rubbing on the tag with a variety of blunt and semiblunt instruments, including fingernails and the bullet point cap of an old-styled Bic pen. Rhoads also used the tip of a common single blade screw driver and a large paper clip. Rhoads testified that the purpose of the reactivation tests was to determine (1) where reactivation and hence deactivation, had occurred in the tags, (2) which dimple deactivated in the case of tags having more than one dimple, such as Checkpoint tags, and (3) where within Actron's dimple deactivation occurred, since Actron's dimple is large enough to allow for localization of deactivation within the dimple (CX-4, Q. 24).

570. Rhoads also conducted another set of experiments in which he added by hand an additional dimple to commercially available tags and then subjecting the tags to deactivation and reactivation tests. The purpose for this set of experiments was to determine whether the manufactured dimple and the hand-made dimple functioned in substantially the same fashion (Rhoads, CX-4, Q. 26).

571. Rhoads, in a further set of electrical experiments, deactivated commercially available tags from all three sources. The purpose for this set of experiments was to verify the existence of a short circuit formed by deactivation and to investigate the quality and the nature of the short circuit so formed (Rhoads, CX-4, Q. 26).

572. Rhoads further inspected the tags from the three sources visually in several ways, with the aided eye, with low power, handheld single lens magnifying glasses, and with a stereo, binocular microscope and he also made dimensional measurements of a variety of tags and features of tags using calipers and micrometer (Rhoads, CX-4, QQ. 27, 28).

573. With respect to the tests Rhoads performed, he testified that several tests addressed the issue of the precise location at which deactivation occurs and that in every single instance in which that location was identified, it occurred at a "dimpled" point where the two capacitor plates had been brought closer together and there was never a deactivation detected away from the dimple; that as far as inducing deactivatability on tags Rhoads could induce deactivatability by a variety of different means and that in all of those different means of creating dimples, he was successful in making some tags that were deactivatable and reactivatable at that same dimple and was successful at inducing deactivatability in tags from all three sources; that as far as determining that the deactivation was in fact by short circuit Rhoads did resistance measurements of the resistance between the capacitor plates after deactivation of the dimple with the circuit broken so that the coupling between those two metallizations provided by the corner crimp or weld was not present, and the only conductance between the two capacitor plates that Rhoads was measuring was that supplied by the deactivation short and he found a very low resistance connection in all cases from which Rhoads inferred that it is likely that the conductive pathway, the short so established, is aluminum or primarily aluminum and not purely carbon; that Rhoads added dimples by hand to tags with dimples already present and found that both kinds of dimples provided deactivation and concluded that the

dimples added by manufacturing by all three sources performed substantially in the same way as my hand added dimples and further concluded that the hand made dimples and the manufactured dimples all deactivated by short circuit and that short circuit is a metallic conductor composed substantially of aluminum (Rhoads, CX-4, Q. 34).

574. During the hearing, and before the introduction of Rhoads laboratory notebook into evidence, Rhoads testified twice about the method he used of adding dimples to the various tags for his hand-made indention experiments. On both occasions he mentioned only the addition of dimples by tapping a tag with a soldering iron. On the second occasion, he testified that he was able to reproduce the amount of pressure added to the soldering iron "within a certain range," and indicated that heat was added to the tags for only about 1/10th of a second. Finally, Rhoads stated that the tap was done in a single motion (Rhoads, Tr. at 708-09, 1009-10).

575. Rhoads was unable to precisely or accurately measure the depth of each dimple which is added in the tests he did (Rhoads, Tr. at 1009).

576. Rhoads stated in his notebook that "hand taps &, to a lesser extent, firm passes were most likely to deactivate the tag with dimpling." Also it was stated that taps were the most likely to produce a dimple which deactivated during activity checking with the HandScan (CRPX-13 at 42).

577. As to the hand tests, Rhoads testified:

Q And I believe you testified yesterday that you made these dimples by hand?

A Yes, sir.

Q Were you able to precisely or accurately measure the depth of each dimple that you added?

A Certainly not.

Q Of any of the dimples that you added?

A No, Sir.

Q Were you able to precisely control the amount of pressure that you added?

A I was able to reproducibly control the amount of pressure within a certain range.

Q And you did that by tapping the soldering iron with your hand, I believe you testified?

A Yes, sir.

Q Were you able to measure the amount of pressure that you added?

A I made no numeric measurements of pressure. No sir.

Q Were you able to precisely measure the amount of time that heat was added to the tags?

A It was on the order of a tenth of a second, a short tap. I did not try to time it.

Q Would you place the soldering iron on the tag before you tapped it or did you tap it in a single motion?

A It was a single motion, sir.

(Tr. at 1009, 1010).

578. Rhoads had no controls in his conductivity testing in deactivation shorts. When asked the question "let's consider hypothetically that you put a Monarch tag on your Checkpoint deactivator, and it deactivated" does that prove that the tag meets the terms of an asserted patent claim, Rhoads testified that there is "insufficient evidence just from deactivating it upon the pad, to assert or not assert the claims of the patent" and that it "would be one kind of evidence which would lend its weight in that direction. But it's clearly far from sufficient to make any determination" (Rhoads, Tr. at 1222-23). In addition, when Rhoads was asked if one took a ball point pen and made an indentation in a Monarch tag and then put it under the deactivator,

would that make a difference as to whether one may be able to assert whether the tag is infringing or not infringing, Rhoads answered that if one could assume the question was phrased to cover having tested a number of tags, he would say that any tag which interacts with the Checkpoint deactivation pad and which deactivates upon it by means of some process which is a dimple could well be infringing but that "there are certainly many other aspects to both the claims and the operations of the tag that should be investigated before such an opinion would be rendered one way or the other" (Rhoads, Tr. at 1223, 1225).

579. Rhoads in his deactivation reactivation tests noticed sometimes with the accused All-Tag tags that "they're somewhat hard to deactivate." (Rhoads, Tr. at 690).

580. Rhoads did tests which addressed the nature of the short in the accused tags by deactivating and measuring the resisteance of that short after de-activation and he considered those tests to be investigations as to the material and nature of that breakdown short. He also believed his reactivation tests addressed that. However Rhoads did not use a machine to measure forces or displacements. He did not know the thickness of the aluminum filament that welds the capacitor plates together in the All-Tag tag although he testified that from the resistance measurements, conductivity data that are available, and the dimensions that can be derived from the sections, it would be possible to calculate such a diameter based upon formulas for resistance and "certain assumptions" (Rhoads, Tr. at 1219-1221).

581. Rhoads commissioned an Altschuler study of cross-sections of tags of All-Tag and Actron respondents (Rhoads, CRX-4 QQ. 19-22, CRX-30).

582. Altshuler did not testify at the hearing.

583. Working with Altshuler Rhoads directed that sample tags from each of the three sources (Checkpoint, Actron respondents, and All-Tag respondents) be sectioned in several ways. Altshuler prepared CRX 30. The terminology used in CRX 30 identifies the Actron/Tokai as the "Purple" product, the All-Tag/Toyo tags as the "Blue" product, and the Checkpoint tags as the "Pink" product. CRX-30 also displays the various angles at which the Actron/Tokai V10 tags were sliced and sectioned. The samples were cold-mounted with a room temperature curing epoxy. Then the surface was ground with successively finer grits, followed by polishing with several grades of diamond dust and, finally, 0.05 micron alumina abrasive. The purpose of the cross-sectioning was to see the dimensions within tags at the locations at which breakdown actually occurs. Beginning with the Actron/Tokai V-10 tags, described by the name "Purple" in the report, Rhoads testified that sections through the indented area of the Actron/Tokai V-10 tags show that in the central area under the squarish area of the small skillet shaped capacitor plate there is betwen 15 and 20 microns of polyethylene separating the two capacitor plates and all sections through the capacitor show much greater thinning at the edges of the indented zone; and that average separation distance between the two capacitor plates is 2 microns at the edge, with many places under 1/2 micron apart which is revealed in Figures 19 through 39 CRX-30 (Rhoads, CRX 30, QQ. 17, 18, 19).

584. Rhoads neglected to ensure that the tags examined by Altshuler were deactivatable and, therefore, representative, of the tags at issue in this investigation. He testified that there "may have been some in there" (Rhoads, Tr. at 988).

