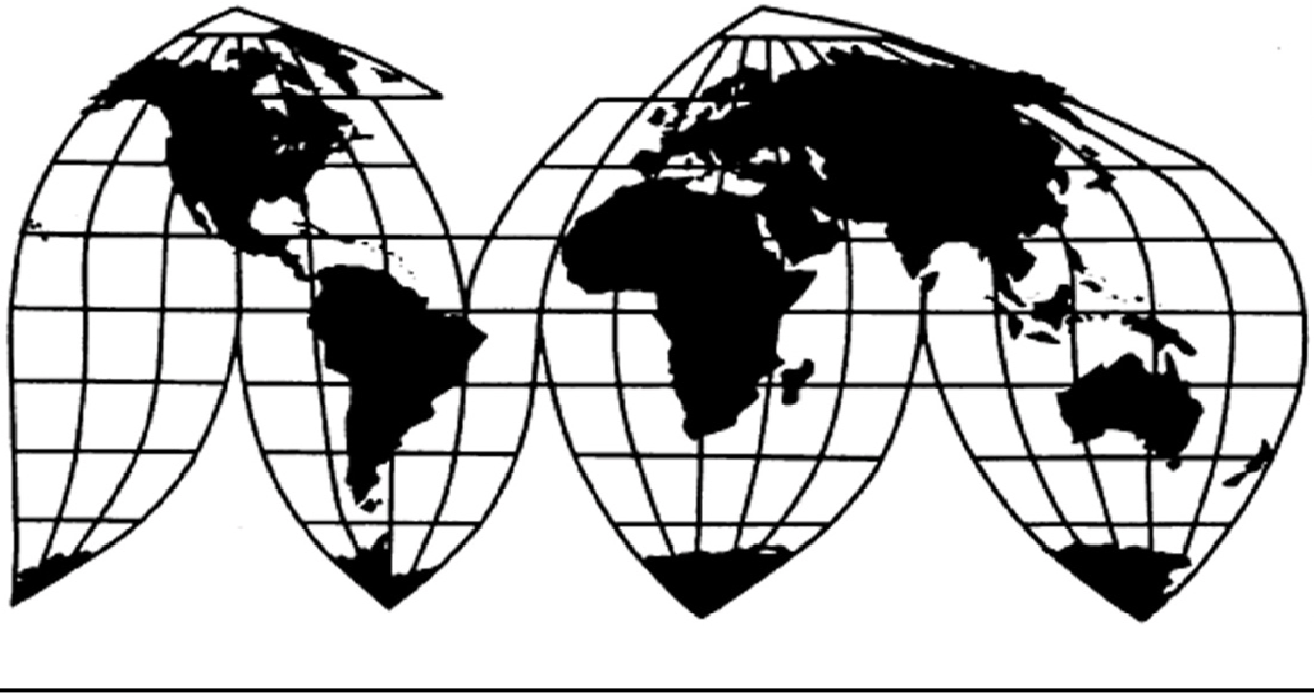
In the Matter of

Certain Electric Robots and Component Parts Thereof

Investigation No. 337-TA-530

Publication 3974 **April 2008**

U.S. International Trade Commission



Washington, DC 20436

U.S. International Trade Commission

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*Commissioner Marcia E. Miller, whose term ended on September 6, 2005, participated in the initial phases of this investigation. Commissioner Shara L. Aranoff, whose term commenced on September 6, 2006, participated in the Commission Final Determination. Commissioner Irving A. Williamson was sworn in on February 7, 2007, and Commissioner Dean A. Pinkert was sworn in on February 26, 2007; they did not participate in this investigation. Commissioner Stephen Koplan, whose term ended on February 6, 2007, and Commissioner Jennifer A. Hillman, whose term ended on February 23, 2007, did participate in this investigation.

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Washington, DC 20436

U.S. International Trade Commission

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

In the Matter of	Inv. No. 337-TA-530
CERTAIN ELECTRIC ROBOTS AND COMPONENT PARTS THEREOF	

NOTICE OF COMMISSION DETERMINATION NOT TO REVIEW A FINAL INITIAL DETERMINATION FINDING NO VIOLATION OF SECTION 337; TERMINATION OF THE INVESTIGATION

AGENCY: U.S. International Trade Commission.

ACTION: Notice.

SUMMARY: Notice is hereby given that the U.S. International Trade Commission has determined not to review the final initial determination ("ID") issued by the presiding administrative law judge ("ALJ") on December 19, 2005, finding no violation of section 337 of the Tariff Act of 1930, 19 U.S.C. § 1337, in the above-captioned investigation. Accordingly, the Commission has terminated the investigation with a finding of no violation of section 337.

FOR FURTHER INFORMATION CONTACT: Timothy P. Monaghan, Esq., Office of the General Counsel, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone 202-205-3152. Copies of all nonconfidential documents filed in connection with this investigation are or will be available for inspection during official business hours (8:45 a.m. to 5:15 p.m.) in the Office of the Secretary, U.S. International Trade Commission, 500 E Street, S.W., Washington, D.C. 20436, telephone 202-205-2000. Hearing-impaired persons are advised that information on this matter can be obtained by contacting the Commission's TDD terminal on 202-205-1810. General information concerning the Commission may also be obtained by accessing its Internet server (*http://www.usitc.gov*). The public record for this investigation may be viewed on the Commission's electronic docket (EDIS) at *http://edis.usitc.gov*.

SUPPLEMENTARY INFORMATION: This investigation was instituted by the Commission based on a complaint filed by FANUC Robotics America, Inc. ("FANUC") of Rochester Hills, Michigan. 70 *Fed. Reg.* 2881 (January 18, 2005). The complainant alleged violations of section 337 of the Tariff Act of 1930, 19 U.S.C. § 1337 ("section 337") in the importation into the United States, the sale for importation, and the sale within the United States after importation of certain electric robots and component parts thereof by reason of infringement of claims 1-24 of U.S. Patent No. 6,477,913 ("the '913 patent"). The complaint and notice of investigation named

Behr Systems, Inc. of Auburn Hills, Michigan, Dürr AG of Stuttgart, Germany (collectively "Dürr "), Motoman, Inc. of West Carrollton, Ohio, and Yaskawa Electric Corporation of Kitakyushu, Fukuoka, Japan ("Yaskawa") as respondents.

On April 26, 2005, the ALJ issued an ID, Order No. 6, which terminated the investigation as to claims 3, 5, and 16 of the '913 patent against respondents Dürr and Behr and terminated the investigation as to claim 6 of the '913 patent against all respondents. On May 15, 2005, the Commission determined not to review Order No. 6.

On May 2, 2005, the ALJ issued an ID, Order No. 7, which granted complainant's motion to amend the complaint to add Dürr Systems, Inc., Dürr Systems GmbH, and Dürr Special Material Handling GmbH as respondents and clarified complainant's claims of contributory and induced infringement. On May 20, 2005, the Commission determined not to review Order No. 7.

On May 31, 2005, the ALJ issued an ID, Order No. 9, which terminated the investigation as to claims 1-5, 7-9, and 15-17 of the '913 patent against respondents Motoman and Yaskawa, claims 1-2, 4, 7-9, 15, and 17 against respondents Behr and Dürr, and claims 1-9 and 15-17 against newly added respondents Dürr Systems, Inc., Dürr Systems GmbH, and Dürr Special Material Handling GmbH. On June 16, 2005, the Commission determined not to review Order No. 9.

On August 23, 2005, the ALJ issued an ID, Order No. 15, which granted complainant's motion for summary determination regarding the economic prong of the domestic industry requirement of section 337. On September 12, the Commission determined not to review Order No. 15.

An evidentiary hearing was held from September 16-23, 2005.

The claims remaining at issue are claims 10-14 and 18-24 of the '913 patent, which claims are asserted against all respondents.

On December 19, 2005, the ALJ issued his final ID and recommended determinations on remedy and bonding. The ALJ found no violation of section 337 based on his findings that respondents' accused products do not infringe any of the asserted claims of the '913 patent; that the asserted claims of the '913 patent are not invalid; that the '913 patent is enforceable; and that a domestic industry exists.

On December 28, 2005, the Commission investigative attorney ("IA"), filed a request for a two day extension of time to file his response to the petitions for review, and that request was granted by the Chairman.

On December 30, 2005, complainant FANUC filed a petition for review of the final ID, and a separate conditional petition for review of the ID. Additionally, on the same date, respondents Yaskawa, Durr, and the IA filed petitions for review of the ID. On January 9, 2006,

Yaskawa and Durr filed responses to complainant FANUC's petitions for review, and complainant FANUC filed a response to Yaskawa, Durr, and the IA's petitions for review. On January 11, 2006, the IA filed a response to complainant FANUC's petition for review.

On January 17, 2006, Yaskawa filed a motion to strike untimely and previously stricken arguments in the response brief of complainant FANUC regarding motor purge tests conducted by Yaskawa. The IA concurs with this motion. On January 27, 2006, FANUC filed a response to Yaskawa's motion to strike. Having considered the motion to strike and the response thereto, the Commission has determined to grant Yaskawa's motion.

Having reviewed the record in this investigation, including the parties' written submissions, the Commission has determined not to review the ALJ's final ID, thereby allowing it to become the Commission's final determination. The Commission has terminated the investigation with a finding of no violation.

This action is taken under the authority of section 337 of the Tariff Act of 1930, 19 U.S.C. § 1337, and section 210.42 of the Commission's Rules of Practice and Procedure, 19 C.F.R. § 210.42.

By order of the Commission.

Marilyn R. Abbott
Secretary to the Commission

Issued: February 3, 2006

CERTAIN ELECTRIC ROBOTS AND COMPONENT PARTS THEREOF **337-TA-530**

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **NOTICE OF COMMISSION DETERMINATION NOT TO REVIEW A FINAL INITIAL DETERMINATION FINDING NO VIOLATION OF SECTION 337; TERMINATION OF THE INVESTIGATION** was served upon the Commission Investigative Attorney, Kevin Baer, Esq., and all parties via first class mail and air mail where necessary on February 6, 2006.

Marilyn R. Abbott

Marilyn R. Abbott, Secretary
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PUBLIC VERSION

UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, D.C.

In the Matter of	)	
	)	
CERTAIN ELECTRIC ROBOTS AND COMPONENT PARTS THEREOF	)	Investigation No. 337-TA-530
	)	
	)	

Final Initial and Recommended Determinations

This is the administrative law judge's Final Initial Determination under Commission rule 210.42. The administrative law judge, after a review of the record developed, finds no violation of section 337 of the Tariff Act of 1930, as amended, 19 U.S.C. § 1337, has occurred.

This is also the administrative law judge's Recommended Determination on remedy and bonding, pursuant to Commission rules 210.36(a) and 210.42(a)(1)(ii). Should a violation of section 337 be found by the Commission, the administrative law judge recommends that the Commission issue limited exclusion orders. He further recommends that any bond during the Presidential review period be in the amount of a 40 percent bond rate.

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ABBREVIATIONS

CBr	Complainant's Post-hearing Brief
CODFF	Complainant's Objection To Respondent Dürr's Proposed Finding
COYFF	Complainant's Objection To Respondent Yaskawa's Proposed Finding
COSFF	Complainant's Objection To Staff's Proposed Finding
CFF	Complainant's Proposed Finding
CPHS	Complainant's Pre-hearing Statement
CPX	Complainant's Physical Exhibit
CRDBr	Complainant's Post-hearing Reply Brief to Respondent Dürr's Post-hearing Brief
CRYBr	Complainant's Post-hearing Reply Brief to Respondent Yaskawa's Post-hearing Brief
CRSBr	Complainant's Post-hearing Reply Brief to Staff's Post-hearing Brief
CRDFF	Complainant's Rebuttal Finding to Respondent Dürr's Proposed Finding
CRYFF	Complainant's Rebuttal Finding to Respondent Yaskawa's Proposed Finding
CRSFF	Complainant's Rebuttal Finding To Staff's Proposed Finding
CX	Complainant's Exhibit
DBr	Respondent Dürr's Post-hearing Brief
DPHS	Respondent Dürr's Pre-hearing Statement
DRBr	Respondent Dürr's Post-hearing Reply Brief
DOCFF	Respondent Dürr's Objection To Complainant's Proposed Finding
DOSFF	Respondent Dürr's Objection To Staff's Proposed Finding
DFF	Respondent Dürr's Proposed Finding

DRCFF	Respondent Dürr's Rebuttal Finding To Complainant's Proposed Finding
DRSFF	Respondent Dürr's Rebuttal Finding To Staff's Proposed Finding
JX	Joint Exhibit
RPX	Respondents' Physical Exhibit
RX	Respondents' Exhibit
YBr	Respondent Yaskawa's Post-hearing Brief
YPHS	Respondent Yaskawa's Pre-hearing Statement
YRBr	Respondent Yaskawa's Post-hearing Reply Brief
YOCFF	Respondent Yaskawa's Objection To Complainant's Proposed Finding
YOSFF	Respondent Yaskawa's Objection To Staff's Proposed Finding
YFF	Respondent Yaskawa's Proposed Finding
YRCFF	Respondent Yaskawa's Rebuttal Finding To Complainant's Proposed Finding
YRSFF	Respondent Yaskawa's Rebuttal Finding To Staff's Proposed Finding
SPBr	Staff's Pre-hearing Statement
SBr	Staff's Post-hearing Brief
SFF	Staff's Proposed Finding
SRBr	Staff's Post-hearing Reply Brief
SRRFF	Staff's Rebuttal Finding To Respondents' Proposed Finding
SRCFF	Staff's Rebuttal Finding To Complainant's Proposed Finding
Tr.	Transcript Of Pre-hearing Conference And Hearing And Also Telephone Conference on September 15, 2005

I. Procedural History

By notice, which issued on January 11, 2005, the Commission instituted an investigation, pursuant to subsection (b) of section 337 of the Tariff Act of 1930, as amended, to determine whether there is a violation of subsection (a)(1)(B) of section 337 in the importation into the United States, the sale for importation into the United States, or the sale within the United States after importation of certain electric robots or component parts thereof by reason of infringement of one or more of claims 1-24 of U.S. Patent No. 6,477,913 (the '913 patent) and whether an industry in the United States exists as required by subsection (a)(2) of section 337. The complaint had been filed with the Commission on December 16, 2004 on behalf of FANUC Robotics America, Inc. of Rochester Hills, Michigan (FANUC). A letter supplementing the complaint was filed on January 4, 2005. The complaint requested that the Commission institute an investigation and, after the investigation, issue a permanent exclusion order and a permanent cease and desist order.

Named in the notice of investigation, as respondents, were: Behr Systems, Inc. (Behr), Dürr AG (Dürr), Motoman, Inc. (Motoman), and Yaskawa Electric Corporation (Yaskawa). The notice of investigation was published in the Federal Register on January 18, 2005 (70 Fed. Reg. No. 11 at 2881-2).

Order No. 3, which issued on February 24, 2005, set a target date of Monday March 20, 2006. Hence any final initial determination had to be filed by Monday, December 19, 2005.

Order No. 6, which issued on April 26, 2005, was an initial determination terminating the investigation as to claims 3, 5, and 16 of the '913 patent against respondents Dürr and Behr and terminating the investigation as to claim 6 of the '913 patent against all respondents. The Commission determined not to review Order No. 6 in a notice dated May 15, 2005.

Order No. 7, which issued on May 2, 2005, granted complainant's motion to amend the complaint to the extent that Dürr Systems, Inc., Dürr Systems GmbH, and Dürr Special Material Handling GmbH were added as respondents and complainant's claims of contributory and induced infringement were clarified. By notice dated May 20, the Commission determined not to review Order No. 7.

Order No. 9, which issued on May 31, 2005, was an initial determination terminating the investigation as to claims 1-5, 7-9 and 15-17 of the '913 patent against respondents Motoman and Yaskawa, claims 1-2, 4, 7-9, 15 and 17 against respondents Behr and Dürr, and claims 1-9 and 15-17 against newly added respondents Dürr Systems, Inc., Dürr Systems GmbH and Dürr Special Material Handling GmbH. By notice dated June 16, 2005, the Commission determined not to review Order No. 9. As a result of Order No. 9, only claims 10-14 and 18-24 of the '913 patent remain which claims are asserted against all respondents.

Order No. 15, which issued on August 23, 2005, was an initial determination granting complainant's motion for summary determination regarding the economic prong of the domestic industry requirement. By notice dated September 12, the Commission determined not to review said Order No. 15.

Order No. 16, which issued on August 26, 2005, required submissions from the parties relating to their positions on certain issues.

Certain motions in limine were filed by private parties in September, 2005 as follows:

Motion No.	Dates Filed	Motions
530-20	9/6/05	Yaskawa Electric Corporation and Motoman, Inc.'s Motion in Limine to Preclude Complainant from Offering Evidence or Testimony Regarding Yaskawa's Motor Purging Tests
530-22	9/7/05	Dürr Respondents Motion in Limine to Preclude Complainant from Offering Evidence or Testimony Regarding Dürr's Purging Test
530-23	9/7/05	Yaskawa Electric Corporation and Motoman, Inc.'s Motion in Limine to Exclude Testimony of Daleep Mohla
530-25	9/12/05	Yaskawa Electric Corporation and Motoman, Inc.'s Motion in Limine to Exclude Testimony of Fanuc Witnesses about Treatment of Geerk and Kawai
530-29	9/12/05	Complainant Fanuc's Motion in Limine on Two Issues
530-31	9/12/05	Dürr Respondents' Motion in Limine to Preclude Complainant from Offering Evidence or Testimony Regarding May 28, 1984 or Later Standards, Including Nema 1988 and Nema 2004
530-32	9/13/05	Dürr Respondents' Motion in Limine to Preclude Complainant from Offering Designations of Deposition Testimony of Dürr Systems Inc.
530-33	9/13/05	Yaskawa Electric Corporation and Motoman, Inc.'s Motion in Limine to Preclude Complainant from Offering Evidence or Testimony Regarding Prosecution History Estoppel
530-34	9/13/05	Yaskawa Electric Corporation and Motoman, Inc.'s Motion in Limine to Preclude Complainant from Offering Evidence or Testimony Regarding Indirect Infringement
530-35	9/15/05	Dürr Respondents' Motion in Limine to Preclude Complainant from Offering Untimely Supplemental Demonstrative Exhibits

In a telephone conference on September 15, 2005, Motion Nos. 530-20, 530-22, 530-23, 530-33, 530-32, 530-25 and 530-35 were denied (Tr. at 59, 60, 63, 69, 81, 96, 116) and Motion Nos. 530-34 and 530-31 were granted. (Tr. at 76, 80.) While Motion No. 530-23 was denied, the administrative law judge granted an oral motion of respondents to take further deposition testimony of Nof and Mohla. (Tr. at 67.) In connection with the denial of Motion No. 530-32 the filing of counter designations was permitted. (Tr. at 82.) Motion No. 530-29 was granted in part as to issue no. 2 (precluding respondents from challenging domestic industry (technical prong) other than on the issue of compartments). (Tr. at 83, 86.) As to issue no. 1 (precluding respondents from presenting testimony regarding non-infringement or invalidity under any construction other than those argued in the pre-hearing statements), Motion No. 530-29 was denied. (Tr. at 95.)

A pre-hearing conference was conducted on September 16, 2005, with the hearing also commencing on that date and continuing on September 19, 20, 21, 22 and 23. All parties participated in the hearing. Post-hearing submissions have been filed.

On November 1, 2005, respondent Yaskawa moved to strike "new" arguments in complainant's post-hearing submissions that (1) under Yaskawa's proposed claim construction for the term "non-explosion-proof electric motor," Yaskawa's products literally infringe the asserted claims of the '913 patent (CBr. at 97-104), and that (2) the word "Code" in Fanuc's proposed construction of "non-explosion-proof electric motor" can mean NFPA 496-1982. (Motion Docket No. 530-39.) In a response dated November 9, 2005, complainant opposed Motion No. 530-39. The staff, in a response dated November 9, 2005, supported in part Yaskawa's Motion No. 530-39. On November 14, 2005, Yaskawa moved for leave to file a reply

to complainant's response to its Motion No. 530-39 on the ground that complainant "misrepresented" Yaskawa's position. (Motion Docket No. 530-41.) Motion No. 530-39 is granted. Motion No. 530-41 is denied on mootness.

On November 3, 2005 Yaskawa moved to strike "new" arguments from complainant's rebuttal post-hearing submissions "never made before in this investigation," viz. alleged "indirect" infringement of the '913 method claims, allegations of literal infringement of "non-explosion-proof electric motor" and "electric motor" and regarding Yaskawa's motor purging tests. (Motion Docket No. 530-40.) In a response filed on November 14, 2005, the staff supported Motion No. 530-40. Complainant, in a response filed on November 14, opposed Motion No. 530-40. On November 21, Yaskawa moved for leave to file a reply to complainant's opposition. (Motion Docket No. 530-42.) Complainant, in a filing dated November 30, argued that Motion Nos. 530-40 should be denied. Motion No. 530-40 is granted. Motion No. 530-42 is denied on mootness.

The matter is now ready for a final determination.

The Final Initial and Recommended Determinations herein are based on the record compiled at the hearing and the exhibits admitted into evidence. The administrative law judge has also taken into account his observation of the witnesses who appeared before him during the hearing. Proposed findings of fact submitted by the parties not herein adopted, in the form submitted or in substance, are rejected as either not supported by the evidence or as involving immaterial matters and/or as irrelevant. Certain findings of fact included herein have references to supporting evidence in the record. Such references are intended to serve as guides to the testimony and exhibits supporting the finding of fact. They do not necessarily represent complete

summaries of the evidence supporting said findings.

II. Parties

See FF 1-8.

III. Jurisdiction

The complaint and notice of investigation state a cause of action under section 337 of the Tariff Act of 1930, as amended. Also, in respondents' responses to the complaint, respondents admit that they have imported accused robots into the United States and sold them in the United States. (Dürr response, Exh. A; Yaskawa response, Exh. A). Thus, the Commission has jurisdiction over the subject matter of this investigation. See Amgen, Inc. v. U.S. Int'l Trade Comm'n, 902 F.2d 1531, 1536 (Fed. Cir. 1990). All parties appeared in the investigation. Hence, the Commission has in personam jurisdiction.

IV. Experts

Complainant proffered Dr. Shimon Nof as an expert. Yaskawa proffered Dr. Hagen Schempf as an expert. Dürr respondents proffered Dr. William Hamel and Mr. James Stallcup as experts.[1] Complainant argued that Schempf, at the time the first application leading to the '913 patent was filed, had just graduated from college while Nof had already earned his Ph.D. (1976), had started teaching (1974), had already published almost two dozen articles in refereed journals, and was about to publish the first edition of his award-winning Handbook in Industrial Robotics (1985); that what Schempf has since learned about the development of industrial robotics, Nof had lived; that Nof is the only expert that appeared before the administrative law judge who has

[1] At the request of the private parties, no proffered expert was qualified during the evidentiary hearing.

worked on paint robots and is more than qualified as an expert in the field of industrial robotics and the operation of industrial robots in hazardous environments as well as the operation of motors used in those robots. (CRBr at 2-3.)

Yaskawa argued that Nof should not be qualified to give opinions regarding motors; that Nof's disclaimer of electric motor expertise in his expert reports and deposition cannot now be withdrawn as an expedient to reconcile complainant's failure to call Mr. Mohla (Fanuc's motor expert) at the hearing and expose Mohla to cross-examination. (YBr at 5.)

Durr respondents argued that Nof does not have any specific training in or experience with motors that would qualify him to testify as an expert in that area and that Nof candidly admitted in both his expert report and deposition testimony that he was not an expert on the subject of motors. (DBr at 2.)

The staff argued that Nof is not qualified to be an expert on motors. (SRBr at 7.)

1. Nof

There is undisputed testimony that Nof received his Bachelor's degree in engineering and Master's degree in engineering from the Technion Israel Institute of Technology, and a Ph.D. degree in industrial operations engineering from the University of Michigan in Ann Arbor, Michigan where he specialized in industrial automation; that he is currently a professor at Purdue University, teaching industrial robotics, industrial automation, computing applications in industry, decision analysis, and internet-based systems and has been on the faculty at Purdue University for twenty-eight years; that he was visiting professor at MIT, at universities in Europe, in Israel, in Japan, and in Chile; that he received honors for books related to industrial robotics; that he received in 2002 the Engelberger award which is considered the highest international

award for robotics experts in the world; that he is a fellow of the Institute of Industrial Engineers; that he has done extensive research development and consulting work with industry, mostly in industrial automation; that during the '80s and '90s, he has had study projects and research projects with several companies in the area of paint robots in the United States, Japan, Mexico and Korea; that as to consulting work on paint robots for automotive manufacturers such as General Motors and Ford in the United States and with Hitachi; that he has been involved, in addition to paint robots in hazardous environments, with explosive laboratory experiments, with clinical processes, the automation of a battery production and automation of paint robots; and that he has authored may publications including ten books involving industrial robotics and industrial automation. (Tr. at 591-96; See also CX-406.)

Nof's testimony, as to his experience with electric motors, is conflicting. Thus Nof testified on direct (Tr. at 606-07):

> I have experience with pneumatic robots, hydraulic robots, DC electric motors, AC motors, AC motors in combination with DC motors, combinations of all of the above with pneumatic -- motors, I mean, motors, so I had experience, and I had followed the development of motors applied in robotics throughout my career.

However Nof testified on cross (Tr. at 995):

> Q. Doctor, you're not an expert on motors, are you?
>
> A. I'm not an expert on motors, but I am an expert in industrial robotics that include the motors in the robots.

Based on the record, the administrative law judge is qualifying Nof as an expert on industrial robotics and the operation of industrial robots in hazardous environments although the

administrative law judge does not find him an expert on the details of electric motors.

2. Schempf

Schempf completed the Ph.D. program at, and received his doctorate from, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution in Mechanical Engineering and Oceanographic Engineering in August of 1990. (Schempf, Tr. at 1329-30; RX-1.) Schempf started and became the Director of the Hazardous Environments Robotics Laboratory at the Robotics Institute of Carnegie Mellon University. (Schempf, Tr. at 1343-44; RX-1.) He designed, developed, and, with his team, put into the field, a robot used in an aboveground storage tank having explosive jet fuel. (Schempf, Tr. at 1330; RX-1.) The aboveground storage tank robot was called Neptune, a project started in the early 1990s in collaboration with the U.S. Army and Raytheon. (Schempf, Tr. at 1331-32; RX-1.)

Schempf also designed, developed, and with his team, put into the field, an electric robot used in a natural gas explosive environment. (Schempf, Tr. at 1330 See also RX-1.) The electric robot used in the natural gas environment was designed and developed by Schempf to drive around in distribution pipelines that distribute natural gas to homes and factories, such as gas mains. (Schempf, Tr. at 1331; RX-1.)

Significantly, in almost every robot Schempf (and his team) built, Schempf and his team wound up having to make up their own electric motors. (Schempf, Tr. at 1342) (YFF26 (undisputed).) Schempf (and his team) has experience putting together electric motors, whether brushed or brushless, whether commutated or not, whether controlled in different ways, and whether using different laminations. (Schempf, Tr. at 1342-43). (YFF 27 (undisputed).) In building electric motors, Schempf and his team developed three different motors, for the specific

purposes of adding them to a robot, from the ground up, using motor components either built according to specifications by Schempf and his team or provided by a third party. (Schempf, Tr. at 1342.) (YFF 28 (undisputed).)

