In the Matter of

CERTAIN RECLOSABLE PLASTIC BAGS AND TUBING

Investigation No. 337-TA-266
(Decision: 54 Fed. Reg. 30286)
(July 19, 1989)

USITC PUBLICATION 2239

NOVEMBER 1989

United States International Trade Commission
Washington, DC 20436

UNITED STATES INTERNATIONAL TRADE COMMISSION

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UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, DC

In the Matter of

CERTAIN RECLOSABLE PLASTIC
BAGS AND TUBING

Inv. No. 337-TA-266
ADVISORY OPINION PROCEEDING

NOTICE OF DETERMINATION NOT TO REVIEW INITIAL ADVISORY OPINION

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is given that the Commission has determined not to review the initial advisory opinion (IAO) issued by the presiding administrative law judge (ALJ) in the above-captioned advisory opinion proceeding, finding that reclosable plastic bags sought to be exported to the United States by Kingdom Plastic Manufacturing Co., Ltd. (KPM) are not covered by the exclusion order issued at the conclusion of ITC Inv. No. 337-TA-266. The IAO therefore becomes the Commission's advisory opinion.

ADDRESSES: Copies of the nonconfidential version of the IAO and all other nonconfidential documents filed in connection with this investigation are 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 SW., Washington DC 20436, telephone 202-252-1000.

FOR FURTHER INFORMATION CONTACT: Paul R. Bardos, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E St., SW., Washington, DC 20436, Room 707M, telephone 202-252-1102. Hearing impaired individuals are advised that information in this matter can be obtained by contacting the Commission's TDD terminal at 202-252-1810.

SUPPLEMENTARY INFORMATION: On April 29, 1988, the Commission issued a general exclusion order at the conclusion of the above-captioned investigation. On June 28, 1988, upon a request by KPM, the Commission instituted an advisory opinion proceeding pursuant to Commission rule 211.54 (19 C.F.R. § 211.54) to determine whether certain reclosable plastic bags sought to be exported to the United States by KPM are covered by the Commission's exclusion order. The proceeding was assigned to the ALJ who had presided over the original section 337 investigation. On March 8-11, 1989, the ALJ held a hearing on the matter in which KPM, the Commission investigative attorney, and the complainant (Minigrip Inc.) in the original investigation participated. On May 25, 1989, the ALJ issued an IAO finding that the reclosable plastic bags sought to be exported to the United States by KPM are not covered by the Commission's exclusion order. On June 12, 1989, complainant Minigrip Inc. filed a petition for review of the IAO. On June 19, 1989, requester KPM filed an opposition to the petition for review.

Authority for the Commission's action is contained in section 337 of the Tariff Act of 1930 (19 U.S.C. § 1337) and Commission interim rule 211.54(b) (53 Fed. Reg. 33075, Aug. 29, 1988).

By Order of the Commission.

Kenneth R Mason

Kenneth R. Mason
Secretary

Issued: July 11, 1989

CERTAIN RECLOSABLE PLASTIC BAGS AND TUBING INV. NO. 337-TA-266

CERTIFICATE OF SERVICE

I, Kenneth R. Mason, hereby certify that the attached NOTICE OF DETERMINATION NOT TO REVIEW INITIAL ADVISORY OPINION, was served upon Cheri M. Taylor, Esq., and upon the following parties via first class mail, and air mail where necessary, on July 11, 1989.

Kenneth R. Mason

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PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
WASHINGTON, D.C.

In the Matter of CERTAIN RECLOSABLE PLASTIC BAGS AND TUBING	Investigation No.: 337-TA-266

Initial Advisory Opinion

Paul J. Luckern, Administrative Law Judge

Pursuant to the Commission Order dated June 28, 1988 this is the administrative law judge's initial advisory opinion under Commission Rule 211.54 (19 C.F.R. 210.54). The administrative law judge hereby determines, after a review of the record developed, that the reclosable plastic bags sought to be exported to the United States by Kingdom Plastic Manufacturing Co., Ltd. (KPM) are not covered by the permanent exclusion order which issued on April 29, 1988.

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ABBREVIATIONS

FF	Findings of Fact
C Post	Complainant's October 1988 Post Discovery Submission
KPM Req.	KPM's Request For Advisory Opinion
KPM Post	Posthearing Statement of KPM (Corrected)
KPM Post 52	KPM's December 23, 1988 Reply to the Supplemental Post Discovery Submission of the Complainant and the Staff
Mini Post	Complainant's Post Hearing Brief
Staff Post	Post-Hearing Brief of the Staff
KPM FF	KPM's Proposed Finding
KPM CL	KPM's Proposed Conclusion of Law
Mini FF	Complainant's Proposed Findings
Mini RFF	Complainant's Proposed Rebuttal Findings
Mini CL	Complainant's Proposed Conclusion of Law
Staff FF	Staff's Proposed Findings
Staff CL	Stab's Proposed Conclusion of Law
KPM Re	KPM's Reply Brief
Mini Re	Complainant's Reply Brief
Staff Re	Staff's Reply Brief
KPM RFF	KPM's Proposed Rebuttal Findings
Mini RFF	Complainant's Proposed Rebuttal Findings
KPM Re Re	KPM's Reply To Complainant's Reply
PEO	Permanent Exclusion Order
PEO ID	Permanent Exclusion Order Initial Determination which issued January 29, 1988
Req.	Request by KPM for Expedited Advisory Opinion
TEO ID	Temporary Exclusion Order Initial Determination which Issued August 31, 1987.

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Introduction

KPM has the burden of establishing noninfringement, pursuant to its request for an advisory opinion [1] that the importation of its reclosable plastic bags would not violate the existing permanent exclusion order (PEO) in this investigation and hence would not infringe either claims 1, 3, 4 or 5 of the '872 patent [2] See, for example the following - Certain Multicellular Plastic Film Inv. No. 337-TA-54 USITC Publication 987 at 23 (June 1979) where the Commission made it clear that the "effect of paragraph 3 [of its order [3]] is to place the burden of establishing

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[1] An advisory opinion proceeding is governed by Commission interim rule 211.54(b). ITC advisory opinions were recently discussed by the Court of Appeals for the Federal Circuit. See, Allied Corp. v. U.S. International Trade Commission 850 F.2d 1573, 7 U.S.P.Q. 2d 1303 (Fed. Cir. 1988), cert. den., 109 U.S. 791 (Jan. 9, 1989).

[2] Only claims 1, 3, 4 and 5 are involved in the PEO. See Procedural History below.

[3] Paragraphs 3 of the order in Inv. No. 337-TA-54 read in part:

> 3. That after considering the effect of such exclusion upon the public health and welfare, competitive conditions in the U.S. economy, the production of like or directly competitive articles in the United States, and U.S. consumers, such film should be excluded from entry;

Paragraph 1 of the PEO is similar. Thus paragraph 1 reads:

> 1. Reclosable plastic bags and tubing manufactured abroad according to a process which, if practiced in the United States, would infringe claims 1, 3, 4 or 5 of U.S. Letters Patent 3,945,872 are excluded from entry into the United States for the remaining life of the patent, except under bond as provided in paragraph 3 below and except as may be licensed by the patent owner.

noninfringement upon would-be importers rather than to require complainant, the aggrieved party in this matter, to prove infringement". [4]

Procedural History

On January 29, 1988 the administrative law judge issued an initial determination finding a violation of section 337 in the alleged unauthorized importation and sale of certain reclosable plastic bags and tubing with the tendency to destroy or substantially injure a domestic industry, efficiently and economically operated, in the United States. Only complainant and the staff made substantive appearances at the hearing which led to the initial determination. On March 16, 1988 the Commission issued a notice not to review that initial determination and on April 29, 1988 issued the PEO. The PEO ordered that reclosable plastic bags and tubing manufactured abroad "according to a process which, if practiced in the United States, would infringe claims 1, 3, 4 or 5 of U.S. Letters Patent 3,945,872 [the '872 patent] are excluded from entry into the United States for the remaining life of the patent, ..." and also that reclosable plastic bags and tubing "which infringe U.S. Trademark Registration No. 946,120 ..." are excluded from entry into the United States. The '872 patent issued on March 23, 1976 and will expire in 1993.

On March 4, 1988, Kingdom Plastic Manufacturing Co. (KPM), relying, <u>inter alia</u>, on a first Yun affidavit and a video tape, requested that the

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[4] In contrast, in a section 337 investigation where a complainant has charged an importer with infringement of a U.S. patent, the complainant has the burden of proving that the importer has infringed a claim of the patent. <u>See</u>, <u>Envirotech Corp. v. Al George, Inc.</u> 730 F.2d 753, 221 U.S.P.Q. 473, 477 (Fed. Cir. 1984); <u>Roberts Dairy Co. v. United States</u>, 530 F.2d 1342, 1357, 182 U.S.P.Q. 218, 255 (Ct. Cl. 1976); <u>See</u> Chisum <u>Patents</u> § 18.06 Vol. 4 (1982).

Commission institute an expedited advisory opinion proceeding and issue an advisory opinion that the importation of KPM's reclosable plastic bags would not violate a general temporary exclusion order (TEO) which issued in this investigation. [5/] In the event that the request was not resolved prior to the expiration of the TEO and a permanent exclusion order issued which would affect KPM's exports of plastic bags, KPM asked that its request be deemed to apply equally to that order.

On June 28, 1988 the Commission, pursuant to Commission rule 211.54(b), instituted an advisory opinion proceeding to determine whether certain reclosable plastic bags sought to be exported to the United States are covered by the PEO. The following requesters of an advisory opinion were named as parties:

(a) Kingdom Plastic Manufacturing Co., No. 9, Alley
240, Chen Kong Road, San Min District, Kao Hsiung,
Taiwan (KPM);

(b) KCL Corp,, Hodell and Prospect Streets,
Shelbyville, Indiana 46176 and KCL Corporation of
Canada Ltd., 1231 Parkinson Road, Woodstock, Ontario,
N4S 7W3, Canada (KCL).

The requests for advisory opinion were certified to an administrative law judge for appropriate proceedings and the issuance, as expeditiously as possible, of an Initial Advisory Opinion (IAO). The requirement of

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[5/] On August 31, 1987 the administrative law judge issued an initial determination granting in part complainant's motion for temporary relief under subsection (e) and (f) of section 337. On October 5, 1987 the Commission decided not to review the initial determination. On November 30, 1987 the Commission issued the TEO prohibiting entry into the United States, except under bond or license, of (1) reclosable plastic bags and tubing manufactured according to a process which, if practiced in the United States, there reason to believe that the process would infringe claim 1 of the '872 patent and (2) reclosable plastic bags and tubing with respect to which there would be reason to believe they infringe U.S. Trademark Registration No. 946,120.

Commission rule 211.54(b) that the requesters have been respondents in the investigation was waived by the Commission.

The Commission, in its June 28, 1988 order, stated that the IAO is to be consistent with the Commission's findings in the original investigation and that the administrative law judge shall rule on the question of whether the reclosable plastic bags sought to be exported to the United States by KPM and KCL are covered by the PEO. 6/

Order No. 63, which issued on June 29, 1988, ordered each of complainant Minigrip, Inc. (Minigrip) and the staff by July 14 to state its position, based on KPM's request, on whether reclosable plastic bags sought to be exported by KPM are covered by the PEO. Also, all the parties were requested by July 14 to present their suggestions concerning whether discovery, and an evidentiary hearing, were necessary. In a response dated July 13, 1988, complainant argued that:

> 1. Bags sought to be exported by KPM should be barred from entry into the United States if, when viewed through a heat-seal-o-scope, they exhibit the birefringence color bands "as set forth by the Commission" [7/] and

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6/ On August 17, 1988 KCL moved to withdraw its request for an advisory opinion. On August 24 the administrative law Judge issued an IAO terminating the advisory opinion proceeding as to KCL. On September 20, the Commission issued a notice not to review that IAO. Hence the question of whether the reclosable plastic bags sought to be exported to the United States by KCL violate the PEO has been rendered moot.

7/ The Commission in its opinion at 4 accompanying the PEO stated:

> We note that a test is now available for use in determining whether a given reclosable plastic bag is produced by a process which infringes the '872 patent. The test is based on the principles of birefringence. Briefly, a Heat-Seal-O-Scope enables an observer to see whether bright blue bands of color appear when polarized light is passed through the reclosable plastic bag being tests, indicated that it is

2. Complainant has reconfirmed its data regarding the birefringence test and hence its belief that that test may be used to determine whether a given reclosable plastic bag is produced by a process, which if practiced in the United States, would infringe the '872 patent.

Complainant suggested that at the close of a discovery period or sooner, if the parties agree that no further discovery is needed, a further hearing be held to determine: (i) whether an evidentiary hearing is necessary and if so, the length and starting date thereof, and (ii) the nature of the final submissions to be made to the administrative law judge.

The staff, in a response dated July 14, 1988, argued that it did not yet have sufficient information from which it could state its position on whether the reclosable plastic bags sought to be exported by KPM are covered by the PEO. The staff then recommended that a sixty day discovery period be established to obtain further information about the process asserted to be utilized by KPM in manufacturing reclosable plastic bags for importation into the United States and that at the end of the sixty day period a determination be made, in light of the information elicited during discovery, on whether an evidentiary hearing was needed.

KPM, in a response dated July 15, 1988, argued that complainant had ignored the administrative law judge's request to state a position on whether reclosable plastic bags sought to be exported by KPM are covered by the PEO, and that no doubt the reason was because complainant did not want to concede that the KPM process in issue clearly did not infringe the '872

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birefringent and therefore infringing. Complainant says that it can provide the U.S. Customs Service with sufficient Heat-Seal-O-Scopes for Customs's use.

patent. KPM also argued that statements of complainant and the staff, which seem to "suggest" that KPM believed that this proceeding must contend with, and resolve, questions regarding the accuracy of the birefringence test, and that KPM is challenging the general use of birefringence by the Customs Service for an infringement test of the '872 patent, are not correct; that there is no need to resort to the secondary or indirect evidence of a birefringence test when there is abundant direct evidence and an offer by KPM of an inspection of the KPM plant; that the Commission did not state in its June 28, 1988 institution notice that the administrative law judge or the Commission itself had to address any birefringence issue; that since the birefringence test was never made part of the PEO, the question of whether a product is covered by the PEO does not necessarily have to deal with the birefringence test; that KPM did not voluntarily raise the issue of birefringence in this proceeding; that KPM expressed its view on birefringence in a June 15, 1988 letter to the Commission only because the Commission requested it to do so before the Commission would institute this proceeding; that as to the broader issue of the accuracy of the birefringence test, KPM had stated, in its June 15, 1988 letter, that as applied to KPM's bags, the birefringence test was inaccurate and inconsistent; and that KPM has no basis to believe that the birefringence test is, or is not, accurate as to any other producer's bags.

Order No. 64, which issued on July 20, 1988 set a discovery period and dates for post discovery submissions. A notice to all parties, which issued on July 22, 1988, based on an oral motion by complainant, extended the dates for the service of post discovery submissions.

On August 25, 1988, KPM moved for a protective order that certain depositions sought by complainant in its notices of August 15 not be had because complainant had waived its right to depositions. Order No. 67, which issued on August 25, denied KPM's motion to the extent that the depositions noticed by complainant would be permitted although the depositions were to take place in Taiwan at a date convenient to the deposed witnesses, unless otherwise agreed to by the parties. Order No. 68, following letters received by the administrative law judge and a telephone call to the staff by the attorney advisor, ordered that discovery in the proceeding be closed on October 14, that post discovery submissions from complainant should be received by the administrative law judge on October 21, from the staff on October 25 and from KPM on October 28. Also Order No. 68 stated that any post discovery submissions should note whether an evidentiary hearing was being requested. The parties were further put on notice that any further motion for extension of procedural dates must be timely made and that in view of the Commission's June 28, 1988 statement that any IAO be issued as expeditiously as possible, a party moving for an additional extension of a procedural date would have a heavy burden to justify the motion.

On October 21, 1988 the administrative law judge received a facsimile copy of complainant's post discovery submission which included an affidavit of Paul A. Tilman and a video tape. Complainant argued that KPM's request for an advisory opinion should be denied, but if an advisory opinion is to be given, such opinion should find that the KPM process in issue infringes claim 5 as well as claim 1 of the '872 patent. Complainant did not believe that an evidentiary hearing was warranted. Complainant summarized its discovery of KPM as follows: plant inspection on August 17, 1988, deposition of KPM's Yun on September 29 and 30, 1988, and request for production of an air ring on October 4, 1988. It also referred to the staff's service of three sets of interrogatories, documents demands and first set of admissions.

The staff, in its post discovery submission received on October 25, 1988, argued that an evidentiary hearing was unnecessary because it has become apparent during discovery that KPM's request does not meet the criteria for issuance of an advisory opinion, and because KPM cannot meet its burden of showing that it does not practice the invention of the '872 patent. In addition, the staff argued that complainant is correct in its assertion that the KPM process infringes the '872 patent at least with respect to claim 5.

KPM, in its post discovery submission received on October 28, 1988 and which included a second Yun affidavit, argued that KPM has standing to maintain its request and that complainant's and the staff's allegations of infringement are without merit. KPM stated that it could see no purpose that would be served by an evidentiary hearing and therefore did not request one. It further contended that complainant's Tilman affidavit and the videotape submitted by complainant are "self serving and unsubstantiated evidence", and noted that KPM "has been denied any ability to conduct discovery of these materials." KPM also argued that while complainant made a passing reference to infringement of claim 1 of the '872 patent, it never demonstrated or even mentioned how KPM's process allegedly infringes that claim.

Order No. 72 which issued on November 4, 1988 granted (1) the staff's Motion No. 266-57 to accept a supplemental post discovery submission, (2) complainant's Motion No. 266-58 to accept a response to KPM's post discovery submission, which response included a supplemental Tilman affidavit, and (3) KPM's Motion No. 266-60 to accept a reply to the additional responses of Minigrip and the staff.

Order No. 73, which issued on November 10, 1988, granted in part KPM's Motion No. 266-56 to strike certain portions of complainant's and the staff's post discovery submissions. The order, citing Commission rules 210.50(b), 210.50(c) and Certain Multicellular Plastic Film, Inc. No. 337-TA-54B, also noted that KPM's request for advisory opinion, which included the first Yun affidavit was in effect a motion for summary determination that the KPM bags sought to be exported to the United States are not covered by the PEO.

Order No. 76, which issued on November 28, 1988 granted a motion of complainant that none of complainant's and the staff's post discovery submissions were to be stricken. Order No. 76, however, gave KPM until December 13 the opportunity to take certain additional discovery with respect to the matters raised by complainant's Tilman affidavits received in October and November 1988 and gave KPM until December 19 to file any supplemental submission relating to any additional discovery.

Order No. 78, which issued on December 5, 1988 granted KPM's expedited motion to set dates for discovery responses to be served by complainant and for deposition of complainant's Tilman. KPM took the deposition of Tilman on December 8 and 9.

Order No. 79, which issued on December 9, 1988, granted in part complainant's cross motion for return of complainant's deposition expenses for KPM's Yun.

On December 19, 1988 pursuant to Order No. 76, KPM served a supplemental post discovery submission in which it represented that because of its firm belief that complainant and the staff have failed to raise a genuine issue of material fact, KPM had taken the position that no hearing, and the enormous additional expense burden which a hearing would impose on KPM, were warranted. However KPM stated that it wished to make clear that its belief that a hearing is unnecessary should not be construed as a waiver of any such hearing in the unlikely event that a determination is made, on KPM's motion for summary determination, that there is a genuine issue of material fact warranting further proceedings.

Order No. 80, which issued on December 27, 1988 granted (1) the staff's "Motion for Leave to File Commission Investigative Staff's Second Supplemental Post-Discovery Submission" (Motion No. 266-64), (2) complainant's request for leave to file a supplemental post discovery submission (Motion No. 266-65) and (3) KPM's motion for leave to reply to the responses filed by complainant and the staff (Motion Docket No. 266-66). Complainant in its supplemental submission requested that a summary determination of infringement be rendered in favor of complainant "in view of the clear evidence that KPM's process does in fact infringe the '872 patent". Order No. 81, which issued on December 29, treated that request of complainant as a motion for summary determination (Motion No. 266-67) and gave KPM and the staff the opportunity to respond to said motion, although the administrative law judge stated that he considered further responses unnecessary. No additional responses were received.

Order No. 82 which issued January 19, 1989 denied KPM's motion for summary determination and complainant's Motion No. 266-67 for summary determination of infringement. Order No. 82 also denied certain contentions of complainant and the staff that the IAO should not be given on whether the KPM bags sought to be exported to the United States would not violate the PEO.