585. It is difficult to cross section the Actron tags because of the ductile nature of aluminum and the plastic nature of polyethylene, which can

deform and flow with heat and/or pressure from sample cutting, epoxy curing, grinding, and other handling of the tag components (Zahn, RAX-11a at Q. 2).

586. Figures 19, 21, 22, 24, and 39 of the Altschuler report appear to show the two aluminum electrodes touching, thereby short circuiting the tag. Such a tag could not resonate and would not be active (Zahn, RAX-11a at Q. 3).

587. While the specification for the thicker aluminum electrode on a V-10 tag is 50 microns plus or minus three percent (Matsumoto, Tr. at 1153), which equals a maximum of 51.5 microns (RAX-11AC at Q. 3), the Altschuler report measured the thicker aluminum electrode to be 67 microns thick (CPX-30 at 1).

588. While the specification for the thinner aluminum electrode on a V-10 tag is 12 microns plus or minus three percent (Matsumoto, Tr. at 1153), which equals a maximum of 12.36 microns (RAX-11ac at Q. 3), the Altschuler report measured the thinner electrode to be 27 microns thick (CRX-30 at 1).

589. Figures 28-30 of the Altschuler report show many grinding marks, predominantly in the direction perpendicular to the flat faces of the electrodes (Zahn, RAX-11a at Q. 4).

590. Figures 57 and 60 of the Altschuler report show the dimple region of a Checkpoint tag and show that the two aluminum electrodes are short circuited, such that the tag could not resonate (Zahn, RAX-11a at Q. 6).

591. Soft and flexible polyethylene elongates and deforms easily under a mechanical stress (RAX-129 at 487-88).

592. Getting measurements of the V-10 tag by sectioning is somewhat difficult because the material is "so soft" (Zahn, Tr. at 996-97).

593. Altshuler ground perpendicular to the long dimension of the V-10 tags (Rhoads, Tr. at 998-99; CRX-30 at Figures 30, 34 and 35).

594. The epoxy mixture used by Altschuler generated heat (Rhoads, Tr. at 994).

595. Altshuler for his report (CRX-30) prepared various cross-sections of the accused tags. With respect to the accused V-10 tag, in the process of cutting to create the cross-sections and the effect of cutting on the structure of the accused V-10, the dimensions of the polyethylene are so small, something like 18 to 26 microns, that in the process of cutting one could be squeezing the aluminuim foils closer together and thinning the dielectric. Moreover, in the epoxy curing, with some epoxies it becomes hot and that might soften the polyethylene such that it gets squeezed and becomes thinner than it really is. Also a grinding transfer forces to the capacitor structure and can shift the electrodes or crack them or move them. In addition grinding in a transverse direction, i.e., perpendicular to the long dimension of the tag, would tend to make the dielectric look like it had been thinned.

(Zahn, Tr. at 2028, 2029).

596. Altshuler cut the capacitor plates before embedding the section in epoxy (Rhoads, Tr. at 989).

597. The results of Altshuler were inconsistent with the known dimensions of the V-10 tag, the All-Tag tag and the Checkpoint tag (Zahn, Tr. at 2019).

598. Zahn testified:

JUDGE LUCKERN: And is it correct for somebody to then say the results are bad and therefore the methodology is bad? I mean, is that a correct follow-up or logic or whatever it is, a deduction to make in your opinion?

THE WITNESS: Yes, sir. The results cannot be accurate and so you cannot use them to understand the structure of the tag before the samples were prepared.

* * *

THE WITNESS: Your Honor, I myself thought about how to do such a measurement and began some preliminary measurements using an instrument that's called a DECTAC-800. This is an $85,000 instrument that is available at the MIT central facilities.

We tried to measure profiles of such tags and we found it very, very difficult because the polyethylene is deformable. This instrument uses a stylist somewhat like a record player that presses down on the polyethylene and can give you the surface profile.

And we found that the measurements were just not reliable. They weren't accurate. The polyethylene would deform even with this very sophisticated instrument.

We've had some other ideas, but most people that I've spoken to don't have an opinion that this methods would be successful.

JUDGE LUCKERN: So it's your testimony that the methodology is wrong and as far as you know there's really no good method to do it. Is that what I hear you say right now?

THE WITNESS: That's correct. At this time I don't know what method would work to give an accurate representation of the cross-section.

* * *

JUDGE LUCKERN: Let me just ask you. These geometric differences, they're very critical in these tests. I mean, I take it from what you've just said that they're extremely critical. Is that what you're saying?

THE WITNESS: Yes, sir. They provide a check on the measurements because there's no disagreement about the thickness of the aluminum foil. So they provide a reference.

If you get a value significantly different, then clearly there's some error somewhere.

JUDGE LUCKERN: Now, if you have an understanding, what is your understanding of Dr. Rhoads' position with respect to what this report shows with respect to these tests that you were just describing that you feel are not good as far as the geometry, et cetera?

THE WITNESS: I think his point being that at the ends of the electrodes, at the edges or at the corners, that the dielectric is greatly thinned to 1 micron or so or less. And I don't see how he can put any credence in that hypothesis when all other dimensions are off by great amounts, more than 100 percent in some cases.

JUDGE LUCKERN: So you feel at the ends that Dr. Alt Schuler [Alschuler] and Dr. Rhoads is putting the stamp on are thin. They're not really thin? Is that what I hear you say?

THE WITNESS: Well, they can't be as thin as shown here because, for example, they give the date at three locations, A, B and C. Presumably at each corner of a tag and in the center. And the thickness there in all three cases in much less than 18 microns.

The average thickness of this tag must be 18 microns or the tag would not resonate at the right frequency. We know it resonates at the right frequency. The average thickness must be 18 microns. And yet the photos show thickness much less, less than a micron or a few microns in the middle [Zahn, Tr. at 2021 to 2026]

599. Rhoads testified:

Q	Did you, in the pictures that are presented, did you take any pictures of the actual hole or gap of the All-Tag tag?

A	We were unable to locate the hole. We were trying on some of the sections.

The process is in the final stages of grinding when you can image the surface, you grind for a while, then you rinse the surface clean and look in the microscope.

Unfortunately, you take off a fair amount of surface, with each grinding. And none of the images appeared to have the hole in them. So apparantly on one of the grinding steps it was overshot.

Because of the limited time, the attempt was not repeated on any further specimens.

I believe that it would be possible to get a section through the hole by repeating this process on a number of samples until one successfully hit the hole. But's it's a little bit like shooting in the dark.

(Rhoads, Tr. at 1221-1222).

600.

601. Rhoads deposition testimony points out the difficulty in making such cross-sections of the accused tags without altering the original tag geometry. Thus at 67, he indicated that "Sectioning is likely to be difficult, because the material is so soft," and at 67 to 68 he noted that the "materials . . . are prone to degradation or damage by heat, a cold casting compound followed by sequential stages of grinding." At 68, Rhoads does not know whether any sectioning tests "will prove adequate to retain the relevent structure." The Actron tags are different to cross-section because of the ductile nature of aluminum and the plastic nature of polyethylene which can deform and flow with heat and/or pressure from sample cutting, epoxy curing,

grinding and other handling of the tag components.

602. Figs. 19, 21, 22, 24, and 39 of the Altschuler report appear to show the two aluminum electrodes touching, thereby short circuiting the tag. That tag could not resonate and would not be active. The Altschuler also gives dimensions of the thicker aluminum electrode to be 67 microns thick while the specification is to be 50 microns, plus or minus 3%, or 51.5 microns thick as a maximum. The thinner aluminum electrode is given as 27 microns thick while the specification is 12 microns, plus or minus 3%, or 12.36

microns thick as a maximum, which shows some error in the sample preparation. Zahn personally measured the thickenss of 4 Actron tags using a jeweled micrometer. Measurements were repeatable within about plus or minus 1 micron. The measured thickness of aluminum for the inductor and polyethylene substrate together was about 74-76 microns in agreement with the specified 50 microns thick aluminum and 26 microns thick polyethylene. The measured polyethylene thickness in the region between inductor and capacitor was from 25 to 28 microns thick, where the specified thickness was 26 microns, and the thickness in the direct center of the tag between the two capacitor plates and polyethylene dielectric was about 86-88 microns in agreement with the specified thickness of 50 micron thick aluminum for the smaller capacitor plate, 26 microns for the polyethylene dielectric and 12 microns for the larger aluminum capacitior plate. Those mesured thicknesses at three locations on the Actron tag are in agreement with Actron specified values, but in great disagreement with Altshuler's reported thicknesses. For the circuit to properly resonate at 8.2 MHz, it is necessary for the average dielectric thickness to be about 18 microns. According to the information given in the Altschuler photographs, the average thickness is much less, so that the tag would not resonate at 8.2 MHZ (Zahn, RAX-11a, Q. 3).