Schempf has received U.S. patents that relate to robots. (Schempf, Tr. at 1345; RX-1.) One of Schempf's U.S. patents is related to a robot used in an aboveground storage tank for hydrocarbons. (Schempf, Tr. at 1345.) Another one of Schempf's U.S. patents is related to a crawling robot used in natural gas mains to perform live inspection while the natural gas keeps flowing. (Schempf, Tr. at 1345.) Schempf currently works as a tenured faculty member and research professor at the Robotics Institute at the Carnegie Mellon University. Schempf did teach, but now focuses on research. (Schempf, Tr. at 1330, 1343.) Other than being Director of the Hazardous Environments Robotics Laboratory at the Robotics Institute of Carnegie Mellon University, Schempf also runs a small robotics company. (Schempf, Tr. at 1345; RX-1.) Schempf co-founded Automatika, Inc. in 1995, a robotics and automation company located in Pittsburgh, Penn. (Schempf, Tr. at 1345; RX-1.) Automatika, Inc. focuses on the development of concepts, product prototyping and small to medium quantity manufacturing applications. (Schempf, Tr. at 1345; RX-1.) Automatika had been contracted for the development of concepts and prototypes of state-of-the-art industrial automation, remote and hazardous inspection as well as servicing robotics and automation systems, leading to the licensing and development of several new inspection and cleanup robot systems, and more than a half dozen patents and other proprietary and confidential products and third-party OEM systems. (Schempf, Tr. at 1345; RX-1.) Schempf holds the positions of Chairman of the Board and Chief Scientist with Automatika, Inc. (Schempf, Tr. at 1345; see also RX-1.)

Based on the record, the administrative law judge is qualifying Schempf as an expert in robots for use in hazardous environments and in electric motors used in robots.

3. Hamel

The testimony is unrefuted that Hamel is a professor of mechanical engineering, and also the head of the mechanical aerospace and biomedical engineering department at the University of Tennessee; that he received a Bachelor's degree in mechanical engineering at West Virginia University and then went to Oklahoma State University, where he received a Master of Science in mechanical engineering, with a focus in fluid power control and then completed his Ph.D. requirements at the University of Tennessee, also in mechanical engineering; that he worked on a lunar digital auto pilot on the Apollo 8 though 13 missions with TRW Systems; that his next job was as an advanced process control engineer with Union Carbide Corporation; that later he moved to the Oak Ridge National Laboratory, where he did a wide range of jobs related to measurement in controls, and it's there that he began his initial work in the robotics and remote handling areas which was in 1972; that he worked at the Oak Ridge National Laboratory for twenty-five years and then started a part-time position as a faculty member at the University of Tennessee and moved to the University of Tennessee as a full-time faculty member in around 1997 and during that time, was able to finish up his full thirty years of career with Oak Ridge National Laboratory, part-time; that today he is a member of professional societies which involve robotics, viz. the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineer (IEEE) and the Robotics and Automation Society, of which he is an officer, and also, the American Nuclear Society; that he has been elected a fellow of the IEEE for his leadership and developments in the area of robotics and remote systems in military space and

nuclear applications; that in the course of his career, Hamel has designed robots that use electrical systems; that at the Oak Ridge National Laboratory, he was involved in the development of three prototype systems two of which were intended for remote operations in nuclear facilities, the first was the model M2 manipulator which was a complete digital control system (one of the first), and which used servo motors, and that the second system was the first modular robot manipulator developed for nuclear applications, and it was called the advanced servo manipulator; that he has an awareness of development of electronically powered robots throughout the '70s and '80s, some of which were used in hazardous environments; and that he has designed robots for use in hazardous environments; and that he regularly teaches graduate level courses in robotics, and occasionally teaches undergraduate robotics courses at the request of the students. (Tr. at 1739-49; see also RX-1110.)

Based on the record, the administrative law judge is qualifying Hamel as an expert qualified in robotics and, in particular, robots for hazardous environments and in motors used for such robots.

4. Stallcup

There is undisputed testimony that Stallcup has experience with codes and standards; that he is former chairman of NFPA code making panel number 14 and 15, that deals with the National Electrical Code; that panel 14 covers hazardous locations, such as Articles 500, 501, 503, all the way through to 516; that he is a chairman of the committee relating to NFPA 496; that he has served on NFPA 70-B committee, a standard that deals with maintenance, frequency checks on equipment; that is now chairman of chapter 4 of NFPA 70-E, which is electrical safety related workplace standard; that he has been a member of the UL electrical council for more than

twenty years; that he has authored fifteen books that relate to codes and standards and how to apply codes and standards for electricians, engineers, maintenance electricians, and inspectors; that he is a member of the IEEE engineering section and the IAEI electrical section; and that he has been in the electrical industry all his life. (Tr. at 1605-06.)

Based on the record, the administrative law judge is qualifying Stallcup as an expert on NFPA 496 and the National Electrical Code.

V. Prosecution History Of The '913 Patent

The '913 patent, which issued on November 12, 2002 with twenty four claims (CX-1) was involved in a lengthy prosecution. (FF 1-133.) U.S. Application Serial No. 06/692,996 filed January 22, 1985 (the '996 application) was the first application in the '913 patent prosecution history. (FF 9.) The second application in the '913 patent prosecution history is U.S. Application Serial No. 06/928,641 filed November 6, 1986 (the '641 application) which was a continuation of the '996 application. (FF 20.) The third application in the '913 patent prosecution history is U.S. Application Serial No. 07/183,452 filed April 14, 1988 (the '452 application) which was a continuation of the '641 application. (FF 40.) The fourth application in the '913 patent prosecution history is U.S. Application Serial No. 07/370,123 filed June 20, 1989 (the '123 application) which was a continuation of the '452 application. (FF 52.) The fifth application in the '913 patent prosecution history is U.S. Application Serial No. 07/613,115 filed November 13, 1990 (the '115 application) which was a continuation of the '123 application. (FF 66.) The last and sixth application in the '913 patent prosecution history is U.S. Application Serial No. 08/343,228 filed November 22, 1994 (the '228 application) which was a continuation of the '115 application. (FF 99.)

Early in the prosecution, applicants represented to the Patent Office what their invention relates to. Thus it was stated:

> . . . Applicants' invention relates to an electrically driven robot having pressurized compartments within drive motors and other conventional electrical equipment are provided. The robot is especially designed to operate in locations where a possibility of explosion exists. Neither the drive motors themselves nor the cables are made explosion proof. . . .

(FF 14 (emphasis added).) Akeel, later, in the prosecution in a sworn declaration, of inventor represented:

> The novelty disclosed in this application relates to the electrically powered robot construction that's explosion proof. It claims no improvement over state of the art methods of explosion proofing, motor design, or any other component design; hence, patents describing individual components or methods are no more pertinent than publications describing other state of the art components used in this construction such as gears, belts, etc. The application describes an apparatus that is a collection of state of the art components and combination of components, that results in a unique, hence novel, arrangement that accomplishes what no similar arrangement could do in the past.

(FF 26 (emphasis added).) In the amendment accompanying the declaration, applicants represented:

> The invention of the present application arose as a result of the long-felt need and satisfies the long-felt need. The automotive industry has embraced the P-150 painting robot [the claimed robot in issue] as not merely a substitute for the prior art hydraulically driven robots, but as a long-awaited improvement thereover.

(FF 28 (emphasis added).)

Much later, in the prosecution applicants in an appeal brief to the Patent Office Board of Appeals and referring to exhibits in an Akeel declaration argued:

> Of course the exhibits "call for" the use of regular motors – that's one of the important concepts underlying the present invention, and has been stressed from the beginning of prosecution more than twelve years ago. It is inconceivable that the Examiner, who has been in charge of this case since it was filed, does not understand this aspect of the invention.

(RX-152, FANUC 004205 (emphasis added).) In the prosecution, the Examiner did allow patent claim 13 in issue. (FF 125.) However it was only after the Board of Appeals of the Patent Office reversed the Examiner on prior art as to the remaining claims 10, 11, 12, 14, 18, 19, 20, 21, 22, 23 and 24 in issue and found them allowable that the '913 patent issued with the asserted claims. (FF 126-129.)

VI. Claims In Issue

The '913 patent in issue issued on November 12, 2002 with twenty-four claims. The claims in issue are claims 10, 11, 12, 13, 14, 18, 19, 20, 21, 22, 23 and 24. Claim 10 of the '913 patent states:

> The method of electrically driving a plurality of relatively movable, compartmented robot parts in a hazardous environment by a lightweight, non-explosion-proof electric motor in the compartment of at least one of the robot parts being driven, characterized by the steps of:
> providing that said compartment be substantially airtight when such compartmented robot parts are movable relative to each other;
>
> supplying sufficiently clean air or inert gas to said compartment from a gas source outside said hazardous environment at a pressure above the pressure of said hazardous environment sequentially to reduce by purging to an acceptable level the concentration of hazardous gas which may have entered said compartment, to maintain said compartment at a pressure above said hazardous environment to prevent entry of said hazardous environment and to compensate for any leakage from said compartment while the gas being supplied surrounds the motor in said compartment, whereby to obviate the need that said motor be heavy and explosion-proof

so that the robot parts may be compact and lightweight.

(CX-1 at col. 8, lns. 27-48.)

Claim 11 states:

> A compartmented robot with electrically movable joints for use in a hazardous environment, said robot having a robot body including a base and relatively movable robot parts forming nearly airtight compartments in fluid communication with each other, and electrical means including non-explosion proof electric motors in respective ones of said compartments and relatively movable with respect to each other when one compartment moves relatively to another compartment, said electric motors operating to move a respective robot part while being potentially spark producing in a respective compartment, and means for pressurizing said compartments with sufficiently clean air or inert gas to and around said electrical motors at a pressure above the pressure of the hazardous environment to prevent entry of the hazardous environment into said compartments and to maintain the pressure in said compartments above the pressure of the hazardous environment.

(CX-1 at col. 8, lns. 49-65.)

Claim 12 states:

> An electrically driven compartmented robot adapted for use in a hazardous environment comprising:
> a base having a first compartment contained therein pressurized to a first pressure above the pressure of the hazardous environment;
> an arm assembly having a second compartment contained therein pressurized to a second pressure above the pressure of the hazardous environment and in fluid communication with said first compartment, said arm assembly being supported for movement on said base at one end thereof so that said compartments are relatively movable with respect to each other, said arm assembly including a wrist adapted for connecting the opposite end of the arm assembly with a fluid delivery tool;
> a first drive system including at least one non-explosion proof electric motor located in said first pressurized compartment to drive the arm assembly; and
> a second drive system including at least one non-explosion proof

electric motor located in said second pressurized compartment to drive the wrist wherein the pressures above the pressure of said hazardous environment prevent flammable gases or vapors from entering said first and second compartments when said compartments are in fluid communication with each other in the hazardous environment.

(CX-1 at col. 8, ln. 66 - col. 9, ln. 23.)

Claim 13 states:

An electric robot for use in a hazardous environment including a base, an arm assembly supported for movement on the base, the base and the arm assembly forming a plurality of compartments including electric motors and cables extending from outside said hazardous environment to the electric motors, the compartments being connected to each other by openings, and means for pressurizing the compartments at a pressure above said hazardous environment, characterized in that a pressure regulator is provided for regulating the pressure in the compartments between maximum and minimum predetermined limits, the pressure regulator having a bypass for allowing a purging by allowing clean air or an inert gas to flow to the compartments and through a purging vent provided for the compartments.

(CX-1 at col. 9, lns. 24-38.)

Claim 14 states:

The electric robot according to claim **13** characterized by venting means for relieving excess pressure above the maximum predetermined limit in the compartments.

(CX-1 at col. 9, lns. 39-41.)

Claim 18 states:

A robot assembly for use in an explosive environment comprising:

a first pressurized compartment;
a second pressurized compartment, moveable relative to the first pressurized compartment;
a first non-explosion-proof electric motor in the first pressurized

compartment;
a second non-explosion-proof electric motor in the second pressurized compartment;
at least one conduit for communicating substantially clean air, an inert gas, or other non-ignitable gas to the first and second pressurized compartments; and
a gas supply for maintaining the substantially clean air, inert gas, or other non-ignitable gas in the first and second pressurized compartments at a pressure higher than the explosive environment.

(CX-1 at col. 9, ln. 53 - col. 10, ln. 9.)

Claim 19 states:

> The assembly of claim **18**, wherein the first and second compartments have openings interconnected for communicating the substantially clean air, inert gas, or other non-ignitable gas between the first and second compartments.

(CX-1 at col. 10, lns. 10-14).

Claim 20 states:

> A robot assembly for use in an explosive environment comprising:
> a first pressurized compartment;
> a second pressurized compartment, moveable relative to the first pressurized compartment;
> a first non-explosion-proof electric motor in the first pressurized compartment;
> a second non-explosion-proof electric motor in the second pressurized compartment;
> at least one conduit for communicating substantially clean air, inert gas, or other non-ignitable gas to the first and second pressurized compartments; and
> a pressure regulator for maintaining the substantially clean air, an inert gas, or other non-ignitable gas in the first and second pressurized compartments at a pressure higher than the explosive environment.

(CX-1 at col. 10, lns. 15-31.)

Claim 21 states:

> The assembly of claim **20**, wherein the first and second compartments have openings interconnected for communicating the substantially clean air, inert gas, or other non-ignitable gas between the first and second compartments.

(CX-1 at col. 10, lns. 32-37).

Claim 22 states:

> A method for operating a robot in an explosive environment comprising:
>
> providing a first compartment with a first non-explosion-proof electric motor;
>
> providing a second compartment with a second non-explosion-proof electric motor;
>
> providing the first and second compartment with substantially clean air, an inert gas, or other non-ignitable gas at a pressure higher than the explosive environment; and
>
> moving the second compartment relative to the first compartment.

(CX-1 at col. 10, lns. 38-49).

Claim 23 states:

> The method of claim **22**, wherein the first and second compartments have openings interconnected for communicating the substantially clean air, inert gas, or other non-ignitable gas between the first and second compartments.

(CX-1 at col. 10, lns. 50-53).

Claim 24 states:

> The method of claim **22**, further providing purging the first and second compartments with substantially clean air, an inert gas, or other non-ignitable gas at a sufficient flow and pressure to reduce to an acceptably safe level of concentration of any flammable gas or vapor.

(CX-1 at col. 10, lns. 54-58).

VII. Claim Interpretation

Claim interpretation is a question of law. Markman v. Westview Instruments, Inc., 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc), aff'd, 517 U.S. 370 (1996); see Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1455 (Fed. Cir. 1998). In construing claims, the court should first look to intrinsic evidence consisting of the language of the claims, the specification and the prosecution history as it "is the most significant source of the legally operative meaning of disputed claim language." Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996); see Bell Atl. Network Servs., Inc. v. Covad Communications Group, Inc., 262 F.3d 1258, 1267 (Fed. Cir. 2001).

The claims themselves "provide substantial guidance as to the meaning of particular claim terms." Phillips v. AWH Corporation 415 F.3d 1303, 1314 (Fed. Cir. 2005), citing Vitronics, 90 F.3d at 1582. It is essential to consider the claim as whole when construing each term, because the context in which a term is used in a claim "can be highly instructive." Id. This requirement is consistent with the Federal Circuit's guidance that a claim term can only be understood "with a full understanding of what the inventors actually invented and intended to envelop with the claim." Phillips, 415 F.3d at 1316, citing Reneshaw PLC v. Marposs Societa' Per Azioni, 158 F.3d 1243, 1250 (Fed. Cir. 1998). Claim terms "are generally given their ordinary and accustomed meaning." Vitronics, 90 F.3d at 1582.

In Pause Technology, Inc. v. TIVD, Inc. 419 F.3d 1326 (Fed. Cir. 2005) the Court stated:

> . . . in clarifying the meaning of claim terms, courts are free to use words that do not appear in the claim so long as "the resulting claim interpretation . . . accord[s] with the words chosen by the patentee to stake out the boundary of the claimed property." Cf. Renishaw PLC v. Marposs Societá per Azioni, 158 F.3d 1243,

> 1248 (Fed. Cir. 1998) (noting that "[w]ithout any claim term susceptible to clarification . . . there is no legitimate way to narrow the property right").

Id. 419 F.3d at 1333. Also claim terms are presumed to be used consistently throughout the patent, such that the usuage of the term in one claim can often illuminate the meaning of the same term in other claims. Research Plastics, Inc. v. Federal Packaging Corp. 421 F.3d 1290, 1295 (Fed. Cir. 2005).

The ordinary meaning of a claim term may be determined by reviewing a variety of sources, which may include the claims themselves, dictionaries and treatises, and the written description, the drawings and the prosecution history. Ferguson Beauregard/Logic Controls v. Mega Sys., LLC, 350 F.3d 1327, 1338 (Fed. Cir. 2003). However the use of a dictionary may extend patent protection beyond what should properly be afforded by an inventor's patent. Also there is no guarantee that a term is used in the same way in a treatise as it would be by a patentee. Phillips 415 F.3d at 1322. Moreover, the presumption of ordinary meaning will be "rebutted if the inventor has disavowed or disclaimed scope of coverage, by using words or expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope." ACTV, Inc. v. Walt Disney Co., 346 F.3d 1082, 1091 (Fed. Cir. 2003). In Terlap v. Brinkmann Corp. 418F.3d 1379, 1384 (Fed. Cir. 2005), the Court concluded that the district court "attached appropriate weight" to the dictionary definitions in the context of the intrinsic evidence in reaching its construction of a claim term "clear."

The specification of a patent "acts as a dictionary" both "when it expressly defines terms used in the claims" and "when it defines terms by implication." Vitronics, 90 F.3d at 1582. For example, the specification "may define claim terms by implication such that the meaning may be

found in or ascertained by a reading of the patent documents." Phillips, 415 F.3d at 1323, quoting Iredto Access, Inc. v. Echostar Satellite Corp., 383 F.3d 1295, 1300 (Fed. Cir. 2004). Importantly, "the person of ordinary skill in the art is deemed to read the claim term not only in context of the particular claim in which the disputed term appears, but in the context of the entire patent, including the specification." Phillips, 415 F.3d at 1314. The Federal Circuit has explained that "although the specification often describes very specific embodiments of the invention, we have repeatedly warned against confining the claims to those embodiments." Phillips, 415 F.3d at 1323.

The prosecution history, including "the prior art cited," is "part of the 'intrinsic evidence.'" Phillips, 415.F3d at 1317. The prosecution history "provides evidence of how the inventor and the PTO understood the patent." Id. Thus the prosecution history can often inform the meaning of the claim language by demonstrating how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be. Vitronics, 90 F.3d at 1582-83; see also Chimi v. PPG Indus., Inc., 402 F.3d 1371, 1384 (Fed. Cir. 2005) "(The purpose of consulting the prosecution history in construing a claim is to exclude any interpretation that was disclaimed during prosecution)", quoting ZMI Corp. v. Cardiac Resuscitator Corp., 844 F.2d 1576, 1580 (Fed. Ric. 1988); Southwall Techs., Inc. v. Cardinal IG Co., F.3d 1570, 1576 (Fed. Cir. 1995). Id. The prosecution history includes any reexamination of the patent. Intermatic Inc. v. Lamson & Sessions Co., 273 F.3d 1355, 1367 (Fed. Cir. 2001).

In addition to the intrinsic evidence, the administrative law judge may, but need not, consider extrinsic evidence when interpreting the claims. Extrinsic evidence consists of all

evidence external to the patent and the prosecution history, including inventor testimony and expert testimony. This extrinsic evidence may be helpful in explaining scientific principles, the meaning of technical terms, and terms of art. See Vitronics Corp., 90 F.3d at 1583; Markman, 52 F.3d at 980. However, "[e]xtrinsic evidence is to be used for the court's understanding of the patent, not for the purpose of varying or contradicting the terms of the claims." Markman, 52 F.3d at 981. Moreover, the Federal Circuit has viewed extrinsic evidence in general as less reliable than the patent and its prosecution history in determining how to read claim terms. Phillips, 415 F.3d at 1318. Also, while extrinsic evidence may be useful, it is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence. Phillips, 415 F.3d at 1319. However in Tap Pharmaceutical Products, Inc. v. Owl Pharmaceuticals, LLC 419 F.3d 1346 (Fed. Cir. 2005), the Court concluded that:

> In light of the two different possible meanings for the term "containing," it was entirely reasonable for the district court to look to the specification as well as extrinsic evidence to determine the manner in which the term was used in three patents at issue.

Id. 419 F.3d at 1354. In Nystrom v. Trex Company 424 F.3d 1136 (Fed. Cir. 2005), the Court stated:

> . . . as explained in Phillips, Nystrom is not entitled to a claim construction divorced from the context of the written description and prosecution history. The written description and prosecution history consistently use the term "board" to refer to wood decking materials cut from a log. Nystrom argues repeatedly that there is no disavowal of scope of the written description or prosecution history. Nystrom's argument is misplaced. Phillips, 415 F.3d at 1321 ("The problem is that if the district court starts with the broad dictionary definition in every case and fails to fully appreciate how the specification implicitly limits that definition, the error will systematically cause the construction of the claim to be unduly expansive."). What Phillips now counsels is that in the absence of

> something in the written description and/or prosecution history to provide explicit or implicit notice to the public– i.e., those of ordinary skill in the art– that the inventor intended a disputed term to cover more than the ordinary and customary meaning revealed by the context of the intrinsic record, it is improper to read the term to encompass a broader definition simply because it may be found in a dictionary, treatise, or other extrinsic source. Id.

Id. 424 F.3d at 1144, 1145. In Free Motion Fitness Inc. v. Cybex International, Inc. 423 F.3d 1343(Fed. Cir. 2005), the Court concluded that:

> "under Phillips, the rule that 'a court will give a claim term the full range of its ordinary meaning', Rexnord Corp. v. Laitram Corp., 274 F.3d 1336, 1342 (Fed.Cir. 2001), does not mean that the term will presumptively receive its broadest dictionary definition or the aggregate of multiple dictionary definitions, Phillips 415, F.3d at 1320- 1322. Rather, in those circumstances, where references to dictionaries is appropriate, the task is to scrutinize the intrinsic evidence in order to determine the most appropriate definition

423 F.3d at 1348,49. In Network Commerce, Inc. v. Microsoft Corp. 422 F.3d 1353 (Fed. Cir. 2005), the Court concluded:

> As we recently reaffirmed in Phillips, "conclusory, unsupported assertions by experts as to the definition of a claim term are not useful to a court." Phillips, 415 F.3d at 1318. Here [expert] Coombs does not support his conclusion [the "download component" need not contain the boot program] with any references to industry publications or other independent sources. Moreover, expert testimony at odds with the intrinsic evidence must be disregarded. Id. ("[A] court should discount any expert testimony that is clearly at odds with the claim construction mandated by . . . the written record of the patent." (internal quotations and citation omitted). That is the case here.

Id,. 422 F.3d at 1361.

Patent claims should be construed so as to maintain their validity. However, that maxim is limited to cases in which a court concludes, after applying all the available tools of claim

construction, that the claim is still ambiguous. Phillips, 415 F.3d at 1327. If the only reasonable interpretation renders the claim invalid, then the claim should be found invalid. See, e.g., Rhine v. Casio, Inc., 183 F.3d 1342, 1345 (Fed. Cir. 1999).

1. The claimed phrase "robot"

The claimed phrase "robot" is found in all of the asserted claims. Complainant argued that the claims set forth the scope of the robot. (CBr at 78.) Yaskawa argued that the claimed "robot," is directed to an apparatus sitting in a hazardous environment, specifically excluding the robot controller 28 of the '913 patent which sits in a non-hazardous location. (YBr at 32.) The staff argued that the '913 patent is directed to electric robots used in hazardous environments, citing CX-1, col. 1, lns. 9-12. (SBr at 5.)

The word "robot" is defined as "a machine in the form of a human being that performs the mechanical functions of a human being but lacks sensitivity." (Webster's Seventh New Collegiate Dictionary (1965) at 744.) The asserted claims do not define the word "robot." However they use the word with other language. For example independent method claim 10 in issue relates to "electrically driving a plurality of relatively movable, compartmented robot parts in a hazardous environment by a lightweight, non-explosion-proof electric motor in the compartment of at lease one of the robot parts being driven." (CX-1, col. 8, lns. 27-30.) Independent claim 11 in issue recites a "compartmented robot with electrically movable joints for use in a hazardous environment" and includes "non-explosion proof electric motors." Independent claim 12 in issue has language comparable to said language in independent claim 11. Independent claim 13 in issue associates the word "robot" with a plurality of compartments and cables extending from "outside . . . [a] hazardous environment to the electric motors," which

the administrative law judge finds indicates electric motors in a hazardous environment. Independent claim 18 in issue recites a "robot assembly for use in an explosive environment" and pressurized compartments and non-explosion-proof electric motors. Independent claim 20 in issue has language comparable to said language in claim 18. Independent method claim 22 recites a "method for operating a robot in an explosive environment" and includes compartments and non-explosion-proof electric motors. Based on the dictionary definition of "robot" and the plain language of the claims in issue, the administrative law judge finds that the claimed phrase "robot" would be interpreted by one of ordinary skill in the art[2] as involving a machine in the form of a human being that performs mechanical functions of a human being although lacking sensitivity, the machine having at least a compartment containing a non-explosive-proof motor in a hazardous (explosive) environment[3] and the machine having any other limitations set forth in the specific claims in issue.

Examination of the remaining portion of the '913 patent in issue and the prosecution history of the '913 patent confirms the interpretation, supra. Because of specific language and figures of the '913 patent, the administrative law judge rejects Yaskawa's argument that the claimed language in issue excludes the robot controller 28 sitting in a non-hazardous location. Thus the '913 patent under the subheading BRIEF DESCRIPTION OF THE DRAWINGS discloses that "FIG 1 is a perspective view of an electric spraying robot constructed in

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[2] A person of ordinary skill in the relevant art at the time the first application leading to the '913 patent was filed would have to have at least an undergraduate degree in a relevant engineering discipline, such as mechanical engineering, automation engineering, electrical engineering, or industrial engineering, and extensive experience in applying industrial robots, in paint area in particular. (Nof, Tr. at 607-08.)

[3] See Section VII. 3, infra.

accordance with the present invention." (CX-1, col. 3, lns. 50-51 (emphasis added).) Said FIG. 1 includes items 28, 26, 44 and 30 which are described respectively as "a robot controller 28 located outside the paint spray booth," "an inlet tube 44, which also extends through the wall 26" and "pressurized conduit 30." (CX-1, col. 4.) FIG. 1 shows that at least a portion of conduit 30 sits in a non-hazardous location.

2. The claimed phrases "electric motor" and "non-explosion-proof electric motor"

The claimed phrases "electric motor" and "non-explosion-proof electric motor" are found in each of the independent claims in issue. Complainant argued that the phrase "non-explosion-proof electric motor" should be interpreted as "an electrically driven motor that is not protected in its own merits according to Code for safe use directly in a Class I, Division I location." (CBr at 24.) It is argued by complainant that "electric motor" means "a machine that converts electrical energy into mechanical energy and is not an 'Explosionproof Apparatus' as defined in the Code." (CBr at 58.) Yaskawa argued that the proper construction of the phrases in issue must exclude the categories of motors defined and disclaimed during prosecution; and that applicants defined and disclaimed their "non-explosion-proof electric motor" from being any motor that is protected in accordance with section 2-2.4 of NFPA 496-1982." (YBr at 10-31.)