Order No. 83, which issued January 19, 1989 ordered KPM to notify the administrative law judge by January 31 whether KPM wanted an evidentiary hearing and, if a hearing was desired, to set forth a proposed prehearing and hearing schedule; and that if a hearing was requested, the parties pursuant to Commission rule 210.30(d)(3), had the duty to timely supplement all discovery responses served in the IAO proceeding upon obtaining information which indicated that a response that had been made was incomplete or incorrect. Order No. 83 concluded that if no hearing was requested the administrative law judge would forthwith reissue the substance of Order No. 82, as an IAO, to the effect that KPM had not satisfied its burden, as a requester of an advisory opinion, of establishing that the reclosable plastic bags sought to be exported to the United States by KPM are not covered by the PEO.

Order No. 86, which issued on February 1, 1989, referred to a response of KPM setting a schedule for a prehearing procedure and hearing and to KPM's statement that all parties had stated their availability for a hearing on March 8 to 10, 1989. Order No. 86 requested that complainant and staff have any comments on the proposed schedule received by the administrative law judge no later than the close of business on February 2. It further noted that in a telephone call to the attorney advisor by complainant's counsel on January 31, 1989, it was stated that complainant had agreed to the hearing dates of March 8 to 10. Order No. 86 concluded that the administrative law judge expected the hearing to take the following format:

(a) Opening arguments, if any,

(b) KPM's case-in-chief,

(c) Complainant's case,

(d) Staff's case,

(e) KPM's rebuttal, and

(f) Possibly closing arguments;

and that comments on the above format should be received no later than the close of business on February 2.

Order No. 88 which issued February 3, 1989 set a prehearing and hearing schedule which hearing was to commence on Wednesday March 8 and conclude on Friday March 10:

Order No. 92, which issued February 15, 1989 denied KPM's motion for reconsideration of Order No. 82, and stated that the facts of Findings 329 to 351 made in Order No. 82 were the only facts considered established in Order No. 82.

A hearing on the matter commenced on Wednesday March 8 and continued through Saturday March 11. Opening and closing arguments were waived by the parties. Testifying live for KPM were Liang Hong Yun, Robert A. Ferrell, Charles A. Garris and Theodore Davidson, for complainant was Mitchell Sieminski and for the staff was Stan Roth. Due to the admissibility into evidence of the Tilman's affidavits, complainant's Tilman also testified. Posthearing statements were submitted. In addition Order No. 100, which issued April 7, 1989, granted leave to KPM to file a corrected posthearing statement. Order No. 101, which issued April 18, granted leave to KPM to file a reply to Minigrip's reply and also stated that the substantive comments raised in complainant's opposition to the reply would be considered. An April 26 letter from KPM's counsel enclosed the original and two copies of KX-28 which was an affidavit of Robert A. Ferrell regarding conversion of certain measurements he took. It was represented in the letter that all parties did not object to the admissibility of the affidavit.

The matter is now ready for an opinion.

This IAO is based on the entire record including the evidentiary record complied at the March 1989 hearing and the exhibits admitted into evidence. The administrative law judge has also taken into account his observation of the witnesses that appeared at the hearing. Proposed findings submitted by the parties, but not herein adopted, either in the form submitted or in substance, are rejected either as not supported by the evidence or as involving matters which are immateral or not pertinent to the result. The additional findings of fact include references intended to serve as guides to the testimony and exhibits supporting the findings of fact. The references do not necessarily represent complete summaries of the evidence supporting the findings.

Infringement Issue

The Commission in its June 28, 1988 order stated that the administrative law judge shall rule on whether the reclosable plastic bags sought to be exported to the United States by KPM are covered by the PEO and hence would infringe either claims 1, 3, 4 and 5 of the '872 patent and/or infringe Trademark Registration No. 946,120. KPM's counsel has not asked for any consideration of the trademark issue. 8/

Analysis of patent infringement involves determination of the scope of the claims as a matter of law and also of the factual finding of whether the properly construed claims encompass the accused process. See Tandon Corp. v. U.S. Int'l Trade Comm'n, 831 F.2d 1017, 4 USPQ 2d 1283 (Fed. Cir., 1987); Texas Instruments, Inc. v. U.S. Int'l Trade Comm'n, 805 F.2d 1558, 231 USPQ 833 (Fed. Cir. 1986), reh. den., 6 USPQ 2d 1886 (Fed. Cir. 1988).

1. Determination of the Scope of Claims 1 and 5 9/

Independent claims 1 and 5 in issue read:

8/ KPM's counsel represented that KPM does not intend to export plastic bags with any type of color line and because there is no potential for infringement KPM did not ask for any consideration of that issue. (KPM Req. at 12). Complainant argued in the fall

In Order No. 82 at 27 the administrative law judge found nothing in the record to establish that KPM will use the color line trademark on bags it intends to export to the United States. Complainant has not challenged that finding.

9/ This IAO incorporates by reference Findings 1 to 328 of the initial determination which issued January 29, 1988. It also incorporates Findings 329 to 351 of Order No. 82. See Order No. 92. Additional findings commencing with Finding 352 follows the "Infringement Issue" section. Claims 1, 3, 4 and 5 are set forth in FF N 31. Because each of remaining claims 3 and 4 recited in the PEO is dependent upon claim 1, their scope is governed by claim 1.

> 1. In the method of making plastic film with shaped profiles on the surface comprising the steps of: extruding a continuous length of an interlocking profile from a die opening with the profile having a precise shape for interlockingly engaging with another profile;
>
> and directing a flow of coolant onto the extruded profile of warm plastic and adjusting the direction of flow of coolant relative to the direction of movement of the profile for controlling the cooling rate and shape of the profile.
>
> 5. In the method of making plastic film with shaped profiles on the surface comprising the steps of: extruding a continuous length of an interlocking profile from a die opening with the profile having a precise shape for interlockingly engaging with another profile;
>
> and directing a flow of coolant against the heated profile and adjusting the pressure of coolant flow for controlling the cooling rate and shape of the profile.

(FF N31).

In Order No. 82, which denied KPM's motion for summary determination that the importation of its reclosable plastic bags would not violate the PEO, it was found at 35 that there was a genuine issue of material fact as to whether the accused KPM process generates controlled distinct jets of air. 10/

In its post hearing submissions, KPM argued that in order to determine whether the KPM accused process generates a distinct, controlled jet of air which can control the shape of the profile of plastic film, KPM "believes that the background of the investigation requires that there be evidence

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10/ With respect to the word "distinct", complainant had argued that the Commission, at most, had construed the claims of the '872 patent "to require that the flow of coolant be in the form of a jet of air, which is said by complainant to be <u>distinct</u> from the low pressure diffuse air normally obtained with a prior art 'Luca pipe' or conventional air ring." (Emphasis added) <u>See</u> Order No. 82 at 17. Minigrip's Tilman has asserted that in his tests alleged to support infringment, air emerges in "clearly defined air jets including two jets each impinging one of the profiles." (CAO-1 at 4, 5).

that a distinct, localized and small flow [in jet form] be impinging the tube [and that the jet must maintain its form to the point at which the jet impinges the profile] in order for a device to read on the '872 patent." (KPM Post at 5, 7, 8). 11/

Complainant in its post hearing submissions has not denied that that the claims in issue must be construed such that the flow of coolant be in the form of a jet at the point of impingement of the profile. Thus it argued that the accused process infringes the claims in issue because it generates controlled distinct jets of air in that, inter alia, complainant has established that if air is supplied to the air rings of a Minigrip extrusion line at high pressure (as distinct from the normal low pressure operation of such air rings) "a series of jets of air emanate from the air ring apertures to strike the profile tubing" (Emphasis added) (Mini Post at 4); that what is clear from complainant's tests is that "if the air

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11/ As stated in Order No. 82 at 22, 23 it had been argued by KPM that the administrative law judge had held that to achieve the profile-shaping effect called for in the '872 claims, a coolant jet mechanism, i.e. individually controllable air jets, "must be used to direct the coolant flow onto formative plastic profiles (Req. at 21). However in Order No. 82 the administrative law judge found nothing in the '872 patent to the effect that the coolant jet mechanism of the specific type of item 24 of the '872 patent or the coolant jet mechanism of the specific type of item 45 of the 872 patent "must be used" in the claim 1 and 5 processes respectively to shape the profile and also found that neither the administrative law judge nor the Commission had ever made such findings. It was further found in Order No. 82 that no finding had been expressed by the administrative law judge or the Commission that a particular apparatus limitation was being read into the '872 claims. KPM in its post hearing submissions argued that this decision was erroneous and represented that, although KPM is mindful of the application of law of the case and has not pressed arguments in the hearing "on issues which have already been decided", KPM "wishes to make clear" that its failure to press those issues at the hearing or to brief them after the hearing was not a waiver of KPM's rights to seek review of those issues before the Commission or to raise them anew in another forum (KPM Post at 3, 4).

emanating from an air ring, whether that ring is a Minigrip air ring or a KPM air ring, is at a sufficiently high velocity, the air flow will be in the form of jets emanating from the air ring orifices which will impact the tube to thereby control the cooling rate and shape of the profiles." (Emphasis added) (Mini Post at 5); that complainant's Tilman and Sieminski "have established that the KPM air rings when operated at a sufficiently high pressure (exit velocity) would produce discrete jets of air which would impact the tube to control the profile shape" (Emphasis added) (Mini Post at 7); that" [t]he evidence is overwhelmingly clear that KPM does utilize a high pressure air ring...with the air emanating from the air ring being in discrete jets and at a sufficiently high velocity so that some of the jets are directed against the back side of the heated profiles" (Emphasis added) (Mini Post at 7); that Tilman conducted in excess of 300 tests "in which a jet of air or was not was directed onto reclosable plastic bag tubing" (Emphasis added) (Mini Post at 8); that "a jet of coolant against the rear of a heated profile [will] control the cooling rate and shape of the profile..." [Emphasis added] (Mini Re at 4).

While complainant admits that that for infringement of the claims in issue the flow of coolant must be in the form of a jet when the coolant impacts the profile, the staff argued that there no is basis for an interpretation of the claims in issue that the flow of coolant must be in the form of a jet at the point of impingement of the profile. (Staff Re at 4, 5, 6).

As to the word "jet", there was uncontradicted expert testimony at the hearing that a "jet" is understood to mean a concentrated and localized region of high velocity flow emerging into a relatively static body of fluid, or into space (FF 387); that in one mode of fluid motion, the flow rapidly becomes complicated and confused and such a flow is said to be turbulent which is characterized by random and chaotic fluctuation in velocity; that in contradistinction to turbulent flow, the regular flow, in which the fluid moves as it were in layers with different velocities, is said to be laminar which is characterized by a smooth, orderly motion with an absence of the chaotic fluctuation found in turbulent flow (FF 387); that a laminar jet emanating from an orifice will ordinarily undergo a transition to turbulent flow at some distance downstream from the orifice (FF 387); and that under any conceivable definition of the word "jet", it is impossible to conclude that a jet will exist in an area where the air could only be described as a peripherally homogeneous turbulent churning stream (FF 398).

In addition, as to the claim language, claim 1 at issue requires "directing a flow of coolant onto the extruded profile of warm plastic" while claim 5 at issue requires "directing a flow of coolant against the heated profile" (Emphasis added). Such claim language itself focuses on the maintenance of the flow at the point of impact on the profile, and emphasizes that the integrity of the flow must be contained as a flow at the point of impact upon the profile. Moreover, the air flow sources identified in the '872 specification are uniformly called "jets" and are depicted in the drawings as being at a distance from the profiles which is less than the height of the profile itself, consistent with a requirement that the jet be maintained at the point of impact (FF 33 to 37, N38).

The necessity of the continuance of a jet at the point of impact is further supported by the complaint in the original investigation. In the complaint, CX-1, paragraph 41, page 26, Minigrip described the '872 patent at issue on which it based its allegations of infringement of claims 1 and 5, as follows:

> The '872 patent is concerned with controlling the shape of the profiles while they are still in the somewhat plastic, formative stage, by <u>directing a controlled jet of coolant fluid</u>, usually air, <u>on the profiles</u> as they emerge from the extrusion die. <u>By directing</u> and controlling <u>the cooling jet only on the profiles</u> their shapes are manipulated and frozen to properly interlock with each other....[Emphasis added].

The necessity of the continued integrity of the jet is further in the prosecution history of the '872 patent. In response to the Examiner's first office action rejecting all the claims for obviousness, the patentee distinguished U.S. Pat. No. 3,462,332 as follows:

> In reference A, patent 3,462,332, the teaching is to position film with a fastener against a cold roll and to spray or blow a coolant such as water or cold air under the surface of the cooling roll in the neighborhood of the parts. To follow the teaching of this art <u>would merely provide blowing a stream of air without attention to its size or shape</u> onto the roll or <u>onto the material</u> and either liquid or air can be blowed or sprayed. This is what the patentee [of the '332 patent] states in column 4, lines 7 through 15. The patentee teaches no necessity nor contains no suggestion of controlling the rate or direction of the coolant nor controlling it in anyway to control the rate of cooling of the profile (FF 336).

This distinction focuses on the size and shape of the flow <u>as it contacts</u> the material cooled. Therein the patentee of the '872 patent argued that reference A contains "no suggestion in this art of controlled cooling nor the control of cooling by the method set forth specifically in applicant's claims." (CX-1, Exh. H at 4). In response to this rejection claims 1 and 5, then designated claims 10 and 11, were allowed by the Examiner (FF 337).

In the petition for reexamination the patentee had similarly stated that:

> In the overall, the extrusion of profiles at relatively high speed of material which is essentially liquid is a critical art and those skilled in the art have had substantial difficulty in maintaining the dimensions of profiles such that they will satisfactorily interlock when cooled. The Noguchi patent 3,945,872 presents a unique and inventive method of cooling and solidifying the plastic of the profiles and yet simultaneously maintaining their dimensional criticality. As set forth in the application and highlighted by the claims, a continuous length of interlocking profile is extruded from a die opening and coolant is directed onto the profile of warm plastic in a unique manner by adjusting the direction of flow of coolant relative to the direction of movement of the profile as set forth in claim 1. ... Claim 5 provides that the pressure of the coolant flow be adjusted. ...
>
> The prior art at best has considered a flow of coolant onto a continually moving extruded tube with profiles on the surface and in some cases as explied [sic] by Luca Re. 26,991, this is done by tubes which direct flow on the film on a side opposite the profiles. Or, in an arrangement such as Behr 3,875,281, localized flow is directed in the region between the rib and groove elements.

Thus, the patentee characterized the claims in issue as directing coolant "onto the profile" in a unique manner.

This summary distinction occurred in the petition for reexamination after patentee Noguchi had already characterized the Naito '379 patent (reissued as Re. 28,959, KX-16) as disclosing "cooling the tube and profiles by annular rings 14 which surround the tube" (CX-1, Ex. I at 10, 11).

Moreover in the proceeding that led to the PEO ID, Minigrip's Ausnit had stated that: "If a profile is in a formative stage you have to deliver to it a controlled jet of air...." (FF 71 at 93). Delivery focuses on the point of impact rather than the point of issuance.

Complainant also presented testimony which was fully credited and found as fact for the PEO ID that a controlled jet of air impinging the profile is necessary for controlling the shape of the profile. See, FF 67 of PEO ID which reads:

> 67. While [the prior art] Luca refers to "air jet openings", Ausnit testified that if one cannot adequately control the air of the jet itself, one cannot control the shape of the profile. (Ausnit Tr. at 689).

Also complainant's Ausnit testified:

> A. I've tried to explain my position. If a profile is in formative stage you have to deliver to it a controlled jet of air, and you have to have reasonably good control on that air jet. (See FF 71 of PEO ID)

"[T]o deliver to it a controlled jet of air" focuses on the point of contact with the profile. See also, FF 101, 85, 91, 95 of the PEO ID which read:

> 101. According to Ausnit, if one cannot control exactly
>
> , the shape of the profile will not be controlled (Ausnit Tr. at 739).
>
> 85.
>
> (Ausnit Tr. at 719-722).
>
> 91.
>
> (Ausnit
>
> Tr. at 726, 727).
>
> 95.
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> (Ausnit Tr. at 731).
>
> 100.
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> (Ausnit Tr. at 735-738).

Moreover, Ausnit's testimony credited in FF 107 of the PEO ID concerning

"What range of angles would you say that the air jets of the 872 patent can be manipulated over to impinge upon the profiles?" [Emphasis added in above quotations].

Accordingly, based on the foregoing, claim 1 and claim 5 in their language "directing a flow of coolant onto the extruded profile of warm plastic" and "directing a flow of coolant against the heated profile", as well as the language "for controlling the cooling rate and shape of the profiles" are interpreted to require that the separate integrity of a flow of coolant as it is directed from the source and that it must be maintained, as an air jet, at the point of its impact upon the profile.

2. Determination of Whether Claims In Issue Are Infringed

KPM argued that it has established that the KPM process does not practice claims 1 and 5 of the '872 patent and hence that it has sustained its burden of proof that importation of plastic bags on tubing made by KPM's process would not violate the PEO (KPM CL 3, 4, 8). 12/

Complainant argued that KPM has failed to meet its burden of proof that the "alleged KPM process" does not infringe claim 5 of the '872 patent and that a positive birefringence test establishes the infringement of claims 1 or 5 of the '872 patent (Mini CL 2, 3). It further argued that while KPM's equipment, upon complainant's inspection on August 17, 1988,

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12/ Claims 3 and 4 also recited in the PEO are dependent on claim 1. Hence, if claim 1 is not infringed, claims 3 and 4 are not infringed.

did not show the use of a separate air hose to deliver a jet of air onto the profiles while they are in their formative stage (C Post at 12) it is clear that KPM practices the method of claim 5, viz. that KPM is employing excessively large quantities of air in its air rings, which emanates via the small openings therein as jets of air that strike the profile for controlling the profiles's cooling rate and shape of the profile (C Post at 16, 18); and that KPM's practice of claim 5 is confirmed because when sufficient air flows from the air rings to create an air jet, as distinct from the "diffuse" flow of air of the prior art, the tell tale birefringence stripe is present as found with KPM's plastic bags while when a diffuse flow of air emanates from the air ring, such as with the air ring blowing a relatively high volume of low pressure air in the Luca patent at col. 3, lines 8 to 11, . (C Post at 15, 21).

Complainant has also argued that through extensive testing done at Minigrip by complainant's Tilman, Minigrip has established that if air is supplied to the air rings of a Minigrip extrusion line at (as distinct from the normal operation of such air rings) a series of jets of air emanate from the air ring apertures to strike the profile tubing; that Tilman further determined that by adjusting the

that complainant's Sieminski, duplicated the Tilman tests but using a KPM air ring; and that the results Sieminski obtained are the same as those Tilman obtained except for the air velocities involved. It is argued that what is clear from the Tilman/Sieminski tests is that if the air emanating from an air ring, whether that ring is a Minigrip air ring or a KPM air ring, is at a

to thereby control the cooling rate and shape of the profiles; that both complainant's Tilman and Sieminski, through the use of smoke passing through the air rings were able to see the and Tilman produced a video tape which clearly shows the ; and that the height of the KPM air ring was observed by KPM's Ferrell to be approximately above the extruder so that the plastic forming the profiles remained in the formative stage as the tubing passed through the air ring (Mini Post at 4 to 6).

The staff's position is that KPM has met its burden of proving that its "alleged process" does not infringe claim 1, but that KPM has not met its burden as to non-infringement of claim 5 of the '872 patent". (Staff CL 1 to 4). It further argued that the type of equipment and operating conditions used by KPM to manufacture its reclosable plastic tubing remains unclear (Staff Post at 5).

(a) The Accused KPM Process and Claim 5 In Issue

Claim 5, as well as claim 1, recite in their paragraph 1:

> In the method of making plastic film with shaped profiles on the surface comprising the steps of: extruding a continuous length of an interlocking profile from a die opening with the profile having a precise shape for interlockingly engaging with another profile;

It is undisputed that the accused process of requester KPM, a Taiwanese company (FF 352), is covered by paragraph 1 of claim 5. <u>See</u> FF 362, 363, 364. At issue is the second paragraph of claim 5, <u>viz</u>:

> and directing a flow of coolant against the heated profile and adjusting the pressure of coolant flow for controlling the cooling rate and shape of the profile.

This second paragraph requires that the separate integrity of a flow of coolant, as it is directed from the source, must be maintained, as an air jet, at the point of the air's impact upon the profile. Thus if it is found that KPM has established that the air is not so controlled, claim 5 is not infringed.

In KPM's production process the integral profiled tubing is extruded upwardly from an extrusion die. Above the die are annular metal air rings, usually two rings, situated around and outside the extruded tube as it travels upwards, each ring directly above the other. The air rings used by KPM each contain along their inner circumference facing the extruded tube

from

which air emanates toward the extruded tubing with the integral profile (FF 365).