603. Figs. 28-30 of the Altshuler report show many grinding marks, predominantly in the direction perpendicular to the flat faces of the electrodes. It appears that the polishing operation is deforming the spacing between electrodes such that the polyethylene is being squeezed, especially near the corners. The photographs do not accurately portray the dimensions and geometry of the tag in its actual operating condition (Zahn, RAX11a, Q. 4).

604. Fig. 39 of the Altshuler report shows that 2 aluminum electrodes touching, thereby short circuiting the tag. Fig. 37 shows a very thin polyethylene gap, about 1/12 of the thin aluminum thickness of 12 microns, so the gap is about 1 micron. Fig. 38 shows a polyethylene gap about 1/6 of the thin aluminum thickness of 12 microns, thus about 2 microns. Even if the electrodes were not short circuited in Fig. 39, a thin dielectric of 1 to 2 microns would not resonate at 8.2 MHZ. Figs. 37-39 are not an accurate representation of the internal structure of the tag because the polyethylene thickness could not possibly be this thin and still have a resonant tag at 8.2 MHZ (Zahn, RAX-11a, Q.5).

605. Rhoads testified:

> Q But do I understand that you did not physically take the tags apart and determine what was inside the tag, either before or after the discharge? Determine what was happening in the tag, in the All-Tag tag.
>
> ****
>
> I have not disassembled tags and attempted to find the discharge short in that manner. The internal structure of the tags has been I believe revealed as accurately as we could achieve by the sectioning. All sections were performed on tags that had not been de-activated (Rhoads Tr. at 1218-19).

606. In any work Rhoads did with respect to taking pictures, he was unable to locate the air gap in the All-Tag tag. He testified that "we" were trying on some of the sections; that the process is in the final stages of grinding when one can image the surface and one grinds for a while, then one rinses the surface clean and looks in the microscope; and that "unfortunately" one takes off a fair amount of surface with each grinding and none of the "images appeared to have the hole in them" and so "apparently on one of the grinding steps it was overshot" and because of the "limited time, the attempt

was not repeated on any further specimens. Rhoads believes that it would be possible to get a section through the hole by repeating the process on a number of samples until one successfully hit the hole but he testified that it is a "little bit like shooting in the dark" (Rhoads Tr. at 1221-22). No sections of the All-Tag tag that Rhoads was exposed to showed any air gap or hole under the crater, i.e. the absence of the substrate layer under the crater (Rhoads Tr. at 1239). He also testified that in Altshuler's Figure 50 there is no hole or crater and its corresponding air gap (Rhoads Tr. at 1400).

607. In order to measure the conductivity of an aluminum bridge connection and a carbon bridge connection, one would first make a sample of some control cross sectional area so that one could come up with an intrinsic conductivity and also a control of length and one would measure the resistance of that material over that length for that particular cross sectional area (Muzzy, Tr. at 2361-62).

Actron Respondents

608. The resonant tag in issue of the Actron respondents at issue, according to complainant and the Actron respondents is the V-10 tag, also known as the "pressed capacitor" tag.

609. Immediately preceding the development of the V-10 resonant tags by the Actron respondents, they were producing and are now producing, a series of tags known as the crater tags (Matsumoto RAX-5 at QQ. 24, 37, Tr. at 1059).

610.

611.

612.

613. During the manufacturing process a portion of the 12 micron thick conducting area is heated and pressed toward the opposite 50 micron thick electrode so as to thin the polyethylene substrate from approximately 26 microns to 18 microns (Zahn, Tr. at 1705).

614. The pressing jig that tunes the tag has a generally flat surface of steel (RAPX-9).

615. Tokai did not have a marketable V-10 tag until approximately the spring of 1992 (Matsumoto, Tr. at 1133).

616. The Actron respondents currently make and sell two different V-10 tags having different sizes and circuit designs: DS-400-08.2 (design no. 9) and DS-500-08.2 (design no. 3) (Matsumoto, RAX-5C at QQ. 24-25; CX-133 at 29-30).

617.

618. The crater tags that Tokai manufactures have a different circuit design than either the DS-400 or the DS-500 V-10 tags (Matsumoto, Tr. at 1154).

619. The non-deactivatable resonant tags that Tokai manufactures have different circuit designs than the DS-400-08.2 V-10 tags, design number 9. (Matsumoto, Tr. at 1154).

620. The non-deactivatable resonant tags that Tokai manufactures have different circuit designs than the DS-500-08.2 V-10 tags, design number 3. (Matsumoto, Tr. at 1154).

621. The DS-400-08.2 (design no. 9) tag is approximately 4 centimeters by 4 centimeters square in size (Zahn, Tr. at 1806).

622. The DS-500-08.2 (design no. 3) tag is approximately 5 centimeters by 5 centimeters square in size (Zahn, Tr. at 1806).

623. CRPX-10 represents an Actron V-10 tag having a model number DS-400-08.2, series 9 (Matsumoto, Tr. at 1051).

624. All V-10 tags comprise a polyethylene substrate (CX-133 at 17).

625. In the V-10 manufacturing process the average thickness of polyethylene between the capacitor plates before heating and pressing is 26 microns while the average thickness of polyethylene between the capacitor plates after the heating and pressing was 18 microns within manufacturing tolerance. The average resonant frequency of a V-10 tag before heating and pressing is 9.7 megahertz while the average resonant frequency of said tag after heating and pressing is 8.2 megahertz (Matsumoto RAX-5, QQ. 47, 48, 49, 50; Zahn, RAX-11 QQ. 47, 48, 59; CX-127 at 16-17; Zahn, Tr. at 1707, 1708).

626. All V-10 tags have a conductive metal film of aluminum etched in a pattern on each surface of the substrate (Matsumoto, CX-133 at 17).

627. The aluminum layer on one side of the polyethylene is 12 microns thick on average, while the aluminum layer on the opposite side of the polyethylene is 50 microns thick on average (Matsumoto, Tr. at 1070).

628. The Tokai manufacturing process forms a laminate of aluminum foil on top and bottom of polyethylene substrate film. The tuned circuit of each tag is formed by etching away some aluminum leaving only the inductor, capacitor electrodes, and connecting leads. Thereafter a corner of the tag is crimped so that the aluminum on top and bottom surfaces touch so that one end of the inductor is electrically connected to the capacitor electrode lead on

opposite side of the substrate. To tune the capacitor, the electrode that is not on the inductor side is heated and pressed to thin the dielectric to the proper thickness for the correct capacitance to resonant at 8.2 MHz. The unpressed tag goes through the same process except for the omission of the heating and pressing process so that the dielectric thickness is equal to the original substrate thickness. The capacitor then has a lower capacitance value and the resonant frequency is higher than 8.2 MHz (Zahn, RAX 11, Q. 59).

629. The manufacturing tolerance at Tokai for the bottom aluminum layer is 50 microns plus or minus 3 percent (Matsumoto, Tr. at 1153).

630. The manufacturing tolerance at Tokai for the top layer of aluminum is 12 microns plus or minus 3 percent (Matsumoto, Tr. at 1153).

631. Tokai performs quality control tests to ensure that the aluminum layers remain within the tolerances of plus or minus 3 percent (Matsumoto, Tr. at 1153).

632. A ridge is formed immediately outside of where the pressing tool contacts the 12 micron thick electrode. That ridge is formed by heated polyethylene which flows from under the pressing tool as it is pressed into the 12 micron thick electrode. That ridge is approximately 40 microns thick (Zahn, Tr. at 1707).

633. In the Tokai manufacturing process, the web moves underneath a heated die, stops moving, the heated die presses the web, the heated die is raised, and then the web moves again (Matsumoto, Tr. at 1161-62).

634. The pressing tool for the DS-400 size V-10 tags is approximately 12 millimeters in width (Matsumoto, Tr. at 1069).

635. The pressing of the plates of the capacitor together decreases the resonant frequency of the tag by increasing the capacitance of the tag (RAX-11 at QQ.94-96, 99, 118).