Dürr respondents argued that the file history mandates an interpretation that "non-explosion-proof electric motor" means an electric motor not housed individually in an enclosure that either contains explosion or prevents ignition. Further, they argued that because applicants treated the term "non-explosion-proof electric motor" synonymously with the term "electric motor," the term "electric motor" should be construed to mean the same thing as the term "non-explosion-proof electric motor." (DBr at 21-23.)

The staff argued that the claimed phrases "electric motor" and "non-explosion-proof electric motor" should be construed in the same way because of the patentees' use of the terms interchangeably during prosecution." (SBr at 11-12.) It argued that the interpretation of "non-explosion-proof electric motor" requires review of the prosecution history "in which the applicants made multiple disclaimers." (SBr at 13.) For example the staff argued that a clear statement of applicants in the prosecution "distinguishes the claimed motors from motors protected by the Code, § 2-2.4" and that "applicants distinguished Dugan (RX-15) as 'no better than the National Electrical Code.'" (SBr at 17.) Accordingly the staff concluded that the term "non-explosion-proof electric motor" should be construed to mean an electric motor, but not to include motors:

1. ventilated with pressurized gas;

2. fluidly communicating with other motors by being vented to a purged and pressurized enclosure;

3. housed individually in an enclosure that is purged and pressurized to prevent internal ignition;

4. housed in a container that contains an internal ignition or prevents ignition; and

5. not protected in their own merit according to Code for safe use in "Class 1, Division 1 locations."

(SBr at 18.)

The Federal Circuit has indicated that the claims themselves provide substantial guidance as to the meaning of particular claim terms, supra. All of the claims in issue recite "electric motor" or equivalent language. The phrase "electric motor" is not defined in said claims. However an electric motor is a piece of equipment that converts electrical energy into mechanical

energy. Also each of the independent claims in issue has additional language with the phrase "electric motor." Thus each of independent claims 10, 11, 18, 20 and 22 recites "non-explosion-proof" electric motors. While the remaining independent claim 13 in issue does not use the phrase "non-explosion-proof," it does refer to an "electric robot for use in a hazardous environment" and further states the presence of "compartments including electric motors and cables extending from outside said hazardous environment to the electric motors."

In addition independent claim 10 further characterizes the electric motor as "lightweight." It also refers to obviating "the need that said motor be heavy and explosion-proof so the that robot parts may be compact and lightweight." Also independent claim 11 states that "said electric motors. . . being potentially spark producing in a respective compartment."

The Federal Circuit has stated that the usage of a term in one claim can often illuminate the meaning of the term in other claims. See supra. Hence as to the independent claims not in issue, independent claim 1 indicates obviating "the need that said motor. . . be heavy and explosion-proof so that the robot parts may be compact and lightweight ." Independent claim 2 recites that the electric motor be "non-explosion-proof and lightweight." Referring to the dependent claims not in issue, claim 6 recites that "one of the electric motors is a brushless DC motor" while claim 7 recites that "one of the electric motors is an AC servo motor." Claim 9 recites that "the electric motor within one of said two of said compartments is smaller than the electric motor within the other of said two of said compartments so that said robot may be further compact and lightweight."

Referring to the claimed phrase "non-explosion-proof electric motor," the phrase is not defined in any of the claims of the '913 patent although independent claim 1 refers to obviating

the need that a motor be explosion-proof, and makes reference to an "explosive atmosphere" and independent claims 18, 20 and 22 refer to an "explosive environment." The word "explosion" is defined as – a sudden bursting or flying to pieces as a result of internal pressure; as, the explosion of a boiler– Webster's New Twentieth Century Dictionary Unabridged" Second Edition (1980) at 646. The word "proof" is defined as – a suffix used in forming adjectives . . . meaning: (a) impervious to, as in waterproof; (b) protected from or against, as in foolproof, weatherproof ...." (Id. at 1442 (emphasis added).) The word "non" is defined as – a prefix meaning not, used to give a negative force, especially to nouns, adjectives, and adverbs, as in nonresident. (Id. at 1218 (emphasis added).)

In construing the claims in issue, the administrative law judge, in addition to the claims, should look to the remaining portion of the patent in issue. See supra. Under the "BACKGROUND ART" portion, the '913 patent stated:

> [e]lectrical equipment which is to be located in areas classified as "hazardous" (i.e. a Class 1, Division 1 location) by Article 500 of NFPA 70, Natural Electrical Code, either must be placed in pressurized containers or must be made explosion proof. If this is done the area immediately around the electrical equipment is no longer classified as a Class 1, Division 1 location, but rather a Class 1, Division 2 location wherein only the location adjacent the enclosure or explosion proof container contains the ignitable concentration of flammable gases or vapors under normal operating conditions. The pressurization of the enclosure entails supplying the enclosure with clean air or an inert gas with or without continuous flow at sufficient pressure to prevent the entrance of combustible gases or vapors which might occasionally be communicated into the enclosure. If the enclosure is maintained under a positive pressure of the least 25 pascals (0.1 inches of water) when the electric equipment is energized, the risk of an explosion in the "hazardous" environment is substantially eliminated.

(CX-1, col. 2, lns. 24-43.) As the Patent Office Board of Appeals stated, the reference to Article 500 of NFPA 70 in the BACKGROUND ART portion of the '913 patent is a discussion "as to how artisans have in the past addressed certain code requirements governing the use of electrical equipment in hazardous environments" (FF 127.) The only other reference to any code in the '913 patent is in the BEST MODE FOR CARRYING OUT THE INVENTION portion wherein the '913 patent, in referring to FIG. 1,[4] states in part:

> The area within the paint spray booth is an area where flammable gases or vapors may be present in the air in concentrations sufficient for the location to be classified as hazardous as defined by Article 500 of the NFPA 70, National Electrical Code. Such an environment may present an explosion or fire hazard arising from the highly flammable nature of the explosive solventair mixture contained therewithin.

(CX-1, col. 4, lns. 40-48 (emphasis added).) As seen in the foregoing, the patentees state that the area within the paint spray booth is an area "where flammable gases or vapors may be present" (emphasis added) in the air such that the location is hazardous as defined by Article 500 of NFPA 70. The administrative law judge does not find that this one recitation mandates that one of ordinary skill in the art would interpret "non-explosion-proof electric motor" as a motor "not protected in its own merit according to Code for safe use directly in a Class I, Division 1 location" as complainant argued.

Immediately following the BACKGROUND ART portion of the '913 patent, there is a DISCLOSURE OF THE INVENTION portion which sets forth the objects of the "present invention." The first object is to provide an improved electrically driven robot adapted for use in

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[4] FIG. 1 of the '913 patent is "a perspective view of an electric spraying robot constructed in accordance with the present invention." (CX-1, col. 3, lns. 50-53.)

a hazardous environment. The second object refers to providing a relatively compact robot adapted for use in a hazardous environment and which "includes a pair of pressurized compartments for housing electric motors therein" (CX-1, col. 2, lns. 55-62.) Thereafter the '913 patent states:

> Yet still another object of the present invention is to provide a relatively compact and inexpensive electrically driven robot adapted for use in hazardous environments, including a base, an arm assembly and first and second drive systems including first and second electric motors, respectively, and wherein at least one electric motor is located in a first pressurized compartment located in the base and at least one electric motor is located in a second pressurized compartment located in the arm assembly.
>
> In carrying out the above objects and other objects of the present invention an electrically driven robot constructed in accordance with the present invention includes a base having a first pressurized compartment contained therein, and an arm assembly having a second pressurized compartment contained therein. The arm assembly is supported for movement on the base at one end thereof. The arm assembly includes a wrist adapted for connecting its opposite end with a fluid delivery tool. The robot also includes first and second drive systems. The first drive system includes at least one electric motor located in the first pressurized compartment to drive the arm assembly. The second drive system includes at least one electric motor located in the second pressurized compartment to drive the wrist.
>
> Preferably, the electric motors comprise brushless servo motors commonly known as brushless D.C. motors or AC servo motors.

(CX-1, col. 2, ln. 63 - col. 3 lns. 21 (emphasis added).) Thereafter the '913 patent, with reference to "electric motors," makes references to cables "electrically coupled to the electric motors" (col. 3, lns. 24-25), the "rotary motion of the drive motors" (col. 3, lns. 41-42) "arm assembly 18 [of FIG. 1] so that non-sparking electric motors can be located . . . . without requiring the use of explosion-proof-electric motors" (col. 4, lns. 23-25), the "rotary motion of the drive motors" (col.

3, lns. 41-42) "electric motors" (col. 4, lns. 26, 29), "electric drive motor 86" and "[t]hree drive motors 86 ... [e]ach drive motor preferably comprises a non-sparking brushless servo motor, commonly known as A.C. servo motor or brushless D.C. motor" (col. 5, lns. 53-59), with reference to FIGS. 4 and 6, "respective electric motors 94" (col. 5, ln. 67), "each motor 94 is smaller than each motor 86" (col. 6, ln. 3), "motors 94" (col. 6, ln. 10) with reference to FIGS. 4, 6, and 7, "electrical equipment including the electric drive motors" (col. 6, lns. 37-38), "use of non-sparking electric motors in the various pressurized compartments eliminates the need for relatively heavy and costly explosion-proof motors," (col. 6, lns. 42-45) and "non-sparking electric motors." (col. 6 lns. 46-47.) Thus as set forth in the specification of the '913 patent, only state of the art "commonly known" electric motors are used in the invention in issue. Significantly nothing is done to said motors in the specification before they are used in the described combinations.

As for the claimed phrase "non-explosion-proof electric motors," that phrase is not found in the specification of the '913 patent. However the BACKGROUND ART portion of the '913 patent indicated that prior art electrical equipment in a hazardous location had to be in pressurized containers or made "explosion-proof." See CX 1, col. 2, lns. 24-43. Moreover the specification and claims make reference to obviating the need for "explosion-proof motors." See CX-1, col. 6. ln. 44, col. 7, lns. 28-29.

Respondents and the staff argued that "non-explosion-proof electric motor" should be restricted to only certain motors based on the doctrine of prosecution disclaimer. See supra. Prosecution history is part of the intrinsic evidence. However a careful analysis of said history is necessary.

Over fifteen years ago the Federal Circuit in LaBounty Mfg. Inc. v. U.S. International Trade Commission 867 F.2d 1572 (Fed. Cir. (1989), vacated the noninfringement determination of the Commission and remanded the case for further proceedings.[5] In remanding the case the Court made specific reference to the final initial determinations of this administrative law judge:

> In holding LaBounty to the literal claim language and denying the assertion of infringement under the doctrine of equivalents, the ALJ looked at the prosecution history only to the extent of determining that the amendments to claims 7 and 20 adding the specific distances and the accompanying arguments were made in response to a rejection based on prior art. Specifically, he stated:
>
> > The language [referring to LaBounty's arguments accompanying the amendments] shows that complainant's argument was in reference to overcoming the prior art. The administrative law judge finds it unnecessary to make a detailed analysis of the prior art. See Prodyne Enterprises, Inc. v. Julie Pomerantz, Inc., [743 F.3d 1581, 1583, 223 USPQ 477, 478 (Fed. Cir. 1984)].
>
> The application of prosecution history estoppel is a question of law and is reviewed for legal correctness. Loctite Corp., 781 F.2d at 871 n. 7, 223 USPQ at 96 n. 7; Moeller, 794 F.2d at 659, 229 USPQ at 996. We conclude that the ALJ here misinterpreted the legal import of Prodyne. Prodyne does not stand for the broad proposition that, if an amendment adds a limitation which distinguishes a feature of the invention from a prior art reference, no equivalent of that feature can be asserted and, thus, no analysis of the prior art disclosure is necessary or appropriate. In Prodyne, the patentee argued that an added limitation was "unnecessary." 743 F.2d at 1583, 223 USPQ at 478. LaBounty does not so argue here. LaBounty accepts the limitation but objects to the denial of any equivalents thereof. It seeks consideration of the prior art to

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[5] See LaBounty Mfg. Inc. v. U.S.I.T.C. 958 F.2d 1066 (Fed. Cir. 1992) for remand. The remand resulted in a second determination by the ITC that there is no section 1337 violation on the ground that the patent in issue was unenforceable due to inequitable conduct in the prosecution.

> show that it is not attempting to resurrect coverage for prior art structures which provide the basis for the accused device. The prior art disclosures, per LaBounty, are markedly different from both the patented invention and Dudley's [accused] shears.
>
> * * *
>
> In view of his ruling on prosecution history estoppel, the ALJ did not complete an infringement analysis. . .

Id. 867 F.2d at 1575, 1576 (emphasis added.)

The Federal Circuit has declined to apply the doctrine of prosecution disclaimer where the alleged disavowal of claim scope is ambiguous. For example in Omega Eng'g Inc. v. Raytek Corp. 334 F.3d 1314, 1324 (Fed. Cir. 2003), the Court stated:

> in Northern Telecom Ltd. v. Samsung Electronics Company, 215 F.3d 1281, 1293-96, 55 USPQ2d 1065, 1074-75 (Fed.Cir.2000), the accused infringer relied on remarks made by the inventors to overcome a rejection as the basis for narrowing the broad language of the claims. Having independently considered the prosecution history, we viewed the inventors' statements as amenable to multiple reasonable interpretations and deemed the remarks so ambiguous that, "[l]ike the district court, we simply cannot tell." Id. at 1294, 215 F.3d 1281, 55 USPQ2d at 1075. Since the prosecution statements were "far too slender a reed to support the judicial narrowing of a clear claim term," we declined to apply the doctrine of prosecution disclaimer under those circumstances. Id.; see also Rexnord Corp. v. Laitram Corp., 274 F.3d 1336, 1347, 60 UPQ2d 1851, 1858 (Fed. Cir. 2001) (refusing to limit the ordinary meaning of the claim because the alleged disclaimer in the file wrapper was at best "inconclusive"); Pall Corp. v. PTI Techs. Inc., 259 F.3d 1383, 1393- 94, 59 USPQ2d 1763, 1770 (Fed. Cir.2001) (finding that the scope of disclaimer over the prior art reference was ambiguous and thus remanding for clarification), vacated on other grounds, 535 U.S. 1109, 122, S.Ct, 2324, 153 L.Ed.2d 152 (2002); DeMarini Sports, Inc. v. Worth, Inc., 239 F.3d 1314, 1326-27, 57 USPQ2d 1889, 1895-96 (Fed.Cir.2001) (refusing to rely on ambiguity surrounding examiner's silence or patentee's lack of argument during prosecution to construe claim term); Vanguard Prods. Corp. v. Parker Hannifin Corp., 234 F.3d 1370, 1372, 57

> USPQ2d 1087, 1089 (Fed.Cir.2000) (refusing to narrow the asserted claim based on prosecution disclaimer because "the prosecution history does not support [the infringer]'s argument that the Vanguard inventors 'expressly disclaimed' claim scope beyond products made by co-extrusion"); Serrano v. Telular Corp. 111 F.3d 1578, 1584, 42 USPQ2d 1538, 1542-43 (Fed.Cir.1997; cf. Spectrum Int'l, Inc. v. Sterlite Corp., 164 F.3d 1372, 1378, 49 USPQ2d 1065, 1068-69 (Fed.Cir.1998) (noting that "explicit statements made by a patent applicant during prosecution to distinguish a claimed invention over prior art may serve to narrow the scope of a claim").

However the Court in Omega concluded that where the patentee had unequivocally disavowed a certain meaning to obtain the patent, the doctrine of prosecution disclaimer attaches and narrows the ordinary meaning of the claim congruent with the scope of the surrender. Thus it stated:

> in Rheox, Inc. v. Entact, Inc., 276 F.3d 1319, 1325, 61 USPQ2d 1368, 1373 (Fed.Cir.2002), we ruled that the scope of the patent in suit did not cover "triple superphosphate" - - an embodiment expressly disclosed in the written description- -because the patentee cancelled a claim covering "triple superphosphate" and expressly disclaimed that compound in his arguments to the examiner to gain patent allowance. Id. We reached a similar conclusion in Ballard Medical Products v. Allegiance Healthcare Corporation, 268 F.3d 1352, 1359-62, 60 USPQ2d 14932, 1499-1501 (Fed.Cir.2001), which involved means-plus-function claims. There, the patentee asserted that the accused devices were equivalents, under paragraph 6 of section 112, to the claimed function's corresponding structure. Id. at 1359, 268 F.3d 1352, 60 USPQ2d at 1499. We rejected that assertion on the basis of prosecution disclaimer:
>
> > When a patentee advises the examiner (and the public after patent issuance) that a particular structure is not within his invention, the patentee is not permitted to assert in a subsequent infringement action that the same structure is equivalent to the structure described in the patentee's specification for purposes of section 112 paragraph 6.
>
> Id. Based on the clear disavowal found in the file wrapper, we

> concluded that the accused device did not include an equivalent to the claimed function's corresponding structure. Id. at 1362, 268 F.3d 1352, 60 USPQ2d at 1501; see also Bell Atl. Network, 262 F.3d at 1273-75, 59 USPQ2d at 1874-76 (relying on prosecution history to limit claimed "transceiver" to the three stated modes, because of clearly limiting statements made by the patentee to the examiner to overcome prior art rejection); Day Int'l, Inc. v. Reeves Bros., Inc., 260 F.3d 1343, 1349, 59 USPQ2d 1790, 1794 (Fed. Cir. 2001) (holding that the patentee had disavowed curing done at the higher conventional curing temperatures, because of representation to the patent examiner that the prior art curing temperatures were too high and because of the numerous references to a "low temperature cure" or "low temperature vulcanization" throughout the file wrapper); Southwall, 54 F.3d at F.3d 1576-77, 34 USPQ2d at 1677 holding that the limitation "sputter-deposited dielectric" excluded a two-step process, because the patentee argued during prosecution that the metal oxide in the process was "directly deposited" and that the invention thus only covered a one-step process).

Id. 334 F.3d at 1324-25. The Court in Omega then stated:

> To balance the importance of public notice and the right of patentees to seek broad patent coverage, we have thus consistently rejected prosecution statements too vague or ambiguous to qualify as a disavowal of claim scope. E.g., Schwing GmbH v. Putzmeister Aktiengesellschaft, 305 F.3d 1318, 1324-25, 64 USPQ2d 1641, 1645 (Fed. Cir.2002) ("[P]rosecution history ... cannot be used to limit the scope of a claim unless the applicant took a position before the PTO that would lead a competitor to believe that the applicant had disavowed coverage of the relevant subject matter."); DeMarine Sports, 239 F.3d at 1326-27, 57 USPQ2d at 1896. Rather, we have required the alleged disavowing statements to be both so clear as to show reasonable clarity and deliberateness, N. Telecom, 215 F.3d at 1294-95, 55 USPQ2d at 1075 (declining to apply doctrine because the infringer had not shown "that the patentees–with reasonable clarity and deliverateness- - defined 'plasma etching' as excluding ion bombardment" (citation omitted)), and so unmistakable as to be unambiguous evidence of disclaimer. E.g., Storage Tech. Corp. v. Cisco Sys. Inc., 329 F.3d 823, 833, 66 USPQ2d 1545, 1552 (Fed.Cir.2003) ("We therefore do not consider the applicants' statement to be a clear and unambiguous disavowal of claim scope as required to depart from

> the meaning of the term provided by the written description."); Invitrogen Corp. v. Biocrest Mfg., L.P., 327 F.3d 1364, 1369, 66 USPQ2d 1631, 1634 (Fed. Cir.2003) ("The prosecution history does not show any clear and unambiguous disavowal of steps in advance of the step of growing E. coli cells in the claimed temperature range"). Consequently, for prosecution disclaimer to attach, our precedent requires that the alleged disavowing actions or statements made during prosecution be both clear and unmistakable.

Id. 334 F.3d at 1325-27. Moreover the Court recently stated that "because the prosecution history represents an ongoing negotiation between the PTO and the applicant, rather than the final product of that negotiation, it often lacks the clarity of the specification and thus is less useful for claim construction purposes." Phillips 415 F.3d at 1317 (emphasis added.) It is basic patent law that the issue of whether prosecution history estoppel exists is a question of law. Cybor Corp. v. FAS Techs., 138 F.3d 1448, 1460 (Fed. Cir. 1998).

All of the parties rely on "code" or "Code" in interpreting "non-explosion-proof electric motor." Respondents and the staff appear to place heavy reliance on the reference to Code with a capital "C" in the prosecution history. Complainant however argued:

> Despite the incorporation of the NEC in the specification twice, [6] a lot of discussion took place at the hearing of why the inventors capitalized "Code" in places in the prosecution history. Respondents attempt to turn this around and say that Code (capitalized) must mean exclusively NFPA 496, not the NEC. FANUC's position is that the use of Code in the prosecution history is, at most, ambiguous, but certainly cannot contradict the specification. No place do the inventors expressly redefine their use of the term "Code" that way. Meanwhile, despite his (unfounded) criticism of the inventors' use of the term, Yaskawa's expert Dr. Schempf in the end admitted, "I don't know why they capitalize the word." Schempf, Tr. 1338 (12-13). Note also that

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[6] The specification of the '913 patent only makes reference to "Article 500 of NFPA, National Electrical Code." It does not make reference to "NFPA 496."

> Dr. Schempf himself repeatedly used the word "code" in his testimony, referring to other sections of the NFPA, for example NFPA 70, the National Electrical Code, without any apparent concern about whether or not he meant the word to be capitalized. (*See, e.g.*, Schempf, Tr. 1426-1427). It is lost on Respondents and their experts that the National Electrical ***Code*** is the "Code," with a capital C in the patent itself. Also inexplicably, Dr. Schempf, despite admitting this Code is cited twice ("this { } is the definition where applicants refer to the specific safety code" (Schempf, Tr. 1446(15-17)), testified inconsistently elsewhere that the inventors, "never used, never referred to 501-8(a)(2) or 501-8." (Schempf, Tr. 1426(16)-1427(12)). But flip-flopping on this point once more, agreeing with FANUC again, Dr. Schempf cited NEC 100 and 501 in the slides he prepared as the applicable Code sections for "Motors Capable of Containing an Explosion." RX-740C at 2. (CFF 389; CFF 365; CFF 376; CFF 606; CFF 388.)
>
> Further contrary to Dr. Schempf and the colloquy from Respondents' lawyers, Dürr's expert Mr. Stallcup testified that the National Electrical Code is generally referred to as a code, while he would "just identify NFPA 496 as a standard." Stallcup, Tr. at 1656(4-10). Likewise, NFPA 496 internally refers to itself as a "standard," not as a "code." Stallcup, Tr. at 1658(1-9). (CFF 392, 393.)

(CBr at 27 (emphasis added).) Yet complainant argued that "non-explosion-proof electric motor" should be interpreted as "an electrically driven motor that is not protected in its own merit according to "Code for safe use directly in a Class I, Division I location." (CBr at 24 (emphasis added).) Yet complainant has admitted at least that "that the use of Code in the prosecution history is, at most, ambiguous." See supra.

Referring to the prosecution history it is a fact that Dugan U.S. Patent No. 3,447,000 was initially relied on by the Examiner in rejecting claims. Significantly, the Examiner however recognized the presence of "any type of conventional motor, including a brushless D.C. motor and an A.C. servo motor" in the claimed combinations. (FF 12.) Applicants, in response, argued:

> The Dugan et al reference is primarily concerned with cooling high-speed electric motors, such as blending motors. There is a need for the free flow of air for cooling a high-speed motor. First and second conduits are provided for supplying air under pressure to the interior of the housing in Dugan as well as means for exhausting the air under pressure from the housing. Dugan et al is not concerned with a range of acceptable superatomspheric pressures and is only concerned if the pressure falls below a predetermined amount.
>
> * * *
>
> The use of explosion-proof motors, such as disclosed in Dugan et al, has long been recognized as one way of protecting electrical equipment in a hazardous environment. However, there are numerous disadvantages to the use of explosion-proof motors as noted in the Background Art portion of the present application. Even if the teachings of the Dugan et al patent could be combined with the other prior art robot patents cited by the Examiner, there is still a need to supply cooling air across the motor of Dugan et al to comply with the teachings of Dugan et al. Applicants have eliminated this need by providing compartments in the robot which are large enough so that heat generated by the electric drive motors is dissipated primarily through radiation, thereby eliminating the need for an explosion-proof motor. Such motors are more costly and also increase the weight and size of the robot. Such explosion-proof motors also necessitate the use of explosion-proof cables which are also more costly and heavier and are also more unflexible and unyieldly.

(FF 17.) The inventor Akeel later characterized Dugan:

> 25. The '000 Patent [Dugan] discloses an explosion-proof blender motor and housing. Such an explosion-proof motor cannot be considered for use in an electric painting robot due not only to the cost of such motors, but also the weight and size of such motors. Also, such motors necessitate the use of explosion-proof cables which are costly, heavy and relatively inflexible and unwieldy. This approach has proven to be impractical as discussed in paragraph 18 of this Declaration.

(FF 25.) The Examiner continued to rely on Dugan in rejecting claims (FF 29.) Applicants,

responding to the continued rejection, argued:

> Even if the Inaba et al and Dugan patents cited by the Examiner were combined or the Sugimoto and Dugan patents were combined, neither of the resulting structures would fall within the present claims of the application. For example, the Dugan patent discloses a ventilation-type, internal pressure, explosion-proof blender motor assembly. Each such motor assembly provided within the Inaba et al or Sugimoto robot would require its own pressure detector and air supply lines from an air source thereby increasing the cost and weight of the resulting structure. Furthermore, such additional detectors and air supply lines take up valuable space in the robot. Additionally, a large capacity air supply source would have to be provided wherein the amount of air consumption, is large. As noted at Column 1, lines 37-40 of Dugan, because of their high speed, blending motors must be constantly cooled. Also, the flow of such cooling air must travel in close proximity to the motor. The air must pass through openings 61 and 63 in the motor as noted at Column 2, lines 30-32 of Dugan.

(FF 33.) Thereafter applicants, in an amendment in a subsequent application, argued:

> Assuming that the prior art previously cited by the Examiner and the Applicants in the prior applications can be combined, what results is a pressurized enclosure type of explosion protection in an industrial robot. There is no teaching in the references to make such a combination. Such a combination, however, would not result in the present invention wherein a communicating means is provided between first and second compartments formed by the robot. Due to such a communicating means it is possible to provide only one pressurizing means for both of the two compartments, thereby reducing cost, weight and volume of the robot and air supply capacity. Pressurizing means is provided in new claim 38 to more particularly point out and distinctly claim that Applicants regard as their invention.

(FF 42.) The Examiner continued to reject claimed subject matter on Dugan et al. again referring to the use of "any type of conventional electric motor" in the claimed combinations. (FF 43.)

Applicants responded:

Briefly, none of the prior art patents, taken either alone or in combination, discloses or suggest an electric robot including a cable bundle extending into an airtight first compartment of a base of the robot, wherein one of the cables is connected to operate an electric motor contained therein and another of the cable extends from the airtight first compartment of the base to an airtight second compartment of an arm assembly of the robot to operate an electric motor contained therein and wherein pressurized gas is fed into the first and second compartments which are fluidly communicated to provide pressurized gas which surrounds the electric motors and the cables within the compartments.