The tubing in KPM's production process is not nearer than a minimum of approximately inches from the inner surface of any air ring and the tubing is usually much further than that from any air ring. On some of KPM's tubing the tubing is more than inches away from the inside of the air ring. As an example one of the tubes extruded during the visit of Robert A. Ferrell [13] to KPM in February 1989 was inch in lay flat

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[13] At the hearing Robert A. Ferrell was qualified as an expert in the area of manufacturing extrusion process for the manufacture of reclosable plastic bags, including tubing and related products (FF 353). Ferrell traveled to KPM's production facility in early February 1989 and spent two full days at the facility observing all phases of KPM's production process under normal operating conditions (FF 357). During Ferrell's visit he made detailed measurements and detailed observations and offered testimony at the hearing on said measurements and observations (FF 357).

size, with a diameter of approximately inches. Since the tube had been extruded travelling through a ring with an inside diameter of inches, the tubing was over inches away from the ring. Ferrell's measurements concerning the rings and tubes extruded therein confirm the testimony of KPM's Yun (FF 360) as to the relative spacing between the tube being extruded and the air ring through which the tubes pass. The videotapes and photographs submitted of the KPM process show a spacing between the diameter of the tube contained within the ring (FF 381).

The tubing in KPM's production process continues travelling upwards after passing through the air rings to the top of a tower and is subsequently collected on a large wooden reel or spool for subsequent conversion into bags (FF 365).

In the accused process, KPM also may use a vertical cooling pipe vertically disposed in the direction of the passage of the tube upwards from the die, and clamped to a metal supporting structure. This vertical pipe is situated above the air rings at a position on the circumference of the tube facing the profiles, with the pipe containing an array of lines of about inch sized holes from which air emanates toward the profiles for their cooling (FF 367).

KPM uses only the air rings and the vertical cooling pipe for cooling the extruded profiled tubing in the accused process (FF 368). It is only the air rings that complainant contends emanate jets of air that strike the profile and thus control the shape of the profile (C Post at 16, 18).

There is uncontroverted testimony by Prof. Charles A. Garris [14] that the term "jet" means a concentrated and localized region of high velocity flow emerging into a relatively static body of fluid, or into space, as opposed to a peripherally spread-out relatively uniform stream of flow. In one mode of fluid motion, the flow rapidly becomes complicated and confused. Such a flow is turbulent. In contradistinction to turbulent flow, regular flow, in which the fluid moves as it were in layers with different velocities, is laminar. Thus turbulent flow is characterized by random and chaotic fluctuations in velocity whereas laminar flow is characterized by a smooth, orderly motion with an absence of such fluctuations. A laminar jet emanating from an orifice will ordinarily undergo a transition to turbulent flow at some distance downstream from the orifice. Such behavior can easily be observed from the smoke of a cigarette in still air whereby it starts as laminar, but above a certain level, it transforms rapidly to turbulent flow (FF 387). As one increases the exit velocity of a jet, the transition distance, i.e. transition from laminar flow to turbulent flow, decreases and once a jet becomes turbulent, diffusion occurs very rapidly. One of the most important factors in

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14/ At the hearing Garris was qualified as an expert in fluid mechanics and heat and mass transfer (FF 358). Garris has been a professor of engineering since September 1978. From June 1985 to September 1986 he was principal investigator, on a contract for "Flow Induction by Rotary Jets." (FF 358). Garris was asked by KPM to examine KPM's process for the manufacture of reclosable plastic tubing with integral profile and in particular the means used by KPM to cool its extruded tubing. He studied the video tapes of KPM's process, the still pictures of that process contained in KPM's Request for Expedited Advisory Opinion, and the description of that process provided by KPM's Yun in his affidavits. He also studied the findings of Ferrell contained in KX-2 and was provided with one of KPM's actual air rings (KPX-1) which it uses on its production lines. He further characterized and measured the air flow emerging from the KPM air ring under KPM's normal operating conditions (FF 359).

determining where diffusion occurs is the interaction between adjacent jets. As the air flow travels radially from an orifice, it grows considerably in size (FF 388). Moreover when one has two turbulent jets in close proximity to each other, the nature of the turbulence is such that it causes those jets to merge into each other. (FF 389).

Complainant has argued that the KPM air rings emanate jets of air that strike the profile. Garris however conducted a detailed and expert mapping test under conditions representative of the conditions of the accused process (FF 391 to 396) and showed that in the accused process the air flow of the KPM air ring underwent a transition from laminar to turbulent flow at approximately inch from the air ring; that at inch the flow became turbulent and erratic, and beyond inch there was no localized area in which the flow displayed any characteristics different than the area as round it; that under any conceivable definition of the word "jet", while separate jets initially emanate from the air ring orifices it is impossible to conclude that any jet existed in the area of the KPM air ring beyond inch from the inner surface of the ring; and that the air in the region adjacent to the tubing could only be described as a peripherally homogeneous turbulent churning stream (FF 398).

The detailed mapping test performed by Garris is the most accurate way to determine the nature of the flow field. Among experts in the field of fluid dynamics, there is no question but that the hot-film (or hot-wire) anemometer employed by Garris in the test (FF 392, 393) and which Garris monitored with an oscilloscope (FF 397) is the preferred instrument for application in mapping jet flows and is among the most accurate for this purpose (FF 407).

An additional study performed by Garris using a helium tracer bubble generator confirmed the results which Garris found in his mapping test (FF 401, 405). Also a smoke visualization test conducted by Garris confirmed the test results from the mapping test (FF 401, 408).

In addition to the tests performed by Garris, a smoke visualization test performed by Ferrell during his February 1989 visit to KPM's facility confirmed Garris' results (FF 410).

Complainant in support of its argument that KPM's air rings emanate jets of air that strike the profile rely on testimony of Sieminski and Tilman. While Sieminski is an expert in the microscopy of polymers and birefringence, he has no training in fluid mechanics nor in the characterizations and measurement of air flow (FF 413). In Sieminski's smoke visualization test

(FF 413). In addition there is uncontroverted expert testimony that the used in Sieminski's measurements was inappropriate (FF 413). Moreover in tests Sieminski conducted and relied on he did not know whether or not adjacent flow patterns merged before impact on tubing (FF 428). Sieminski testified that all he could say was that it is his opinion that jets "are impinging in the vicinity of the profile, but I cannot say that it's impinging on the profile" (FF 426). He later testified that at the point he contends there is some impingment "in the area", he has no idea what the dimensions of the flow stream are (FF 426). Referring to a Tilman videotape relied on by complainant, Sieminski testified that it was

The administrative law judge rejects complainant's argument that as to KPM's air rings the size of the holes and spacing thereof "does not appear correct" based upon the circumference of the rings (Mini RFF 2). KPM's air rings used in the accused process have the same basic design with inlet ports. However they come in three sizes, i.e. small, medium and large which are approximately inches respectively in internal diameter (FF 372). Garris, consistent with those calculations, testified that his measurements indicated that the holes on the KPM air ring (KPX-1) were spaced approximately inch. This inch measurement is in harmony with an examination by the administrative law judge of the physical ring Garris examined and Garris' depiction of the air ring in KX-11 indicating center-to-center markings. Based on these calculations and Garris' measurement of the size of the air hole diameter, the distance from the nearest edge of one hole to the nearest edge of an adjacent hole (i.e. spacing minus about diameter of a hole equals the edge to edge distance) is consistent for KPM's three different sized air rings and is respectively approximately (FF 377).

Complainant and the staff have argued that the record shows inconsistencies in the internal diameter of KPM's air rings, size of the holes and height of the air ring. (Mini FF 2, 17, Staff FF B1, B2, B3).

As to the KPM air rings, KPM does not make its air rings. The air rings are given to a metal shop to make and the shop makes them roughly to size (FF 372). The testimony of KPM's Yun at the hearing was credible and was substantially corroborated by KPM's extrusion expert Ferrell. Earlier inconsistent statements of Yun concerning the non-critical height of the air rings and the non-critical size of the air ring openings were explained at the hearing. The administrative law judge can understand Yun's position that he initially did not think it important to list variations in air ring diameter. Before this advisory opinion proceeding there had been no contention that an air ring could be used to practice the '872 process. Contentions that an approximate inch diameter, for example, is inconsistent with an attested inch diameter are considered specious, unrealistic and inconsistent with the meaning of approximate. The testimony of Yun and Ferrell concerning KPM equipment and process are persuasive and unrefuted by any contrary evidence.

As to the height of the air ring, the vertical adjustment of the air ring in terms of height from the top of KPM's die does not affect the velocity or type of air coming out of the KPM air ring and KPM uses no specific standards in terms of where the air ring is set vertically relative to the tope of the die head, and is not critical in terms of the claimed process steps (FF 379). Moreover, of particular consequence is uncontroverted expert testimony that the single most significant characteristic that affects the flow of air from the KPM air ring is the merging of the turbulent jets and the most important parameter is the spacing between the holes or orifices of the air rings; that the size or diameter of the holes in the KPM air rings is not an important factor in affecting the flow of air within the range of the size of holes KPM has used in the accused process; that a change in the size of the hole of the KPM air ring from two millimeters to four millimeters is not a significant factor in the effect of the air flowing from the ring; and that there would not be a major effect in any difference in the characteristics of air flow that would emerge from the various sizes of air rings which KPM uses, assuming the same level of pressure (FF 374).

Complainant argued that KPM practices the method of claim 5, *viz*. that KPM, using adjustable high pressure large capacity blowers and operating near the point at which the tubing starts to shake, is employing excessively large quantities of air in its air rings which emanates via the small openings therein as jets of air that strike the profile (CPost at 16, 18). Thus according to complainant's theory, shaking is due to the high air pressure level from KPM's air ring. In support of complainant's argument complainant relies on the testimony of its Sieminski to the effect that in a videotape of KPM's production process Sieminski observed the plastic tubing shaking and particularly noticed the The videotape was the only exposure by Sieminski to KPM's accused process. Ferrell, an expert in extrusion, in his observation of the accused process in Taiwan did observe some detectable but non-dramatic movement of the tubing on only one of the lines used by KPM to produce profiled tubing. That movement was being caused by Ferrell was certain that any movement was not due to the air pressure level from the air ring. [15/] To be certain Ferrell shut the air intake completely, stopping the flow of air altogether through the ring but still observed said movement to the same degree (FF 414). The record does establish that at the beginning of each production run the opening of a cover plate on a blower intake may be adjusted by the workers by opening or closing panels to the air blower. The adjustment by the workers is made only to ensure that the velocity of air flowing from the air rings is enough to cool the extruded tubing evenly around its entire circumference. Once an opening is set no further adjustments to the opening are made and no detailed measurements or settings for the KPM machines are kept. The openings are not set relative to some point at which the tube is shaking (FF 384). It is found that the record supports the finding that any movement, i.e. shaking, of the tubing in KPM's accused process in not due to any adjustment of the velocity of air coming from the air rings.

Complainant has argued that a positive birefringence test established infringement of claim 5. While the administrative law judge found from the uncontested PEO hearing that the birefringence tests "provide evidence of the use of the '872 process" (PEO ID at 25) he did not find that the tests establishes infringemnt when there is direct evidence, as found here, that the accused process does not infringe a claim. Moreover the evidence at the hearing showed that a birefringence test does not conclusively

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15/ Both Ferrell in his pressure determination of the accused process and Garris in his pressure determination during the tests he conducted used a U-tube manometer (FF 390, 391). The U-tube manometer is an extremely simple and well accepted device and its accuracy depends only on the degree to which the difference in elevation between two miniscus can be measured with an ordinary ruler, and the knowledge of the properties of the manometer fluid (FF 391).

establish that a given reclosable plastic bag is produced by a process which infringes the '872 patent. Thus even complainant's Sieminski testified in the March 1989 hearing that if the bag looked at is not a 2-mil bag, a positive birefringence test would not show that an air jet was used in producing the bags (FF 429). Prof. Theodore Davidson, who at the hearing was qualified as an expert in the analysis of polymers by means of polarized light (FF 429), testified that the measurement of birefringence alone in extruded polyethylene does not allow specification of the thermal history of the extruded polythylene (FF 438).

Based on the foregoing the administrative law judge finds that KPM has established that the accused process in issue does not infringe claim 5.

(b) *Claim 1 In Issue*

Claim 1 in issue can be broken down into the follow steps:

> 1. In the method of making plastic film with shaped profiles on the surface comprising the steps of:
>
> [1] *extruding a continuous length of* an interlocking *profile* from a die opening with the profile having a precise shape for interlockingly engaging with another profile;
> and [2] *directing a flow of coolant onto the extruded profile* of warm plastic
> and [3] *adjusting the direction of flow* of coolant relative to the direction of movement of the profile for controlling the cooling rate and shape of the profile. [Emphasis added]

In Order No. 82 it was found at 35-36 that the antecedent in claim 1 to "adjusting the direction of flow of coolant" of step 3 is the claim's recitation in step 2 of "directing a flow of coolant"; that only one flow of coolant is required and referred to in the step 2 recitation of "*a* flow of coolant" (Emphasis added); and that hence a literal reading of claim 1 requires that the adjustment of direction be made in *a* coolant flow.

Reference was also made to the fact that complainant has offered no testimony from one skilled in the art that claim 1 can be read on a process merely having different coolant flows impinging the profile from different directions and that to the contrary FF 85 of the PEO ID showed that when complainant practices the process of the '872 patent, Finally it was pointed out that complainant had not contradicted the testimony of KPM's Yun that the direction of the flows of jets within its fixed air ring is not adjusted. While Order No. 92 states that the facts of findings 329 to 351, which formed a portion of Order No. 82 and which did not relate to whether KPM infringed claim 1, were the only facts considered established through Order No. 82, complainant at the hearing made no attempt to show that claim 1 should be interpreted as reading on a process wherein there merely exists more than one stationary coolant flow or to show that KPM's Yun is in error in taking the position that the direction of the individual flows of KPM's jets is adjusted in direction. Hence, the administrative law judge finds that KPM has established that it does not adjust the direction of flow of coolant relative to the direction of movement of the profile. Thus KPM's air ring is only adjusted before the production run (FF 379, 380). KPM's Yun testified that the ring Since the rings are kept the direction of air flow relative to the movement of the profile is consistent (FF 380). The perpendicular angle that the horizontal radial air flow makes, relative to the vertical direction of profile movement is unchanged. Thus, the direction of the movement of coolant flow relative to the direction of profile movement is unchanged. Moreover, Yun's statement of the fact that the ring is supported by the nature of KPM's air ring apparatus (FF 366, 382, 383). The

supports the position that an in-process annular adjustment in the air ring position would be awkward.

In addition for reasons stated with respect to claim 5 it is found that KPM has established that in its process it is not "directing a flow of coolant onto the extruded profile or warm plastic" called for by paragraph 2 of claim 1. Accordingly, it is found that KPM has established that its accused process does not infringe claim 1 in issue.

Additional Findings of Fact

Requester KPM

352. Requester Kingdom Plastic Manufacturing Co. (KPM) is a Taiwanese company with offices located at No. 39 Chung San North Rd., Taipei, Taiwan. KPM currently at a factory located at No. 1, Lane 49, Gwu Ching Rd., Pan Chiao City, Taipei Hsien, Taiwan manufactures, by extrusion, profiled polyethylene plastic tubing for reclosable plastic bags which bags it is seeking to export to the United States. (Yun 2/88 Aff. KX-8 at 1-3; Yun Dep. CPX-4 at 92-93; Order No. 82, FF 341; SX-AO Ex. 12 at 2, SX-AO Ex. 17 at 1).

Robert A. Ferrell

353. Robert A. Ferrell is KPM's qualified expert in the area of manufacturing extrusion process for the manufacture of reclosable plastic bags, including tubing and related products. (Tr. at 623; KX-2 at 1 to 4; KX-5).

354. Ferrell after graduating from college in 1949, became employed by Kennedy Car Liner and Bag Co. of Shelbyville, Indiana. In 1964, the company changed its name to KCL Corp. Ferrell worked for KCL from 1949 until his retirement in June of 1988. Upon joining KCL Ferrell was part of the Product Development Department, where he worked on the company's transition from paper to plastic packages. In the period 1955-1956 Ferrell became technical director at KCL, in which position he continued his work on developing new plastic packaging products and processes for the manufacture of those products. In 1965 he was named Vice President, Research and Development, and held that position until his retirement,

continuing his work on developing new paper and plastic packaging products and manufacturing processes. (Ferrell KX-2 at 2).

355. During Ferrell's period of work on polyethylene (PE) reclosable bags, Ferrell (and KCL) had extensive contacts with complainant. In the early days, the only significant participants in this market were KCL, complainant (known then as Flexigrip), and a company known as Polyfab, which KCL eventually acquired. In approximately 1962, complainant acquired certain patent rights from the Japanese company Seisan Nappon Sha (Seisan).

356.

From around the time that complainant moved to Orangeburg (around 1964), Ferrell visited complainant's plant on a frequent basis (at least 4 or 5 times a year) to review with complainant new developments in production processes and technology in the field and during those visits Ferrell had exposure to the production processes that complainant was using, including, the means complainant was using to cool extruded film and profile. On those visits Ferrell dealt principally with complainant's Steve Ausnit, whom Ferrell has known since 1955. During the years of said visits Ferrell also traveled frequently out of the United States to visit plastic bag producers. Those visits included a trip to the Seisan factories in Japan in 1972, where he met Noguchi and saw the production processes then being used and developed, trips to Denmark, France, Finland, Germany, Italy, Spain, Taiwan, Hong Kong, Singapore, Switzerland, England, New Zealand and Australia, where Ferrell visited producers of plastic packaging.

As part of Ferrell's position as Vice President, Research and Development at KCL, it was his responsibility to familiarize himself with and follow patent developments related to reclosable plastic bags and production processes therefor. (Ferrell KX-2 at 3, 4).

357. Ferrell was asked by KPM to travel to its production facility in Pan Chiao City, Taiwan, to observe its production process first-hand and take detailed measurements and make detailed observations of that process. Ferrell in early February 1989 spent two full days at that facility observing all phases of the production process under normal operating conditions (in fact, because the Chinese New Year holiday had just ended, the facility's was faced with the tight production schedule). Ferrell was advised by the facility's personnel, and had no reason to doubt, that the operating conditions he observed were the conditions under which the production process ordinarily operated. (Ferrell, KX-2 at 10).

Charles A. Garris

358. Professor Garris is KPM's qualified expert in fluid mechanics and heat and mass transfer. Garris has been a professor of engineering since September 1978. From June 1, 1985 to September 1986 he was principal investigator, on a contract for "Flow Induction Rotary Jets." (Tr. at 906; KX-6; Garris KX-3 at 1).

359. Garris was asked by KPM to examine its process for the manufacture of reclosable plastic tubing with integral profile and in particular the means used by KPM to cool its extruded tubing. He studied the video tapes of KPM's process, the still pictures of that process contained in KPM's Request for Expedited Advisory Opinion, and the descriptions of that process provided by KPM's Yun in his affidavits. He also studied the findings of Robert Ferrell contained in KX-2 and was provided with one of KPM's actual air rings (KPX-1) which it uses on its production lines. He further was asked to characterize and measure the air flow emerging from KPM's air rings under KPM's normal operating conditions. (Garris KX-3 at 1, 2, KX-22).

Liang-Hong Yun

360. Liang-Hong Yun, who testified on behalf of KPM, is both sales manager and chief engineer for and is an owner of KPM. Yun has worked in the field of reclosable plastic bag extrusion since the founding of KPM at the end of 1986. Mr. previously worked in sales and is a high school graduate who thereafter served in the army as a mechanic. (Yun KX-9 at 1; Yun Dep. CPX-4 at 15-24).

The Equipment and Process of KPM

(a) Number of Extruder Lines

361. Ferrell in his visit to the KPM plant observed that KPM had extruder lines at the Pan Chiao City factory which confirms testimony of KPM's Yun. (Yun Dep. CPX-4 at 49, 53. 54. 58. 169, 208). At the time of Ferrell's visit

All of the lines had the same basic configuration, i.e., two cooling rings and a vertical pipe above them, which Ferrell testified is the same as the pictures contained in KPM's Request for Expedited Advisory Opinion. Ferrell, consistent with KPM Yun's testimony (KX-1 at 2), testified that he observed no individual, controllable air jets at any place in the KPM production process nor did he see any evidence that would have suggested such jets were ever used on KPM's machines. (Ferrell KX-2 at 6 to 8; Ferrell Tr. at 660, 661).