636. By pressing the capacitor within an area encircled by the silver trough on CRPX-10, the resonant frequency of V-10 tag, series 9, is reduced from 9.7 MHz to 8.2 MHz (Matsumoto, Tr. at 1054, RAX-5 at Q. 49, Q. 46; Zahn, Tr. at 1725).

637. The V-10 tag includes a square-like spiral around the outside that forms the inductor, a pair of conducting areas on either side of the polyethylene substrate that forms the capacitor, a connecting lead between the inductor and the capacitor on one plate, as well as a connecting lead on the opposite side, and two connecting leads are crimped together at the upper right corner (Zahn, Tr. at 1703-04).

638. In the V-10 tag one lead extends from the 12 micron plate to one of the corners of the tag, where it is connected to the inductor by a crimp made through the polyethylene substrate which establishes contact with the 50 micron thick aluminum of the inductor (Zahn, Tr. at 1704).

639. In the V-10 tag the inductor is composed of a flat spiral of the 50 micron thick aluminum which begins at the outside perimeter of the tag and spirals in toward the smaller square capacitor electrode (RAX-5 at A. 64, A. 65; Zahn, Tr. at 1703).

640. The V-10 tags have a large pressed area in the center of the tag that has a width of approximately 1.2 centimeters for a DS-400-08.2, design no. 9 (Zahn, RAX-11, Q. 59; Matsumoto, Tr. at 1069).

641. Q is the quality factor of a resonant tag circuit, and is decreased by the heating and pressing of the V-10 capacitors because the

heating and pressing increases the capacitance while not affecting the inductance or resistance of the circuit (Zahn, RAX-11 at QQ. 101-102, 118).

642. In the '076 patent, the means in the fourth claus of claim 1 is a thinning of the dielectric to lower the voltage breakdown strength between the capacitor plates.

The function of fourth clause of claim 1 of the '076 patent is to short through a high dielectric strength substrate material. This is done by forming a localized point indentation which greatly narrows the dielectric thickness. This lowers the breakdown voltage of the tag without affecting or reducing the Q of the resonant circuit.

(Zahn, RAX-11a, QQ. 137, 138).

643. The large pressed area in the V-10 tag changes both the Q and the resonant frequency of the tuned circuit (Zahn, RAX-11, Q. 138).

644. The pressing of the capacitor plates of the V-10 tag during the manufacturing process creates a preferred path for an arc discharge to occur while decreasing the Q of the resonant tag circuit (Zahn, RAX-11, Q. 138).

645. The V-10 tag does not contain a planar substrate as defined by the '076 and '473 patents due to the pressing operation that thins at least a portion of the capacitor (Zahn, RAX-11, Q. 105).

646.

647.

648. In tests done by Matsumoto, 250 Checkpoint tags and 250 V-10 tags were placed on a deactivator. All 250 V-10 tags deactivated while 234 Checkpoint tags deactivated. The shake test had seven V-10 tags reactivate and six Checkpoint tags reactivate. However, with the oven test where the samples were placed on the oven at 80 degrees C for 20 hours, 137 of the Checkpoint tags reactivated whereas only 23 of the Tokai tags reactivated. Thus the thermal properties of the two tags are entirely different and therefore the structure and breakdown paths are probably entirely different (Zahn, RAX-11a, Q. 135).

649. After heating Tokai tags and Checkpoint tags in an oven at 80 degrees C for a number of hours, the Checkpoint tags had an increased breakdown voltage value and greater variability as compared to V-10 tags (Matsumoto, RAX-5C at QQ. 129-137; Matsumoto, RAX-5 at QQ. 112-16; Matsumoto, Tr. at 1098-99).

650. After heating Tokai tags and Checkpoint tags at 80 degrees C for a number of hours, the Checkpoint tags were more likely to become reactivated (Matsumoto, RAX-5 at QQ. 112-16, 138-140, Matsumoto, Tr. at 109).

651. After heating Tokai tags and Checkpoint tags cyclically in an oven, the Checkpoint tags showed much higher breakdown voltage values and more variability as compared to V-10 tags (Matsumoto, RAX-5, Q. 117-18).

652. After heating Tokai tags and Checkpoint tags cyclically in an oven, the Checkpoint tags showed much higher reactivation rates as compared to V-10 tags (Matsumoto, RAX-5, QQ. 124-25).

653. After heating Tokai tags and Checkpoint tags and submitting them to a pressure of 4 kilograms per square centimeter for six seconds, the Checkpoint tags showed much higher breakdown voltage values and more variability as compared to V-10 tags and to a control group (Matsumoto, RAX-5 QQ. 119-20).

654. After heating Tokai tags and Checkpoint tags and submitting them to a pressure of 4 kilograms per square centimeter for six seconds, the Checkpoint tags showed much higher reactivation rates as compared to V-10 tags (Matsumoto, RAX-5 QQ. 124-27).

655. The pressing operation allows deactivation to occur at a breakdown voltage of 2 or 3 volts in the vicinity of the pressed capacitor region by

means of an arc discharge which destroys the resonant properties of the tag (RAX-82 col. 8 lines 36-47).

656. Zahn microscopically analyzed and/or studied sixty-two samples of V-10 tags. Some of those samples had gone through the pressing operation and the remaining samples had not done so (Zahn, RAX-11, QQ. 66, 69).

657. Of the samples that Zahn studied, some that had been pressed were deactivatable whereas others were not. None of the samples that had not been pressed were deactivatable (Zahn, RAX-11, Q. 67).

658.

659. Zahn further tested a pressed V-10 tag using a dying technique which makes spark discharges visible in plastic, and for such a tag that had been deactivated and had cracks, Zahn could find no evidence of a spark discharge through the plastic (Zahn, RAX-11, Q. 104).

660. Zahn studied Tokai V-10 tags, types DS-400-08.2 and DS-500-08.2, both pressed and unpressed (Zahn, RAX 11, Q. 58).

661. Zahn, to prepare his tests, cut each sample from a large roll of tags, each of which had a paper backing on one side only, the side of the small capacitor plate. For all tests it was necessary to remove the paper using an adhesive solvent to get access to the electrical terminals of the capacitor and inductor. For microscopic observation it was also necessary to

remove all aluminum off the polyethylene using an etching solution (Zahn, RAX-11, Q. 60).

662. Zahn examined the polyethylene under an optical microscope at up to a 45 times magnification. He measured the resonant frequency of pressed and unpressed tags. The capacitance, inductance, and circuit resistance was measured and the Q of pressed and unpressed tags was determined. He also measured the AC breakdown voltage at the resonant frequency of pressed tags. Zahn further measured the natural ringing response of the tag to verify the high Q circuit oscillations and also did some measurements of the thickness and surface profile of the polyethylene samples and finished tags (Zahn, RAX-11, Q. 61).

663.

664.

665. Zahn in the first step of his testing, determined that every pressed sample cut from sample rolls was active at that point. For the unpressed samples because their resonant frequency was not the proper frequency for the sensor, there was no signal as to whether the unpressed tags were active or deactivated. The next step was to take half of the samples of each of the four types and put them aside as being those samples that were not deactivated. The other half of the samples, one at a time, were placed on to the Actron deactivator and then removed. The Actron tester was used to verify that each sample was deactivated (Zahn, RAX-11, Q. 66, 67).

666. Zahn for the microscopic observations removed the paper which was on one side of the tag by putting the tags in an ethyl acetate solution. About half of the samples were then removed for electrical testing. To examine the polyethylene under a microscope for the other half of the samples, a bath of copper sulfate and hydrochloric acid was prepared to remove the aluminum. The polyethylene was then washed under water and left to dry (Zahn, RAX-11, Q. 68).

667. Zahn prepared 62 samples for which the paper and the aluminum were removed and which were examined under the microscope (Zahn, RAX-11, Q. 69).

668.

669.

670.

671. Zahn measured the resonant frequency of the Tokai tags and found that for the pressed samples, there was a resonance over a range of 7.7 to 8.2 megahertz and for the unpressed samples, for which the capacitance is much less so that the resonance frequency should be higher Zahn observed a higher resonant frequency over the range of 8.9 to 9.4 megahertz (Zahn, RAX-11, Q. 88).

672. Zahn, in DC voltage breakdown tests, found no sample that was unpressed which broke down with up to 100 volts DC applied to it. He tested one pressed DS-500 Tokai tag and it broke down at 7.6 volts DC (Zahn, RAX-11, Q. 92, 93).