Applicants are not merely providing electric motors in pressurized robot compartments as suggested by the Examiner. Rather, Applicants have invented the electric robot described above with the base, arm assembly, first and second drive mechanisms, cable bundle, and pressurized compartments recited by the claims.

None of the references of record teach or, in any way, suggest the electric robot now claimed. More specifically, the Sugimoto et al patent discloses a base 21 having an electric motor drive 29a that is exposed to the environment and also has a base motor 34a, as well as including an arm assembly having a motor 40a that drives the forearm 24 and a motor 51a that drives the wrist 26. Dugan et al does disclose a blender whose base or housing 11 receives an electric motor 17 to which pressurized gas is supplied through conduits 57 and 59. Even if the disclosure of the Dugan et al blender is combined with the electric robot of Sugimoto et al for purposes of argument, which Applicants believe would not [sic] an obvious expedient, the result would merely be pressurization of Sugimoto et al's base motors 29a and 34a. There would still be no provision of the electric robot invention now claimed by the present application wherein a cable bundle operates electric motors of first and second drive mechanisms, respectively located within airtight first and second compartments of the robot base and the robot arm assembly.

Likewise, the industrial robot of Inaba et al has each of its electric motors 52, 66, and 68 located within the base 40 as opposed to the electric robot of the present invention wherein the first drive mechanism is located within the pressurized base and the second drive mechanism is located within the pressurized arm

assembly with cables of the cable bundle operating these drive mechanisms.

(FF 44.) Following further rejection of claimed subject matter, applicants argued:

> The Dugan patent reference only teaches the pressurization of a single compartment having an electric motor therein and not the pressurization of multiple compartments in two parts, one of which is mounted for movement on the other. Dugan also fails to teach any communication of pressurized gas between first and second airtight compartments, each of which contains an electric motor.

(FF 46.) In an amendment after a final rejection, applicants argued:

> The Dugan patent references only teaches the pressurization of a single compartment having an electric motor therein and not the pressurization of multiple compartments in two parts, one of which is mounted for movement on the other. Dugan also fails to teach any communication of pressurized gas between first and second airtight compartments, each of which contains an electric motor.

(FF 49.) In a later application, following a rejection of claims on references, including Dugan et al, applicants argued:

> This brings us to Dugan et al. which is no better than the National Electric Code incorporated by applicants at page 4 of their specification, convenience copy attached hereto as Attachment A. Applicants knew prior to their invention that a robot for a hazardous environment could be built with "explosion-proof motors." This is what Dugan et al. did and what the Code calls for. Like Lehmann, Dugan et al. placed his motor in an inner housing and then put the shielded motor in an airtight outer housing. His improvement was to circulate air through the inner housing to cool the motor. The added structure of the inner housing which Dugan used to make his motor "explosion-proof" also made the motor heavier and bulky. This is the solution which applicants knew about when they faced the problem. It is also the solution they sought to avoid by using "non-explosion-proof motor(s)" and "non-explosion-proof cable(s)" in their robot.

(FF 56 (emphasis added).) Attachment A, which is NFPA 496, is not cited in the '913 patent and is not identical with NFPA 70 cited in the '913 patent. (FF 56.)

Applicants, in a preliminary amendment in a subsequent application, pointed out that "Dugan shows a motor requiring ventilation for cooling." (FF 68.) After an Office Action, applicants attempted to distinguish the use of Dugan-type ventilated motors in the interior of a robot:

> However, if the skilled practitioner installed Dugan's motor in the Sugimoto robot, he would end up again with nothing more than the admitted prior art - an explosion-proof motor in a heavy, bulky, costly, separate housing.

(FF 72.) Applicants also addressed the additional prior art reference, Sagata (JP 59-92053) (RX-11):

> (Sagata) relates to a robot provided with a driving motor which is adapted to be explosion-proof so that the robot may operate in a hazardous environment. Sagata makes their servo motors explosion-proof by adding pipes for supplying a continuous flow of inert gas to and over each motor or other sparking source.

(FF 73.) Applicants then in a chart characterized the claimed invention as "[n]on-explosion-proof motors (Special robot structure meets NEC)" and Sagata as "[e]xplosion-proof motors (Follows Code)." (FF 74.) Applicants further, with regard to Sagata, argued:

> Applicants knew prior to their invention that a robot for a hazardous environment could be built with "explosion-proof" motors. This is what Sagata did and what the Code calls for. Thus, Sagata follows the Code by making their servomotors explosion-proof by adding pipes for supplying a continuous flow of inert gas to and over each motor or other sparking source. Such pipe-motor combinations do not suggest that non-explosion-proof motors could be combined in articulated, hollow-arm, electrically driven robots to create a robot specifically designed for painting or other explosive environment. The plurality of pipes and nozzles to carry and direct the flow of air to each motor adds to the cost, weight and size of the robot. Sagata has none of applicants'

technical advantages.

(FF 75.) In remarks to overcome Sagata, applicants argued:

> This brings us to Dugan et al which is no better than the National Electrical Code incorporated by applicants at page 4 of their specification.
>
> Applicants knew prior to their invention that a robot for a hazardous environment could be built with "explosion-proof" motors. This is what Dugan et al did and what the Code calls for. Thus, Dugan et al placed his motor in an inner housing and then put the shielded motor in an airtight outer housing. His improvement was to circulate air through the inner housing to cool the motor. The added structure of the inner housing which Dugan used to make his motor "explosion-proof" also made the motor heavier and bulky. This is the solution which applicants knew about when they faced the problem. It is also the solution they sought to avoid by using "non-explosion-proof motor(s)" and "non-explosion-proof cable(s)" in their robot.

(FF 76.) The Examiner then rejected the claims under 35 U.S.C. § 112, second paragraph, as being indefinite in reciting the term "non-explosion-proof electric motor:"

> It is unclear what applicants intend their phrase "non-explosion-proof electric motor" in claims 19, 20, 30, 32 and 36 to mean and how this structurally differs from an explosion proof motor and what basis they use to conclude on page 25 of their amendment filed 8/12/91 that the Japanese reference 59-92053 uses explosion-proof motors. Applicant's specification appears to be disclosing no more than placing an electric motor in a container and pressurizing the container. However, this is exactly one of the arrangements they state on page 4, line 8-13, that the code requires and is exactly what Dugan and the Japanese reference are doing. The code appears to further require the use of an explosion proof motor if the motors [sic] is not placed in a pressured container. It appears this means placing the electric motor in a heavy casing without pressurization. None of applicants, Dugan or the Japanese reference as [sic] this.
>
> In conclusion, Dugan and the Japanese reference place their motors in a pressured container as applicants do. It is unclear

how applicants conclude their motor is non-explosion proof and those in Dugan and the Japanese reference are explosion proof since they are all contained in pressurized containers.

(FF 80.) Applicants, in a subsequent amendment, argued:

> Applicants concede the need for further clarification and supplement their earlier explanation as follows. In short, the prior art sought to follow the Code as to each component of the manufactured product, whereas applicants choose not to follow this obvious route but to design the whole robot itself into an unobvious combination which will accept components thereof irrespective of their individual compliance with the Code while maintaining compliance as to the robot as a whole.
>
> Thus, Dugan applies the Code to individual non-explosion proof motors to make them individually explosion proof. Sagata neither uses explosion proof motors, nor makes them explosion proof. Sagata just blows air/gas at the source of sparking such as the brushes in a DC motor....
>
> In contrast, and in addition to other features, the combination of the applicants' invention applies the Code to individually pressurize relatively moving compartments that can contain components such as motors, cables.... Applicants' invention does not make any individual motor explosion proof a la Dugan or what may be understood from the meager, and indefinite teaching of Sagata. Furthermore, Sagata does not even indicate adequate knowledge about the Code or reference it in explaining his method of protection.

(FF 81.) Applicants further argued:

> Applicants respond as follows to show that each reference teaches a separate item without any teaching of how the elements should be correlated or combined.
>
> Sugimoto: Motors inside robot arms
>
> Dugan: Pressurized and purged motor
>
> Fields: Uses pressurized undersea cable conduits to keep water out

Buschor: Uses an inert gas

Applicants comment as follows

> It appears that the patentability issue is confused by the terminology of 'explosion-proof motor.' It may be stated that the term is applied to an electric motor housed individually in an enclosure that either contains explosion or prevents ignition. A strong enclosure that contains an internal ignition without exploding makes the motor explosion-proof; a lighter or weaker box or enclosure that is purged and pressurized according to Code prevents ignition from being initiated and makes a motor explosion-proof. Applicants' use of "non-explosion-proof motor" means that the motor is not protected in its own merit by any of these two approaches. Applicants' invention uses "non-explosion-proof motors" and applies the Code, in addition to other novel features, to make the whole robot explosion-proof and suitable for use in explosive environments.
>
> * * *
>
> If an argument is made that each individual motor enclosure is made fluidly communicated with all other as well as cable conduits, the Code, Attachment B, requires according to [R]ule 2-2.4 (a), (b), and (c), that other provisions be made which adds complexity and cost and could render the robot inoperative.
>
> In contrast, the invention's novel features makes it possible to apply the Code to the robot, not to individual motors, in a manner that accommodates the particulars of a robot construction which includes relatively moving parts, and not jeopardize its performance flexibility or add prohibitive cost.

Attachment B referenced was NFPA 496 not cited in the '913 patent. (FF 82.) Applicants also argued:

> The application of the Code is well known and applied by the prior art to make conventional motors explosion-proof, such as Dugan's. There is no known prior robot art that houses multiple motors and their power supplying cables in multiple relatively moving compartments that are pressurized and purged to meet Code requirements, and be additionally protected by control elements that assures the safety of their operation in a hazardous atmosphere.

> The invention allows a robot powered by an electric power source, with its potential sparking capability, to operate in an explosive atmosphere with a minimum of weight, cost, and complexity and at the highest level of reliability. The prior art of robot construction had discounted such novelty and powered the robots with intrinsically safe, non-sparking power sources, such as hydraulics and pneumatics. Only Sagata suggests the use of electrical drives but his lack of reference to, and obvious conflict with, the Code, renders his method inoperative in an explosive environment despite his claim of applicability.

(FF 83.)

Thereafter applicants, in an appeal brief, argued:

> Applicants knew prior to their invention that a robot for a hazardous environment could be built with "explosion-proof" motors. This is what Dugan et al did and what the Code calls for. Thus, Dugan et al mounted his motor 17 within an airtight housing 11, 13. His improvement was to circulate air continuously, in a "closed" system, through the housing to "constantly" cool or ventilate the motor. The added structure of the housing which Dugan used to make his motor "explosion-proof" also made the motor heavier and bulky. This is the solution which Applicants knew about when they faced the problem. It is also the solution they sought to avoid by pressurizing the movable robot compartments so that "non-explosion-proof motor(s)" and "non-explosion-proof cable(s)" could be used in their robot.

(FF 93.) In the appeal brief, with respect to individually pressurized robots, applicants stated: "[o]ne skilled in the art would understand 'individually pressurized' in the context of the total specification to mean that rather than pressurize the robot compartments internally, each compartment could be separate from one another and provided with separate or individual tubes or hoses to pressurize each compartment individually." (FF 94.) The Board of Appeals then found with respect to the Sagata reference:

> In Sagata there is disclosed a compartmented robot with electrically movable joints, for use in a hazardous (painting environment). Sagata tells us its control system (control box 16)

> and robot main outer shell (10 in Figure 2, made up of the base and arms 3, 4, Figure 1) are configured to be "nearly airtight." Sagata also teaches us the pressurized application of an inert gas to the body compartment and control box and each part where there is a possibility of spark ignition. It is clear to us that one of ordinary skill in this art would have appreciated the teaching of Sagata is the application of pressurized inert gas to and around to the electrical motors which are non-explosion proof at a pressure above the ambient because it is to be continuously forced out of the robot body into the ambient and thus preventing entry of the hazardous ambient environment into the robot body. Sagata states the robot body is "nearly airtight" which in our view corresponds to the "substantially airtight" compartmented, relatively movable robot parts as claimed. . .

(FF 95.) However the Board reversed the Examiner's obviousness rejections that relied on Dugan in a combination:

> Turning now to the rejection of appealed claims 19-21, 30, 31, 36 and 37 under 35 U.S.C. § 103 over Sugimoto, Dugan, Fields and Buschor; we will not sustain the rejection. It is our view that, while particular individual elements, components or concepts making up appellants' invention may have been known in the prior art, there is lacking any basis in the collection of references relied upon by the examiner and in the prior art as a whole which would have motivated the artisan to bring this diverse collection together to arrive at the appellants'claimed invention, the examiner's rationale to the contrary notwithstanding.
>
> * * *
>
> Here there is no suggestion in these prior art disclosures which would have motivated the artisan to apply to the robot of Sugimoto, which is not concerned with hazardous environment use or apparently with light weight, a pressurized motor environment system such as that of Dugan over other arrangements such as explosion proof motor.

(FF 97.)

In yet a subsequent application, the Examiner rejected claims 18-31 under 35 U.S.C. § 102 over Sagata, and under 35 U.S.C. §103 over the combination of Sagata (RX-11) and Turner

(USP 4,547,120) (RX-21), the combination of Lehmann (RX-16), Buschor (RX-17), and Fields (USP 4,149,935) (RX-18), the combination of Sugimoto (RX-13), Clarke (USP 4,278,046) (RX-20), Fields, and Buschor, and the combination of Lehmann, Buschor, Fields, and Dugan. (FF 106.) Thereafter, in a subsequent Office action, Dugan et al was only relied on by the Examiner with respect to claim 25, the Examiner stating that it would have been obvious to provide a pressure detecting means in view of Dugan. (FF 118.) Claim 25 on appeal corresponds to patent claim 8 which is not in issue. (FF 128.) Moreover the Board reversed the Examiner on his rejection of appealed claim 25. (FF 127.)

In reversing the Examiner with respect to the claims in issue, the Board found that the robot arm in independent claims 27-29 (patent claims 10-12 in issue), independent claim 35 (patent claim 18 in issue) independent claims 37 and 39 (patent claims 20 and 22 in issue) is adapted for exposure to an explosive or hazardous atmosphere in one form or another. It also found that independent claim 28 (patent claim 11 in issue) provides for airtight chambers having fluid communication therebetween; that independent claims 28, 29, 35 and 37 (patent claims 11, 12, 18 and 20 in issue) have non-explosion-proof electric motors and/or cabling; that independent claims 28, 29, 35, 37 (claims 11, 12, 18 and 20 in issue) have a gas supply means connected to a chamber for supplying gas thereto at a pressure above atmospheric or ambient; that method claim 27 (patent claim 10 in issue) is directed to a method of driving compartmented robot arm parts by non-explosion-proof motors housed in airtight compartments by supplying clean air or inert gas to the compartments at a pressure above ambient; that method claim 39 (patent claim 22 in issue) is to a method of operating a robot in an explosive environment by providing clean air, an inert gas, or other non-ignitable gas at a pressure higher than the explosive environment to first and

second compartments each having a non-explosion-proof motor. (FF 129.) The Board perceived the core principle of the claimed invention involves utilizing component parts of the robot arm to provide a pressurized environment for non-explosion-proof motors and cabling. It found that independent claims 27 and 28 (claims 10 and 11 in issue) have housings for the various components and motors which are substantially airtight; that independent claims 27-29, 35, 37 and 39 (patent claims 10-12, 18, 20 and 22 in issue) call for non-explosion-proof motors; and that independent claims 28 and 29 (patent claims 11 and 12 in issue) have chambers formed by housing in fluid communication. (FF 130.) The Board further found that the claimed subject matter on appeal involves "keeping hazardous (explosive) gases out so that non-explosion proof motors and cabling may be utilized and "non-explosion-proof-motors housed in the arm" and rejected a Fields reference "being an underwater weld-inspection device ... [because it] does not appear to be concerned with potential explosions in a hazardous environment." (FF 131.)

Based on the prosecution history supra the administrative law judge rejects the arguments of respondents and the staff that there are clear and unmistakable disclaimers as so asserted. To the contrary he finds the prosecution history ambiguous. See SanDisk Corp. v. Memorex Prods., 415 F.3d 1278, 1287 (Fed. Cir. 2005). It is a fact that the Board overruled the section 103 rejections that used Dugan et al in combination and found that Dugan et al should never have been part of a prima facie case of obviousness. (FF 97.) Moreover even the Examiner abandoned Dugan et al during the prosecution ultimately relying on Dugan et al only for rejecting appealed claim 25 because it would be obvious to provide a pressure detecting means in view of Dugan to the claimed combination. (FF 127, 128.) The Board in turn reversed the Examiner on appealed claim 25 because "the additional teachings of the Dugan reference . . . do not render obvious

what we have found to be lacking in Lechmann, Buschor and/or Fields" (FF 127, 128.)[7]

Dürr respondents, citing Phillips Petroleum Co. v. Huntsman Polymers Corp. 157 F.3d 866 (Fed. Cir. 1998) argued that the "Board's decision does not erase the applicant's statements to the Patent Office." (DRBr at 13-14). The administrative law judge rejects said argument. To the contrary the Court in Phillips stated:

> In light of the Examiner's rejection, we read the Board's statement as addressing the number of polymer blocks required in a given block copolymer molecule. We do not construe this statement as inconsistent with the remainder of the prosecution history requiring the polymer blocks to be a significant portion of the block copolymer molecules. We read the Board's ruling as simply not requiring the block copolymer molecules of the claimed block copolymer composition to contain more than two adjacent polymer blocks.

Id. 157 F.3d at 873, 874. (emphasis added). Moreover it is a fact that the '913 patent issued with the asserted claims only after the Board reversed the Examiner. (FF 127.)

The administrative law judge further rejects the extensive reliance on "Code" or "code" by the private parties and the staff for any claim interpretation. In the prosecution history, inventor Akeel in his Rule 132 declaration submitted to the Patent Office in August 1987 did make brief references to the existence of standards governing electrical equipment used in hazardous locations (FF 23) as well as safety codes for the use of electric drives in hazardous locations without identifying the standards or safety code requirements. (FF 24.) Thereafter applicants in a June 1989 amendment made reference to the disclosure in the '913 patent at col. 2, lns. 25-27 which the administrative law judge has found relates to a discussion as to how

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[7] Claim 8 of the '913 patent which corresponded to appealed claim 25 is not in issue. (FF 128.)

artisans in the past have addressed certain code requirements governing the use of electrical equipment in hazardous environments. (FF 49.) Applicants in remarks on February 12, 1990 did refer to the "National Electric Code" in an attachment A which (1) related to NFPA 496, (2) is not cited in the '913 patent and (3) is not the same as the NFPA 70 cited in the '913 patent. (FF 56.) Thereafter, applicants in an amendment filed August 9, 1991, argued that the patent Dugan et al "is no better than the National Electrical Code" and referred to col. 2, lns. 25-27 of the '913 patent which refers to BACKGROUND ART. (FF 77.)

Applicants, in the August 1991 amendment, submitted a chart alleging the differences between the claimed invention and a Sagata reference referring the "Explosion-proof motors (Follows Code)" of Sagata and argued that applicants knew prior to their invention that a robot for a hazardous environment could be built with "explosion-proof motors" and this is what "Sagata did and what the Code calls for." (FF 74, 75.) The Code was not defined in this amendment. However applicants in a March 16, 1992 amendment argued that the prior art "sought to follow the Code as to each component" of a robot whereas applicants have a combination which will accept components "irrespective of their individual compliance with the Code" and also "applies the Code to individually pressurize relatively moving compartments" and also does not make "any individual motor explosion proof a la Dugan." (FF 81.) For the Code, applicants again referenced NFPA 496 (FF 82) which is not cited in the '913 patent.

In an August 4, 1992 amendment, applicants argued that the Dugan patent "applies the code to individual non-explosion-proof motors to make them individually, explosion-proof." In this amendment, while applicants did not identify the code, they did not capitalize the letter "c" of the word code. (FF 88.) However applicants in a September 1992 amendment argued that

applicants knew prior to their invention that a robot for a hazardous environment could be built with "explosion-proof" motors and this is "what Dugan et al did and what the Code calls for." In this amendment while applicants did not identify the code, they did capitalize the letter C of the word code. (FF 93.) Thereafter in a December 1995 amendment applicants argued that the term "hazardous environment" is defined by Article 500 of NFPA 70 of the National Electrical Code which is referred to in the BACKGROUND ART portion of the '913 patent. (FF 114.) Hence what a person of ordinary skill in the art would find in the prosecution history is that there is sometimes (1) a reference to undefined standards and safety codes, (2) a reference to undefined "Code" and code, (3) a reference to NFPA 496 which is not cited in the '913 patent and (4) a reference to Article 500 of NFPA 70 which is cited in the BACKGROUND ART portion of the '913 patent and is further cited in connection with an environment which "may" present an explosion or fire hazard. In addition a person of ordinary skill in the art would find minimal reference to code or Code in the Office Actions of the Patent Office and decisions of the Board of Appeals in the prosecution of the '913 patent. The Examiner in his answer before the last decision of the Board did direct the Board's attention to applicants' comments in their appeal brief, the Examiner stating:

> The motivation to combine in the instant rejection comes from both the teaching in Fields and the dictates of the code. The Board's attention is directed to appellant's [sic, appellants'] comments on page 34 of their brief wherein it is stated that the code required the use of pressurized containers or explosion proof containers. See page 34, lines 16, 17, of the brief. This dictate which is common knowledge to one having ordinary skill in the art, would be sufficient motivation to an artisan to use the system in Fields in the robot of Sugimoto to prevent a hazard if desiring to use the robot in a hazardous environment. Appellant[s] would have the Board [believe] that it was their idea to use pressurize[d]

> containers and also their idea to use a pump, conduit, seals and housings connected together to avoid a hazardous environment from reaching wiring and motors. However, Fields teaches and the code dictates the first and Fields teaches the second.

(FF 127 (emphasis added).) The Board however concluded:

> We consider the examiner's reference here to "the code" and "the dictates of the code" as being directed to the discussion on pages 4 and 5 of appellant's specification as to how artisans have in the past addressed certain code requirements governing the use of electrical equipment in hazardous environments.

(FF 127.) It later stated:

> We agree with the examiner that it would have been obvious, as a general principle, based upon code requirements for example, to adapt the robot arm of Sugimoto for use in an explosive environment. However, the examiner has not adequately explained, and it is not apparent to us, where suggestion is found in Fields or the other secondary references relied upon, or in the discussion on pages 4 and 5 of appellants' specification of certain code requirements governing the use of electrical equipment in hazardous environments; for what we perceive to be the extensive modifications of Sugimoto that would be required in order to arrive at the claimed subject matter.

It then reversed the Examiner, independent of the existence of any code or Code. (See FF 127.)

Referring to the proper interpretation for "electric motor" and "non-explosion-proof electric motor," it is basic patent law, as applicants argued that "[f]irst and foremost, claims are construed as a matter of law based on intrinsic evidence, starting with the claims themselves, and followed in importance by the specification as a whole." (CBr at 39.) The claims of the '913 patent suggest to a person of ordinary skill in the art that any electric motor used in the claimed combinations be compact and lightweight and not be explosion-proof; that said motors may be a brushless DC motor or an AC motor. There is nothing in the claims to suggest that anything

should be done with the motors before they are used in the claimed combinations. To the contrary, the claims the administrative law judge finds suggest use of state of the art electric motors which can explode in a hazardous environment. See supra.

Turning to the second most important source for claim interpretation, viz. the specification, it states that "[p]referably, the electric motors comprise brushless servo motors commonly known as brushless D.C. motors or AC servo motors" may be used in the claimed combination. (CX-1, col. 3, lns. 19-21 (emphasis added).) Thereafter frequent reference is made in the specification to electric motors. However, other than characterizing certain attributes of existing prior art electric motors, the administrative law judge finds no suggestion in the specification that something should be done to the prior art electric motors before their use in the claimed combinations. See supra. Moreover, referring to the prosecution history and as set forth in Section V supra, inventor Akeel in a sworn declaration stated:

> The novelty disclosed in this application relates to the electrically powered robot construction that's explosion proof. It claims no improvement over state of the art methods of explosion proofing, motor design, or any other component design; hence, patents describing individual components or methods are not more pertinent than publications describing other state of the art components used in this construction such as gears, belts, et. The applicants describes an apparatus that is collection of state of the art components and combination of components, that results in a unique, hence novel, arrangement that accomplishes what no similar arrangement could do in the past.

(FF 26 (emphasis added).) Also applicants made reference to the use of "conventional electrical equipment" in the claimed subject matter. (FF 14.) Later on, reference was made to "the admitted prior art - an explosion-proof motor." (FF 72 (emphasis added).) Also as set forth in Section V supra, applicants in an appeal brief, and referring to exhibits of an Akeel declaration,

argued:

> Of course the exhibits "call for" the use of regular motors – that's one of the important concepts underlying the present invention, and has been stressed from the beginning of prosecution more than twelve years ago. It is inconceivable that the Examiner, who has been in charge of this case since it was filed, does not understand this aspect of the invention.

(RX-152, FANUC 004205 (emphasis added).) The Examiner also recognized that conventional electric motors were to be used in the claimed combinations. (FF 12, 43.) In addition the Patent Office Board of Appeals concluded that "particular individual elements, components . . . making up appellants' invention may have been known in the prior art." (FF 97.) Thus the administrative law judge finds ample support in the instrinic evidence that a person of ordinary skill in the art would conclude that state of the art, "off- the-shelf" electric motors are to be used in each of the asserted claims in issue.

Based on the foregoing, the administrative law judge interprets the claimed "non-explosion-proof electric motor" as a conventional state of the art "off-the-shelf" electric motor, devoid of features to protect against explosion (heavy cladding) or to prevent ignition (ventilation or purging and/or pressurization). Moreover he rejects complainant's argument that the interpretation of the claimed "electric motor" should differ from the interpretation found for "non-explosion-proof electric motor." As the title of the '913 patent indicates, the claimed invention relates to an electric robot for use in a hazardous location. An electric motor is required for said robot. Moreover the claims, specification and prosecution history are replete with equating "electric motor" with "non-explosion-proof electric motor."

3. The claimed phrases "hazardous environment" and "explosive environment"

Asserted claims 10 through 14 contain the phrase "hazardous environment," while asserted claims 18 through 24 have the phrase "explosive environment." Complainant argued that the "hazardous environment" means "a Class I, Division 1, location as defined by Article 500 of the National Electrical Code." (CBr at 62.) Complainant further argued that "[f]or purposes of this patent ['913 patent] on a spray painting robot, . . . an 'explosive environment' is a paint booth where the flammable paint fumes in the air could ignite and explode." (CBr at 63.) It is argued that "Yaskawa's construction includes radioactive and underwater environments never mentioned in the patent, the NEC, or NFPA 496" (Id.)

The staff argued that the definitions for "hazardous environment" and "explosive environment" should be governed by their plain meanings; that importing a code limitation into the claims is not warranted; and that hazardous environment means a dangerous environment and an explosive environment means an environment that could cause an explosion. (SBr 9.)