(b) KPM Uses A Blown Film Continuous Extrusion Process

362. KPM utilizes a blown film continuous extrusion process in which plastic raw material, polyethylene in pellet form, is first placed in an inverted conically shaped hopper which opens into a rectangular shaped powered extruder machine in which the plastic is mixed and heated, with a main control panel regulating the extrusion speed and the temperature in different zones of the extruder. The heated molten polyethylene plastic is continuously extruded upwardly from the extruder through an annular opening in a mold or die, in the form of a continuous thin plastic film of annular tubing. Continuously and integrally extruded out of a single die with the tubing are two lengths of relatively thicker plastic profile situated at

two positions on the inside circumference of the tubing. Air is fed into the tubing supplied from a compressed air supply source at a constant pressure through an opening in the center of the mold as the annular tube issues from the extruder, so that the molten extruded tubing is blown and kept inflated after it exits the die and is prevented from collapsing inwardly until later cooled. (Yun KX-8 at 4-8; KPX-10; Yun Dep. CPX-4 at 40-3, 164; Yun Dep. Ex. 6; CPX-2; SPX-AO Ex. 1; Ferrell KX-2 at 7).

(c) KPM Extrudes Profiled Tubing of Different Sizes

363. KPM extrudes tubing of different sizes in depth and has to change molds to make tubing of certain different sizes. KPM extrudes profiled tubing of (Yun Tr. at 471; Yun Dep. CPX-4 at 49, 53, 58, 74, 169, 208; Ferrell KX-2 at 6-8; SPX-AO Ex. 1).

364. KPM's profiled tubing contains two shaped, small sized and continuous profiles for interlocking engagement upon the conversion of the tubing into reclosable plastic bags. One profile is a rib or male profile with one arrowhead barbed prong and the other profile is a female or grooved profile with two closely spaced prongs with opposing barbs for receiving and retaining the male profile in an interlocking engagement. Upon visual inspection of KPM samples of profiled tubing, the profiles are small in size, with the female profile overall appearing to be roughly .1 inch total in width. Measurement of a single length of KPM tubing sampled showed that the gap between the two prongs of the female profile is between inch, indicating the small size of the KPM profile. (Yun KX-8 at 1, 8; Yun Dep. CPX-4 at 214-218; CPX-5; SPX-AO Ex. 2A.& B; Garris KX-22 at 8-9; KX-19C).

(d) KPM Uses Air Rings

365. The integrally profiled tubing in KPM's process is extruded upwardly from the extrusion die and continues travelling in a vertical direction from the die. Above the die are annular metal air rings, usually two rings, situated around and outside the extruded tube as it travels upwards, each ring directly above the other. The air rings used by KPM each contain along their inner circumference facing the extruded tube a from which air emanates toward the extruded tubing with the integral profile. The tubing continues travelling upwards to the top of a tower and across a guide roller situated there in a position well above the die, and from there the tubing moves down to opposed powered moving rollers which pull the tubing. The tubing travels through and around guides and roller bars and is flattened and subsequently collected on a large wooden reel or spool at the end of the extrusion line for subsequent conversion into bags. (Yun KX-8 at 11-12; Yun Dep. Ex. 6; Yun Dep. at 41-44; KPX-10; CPX-2; CPX-3; SPX-AO Ex. 1)

(e) KPM's Extrusion Lines And Air Ring Support

366. Each extrusion line contains a series of framed metallic towers in which the rollers and guides are located. The first tower in the extrusion line has four vertical corner posts and a rectangular floor or base on which rests the end portion of the extruder containing the extrusion die, the die being positioned centrally above the base. Secured proximate to the vertical frame posts are vertical metallic support rods. Secured to the vertical support rods are horizontal support rods which terminate in a C shaped clamp,

(CPX-11; CPX-12; SPX-AO Ex. 1, frames, e.g. 535, 565, 2081; CPX-2; KPX-8; KPX-10).

(f) KPM Also Uses Vertical Cooling Pipe

367. As a part of KPM's process of extruding profiled tubing, KPM also uses a vertical cooling pipe vertically disposed in the direction of the passage of the tube upwards from the die, and clamped to a metal supporting structure. This vertical pipe is situated above the air rings at a position on the circumference of the tube facing the profiles, with the pipe containing inch sized holes from which air emanates toward the profiles for their cooling. On the rare occasion when the weather is extremely hot, KPM uses and under certain weather conditions The pipe receives air supplied through a hose attached to a blower comprising an electric motor operating a fan and a circular air intake with covering panel, similar to the blower used as the air supply source for the air rings. (Yun KX-8 at 8-11, 13; Yun CPX-4 at 41-42, 44, 177-179; Yun CPX-4, Exs. 6, 13-I, 16-H, 17-G; Ferrell KX-2 at 7-8).

368. Other than the air rings and the vertical pipe, KPM does not use any other machinery for the purposes of cooling the extruded profiled tubing in the accused process. (Yun KX-8 at 4; Yun Dep. at 44; CPX-2; CPX-3; SPX-AO Ex. 1).

(g) Ferrell's Measurements

369. In Ferrell's visit to KPM in February 1989 Ferrell took, or under his supervision had taken, a series of detailed measurements of each of the machines extruding tubing at KPM's factory including the air rings. These measurements had to be converted to standard English measure because of the difference with the "Chinese" inch used in Taiwan (KX-28). Ferrell testified that the lines were set up as follows:

A. Line 1

Tubing size:
Air Ring size (inside diameter):
Number of Air Rings:
Blower size (per spec):
Blower Intake Opening:
Line speed:
Air Temperature:

B. Line 2

Tubing size:
Air Ring size (inside diameter):
Number of Air Rings:
Blower size (per spec):
Blower Intake Opening:
Line speed:

C. Line 3

Tubing size:
Air Ring size (inside diameter):
Number of Air Rings:
Luca Pipe
Blower size (per spec):
Blower Intake Opening:
Line speed:

D. Line 4

Blower size:

E. Line 5

Tubing size:
Air Ring size (inside diameter):
Number of Air Rings:
Luca Pipe
Blower size (per spec):
Blower Intake Opening:
Line speed:

(Ferrell KX-2 at 7, 8 KX-23 at 1; Ferrell Tr. at 664-671; Ferrell KX-28).

The Structure of the KPM Air Rings

370. KPM normally uses air rings in its process for extruding reclosable plastic tubing. During the inspection by complainant on August 17, 1988 and during Ferrell's visit in February 1989, KPM was operating with annular air rings for cooling the extruded plastic tubing on each extrusion line as shown in a videotape of its process. The air rings shown in the videotape (KPX-10) have an external diameter of about and an internal diameter estimated by measurement to be about The videotape depicted one extrusion line to illustrate the KPM process, although KPM at the time of the videotape had multiple extruding lines. The particular apparatus used by KPM may vary slightly from the configuration shown in the videotape. (Yun KX-8 at 9, 12; Yun Tr. at 145, 444-448; Ferrell KX-2 at 7-8).

371. All of the KPM air rings operating on an extrusion line Different size rings and different size tubing may be

used in the extrusion lines. (Yun KX-1 at 2, Ferrell KX-2 at 7, 8; CPX-2 SPX-AO Ex. 1).

372. Although all of KPM's air rings have the same basic design with the air rings on KPM's production lines come in three sizes, i.e. KPX-1 is one of the sized air rings. The KPM's air rings contain holes on the inside circumference of the ring, with approximately holes in the inch inch ringe, approximately holes in the inch ring, and approximately holes in the inch ring. During Ferrell's visit KPM's air ring was measured by estimating its diameter since at that time tubing was being run in it and the ring size could not be measured accurately. That line was finally shut down, the ring was measured and found to have an exact inside diameter of inches rather than inches. KPM does not make its air rings. The air rings are given to a metal shop to make, and the shop makes them roughly to size after instructions to the shop to make the ring about a certain size. Thus Yun testified:

> Q Mr. Yun, I'd like you to measure this inside diameter of KPX-7 [sic]
>
> A It's close to [i.e. CPX-7].
>
> Q And your testimony is that you have never sized this size air ring on a KPM extruder; is that correct?
>
> A My testimony, I didn't say we didn't use diameter, but this is our ring, but we didn't make them. We give to the machine shop or metal shop to do, to make all this, and they don't really match it very carefully, because we tell them, well, about and so on, and they just make it in roughly that size.

(Yun KX-1 at 3; Yun KX-24 at 1, Ferrell KX-2 at 7-8, Ferrell KX-23 at 1; Ferrell Tr. at 703-704, 713-714; Yun Tr. at 449-450, 536-537; KPX-1; Garris KX-3 at 2; Sieminski CPX-9 at 2-4).

373. The normal size of the air ring holes used in the KPM production process is approximately millimeters. This is equivalent to inch, as one millimeter is equivalent to .04 inch (American Heritage Dictionary at 779 (2d College Ed. 1982)). Garris found them to be about inch diameter. However KPM has previously, at an early stage, used an air ring having larger mm sized holes. The distance between the holes in a KPM air ring with holes larger than millimeters is approximately inch which is the same distance in the KPM air rings with holes of millimeters. (Ferrell Tr. at 654-5; Yun Tr. at 454, 455, 456, 458, 516, 517, 537, 543-544, 547, 548, 549; Yun KX-1 at 3; Yun KX-8 at 13, Yun Dep. CPX-4 at 180-182, Garris KX-3 at 2; Garris Tr. at 1025).

374. The single most significant characteristic that affects the flow of air from the KPM air ring is the merging of the turbulent jets and the most important parameter is the spacing between the holes or orifices of the air rings. The size or diameter of the holes in the KPM air rings is not an important factor in affecting the flow of air within the range of the size of holes KPM has used in its production processes. A change in the size of the hole of the KPM air ring from to is not a significant factor in the effect of the air flowing from the ring. There would not be a major effect in any difference in the characteristics of air flow that would emerge from the various sizes of air rings KPM uses, assuming the same level of pressure. (Garris Tr. at 1060 to 1063; Garris KX-22 at 3).

375. KPM's air rings are

(Yun Tr. at 479; KX-1 at 3; KPX-10; Ferrell Tr. at 673-74; Garris Tr. 1002-1011).

376. Garris took very detailed measurements of a KPM air ring, KPX-1, which was supplied to him and found that the ring had an internal diameter of approximately inches and a around its inside circumference. The air hole or orifice spacing was approximately inch. (Garris KX-3 at 2; KX-11; Sieminski CPX-9 at 2-4).

377. Based upon the above ring internal diameter measurements, the circumferences of the three rings found by multiplying pi (3.14159) by the respective diameter are respectively approximately The spacing between the center of adjacent holes on the air ring, based on the circumference and number of holes (i.e. circumference divided by number of holes equal spacing) is thus consistent between the three different air ring sizes and is respectively Even with a possible variance of 1 or 2 holes in the number of holes in an air ring, (Yun Tr. at 460-461), the spacing between holes would not significantly change. Garris, consistent with those calculations, testified that his measurements indicated that the holes on the KPM air ring KPX-1 were spaced approximately inch. This inch measurement is in harmony with examination by the administrative law judge of the physical ring Garris examined and Garris' depiction of the air ring in KX-11 indicating center-to-center markings. Based on the calculations

in this finding and Garris' measurement of the size of the air hole diameter, the distance from the nearest edge of one hole to the nearest edge of an adjacent hole (i.e. spacing minus about diameter of a hole equals the edge to edge distance) is consistent for the different sized air rings and is respectively inch (i.e.), inch and inch. (Garris KX-3 at 5; Garris KX-22 at 3; Yun Tr. at 450, 460-461, 516-517, 558-562, 572-573; Yun KX-1 at 3; Yun KX-24 at 1; Ferrell KX-2 at 7-8; Ferrell KX-23 at 1; Ferrell Tr. at 654-655; KX-11; KPX-1).

<u>Relative Position of Air Rings and Vertical Pipe</u>

378. In use the KPM air rings are located above the die of the extruder. When KPM uses it places the approximately inch above the die head, depending on the scope of the tubing, and the approximately inch above the first ring. Infrequently KPM uses a KPM's vertical cooling pipe is located above the cooling rings. Before Mr. Ferrell's visit KPM had been measuring the height of the bottom part of the air ring above the extruder, rather than measuring the height of the air ring above the die. (Yun KX-1 at 2; Yun Tr. at 101-109, 141; CPX-11).

379. The used on a KPM extrusion line is stationed approximately inches above the extrusion die head, and is positioned a certain distance above The adjustment of the air ring in terms of height from the top of the die does not affect the velocity or type of the air coming out of the KPM air ring. KPM uses no specific standards in terms of where the air ring is set vertically relative to the top of the die head and the setting is based on

experience. When KPM is producing the same size bag,

(Yun KX-1 at 2; Yun Tr. at 101 to 109, 513, 514, 565 to 568).

380. KPM does not align any particular portion of the air ring relative to the profile or any portion of the bag, since the air holes are At the beginning of each production ring, KPM's workers try to ensure that the tube is (Yun KX-1 at 3; Yun KX-9 at 8; Yun Tr. at 565-568).

381. KPM produces various sizes of profiled tubing on its extrusion lines but the tubing is not nearer than a minimum of approximately inches from the inner surface of the air ring and the tubing is usually much further than that from the air ring. On some of KPM's tubing the tube is more than inches away from the inside of the air ring. As an example one of the tubes extruded during Ferrell's visit to KPM in February 1989 was inches in lay flat size, with a diameter of approximately inches. Since the tube had been extruded travelling through a ring with an inside diameter of inches, the tubing was over inches away from the ring. Ferrell's measurements concerning the rings and tubes extruded therein confirm Yun's testimony as to the relative spacing between the tube being extruded and the air ring through which the tubes pass. The videotapes and photographs submitted of the KPM process show a significant relative spacing between the air ring and the diameter of the tube contained within

the ring. (Yun Tr. at 538-39; Yun KX-1 at 3; Yun KX-24 at 2; KPX-10; CPX-2; SPX-AO Ex. 1; CPX-4, Ex. 13-F, 14-F, 15-F, 16-F, 17-F; Ferrell KX-2 at 6-8; Ferrell Tr. at 665-672).

<u>Air Supply to KPM Air Rings</u>

382. The air rings used by KPM each have tubular inlet ports emanating from the outside of the ring, the ports located at A hose is secured to each of the inlet ports, and the hoses hang down from the inlet ports variously around the extruder and/or the tower frame, all hoses .

The

(Yun Tr. at 107-114; Ferrell Tr. at 645-649; Yun KX-8 at 2-3; CPX-11; CPX-12; SPX-AO Ex. 1; KPX-10; CPX-2; CPX-7; KPX-1; KPX-8).

383. The hoses secured to the inlet ports of the air rings of a particular KPM extruder line are coupled by hoses to an air supply which constitutes a blower. The blower comprises an electrically powered fan operating and in a circular air intake opening to draw ambient air into the blower from outside. The air blower receives power through the main control panel containing an on-off electrical switch for this power, and there is no other means to vary the speed of the blower fan. The blower provides a current of cooling air which issues upward through a

and from there to the inlet ports of the air rings. Each of KPM's extrusion lines use the same model blower for the air rings, with rated specifications of (Yun KX-8 at 4-5, 8-9; Yun KX-1 at 2; CPX-11; SPX-AO Ex. 1; KPX-10; Ferrell Tr. at 669-670).

384. Fastened to the air intake opening is an air intake panel which is disc shaped of a size to cover the circular air intake opening. At a point on its upper periphery the panel is attached to a corresponding point on the periphery of the air intake opening by means of a threaded bolt passing through the panel and an overlying wing nut fastener. By loosening the wing nut, the panel may be swung pivotally about the bolt, thereby uncovering portions of the air intake opening to supply air, with the panel thereafter secured in such an open position by resecuring the wing nut. When the panel fully covers the air intake opening the enclosed blower fan does not supply air. (Yun KX-1 at 3-4; Ferrell KX-2 at 12; CPX-11; CPX-12).

385. The panels to the air blowers can be opened or closed to allow more or less air into the blowers and to change the air pressure and rate of air flow supplied to the blowers. There is a direct relationship between the size of the intake openings and the amount of pressure in the rings, and with the velocity of air issuing from the rings. Thus the larger the opening is the greater are the pressure and velocity. With the opening closed the blower supplies no air to the ring, and with it open to the greatest possible extent it supplies air at approximtely inches of water pressure in the ring as measured by a manometer.

workable tubing. (Ferrell KX-2 at 7-9, 12; Ferrell KX-23 at 5; Ferrell Tr. at 665-682; Yun KX-1 at 5).

386. At the beginning of each production run

The adjustment by the workers is made only to ensure that enough air is flowing to cool the extruded tubing evenly around its entire circumference.

(Yun KX-1 at 3-4; Yun KX-9 at 8; CPX-11; CPX-12;

CPX-4, Exs. 13-G, 14-C, 15-D, 16-E, 17-C; KPX-10 at approx. frame no. 230, Yun Tr. at 569).

Air Flow From KPM Air Rings

387. In fluid mechanics terminology, a "jet" is understood to mean a concentrated and localized region of high velocity flow emerging into a relatively static body of fluid, or into space, as opposed to a spread-out relatively uniform stream of flow. In one mode of fluid motion, the flow rapidly becomes complicated and confused. Such a flow is said to be turbulent. In contradistinction to turbulent flow, the regular flow, in which the fluid moves as it were in layers with different velocities, is said to be laminar. Turbulent flow is characterized by random and chaotic fluctuations in velocity whereas laminar flow is characterized by a smooth, orderly motion with an absence of such fluctuations. A laminar jet emanating from an orifice will ordinarily undergo a transition to turbulent flow at some distance downstream from the orifice. Such behavior can easily be observed from the smoke of a cigarette in still air whereby it starts as laminar, but above a certain level, it transforms rapidly to turbulent flow. (Garris KX-3 at 2-3; Garris Tr. at 938).

388. It is well known in the field of fluid mechanics that as one increases the exit velocity of a jet, the transition distance, i.e. transition from laminar flow to turbulent flow, decreases and that once the jet becomes turbulent, diffusion occurs very rapidly. Thus a jet will diffuse at a certain distance from the exit. One of the most important factors in determining where diffusion occurs is the interaction between adjacent jets. As the air flow travels radially from the orifice towards

the tube, it grows considerably in size. (Garris KX-22 at 2-3, 7; Garris Tr. at 1049).

389. One can have a laminar jet and a turbulent jet. However when one has two turbulent jets in close proximity to each other, the nature of the turbulence is such that it causes those jets to merge into each other. In the jets from the KPM air ring, there is a two-step process going on. The first is the transition to turbulence and second is the turbulence causing a merging of adjacent turbulent jets. (Garris Tr. at 1049).

390. While at KPM's facility, Ferrell constructed a U tube water manometer, which is a pressure measuring gauge, and had this manometer attached to a inch inside diameter KPM air ring by means of a fitting installed on the ring which was used on KPM's line KPX-8 is a photograph depicting the way in which the manometer was attached to the air ring. The manometer comprises clear plastic tubing secured in a U shape, with a ruler placed between the two arms of the U to measure the relative distance in height between the water level in the two arms of the U. One arm of the U was coupled to the air ring fitting.

at its normal operating condition, Ferrell found that the pressure in the ring was approximately inches of water pressure and that there was a direct relationship between the size of the effective blower intake opening and the level of water pressure, i.e., as the opening size was increased the pessure increased. The intake panels on the other lines producing profiled tubing had been set so that the effective blower intake opening were inches. Since the blowers on different lines were all the same, with the same specs, the air rings on

KPM lines were operating at or below approximately inches of water pressure. (Ferrell KX-2 at 9; Ferrell Tr. at 641-657, 672-675, 679-680, 714, 733-737, KPX-7).

391. Garris conducted detailed and well documented tests, measurements and demonstrations representative of the conditions under which KPM operates, with one of KPM's actual air rings in his lab in Washington, D.C. The air ring used, KPX-1, has an inside diameter of inches and a

To recreate the conditions under which the KPM air ring is used in the accused process, Garris in his laboratory first attached a variable flow rate air supply to a manifold connected to the air intakes with tubing roughly of the same dimensions as used by KPM. KPX-2 is a photograph Garris took of the test apparatus. Garris placed a inch rigid cylindrical tube in the center of the ring to simulate tubing of plastic being extruded and attached a U tube water manometer to a tap or fitting in the same location on the air ring as Ferrell had done in the measurements Ferrell took of the KPM air rings in operation. Garris then brought the air pressure in the air ring to exactly inches of water pressure, which is equivalent to . In the field of fluid mechanics, such a pressure level is considered extremely low. With the air pressure of inches of water and the simulated tubing the conditions of his test apparatus was nearly identical to those on KPM's extrusion lines and were similar enough for accurate measurement and characterization of air flow from the ring. KPX-4 is a photograph Garris took of the manometer. The U-tube manometer, used by both Ferrell and

Garris, is an extremely simple and well accepted device and its accuracy depends only on the degree to which the difference in elevation between the two miniscus can be measured with an ordinary ruler, and the knowledge of the properties of the manometer fluid. Such manometer devices are used to calibrate laboratory electronic measuring devices. Since Ferrell and Garris both used ordinary water as their manometer fluids, and measuring distances of around inch accurately with a ruler is quire routine, and they both located their taps in the air rings in the same locations, the air-ring conditions in Garris' laboratory closely simulated the operating conditions at the KPM facility as observed by Ferrell. (Garris KX-3 at 2-3; Garris Tr. at 978-81, 1003-1036; KPX-2; KPX-4; Garris KX-22 at 3; Ferrell Tr. at 733-37).