673. Zahn, regarding the results of his capacitance measurements for both the unpressed and pressed tags, for the DS-400 series the unpressed tags had capacitance of approximately 69 picofarads. Pressed tags had a higher capacitance of 83 picofarads because the dielectric thickness was less. For the DS-500 series, unpressed tags had a capacitance of approximately 80 picofarads, and pressed 500 tags had a higher capacitance of approximately 108

picofarads. Zahn's inductance measurements for each tag type, whether pressed or unpressed, was essentially the same (Zahn, RAX-11, QQ. 94, 95).

674. Zahn, as a result of his testing, concluded that a pressed tag has a higher capacitance because the dielectric thickness is decreased which he concluded is verified by theory and by measurements (Zahn, RAX-11, Q. 99).

675.

676.

677.

678.

679.

680.

681.

682.

683.

684.

685.

686.

687.

688.

689.

690.

691.

692.

693.

694.

695.

696.

697. The fact that a large area of the capacitor region of the V-10 tag is indented does not mean that all of the capacitor region is indented, and therefore that the indentation in a V-10 tag is not "localized". There are other areas in the lower conductive area of the V-10 tag which exhibit capacitance, and where an indentation could be placed in order to fall within the claims of the patents at issue (Rhoads, Tr. at 878-884; CRPX-10).

698. Zahn testified that a capacitor is two conducting electrodes with a dielectric in between; that the voltage across the capacitor is changing sinusoidally with time at the resonant frequency and, referring to CRPX-10, that when the V-10 tag is resonating that is what is taking place between the central pink area and the silver area behind it in CRPX-10; and that the same

phenomenon is occurring in the remaining portion of pink that extends out of the square central pink area and runs up to the right as far as this green line and to the same extent that there is capacitance between the pink square area and the silver behind it, there is also capacitance between the remaining pink area which is sometimes referred to as the skillet handle and the silver behind it (Zahn, Tr. at 1811-12).

699. Referring to CRPX-10, Rhoads made a green mark on the one edge of the pink trace that forms part of the capacitor and then in the other direction forms the inductor at the boundary where the silver trace beneath it ends and from the green line into the central squarish portion all of the pink which is the near-surface metallization and the far side metallization directly beneath it comprise the capacitor of the V-10 tag (Rhoads, Tr. at 777).

700. The square part of the V-10 capacitor is not the entire capacitor. The V-10 capacitor is skillet shaped with the roughly square portion of the capacitor contributing 6/7 (86 percent) to the total capacitance after pressing. Its contribution was 80 percent before pressing using the 9.7 MHz to 8.2 MHz frequency change data. The skillet handle contributes 1/7 (14 percent) to the total capacitance after pressing. Only the roughly square portion of the TV-10 skillet shaped capacitor is pressed. To say that the V-10 capacitor electrodes are designed to be flat, one must exclude the handle and its 1/7 contribution. Also if the capacitance of the skillet handle were not desired in the V-10 tag, it could have been easily eliminated with any of several trivial modifications. For example all that is required is to run either the large skillet's handle or the small skillet's handle off at different angle so they do not lie one above the other (Rhoads, CRX-4, Q. 65).

701. The "skillet handle" that extends out from the smaller, squarish central region of the V-10 tag constitutes a part of the tag's capacitor (Rhoads, Tr. at 777-78; CRPX-10; Zahn, Tr. at 1811-13).

702. The "skillet handle" constitutes approximately 1/7 of the total area of the capacitor in the V-10 tag, and accordingly provides approximately 1/7 of its capacitance (Rhoads, Tr. at 770-71).

703. The square capacitor electrode portion made of 50 micron aluminum is smaller is surface area than the square capacitor electrode portion made of 12 micron aluminum (Matsumoto, Tr. at 1084; Zahn, Tr. at 1705).

704. The "primary" function of the smaller square capacitor electrode and that portion of the larger square capacitor electrode which directly confronts the small square capacitor electrode is to generate most of the capacitance of the tags (Rhoads, Tr. at 751-52, 806-07).

705. The smaller square capacitor electrode and the portion of the larger square capacitor electrode which directly confronts the smaller capacitor electrode generate about 86% of the capacitance of the tag (Rhoads, Tr. at 751-52, 806-07).

706. The inductor generates a certain minor amount of capacitance known as stray capacitance between its coils as it crosses over the wider lead on the opposite side of the polyethylene substrate (Rhoads, Tr. at 748-49).

707. Without a narrower lead, the resonant tag circuit would be opened (Rhoads, Tr. at 752).

708.

709.

710.

711.

712. The pressing jig used today to manufacture the DS-400 V-10 tags, design number 9, has rounded edges and corners in comparison to the die discussed in CX-135 (Matsumoto, Tr. at 1157).

713. By pressing the polyethylene in the V-10 tags, Tokai at times was able to reduce the variance of the polyethylene thickness. Because the thickness of the polyethylene is the most important parameter for frequency, pressing the polyethylene enables Tokai to reduce the thickness variances and therefore to reduce the frequency variance at times (Matsumoto, Tr. at 1155; RAX-5C at Q. 39).

714. On CPX-15, the lower capacitor plate is actually narrower than the width of the jig itself. The drawing in red on CPX-15 is a corrected sketch showing the relative sizes between the heated jig and the lower capacitor plate by Matsumoto (Matsumoto, Tr. at 1151-52).

715.

716.

717.

718.

719.

720.

721.

722.

723.

724.

725.

726.

727.

728.

729.

730.

731. Almost all of the items represented on CRPX-3 are dimensionally inaccurate (Matsumoto, Tr. at 1074).

732. CRPX-3 incorrectly omits a layer of glue between the brown layer and a blue layer (Matsumoto, Tr. at 1071).

733. On CRPX-3, the upper blue layer represents the 12 micron thick layer of aluminum (Matsumoto, Tr. at 1070).

734. On CRPX-3, the yellow layer represents the layer of polyethylene. (Matsumoto, Tr. at 1070).

735. On CRPX-3, the lower blue layer represents the 50 micron thick aluminum layer. This layer corresponds to the pink capacitor area shown on CRPX-10 (Matsumoto, Tr. at 1070).

736. On CRPX-3, the green layer represents a layer of steel of 0.3 millimeters thickness (Matsumoto, Tr. at 1072).

737. On CRPX-3, the pink layer represents a layer of silicon rubber with a thickness of about 20 millimeters (Matsumoto, Tr. at 1072).

738. CRPX-3 omits a one to two micron thick layer of ink between the 50 micron aluminum layer and the missing layer of glue (Matsumoto, Tr. at 1075).

739. On CRPX-3, the missing layer of glue is approximately 30 microns thick (Matsumoto, Tr. at 1075).

740. On CRPX-3, the silicon liner is about 80 microns thick (Matsumoto, Tr. at 1076).

741. Assuming that the pink layer on CRPX-3 is accurate, the green layer should be 6 to 7 percent thinner (Matsumoto, Tr. at 1079-80).

742. Assuming the accuracy of the thickness of the pink silicon layer on CRPX-3, the blue layer representing the 50 micron thick aluminum should be thinner by 16.5 percent (Matsumoto, Tr. at 1081).

743. Assuming that the thickness of the pink silicon rubber layer on CRPX-3 is accurate, the yellow polyethylene layer should be made slightly thinner (Matsumoto, Tr. at 1082).

744. Assuming that the pink silicon layer in CRPX-3 is accurate, the 12 micron thick layer of aluminum shown in blue must be made about one-third of the thickness of that layer (Matsumoto, Tr. at 1082).

745. On CRPX-3, the gray representation of the jig is not accurate and should be made about 30 percent wider (Matsumoto, Tr. at 1082-83).

746. On CRPX-3, the ratio of widths for the gray jig and the blue layer representing the 12 micron thick layer of aluminum are correct (Matsumoto, Tr. at 1084).

747. The parties are in agreement that the voltage required to breakdown air is normally less than polypropylene (Holt, RTX-3 Q. 21; Zahn, RAX-11 Q. 110 - 111, CRX-4, Rhoads, Q. 32). However, Rhoads testified that this is not the same when one is talking about distances in the range of a few microns such as in the All-Tag tag (Rhoads, CRX-4, Rhoads, Q. 32).

748.