The word "hazard" is defined as "danger; risk; peril." The Random House College Dictionary (1980) at 608. It is a fact that the specification and prosecution history of the '913 patent repeatedly indicate that a hazardous environment and an explosive environment are spray paint booths where the flammable paint fumes in the air could ignite and explode. An explosive environment is a danger. Hence the administrative law judge finds that a person of ordinary skill in the art would interpret "hazardous environment" as an explosive environment generated in spray painting, and would equate the claimed phrases "hazardous environment" and "explosive environment."

4. The claimed phrase "compartment"

The claimed phrase "compartment" is referenced in each of the claims in issue.

Complainant argued that "compartment" means "a space or cavity in the robot." (CBr at 68.) Yaskawa argued that "compartment" cannot be interpreted in a vacuum; and that when looking at all the words of claims 10-13, 18, 20, and 22, it is apparent that those claims do not merely recite a compartment, but rather, the combination of a compartment with additional features in various combinations pertaining to the relative movement of compartments, fluid communication between compartments, openings between the compartments, and maintaining airtightness when the compartments move relative to each other. (YBr at 40.)

Dürr respondents argued that "compartment" is properly interpreted as defining an inner space within the robot, which requires structure distinct from the outer walls of the robot parts. (DBr at 28.)

The staff argued that "compartment" means a space or chamber. (SBr at 19.)

Claim 10 recites, inter alia, "providing that said compartment be substantially airtight when such compartmented robot parts are movable relative to each other." Here, the term "compartment" is qualified by the additional limitations that it be "substantially airtight when such compartmented robot parts are movable relative to each other." Claim 11 recites, inter alia, "a robot body including a base and relatively movable robot parts forming nearly airtight compartments in fluid communication with each other." Structure must exist for the robot parts to form the nearly airtight compartments, move relative to each other, and have the compartments be in fluid communication. Claim 12 recites, inter alia, "an arm assembly having a second compartment contained therein . . . in fluid communication with said first compartment . . . said compartments are relatively movable with respect to each other." Claim 13 recites "the base and the arm assembly forming a plurality of compartments..., the compartments being connected to

each other by openings." Claims 18 and 20 recite "a second pressurized compartment, moveable relative to the first pressurized compartment."

As seen from the foregoing the claimed phrase "compartment" cannot be looked at in a vacuum. Rather the administrative law judge finds that a person of ordinary skill in the art would interpret the phrase as a space or cavity in a robot which is qualified by the remaining language of a specific claim.

5. The claimed phrase "pressurized"

The claimed phrase "pressurized" is found in asserted claims 12 and 18-21. Complainant, relying on NFPA 496-1982, argued that "pressurized" means the state of being under a positive pressure of at least 25 Pa (0.1 in.water). (CBr at 72.) The staff argued that "pressurized" means the state of being under a positive pressure, higher than an external pressure. (SBr at 21.)

The Random House College Dictionary (1980) at 1049 defines "pressurized" as "to apply pressure to (a gas or liquid)." The claims do not require any particular numerical limit for "pressurized." Moreover NFPA 496-1982 is not even set out in the specification of the '913 patent. The administrative law judge finds nothing in the specification nor the prosecution history that conflicts with the ordinary meaning, viz. to apply a pressure to a gas or liquid. Hence the administrative law judge finds that the ordinary meaning is controlling.

6. The claimed phrase "conduit"

The claimed phrase "conduit" is found in asserted claims 18-22. Complainant argued that said phrase means – a structure, such as a pipe, tube, or hose, through which something may flow or be channeled or transmitted. (CBr at 76.) Yaskawa argued that to one skilled in the art a

"conduit" is a rigid, hollow pipe. (YBr at 35.) The staff argued that the phrase "conduit" means a tube or duct device for moving fluids or channeling wires. (SBr at 24.)

The ordinary meaning of conduit is a tube or duct device for moving fluids or channeling wires. See American Heritage Dictionary. Second College Edition (1982) at 307; Webster's II New College Dictionary (1995) at 235. The administrative law judge finds nothing in the intrinsic evidence wherein the inventors disavowed the scope covered by said ordinary meaning.

7. The claimed phrase "purging"

The claimed phrase "purging" is found in claims 10, 13 and 24. Complainant argued that "NFPA 496" defines purging as: "the process of supplying an enclosure with clean air or inert gas at sufficient flow and positive pressure to reduce to an acceptably safe level the concentration of any flammable gas or vapor initially present and to maintain this safe level by positive pressure with or without continuous flow" and argued that such definition is controlling. (CBr at 71.) The staff argued that the term "purging" means to "remove (impurities and other elements) by or as if by cleansing." American Heritage, supra, at 1004; Webster's, supra, at 899. (SBr at 20.)

As used in method claims 10, 13 and 24, the term further requires purging until "an acceptable level [of] concentration of hazardous gas" (claim 10), "allowing clean air or an inert gas to flow to the compartments" (claim 13), and "to reduce to an acceptably safe level of concentration of any flammable gas or vapor." (claim 24.) The administrative law judge finds that a person of ordinary skill in the art would interpret "purging" according to its ordinary meaning as qualified by the specific language of the specific claim.

VIII. Infringement

Complainant argued that the following Yaskawa robot models infringe the asserted claims as indicated:

Claim:	10	11	12	13	14	18	19	20	21	22	23	24
YASKAWA MODELS:												
PX800		✔	✔	✔	✔	✔	✔	✔	✔			
PX50 Series (1450, 1850, 2050, 2750, 2850)		✔	✔	✔	✔	✔	✔	✔	✔			
PX2900		✔	✔	✔	✔	✔	✔	✔	✔			
PX2900 MAP						✔		✔				

(CBr at 82.[8]) Complainant argued that the following robot models of Dürr respondents infringe the asserted claims as indicated:

Claim:	10	11	12	13	14	18	19	20	21	22	23	24
DÜRR MODELS:												
Eco RP6	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Eco RP7	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
EcoOpener (D&H)						✔	✔	✔	✔	✔	✔	✔

(CBr at 108.) Each of Yaskawa, as to said Yaskawa robot models and the Dürr respondents, as to their robot models, argued that complainant has not established, by a preponderance of the

[8] Yaskawa in its YBr renews its motion to terminate the investigation to the extent it has been accused of infringing method claims 10 and 22-24 and/or an initial determination of non-infringement (direct or indirect) of method claims 10 and 22-24. (YBr at 62.) In view of the allegations of complainant in its CBr that it does not accuse Yaskawa of infringing any method claims, see chart supra,Yaskawa's motion to terminate and/or an initial determination has been mooted.

evidence, that said robot models infringe said claims.

The staff argued that complainant has not met its burden in establishing infringement of the accused robot models.

Under the provisions of 35 U.S.C. § 271, liability for infringement arises if "whoever without authority makes, uses, offers to sell, or sells any patented invention, within the United States or imports into the United States any patented invention during the term of the patent therefor." 35 U.S.C. § 271(a). This infringement of a patented invention is the usual meaning of the expression "direct infringement." See Joy Techs., Inc. v. Flakt, Inc., 6 F.3d 770, 773 (Fed. Cir. 1993).

A determination of infringement requires a two-step analysis. First, the patent claim must be properly construed to determine its scope and meaning. Second, the claim as properly construed must be compared to the accused device or process. Zelinski v. Brunswick Corp., 185 F.3d 1311, 1315 (Fed. Cir. 1999), citing Markman v. Westview Instruments, Inc., 52 F.3d 967, 976 (Fed. Cir. 1995). Whereas claim construction is a matter of law and, therefore, the exclusive province of the court, "whether a claim encompasses an accused device, either literally or under the doctrine of equivalents, is a question of fact." Zelinski, 185 F.3d at 1315, citing N. Am. Vaccine, Inc. v. Am. Cyanamid Co., 7 F.3d 1571, 1574 (Fed. Cir. 1993).

To prove literal infringement, the patentee must prove, by a preponderance of the evidence, that the accused device contains every limitation in the asserted claims. WMS Gaming Inc. v. Int'l Game Tech.,184 F.3d 1339, 1350 (Fed. Cir. 1999), citing Mas-Hamilton Group v. LaGard, Inc., 156 F.3d 1206, 1211 (Fed. Cir. 1998); General Mills Inc. v. Hunt-Wesson, Inc., 103 F.3d 978,981 (Fed. Cir. 1997); Lemelson v. United States, 752 F.2d 1538, 1551 (Fed. Cir.

1985). An accused device that does not literally infringe a claim may, in some circumstances, infringe under the doctrine of equivalents if differences between the accused device and the claimed invention are "insubstantial." Desper Prods. Inc. v. QSound Labs, Inc., 157 F.3d 1325, 1338 (Fed. Cir. 1998). Equivalency of a claimed element to an element of an accused device is determined on an element-by-element basis at the time of infringement. Warner-Jenkinson Co. v. Hilton Davis Chem. Co., 520 U.S. 17, 40 (1997).

1. Respondent Yaskawa

The motors used in the PX series robots of Yaskawa are{ } (Takahashi, Tr. at 1164-65.[9]) The{ } for each Yaskawa motor in each PX series robot are summarized in RX-745.

ROBOT		MOTOR				
TYPE	AXIS	MOTOR TYPE	{			}
PX800	S	SGMPH-04A1A -YR51	{			}
	L	SGMPH-02A1A -YR41	{			}
	U	SGMPH-01A1A -YR41	{			}
	RBT	SGMAH-A5A1 A-YR31	{			}

[9] Takahasi participated in the discussion about the holes and that is why he knows about the motors. (Tr. at 1165.) He is employed by Yaskawa, the parent company of Motoman, and is assigned to the { } (CFF 132 (undisputed).)

(*) {

}

ROBOT		MOTOR				
TYPE	AXIS	MOTOR TYPE	{			}
PX2850 PX2750 PX2050 PX1850 PX1450	S	SGMDH-12A2 A-YRA1	{			}
	L	SGMGH-30A2 A-YRA1	{			}
	U	SGMDH-12A2 A-YRA1	{			}
	RBT	SGMPH-04A1 A-YR61	{			}
	Run	SGMDH-32A2 A-YRA1	{			}

ROBOT		MOTOR				
TYPE	AXIS	MOTOR TYPE	{			}
PX2900 (Std.)	S	SGMGH-30A2 A-YRA1	{			}
	L	SGMGH-44A2 A-YRA1	{			}
	U	SGMGH-13A2 A-YRA1	{			}
	RBT	SGMPH-04A1 A-YR51	{			}
	Run	SGMDH-32A2 A-YRA1	{			}
	PUMP	SGMPH-04A1 A-YR71 or SGMPH-04AB A-YR11	{			}

ROBOT		MOTOR				
TYPE	AXIS	MOTOR TYPE	{			}
PX2900 (MAP)	S-Run	SGMGH-30A2 A-YRA1	{			}
	L	SGMGH-44A2 A-YRA1	{			}
	U	SGMGH-13A2 A-YRA1	{			}
	RBT	SGMPH-04A1 A-YR51	{			}

	EVB	SGMPH-02A1 A-YR41	{			}

(RX-745; YFF 625 (undisputed).) The charts supra show the{

} (Takahashi, Tr. at 1166-67, 1316-18.) Complainant has admitted that Yaskawa designed the{

} of the motor. (RX-607C-RX-610C; Takahashi, Tr. 554-56; CX-222C at HW 0280272.) (See CRYFF623.) There are depressions and protrusions on the outside of the motor,{

} (Takahashi, Tr. at 1165.) Through the addition of{

}

(Schempf, Tr. at 1452-53; RX-740C.) Page 45 of RX-740C shows how the motor on page 44 of RX-740C is{ } Not all Yaskawa motors used in the PX series robots look like what is shown on page 45 of RX-740C and Yaskawa's motors could be slimmer, fatter, etc. with the key point being that Yaskawa's motors used in the PX series robots are{

} (Schempf, Tr. at 1453-55; RX-740C.)

Regarding the air flow through Yaskawa's PX 50 series robots, RX-561.99C is a Yaskawa drawing showing the air flow through a PX2850 robot. Because{

}RX-561.99C is representative of the air flow of{

}(Takahashi, Tr. at 1213.) The upper right-hand corner of RX-561.99C is a schematic of the pneumatics unit and the exterior of a PX2850 robot. (RX-561.99C.) The left-hand side of RX-561.99C shows the path of the air through a PX50 series robot. (RX-561.99C; Takahashi, Tr. at 1131.) Air is supplied from the air source into the pneumatics unit, located outside the hazardous environment. (Takahashi, Tr. at 1132; RX-561.99C.) From the pneumatics unit, the air flows into the stationary base of the robot, and then{

} (Takahashi, Tr. at 1132-33; RX-561.99C.) {

} (RX-561.99C.) {

} (RX-561.99C.) {

}(RX-561.99C.) RX-703.82C is a photograph of the base of a PX2850 robot, showing where the air enters the base. RX-703.39C is also a photograph of the base of a PX2850 robot,{

} (Takahashi, Tr. at 1139.) RX-703.40C is a closer photograph of the {

} (RX-703.40C.) {

} which is shown in the upper left-hand portion of RX-561.99C. (Takahashi, Tr. at 1139; RX-561.99C.)

RX-703.32C is a photograph of the{ } in the U-arm of a PX2850

robot. (Takahashi, Tr. at 1139-40.) {

} (RX-561.99C.) {

}(RX-561.99C.) {

} (Takahashi, Tr. at 1140; RX-561.99C.){

}(RX-561.99C.)

RX-703.28C is a photograph of the{ }on the PX2850 robot. (Takahashi, Tr. at 1140; RX-703.28C.) In the lower left of RX-703.28C,{

} (RX-703.28C.) RX-703.62C is another photograph of the PX2850{

} (RX-703.62C.) In RX-703.62C,{

} (RX-703.62C.)

RX-703.60C is another view of the same{

} (RX-703.60C.) {

} (RX-561.99C.) {

} (Takahashi, Tr. at 1141; RX-561.99C.)

RX-703.44C is a photograph of the{ }in a PX2850 robot.Visible in the bottom of RX-703.44C is{ } (RX-703.44C.) {

}

(Takahashi, Tr. at 1141; RX-561.99C.)

RX-703.31C is a photograph of the{

} is visible. (Takahashi, Tr. at 1141-42; RX-703.31C.) RX-703.50C is a photograph showing a closer view of the{

} is visible in the photograph. (CX-703.50C.) {

} is shown in the drawing RX-561.99C and can also be seen in the photograph RX-703.31C, located at the far right-hand side of the{ } (RX-703.31C.) {

} (RX-561.99C.) { } is shown at the bottom of RX-703.44C. RX-703.77C is a photograph of the{ } The purple item toward the center of the photograph RX-703.77C is{

}

Regarding the air flow through Yaskawa's PX 2900 (Std.) robot[10], RX-339.30 is a

[10] The PX2900(Standard) has six axes of rotation: S, L, U, R, B, T. (JX08C at 20-24; RX-591 at Y 129121.) The S & L axes motors are in the base (S-Head). (JX-8C at 20-22); CX-222C at HW0280278.) The U, R, B, and T axes motors are in the upper arm. (JX-9C at 22-24; CX-222C at HW0280278.) The upper arm moves relative to the lower arm and base. (JX-8C at 14); RX-591 at Y 129121; CX-222C at HW0280278.) The upper arm moves relative to the lower arm. (Nof, Tr. at 823.) The base (S-head) moves relative to the stationary base while the whole arm assembly including the lower arm and the upper arm can move relative to the base

photograph of a PX2900(Std.) robot. (YFF 719 (undisputed).) Like the PX50 series robots, air is supplied to the interior of the PX2900(Std.), both during purging and during operation of the robot. (RX-577C, Y016536.) RX-648.153C is a drawing of the air flow inside a PX2900(Std.) robot. (Takahashi, Tr. at 1146.) {

}(RX-741C; RX-743C.) { } in the PX2900(Std.) robot, there are two air lines entering the robot at the stationary base. (Takahashi, Tr. at 561; RX-648.153C; RX-743C.)

RX-339.8C is a photograph of the base of a PX2900(Std.) robot showing where the two air inlet lines (the clear tubes) enter the base of the robot. (Takahashi, Tr. at 561; RX-339.8C.) When the air passes into the base of the robot, through the two air lines,{

} (RX-743C.) {

} (Takahashi, Tr. at 560-63, 1146-47; RX-648C.153C; RX-743C.) {

} (Takahashi, Tr. at 560-63, 1146-47; RX-648C.153C; RX-743C.) {

}

(Takahashi, Tr. at 560-63, 1146-47; RX-648C.153C; RX-743C.) Pump-axis motors are an option that the customer can choose. Those motors are used to power the pump that assists in the spray painting operation. (RX-577C, Y016535, paragraph 2.2.) {

(S-Head.) (JX-8C at 10-15; RX-591 at Y 129121; CX-222C at HW0280278.)

} (Takahashi, Tr. at 560-63, 1146-47; RX-648C.153C; RX-743C.) {

} (Takahashi, Tr. at 560-63, 1146-47; RX-648C.153C; RX-743C.) The air then flows out of the base through two exhaust tubes, which are combined just outside the robot. (Takahashi, Tr. at 560-63, 1146-47; RX-648C.153C; RX-743C.) From there, the air flows into the pressure detector unit. (RX-743C.)

{

}(Takahashi, Tr. at 1147; RX-743C; RX-741C.) The PX2900(Std.) robot pressure detector unit is shown in the photograph RX-339.27. (Y122914.) RX-743C is a schematic depicting the flow of air through the PX2900(Std.) robot. (Takahashi, Tr. at 1146; RX-743C.) The schematic shows the two air lines entering the base of the robot.{

}(Takahashi, Tr. at 1146; RX-743C.) {

} (Takahashi, Tr. at 560-63, 1146-47; RX-648C.153C; RX-743C.) {

} (Takahashi, Tr. at 560-63, 1146-47; RX-648C.153C; RX-743C.){

} It exits the robot where the two exhaust lines are shown. (Takahashi, Tr. at 560-63, 1146-47; RX-648C.153C; RX-743C.) Those lines are combined and then the air flows into the pressure detector unit. (Takahashi, Tr. at 560-63, 1146-47; RX-648C.153C; RX-743C.)

Regarding the air flow through the Yaskawa's PX2900 (MAP) robot, the PX2900(MAP)

{ } (Takahashi, Tr. at 1147-48.) (YFF742 (undisputed).)

{

} (Takahashi, Tr. at 1148-49; RX-540.53C.) {

} (Takahashi, Tr. at 1148.) RX-540.53C is a drawing of the PX2900(MAP) robot showing the air flow inside the robot. (Takahashi, Tr. at 1148; RX-540.53C.) After leaving the pneumatics unit, the air is split into two tubes that both enter the robot in the stationary base. (RX-540.53C; RX-742C.) This is shown by the two arrows next to the words "Flow-in" in the bottom right-hand corner of RX-540.53C. After the air enters the base of the robot,{

} (RX-742C.) {

} (RX-742C.) { } (RX-742C.) This is shown in the middle figure in the drawing RX-540.53C, where the arrows go above and near the{

}(RX-540.53C.) {

} (RX-742C.)

In the center figure on RX-540.53C (Y014937),{

} (Takahashi, Tr. at 1149.) {

} (RX-540.53C; RX-742C.) {

} is shown in RX-339.53 and RX-

339.54C. (Takahashi, Tr. at 1149, 1156.){

}(RX-540.53C; RX-742C.) {

} (Takahashi, Tr. at 1157-58; RX-540.53C; RX-742C.) {

} (RX-540.53C.) {

} (Takahashi, Tr. at 1158; RX-540.53C; RX-339.54C.) {

} (Takahashi, Tr. at 1158; RX-540.53C; RX-339.54C.) That tube carries the air out of the robot base and to the pressure detector unit. (Takahashi, Tr. at 1158; RX-540.53C; RX-339.54C.) The air{ }exits the robot through a hole in the wall of the robot base, near where the air{ }exits. (Takahashi, Tr. at 1158; RX-540.53C; RX-339.54C.)

RX-339.41 shows the two air tubes exiting the base of the PX2900(MAP) robot on the way to the pressure detector unit. There are two pressure detector units for the PX2900(MAP) robot. (RX-540.53C.) {

}(RX-339.42C.) {

} (Takahashi, Tr. at 1193.) {

} (Takahashi, Tr. at 1158.) {

} (Takahashi, Tr. at 1158.)

Regarding the air flow through Yaskawa's PX800 robot, the interior of the PX800 robot

{ } (Takahashi, Tr. at 570.) RX-546.83C is a drawing of the air flow in a PX800 robot. (Takahashi, Tr. at 1162.) CX365C at FANUC 077218 is a photograph of a PX800 robot with its covers removed. In RX-546.83C, in the bottom of the drawing, toward the middle, the word "Inflow" and an arrow show where the air enters the base of the robot from the pneumatics unit. When the air enters the base,{

} (Takahashi, Tr. at 570; RX-546.83C; RX-744C.) {

} out an exhaust hole in the base of the motor. (Takahashi, Tr. at 570, 1161-63; RX-546.83C; RX-744C.) The word "Exhaust" and an arrow in RX-546.83C show where the air exits the robot base in the PX800. The air exits into a tube that carries it to the pressure detector unit located outside the robot. (RX-546.83C; RX-744C.) { }
(Takahashi, Tr. at 1163.)

CX-365C at FANUC 077246 is a photograph showing the PX800 pressure detector unit with its cover removed. CX-365C at FANUC 077244 is a photograph of the base of a PX800 robot showing where the air enters and exits the robot base. RX-744C is a schematic drawing depicting the air flow through a PX800 robot. (Takahashi, Tr. at 1164; RX-744C.) On the left-hand side of the drawing, an arrow shows where the air enters the base of the robot. (Takahashi, Tr. at 1164; RX-744C.) {

} (Takahashi, Tr. at 1164; RX-744C.) { } out of the robot base to the pressure detector unit. (Takahashi, Tr. at 1164; RX-744C.)

Based on the foregoing, the administrative law judge finds that the motors used in the

accused PX series robots have{ } that said motors are not regular, off-the-shelf motors but rather are{ }Moreover he further finds that motor purge tests conducted by Yaskawa prove that{ } (Schempf, Tr. at 1469.)

Complainant's Nof, who has been found not to be an expert on the details of electric motors (see Section IV, supra) testified that if a respondent Yaskawa motor is put in a paint booth and operated:

> A. They would ignite or spark and would not be able to keep those sparks internally,{ }there is a chance that those sparks will come out freely, get in contact with the flammable vapors that are present in a paint booth and will cause a terrible explosion, terrible damage, as I mentioned before.

(Nof, Tr. at 672 (emphasis added).) Nof gave no indication as to what types of sparking (if any) would occur, what the nature of any such sparking is, whether the spark (if any) would be sufficient to initiate ignition of an explosive gas, how long the motor must run in order for the temperature to reach a level that would ignite surrounding explosive gases, what concentration of explosive gases would need to surround the motor, and whether all of the different types of Yaskawa{ } motors would perform the same way.

In light of the record developed at the hearing, the administrative law judge finds that complainant has not met its burden in establishing that respondent Yaskawa motors in issue literally infringe asserted claims 11, 12, 13, 14, 18, 19, 20 and 21 which complainant put in issue in its CBr.

Nof testified that respondent Yaskawa's "Sigma motors infringe the asserted claims under

the doctrine of equivalents." (CBr at 96.) Yaskawa's motors used in the PX series robots do perform substantially the same function with substantially the same results as the claimed "non-explosion-proof electric motor." (Schempf, Tr. at 1471-72.) The result of performing that function (which is to take electrical energy, convert it into rotational energy, and do so in a safe manner inside of an enclosure that is inside an explosive environment) is that robot links will move. (Id.) Yaskawa's motors however are not insubstantially different from the claimed motors. Thus Yaskawa's motors perform the function in a substantially different way from the motors recited in the asserted claims. Thus Schempf testified:

> Q. And what is your analysis, under your understanding of the doctrine of equivalence, as one of ordinary skill in the art?
>
> A. Well, it's my opinion that the Yaskawa motors basically performed the same function, which means that they take electric energy, convert it into rotational energy and do so in a safe manner, meaning properly for operation, inside of an enclosure that's inside of an explosive environment. Furthermore, it's my opinion that the end result is the same.
>
> All robots, regardless of whatever electric motor you put in, the end result is that the links will move. The difference here is that this electric motor is a particular kind. It's a non-explosion-proof electric motor, so it has to do so safely. So the end result, in my mind, is still the same for both motors, both motor types, namely, the '913 patented claimed motor, as well as theYaskawa motor.
>
> But there's a main difference. The key thing to note is that the Yaskawa motors, in my mind, use a different way to perform this. They use a different way to safeguard, protect the motors, and it falls into one of several, of what I deem to be

> descriptions that applicants provided in the prosecution history, where they said this is not what our motor is and that is, those several descriptions, several different kinds of descriptions that I deem Yaskawa's motor to fall under.
>
> So it's a different way to do it. . .

(Tr. at 1471-72 (emphasis added).) Hence the administrative law judge finds that complainant, who has the burden by a preponderance of evidence, has not sustained its burden in establishing infringement under the doctrine of equivalents.

Complainant, in its rebuttal brief argued that Yaskawa "indirectly" infringes method claims 10 and 22-24. That allegation is procedurally defective. Thus said allegation was the subject of Yaskawa's Motion No. 530-34 in limine to preclude complainant from offering evidence, including testimony, regarding indirect infringement filed on September 13 which was granted on September 15. See Procedural History, supra. Assuming arguendo that complainant can allege indirect infringement, a necessary prerequisite to finding indirect infringement is a finding of direct infringement. In posthearing submissions, complainant dropped all allegations of infringement concerning method claims 10, and 22-24 against Yaskawa. (See CBr 82, 106-07; CFF at 130-231.)[11]

2. Dürr Respondents

FANUC has accused Dürr's electric robots known as the EcoPaint RP6 and RP7 paint

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[11] Complainant, in footnote 464 at 106 of its CBr, did argue that "Yaskawa is liable for contributory infringement for selling products that directly infringe the claims of the patent when operated." Complainant in said footnote did not recite specific claims. Moreover in view of the allegations in CBr and CFF, the administrative law judge finds said footnote inadequate for raising indirect infringement, assuming arguendo that the administrative law judge had denied Yaskawa's Motion No. 530-34.

robots (EcoRP6 and EcoRP7), and the EcoOpener D and H handler robots of violating section 337. (Amended Complaint, at 34.) The designators "6" and "7" of the EcoRP6 and the EcoRP7 denote 6 and 7 axes of movement, respectively, for the robot. (Haas, Tr. at 308 to 309.)[12] The six axes of the EcoRP6 robot are driven by 6 Indramat MHD motors. (Haas, Tr. at 314.) The seventh axis of the RP7 robot is a rail positioned parallel to the movement of an automobile body through the paint booth. (JX-14, at p. 89, lns. 6-13.) The seven axes of the EcoRP7 robot are driven by 6 Indramat MHD motors, and 1 Indramat MKE motor. (Haas, Tr. at 314.)

{

[12] Juergen Haas was the project manager for the development of Dürr's Ecopaint RP 6/7 robots. (Tr. at 308.)