392. Using Garris' test apparatus, Garris conducted a lengthy and detailed process of measuring or "mapping" the velocity of the air issuing from holes in the air ring, using a sensitive research grade hot film anemometer mounted inside the ring in a fashion to allow both radial movement away from the inner surface of the air ring and angularly in the horizontal plane of the orifices or air holes to allow measurement in the areas between orifices. KX-10 is a technical brochure describing this device. The model Garris used was a Thermosystems International #1210.60. Garris has regularly used such an anemometer in his work and Garris testified that it is one of the most accurate means to measure the air flow and is a standard tool for researchers in aerodynamics and fluid dynamics. Detailed measurements such as Garris' mapping is the most precise way of determining the characteristics of flow, as opposed to flow visualization demonstrations. The anemometer has unique advantages because it is so

small, having a sensor diameter of 0.006 inch (a human hair is about 0.003 inch). The anemometer will not create distortions in the air flow patterns sought to be measured. Its time response is extremely high enabling detailed analysis of the turbulence structure. The anemometer can resolve extremely small spatial variations in velocity. In the case of the flow from the air ring (KPX-11) the holes are about inch which is more than times larger than the probe diameter, and which enables precise determination of the jet proportion. (Garris KX-3 at 2-5; Garris Tr. at 913-943).

393. Garris has used the hot-film anemometer on a regular basis in the course of his professional work and is skilled in its use and interpretation of its results. He made sure that the device was properly calibrated before he began the testing was certain that the device was in good working condition and that its results were accurate. (Garris KX-3, at 5).

394. KX 11 is an actual size drawing indicating the locations at which Garris measured the flow of air from the KPM ring. Measurements were taken beginning at a point inch from the inner surface of the ring and progressing outward to a point inch from the cylinder. The tube was inches from the inner surface of the ring. (Garris KX-3 at 5; Garris Tr. at 914; KX-11).

395. KX 12 is a set of graphs which were plotted from the resultant data Garris obtained from his measurements at the positions noted on KX 11. Those graphs plot velocity in feet per second on the vertical axis and angular position in minutes (60 minutes equal one degree) along the horizontal axis. Garris was able to adjust accurately the anemometer

radially, and then rotate the probe angularly in precise intervals along the inner surface of the ring at an equal distance from the surface utilizing a high precision rotary table calibrated in minutes of arc. KPX-5 is a photograph of the rotary table he used. In this way Garris scanned the velocity readings across a horizontal plane centered on the holes in the air ring. The graphs represent a map of air velocity across a portion of the ring covering approximately holes. There was slightly over between each hole. Page one of KX 12 indicates that at a position of inch it was found that there were well defined regions of higher velocity air flow peaking at about feet per second (fps). The flow pattern at this short distance from the hole shows a laterally confined and concentrated, very intense jet. As the anemometer was moved to a position between the holes, velocity decreased to zero. The graphs contain at certain positions a small box and cross (plus) symbols which indicate high and low readings at that position. For example, on page 1 of KX 12, at angular position 100, there is a small distance between the box and cross which indicates that there was a fairly small variance between high and low readings at this position. The small variance indicates that the flow is fairly steady and coherent. Conversely, where there is a large difference between low and high readings there was turbulent and erratic air flow, as Garris found. (Garris KX-3 at 5, 6; Garris Tr. at 927-928).

396. Examining the results of the air flow mapping reflected in KX 12 one sees very clearly that as one moves out from the ring the velocity decreases rapidly, the differences in maximum and minimum velocity decrease rapidly, and the flows spread out as Garris testified. At inch the

curves are peaking at less than half the velocity observed at inch. At inch the peaks are nearly gone altogether and a drastic change has occurred in what were initially jet flows. At inch and distances beyond Garris found a flat line. A flat line indicates that there are no differences at all in air velocity over the entire area scanned and that air is moving at the same velocity in this entire region. At this distance there was a uniform stream in the areas between the orifices. Garris spot tested the anemometer in other areas of the ring to assure himself that the readings he was getting in this area were characteristic of all other regions of the ring, and he found they were. The results were not sensitive to the diameter of the air-ring and is applicable to the entire range of sizes of air-ring used by KPM. (Garris KX-3 at 6, 7; Garris Tr. at 928, 934-939).

397. Garris monitored the anemometer with an oscilloscope which provided him with visual readings of high and low velocity readings at a point directly in front of the orifice. When the flow is steady and coherent there was not substantial fluctuations. Once the flow becomes turbulent and erratic he began to see wide fluctuations in said points which is represented on the oscilloscope by a very erratic pattern. KPX 3A through KPX 3H are a series of Polaroid photographs Garris took of the oscilloscope displaying readings at various distances from the ring KPX 3A is nearest the ring and KPX 3H is furthest and each is marked on its back. The oscilloscope showed clearly that between inch and inch the flow of air demonstrated a fairly low level of turbulence, whereas beyond inch the air suddenly underwent transition to turbulence. Such characteristic was quite repeatable and hence laminar flow did not exist

beyond   inch from the orifice. (Garris KX-3 at 7, 8; Garris Tr. at 940).

398. Garris' results allow for an accurate and quite detailed description of the flow of air from KPM's rings and his data demonstrate that the air flow underwent a transition from laminar to turbulent flow at approximately   inch; that at   inch the flow became turbulent and erratic, and beyond   inch there was no localized area in which the flow displayed any characteristics different than the area round it; that under any conceivable definition of the word "jet", it is impossible to conclude that any jet existed in the area of the ring beyond   inch from the inner surface of the ring; and that the air in the region adjacent to the tubing could only be described as a peripherally homogeneous turbulent churning stream. Thus based on the velocity mapping the jet had grown from the   inch orifice diameter to approximately   inch by a point   inch from the orifice. Assuming the jet air flow persisted as it traveled to the profile, the flow size would grow considerably larger in size. (Garris KX-3 at 8; Garris Tr. at 937-940; Garris KX-22 at 7).

399. In order to visualize his findings Garris also conducted tests on the KPM air ring using a Sage Action Inc. helium bubble generator. KX 13 is some literature describing this device. The principle upon which the generator functions is based on the injection of minute tracer bubbles into the flow just prior to emanating from the orifices. These tracer bubbles can be followed visually and photographically as they proceed through the flow field by means of a Xenon arc lamp illumination. Garris has frequently used this device and believe that it was in good working order at the time he used it to conduct the tests. KPX 6A through KPX 6D are

photographs Garris took of the tests visualizations and which confirm the results he obtained by means of the hot film anemometer. KPX 6A is a photograph of the region near the ring orifice which shows the trajectory of air flow as being fairly well defined for a short distance. KPX 6B shows the region nearer the tube and clearly shows a very turbulent and erratic flow pattern. KPX 6C does show the behavior of the flow as it strikes the tube which shows a very erratic turbulent flow pattern with no indication at all of jet characteristics Garris also spent a considerable amount of time observing said patterns. The helium bubbles revealed an undulating and chaotic motion. (Garris KX-3 at 8, 9).

400. The exit velocity of air discharged from the air orifice of the KPM air ring at approximately   inches of pressure is about   fpm as shown by Garris' test results in KPM's standard operating conditions. (Garris KX-22 at 2).

401. Garris' mapping of air flow from the KPM air ring also involved the use of an oscilloscope which illustrated the degree of fluctuation in air flow at particular positions, indicating a turbulent and erratic air flow. Garris additionally used a helium tracer bubble generator and a xenon arc lamp to make the air flow visually apparent. This study confirmed the results of the anemometer mapping. Thus the region near the air flow from the orifices of the KPM air ring shows a trajectory of air flow that is fairly well defined for a short distance, but as one nears the tube there is a very turbulent and erratic flow pattern with no indication of jet characteristics. Garris' visual observations revealed an undulating and chaotic motion rather than coherent jets. Upon visual inspection the bubble illumination demonstration photographs do appeared to show a less

coherent flow in the region of the cylinder, with the general direction of the longitudinal movement towards the cylinder, e.g., KPX-6D. Garris also conducted smoke visualization tests on his test apparatus at inches of water pressure. He found the smoke test confirmed his previous tests results, including the more preferred hot-film anemometer test, estimating the distance at which the jet diffused at approximately inch from the discharge orifice, and that beyond inch, well before the simulated tubing was approached, in no case was a distinct jet visible. (Garris KX-3 at 8-9; KPX-6A-6D; Garris KX-22 at 5-6).

(THERE IS NO FINDING 402)

403. The turbulent flow after inch was identified by Garris as due to the merging of the flows from adjacent jets creating a single mass of turbulent air. Although the air emanates from the orifice into stationary fluid as a jet, the flows spread and later intermix and become turbulent, causing the jet to dissipate. The initially separate flows from the ring become a peripherally homogeneous and a uniform stream. (Garris KX-3 at 4, 7-10; KPX-3A-3H; KX-14; Garris Tr. at 937-939, 1035).

404. Garris additionally tested and evaluated the air flow from the KPM air ring when the air pressure in the ring was at inches of water pressure as measured by the manometer. At this pressure, equivalent to , the characteristics of the flow were not much different. Thus the flow still underwent transition from laminar to turbulent flow and beyond inch there was an undifferentiated mass of turbulent air, with no discernible jet beyond . This behavior was consistent with a theoretical understanding of air flow and the dissipation of energy within a jet by means of turbulent mixing with the surrounding fluid, and expected

results at higher pressure would not be any different. (Garris KX-3 at 10).

405. In order to help visualize what is occurring with the KPM air rings, Garris prepared a schematic of the air flow emanating from the ring which schematic is based on his measurements, helium bubble, trace observations, and knowledge of fluid mechanics. KX-14 is the schematic. The schematic indicates that the air emerges from the ring orifice in a laminar jet stream and maintains that form for approximately inch and thereafter the flow becomes turbulent and the flows from adjacent jets begin to merge with each other creating a single mass of turbulent air, as Garris testified. This behavior is entirely consistent with well established principles of fluid mechanics <u>viz</u>. that the flow of fluid through an orifice into a stationary fluid will always begin as a jet and that subsequent turbulence and mixing will cause the jet to dissipate (Garris RX-3, para. 15).

406. Garris examined the air flow at inches of water pressure, which is equivalent to to see if any significant difference occurred at this higher pressure, which Garris understood to be the level under which KPM operates. While the pressure was greater, the characteristics of the flow were not much different, as Garris found. In particular, the flow still underwent a transition from laminar to turbulent at approximately inch from the ring orifice and that beyond inch there was simply an undifferentiated mass of turbulent air. There was no discernible jet of any type beyond inch. This behavior is consistent with theoretical understanding of air flow, <u>viz</u>. the dissipation of energy within the jet by means of turbulent

mixing with the surrounding fluid. On the basis of this experiment it was not expected that the results at inches of pressure to be any different. (Garris KX-3. para. 16).

407. The most accurate way to determine the nature of the flow field is by the type of detailed mapping Garris performed. Among experts in the field of fluid dynamics, there is no question but that the hot-film (or hot-wire) anemometer is the preferred instrument for applications in mapping jet flows and is among the most accurate for this purpose. (Garris KX-22 at 5; Garris Tr. at 953).

408. Garris performed smoke visualization tests, which are only a very approximate indicator of the behavior of a flow field, under the KPM operating conditions of inches of water pressure with a inch tube and photographed the smoke patterns. From the photographs, consistent with Garris' own observations, the processes leading to the diffusion of the jet were apparent and Garris was able to estimate the diffusion distance which occurred at approximately inches from the discharge orifice. KPX-11 is a photograph of the smoke test. Beyond inch, in no case, was a distinct jet visible. Those flow visualization results were consistent with Garris' previous tests. When Garris repeated the tests at inch and inches of water pressure, the diffusion of the jets occurred well before the tube was approached and the repeated tests behaved in a fashion consistent with Garris' previous results. (Garris KX-22 at 5; Garris Tr. at 943).

409. There is no jet impinging on the profiles in KPM's production process and hence it is impossible to state that any change in profile gap, if there is one, is the result of a jet. (Garris KX-22 at 5, 6).

410. To show that air was not being forced out of the KPM air rings under pressure sufficient to create a jet that would impinge the profile or tubing and to show that by the time the air got to the tubing it was disperse and turbulent, Ferrell introduced smoke into KPM's blower intake while at KPM's facility. Ferrell used both sulfur smoke as well as dry ice. When doing this Ferrell could observe some air flowing from the ring for about inches but beyond that it was impossible to see any flow. Even within the area of inch Ferrell stated that he would not characterize the flow as a jet in terms of a narrowly defined and controlled stream of air. Ferrell stated that there was no jet impinging the profile. Ferrell observed jets, i.e. straight line emanations of colored smoke, coming out of the KPM air ring opening. Smoke was seen moving up with the tube. (Ferrell KX-2 at 10, 11; Ferrell Tr. at 675, 676, 688, 689).

411. Ferrell during his February 1989 visit to KPM's plant determined that the extrusion lines producing profiled tubing variously had blower intake openings ranging of inches in size. He found that there was a direct relationship between the size of the intake openings and the amount of pressure in the ringe. Thus the larger the size the greater the pressure.

412. Complainant's expert Sieminski testified:

> 16. <u>Question</u> Have you reviewed Minigrip's physical exhibits 2 and 3 which were represented to you to be video tapes of the KPM production process?

> Answer Yes.
>
> 17. Question Did you observe the plastic tubing shaking in the KPM production process shown on the video tape?
>
> Answer Yes. I did observe the shaking and particularly noticed

(Sieminski CPX-9 at 8, 9).

413. KPM does not challenge FF 176b of the PEO ID which stated that Sieminski is an expert in the microscopy of polymers and birefringence (Tr. at 192, 193). However Sieminski is not an expert in the extrusion of polyethylene tubing. (Sieminski Tr. at 209). Also Sieminski has no training in fluid mechanics nor in the characterization and the measurement of air flow. An air velocity measuring instrument presents a lot of subtleties and can present inappropriate results when not used by one with training. The Sieminski used in his measurements to characterize and measure air flow from the KPM air ring was not appropriate for that application and for precise fluid dynamic structure. Also Sieminski's measurements would not have been representative of the actual depth of penetration of the flows. (Sieminski Tr. at 206; Garris Tr. at 951-957, 1000, 1029-1033).

414. During Ferrell's observation of KPM's process, Ferrell observed some detectable but non-dramatic movement of the tubing on only one of the lines used by KPM then to produce profiled tubing, which he said continued even after the air intake to the rings was shut completely. That movement was being caused by

Thus since the tubing has an

Ferrell was certain it was not due to the air pressure level from the air ring because the ring was at such a low pressure. To be certain Ferrell shut the air intake completely, stopping the flow of air altogether through the ring but still observed said movement to the same degree. (Ferrell KX-2 at 11-12; Ferrell Tr. at 725).

415. Ferrell testified:

> Q I'd like to refer you to paragraph 19, page eleven of your witness statement.
>
> A [Perusing document.]
>
> Q On your observation of the KPM extrusion lines for shaking, did you look at all of the lines that were running to determine if there was shaking of the tubing?
>
> A I didn't look at them with the specific purpose of seeing if they were shaking. However, I did look at them to see their run conditions, and had they been shaking, I would have taken note of it.
>
> Q And your testimony is that on only one line, you saw shaking?
>
> A That was during our testing, yes.
>
> Q Did you see -- I think you testified that that line
>
> A It has some movement, not shaking. It was what I would team "walking." The tube had a tendency to ride to one side, and
>
> Q Did you see --
>
> > JUDGE LUCKERN: You used the term "walking" W-a-l-k-i-n-g?

> THE WITNESS: Yes.
>
> JUDGE LUCKERN: What -- how do you use that term "walking"?
>
> THE WITNESS: Termination in -- the term "walking" on tubular extrusion means that the tube, at the top nip, where it goes over the roller, has a tendency to go to one side. It walks from the center or one side to the other. And occasionally, it'll walk back and forth.
>
> JUDGE LUCKERN: Okay. All right.
>
> BY MS. TAYLOR:
>
> Q Mr. Ferrell, did you see

(Ferrell Tr. at 624, 725).

416. There is some slight movement in KPM's tube during normal operations but this is caused by the drawing mechanism itself. (Yun KX-1 at 4).

417. Ferrell, based upon his visual and hand sensing, had no doubt that the air issuing from the KPM air rings was diffuse in the area adjacent to the tubing. Ferrell's hand sensing made him certain that air was not being forced out of the air rings sufficient to create a jet that would impinge the profile or tubing and that by the time it reached the tubing it was disperse and turbulent. (Ferrell KX-2 at 7, 10-11).

418. As to the use of the word "jet" in Sieminski's witness statement Sieminski testified:

> THE WITNESS: The use of the word "jet" in this context has to do with the smoke flow emanating from an air ring. The narrowness refers to the stream emanating from the hole and then travelling through the atmosphere. The form of that smoke flow I am

describing as being a jet to the extent that that stream maintains a certain conformation.

BY MR. SOBIN:

Q I see. Then is the definition then or the meaning that you're using based on what you observed during the KPM smoke test then and not on some other body of knowledge of fluid mechanics or jet behavior?

A Only that, because I have already indicated I have no knowledge of fluid mechanics.

Q So when you say only that, you mean only on what you were looking at in the smoke visualization test that you did.

A I've mentioned jet in that context, yes.

(Sieminski Tr. at 212, 213).

(THERE IS NO FINDING 419)

420. As to the term "diffuse", Sieminski testified:

Q Could you tell us what your meaning is, or your definition, as you use that word in your witness statement?

A May I answer that this way, that when I refer to a jet, I mentioned that I referred to in this specific case a flow of smoke with a well-defined profile. In other words, I'll quote the word "sharp edges." When I speak of diffuse, I have something which has ill-defined edges, maybe sort of a cloud-like formation. That is my concept of diffuse.

With respect to the smoke test, Sieminski testified:

Q And did you know that at the point where the air was impinging the sensing head in the smoking test, did you know what the relative size and diameter of the air flow was at the point of impingement relative to the diameter of the sensing head?

A No.

Q Did you know those facts for the application on the actual extrusion line, that is, the relative diameter of the air flow at the point of impingement of the air flow as opposed to the sensing head?

A I had no way of doing that.

Q When you were conducting the smoke test and you had this measuring device, was it also about an eighth of an inch from the surface of the ring?

A Yes.

Q Did you see at that point was the flow emerging from the ring and there was a little bit of backflow or deflection of that particular jet up or around or down?

A I don't know.

Q You didn't observe that?

A I did not look for it, so that I don't know whether or not it happened.

(Sieminski Tr. at 264, 265).

421. Sieminski testified as to the Tilman videotape:

Q Mr. Sieminski, in your witness statement you make reference to the Tilman videotape, which we viewed earlier and which has been marked as CPX-1-C. Is it your contention that in that videotape you see jets of air impinging the tubing being produced?

A No.

Q You do not see jets of air impinging the tubing?

A No, not at that one set of readings that we saw.

* * *

Q I'm sorry. The question was meant with reference to any of the various air level readings depicted in the Tilman videotape. If you would like to view it in its entirety --

A I would really like to see the whole thing.

Q Sure. If you would like it to pause at any point or something, we would be happy to do that.

A Okay.

[Videotape presentation.]

THE WITNESS: This is the first point where I would imagine that the jet could be impinging upon the tool [sic], but it's difficult for me to say definitely because there is such a cloud of smoke or cloud of vapor, I'll call it. I'm not sure that it's smoke, that makes real determination difficult, at least on the video.

BY MR. SOBIN:

Q Okay. And we are now looking at Frame 349.

A I'll take your word for it. I can't see it.

JUDGE LUCKERN: He has to take his word, unless he goes up and looks at it, Mr. Sobin. Do you want to look at it?

THE WITNESS: Okay. It's 349.

BY MR. SOBIN:

Q And the observations you just made were with respect to what's depicted on Frame 349 in --

A Yes.

Q And roughly within a few frames either side of that.

A Yes.

Q So --

A I can't say absolutely because of the that cloud formation.

Q Could you point for us or somehow orally describe what the cloud formation is that you're referring to?

JUDGE LUCKERN: And put it in words, too, Mr. Sieminski, because if you just point to it, it's not going to help me when I look at it a week from now, two weeks from now.

THE WITNESS: I understand. Beginning with the inner face of the ring and looking generally at a point not down -- I'm pointing here to the right -- not down in this area. the perspective there is such that one doesn't know what's happening, so that I have to focus my attention in an area, let's say, where I could see the whole length of the jet. Now, here it's completely clouded by this infuse whitish vapor.