749.

750.

751.

All-Tag Respondents

752. The All-Tag deactivatable resonant tag is manufactured according to a process described in U.S. Letters Patent 5,187,466 to Fritz Pichl, issued on February 16, 1993 (the Pichl patent) and titled "Method of Deactivating a Resonance Label." Pichl testified at the hearing (RTX-17, Pichl, RTX-1, Q. 150-151, Tr. at 2312).

753. The All-Tag tag was designed and developed in 1991 by Pichl. Pichl also was responsible for the design and development of the manufacturing process and machine for making the All-Tag tag (Pichl, Tr. at 2167).

754. At the hearing, Pichl, the manager of All-Tag, showed a series of photographs of magnifications of the deactivation structure of an All-Tag deactivatable resonant tag (Pichl, Tr. at 2180:3-2192:13; RTX-7; RTX-19).

755. The pictures shown by Pichl indicate the presence of a crater in the 10-micron thick aluminum upper capacitor plate, and a much larger hole (approximately twice as large as the crater) through the 20-micron thick

polypropylene substrate between that plate and the 50-micron thick lower capacitor plate (Pichl, Tr. at 21803-2185; Pichl, RTX-1 Q153-Q165; Holt, RTX-3 at 3-4, 6 Q9-Q11, Q14); RTX-19).

756. Deactivation of its resonant tag occurs in the hole in the substrate where the plastic has been removed, by means of an arc discharge between the metal edges of the crater in the upper capacitor plate and the lower capacitor plate (Pichl, RTX-1 Q. 163; Muzzy, RTX-2 Q. 16; Holt, RTX-3 Q. 16; RTX-19 (Picture 9)).

757. The arc discharge in the All-Tag tag melts the aluminum and forms an aluminum filament between the upper plate and the lower plate, thus creating an electrical connection between them (Pichl, RTX-1 Q. 164-166; Muzzy, RTX-2 Q16; Holt, RTX-3 Q16; RTX-7 (Picture 8); Pichl, Tr. at 2190-2192, 2299-2303).

758. The arc does not pass through the plastic part of the substrate (Pichl, RTX-1 Q165; Muzzy, RTX-2 Q. 27; Holt, RTX-3 Q. 21).

759. All-Tag manufactures and sells deactivatable and non-deactivatable resonant tags. The tags are sold in two sizes, namely 40 millimeters X 40 millimeters and 50 millimeters X 50 millimeters (Pichl, RTX-1, Q. 5, 7, 9, 131). The All-Tag deactivatable resonant tag is in issue in this investigation.

760. The All-Tag deactivatable commercial tag is shown in RTX-4 (Pichl, RTX-1, Q. 89).

761. The All-Tag component parts for making the All-Tag tag are shown in RTX-5 and include the web material for making the tag without the deactivation structure; the web material after the deactivation structure has been added to the web and the final commercial tag. A further detailed

description of the All-Tag tag with respect to its manufacture is shown in RTX 18 (Pichl, RTX-1, QQ. 90, 152).

762. The All-Tag manufacturing process for making the All-Tag tag is explained and described in an All-Tag video (RTPX 11). There is no dispute with respect to the All-Tag manufacturing process. The manufacturing process is further shown in detail in RTX 8 - RTX 15 which are pictures of the All-Tag machine with corresponding descriptions of the machine (Pichl, RTX 1, Q. 116).

763. The All-Tag deactivatable resonant tag structure generally comprises a laminated composite of (1) a 10 micron aluminum foil layer (2) a 20 micron polymer film layer of polypropylene; and (3) a 50 micron aluminum foil layer. The desired tuned circuit structure in aluminum has been printed on the tag in blue. The blue is an etch resistant ink. Through an etching process the unwanted aluminum is removed. Thus, the final resonant tag includes on one side of the 20 micron polypropylene film the 10 micron aluminum capacitor plate and on the other side of the polypropylene film the 50 micron capacitor plate and the inductor coil of aluminum foil. All-Tag selected polypropylene for its intermediate layer because of its superior mechanical properties such as better form stability, heat resistance etc., over other materials (Pichl, RTX 1, Pichl, Q. 91).

764. The All-Tag process for making the All-Tag tag comprises the steps of (1) deforming a local area of the dielectric layer to place the capacitor surfaces closer together at the local area to induce a short circuit between the surfaces by moving a heated metal rod against a first capacitor surface at the local area to thermally displace the dielectric layer and make conductive contact with the other capacitor surface and (2) passing an electric current

between the capacitor surfaces in conductive contact of enough magnitude to permanently deform the materials around the local area and leave a gap between the surfaces so that the deactivating system can melt the capacitor surfaces together at the local area to form a permanent short circuit (RTX-17, col. 5, lines 5-20. The All-Tag process has been characterized as done in two phases. In the first phase the rod resting against one surface of the capacitor is connected to the other pole of the current source, such that a current flow appears, i.e. when the capacitor surfaces contact each other and/or are crimped to each other, the desired state can be supposed to be achieved and the moving of said surfaces of the capacitor towards each other is terminated. In the second phase a current/voltage source is again connected to the now short circuited capacitor and the crimping formed in phase 1 is burnt off by an electrical overload. By an appropriate adjusting of the ampere/volts ratio the thinner surface of the capacitor burns off in such a manner that the distance between the edge of the burnt out hole and the second surface corresponds to the deactivatable distance (RTX-17, col. 1, lines 51ff).

765. Figure 4 of the '466 patent illustrates the cut-out of the capacitor in accordance with phase 2. The crimping has been removed by an electrical overload. This occurs by a burning like procedure during which a crater shaped irregular hole 6 or a plurality of such holes are formed in the thinner surface of the capacitor. At the same time the dielectric material burns within the area of the edge of the hole between the two surfaces of the capacitor thereby generating an air gap S having a width of about 1.5 to 3 microns. This hole 6 in Figure 4 has a diameter of for example about 70 microns. A part of the aluminum which has been melted away is thereby piled up at the edge of the hole and forms said crater. Figure 4 depicts further

that the air gap extends further behind the edge of the crater and specifically beyond that area where the lower edge of the crater is at a distance of three microns from the second surface of the capacitor which guarantees that the deactivating occurs always by a metal thread (RAX-17 col. 4, lines 23ff) RTX 4 shows the structure of the All-Tag in issue. Looking down on the blue surface of the tag, a circular depression is evident in the middle of the capacitor plate. Microscopically, one or more holes can be seen inside the depression. The holes are in the thin aluminum layer comprising the top plate of the capacitor. A large diameter hole exists in the plastic film. This hole is centered on the axis defined by the hole in the top aluminum plate. There is no hole through the bottom aluminum plate. Thus, an air capacitor has been created in the annulus defined by the hole in the top aluminum plate. This structure is consistent with Figure 4 in the '466 patent and the description presented in col. 4, lines 23-39 of that patent (Muzzy, RTX-2, Q. 5).

766. During the burning process in the second phase of the All-Tag process at least one hole is produced in the thinner surface of the capacitor. Such holes have an irregular crater like edge. Said current/voltage source shall be able to supply about 10 to 20 volts and 2 to 3 amperes. The crater like openings thus produced have a diameter of e.g. 70 microns whereby an air gap of 1.5 to 3 microns has been formed at the area of the edge of the crater between the two surfaces of the capacitor. In the deactivation stages of the All-Tag tag an electrical current is induced between the prepared surfaces of the capacitor, leading to the building up of an electrical connection in form of an aluminum thread between the two surfaces of the capacitor by a melting of the aluminum at least one location. Under normal circumstances this short

circuit can not be destroyed anymore and the tag is thereby deactivated with the greatest possible safety (RTX-17, col. 2 lines 65 ff). In the second phase All-Tag burns off the aluminum and plastic substrate between the aluminum plates and makes a hole in the 10 micron aluminum plate and the 20 micron plastic layer. This forms an air gap. At the air gap the distance between the aluminum plates is about 0.5 to 2 microns (Pichl, RTX 1, Q. 96-102 Tr. at 2177, 2196-97; RTX 8-15; Muzzy, Tr. at 2397; Holt, RTX-3 Q. 9). In preparing the Checkpoint tags in issue in this investigation, there is no formation of crater like openings whereby an air gap is formed at the area of the edge of the crater between the two surfaces of the capacitor (CX-9, RAX-22).