[13] {

}

[14] {
}

} The administrative law judge has examined the testimony of Ostin relied on by complainant and finds nothing in that testimony where Ostin contradicted the conclusions he

drew from the conducted tests. Significantly complainant, who has the burden of establishing infringement, offered no evidence as to how any alleged variance of the conditions of Ostin's tests and how the fact that the tested motors were not in dynamic movement, would affect the conclusions Ostin drew from the tests. Complainant relied on Ostin's testimony to the effect that he is not the expert on the robot. However Ostin is the director of research and development at Dürr systems and was involved in the design of the tests as was Hamel. (Tr. at 1555-56.) Hamel has been qualified as an expert in robots for hazardous environments and in motors used for such robots. See Section IV supra.

Based on{

} the administrative law judge finds that complainant has not met its burden in establishing that Dürr respondents literally infringe the asserted claims.

Complainant argued that the MHD motors infringe under the doctrine of equivalents and the {

} (CBr at 120-21.) Complainant however has the burden of establishing infringement under the doctrine of equivalents. The administrative law judge finds that complainant has not established, by a preponderance of evidence, that said difference is "insubstantial" in the way the motors operate.

Complainant, in its reply brief, argued that Dürr respondents "indirectly" infringe the method claims in issue. (CRBr at 45, 46.) However, as indicated supra with respect to the indirect infringement allegation against Yaskawa, the granting of Motion No. 530-34 on September 15, 2005 precluded complainant from offering evidence or testimony regarding indirect infringement. Moreover, direct infringement of the method claims is a prerequisite for

finding indirect infringement. There is unrefuted testimony that{

} Hence, assuming arguendo that Dürr respondents were using an off-the-shelf electric motor in the method claims and Motion No. 530-34 had been denied, the administrative law judge finds no direct infringement of the method claims in issue because{

} Hence because there is no direct infringement by Dürr respondents, there could be no indirect infringement of the method claims in issue.

IX. Validity

Each of Dürr respondents, respondent Yaskawa and the staff has put in issue the validity of the '913 patent. Complainant argued that respondents did not prove a "§102 defense," a "§ 103 defense" or a "§ 112 defense."

1. Anticipation

A patent issued from the Patent Office bears the presumption of validity. 35 U.S.C. § 282. The party challenging a patent's validity has the burden of overcoming this presumption by clear and convincing evidence. Advanced Display Sys., Inc. v. Kent State Univ., 212 F.3d 1272 (Fed. Cir. 2000). An analysis for anticipation under section 102 is a two-step inquiry. Power Mosfet Technologies, L.L.C. v. Siemens AG, 378 F.3d 1396, 1406 (Fed. Cir. 2004). The first step requires construing the claim, which is a question of law to be decided by the administrative

law judge. Oakley, Inc. v. Sunglass Hut Int'l, 316 F.3d 1331, 1339 (Fed. Cir. 2003); Markman v. Westview Instruments, Inc., 52 F.3d 967, 970-71 (Fed. Cir. 1995). The second step requires a comparison of the properly construed claims to the prior art, which is a question of fact. Power Mosfet, 378 F.3d at 1406; Oakley, 316 F.3d at 1339.

A patent claim is invalid for anticipation if a prior art reference discloses, either expressly or inherently, all of the limitations of a claim. EMI Group N. Am., Inc. v. Cypress Semiconductor Corp., 268 F.3d 1342, 1350 (Fed. Cir. 2001) (citation omitted). As to any inherent disclosure of a prior art reference, the Federal Circuit has stated:

> To serve as an anticipation when the reference is silent about the asserted inherent characteristic, such gap in the reference may be filled with recourse to extrinsic evidence. Such evidence must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill.

Metabolite Laboratories, Inc. v. Laboratory Corp. Of America Holdings, 370 F.3d 1354, 1367 (Fed. Cir. 2004).

Dürr respondents argued that claims 10-14 and 18-24 of the '913 patent are "anticipated" by German Patent No. DE2228598 (Geerk or Geerk patent) published on January 3, 1974 and Japanese Patent No. JP56-15686 to Kawai (Kawai or Kawai patent) published on February 10, 1981. (DBr at 77-82; RX-9 at 1; RX-10 at 1.) It was also argued that claims 10-14 and 18-24 are "anticipated" by each of Japanese Patent No. JP59-92053 to Sagata (Sagata or Sagata patent) published on May 28, 1984, and Japanese Patent Application No. JP59-160193 of Ageta (Ageta) published on October 26, 1984. (DBr at 87-88, citing RX-11 and RX-12.) Respondent Yaskawa argued that claim 10 of the '913 patent is invalid because it is anticipated by Geerk and Kawai. (YBr at 74-79.) Yaskawa also argued that claims 10, 12, 22-24 are anticipated by Sagata. (YBr

at 89-90.) The staff argued that the evidence shows that Geerk anticipates claims 10-12 and 18-24 and Kawai anticipates claim 10 of the '913 patent. The staff also argued that Sagata anticipates claims 10-12 and 18-24 and Ageta anticipates claims 10-12 and 18, 20, 22, and 24. (SBr at 52-55.)

A. Geerk

Dürr respondents argued that Geerk discloses an electrically driven robot for use in a hazardous environment. It is argued that the robot has multiple limbs that are rotatable with respect to one another; that for each joint, there are two mutually rotatable parts which combine to form a compartment (DBr at 74, citing RX-9 at 1); that the motors and gears are located within the capsules; that means are provided for sealing the inner-space of the capsule against outside gases or liquids (Id.); that the compartments of the robot limbs are fluidly connected (Id., citing RX-9 at 2-3); that it is possible to fill the inside chambers of the limbs that are connected in series via the hollow drive spindles, such as the shoulder-upper arm-forearm, with a gas or liquid (Id., citing RX-9 at 3); that Geerk teaches pressurizing the fluidly connected compartments of the robot limbs (Id., citing RX-9 at 2); that Geerk discloses regulating the internal pressure of the fluidly connected compartments (Id.); and that although Geerk states that the robot disclosed therein may be suitable for underwater use, the disclosure of Geerk is in no way limited to underwater use. (Id., citing RX-9 at 2.)

Respondent Yaskawa argued that Geerk describes an electrically driven, jointed, internally-compartmented, hollow robot for use in a hazardous environment. (YBr at 67, citing YFF946.) It is argued that each limb of the robot has an electric motor that resides inside a joint capsule that is connected to the limb compartment and has a sealed interface to drive the next

limb that is serially connected (Id., citing YFF947); that Geerk discloses that the robot arm is designed as a serial connection of limbs, whereby the internal compartments of each limb are fluidly connected to each other (Id., citing YFF948); that Geerk discloses that the insides of the limb compartments are pressurized using gas or liquid to avoid any entry of the outside environment into the sealed portions of the robot (Id., citing YFF949); that the drawings in Geerk demonstrate that the internal compartment of the limb, as well as the internals of the joint-capsule, cabling and hollow axle cable passage, are all in a common pressurized volume, which is also connected to the next limb's internal compartment (Id., citing YFF951); that two adjacent limbs are rotated relative to each other in fluid-tight fashion (Id., citing YFF952); and that there is a hollow spindle that serves as a conduit for electrical, hydraulic and pneumatic lines as well as for pressure compensation between the inner cavities of the limbs. (Id. at 67-68, citing YFF953.)

While Yaskawa asserted that the "asserted claims of the '913 patent are invalid because they are anticipated by Greek" (YBr at 74), its arguments for anticipation focus only on claim 10. (YBr at 74-79.) With regard to claim 10 of the '913 patent, Yaskawa argued that Geerk discloses a method of electrically driving a plurality of relatively movable, compartmented robot parts in a hazardous environment by a lightweight, non-explosion-proof electric motor in the compartment with at least one of the robot parts being driven; that Geerk discloses a jointed manipulator, in which each of the joints consists of two mutually rotatable parts that combine to form a cylindrical capsule, called a "joint capsule," and that the motors and gears are located in the joint capsules, which are fluid-tight to seal the inner space of the capsule against the outside in gas- and liquid-tight fashion; that Geerk discloses that the use of the fluid-tight joint capsules prevents the components housed in those capsules from being exposed to the destructive effect of external

factors; and that the joint capsules and limbs are completely sealed against the outside and are thus protected from any external influence. (YBr at 74-75, citing YFF1175-1180.) Yaskawa further argued that although it is not limited to underwater applications, Geerk discloses that the robot may be used underwater, which applicants told the USPTO was a hazardous environment according to the invention. (YBr at 75, citing YFF958 and YFF1222.)[15]

Yaskawa argued that the Geerk motors meet the proposed constructions of "non-explosion-proof electric motor" of the private parties. (YBr at 75.) It is argued that claim 10 recites a step of "providing that said compartment be substantially airtight when such compartmented robot parts are movable relative to each other" and Geerk discloses that "means are provided that serve to seal the inner space of the capsule against the outside in gas- and liquid-tight fashion" with the reference disclosing that a membrane element bridges the space between two modules to form a seal as the two modules are rotating relative to each other (YBr at 76, citing YFF1190); and that Geerk meets all the remaining limitations of claim 10. (YBr at 79.)

The staff argued that the evidence shows that each limitation of claims 10-12 and 18-24 is found in Geerk, including the fact that the Geerk robot was designed for use in hazardous environments. (SBr at 53, 54.)[16]

Complainant FANUC argued that Geerk's disclosed device is not designed for use in

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[15] Yaskawa fails to acknowledge that the Board of Appeals of the Patent Office rejected a Fields reference because "Fields, being an underwater weld-inspection device, also does not appear to be concerned with potential explosions in a hazardous environment." (FF 127, 132.)

[16] The staff attached claim charts applying Geerk to claims 10-12 and 18-24 as Appendix B.

hazardous environments as defined in the '913 patent (CRBr at 66); that the phrase "for use in a hazardous environment" is fundamental to complainant's invention and is an element of all asserted claims; that as complainant's Nof explained:

> { } talking about the underwater manipulator, and it is using non-explosion-proof electric motors, but it is designed for a completely different environment underwater, it is designed to protect the robot. The whole idea here of the patent is to prevent damage to the inner side, inner parts of the robot from a high pressure of water when it is in deep sea and prevent the corrosion for the inner part of the robot.
>
> So it is designed to protect the robot and has nothing to do with the protection of the environment. It doesn't anticipate also, because it is not designed for a class I, division 1 location, and as a matter of fact, this patent talks about motors, electric motors that are designed in the drawings.

(CRBr at 67, citing Nof, Tr. at 860); and that Geerk is concerned with "corrosion, strong water pressures," and "rapid wear and tear" of the motor and not concerned with explosions, flammable gases, or vapors. (CRBr at 67.)

Complainant further argued that Geerk fails to teach a pressure regulator (claims 11, 13, 14, 20, 21), a motor residing in a pressurized compartment (claims 10-14, 18-24), purging (claims 10, 13, 14, 24), a purging vent (claims 13, 14), a conduit for communicating substantially clean air or inert gas or other nonignitable gas to the first and second pressurized compartments (claims 18, 19, 20, 21), and a wrist adapted for connecting the opposite end of the arm assembly with a fluid delivery tool (claim 12). (CRBr at 67-68, citing Nof, Tr. at 866-868.)

The Geerk patent relates to an anthropomorphous manipulator that is composed of a torso, arms with hands, and legs and feet, or merely of two arms with hands and a pair of shoulders, or of only one shoulder with one arm and one hand, with joints that permit varying angulation of the individual limbs relative to one another and/or their rotation relative to one

another, as well as "motors" that drive the desired movements of these limbs. (RX-9 at 1.) The drawings in Geerk demonstrate that the internal compartment of the limb, as well as the internals of a joint-capsule, cabling and hollow axle cable passage, are all in a common pressurized volume, which is connected to the next limb's internal compartment. (RX-9.) The "invention further provides for the motor and the reducing gear that serves to step down the rapid rotation of the motor shaft to be accommodated inside the joint capsule." (RX-9 at 1.) Figure 3 of Geerk shows a human-like manipulator arm with joint capsules that are relatively moveable elements, and a gripper. There are motors located at each joint that are used to drive the manipulator links of Geerk. (RX-9 at 11.) The motors of Geerk are powered through electrical cables routed through the insides of the robot arm. (RX-9 at 3.)

Figure 1 of Geerk shows one example of the invention. Specifically, Figure 1 shows "a joint capsule (1) with a capsule endplate (2) on the motor side and a capsule endplate (3) on the gear-box side, a motor (4) and a gear system (5), a drive shaft (6) and drive spindle (7), as well as the limbs (8) and (9) and the seal (10)." (RX-9 at 4.)

Figure 2 of Geerk discloses another example of the invention showing a cross-section of one of the interconnected links that are hollow including a joint capsule, which is basically a motor and gearbox combination used to drive one link with respect to the other. (RX-9 at 10.) Specifically, Figure 2 of Geerk shows a "joint capsule (1) with an electric disk-armature motor consisting of a disk-type 'pancake' rotor (11), a permanent magnet (12) and the hollow motor shaft (13), the gear system (5) with the drive shaft (6), the hollow drive spindle (14) and the support flange (15), a seal (10) as well as an electric potentiometer (16) ... and the axis (26) with which the motor shaft, the gear drive shaft and spindle, the joint capsule and the potentiometer

are coaxially aligned." (RX-9 at 4-5.)

The example shown in Figure 2 is distinct from that of the example shown in Figure 1 in that Figure 2 specifically discloses an electric disk-armature motor with a hollow drive spindle (14) through which a cable harness (20) passes. The electric disk-armature motor includes at least a "disk-type 'pancake rotor (11)" and a permanent magnet (12).[17] The patent also teaches that the invention provides "the hollow drive spindle to serve as a conduit for electric, hydraulic and/or pneumatic lines and/or for establishing a pressure equilibrium between the cavities of the individual limbs." (RX-9 at 3.) Thus the embodiment which teaches "establishing a pressure equilibrium between the cavities of the individual limbs" is only the one shown in Figure 2, not Figure 1. Although Figure 1 discloses a seal (10), the administrative law judge finds that Figure 1 does not show a hollow drive spindle or any other structure for "establishing a pressure equilibrium between the cavities of the individual limbs" as shown in Figure 2. Furthermore, the administrative law judge finds that throughout the specification, the teaching about "establishing a pressure equilibrium between the cavities of the individual limbs" is always disclosed in the context of "the hollow drive spindle." For example, claim 2 discloses that "provisions are made for using the hollow drive spindle as a conduit for electrical, hydraulic and pneumatic lines or the like and/or for pressure compensation between the inner cavities of the individual limbs. Claim 3, which depends on claim 1 or 2, also discloses that hollow drive spindles "are filled with a gas or a liquid whose pressure can be regulated by an automatic control system in a way as to match the pressure of the surrounding liquid or to establish a correspondingly selectable pressure

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[17] Elements 11 and 12 of Figure 2 of Geerk show a magnet and rotor combination for a motor. (YFF967 (undisputed), citing Schempf, Tr. at 1492 and RX-9.)

differential." (RX-9 at 6-7.) Claim 1 discloses a sealing means and a gear drive spindle but does not disclose a hollow drive spindle nor any other structure for "establishing a pressure equilibrium between the cavities of the individual limbs." (RX-9 at 6.)

As shown in Figure 2, the administrative law judge finds that the motor housing and the joint capsule are a single structure and that the motor housing (i.e., joint capsule) is exposed to the external environment. Thus the administrative law judge finds that Geerk does not disclose an electrically driven motor residing in a pressurized compartment, which is a required element in claims 10-14 and 18-24 of the '913 patent. Significantly, he finds no teaching in Geerk to use conventional off-the-shelf electric motors. To the contrary, in Geerk's Fig. 2, an "electric disk-armature motor" is used. (RX-9 at 4.) Hence, the administrative law judge finds that Geerk does not anticipate claims 10-14 and 18-24 of the '913 patent.

Claims 10-14 in issue require a "hazardous environment "while claims 18-24 require an "explosive environment." The administrative law judge has determined that the claimed phrase "hazardous environment" of claims 10-14 means an explosive environment generated in spray painting and that a person of ordinary skill in the art would equate the claimed phrases "hazardous environment" and "explosive environment." The administrative law judge finds that Geerk is not concerned with said environments where there is a hazard of explosion generated by spray painting. Thus the sole recitation in Geerk of any use of the Geerk anthropomophous manipulator is as follows:

> This invention also relates to an anthropomorphous manipulator that is intended for underwater work as for instance in deep-sea deployment, where for relieving the stress on the material and especially the seals it is possible to fill the inside chambers of the limbs that are connected in series via the hollow drive spindles,

> such as the shoulder – upper arm – forearm, with a gas or liquid. An automatic system can regulate the gas or fluid pressure in a way as to match the pressure of the surrounding liquid or to create an adjustably differentiated counterpressure. It may be desirable for the internal pressure to always be slightly higher than the pressure of the surrounding liquid, so that in the event of a minor leak it is automatically replenished gas inside the limbs that seeps to the outside, rather than allowing the surrounding liquid to penetrate into the inside.

(RX-9 at 3 (emphasis added).) Hence, based on the administrative law judge's construction of the claimed phrases "hazardous environment" and "explosive environment," the administrative law judge finds that Geerk does not anticipate the asserted claims on yet another basis.

The administrative law judge further finds that Geerk does not disclose a pressure regulator which is a required element in each of the claims 13, 14, 20 and 21 nor a means for pressurizing which is a required element in claim 11. Even Yaskawa agreed that Geerk "does not 'explicitly' disclose a 'means for pressurizing.'" (YBr at 79, citing YFF1204.) Yaskawa's expert witness Schempf also agreed that Geerk does not disclose a pressure regulator. (Schempf, Tr. at 1500.) Hence the administrative law judge finds that Geerk does not anticipate claims 11, 13, 14, 20 and 21 of the '913 patent on yet a further basis.

Purging is a required element in each of the claims 10, 13, 14 and 24. Dürr respondents argued that it is inherent within Geerk that it is purged prior to pressurization. (DBr at 78, citing Schempf, Tr. at 1502.) The staff merely pointed to the pressurizing element in Geerk but not purging. (SBr, Appendix B at 1-2.) The administrative law judge finds that Geerk does not disclose purging which is a required element in each of the claims 10, 13, 14 and 24. Hence the administrative law judge finds that Geerk does not anticipate claims 10, 13, 14 and 24 of the '913 patent on still a further basis.

A purging vent is a required element in each of the claims 13 and 14. Dürr respondents merely argued that claim 13 requires a purging vent and that the 1982 NFPA 496 requires that the purging air leave the compartment that is being purged. (DBr at 80.) The staff argued that "[p]urging would be inherent with a system such as Geerk that uses gas to exclude other dangerous gases. (SBr, Appendix B at 9, citing Nof Tr. at 1087-89.)[18] The administrative law judge finds that Geerk does not disclose a purging vent which is a required element in each of the claims 13 and 14. Hence the administrative law judge finds that Geerk does not anticipate claims 13 and 14 of the '913 patent on another basis.

A conduit for communicating substantially clean air or inert gas or other nonignitable gas to the first and second pressurized compartments is a required element in each of the claims 18, 19, 20 and 21. Dürr respondents argued that if Geerk were modified by a person of ordinary skill in the art to be compliant with either NFPA 496 or Hoesl, some type of supply would be needed [for gas] and that Geerk has gas that is supplied to the conduit. (DBr at 80-81.) The staff argued that a hollow drive spindle is same as a conduit. (SBr, Appendix B at 13.) The administrative law judge has determined that "conduit" would be interpreted by a person of ordinary skill in the art as a tube or duct device for moving fluids or channeling wires. Specifically, the conduit as required in claim 18 is "for communicating substantially clean air or inert gas or other nonignitable gas to the first and second pressurized compartments." (Emphasis added.) While the hollow drive spindle (14) of Geerk may be described as a conduit, the hollow drive spindle of Geerk is located inside the individual compartments and thus is not connected to any of the compartments (joint cases 27, 28, 29, 30 and 31). In contrast, in the '913 patent, the conduit is

[18] The staff cited to Nof's testimony about Dugan, not Geerk.

for communicating air or gas to the first and second compartments.[19] Hence the administrative law judge finds that Geerk for yet another ground does not anticipate claims 18, 19, 20 and 21 of the '913 patent.

A wrist adapted for connecting the opposite end of the arm assembly with a fluid delivery tool is a required element in claim 12. The staff cited to the "anthropomorphous manipulator that is composed of torso, arms with hands, and legs with feet . . . with joints that permit varying angulation of the individual limbs relative to one another and/or their rotation relative to one another, as well as motors that drive the desired movements of these limbs." ((SBr, Appendix B at 6, citing RX-9 at 2.) Figure 3 clearly shows a forearm joint capsule (31) rotatable around the axis E-E. The administrative law judge finds that while this forearm joint capsule (31) is similar to a wrist, that forearm joint capsule (31) is structurally different from the wrist mechanism (24) of the '913 patent and furthermore is not "adapted for connecting the opposite end of the arm assembly with a fluid delivery tool" as recited in claim 12. (See CX-1 at Figure 1 and col. 4, lns. 26-30.) Hence, the administrative law judge finds that Geerk does not disclose a wrist adapted for connecting the opposite end of the arm assembly with a fluid delivery tool which is a required element in claim 12. Thus the administrative law judge finds that Geerk does not anticipate claim 12 of the '913 patent for yet an additional basis.

Based on the foregoing, the administrative law judge finds that respondents have failed to prove, by clear and convincing evidence, that the Geerk patent anticipates claims 10-14 and 18-

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[19] The '913 patent discloses that "the robot includes cables which are housed in a pressurized conduit attached to the outer surface of the base ... [t]he conduit is in fluid communication with first and second pressurized compartments. Consequently, the cables may comprise regular duty cables rather than heavy duty, explosion-proof cables." (CX-1, col. 3, lns. 23-30 (emphasis added).) See also pressurized conduit 30 of Fig. 1 of the '913 patent.

24 of the '913 patent.

B. Kawai

Dürr respondents argued that claims 10-14 and 18-24 of the '913 patent are anticipated by Kawai. (DBr at 77-82.) It was argued that Kawai (RX-10) describes an electric manipulator having multiple joints that contain actuators; that the joints are sealed to the outside at their rotary locations, and include internal passages that allow air to flow from the proximal (base) end of the robot, through all the joints and over motors and gearboxes, all the way to the distal end of the manipulator, where it is allowed to exhaust to the ambient environment; that Kawai discloses that the manipulator utilizes pressurized air to create a higher pressure inside the manipulator than outside to prevent dust particles from entering the manipulator; that applicants distinguished Kawai by calling it a ventilation type system (RX-96, at FANUC 012315); and that because it was a ventilation type system, the applicants argued that the hazardous environment might "siphon outside explosive atmosphere into the motor compartments...." (RX-96, at FANUC 012316) (DBr at 75.)

Respondent Yaskawa argued that Kawai describes an electric manipulator having multiple joints that contain "actuators" (YBr at 68, citing YFF999 (undisputed));[20] that the joints are sealed to the outside at their rotary locations and include internal passages that allow air to flow from the proximal (base) end of the robot, through all the joints and over motors and gearboxes, all the way to the distal end of the manipulator, where it is allowed to exhaust to the ambient environment (Id. at 68-69, citing YFF1000); and that Kawai discloses that the

[20] As respondent Yaskawa treated Geerk, while Yaskawa argued that the "asserted claims of the '913 patent are invalid because they are anticipated by ... Kawai" (YBr at 74), its arguments focus only on claim10. (YBr at 74-79.)

manipulator utilizes pressurized air to create a higher pressure inside the manipulator than outside to prevent dust particles from entering the manipulator. (Id. at 69, citing YFF1001.)

Yaskawa further argued that the "actuators" disclosed in Kawai meet the claim limitation "non-explosion-proof" electric motors (YBr at 75, 76, citing YFF1185); that with respect to the preamble of claim 10, Kawai discloses "joints 3, 4, 5 ... provided such that each can be rotated or bent, the inside of the which has a structure as shown in Fig. 2." (page 2, 3d para) and that Fig. 2 shows that joints 3, 4, 5 have such (actuators 10, 21, 31 (Id., citing YFF1194); that regarding the substantially airtight compartment and compartmented robot parts being movable relative to each other, Kawai discloses that "[e]ach of the joint portions of the joints 3, 4, 5 is provided with appropriate seals 41, 42, 43" (Id., citing YFF1195); that with respect to the gas source being outside the hazardous environment, it is evident that an air supply for a robot used in a nuclear hazardous environment must be outside the hazardous environment, particularly in view of the desirability to keep the nuclear dust out of the robot; and that with respect to the purging step of claim 10, Kawai has a disclosure of purging (Id., citing YFF198).

The staff argued that the evidence shows that each limitation of claim 10 is found in Kawai. (RX-10; SBr at 55, citing Appendix D, the claim chart applying Kawai to claim 10 of the '913 patent.)

Complainant FANUC argued that like Geerk, Kawai does not disclose a robot for use in a hazardous environment as defined in the '913 patent but instead is designed for a nuclear environment, where the overriding concern is an effort to cool the device's motors. (CRBr at 68 citing Nof, Tr. at 874.) Complainant further argued that Kawai's "open system" fails to disclose substantially or nearly airtight compartments (claims 10, 11), a pressure regulator for maintaining

the pressure between maximum and minimum predetermined limits (claims 11, 13, 14, 20, 21), a pressure regulator having a bypass (claim 13), a venting means for relieving excess pressure (claim 14) (CRBr at 68, citing Nof, Tr. at 873-74), and a wrist adapted for connecting the opposite end of the arm assembly with a fluid delivery tool (claim 12) (CRBr at 74, citing Nof, Tr. at 873-74) and Schempf, Tr. at 1520); and that in Kawai air flows continuously through the system and exits to the atmosphere. (CRBr at 68.)

Figure 1 of Kawai depicts a manipulator or robot arm having multiple joints capable of relative motion with multiple joints that are connected to each other. (RX-10.) Figure 1 also shows that several joints (3, 4 and 5) make up the arm (6) and said arm (6) is attached to the base (7). Figure 2 of Kawai depicts a cross-sectional view of the cooling structure, in a different configuration than that shown in Figure 1, and Figure 2 also depicts a cross-sectional view of the joint structure of the arm with cross-hatched or hatched areas that represent different elements. (RX-10.) Figures 1 and 2 also disclose air flow through the arm. Figure 1 shows air flowing through the connection duct (9) continuing through the base (7) and the arm (6), exiting at fingers (8). Figure 2 shows detailed airflow through the structures disclosed inside the arm 6. (RX-10.)

Kawai, as its title indicates, is concerned with a cooling structure of an arm in a manipulator (robot) (RX-10). The arm has multiple joints or links (RX-10) with the joints or links interconnected and relatively movable with respect to each other. Kawai further discloses a "cooling wind blown from the connection duct 9 that passes through the cooling passenges and the spaces" of the manipulator "to directly cool the actuators 10, 21, 28." (RX-10 at 3.) The interior of the manipulator or robot disclosed in Kawai contains actuators 10, 21 and 28. (RX-10.) Significantly, Kawai does not describe actuators 10, 21 and 28 as state of the art, off-the-

shelf electric motors.

Claims 10-14 in issue require a "hazardous environment," while claims 18-24 require an "explosive environment." The administrative law judge has determined that the claimed phrases in issue means an explosive environment generated in spray painting. The Kawai utility model application is silent about the use of the cooling structure of an arm in a manipulator (robot) with the exception of the following:

> In particular, when the manipulator 1 is used in the nuclear field, the inside of the manipulator 1 has a higher pressure than the outside because of the wind pressure made by the cooling wind, so as to prevent the dust particles from entering inside, and therefore, it is easy to wash it at the time of disassembling and maintenance of the manipulator 1.