THE WITNESS: Yeah, the upper portion.

BY MR. SOBIN:

Q Sir, perhaps it may be easier if we were to divide that into segments comparable to a clock. If you could roughly, are we talking about from 9:00 to 3:00?

A Roughly from 9 to 3. Roughly, yes, from 9 to 3:00.

JUDGE LUCKERN: All right, thank you. And you're talking about the circle there as a clock, aren't you. Thank you, Mr. Sieminski.

BY MR. SOBIN:

Q So, at this point, what you're saying is that it's a little too smoky to see if any of the jets are actually impinging the tubing.

A Yes.

Q Okay. Let's continue playing on the tape. If I might pause, up until the point that the videotape went black, before the still picture we see now in Frame 393. At any point, were you able to specifically observe a jet impacting the tubing?

A No, I didn't.

Q Thank you. So let me ask you, with respect to what appears to a still shot contained on this videotape, we're now looking at Frame 408, is it your understanding that this is a still shot or perhaps the question is could you describe what the conditions are that are being depicted there?

JUDGE LUCKERN: The frame says low air pressures too.

MR. SOBIN: Yes, Your Honor.

JUDGE LUCKERN: And that's what frame, 393?

MR. SOBIN: No, 408.

JUDGE LUCKERN: 408, okay.

MR. SOBIN: I can continue.

JUDGE LUCKERN: There's a question.

THE WITNESS: No. I can make an observation here. I'm focussing my attention let's say between 2:00 and 4:00, in the terminology we used previously. I see jets of smoke emanating from the air ring, but they're emanating only relatively a short distance. I have no way of knowing what the magnification is there, so I can't make a guesstimate of the length. But certainly, it's some good distance away from the tube. The vapor is becoming diffuse, disbursed, and resulting in a kind of cloud.

BY MR. SOBIN:

Q Do you see the velocity measuring device attached to the ring at any point in this frame?

A I really can't recognize it. There is one line, let's say, between 8 and 9:00, but that more nearly I think is probably the top of the air ring and the inner face. I think it's just a reflection there and that's probably the better possibility. I really can't see anything there which is.

Q And that device that you are referring to between 8 and 9:00, is it white in color?

A Yes, but I think that that is not the sensing device, but is simply a reflection from the top edge of the air ring.

Q We'll continue with the tape. Sir, do you know whether, in this frame here, which is now at 430, the same still picture, whether that's actual tubing that's being extruded or is that a prop or some other device that's in there? Is the line actually working there, do you know that?

A I have absolutely no knowledge of that. The only thing is, the only thing that would make me feel that the tubing is actually being extruded is that there seems to be an upward flow of that smoke, which I would presume to be some kind of drag by means of that upward traverse of the tube.

Q Could that same flow be the result of an exhaust system above it?

A It could be a number of things, yes.

Q Do you know what the device is that roughly spans from 7:00 to 5:00 in a sort of half of an egg shape, let's say, that appears to be inside the tube?

A I don't know. I don't know.

Q Have you ever seen that in any extrusion, actual extrusion lines run by Minigrip?

A No, I haven't. That doesn't mean that it isn't there, but I haven't seen it.

Q And in this frame, can you see an actual air jet impinging the tube?

A I'm sorry?

Q Are there words on the screen --

A Yes. The words indicate medium air pressure

Q Do you know at what air velocity that would refer to?

A I don't know. I don't remember the reading, if it were given. I don't recall it.

Q In this photograph, do you see the
?

A I am not at all sure. I would imagine it might be, let's say, between again 8 and 9:00.

Q And are you referring to a device that appears to have a black round knob or value on it?

A Something of that sort, yes.

Q Do you know enough to be able to interpret where the actual sensing head is and how it's --

A I don't know.

Q And again, do you whether the tubing, actual tubing is being extruded upward in this photograph?

A Again, I would make the same comment, that I would assume, because of the directional flow, that it is being carried up, as I say, by drag. That's assumption.

Q So you don't know.

A I don't know.

Q And now, at roughly Frame 730, do you see a new still picture there?

A Yes, I do.

Q And are there words on the screen there?

A High air pressure .

Q Now, again, do you see an actual jet in this picture impinging the tubing?

A I don't.

Q Is there too much smoke to make that out?

A There is too much smoke and, as I say. I must make my judgment in an area where the perspective is such that I'm sure that I could see something.

Q And that is --

A And that is in an area, let's say, roughly about 2 to 3:00 and there is too much, I call it a cloud formation, if you will, or diffuse vapor around there to make me or to permit me to see clearly. I just can't see it.

Q Okay. Let's look at, if we could, the air flows that appear to be coming out of the ring at approximately 4:00. Would you agree that these air flows here are approximately 4:00?

A Yes.

Q Could you describe for me the appearance of that air flow out to a region -- well, as far as you can characterize it?

A As the smoke leaves the air ring -- again, I preface my remarks by saying that I am not an expert and I am simply commenting as a layman.

Q That I understand, sir.

A Again, as the jet of smoke comes out, it is reasonably well-defined and, again, strictly eyeballing, one would have to put a ruler on the thing, but I would say let's say roughly about an inch or so away from the inner ring, the jet loses its continuity and becomes diffuse.

Q Okay. Is there some point -- so it becomes sort of a continuous jet and then loses its continuity and becomes a diffuse jet?

A Yes, yes.

Q So it's a diffuse jet. And by that explanation, if one were to assume the jet impinged the tube, you would describe it -- it certainly could be no more than a diffuse jet by the time in impinged the tube.

A No more than what, sir?

Q Than a diffuse jet.

A That would be my impression in viewing the tape.

JUDGE LUCKERN: What counter frame are we at there, Mr. Sobin?

MR. SOBIN: I'll go back. We are at 826.

JUDGE LUCKERN: Thank you, Mr. Sobin.

BY MR. SOBIN:

Q But you testimony is basically that because of the amount of smoke, you cannot really see what the jet looks like at the point it hits the profile.

A Exactly.

JUDGE LUCKERN: That frame says high air pressure

.

THE WITNESS: Profile.

(Sieminski Tr. at 273 to 282).

422. Sieminski testified as to air flows in his tests:

Q Could you describe for us what you mean by the edges of the profile crossed?

A Just as an aside, to me, the word crossed means just a crossing. In other words, where one jet impinged on the other. In other words, the edge of one jet impinged on the other.

Q At the point that you observed the air flows to cross, is it your contention that at any point beyond that you could still identify what you had referred to as a jet of air?

A Definitely no.

Q So at whatever point you observed the profiles to cross, you could not characterize the air flow beyond that as a jet.

A I could not.

(Sieminski Tr. at 296, 297).

423. Sieminski testified as to videotapes:

Q Let's refer back to those videotapes that we watched before the lunch break and the Tilman videotape CPX-1. You will agree with me that when you observed that, it was your testimony that because of the general amount of smoke, it was difficult to see or impossible to see in any of those frames whether or not an actual jet had reached or impinged the tubing. Do you recall the testimony?

A Yes.

(Sieminski Tr. at 297, 298).

424. Minigrip's Tilman first conducted a large number of experimental extrusion runs producing profiled tubing at Minigrip's pilot plant on a air ring and stated that he associated of a certain level. After already having conducted these tests and finding this relationship, then Tilman conducted a demonstration to indicate the which was videotaped as CPX-1. Tilman admitted at the hearing that he is not an expert in analyzing

Tilman's testimony at the hearing purportedly identifying a

(CAO-1) Tilman however testified at the hearing with respect to "Minigrip Physical Exhibit 1" initially referred to in paragraph 12 of his affidavit and which exhibit presumably he was familiar with:

> Q It is your contention that you see a specific jet of air hitting the profile area, is that what you are contending?
>
> A Yes, Mr. Sobin, I am.
>
> Q Are you an expert in analyzing air flow visualized with smoke?
>
> A No, I am not.
>
> Q Do you mind coming here and showing us on the screen where you see this air jet hitting the -- an individual air jet hitting an individual profile?
>
> A May I say that to freeze frame like this you do not see clearly. To continue the video you have a much better picture.

MR. SOBIN: Would you mind stepping up here and I'll start the video and you can point to me where you see this individual jet hitting an individual profile?

THE WITNESS: Yes, I will.

JUDGE LUCKERN: Maybe also you'll want to back wind it a little bit because there may have been, you know, a little passage by the time you stopped it so we want to make sure that the witness, what he sees is what he says and you can stop it immediately.

You can pick that up. That's fine.

Q Are you all set, Mr. Tilman?

JUDGE LUCKERN: And would you back wind it a little bit too.

MR. SOBIN: Yes, I did, Your Honor. I backwound it to Frame 232.

JUDGE LUCKERN: All right.

THE WITNESS: All set, Mr. Sobin.

BY MR. SOBIN:

Q Do you see it there, Mr. Tilman, at Frame 263 or thereabouts?

A Mr. Sobin, I think we have to take the tape back to the beginning of the   foot per minute setting.

Q But you couldn't see it there?

A We were further on into the tape than we should have seen.

Q Set fine?

A Yes, thank you.

[Videotape presentation.]

Q Does the smoke make it a little difficult to see that?

A At this stage in the videotape, yes. May we adjust the contrast on this to get a better picture?

Q Sure.

[Brief pause.]

A May I now go back to the original portion of the ?

[Brief pause.]

Q What adjustments are you making there, Mr. Tilman?

A I'm just darkening the picture down. You can see the jets striking the profile here.

Q You can see it striking the profile?

A Here. This jet here.

JUDGE LUCKERN: What frame?

BY MR. SOBIN:

Q At 244?

A Did you stop it at 244, or did we go past 244?

Q It's at 244 now. And how large is whatever you observed --

JUDGE LUCKERN: As I just said, I want to make sure this is the frame that the witness is referring to.

MR. SOBIN: I'll back it up again, if you like.

THE WITNESS: Yes, please.

[Brief pause.]

THE WITNESS: You actually have a spread of shots here. It looks like from 230, before the smoke -- approximately 230 to 240.

JUDGE LUCKERN: This is where you're saying it impinges. Is that what you're saying? What you are saying is between 230 and 240, Mr. Tilman?

THE WITNESS: Because the time lag between --

BY MR. SOBIN:

Q Do you mean frame 230 and 240?

A No, from frame 230 through to 240.

Q Is the area in which you're contending you see --

A Is the area.

Q Now, in that area, do you see a single and identifiable jet that is alone impinging a profile? A single identifiable, and localized jet, a single one hitting a profile? Is that what you're contending you saw on the video?

A Mr. Sobin, before I answer that, can we just go on to the -- there are some other shots on this video.

Q Well, because of my time limitation, Mr. Tilman, I'd like to return -- this has taken a little bit more time -- I'd like to return to a further line of questioning now.

JUDGE LUCKERN: Has the witness been shown the whole tape, Mr. Sobin?

MR. SOBIN: No. I mean, has he seen -- today, has he seen the whole tape. Have we gone through the whole tape today. I mean right before this witness. Right now.

MR. SOBIN: Oh, now?

JUDGE LUCKERN: Yes.

MR. SOBIN: No.

THE WITNESS: No, Your Honor.

JUDGE LUCKERN: Oh, okay. I just --

MR. SOBIN: It's just that I'm running out of time.

JUDGE LUCKERN: Oh, yeah, I agree. I know why. I just didn't know whether the tape has been finished. Okay. All right.

JUDGE LUCKERN: Go ahead, Mr. Sobin.

BY MR. SOBIN:

Q Mr. Tilman, when you ran the tests that you did, as reflected in your affidavit, marked as CAO-1(c), in which you examine the impact of producing a tubing at various air velocities, did you actually observe or visualize the flow of air that was being directed at the tubing while you were doing those experiments, that is apart from the experiment in paragraph number 12? Whey you are producing the samples.

A	Mr. Sobin, you're referring to the paragraph 12, 13 and 14 that refer to the videotape, yes?

Q	Right now, I'm asking you, in the testing you did as reflected in paragraph number 10, were you -- or did you actually visualize an air jet impinging the profile when you ran those series of tests to produce your samples which you then examined?

A	Mr. Sobin, when you state -- "visualize," are you saying with a -- by using smoke as the visual medium?

Q	Smoke or any other medium.

A	No, on paragraph ten, we did not -- we did not visualize -- or I did not visualize the air jets.

Q	So then you were making an assumption that a jet was hitting the profile?

A	Mr. Sobin, I cannot see an assumption in paragraph ten.

Q	Well, if you didn't see it, then how do you know it impacted it? You had to have been operating under an assumption.

A	Mr. Sobin, can you point me to the line in paragraph ten that says that there is an air jet hitting the profile?

Q	Oh. So is it your contention that, within the air ranges that you specified that there was no air jet hitting the profile?

A	Mr. Sobin, you told me that there was an air jet hitting the profile in paragraph ten. That's what I heard you to say, sir.

JUDGE LUCKERN: He didn't tell you. He's not testifying. He didn't tell you that there is air. I guess what he's asking you -- I guess -- is do you have an opinion whether this -- what's recited in paragraph ten, is it your opinion that the experiment, or whatever you have there, the columns, whatever you have there, in any of that in paragraph ten, is it your opinion that the air jet is impinging the profile.

THE WITNESS: Thank you, Your Honor, for clarifying that.

JUDGE LUCKERN: Did I --

MR. SOBIN: That's it, Your Honor.

JUDGE LUCKERN: All right.

MR. SOBIN: Thank You.

THE WITNESS: <u>It is my opinion, yes</u>.

BY MR. SOBIN:

Q And so you've just said that you didn't actually see the jet impinging the profile. So am I correct, then, that some assumption had to have been made?

JUDGE LUCKERN: In other words, how do you know? You just said that, yes, in this paragraph ten, somewhere, the jet is impinging the profile. How do you know that, Mr. Tilman?

THE WITNESS: Excuse me, Your Honor, this is what I was -- in paragraph ten, there is no mention of an air jet hitting the profile.

JUDGE LUCKERN: But you say that it happens in what is described in paragraph ten. That's what I thought you said to me.

THE WITNESS: Mr. Sobin, I'm sorry, the -- I seem to have trouble understanding. Can you please repeat the question.

BY MR. SOBIN.

Q It's my understanding you've already testified, sir, that in this series of tests, you did not see an air jet impinging the profile. And it's my understanding futhermore that you have testified that you do believe, within some range of air levels in which you speak of in this paragraph, that a jet impinges the profile.

The question I have, sir, is, if you didn't see it, how did you know it was hitting the profile?

MR. LEVY: Your Honor, I object only in that Mr. Sobin has mischaracterized his testimony. His testimony about impacting was based on the smoke test.

MR. SOBIN: No, no. Come on, now.

JUDGE LUCKERN: Let's not discuss it between counsel, Mr. Sobin. Let's not be talking with Mr. Levy. That's what Mr. Levy says.

MR. SOBIN: That's the witness' position --

JUDGE LUCKERN: Well, I don't know what the witness' position is. I really don't know. Maybe you can start over with a very short question so we can lay a foundation, because I'm confused. I don't know what the witness' position is.

I mean, it may be in the record, and he maybe already testified it, but --

MR. SOBIN: Can the witness answer the question? Or, I guess there hasn't been a ruling.

JUDGE LUCKERN: Well, shall I try to find the question?

MR. SOBIN: Well, I can repeat it easily enough.

JUDGE LUCKERN: All right. Repeat it, and if you have another objection --

MR. LEVY: Why don't you repeat it without his characterization of his previous testimony? That's where my objection was.

JUDGE LUCKERN: The problem is Mr. Sobin thinks he's testified a certain way, and therefore the question is dependent on how he's testified -- he thinks he testified.

MR. SOBIN: Well, I'd have to repeat three questions.

JUDGE LUCKERN: Whatever you want to do. You know what we're up against.

MR. SOBIN: I though we were going to keep our objections to a minimum.

JUDGE LUCKERN: Well, let's -- please, Mr. Sobin. Please go on.

Can you answer that question, Mr. Tilman?

THE WITNESS: Your Honor, I believe what Mr. Sobin is referring to is a very distinct statement in paragraph 13, which refers to --

JUDGE LUCKERN: Well, he hasn't said -- let's not get into paragraph 13. I know we're into paragraph ten.

BY MR. SOBIN:

Q Is your conclusion that a jet was impinging the profile in paragraph ten based on the appearance of some particular birefringence pattern?

A It is based on a birefringence pattern.

(Tilman Tr. at 1084 to 1094) (Emphasis added)

425. Concerning the results of Tilman's tests with a Minigrip air ring Tilman indicated at his deposition that the air flow contacting the profile in his tests is not at a pressure than the air contacting any other portion of the tube, and that the same air contacting any other portion of the tube, and that the air pressure is being applied surface of the tube. Tilman stated at his deposition that

not because of a difference in the pressure of the air contacting the profile as compared to the rest of the body of the tube or bag. He then stated that the application of air from an air ring is more spread and not as distinct an impact as that applied by as in Noguchi which is essentially in very close contact with the extrusion. (Tilman Dep. KPX-15 at 74-76, 100, 233).

426. As to the tests Sieminski conducted, Sieminski testified:

Q Does the nature of the jet that you contend exists change between air velocity reading ?

A When you say the nature of the jet, I can answer only that on the basis of our air velocity tests, that as we increase the velocity we increase the length of the jet, so that the question of, let's say, , I would say that there would be an increase in the length of the jet.

Q But other than the length of the jet, would the nature and characteristics and behavior of the air flow be any different other than it was longer?

A I have no idea.

Q Now, when you were producing this tubing, you didn't actually see what you contend was a jet from the point of the inner ring surface to any other point, did you? You couldn't visualize it, could you?

A Definitely could not.

Q Do you contend that at some point the jet impinged a particular part of the tube?

A Yes.

Q At what point?

A I indicated in the test, smoke test on the air ring that when we got to something like, I believe it was, feet per minute, that our jet length was, I believe, in excess of four inches. In this particular test we were using a inch inside diameter KPM air ring. In the center of that we had tube, which left us a clearance on either side of a little less than inches, and so that based on our results with the velocity of the air versus, lets's say, jet length, I would say that that was sufficient to impinge.

Q But you didn't actually observe it. You were just making an assumption based on the tests you had run with smoke visualization?

A I said previously. We could not see it on the line. And it is based on our work on the static test.

* * *

Q So you therefore have no idea as to whether it hit a part of the profile, all of the profile or none of the profile.

A Based on the length of the air jets, based on the spacing between the air apertures on the inner face of the air ring, and based on the difference in distance, let's say, between the female profile and the, let's say, male profile, I would say that there was an impingement in that area.

Q How do you know that there was an impingement on the profile itself?

A Not necessarily. It would depend on the exact spacing. I am talking about a general region.

Q In talking about a general region, what are we talking about, an inch either side of the profile?

A Yes. Again, my guesstimate might be on the order of something like a quarter of an inch along the way. That is strictly guesstimate.

And how wide do you estimate?

JUDGE LUCKERN: What word are you using there?

THE WITNESS: Guesstimate, I'm saying.

JUDGE LUCKERN: Guess estimate?

THE WITNESS: No, guesstimate. In other words, it is an estimate by guess, so to speak.

JUDGE LUCKERN: Would you rely on a guess estimate, you as a technical person.

THE WITNESS: I'm using that in the terms of an approximation.

JUDGE LUCKERN: For example, if I had a witness who said he was going to guess an answer, I really wouldn't put an awful lot of weight on the answer if the witness is going to guess. In the skill and the art of an expert, when you say guess estimate --

THE WITNESS: I understand the problem.

JUDGE LUCKERN: If you can give me an opinion, because you've been using this term "guess estimate", so use the term. You have an idea of what it is, but I'm wondering what weight -- you not me. I decide what weight to give it, but what weight you would give it when you say it's a guess estimate as a against an exact measurement. As a scientific person, you know what I mean. Well, you know when you're making an exact measurement, don't you?

THE WITNESS: Yes. I can't make an exact measurement.

JUDGE LUCKERN: No, I know. I understand that. So, you're guess estimating. Now, how reliable is a guess estimate, in your opinion? Could four different experts have come out with four different readings for guess estimate? Bring in 10 experts, not related, what's your guess estimate? Would you have a variance" And you know, when you get into -- since I've used the error ratio or whatever you call it, but if you know. Do you understand what I'm trying to ask you?

THE WITNESS: I do. All I can say that it is my opinion that these kits [sic] are impinging in the vicinity of the profile, but I cannot say that it's impinging on the profile.

JUDGE LUCKERN: But some of these numbers are based on a guess estimate. Is that correct? Some of these 4-inchers or 3-inchers or some of these numbers are guess estimates?