767. The air gap in the All-Tag tag is anywhere from a half a micron to three microns (Muzzy, Tr. at 2387).

768. With respect to how the aluminum bridge that is formed in the All-Tag tag deactivation, heat would be provided to start melting the aluminum which would take place more effectively on the top plate because there is less aluminum there and the melted aluminum will start beading up so that the bead would come in close proximity to the bottom plate because the beads could easily get to be few microns and the bottom plate being colder it would freeze there with the resulting solidified aluminum filament going from the bottom plate to the top plate It is a localized phenomenon and could take less than seconds. A second possibility for forming the bridge is that there are rough surfaces and if there is a one micron gap, then localized nodules would come very close together (Muzzy, Tr. at 2412, 2413).

769. RTX-7 comprises pictures 1 thru 10 which pictures Pichl took showing an All-Tag tag before deactivation and after deactivation to show that

deactivation occurs by an arc through an air gap. In picture 1 one sees the burn off crater of an All-Tag tag (Pichl, RTX-1, QQ. 113, 114, Tr. at 2187-92).

770. In taking the pictures shown in RTX-7, All-Tag had a video camera connected to a microscope which focused on the region of the crater area of the 10 micron aluminum layer (Pichl, Tr. at 2186 - 2192). The All-Tag tag was then deactivated. In a first example shown in Pictures 1 - 5 of RTX 7, a picture was taken of the tag before deactivation, Picture 1 of RTX 7, and a picture was taken after deactivation, Picture 2 of RTX 7. Thereafter, electron microscopic pictures were taken of the deactivated tags, Pictures 3 through 5 of RTX 7. A second tag is shown before deactivation, Picture 6 of RTX 7, and after deactivation in Picture 7 of RTX 7. Additional electron microscopic pictures were taken of this second tag as seen in Pictures 8 through 10 (Pichl, RTX 1, Q. 113 -114, Tr. at 2186-2192).

771. Picture 2 within RTX-7 shows the same tag after deactivation. The location of the deactivation is visible in the form of a reddish brown spot outside and to the right of the brown ring (Pichl, Tr. at 2221).

772. While complainant, relying on Muzzy, Tr. at 2438 asserted that Muzzy acknowledged that what ultimately determined the ease of deactivatability of All-Tag tags is the proximity of the two capacitor plates to one another, the testimony relied on does not support that conclusion.

773. The Muzzy testimony referred to in the previous finding is as follows:

> Q. And so is it your testimony that what ultimately determines the ease of deactivatability of these All-Tag tags is the proximity of the two plates to one another?

A. The proximity <u>in the air gap</u>, yes. (Muzzy, Tr. at 2438) [Emphasis added]

774. While the All-Tag tag would not be expected to deactivate on a machine like CPX-3 if there were no point in the entire capacitor at which the two plates were not brought much closer together than 20 microns (Tr. at 2374), if one took the All-Tag tag and filled in the air gap with plastic, i.e. displaced the air with polypropylene, the break down mechanism in the All-Tag tag would then still not be identical to the break down mechanism in the '076 patent. The thinned section that exists in the All-Tag tag does not have any sharp bend and thus one does not have the same means of focusing as one does with the '076 patent where one makes a point indentation in the capacitor plate to get a specific spot where one is going to have a charge in it. Having a point magnifies the ability to get the arcing where that point is because one has a concentrated field and to the contrary when one fills the air gap in the All-Tag tag with polypropylene one does not have a concentrated field. One could make a round indentation rather than a point indentation and get a similar type effect but one could not have the performance one was seeking without having sharp edges. It is not just the presence of air in the All-Tag tag because there is a bridge also created. The All-Tag tag is "in a much better position for avoiding reactivation" (Muzzy, Tr. at 2500-02).

775. Complainant has asserted that the location of the deactivation that is revealed by picture 2 of RTX-7 of the All-Tag tag has not occurred within the boundaries of the air gap that is claimed by All-Tag to exist because the diameter of the hole in the polypropylene is twice the diameter of the hole formed in the aluminum layer while picture 2 of RTX-7 shows that the distance from the center of the burnout hole to the deactivation site is more than three and one-half times the distance from the center to the perimeter of

the hole in the aluminum layer (proposed finding 707). Pichl however has testified that the hole in the polypropylene layer can be greater than twice the diameter of the crater (Pichl, Tr. at 2313). Significantly in measuring the hole in the plastic layer of picture 8 of RTX 19 in relation to the crater hole in picture 2 of RTX 19 and as seen in a composite in picture 9 of RTX 10, the hole in the polypropylene substrate was more than three times larger than that of the hole in the top aluminum layer (Pichl, Tr. at 2313-15). Moreover, while All-Tag's Muzzy agreed a particular hole in the plastic was "roughly twice" of the equivalent diameter as a hole in the aluminum of an All-Tag tag he has seen others where the plastic area is much bigger (Muzzy, Tr. at 2378).

776. Dielectric strength of air is lower than the dielectric strength of polypropylene (Muzzy, Tr. at 2492).

777. If one had an idealized setup where there are smooth parallel plates and there are no rough surfaces where there are anomalies or if there exists a large gap it may takes at least 350 volts to breakdown air under any air gap length under any pressure. However such would not apply to micron thick air gaps (Muzzy, Tr. at 2462-64, 2468).

778. The voltage breakdown for air at 1 atmosphere is a great deal lower than 350 volts (Holt, Tr. at 2545).

779. At no point in the All-Tag tag does the aluminum bridge come in contact with any plastic that remains in the tag. While on a probablistic basis there could be times when the aluminum bridge might come in contact with the plastic, the intent and the basis for how the aluminum filaments are formed are not in any way related to the plastic. The polypropylene that has not been burned away which is at the parameter of the air gap is not necessary for the formation of the aluminum bridge (Muzzy, Tr. at 2408-10).

780. Relying on testimony of Rhoads, Tr. at 1247-53 and Zahn Tr. at 1789-91, Checkpoint asserted that the method of deactivation postulated by the All-Tag theory is incapable of occurring (Proposed finding 710). However the cited testimony shows that Rhoads was referring to a "hypothetical experiment" and Zahn was addressing conditions as they existed with the Tokai tag, not the All-Tag tag. In the All-Tag tag the aluminum bridge is not formed in cracks a distance of 18 micons but in the air capacitor having a distance of about 0.5-2 microns (FF 765, 767).

781. All-Tag, through Pichl, was aware of the patents in suit and in designing the All-Tag tag purposely decided not to make a tag which required deactivation to occur by arcing through the plastic dielectric substrate because of the unreliability of such a short circuit (Pichl, RTX-1, QQ. 67 - 69, 81 - 86, Tr. at 2213 - 2214, 2290).

Toyo

782. Pichl informed Toyo prior to the institution of this investigation that All-Tag was using Toyo's laminated circuit material to manufacture deactivatable resonant tags (Pichl, CX-142 at 84).

783. Toyo sells the laminated circuit material it manufactures for All-Tag to a Japanese trading company Itochu, which then sells the material to All-Tag which is used by All-Tag in the manufacture of its deactivatable tag (Pichl, CX-142 at 146-47; Pichl, RTX-1 Q122).

784. In a letter from Pichl to Kurihara of Itochu on February 10, 1993, Pichl told Mr. Kurihara that complainant had filed a section 337 complaint "to stop us from importing our deactivatable tag into the USA and only into the USA." Pichl also identified the patents in suit, describing these patents as "deactivation patents," and enclosed an opinion from All-Tag's patent counsel

that Pichl said concluded that the All-Tag deactivatable resonant tag does not infringe the patents in suit (CX-143).

785. Since receiving Pichl's February 10, 1993 letter and service of the complaint in this investigation, Toyo has continued to supply, and currently is supplying laminated circuit material to All-Tag on a monthly basis (CRX-143; CRX-21).

786. All-Tag manufactures both deactivatable and non-deactivatable resonant tags by a machine that makes both kinds using the Toyo web material (Pichl, RTX-1 Q94-Q96, Q124, Q131-142).

787. All-Tag sent to Toyo a drawing specifying the precise locations on the laminated circuit where Toyo should manufacture the probe point connection pads that permit All-Tag to manufacture deactivatable tags (Pichl, CX-142 at 38-40).

788. All-Tag performed the design and development of its tags, and Toyo suggested certain types of plastics to use, of which polypropylene was chosen (Pichl, RTX-1 Q126).