(RX-10 at 3 (emphasis added).) The administrative law judge finds that Kawai is not concerned with the environment of the asserted claims where there is a hazard of explosion generated by spray painting. Hence, the administrative law judge finds that Kawai does not anticipate the asserted claims of the '913 patent on yet another basis.

Claim 10 requires a method of providing substantially airtight compartments when the compartmented robot parts are movable relative to each other. (CX-1, col. 8, lns. 27-34 (emphasis added).) Similarly, claim 11 requires "relatively movable robot parts forming nearly airtight compartments in fluid communication with each other." (CX-1, col. 8, lns. 51-53 (emphasis added).) The administrative law judge has found that Figure 1 shows air flowing through the connection duct (9) continuing through the base (7) and the arm (6), exiting at fingers (8). Both respondent Yaskawa and Dürr respondents also agreed that air flows "from the proximal (base) end of the robot, through all the joints and over motors and gearboxes, all the

way to the distal end of the manipulator, where it is allowed to exhaust to the ambient environment." (Id. at 68-69, citing YFF1000; DBr at 75.) Moreover, Yaskawa's expert witness Schempf testified that the "air entering the robot arm only exit the robot at the bottom, at the wrist." (Schempf, Tr. at 1518.) It is also undisputed that Kawai discloses a hollow robot in which air is blown continuously through the robot (YFF1223 (undisputed), citing RX-10). Hence, the administrative law judge finds that the air entering the robot arm of Kawai exits at the fingers and thus that said robot arm is not sealed but continuously vented at the fingers. Since Kawai is continuously vented, the administrative law judge further finds that Kawai does not disclose substantially airtight or nearly airtight compartments as required by claims 10 and 11, respectively. Therefore the administrative law judge finds that Kawai does not anticipate claims 10 and 11 of the '913 patent on an additional basis.

The administrative law judge further finds that Kawai does not disclose a pressure regulator which is a required element in each of the claims 13, 14, 20 and 21 nor a means for pressurizing which is a required element in claim 11. Even Yaskawa agreed that Kawai "does not explicitly disclose a 'means for pressurizing'" (YBr at 80, citing YFF1210.) The administrative law judge also finds that Kawai does not disclose a pressure regulator having a bypass, which is a required element in claim 13. Hence, the administrative law judge finds that Kawai does not anticipate claims 11, 13, 14, 20 and 21 of the '913 patent on still a further basis.

A venting means is a required element in claim 14. Yaskawa's expert Schempf testified that the "air entering the robot arm only exit the robot at the bottom, at the wrist." (Schempf, Tr. at 1518.) The administrative law judge has found that the air entering the robot arm (6) of Kawai exits at the fingers (8). The administrative law judge further has found that Kawai discloses a

hollow robot, or manipulator in which air is blown continuously through. Hence, the administrative law judge found that the robot arm is continuously vented at the fingers. Since Kawai is continuously vented but the purging vents of claim 13 of the '913 patent (illustrated in the specification as 53, 63 and 83) do not have to vent continuously, the administrative law judge finds that Kawai does not disclose a purging vent as required by each of the claims 13 and 14 nor a venting means "for relieving excess pressure above the maximum predetermined limit in the compartments" as required by claim 14. Thus the administrative law judge finds that Kawai does not anticipate claims 13 and 14 of the '913 patent on yet another basis.

A wrist adapted for connecting the opposite end of the arm assembly with a fluid delivery tool is a required element in claim 12. Dürr respondents merely argued that "a wrist and fluid delivery tool would be obvious" if Kawai was used in a paint booth environment (DBr at 80).[21] Figure 1 of Kawai shows a fingers (8) element. However, the administrative law judge finds this fingers (8) element structurally different from the wrist mechanism (24) of the '913 patent and furthermore said fingers element is not adapted for connecting the opposite end of the arm assembly with a fluid delivery tool. See CX-1 at Figure 1 and col. 4, lns 26-30. Hence, the administrative law judge finds that Kawai does not disclose a wrist adapted for connecting the opposite end of the arm assembly with a fluid delivery tool which is a required element in claim 12. Additionally, claim 12 requires preventing flammable gases or vapors from entering the first and the second compartments when the compartments are in fluid communication with each other. The administrative law judge finds that Kawai does not disclose this element. Even

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[21] Although Dürr respondents stated that claim 11 includes a wrist with a fluid delivery tool (DBr at 80), the administrative law judge assumes that their reference to claim 11 was in error since claim 12 discloses a wrist but claim 11 does not. (CX-1, col. 8 ln. 49 - col. 9 ln. 24.)

respondent Yaskawa conceded that Kawai "does not expressly disclose keeping flammable vapors out of the robot." (YBr at 82, citing YFF1227.) Thus, the administrative law judge finds that Kawai does not anticipate claim 12 of the '913 patent on yet a further basis.

Based on the foregoing, the administrative law judge finds that respondents have failed to establish, by clear and convincing evidence, that the Kawai patent anticipates claims 10-14 and 18-24 of the '913 patent.

C. Sagata

A critical issue, relating to Sagata, is whether Sagata is or is not prior art in view of the Akeel Rule 131 declarations filed during the prosecution of the '913 patent[22] and the record in this investigation.[23] Respondent Yaskawa argued that the declarations and the materials submitted therewith do not meet the standards for establishing an earlier date of invention; and that accordingly, the earliest effective filing date to which complainant is entitled for the '913 patent is January 22, 1985, the filing date of the first application in the chain leading to the '913 patent. (YBr at 69-70.)

Dürr respondents argued that Sagata (RX-11) was published on May 28, 1984, and thus qualifies as prior art under 35 U.S.C. §102(a), because complainant is not entitled to the alleged earlier conception date in the Akeel 131 declarations. (DBr at 75.)

The staff argued that the Sagata reference (RX-11) is one of the prior art references that complainant attempted to swear behind in claiming a conception date before the date of the

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[22] The Examiner in the prosecution of the '913 patent found that Sagata was not prior art in view of said declarations. (FF 120.)

[23] At the hearing, inventors Hadi Akeel and Tony Malarz as well as non-inventor William Poynter testified regarding the invention date for the asserted claims.

patent application; and that because the evidence shows that complainant is not entitled to a conception date earlier than the application date, Sagata is a proper prior art reference. (SBr at 52.)

Complainant argued that not a single witness at the hearing mentioned the Sagata reference (CBr at 66); that Sagata is not prior art; that the evidence in the record, including the testimony of the inventors (Akeel and Malarz) and a non-inventor (Poynter), as well as the documents admitted into evidence, show that the '913 patent's inventors conceived of the invention before Sagata's May 28, 1984 publication date. (CRBr at 68.)

The Akeel 2-6-95 declaration was accompanied by Exhibits 1-18 and Exhibits 30-104. (RX-130, paragraphs 7-16 at pages FANUC 003728-003731.) Referring to the exhibits accompanying the Akeel 2-6-95 declaration, Exhibit 1 is a 1983 catalog of information describing FANUC LTD's AC servo motors. (Akeel, Tr. at 77-79.)[24] Akeel testified that Exhibit 1 "is the catalog of information describing the characteristics of the FANUC AC servo motors, the whole series of all sizes." (Akeel, Tr. at 78.)

Exhibit 2 is a two-page February 22, 1984 memorandum from Akeel to FANUC LTD's Mr. Torii with five pages of attachments. (CX-67; Akeel, Tr. at 81.)[25] In this memorandum, Akeel wrote to Torii, stating, in part: "We studied explosion protection requirements . . . and think the explosion proof box is not necessary. It is possible to use light structure enclosure with

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[24] Respondents take issue with the authenticity of the dates on the exhibits accompanying the Akeel 2-6-95 declaration because the dates were redacted in the actual exhibits submitted to the Patent Office. The administrative law judge finds no evidence to suggest that the dates on the unredacted original documents are not authentic.

[25] Exhibit CX-67 is an unredacted version of Exhibit 2 accompanying the Akeel 2-6-95 declaration.

air pressure (0.1 inch water for US, 6mm for Japan.) The design requirements are simple and certification will be much easier." (CX-66, Exhibit 2, FANUC 28991 (emphasis added).) Additionally, handwritten notes on the fifth page of Exhibit 2 states in part, "explosion protected chamber contains standard motors," "3-6 mm air press[ure]," that "[c]lean air is always available with painting"; and that "[c]hamber can be tight with no flow. Requires purging 12 volumes of air out of chamber . . . " (CX-66, Exhibit 2, FANUC 28995; Akeel, Tr. at 86-7 (emphasis added).) Akeel testified that said handwritten note referring to "Explosion protected chamber - contains standard motors 3-6 mm air pressure" means that the "enclosure is pressurized for explosion protection" and that the pressure meets the applicable U.S. and Japanese requirements. (Akeel, Tr. at 85-6.) Akeel further testified that the drawing on page 5 of Exhibit 2 shows motors in two pressurized housings or compartments (Akeel, Tr. at 90; CX-66, Exhibit 2, FANUC 28995); that the drawings on pages 5 and 6 of Exhibit 2 show that the inventors had conceived of a robot component "using all regular motors that are not explosion proof" (Akeel, Tr. at 88-9; CX-66, Exhibit 2, FANUC 28995-6 (emphasis added)); and that the drawing on page 7 of Exhibit 2 shows the drive arrangement for a regular motor, and the compartment that it is enclosed in. (Akeel, Tr. at 90-1; CX-66, Exhibit 2, FANUC 28997.) Moreover, inventor Malarz testified that during February 1984 he worked 236 hours on the electric paint robot project. (Malarz, Tr. at 297.)

Exhibit 3 is a two-page February 27, 1984 memorandum from Akeel to Torii with thirteen pages of attachments. (CX-68; Akeel, Tr. at 91.)[26] Akeel testified that Exhibit 3 "is a

[26] Exhibit CX-68 is an unredacted version of Exhibit 3 accompanying the Akeel 2-6-95 declaration.

memo . . . describing the S-2 robot development.." (Akeel, Tr. at 91.) Akeel wrote to Torii that "the use of regular motors in a slightly pressurized enclosure . . . . is a low expense solution, is it acceptable in Japan?" (CX-66, Exhibit 3, FANUC 28999 (emphasis added).) Akeel testified that he made this comment to Torii as part of an effort to convince FANUC LTD to accept the concept of using regular motors in a slightly pressurized enclosure. (Akeel, Tr. at 92.)

Exhibit 4 is comprised of a single page of notes handwritten by Akeel on March 6, 1984 in preparation for a meeting with Factory Mutual consultant Mr. Martell, and six pages of notes handwritten during the consultation. (CX-69; Akeel, Tr. at 92-4.)[27] Akeel testified that his outline of topics to be discussed at this meeting with Factory Mutual included "[r]eview [of] motor compartment layout[,]" specifically "[b]ox strength, sealing of covers as long as it maintains pressure, pressurizing, interlocks, pneumatic valve, normally closed, signal to relay that cuts power, overcurrent protection, limit switches, [and] intrinsic safety" (Akeel, Tr. at 96); that a goal of the meeting was to discuss whether to "[p]ressurize all of the base [i]ncluding cable compartments" or whether "the cable compartments [should] be not pressurized" (Akeel, Tr. at 96-7); that another goal of the meeting was to discuss whether the "[m]otor shaft seals [have] any special requirement" (Id.); that Akeel's outline of topics to be discussed at the meeting included the location, testing, and physical characteristics of cables (Akeel, Tr. at 97); and that at the time of said meeting, he "[a]bsolutely" had the idea of having regular motors in different compartments of the robot. (Akeel, Tr. at 102.) Said notes written by Akeel in preparation for this meeting refer to an "outside pressure compartment" and an "inside pressure compartment,"

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[27] Exhibit CX-69 is an unredacted version of Exhibit 4 accompanying the Akeel 2-6-95 declaration.

(CX-66, Exhibit 4, FANUC 29013) and said notes further discuss the need to cut power in case of air failure or low pressure inside the compartment: "Pneumatic valve, normally closed signal is relay that cut power." (CX-66, Exhibit 4, FANUC 29013.) Furthermore, a diagram drawn by Akeel during this meeting shows a conduit, leading from outside of the hazardous environment and connecting to the base of the robot. (CX-66, Exhibit 4, FANUC 29018.) Notes written by Akeel during this meeting discuss purging and requirements associated with purging, stating that "purging must be automatic by timer," and said notes further describe a "[s]olenoid for vent during purge" and the use of relief valves for overpressure. (CX-66, Exhibit 4, FANUC 29014.)

Exhibit 5, accompanying the Akeel 2-6-95 declaration, is a four-page March 13, 1984 memorandum from Akeel to Torii with seven pages of attachments. (CX-70; Akeel, Tr. at 108.)[28] Akeel's memorandum to Torii states, in part, "Explosion proof. I have attached some information on pressurized enclosures for your information. I shall bring with me more detail when I come to Japan." (CX-66, Exhibit 5, FANUC 29021; Akeel, Tr. at 109.) Inventor Malarz traveled with Akeel to Japan on March 19, 1984, arriving in Japan on March 20, 1984. (Malarz, Tr. at 283-4.) Malarz testified that on the Saturday before leaving for Japan (March 17, 1984), that he worked a 14-hour day, from 6:00 a.m. to 9:00 p.m., finalizing the last drawing of the electric paint robot (Malarz, Tr. at 284); that by the end of March 17, 1984, all layouts for the electric paint robot were complete, except for small items such as screws, dowels, etc (Malarz, Tr. at 284-5); that as of March 19, 1984, the electric paint robot that Akeel and Malarz developed had six motors, all positioned inside the robot — three in the base and three in the upper arm

[28] Exhibit CX-70 is an unredacted version of Exhibit 5 accompanying the Akeel 2-6-95 declaration.

(Malarz, Tr. at 285, 294-5); and that the electric paint robot that Akeel and Malarz developed included multiple pressurized compartments before Akeel and Malarz left for Japan on March 19, 1984. (Malarz, Tr. at 295-6.)

Exhibit 6 is a two-page March 23, 1984 memorandum from Akeel to Mr. Bartlett, Mr. Day, and Mr. Patel with four pages of attachments. (Akeel, Tr. at 113; CPX-12.) Exhibit 6 includes attached drawings showing relatively movable robot parts forming compartments in communication with each other and that the robot has at least four components, specifically a base, an inner arm, an outer arm, and a wrist. (CX-66, Exhibit 6, FANUC 29033-34.) Additionally, Exhibit 16 is a one-page May 14, 1984 memorandum from Akeel to Torii which discusses aluminum tubing for the wrist drive train. (CX-71; CX-66, Exhibit 16, FANUC 29072.) Malarz testified that the motors operated the various parts of the robot, such as the waist, shoulder, elbow, and wrist (Malarz, Tr. at 289); that as of March 19, 1984, the electric paint robot that Akeel and Malarz developed had multiple compartments, including the base (waist) and the arm (Malarz, Tr. at 289); that as of March 19, 1984, the compartments in the electric paint robot that Akeel and Malarz developed moved relative to each other (Malarz, Tr. at 289-90); that as of March 19, 1984, the components of the electric paint robot that Akeel and Malarz developed included a base, an inner arm, an outer arm, and a wrist (Malarz, Tr. at 293-5); and that as of March 19, 1984, there were gears and a pressure regulator inside the electric paint robot that Akeel and Malarz developed. (Malarz, Tr. at 295.)

Exhibit 8 is a twelve page March 26, 1984 summary of a meeting between Akeel and GMF's Malarz and FANUC LTD's Torii, Mr. Nakashima, and Mr. Toyoda. (CX-523C; Akeel, Tr. at 122.) Page 3 of the March 26, 1984 meeting summary describes, in part, "the

specifications of the robot . . . that it will have anti-explosion means with the input signals being intrinsically safe construction according to the Japan standard number (i2G4), and that the motor drive is explosion proof construction according to Japanese (f2G4), which is the pressurized and purged method, and that it has intrinsically safe operator pendant." (Akeel, Tr. at 123; CX-66, Exhibit 8, FANUC 29054.) Page 9 of this meeting summary describes, in part, the hazardous environment of the paint booth and the standard of explosion-proof certification for the robot and for the drive system and refers to the desired level of pressurization within the robot compartments. (CX-66, Exhibit 8, FANUC 29060.) Specifications for the S-Model 2 prototype include AC servo motors as the "Driving Method." (CX-66, Exhibit 8, FANUC 29055.) Specifications for the S-Model 2 prototype include the heading "3. Explosion Proof" under which is the statement "Motor Power/Feedback Signals . . . Pressurization: Pressure Difference More Than 5mm H2) (Water)." (CX-66, Exhibit 8, FANUC 29060.) Malarz testified that his visit to Japan lasted four weeks, until April 14, 1984 (Malarz, Tr. at 296-8); that while in Japan in March and April 1984, Malarz worked on gear drive design for the electric paint robot that he and Akeel developed (Malarz, Tr. at 296); that during March 1984, Malarz worked 259 hours on the electric paint robot project (Malarz, Tr. at 297); and that during April 1984, Malarz worked 208 hours on the electric paint robot project. (Malarz, Tr. at 298.)

Exhibit 9 is a one-page drawing dated March 15, 1984. (Akeel, Tr. at 127-9.) Exhibit 9 shows part of the GMF P-150 robot and the location of part no. 1015/1 as a "FACE SEAL/FLUOROCARBON OMNISEAL," which provides a seal for maintaining pressurization of the gas in two airtight chambers. (CX-66, Exhibit 9; RX-137, FANUC 003904.)

Exhibit 17 is a two-page set of drawings dated May 18, 1984. (CX-71; Akeel, Tr. at 135-

6; CPX-12.) These drawings show the drive systems including motors located in the base and arm assembly. (CX-66, Exhibit 17, FANUC 29073-74.) The drawing on page 1 of Exhibit 17 (FANUC 29073) shows a top plan view of two compartments with cable routing between them, the arm assembly connected to the base, said arm being movable relative to the base, and the arm assembly supported for movement on the base, the base and arm assembly forming compartments including electric motors and cables. The drawing on page 2 of Exhibit 17 (FANUC 29074) shows a side elevational view of two compartments with cable routing between them, arm assembly connected to the base, said arm being movable relative to the base, and the arm assembly supported for movement on the base, the base and arm assembly forming compartments including electric motors and cables.

Exhibit 18 is a one-page May 18, 1984 memorandum from Akeel to FANUC LTD's Torii and Mr. Terada with two pages of attachments. (Akeel, Tr. at 145-6.) Said two pages of attachments are copies of the two-page set of drawings of Exhibit 17 with handwritten notes by Akeel. (Akeel, Tr. at 146.) The drawing on the second page of Exhibit 18 includes a note handwritten by Akeel indicating that the robot compartment is "pressurized." (CX-66, Exhibit 18, FANUC 29076; Akeel, Tr. at 146.) Akeel testified that his handwriting on page 2 of Exhibit 18 noting "pressurized" indicated that "the compartment that includes the electrical . . . connectors for the cables" is pressurized. (Akeel, Tr. at 146.) Malarz testified that earlier on in the project, Akeel and he had contemplated putting all the motors in the base, but they concluded that doing so would be too expensive and impractical (Malarz, Tr. at 285); and that during May 1984, Malarz worked 242 hours on the electric paint robot project. (Malarz, Tr. at 298.)

In addition to the foregoing, Exhibits 30-104 (RX-130, FANUC 03786-04185)

demonstrate that prior to May 28, 1984, Akeel coupled his conception of the invention with due diligence by himself and others at his direction to the filing date of the original application on January 22, 1985. Exhibits 30-104 include detailed design drawings, interoffice memoranda regarding project schedule, project progress and status, bills of materials, etc., and project labor timesheets, and other documents. For example, Exhibit 103 is a project labor timesheet tracking the employee labor manhours spent on the electric painter project from January 1, 1984 to December 31, 2004. (RX-130, FANUC 04175-04182.) Also at the hearing, Akeel testified as to the on-going work:

Q. I'd like to now look at a couple of documents in this same time frame. Dr. Akeel, if you look in the binders that you have, if you look at 527C, do you see that, Dr. Akeel?

A. Yes.

Q. Do you recognize this?

A. Yes, I do.

Q. What is this?

A. This is a very rough draft of a schedule that I developed, it's my handwriting, to kind of estimate the different tasks of the project and the duration of it aiming at having prototype sometime in mid-July.

Q. Now, I'd like to just have you explain a little bit as to how this is set up. Across the top here, I'm going to highlight this. There are some numbers. What do those numbers represent?

A. These are dates, months, starting from February 1984 and ending up, the last one is January1985.

Q. So the first column that's got a two in, what year is that?

A. 1984.

Q. And the plan that you had was to actually have a robot working when for a prototype demonstration?

A. A prototype demonstration, as you can see here, by approximately mid-July, and we would have two of them.

Q. Now, mid-July of 1984?

A. Of 1984.

Q. Did you make that deadline?

A. No, we actually slipped to the end of -- we made it a Christmas gift to the company, and we gave them prototype in mid-December '84.

Q. Dr. Akeel, I'd now like you to turn to Exhibit 516.

A. 516?

Q. 516.

A. 516.

Q. And I put that up on the screen, and you should have it in front of you, in addition to having it in your binder, 516, sir.

A. Oh, yes.

Q. Can you tell us what Exhibit 516 is?

A. It is like a note, a memo about the status of the electric painter development, dated January --

I mean, February 15, '84, and it's a memo that I copied to Mr. Inaba, who was the executive vice president.

Q. Now, on the second page, I note that there is a schedule. It looks a little bit like the one we just had up on the screen that was Exhibit 527.

A. Yes.

Q. Was that your schedule?

A. Yes.

(Akeel, Tr. at 58-60.)

There is also the hearing testimony of non-inventor Poynter. Poynter testified that he worked as a machine tool designer for 23 years and a robotics designer for 20 years; that he joined FANUC's predecessor company, GMF, on Monday, March 12, 1984; that he worked with FANUC until his retirement in 2004; and that his work on the electric paint robot project began with laying out gear boxes and speaking with Akeel and Malarz. (Poynter, Tr. at 2066-70.) Poynter further testified that his understanding of the electric paint robot project was that the robot would be used in a dangerous area, in particular paint booths that had fumes and were explosive (Poynter, Tr. at 2074-75); that he understood that the structural components of the electric paint robot that GMF developed had a base, a turret (or upper base), an inner arm, an outer arm, and a wrist assembly, and was a six-axis robot (Poynter, Tr. at 2076-77); that the week of March 12, 1984 was a very busy week for GMF and its electric painter project, as the project team was getting ready for Akeel and Malarz to travel to Japan to meet with FANUC LTD (Poynter, Tr. at 2070-71); and that he learned, by mid-April 1984, after Malarz returned from Japan, that the robot was going to be purged with multiple volumes of air. (Poynter, Tr. at 2081-82.)

Poynter further testified that he understood, by the end of his first week with GMF (or by March 17, 1984), that the electric paint robot that GMF developed was a type that "was never, never been made before" and that the electrical and mechanical parts were going to be positioned inside the robot, in its own atmosphere (Poynter, Tr. at 2078-79); that he understood, by the end

of his first week with GMF, that the robot's electric motors were positioned inside the robot, in the upper base and inner arm (Poynter, Tr. at 2079); that he understood, by a week to ten days after the end of his first week with GMF, that the motors would be protected by pressurizing the atmosphere around the motors, inside the robot (Poynter, Tr. at 2079-80); that he understood, by the end of March 1984, that the robot would be a pressurized robot with three motors inside the base and three motors inside the inner arm (Poynter, Tr. at 2080-81); and that he understood, by the end of April 1984, that the robot's components were connected to each other through gear boxes and joints with air communicating through the joints. (Poynter, Tr. at 2082-83.)

Yaskawa rejected the testimony of Poynter as not credible. It argued:

> According to GMF Fanuc's detailed Project Labor tabulation of employees, project, hours worked, and pay date for 1984 (found in Akeel's Rule 131 Declaration, at Exhibit 103), while the hours worked and pay dates show up for several other employees, including Dr. Akeel and Mr. Malarz, going back to February 1984, the very first entry for hours worked and pay date for Mr. Poynter does not show up until November of 1984.[29] While Mr. Poynter testified at the hearing that he started at GMF Fanuc on March 12, 1984 and worked on the painting robot project within two weeks (Poynter, Tr. 2079(18)-2080(9)), Fanuc's records show that Mr. Poynter did not appear on any time records for the paint robot project until six months later...

(YRCFF2394 (emphasis added).) The administrative law judge rejects Yaskawa's argument. To the contrary he found the testimony of Poynter that he worked on the robot project prior to May 28, 1984 credible. Moreover Poynter's live testimony is corroborated by the fact that his name is found on certain drawings. (See Exhibits 7 and 12; CX-66 at FANUC 29037; Poynter, Tr. at 2087; CX-66 at FANUC 029067-68; Poynter, Tr. at 2096, 2098; CPX-12 at Exhibits 12, 14, 15,

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[29] Actually, the very first entry for hours worked and pay date for Poynter does not appear until October of 1984. (RX130, Exhibit 103, FANUC 004179.)

and 17 (second page), all of which show Poynter's name as the person who prepared the drawing.) The administrative law judge does not find Poynter's credible testimony and the underlying exhibits to be undermined by an apparent bookkeeping error.

Based on the declarations, including accompanying exhibits, submitted to the Patent Office and the additional evidence, including oral testimony adduced at the hearing, the administrative law judge finds that complainant has established that the inventors of the '913 patent conceived the inventions of the asserted claims before May 28, 1984, which finding is consistent with the Examiner's finding in the prosecution of the '913 patent.

D. Ageta

As with Sagata, if the Akeel Rule 131 declarations filed during the prosecution of the '913 patent and the record in this investigation established the conception date for the asserted claims prior to May 28, 1984, then Ageta is not prior art. The administrative law judge has found that the inventors of the '913 patent conceived the inventions in issue prior to May 28, 1984 and hence Ageta is not prior art. Thus he rejects the arguments of Dürr respondents that Ageta anticipates asserted claims 10-14 and 18-24 of the '913 patent. (DBr at 77 and 88.) For the same reason he rejects the staff's argument that Ageta anticipates at least asserted claims 10-12, 18, 20, 22 and 24. (SBr at 54.)

2. Obviousness

Dürr respondents argued that claims 10-14 and 18-24 of the '913 patent are rendered obvious by Geerk or Kawai. (DBr at 77-82.) Likewise, respondent Yaskawa argued that claims 10-14 and 18-24 of the '913 patent are rendered obvious by Geerk, Kawai or Sagata. (YBr at 79-90.) Dürr also argued that claims 10-14 and 18-24 of the '913 patent are obvious in view of

Sagata or Ageta either alone or in combination with the Code (NFPA 496-1982). (DBr at 82-89; DRBr at 22.)

The staff argued that the evidence shows that "Sagata in combination with the prior art NFPA 496 code section" would render all the claims invalid under § 103 (SBr at 52-53) (emphasis added); that Geerk "in combination with the prior art Code, Sugimoto, Inaba, Sagata or Ageta" render all the claims invalid under § 103 (SBr at 53) (emphasis added); that Ageta "in combination with the prior art code or Sagata" would render all of the claims invalid under § 103 (SBr at 55) (emphasis added) and that Kawai "in combination with the prior art code or Sagata" would render all of the claims invalid under §103.[30] (SBr at 55 (emphasis added).)