THE WITNESS: That's one degree, but then again, we're relying on the results of our test in looking at the -- for the presence of retardation colors within the area of the female profile, and so that what we're saying really is that by using these air velocities in these situations that the air is impinging on the tube, and I can't say exactly where, but that we do get these retardation colors developing, and we do get a commercially-acceptable reclosable --

JUDGE LUCKERN: Okay, but I may be wrong. I've got to read all this testimony, and you can rest assured that I'll be on top of it, and I'll read it, but I think -- whatever your testimony. I'm not trying to characterize your testimony. What assurance do you have that you do have this impinging, this air jet impinging on the profiles? I mean this morning I heard about the clouds and whatever you have, and it will speak for itself, and I mean I know you get the colors. You say you do. At least, you say you do, but tell me why you say that this air jet is impinging on the profile? What evidence do you have that you do have an actual impingement of the air jet on the profile?

THE WITNESS: No, Your Honor. I believe I did not say it was impinging on the -- I said that it's in the area of the profile.

JUDGE LUCKERN: What does that mean? I mean would it be within half an inch or a 10th of an inch, a 100th of an inch, a 1000th of an inch?

THE WITNESS: Your Honor, I don't know by actual measurement. I know only by the ultimate consequence. In other words, by the result that we get in the end that we effect a control of the female profile and that we get the development in that particular area of the retardation color.

JUDGE LUCKERN: All right. Go ahead, Mr. Sobin.

BY MR. SOBIN:

Q Mr. Sieminski, at the point that you contend there is some impingement in the area, do you have any idea what the dimensions of the flow stream are?

A None whatsoever.

Q So, you can't tell whether it's 10 times bigger than the profile or 10 times smaller?

A No.

Q Do you have an opinion as to whether it's bigger than the profile by the time it impacts a profile?

A I don't know.

Q Mr. Sieminski, do you contend that the relationship between
?

A I have no opinion.

(Sieminski Tr. at 344, 345, 346 to 350).

427. As to any shaking in KPM's process, Sieminski testified:

Q Is it your contention -- do you know enough about the extrusion process to know whether shaking can be the result of only one cause on an extrusion line?

A This is an observation purely on whether there was motion, sort of oscillatory, in that tube.

Q So, you don't really have a basis to be able to make any assertion as to what caused that shaking?

A In our tests with the KPM ring at Minigrip, as I recall, we had a until we got to the
when there was a suggestion of

shaking. This was in contradistinction to the kind of shaking I observed on the videotapes.

Q But you said a moment ago that you don't know enough about the production process to know whether there are other causes of shaking.

A I did say that.

Q So that just by viewing a videotape, you cannot definitively say what is the cause of any shaking that you might observe?

A I can't, no. All I can say is that shaking was observed.

(Sieminski Tr. at 360, 361).

428. With respect to a jet of air hitting the profile, Sieminski testified:

Q Okay. If you define impact of the jet as being the physical dimensions of the air stream actually hitting the tubing, if we can envision a diameter or some other shape, the physical shape and size of the end of the jet that's hitting the tubing.

If we adopt that as the definition, is it your testimony that at the point of impingement there are separate and distinct air jets or flows around the entire surface of the tube?

A Again, your question bothers me, because I don't know whether you're talking physical impact in that area or whether you're speaking of a cooling, localized cooling.

Q I'm speaking of physical impact.

A I don't know the extent of that physical impact, if it was such as to deform, in other words, produce a localized stress, then I would expect to see some development of retardation color, yes.

Q I'm asking you on the samples that you actually did, what the conditions were, not in theory. I'm asking in the samples that you ran, 1 through 7, do you have an understanding as to what the physical shape of the jet looked like, one jet versus the one next door to it?

A I don't know the difference, no.

Q So you don't know then whether perhaps one jet may have -- or one air flow may have merged with another by the time that it impacted the profile, physically impacted the profile?

A Based on the results we did, I said that under some conditions, the flows -- adjacent flow patterns could merge before it impacted on the tubing, and in other cases it would not.

Q I'm asking in those sample runs where you found the blue retardation in the profile area, where you know enough to tell us that at the point that air impacted the tubing, that they were physically distinct areas or whether you just don't know enough to know whether they might have merged at some point prior to that?

A I don't know.

(Sieminski Tr. at 374 to 376).

429. As to a positive birefringence test, Sieminski testified:

THE WITNESS:

THE WITNESS: Yes. But I mentioned --

JUDGE LUCKERN: Did you say yes?

THE WITNESS: I said yes. But again, I'm talking here about the 2-mill bags. If one were to take 4-mill or 6- mill bags, we could get different colors developing because of a thickness effect. We would still get our birefringence values, but because of the thickness effect, we would get different colors showing, and we could get, for instance, a red showing.

JUDGE LUCKERN: Go ahead. You say you could -- a red showing, and that would be a positive birefringence?

THE WITNESS: That would be a positive, yes.

JUDGE LUCKERN: But this would be in a different thickness of a bag.

THE WITNESS: In a different thickness of a bag, yes.

JUDGE LUCKERN: Because -- well, as the Commission in its notice -- pardon me?

The Commission in its notice said we know -- I might better put some of it in the record -- we know that a test is now available for use in determining whether a given reclosable plastic bag is produced by a process which infringes the 872 patent, and then it goes on, and Complainant says that it can provide the U.S. Customs Service with sufficient heat sealscopes for Customs use. So if somebody in Customs is going to be using this heat sealscope, and I guess what I hear you saying, and maybe I'm wrong, is if you get this blue band, your understanding is that's a positive birefringence test, and it infringes the patent.

THE WITNESS: Yes.

JUDGE LUCKERN: However that if you get a red band or some other color, that could still be using a Noguchi air jet and still could be, as an expert, still consider it a positive birefringence test,

Is that what you're telling me?

THE WITNESS:

But the point is that in our experience with 2-mil bags --

JUDGE LUCKERN: But the Commission notice is not restricted to any thickness of a bag.

All right. No, I know. No, I'm not -- you can't read into the Commission's mind. I can't read into the Commission's mind, and I -- the Commission put this in there. That's all I -- no, I'm not expecting you, Mr. Sieminski, to read into the Commission's mind, but -- all right. I just wanted to explore that point.

But let's go ahead with the direct examination -- I mean, the re- -- you're finished?

MS. TAYLOR: Your Honor, I have one further question in this line of questioning.

JUDGE LUCKERN: Fine. Proceed with redirect.

BY MS. TAYLOR:

Q Mr. Sieminski, if you place a bag, whether its thickness be 2, 4 or 6 millimeters under a heat sealscope and the blue band appears, is it your opinion that an air jet has been used to manufacture that bag?

A If I knew that it were a 2-mill bag, I would say that there has been an air jet impinging. If it's a 4 or a 6-mill bag, I would then have to use the step wedge to make the measurement, absolute measurement of birefringence, and then make the comparison of the birefringence in the vicinity of the profile as against that in the vicinity of the body -- I'm sorry -- in the body, rather than the vicinity, but in the body.

Q So is it your testimony, on a 4-millimeter bag, if that blue banding appears, it's not subjected to a secondary test such as a step wedge test, you cannot determine whether an air jet was used to manufacture it or not?

A That's right. In the case of something other than a 2-mil bag, one would have to make that other determination.

(Sieminski Tr. at 418 to 422).

Air Ring Location as to Warm Profiles in Formative State

430. On Ferrell's visit to KPM's plant and observation of profiled tubing there, Ferrell found that there was a fairly constant relationship between where the frost line

The frost line refers to the visually observable point at which the molten extruded polyethylene (PE) freezes and turns from a transparent to a somewhat cloudy or milky condition, as illustrated by a photograph taken of the KPM extruded tube, KPX-9. The frost line indicated that the extruded PE is still in a formative condition. Ferrell found that the frost line

Ferrell's measurements of the height of the frost lines are reproduced in finding 369. (Ferrell KX-2 at 6-8, 10; Ferrell Tr. at 723-724).

431. Ferrell's findings confirmed Yun's testimony that KPM has consistently observed that the frost line

432. It is Sieminski's opinion that if an air jet were applied to the body of a bag where the body of the bag had already become frozen in structure or solidified and no longer in the molten state, birefringence would not result in application of an air jet. (Sieminski Tr. at 383).

Minigrip Air Ring

433. Garris noted that there were significant differences in geometry between

. Garris and Sieminski appear to agree that a jet will diffuse at a certain distance from the exit. One of the important factors in determining where diffusion occurs is the interaction between adjacent jets. Based on Garris' experience with other turbulent jets, Garris would expect that the distance that the jet penetrates prior to interacting with its neighbor would be increased by a factor comparable to the increase in the space between orifices . On the basis of principles of fluid mechanics, those differences would lead to different types of air flow from the two devices. Because of those differences, it is impossible to contend that air flow from one device would be an accurate model or representation of the air flow characteristics of the order device. The statement made by Tilman in his Supplemental Affidavit that a

is not consistent with well-established principles of physics. A turbulent high-speed jet will diffuse with neighboring jets in an array of jets more rapidly than a laminar low-speed jet and this principle is exploited in aircraft combustors to speed up fuel/air mixing and thus shorten the combustor. (Garris KX-22 at 4, 5; Garris Tr. at 1047-50).

433a. KPM's retained expert in fluid mechanics Garris observed the

he found with the KPM ring, <u>viz</u>. that the air flow first emerged from the air ring as a coherent laminar flow and after a certain distance a transition to turbulence occurs, followed by a merging of adjacent jets; and that from the point of merging it is impossible to speak of any localized, jet-like flow of air, and the air flow does not appear to be impinging the tubing in any coherent form. Garris' expert testimony is consistent with the administrative law judge's . (Garris KX-22 at 4-5; CPX-1).

Analysis Of Polymers By Polarized Light

434. Prof. Theodore Davidson is KPM's qualified expert in the analysis of polymers by means of polarized light. (Tr. at 753, KX-7).

435. Birefringence is a function of the stresses and strains in the plastic when freezing takes place and, for a crystalline polymer, also on the thermal history. The process by which those orientations are achieved cannot be inferred from relative or absolute values of the optical retardation or the birefringence. A multitude of process paths can lead to very similar or identical color patterns in polarized light. (Davidson KX-4 at 2).

436. Materials whose refractive index varies with direction in the substance (anisotropic materials) exhibit the phenomenon of optical double refraction or birefringence. When plane polarized light is passed through such a birefringent material, one ray, the extraordinary ray, is slowed relative to the ordinary ray. The difference in propagation speeds causes an optical interference which is visible as color bands known as "Newton's colors. The observed retardation is proportional to the thickness of the specimen and to its birefringence. The relationship is expressed as: Retardation = thickness x birefringence. In polymeric materials, differences in orientation and molecular polarizability are the causes of

the anisotropy which array appear as birefringence. (Davidson KX-4, at 2, 3).

437. According to Davidson the processes of flow which are created in extruding polymers give rise to orientation of the polymer molecules which orientation can be "trapped" by freezing the materials -- as occurs at the transition between molten and solid polymer; that in the case of polyethylene (PE) this freezing is accompanied by crystallization of some of the macromolecules; and that for polyethylene, the result is a partially crystalline solid which exhibits orientation induced by flow stresses in the melt resulting in an anisotropic material. (Davidson KX-4 at 3).

438. It is Davidson's opinion that the birefringence coloration observed in extruded polyethylene is representative of the state of orientation induced by processing stresses, strains, and thermal history; that measurement of the birefringence alone does not allow specification of the thermal history since the birefringence depends on all three sets of factors; that the effects of all of these various factors are "frozen in" as the material solidifies (at the "frost line" in the processes being considered); that the birefringence does not uniquely reflect the rate of cooling or the detailed process by which freezing is achieved but that it correlates with the molecular anistropy of the polymer and the stresses present at solidification. (Davidson KX-4 at 3, 4).

<u>KPM's Quality Control</u>

439. KPM itself has never measured the gap between the sides of the female profile on its extruded tubing, and has no equipment for such measurement. Its quality control consists only of unaided visual inspection of the seal between the two profiles and manual pulling and

resealing of the profiles for interlocking. (Yun KX-24 at 1-2; Ferrell Tr. at 680).

Conclusions Of Law

1. KPM has sustained its burden in establishing that its reclosable bags sought to be exported to the United States are not covered by the PEO.

2. The reclosable plastic bags sought to be exported to the United States by KPM are not covered by the PEO.

INITIAL ADVISORY OPINION 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 proposed findings of fact it is the administrative law judge's opinion that the reclosable plastic bags sought to be exported to the United States by KPM are not covered by the PEO.

The administrative law judge hereby CERTIFIES to the Commission this IAO, together with the record in this IAO proceeding consisting of the following:

1. The transcript of the March 1989 hearing; and
2. The Exhibits admitted into evidence at the March 1989 hearing.

The pleadings of the parties 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 Rule 210.44(b), all material heretofore marked <u>in camera</u> because of technical, 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 those portions of the IAO which contain confidential business information to be deleted from the public version of the initial determination no later than Tuesday June 6, 1989. Such portions containing confidential information should be bracketed. The designation of confidential matter should be done with restraint and strictly limited to protectable confidential information under Commission rule 210.6(a) which disclosure would be of significant competitive harm to the supplier or significant competitive benefit to others. If no comments are received from a party it will mean that the party has no objection in removing the confidential status, in its entirety, from this IAO. In view of the holiday on May 29 and the June 6 date, the parties have been notified on May 25 about the issuance of this IAO.

Pursuant to the Commission's order dated June 28, 1988, petitions for review of the IAO may be filed within 10 days after service of the IAO. Responses to such petitions may be filed within 5 days after service of the petitions. The IAO shall become the Commission's advisory opinion within 45 days after service of the IAO, unless the Commission orders a review of the IAO or changes the deadline for determining whether to order a review.

Paul J. Luckern
Paul J. Luckern
Administrative Law Judge

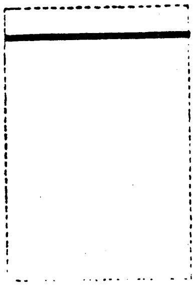
Issued: May 25, 1989

United States Patent Office

946,120
Registered Oct. 31, 1972

PRINCIPAL REGISTER
Trademark

Ser. No. 374,045, filed Oct. 22, 1970



Minigrip, Inc. (New York corporation)
Route 303
Orangeburg, N.Y. 10962, by merger from
Flexigrip, Inc. (New York corporation)
Orangeburg, N.Y.

For: PLASTIC BAGS, in CLASS 2 (INT. CL. 16).

First use Mar. 26, 1959; in commerce Mar. 26, 1959.

The mark consists of a horizontal stripe adjacent the bag top lined for the color red. However, applicant makes no claim to any specific color apart from the mark as shown.

Owner of Reg. No. 853,436.

R. S. KOLAKOSKI, Examiner

REGISTERED FOR A TERM OF 20 YEARS FROM Oct. 31, 1972

COMB. AFF. SEC 8 & 15

CERTIFIED TO BE A TRUE COPY OF THE REGISTRATION WHICH IS IN FULL FORCE AND EFFECT, WITH NOTATION OF ALL STATUTORY ACTIONS TAKEN THEREON, AS DISCLOSED BY THE RECORDS OF THE UNITED STATES PATENT AND TRADEMARK OFFICE. SAID RECORDS SHOW TITLE TO BE IN: Minigrip, Inc., a corp. of NY

Attest

OCT 29 1986

Attesting Officer

COMMISSIONER OF PATENTS AND TRADEMARKS

ted States Patent [19]
Noguchi

[11] 3,945,872
[45] **Mar. 23, 1976**

[54] **MAKING PLASTIC FILM WITH PROFILES AND OPENING MEANS FOR BAGS**

[76] Inventor: **Takashi Noguchi**, Tokyo, Japan

[22] Filed: **Dec. 26, 1973**

[21] Appl. No.: **428,433**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 178,086, Sept. 7, 1971, Pat. No. 3,787,269.

[52] **U.S. Cl.** **156/244**; 156/498; 156/500
[51] **Int. Cl.²** **B32B 31/30**
[58] **Field of Search** .... 156/66, 91, 244, 497, 498, 156/500; 150/3; 264/176 R

[56] **References Cited**

UNITED STATES PATENTS

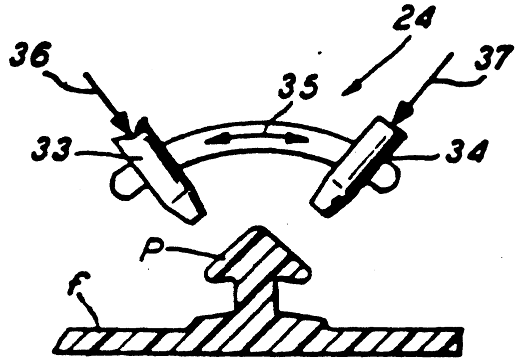
2,415,644 2/1947 **Leonhard et al.** 156/497
3,462,332 8/1969 **Goto** 156/244
3,780,152 12/1973 **Kriesner** 156/244

Primary Examiner—**Caleb Weston**
Attorney, Agent, or Firm—**Hill, Gross, Simpson, Van Santen, Steadman, Chiara & Simpson**

[57] **ABSTRACT**

A method and mechanism for continuously making a plastic film with shaped profiles on the surface including extruding a continuous length of interlocking profiles from a die shaped with a precise shape for interlockingly engaging with another profile and directing a flow of coolant on the profile from a stationary coolant means and adjusting the direction of flow of coolant relative to the direction of movement of the profile or controlling the pressure and temperature of the flow of coolant to control the cooling rate and the shape of the profile.

8 Claims, 7 Drawing Figures



MAKING PLASTIC FILM WITH PROFILES AND OPENING MEANS FOR BAGS

This application is a continuation-in-part of my copending application, U.S. Ser. No. 178,086, filed Sept. 7, 1971 U.S. Pat. No. 3,787,269.

BACKGROUND OF THE INVENTION

The invention relates to improvements in plastic extrusion equipment and methods for forming film with shaped profiles on the surface where such film is eventually used in making reclosable bags or similar products.

More particularly, the invention relates to improvements in forming the profiles such that the shape can be more completely controlled at relatively high extrusion speeds so that a precise shape can be maintained to accurately and strongly interlock with another mating profile. One type of film having profiles on the surface is formed by supplying a continuous sheet of film and simultaneously extruding a profile which is laid on the film while hot so that it integrally attaches itself to the film to form a completed profile sheet. Mechanisms and processes for forming such sheets are shown in the copending applications of Takashi Noguchi, U.S. Ser. No. 178,086, filed Sept. 7, 1971 and U.S. Ser. No. 178,087, filed Sept. 7, 1971. It will be understood that the features of the invention find advantage in forming profiles by other methods and other mechanisms, but the invention will be primarily described in connection with an environment such as that shown in the above referred to copending applications, the disclosures of which are embodied herein by reference. The features described herein may be employed, for example, in an extrusion arrangement wherein the profile is not formed separately and applied to a film white hot, but wherein the profile and film are extruded simultaneously out of a single die opening. It is also contemplated that the features of the invention may be employed in an arrangement wherein the film and profile are extruded separately, but substantially immediately joined to each other.

In the formation of profile sheets with the improvement of extrusion techniques and profile and film designs, it has become possible to form a very thin film of only a few mils of thickness and to make the profile very small and yet obtain interlocking profiles which will join to each other with a strength that approaches or surpasses the strength of the film. To obtain an efficient highly effective interlocking profile depends upon the accuracy thereof, and this accuracy is hard to maintain at high extrusion speeds. It has been discovered that an important factor in maintaining the shape of the profile is in controlling the cooling thereof.

It is accordingly an object of the present invention to provide an improved mechanism and method for the production of profiled film obtaining more accurate and better control of profile shape and/or higher extrusion rates.

A still further object of the invention is to provide an improved method and mechanism for accurately controlling the shape of extruded plastic profiles during continuous extrusion.

Other objects, advantages and features, as well as equivalent mechanisms and methods which are intended to be covered herein, will become more apparent with the disclosure of the preferred embodiments in the specification, claims and drawings, in which:

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a somewhat schematic elevational view of a mechanism for making profile film constructed and operating in accordance with the principles of the present invention;

FIG. 2 is a vertical sectional view taken through a film strip with profiles illustrating the type of construction formed in accordance with the invention;

FIG. 3 is a vertical sectional view taken through the top of a bag formed from the film of FIG. 2;

FIG. 4 is a somewhat schematic enlarged fragmentary sectional view showing a portion of the cooling mechanism;

FIG. 5 is a fragmentary enlarged side elevational view of another form of the cooling mechanism;

FIG. 6 is a fragmentary detailed view of a further form of the invention; and

FIG. 7 is another fragmentary schematic view of a further form of the invention.