789. There is no evidence in the record that reveals Toyo's knowledge of Checkpoint's patents prior to the filing of the complaint in this investigation (CX-143).

790. The rolls of laminated circuits manufactured by Toyo are made by a process substantially similar to that described in the expired Lichtblau '219 patent (CX-26; CX-126).

791. All-Tag manufactures and sells both non-deactivatable and deactivatable tags from the rolls of laminated circuit purchased from Toyo (Pichl, RTX-1 at 38).

792. All-Tag selects whether non-deactivatable tags or deactivatable tags are produced by a switch on the manufacturing machine (Pichl, RTX-1 at 40-41).

793. The term "crimping" refers to the interconnection of the two sides of the resonant tags (Pichl, RTX-1 at 42).

794. In the manufacture of both non-deactivatable tags and deactivatable tags, All-Tag crimps the conductive path on the second side to the outer coil terminal on the first side (Pichl, Tr. at 2169-70).

795. According to Pichl, Toyo has no "input" into All-Tag's decision to make deactivatable or non-deactivatable tags from a web, stating that "[a]t the time of ordering the web even we [All-Tag] don't always know what we will be producing" (Pichl, RTX-1 at 38).

796. Toyo supplies laminated circuit material exclusively to All-Tag. All-Tag uses the laminated circuit material to manufacture disposable anti-theft resonant tags, including deactivatable tags. Toyo has provided laminated circuit material to All-Tag on a monthly basis since 1991 (Nakatou, CX-140 at 78-79; Pichl, CX-142 at 36-37, 84; CRX-21).

797. The All-Tag 4 cm. tag differs in appearance from an individual tag of the web received from Toyo in the following four respects:

1. The silvery "indentation" within the circle marked "P" on CRPX-11 is not present on the Toyo product;
2. The silvery "indentation" within the area marked "CR" on CRPX-11 is not present on the Toyo product;
3. The silvery bluish "indentation" within the area marked "CP" on CRPX-11 is not present on CRPX-11; and
4. The silvery circular area indicated by Pichl as the burn-out point is not present on the Toyo product.

(Pichl, Tr. at 2324-29; CRPX-11).

798. Mr. Hamuro, the Assistant Manager of the Quality Assurance Department of Toyo's New Product Development, compiled a "Tag Material Specification," dated May 21, 1992, for the All-Tag tag that describes with particularity its manufacturing specifications as the thickness of the aluminum foil, the thickness of the dielectric substrate, the specific design of the tag, the resonant frequency, and the quality control procedures. Seven detailed drawings by Toyo are included in the specification, including drawings depicting the probe contact points (Ibi, CX-123 at 87-88; CX-126).

799. After preparing the manufacturing specification, Hamuro sent it to All-Tag for approval by Pichl (Ibi, CX-123 at 87).

800. All-Tag sent to Toyo a drawing specifying on the laminated circuit where Toyo should manufacture the probe point connection pads that permit All-Tag to manufacture deactivatable tags (Pichl, CX-142 at 38-40).

801. The laminated circuit material manufactured by Toyo has two probe point connection pads to permit All-Tag, in forming the spot weld, to monitor the current flow as the capacitor plates are pushed together at the site of an indentation (Farestad, CX-3 at 31). Pichl testified that through the use of these contact areas All-Tag's machine determines that the indentation is complete, i.e., whether the two metal surfaces are joined together and all the plastic has been pushed to the side (Pichl, Tr. at 2286-87; CRPX-11).

802. Without the probe point connection pads on the webbing All-Tag receives from Toyo, All-Tag would be unable to perform the burn-off process involved in creation of the deactivation structure of its deactivatable circuit (Pichl, Tr. at 2327).

803. The probe point connection pads on the Toyo laminated circuit material are essential for All-Tag to manufacture deactivatable resonant tags. (Pichl, CX-142 at 48).

804. The probe point connection pads on the Toyo laminated circuit material are not essential for All-Tag to manufacture non-deactivatable resonant tags (Pichl, CX-142 at 48).

805. The resonant frequency of the All-Tag deactivatable tag is approximately 7.87 MHz (Farestad, CX-3 at 29). The All-Tag tag is deactivatable at 8.2 MHz. (Holt, RTX-3C at 7-8).

806. The All-Tag machine that manufactures both deactivatable and non-deactivatable tags from the laminated circuit material manufactured by Toyo consists of three "workstations," viz. station 1 where the spot weld is formed, station 2 where the spot weld is burned off, and station 3 where the crimping process is accomplished (Pichl, Tr. at 2169).

807. In workstation 1, the web is fed into the machine and automatically is brought into contact with five heating rods, each of which have a temperature of approximately 750 degrees Fahrenheit, to make the spot weld forming a connection between the capacitor plates. When the connection is complete the heating rods are automatically withdrawn (Pichl, Tr. at 2175-76; Pichl, RTX-1 at 25-26; RTPX-5).

808. In workstation 2, an electrical connection is made through metal surfaces designed into the tag and a high power spark is created which overloads the metal connection between the capacitor surfaces and burns off the "short" created in workstation 1. According to Pichl, this process creates a "crater" in the 10 micron aluminum capacitor and a hole in the

plastic film that is approximately double the diameter of the crater in the aluminum (Pichl, Tr. at 2177; Pichl, RTX-1 at 26-27; RTPX-6; RTPX-7).

809. In manufacturing non-deactivatable tags, All-Tag by-passes workstations 1 and 2. Only workstation 3, where crimping is accomplished, is in operation during the manufacture of non-deactivatable tags (Pichl, Tr. at 2170).

810. An invoice dated April 1, 1993 reflects the sale of 100,000 barcoded non-deactivatable resonant tags by All-Tag to Sen Tach Corporation in Deerfield Beach, Florida (RTX-61).

CONCLUSIONS OF LAW

1. The Commission has *in rem* jurisdiction and subject matter jurisdiction.

2. There is no infringement of the asserted claims of the '076 and '473 patents.

3. The asserted means claims of the '076 and '473 patents are not invalid under 35 U.S.C. §103.

4. Claims 25, 26 and 27 of the '473 patent are not anticipated by Vandebult or the '219 patent.

5. The asserted claims of the '076 and '473 patents are not invalid under 35 U.S.C. §102(f).

6. The asserted claims of the '076 and '473 patents are invalid under 35 U.S.C. §102(g).

7. The asserted claims of the '076 and '473 patents are not invalid under 35 U.S.C. § 112.

8. There is a domestic industry involving each of the asserted claims of the '076 and '473 patents.

9. There are no unfair acts in the importation of the subject matter in issue.

10. There is no violation of section 337.

INITIAL DETERMINATION AND ORDER

Based on the foregoing findings of fact, conclusions of law, the opinion, and the record as a whole, and having considered all of the pleadings and arguments presented orally and in briefs, as well as certain proposed findings of fact, it is the administrative law judge's determination that there is no violation of section 337 in the importation into the United States and sale for importation, or the sale within the United States after importation of certain anti-theft deactivatable resonant tags and components thereof.

The administrative law judge hereby CERTIFIES to the Commission this initial determination, together with the record consisting of the following:

1. The transcript of the hearing; and
2. The exhibits admitted into evidence and the exhibits as to which objections have been sustained.

The pleadings of the parties filed with the Secretary are not certified, since they are already in the Commission's possession in accordance with Commission Rules of Practice and Procedure.

Further it is ordered that:

1. In accordance with Commission interim rule 210.44(b), all material heretofore marked _in camera_ because of business, financial, and marketing data found by the administrative law judge to be cognizable as confidential business information under Rule 201.6(a) is to be given _in camera_ treatment continuing after the date this investigation is terminated.

2. Counsel for the parties shall have in the hands of the administrative law judge a copy of this final initial determination with those portions containing confidential business information designated in brackets, no later

than Thursday, December 23, 1993. Any such bracketed version shall not be served by telecopy on the administrative law judge. If no such version is received from a party, it will mean that the party has no objection to removing the confidential status, in its entirety, from this final initial determination.

3. With respect to Commission action on this final initial determination, reference is made to the notice of a Commission determination, dated November 22, 1993, to apply a modified procedure for considering this final initial determination and for deciding whether there is a violation of section 337 of the Tariff Act of 1930.

Paul J. Luckern
Administrative Law Judge

Issued: December 9, 1993