DESCRIPTION

FIG. 1 illustrates a mechanism for attaching a profile to a traveling strip of film. The structure is somewhat similar in principle to the mechanism shown in the copending application, Ser. No. 178,086 but other variations may be employed. In accordance with the type of mechanism generally illustrated, a flat thin strip of film is delivered traveling along a path and a freshly extruded profile is positioned on the film to be bonded thereto by the heated plastic of the profile adhering to and solidifying with the film.

In FIG. 1 a strip of thin plastic film such as a laminate with one polyethylene surface travels over a guide roll 10 and successive rolls 11, 12 and 13 to pass upwardly in the nip between a pair of press rolls 14 and 15. The press roll 15 has a recess so as to admit a freshly extruded heated plastic profile P. The profile emerges from the die opening of an extruding head 16 which is supplied with heated plastic from an extruder 17. The die 16 and extruder 17 may be of various conventional designs which will be fully recognized by those versed in the art.

The film sheet F is preferably heated such as by passing over the heated roll 14 so that the profile will more readily adhere to the surface and form a firm bond. The plastic of the profile P being freshly extruded is relatively hot and must be cooled so that it will solidify for subsequent interlocking or for rolling up the profile film on a roll in a continuous operation. For this purpose a coolant jet mechanism 24 is provided directing a flow of coolant against the heated profile to remove heat therefrom. The film sheet is guided upwardly over a series of guide rolls 19, 20, 21 and 22.

The coolant jet 24 may be referred to as a control coolant jet because it has been discovered that this jet can control the shape of the resultant profile on the film. The profile after being adhered to the film, is in the somewhat plastic formative stage, and it has been found that the coolant jet 24 can influence the shape of the profile by controlling the location where the coolant fluid is directed and the direction at which it engages the profile as well as the pressure or velocity at which it engages the profile. The coolant employed is preferably air, but other gases or water may be used.

An additional cooling means 23 further along the path of travel of the strip m[illegible] employed for completing the cooling operation. The primary or the control coolant jet 24 removes the majority of heat and controls the shape of the profile, and the secondary coolant means 23 completes the operation, but usually has no effect on the size and shape of the profile. Also, to increase the cooling operation, a cooling means 23a may be placed in opposing relationship to the cooling means 23.

The extruder head 16 may be designed to extrude one or more profiles and, for example, a rib profile and a groove profile may be simultaneously extruded. The profiles must be accurately sized and shaped to be able to interlock when pressed together and to hold together with maximum strength. To accomplish this with the smallest profile possible and to thereby save the amount of plastic required and to be able to do so at as high a speed as possible, preciseness and accuracy in the shape of the profile is mandatory. In accordance with the present invention, it has been discovered that this shape can be controlled by controlling the direction and/or pressure of coolant directed against the profile after it has been placed on the sheet.

A sheet of the type formed with the mechanism illustrated is shown in FIG. 2 wherein the plastic film 26 has profiles 27 and 28 bonded to the surface. A use for this type of film is shown in the structure of FIG. 3 wherein the film sheet is doubled to form a doubled closed bag with a top 30 and a bag interior 29 and a bottom 30*b*. The top of the bag has interlocking profiles 27 and 28. For use the bag will be slit along the top 30, and the profiles can be pulled apart by the flanges located above them for access to the interior of the bag. For reclosing the bag the profiles 27 and 28 will be pressed together by applying a lateral pressure along the top of the bag on either side of the profiles.

A typical set of profiles will consist of a general arrowhead shape for one profile as shown schematically at 27 in FIG. 2, and a complementary groove shape with overlapping side jaws for the other profile as shown schematically at 28 in FIG. 2.

FIG. 4 illustrates the relationship between the profile P on the film F and the cooling head 24. The cooling head is shown as having one or more jets illustrated by the air jets 33 and 34. Air supply lines 36 and 37 are connected to the jets. The jets are mounted on a movable adjustment piece 35 so that their angle can be altered in a direction transversely of the direction of travel of the profile. By shifting the jets in an arcuate path through 180° relative to the profile, more or less heat will be removed from one side of the profile than the other in the initial cooling which will change the shape of the resultant profile. During operation, the position of these jets can be changed to obtain the optimum shape in the profile. Thus this shape may be changed to correct, for example, unequal size jaws in the female profile. This feature may be also used to correct resultant unequal size barbs of the male profile due to inaccuracies in the shape of the die 16. Additionally, if at different speeds of extrusion, the plastic tends to flow so that the head or jaw of the male or female profile is smaller on one side than on the other side, then compensation can be made by adjusting the position of the air jets.

FIG. 5 shows an arrangement wherein a coolant jet 38 is adjustable through 180° so that the jet can be directed from a position facing the oncoming moving

profile P to a position where its direction is parallel with the movement [illegible] he profile. This arrangement tends to control the profile height and its general shape. The adjustment arrangement wherein the coolant jet direction is adjusted in the direction of movement of the profile or normal to the direction of movement of the profile may be combined or may be used individually.

FIG. 6 shows an arrangement wherein a plurality of individual jets 40, 41, 42 and 43 are used such as with a female profile F. These jets will be individually adjustable and also adjustable as a block in both of the directions illustrated in FIGS. 4 and 5 so as to be able to vary the direction and position of engagement of the coolant with the moving profile. Adjustment means are shown at 48, 49, 50, 51 and 52.

A further variation may be introduced in control of the pressure of the flow of coolant. As shown in FIG. 7, a traveling profile has a jet 45 directed thereagainst supplied with a flow of coolant through a line 46 controlled by a pressure control valve 47. By varying the valve 47, the rate of flow of the coolant through the jet 45 is altered which will have an effect on the resultant shape of the profile P. The pressure control arrangement of FIG. 7 may be employed alone or simultaneously with the arrangement shown in FIGS. 4 through 6.

An additional variation may also be introduced by controlling the temperature of the coolant by passing it through a heat transfer mechanism 53 wherein the coolant can be brought to and maintained at a predetermined optimum temperature for satisfactorily cooling the profiles.

I claim as my invention:

1. In the method of making plastic film with shaped profiles on the surface comprising the steps of:
   extruding a continuous length of an interlocking profile from a die opening with the profile having a precise shape for interlockingly engaging with another profile;
   and directing a flow of coolant onto the extruded profile of warm plastic and adjusting the direction of flow of coolant relative to the direction of movement of the profile for controlling the cooling rate and shape of the profile.

2. In the method of making a plastic film with shaped profiles on the surface in accordance with claim 1.
   wherein said direction is adjusted through an arc of 180°.

3. In the method of making plastic film with shaped profiles on the surface in accordance with the steps of claim 1.
   wherein the flow of coolant is adjusted in an arc extending in the direction of travel of the profile length.

4. In the method of making plastic film with shaped profiles on the surface in accordance with the steps of claim 1.
   wherein the flow of coolant is adjusted in an arc extending transversely of the direction of movement of the profile length.

5. In the method of making plastic film with shaped profiles on the surface comprising the steps of:
   extruding a continuous length of an interlocking profile from a die opening with the profile having a precise shape for interlockingly engaging with another profile;

and directing a flow of coolant against the heated profile and adjusting the pressure of coolant flow for controlling the cooling rate and shape of the profile.

6. In the method of making plastic film with shapes profiles on the surface, the steps of:

extruding a continuous length of an interlocking profile from a die opening with the profile having a precise shape for interlockingly engaging with another profile;

directing a flow of coolant onto the extruded profile of warm plastic;

and varying the temperature of the coolant flow for controlling the cooling rate and shape of the profile.

7. In the method of making plastic film with shaped profiles on the surface, the steps of:

extruding a continuous length of an interlocking profile from a die opening with the profile having a precise shape for interlockingly engaging with another profile;

directing a first flow of coolant against the heated profile length in a small jet shape;

and directing a second flow of coolant in a small jet shape against the heated profile length;

said first flow being directed laterally relative to the axis of the profile and said second flow being directed in a direction laterally opposing the first flow of coolant.

8. In the method of making plastic film with shaped profiles on the surface, the steps of:

extruding a continuous length of an interlocking profile from a die opening with the profile having a precise shape for interlockingly engaging with another profile;

directing a first flow of coolant in a small jet shape against the heated profile length;

and directing a second flow of coolant in a small jet shape against the heated profile length;

said second flor of coolant being positioned after the first flow of coolant in the direction of profile lenth movement.

* * * * *

Fig. 1

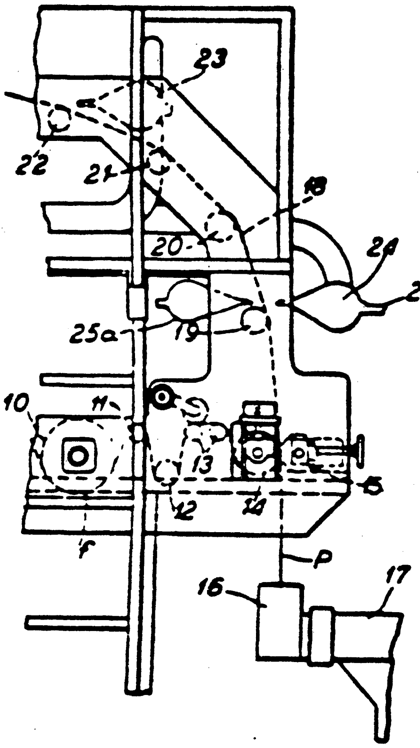
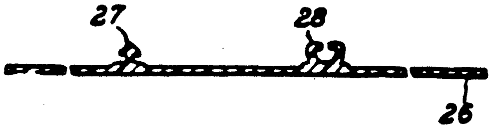


Fig. 2



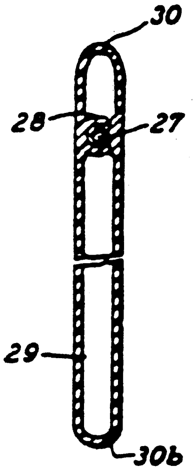


Fig. 3

Fig. 4

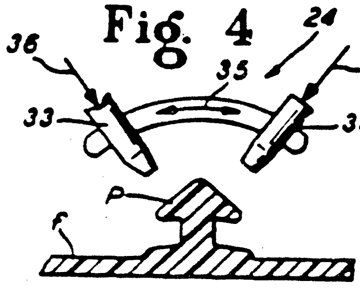
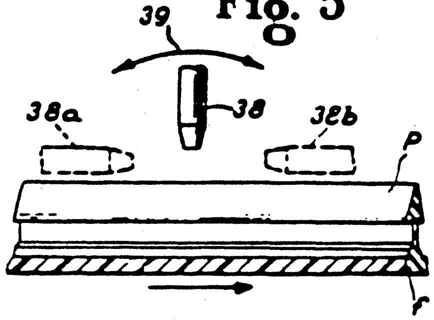


Fig. 5



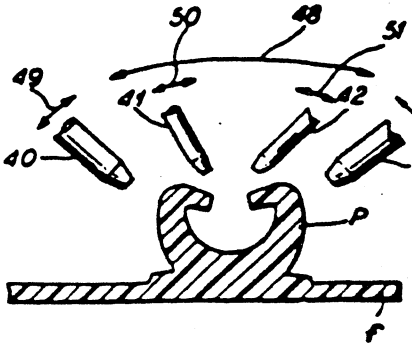


Fig. 6

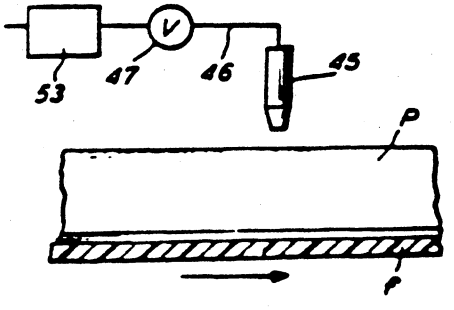


Fig. 7

APPENDIX A

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.
Before Paul J. Luckern
Administrative Law Judge

In the Matter of)
)
CERTAIN RECLOSABLE PLASTIC) Investigation No. 337-TA-266
BAGS AND TUBING)
)

Commission Investigative Staff's Exhibits for Advisory Opinion

Documentary Exhibits

SX-AO Ex. No.	Description
SX-AO Ex. 0	Staff's Exhibit List
SX-AO Ex. 1(C)	Tillman Deposition Exh. 7
SX-AO Ex. 2(C)	Tillman Deposition Ex. 7a
SX-AO Ex. 3(C)	Tillman Deposition Ex. 8
SX-AO Ex. 4(C)	Tillman Deposition Exh. 8a
SX-AO Ex. 5(C)	Tillman Deposition Ex. 9
SX-AO Ex. 6(C)	Tillman Deposition Ex. 9a
SX-AO Ex. 7(C)	Tillman Deposition Ex. 21
SX-AO Ex. 8	First Set of Interrogatories of CIS Propounded to KPM
SX-AO Ex. 9	Second Set of Interrogatories of CIS Propounded to KPM
SX-AO Ex. 10(C)	Third Set of Interrogatories of CIS Propounded to KPM
SX-AO Ex. 11(C)	First Set of Requests for Admissions of CIS Propounded to KPM

SX-AO Ex. 12(C)	Response of KPM to First Set of CIS's Interrogatories
SX-AO Ex. 13(C)	Supplemental Response of KPM to First Set of CIS's Interrogatories
SX-AO Ex. 14(C)	Response of KPM to Second Set of CIS's Interrogatories and Document Request
SX-AO Ex. 15(C)	Response of KPM to Third Set of CIS's Interrogatories
SX-AO Ex. 16(C)	Response of KPM to CIS's Request for Production of Documents
SX-AO Ex. 17(C)	Response of KPM to First Set of CIS's Request for Admissions
SX-AO Ex. 18	September 6, 1988, Certification of Yun's Responses
SX-AO Ex. 19	September 27, 1988, Certification of Yun's Responses
SX-AO Ex. 20(C)	September 27, 1988, Letter of KPM Forwarding Document
SX-AO Ex. 21(C)	Witness Statement of Stan Roth
SX-AO Ex. 22(C)	Affidavit of Gary Schlatter
SX-AO Ex. 23	Agreement between Stan Roth and KPM Regarding Roth Videotape (SPX-AO Ex. 1(C)).

Physical Exhibits

SPX-AO Ex. No.	Description
SPX-AO Ex. 1(C)	Videotape of Extrusion Process at No. 1, Lane 49, Gwu Ching Road, Pam Chiao City, Taipei Hsien, Taiwan
SPX-AO Ex. 2(C)A&B	Sample Bags Depicted in SPX-AO Ex. 1

Respectfully submitted,

Cheri M. Taylor

Cheri M. Taylor, Esq.
Commission Investigative Attorney
Office of Unfair Import Investigations

Dated: March 24, 1989

CERTIFICATE OF SERVICE

I hereby certify that the several attached documents entitled POSTHEARING STATEMENT OF KINGDOM PLASTIC MANUFACTURING CO. LTD. were filed with the Commission on March 24, 1989 and caused to be served on the following persons by the means indicated, as follows:

Honorable Kenneth R. Mason
Secretary
U.S. International Trade Commission
500 E Street, S.W.
Washington, D.C. 20436 (BY HAND)

Honorable Paul J. Luckern
Administrative Law Judge
U.S. International Trade Commission
500 E Street, S.W.
Washington, D.C. 20436 (BY HAND)

Cheri M. Taylor, Esq.
Office of Unfair Import Investigations
U.S. International Trade Commission
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<u>Counsel to Minigrip, Inc.</u>

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Sturgis M. Sobin

CERTAIN RECLOSABLE PLASTIC BAGS AND TUBING Inv. No. 337-TA-266

Certificate of Service

I, Kenneth R. Mason, hereby certify that the attached PUBLIC ADVISORY OPINION was served upon Cheri M. Taylor, Esq., and upon the following parties via first class mail, and air mail where necessary, on June 22, 1989.

Kenneth R Mason

Kenneth R. Mason, Secretary
U.S. International Trade Commission
500 E Street, S.W.
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For Complainant Minigrip, Inc.

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Michael T. Schmitz
Chief Counsel
U.S. Customs Service
1301 Constitution Avenue, N.W.
Washington, D.C. 20229

PHYSICAL EXHIBITS	**DESCRIPTION**
CPX-4-C	Yun Deposition and Exhibits Identified therein
CPX-5(A)-5(E)	KPM Samples
CPX-6(A)-6(G)	Samples of Tubing from Testing done by Mitchell Sieminski
CPX-7-C	KPM Air Ring
CPX-8-C	Portions of this exhibit have been included but marked separately with respective exhibit numbers.
CPX-9-C	Witness Statement of Mitchell A. Sieminski
CPX-10(A)-(J)	A series of pictures of building (KPM)
CPX-11-C	Exhibit 7 to Request
CPX-12-C	Exhibit 10 to Request
CPX-13-C	Large drawing made by Dr. Garris

Respectfully submitted,

Kane, Dalsimer, Sullivan,
Kurucz, Levy, Eisele
and Richard

by: ____________________

711 Third Avenue
New York, N.Y. 10017
Attorneys for Minigrip Inc.

Of Counsel

Gerald Levy, Esq.
Ronald R. Santucci, Esq.

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.
Before Paul J. Luckern
Administrative Law Judge

In the Matter of

CERTAIN RECLOSABLE PLASTIC BAGS AND TUBING

Inv. No. 337-TA-266

MINIGRIP INC.'S REVISED DIRECT EXHIBIT LIST

DOCUMENTARY EXHIBITS	DESCRIPTION
CAO-1-C	Affidavit of Tilman dated October 21, 1988
CAO-2-C	Affidavit of Tilman dated November 1, 1988
CAO-3-C	Secrecy Agreement
CAO-4-C	Yellow Sheet of Paper with Markings on it by Ferrell
CAO-5-C	Ferrell's Work Papers

PHYSICAL EXHIBITS	
CPX-1-C	Video Tape of Smoke Test
CPX-2-C	Video Tape of KPM Process Taken On August 17, 1989
CPX-3-C	Video Tape of KPM Process Taken On August 17, 1989

LIST OF PHYSICAL EXHIBITS

		Conf.* Status
KPX 1	KPM 12-3/4 inch Air Ring	C
KPX 2	Photograph of Air Ring Test Apparatus	C
KPX 3A-3H	Photographs of Oscilloscope Readings	C
KPX 4	Photograph of Manometer used by Dr. Garris	N
KPX 5	Photograph of Rotary Table	N
KPX 6A-6D	Photographs of Helium Bubble Test	C
KPX 7	Photograph of Manometer used on KPM Ring	C
KPX 8	Photograph of Manometer Hose Fixture	C
KPX 9	Photograph Depicting Frost Line on KPM Tubing	C
KPX 10	Video Tape of KPM Process Submitted with Request for Expedited Advisory Opinion	C
KPX 11	Photograph of Smoke Visualization	C
KPX 12	Photograph of Minigrip Ring (Identified Only)	C
KPX 13	Photograph of a Sheet of Paper indicating a single row of air jets within the air ring (Identified Only)	C
KPX 14	Sieminski's Probe (Identified Only)	C
KPX 15	Depositions of Paul A. Tilman	C

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* C = confidential; N = non-confidential

KPM

LIST OF EXHIBITS

		Conf.* Status
KX 1	Witness Statement of Liang Hong Yun	C
KX 2	Witness Statement of Robert A. Ferrell	C
KX 3	Witness Statement of Dr. Charles A. Garris	C
KX 4	Witness Statement of Dr. Theodore Davidson	C
KX 5	Resume of Robert A. Ferrell	N
KX 6	Resume of Dr. Charles A. Garris	N
KX 7	Resume of Dr. Theodore Davidson	N
KX 8	Affidavit of Liang-Hong Yun (2/29/88)	C
KX 9	Affidavit of Liang-Hong Yun (10/27/88)	C
KX 10	Brochure Re Anemometer	N
KX 11	Drawing of Air Flow Measurement Positions	C
KX 12	Velocity Profiles	C
KX 13	Bubble Generator Literature	N
KX 14	Schematic of Air Flow	C
KX 15	U.S. Patent Re. 26,991 - Luca	N
KX 16	U.S. Patent Re. 28,959 - Naito	N
KX 17	U.S. Patent Re. 29,208 - Naito	N
KX 18	Scale Drawing	C
KX 19A-19C	Profile Sampling Results	C
KX 20	Goto '332	N
KX 21	Rebuttal Statement of Dr. Theodore Davidson	C
KX 22	Rebuttal Statement of Dr. Charles A. Garris	C
KX 23	Rebuttal Statement of Robert A. Ferrell	C
KX 24	Rebuttal Statement of Liang-Hong Yun	C
KX 25	Statement of Thomas Lee Gilles (Withdrawn)	N
KX 26	Resume of Larry Shen	N
KX 27	Notes of Mitchell Sieminski	C
KX 28	Affidavit of Robert Ferrell#	C

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* C = confidential; N = non-confidential

\# This affidavit has not yet been submitted due to delays in getting the tape measure from Taiwan. It will be submitted, after obtaining the parties' agreement, as soon as possible.