Under 35 U.S.C. § 103, a patent is valid unless "the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains." The ultimate question of obviousness is a question of law, but "it is well understood that there are factual issues underlying the ultimate obviousness decision." Richardson-Vicks Inc. v. The Upjohn Co., 122 F.3d 1476, 1479 (Fed. Cir. 1997); Lockwood v. American Airlines, Inc., 107 F.3d 1565, 1570 (Fed. Cir. 1997). To establish obviousness, the patent challenger must demonstrate, by clear and convincing evidence, that "there is a reason, suggestion, or motivation in the prior art that would lead one of ordinary skill in the art to combine the references, and that would also suggest a reasonable likelihood of success." Ruiz v. A.B. Chance Co., 234 F.3d 654, 664-65 (Fed. Cir. 2000) (Ruiz). The Federal

[30] The staff's position on obviousness is confusing since in one instance it refers to "NFPA 496" and in another instance merely refers to "prior art Code" and in yet a third instance refers to "prior art code."

Circuit has rejected "broad conclusory statements regarding the teaching of multiple references" so as to guard against "the subtle but powerful attraction of a hindsight-based obviousness analysis." In re Dembiczak, 175 F.3d 994, 999 (Fed. Cir. 1999).

After construing the claims, the next "step in an obviousness inquiry is to determine whether the claimed invention would have been obvious as a legal matter, based on underlying factual inquiries including: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) secondary considerations of nonobviousness, also known as 'objective indicia of nonobviousness." Ruiz, 234 F.3d at 660; Graham v. John Deere Co., 383 U.S. 1, 17 (1966). Secondary considerations, also part of the Graham factors, include commercial success, long-felt but unresolved need, failure of others, copying, and unexpected results. Id.

With respect to the scope and content of the prior art, as the Federal Circuit stated in State Contracting & Engineering Corp. v. Condotte America, Inc., 346 F.3d 1057 (Fed. Cir. 2003), citing In re Clay, 966 F.2d 656, 658 (Fed. Cir.1992): "A prerequisite to making a finding on the scope and content of the prior art is to determine what prior art references are pertinent." References within the statutory terms of 35 U.S.C. § 102 (anticipation) can qualify as prior art for an obviousness determination only when analogous to the claimed invention. In re Clay, 966 F.2d 656, 658 (Fed. Cir. 1992). The Federal Circuit restated the test for determining the scope and content of the prior art to be considered for obviousness purposes in In re Bigio as follows:

> Two separate tests define the scope of analogous prior art: (1) whether the art is from the same field of endeavor, regardless of the problem addressed and, (2) if the reference is not within the field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved. In re Deminski, 796 F.2d 436, 442 (Fed. Cir.1986); see also

In re Wood, 599 F.2d 1032, 1036 (CCPA 1979).

In re Bigio, 381 F.3d 1320, 1325 (emphasis added); accord State Contracting, 346 F.3d at 1069. One of ordinary skill in the art would have known of such art because such a person is a hypothetical person who is presumed to be aware of all the pertinent prior art. Custom Accessories, Inc. v. Jeffrey-Allan Industries, Inc., 807 F.2d 955, 962 (Fed. Cir. 1992).

At the outset Sagata and Ageta are not prior art. See supra. As for Geerk or Kawai for the reasons set forth supra in rejecting the arguments of respondents and/or the staff that the asserted claims are anticipated by Geerk or Kawai, the administrative law judge rejects the arguments of respondents that the claimed subject matter is rendered obvious under 35 U.S.C. §103 in view of merely Geerk or Kawai. He further rejects the arguments of respondents and the staff that any of the suggested combinations would render the asserted claims obvious under 35 U.S.C. § 103.

Neither respondents nor the staff has pointed to specific provisions of NFPA 496-1982 or of a "code" or "Code" nor to any disclosure in Sugimoto or Inaba that would cure the deficiencies the administrative law judge has found in Geerk and Kawai. Referring to Sugimoto (RX-13), the robot arm of Sugimoto is not disclosed as being adapted for exposure to an explosive or hazardous atmosphere. Also, Sugimoto's robot arm is not disclosed as being provided with airtight chambers having fluid communication therebetween, or non-explosion-proof electric motors and/or cabling, or gas supply means connected to chambers for supplying gas thereto at a pressure above atmospheric or ambient. In addition, Sugimoto is not directed to a method of driving compartmented robot arm parts by non-explosion-proof motors housed in airtight compartments by supplying clean air or inert gas to the compartments at a pressure above ambient, or to a method of operating a robot in an explosive environment by providing clean air,

an inert gas, or other non-ignitable gas at a pressure higher than the explosive environment to first and second compartments each having a non-explosion-proof motor.

Referring to Inaba (RX-19), the industrial robot of Inaba has each of its electric motors 52, 66, and 68 located within a base 40 as opposed to the electric robot recited in the asserted claims wherein the first drive mechanism can be located within the pressurized base and the second drive mechanism can be located within the pressurized arm assembly with cables of the cable bundle operating these drive mechanisms.

As for reliance on a code in combination with Geerk or Kawai, reference in the '913 patent is made to "Article 500 of NFPA 70, National Electrical Code." (CX-1, col. 2, lns. 25-27, col. 4, lns. 44-45.) However the administrative law judge finds that said reference merely governs how artisans in the past have addressed certain code requirements governing the use of electrical equipment in hazardous environments and as the Patent Office Board of Appeals found is not sufficient suggestion for the extensive modifications required in the primary references.[31] In summary, given the disparate nature of the secondary reference teachings coupled with the deficiencies of the primary references, the suggestion to combine them in the particular manner necessary to meet the limitations of the claims in issue is provided only via the hindsight accorded one who first viewed the inventions in issue. As the Federal Circuit indicated in In re Fritch (972 F.2d 1260, 1266 n.15, 23 USPQ2d 1780, 1783-84 n.15 (Fed. Cir. 1992)), it is impermissible to use the claimed inventions as an instruction manual or "template" to piece together isolated disclosures and teachings of the prior art so that the claimed invention is

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[31] While the Board was treating Sugimoto as the primary reference (FF 127), the administrative law judge finds Geerk and Kawai comparible to Sugimoto in lacking elements of the claimed inventions in issue.

rendered obvious.

Regarding secondary considerations of nonobviousness, an embodiment of the invention claimed in the asserted claims is the P-150 which was first introduced to the public in June of 1985 at an annual robot show that Akeel attended. (Akeel, Tr. at 1925-27; RX-48 at FANUC 001488, ¶ 19.) The robot was a hit at the show and later became a huge financial success for GM FANUC. (Akeel, Tr. at 1929.) Immediately after the introduction of the P-150, orders for a hydraulic NC Painter "completely dried out." (Akeel, Tr. at 1930; Nof, Tr. at 614.) Akeel testified that "most of the orders for the hydraulic paint robot{ } that were already booked by GM FANUC were converted to the new electric driven paint robot, P-150." (Tr. at 1930.) In a very short period of time, GM FANUC sold over $110,000,000 of paint systems incorporating the P-150 robot. (RX-48 at FANUC 001492, § 36; Akeel, Tr. at 1934-1935.) Hence, the administrative law judge finds evidence of secondary considerations.

Based on the foregoing, the administrative law judge finds that respondents have not established, by clear and convincing evidence, that the asserted claims are obvious under 35 U.S.C. § 103.

3. 35 U.S.C. § 112

A decision on whether a claim is invalid under 35 U.S.C. requires, inter alia § 112, a determination of whether those skilled in the art would understand what is claimed when the claim is read in light of the specification. Orthokinetics, Inc. v. Safety Travel Chairs, Inc., 806 F.2d 1565, 1576 (Fed. Cir. 1986). Section 112, ¶ 2 provides that "[t]he specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention." A patentee's failure to do so renders the

patent indefinite and invalid. See Default Proof Credit Card Sys., Inc. v. Home Depot U.S.A., Inc., 412 F.3d 1291, 1298 (Fed. Cir. 2005). A determination of claim indefiniteness is a legal conclusion that is drawn from the court's performance of its duty as the construer of patent claims. Id. citing Atmel Corp. v. Information Storage Devices, 198 F.3d 1374, 1378 (Fed. Cir. 1999).

A. The claimed phrases "compact," "lightweight," and "heavy"

Yaskawa argued that the terms "heavy," "compact," and "lightweight" of claim 10 are relative terms, and that the '913 patent does not contain a base or standard to guide the interpretation of said terms. (YBr 92-94.) It was further argued that the claim does not specify which "robot parts" are referred to. (YBr at 94.) Hence it is argued that claim 10 is indefinite under 35 U.S.C. § 112, ¶ 2.

Complainant argued that the claim terms were definite enough for the respondents to argue claim construction, obviousness, and novelty issues, and that the claims have a presumption of validity, especially since all 112 issues were addressed during prosecution. (CBr at 142-3.)

The staff argued that no testimony from Yaskawa was elicited at the hearing concerning the defense, and there is no clear and convincing evidence in the record to establish it. (SBr at 57.)

The '913 patent concerns an electric robot able to operate in a hazardous environment. ('913 Patent, col. 1, lns. 9-12.) The Background Art portion of the specification compares a prior-art electric robot to a prior-art electric robot that is made "explosion proof," stating that

"the use of explosion-proof motors . . . increases the weight and

> size of the robot. Also, the use of explosion-proof motors necessitates the use of explosion-proof cables. Such cables not only are more costly and heavier, but also are more inflexible and unwieldily. Such explosion-proof motors and cables also take up valuable space in or on the robot and, consequently, in the paint spray booth."

(CX-1 col. 2, lns. 46-53.) The specification of the '913 patent calls the invention "relatively compact," discussing the advantages of using "regular duty cables rather than heavy duty, explosion-proof cables," and calling the invention "relatively small and lightweight." (CX-1, col. 2, ln. 60; id., col. 3, lns. 27-20; id., col. 3 ln. 35.) Later in the specification, the '913 patent states "[t]he above construction allows the use of a relatively small and inexpensive electric robot in a hazardous environment such as can be found in a conventional paint spray booth." (CX-1, col. 6, lns. 30-33.) Testimony from the hearing points to a person of ordinary skill in the art being able to properly interpret the specification. (See Nof Tr. at 611, 653, 660.)

Based on the foregoing, the administrative law judge finds that Yaskawa has not met its burden of proving that claim 10 is indefinite under 35 U.S.C. § 112 ¶ 2.

B. The claimed phrases "first pressure" and "second pressure"

Yaskawa argued that claim 12 is internally inconsistent, as the claim states that a first compartment having a "first pressure" and a second compartment having a "second pressure" must mean that the compartments have different pressures, while the claim later states that the compartments are in "fluid communication" which necessitates that said pressures are the same. (YBr at 94-95.)

Complainant argued that the claimed terms in issue were definite enough for the respondents to argue claim construction, obviousness, and novelty issues, and that the claims

have a presumption of validity, especially since all 112 issues were addressed during prosecution. (CBr at 142-3.)

The staff argued that no testimony from Yaskawa was elicited at the heairng concerning this defense, and there is no clear and convincing evidence in the record to establish the defense. (SBr at 57-58.)

There is no language in claim 12 that compares the first and second pressure, and no language that requires them to be equal or different to each other. In reading the specification, there are several references mentioning compartments that are in fluid commination with each other, and occasionally have different pressures. For example,

> "[a] pair of umbrella vents 60 are also provided between the first compartment 52 and the inner compartment 59 at the inner wall 50 to relieve any excess pressure generated by the pressure regulator 48 above a maximum predetermined limit. The umbrella vent 60 communicates the excess pressure from the first compartment 52 to the inner compartment 59."

(CX-1, col. 5, lns. 18-25.) Therefore, based on the specification of the '913 patent, two compartments that are in fluid communication, may be the same, and occasionally be different, such as when one changes pressure and the other changes to compensate. The testimony of Nof during the hearing further supports the interpretation. (Nof, Tr. at 813, 814, 847-48.)

Based on the foregoing, the administrative law judge finds that Yaskawa has not met its burden of proving that claim 12 is indefinite based on internal inconsistencies.

C. The "providing" steps and "operating" steps

Yaskawa argued that claim 22 is invalid, as it is a method claim directed to operating a robot, but that the first two recited steps "providing a first compartment" and "providing a second

compartment" could only occur during manufacturing. (YBr at 96.) Claims 23 and 24 depend from claim 22.

Complainant argued that the claim terms were definite enough for the respondents to argue claim construction, obviousness, and novelty issues, and that the claims have a presumption of validity, especially since all 112 issues were addressed during prosecution. (CBr at 142-3.)

The staff argued that no testimony was elicited at the hearing concerning this defense, and there is no clear and convincing evidence in the record to establish said defense. (SBr at 58.)

Respondent Yaskawa points to no testimony or evidence to support its argument, as each of the relevant findings of fact (YFF 1406 - YFF 1411[32]) are conclusory statements of law with no support. No expert testified on this defense. Moreover, the plain language of the claim and the specification does not support Yaskawa's argument. The invention of the '913 patent relates to a robot. (CX-1, col. 1, lns. 9-12.) In light of the specification, the language of the claim is clear. The plain language of "providing a first compartment with a first non-explosion-proof motor" of claim 22 (CX-1, col. 10, lns. 39-40) has a simple meaning, viz. installing that kind of a motor into the robot's first compartment. Likewise, the claim also requires installing a second motor of that type in the second compartment. Said motors are required to operate the robot, and therefore are necessary for the required claim element of "method for operating." (CX-1, col. 10, ln. 37.) Nothing in the claim or the specification requires that said motors be installed during manufacturing as asserted by Yaskawa.

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[32] The only other finding of fact referred to by Yaskawa for this argument is YFF 1405. It merely recites claim 22 from the '913 patent.

Based on the foregoing, the administrative law judge finds that Yaskawa has not met its burden of proving that claims 22, 23, and 24 are indefinite.

D. Best Mode

Dürr respondents argued that Akeel, one of the inventors of the '913 patent, was aware of Type X purging; that Fanuc's P-150 commercial robot allegedly used Type X purging; and that the patent specification actually teaches away from said purging. (DPHS at 103.) Dürr respondents make no such argument in their DBr.

Complainant argued that the subject matter of X Type purging is not claimed matter, and therefore the best mode inquiry is not relevant. (CBr at 143-44.)

The staff argued that Akeel may have been aware of the NFPA 496 requirements regarding purging, but that Akeel did not understand purging, and thus could not have been expected to put it in the '913 patent. (SBr at 56-57.)

Ground rule 17 states that "[a]ny issues of patent claim interpretation, including specific contentions for proposed interpretations or pertinent claim language, shall be fully developed at the hearing, in the post-hearing briefs and in the proposed findings of fact." As Dürr respondents have not argued a best mode defense in their post-hearing brief, the administrative law judge finds that Dürr respondents' arguments on this issue have been waived.

X. Enforceability

Yaskawa, in support of its allegation that the '913 patent is unenforceable due to complainant's alleged inequitable conduct argued that over the course of the prosecution of the '913 applications, complainant Fanuc disclosed 75 references to the Patent Office, but failed to provide Geerk and Kawai; that Fanuc failed to do so even though those references were

repeatedly relied upon by the examiners in the corresponding German and Japanese prosecutions, and even though the materiality of the two references was clearly known to both the Fanuc attorneys and named inventor Akeel; and that rather than disclose the references as it had for numerous references of only marginal materiality, Fanuc "identified" them for the Examiner, but then so mischaracterized their alleged disclosure that Fanuc could be confident that the Examiner would not further investigate the references. (YBr at 97.)

Dürr respondents argued that applicants committed inequitable conduct with respect to Geerk and by failing to properly disclose Kawai. (DBr at 93-105.)

The staff argued that given the high degree of materiality of Geerk and the knowing and intentional withholding of that reference, a finding of inequitable conduct for failure to submit Geerk is warranted. Concerning Kawai, the staff does not believe the evidence adduced at trial showed an intentional decision to withhold a "translation," and hence argued that a finding of inequitable conduct, as to Kawai, is not justified. (SBr at 60-61.)

Complainant argued that Geerk is a German patent document for an electric manipulator that is pressurized for use in an underwater environment; that Kawai is a Japanese publication directed to a robot that is air-cooled, which might be suitable for use in nuclear-energy related fields; that it is undisputed that FANUC's attorneys disclosed both of those references to the Patent Office in the prosecution of the application that led to the '218 patent, which precedes the '913 patent in the chain of related U.S. patents; that with regard to each reference, FANUC explained to the Examiner that the references had been cited by foreign patent offices in the prosecution of FANUC's corresponding foreign patent applications; that as to each reference, FANUC also provided a statement of its understanding of the reference at the time; and that there

is no evidence that FANUC misrepresented its understanding, withheld material information or engaged in any conduct with an intent to deceive. (CBr at 146.)

To establish unenforceability, due to inequitable conduct, a respondent must prove, by clear and convincing evidence, that a patentee failed to disclose material information during prosecution of a patent with an intent to mislead the Patent Office. Bristol-Myers Squibb Co. v. Rhone-Poulenc Rorer, Inc., 326 F.3d 1226, 1233 (Fed. Cir. 2003). Affirmative misrepresentation of material fact or submissions of false material information to the Patent Office can also form the basis of an inequitable conduct defense. Id. Within the context of an inequitable conduct analysis, "[i]nformation is deemed material if there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a part." Brasseler, U.S.A. I,L.P. v. Stryker Sales Corp., 267 F.3d 1370, 1380 (Fed. Cir. 2001); accord Baxter Int'l Inc. v. McGaw, Inc. 149 F.3d 1321, 1327, (Fed. Cir. 1998). In a case involving an omission of a material reference to the Patent Office, there must be clear and convincing evidence that the applicant made a deliberate decision to withhold a known material reference. Baxter Int'l, Inc., 149 F.3d at 1329, citing Molins PLC v Textron, Inc., 48 F.3d 1172, 1181 (Fed. Cir. 1995). A mistake or the simple absence of information (even material information) from the prosecution record does not prove deceptive intent. See Jazz Photo Corp.v. Int'l Trade Com'n, 264 F.3d 1094, 1110 (Fed. Cir. 2001); see also Kingsdown Med. Consultants, 863 F.2d at 876; Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 939 (Fed. Cir. 1990); Allen Organ Co. v. Kimball Int'l, Inc., 839 F.2d 1556, 1567 (Fed. Cir. 1988).

The claimed subject matter of the '913 patent is directed to a collection of state of the art components and combination of said components to provide a novel arrangement. The

administrative law judge has found that neither Geerk nor Kawai suggests such a combination as set forth in the claimed subject matter in issue. See supra. Hence he does not find the references material to the prosecution of the '913 patent. Moreover complainant did identify Geerk to the Patent Office, through its attorneys. (RX-91, FANUC 012336-37.) Also Kawai was brought to the attention of the Patent Office. (See RX-96, FANUC 12315-16.)

Based on the foregoing, the administrative law judge finds that respondents have not established, by clear and convincing evidence, that complainant failed to disclose material information to the Patent Office. Hence, he finds that the '913 patent is enforceable.

XI. Domestic Industry

There can be a violation of section 337 "only if an industry in the United States, relating to articles protected by the patent ... exists or is in the process of being established." 19 U.S.C. § 1337(a)(2); see also Certain Methods of Making Carbonated Candy Products, Inv. No. 337-TA-292, USITC Pub. 2390, (Mar. 1990). The existence of a domestic industry is measured at the time the complaint is filed. See Bally/Midway Mfg. Co. v. U.S. Int'l Trade Comm'n, 714 F.2d 1117, 1121-22 (Fed. Cir. 1983).

The Commission has established a two-prong test for determining whether a complainant has satisfied the domestic industry requirement. The technical prong considers "whether the complainant is exploiting or practicing the patent in controversy," while the economic prong addresses "whether there is significant or substantial commercial exploitation." Certain Microsphere Adhesives, Process for Making Same, and Products Containing Same, Including Self-Stick Repositionable Notes, Inv. No. 337-TA-366, USITC Pub. 2949 (Jan. 1995). As the complainant, FANUC bears the burden of proving that it has satisfied both the technical prong

and the economic prong.

The staff argued that the evidence shows that complainant practices at least claim 18 of the '913 patent; that complainant's P-200E robot is a painting robot that operates in a hazardous environment with{ }citing CX-403 at 6739-41;{ } id. at 7019, 7043, 7047-50; { }citing CX-404, ¶¶2.2, 2.3, 2.5. (SBr at 43.)

Yaskawa does not dispute that complainant has established a domestic industry. (YRBr at 47.) Dürr respodents, in their DBr and DRBr do not contest that complainant has established a domestic industry.

1. Economic Prong

The administrative law judge has found that complainant has satisfied the economic prong. See Order No. 15 which issued on August 23, 2005. The Commission on September 12, 2005 decided not to review Order No. 15.

2. Technical Prong

In CX-431, the private parties stipulated as follows:

> Complainant FANUC Robotics America, Inc. ("FANUC") has submitted, without objection, certain exhibits (CX-403C, CX-424C, CX-428C, CX-429C, and CX-430C). These exhibits have been admitted into the evidentiary record in this case. The parties stipulate that these exhibits accurately depict the structure of FANUC's P-200E robot. (CX-431).

(emphasis added). CX-403 is a manual for the "system RJ3 controller, P-200E Mechanical unit,

pedestal, clean wall rail, modular in-booth rail parts, and service manual." (Nof, Tr. at 852-53.)[33] The P-200E is a robot assembly for use in an explosive environment. (Nof, Tr. at 854.) The P-200E{ }(Nof, Tr. at 854.) The area of the base of the robot that has{ }(Nof, Tr. at 855.) It is a compartment "because it is an inner space inside the robot that is defined." (Nof, Tr. at 866.) The pressurization in the P-200E{

}(Nof, Tr. at 855.) The P-200E has a{

}(Nof, Tr. at 855.) The lower arm of the P-200E is{

} (Nof, Tr. at 856.) The P-200E has{

} (Nof, Tr. at 856.) The P-200E has{

} (Nof, Tr. at 856-857.) Moreover the P-200E has a compartment (an inner space within the robot and structure distinct from outer walls of the robot parts). (Nof, Tr. at 857.)

Based on the foregoing, the administrative law judge finds that complainant has established that it satisfies the technical prong requirement.

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[33] Nof reviewed documentation relating to FANUC's P-200E, including CX-403C. (Nof, Tr. at 852-53.) Nof has been to FANUC's facility in Michigan, has inspected several FANUC paint robots, was able to see FANUC paint robots in operation, and had talked with FANUC personnel about the operation of FANUC's robots. (Nof, Tr. at 853.)

XII. Remedy And Bonding

Under Commission rule 210.42(a)(1)(ii), the administrative law judge is to consider the issues of remedy and bonding and issue a recommended determination thereon. The Commission has broad discretion in selecting the form, scope, and extent of the remedy in a section 337 proceeding. See Certain Condensers, Parts Thereof and Products Containing Same, Including Air Conditioners for Automobiles, Inv. No. 337-TA-334 (Remand), Comm'n Op. (U.S.I.T.C., Sept. 10, 1997) (citing Viscofan, S.A. v. ITC, 787 F.2d 544, 548 (Fed. Cir. 1986)). When a section 337 violation has been found, the Commission has the authority, with respect to the imported articles concerned, to enter an exclusion order, a cease and desist order, or both. 19 U.S.C. § 1337(d) and (f).

1. Exclusion Order

Complainant seeks a permanent limited exclusion order pursuant to section 337(d) of the Tariff Act of 1930, as amended, excluding entry into and sale or offer for sale within the United States, the following subject robots, howsoever identified: Dürr Eco RP6, Dürr Eco RP7, Dürr Eco-Opener H, Dürr Eco-Opener D, Yaskawa PX800, Yaskawa PX1450, Yaskawa PX1850, Yaskawa PX2050, Yaskawa PX2750, Yaskawa PX2850, Yaskawa PX2900, and Yaskawa PX2900 MAP. (CBr at 153.)

It is argued by complainant that the Commission "has long recognized that an exclusion order directed at specific models adjudicated to be infringing does not protect the patent owner's rights by preventing importation of all infringing merchandise, and is subject to circumvention; it fails to achieve the intended effect of exclusion orders of preventing future violations with respect to the type of products involved in the investigation." Certain Hardware Logic Emulation

Systems and Components Thereof, Inv. No. 337-TA-383, USITC Pub. 3089, Comm'n Op. at 23, (Mar. 1998) (Hardware Logic) (citing Certain Nonwoven Gas Filter Elements, Inv. No. 337-TA-275, USITC Pub. 2129, Comm'n Op. at 7-8 (Sept. 1988); Certain Cellular Radio Telephones, Inv. No. 337-TA-297, USITC Pub. 2361, Comm'n Op. at 5-6 (Feb. 1991)). Complainant noted that limiting the scope of an exclusion order to the specific models of accused devices found to infringe a patent owner's patents "merely invites an unscrupulous respondent to change the model numbers to circumvent the order." Hardware Logic at 8. Thus, complainant argued that, in accordance with long-standing and well-settled Commission practice, FANUC seeks an exclusion order that does not just specify the models or parts adjudicated to be infringing for purposes of determining either whether a violation has occurred or the scope of the order (i.e., whether the order is applicable to contributorily infringing articles or inducement to infringe) but one that is also directed to all of respondents' electric robots for painting and/or spraying, including hood and door openers. Further, complainant requests that the Commission require Customs "to prevent the entry of any of { } products until the Commission has determined them to be non-infringing" in a modification proceeding or advisory opinion, citing Hardware Logic at 23. (CBr at 153, 154.)

The staff argued that if a violation of Section 337 is found, a "limited exclusion order" directed to any infringing products" should be recommended. (SBr at 62.)

Yaskawa represented tht "[a]ll the private parties and the Staff joined in an unopposed motion regarding the remedy and bonding." (YBr at 113.)

Having considered the arguments of the parties and the record, if a violation is found, the administrative law judge recommends limited exclusion orders directed against all of

respondents' electric robots and component parts thereof which infringe the asserted claims in issue.

2. Cease And Desist Order

In addition to, or in lieu of, an exclusion order, the Commission may issue cease and desist orders to respondents found to be violating Section 337. 19 U.S.C. § 1337(f)(1). Under Commission precedent, "cease and desist orders are warranted with respect to domestic respondents that maintain commercially significant U.S. inventories of the infringing product." Certain Agricultural Tractors Under 50 Power Take-off Horsepower, Inv. No. 337-TA-380,USITC Pub. 3026, Commission Opinion at 31 (March 1997); see also, Certain Cigarettes and Packaging Thereof, Inv. No. 337-TA-424, USITC Pub. 3366 Commission Opinion at 10 (Nov. 2000).

Complainant argued that although this investigation does not present the perhaps-typical situation of a warehouse of infringing products and while FANUC does not presently know the location of any subject robots that are in the process of being "set-up and configured with spray paint application equipment after importation," the parties entered into the following stipulation: (Joint Stipulation of August 9, 2005 at 2)

> Unlike consumer products, paint robots are normally produced to order. As Respondents produced their subject robots abroad, they do not maintain inventories of subject robots in the United States, except for brief periods of time while robots are set-up and configured with spray paint application equipment after importation into the United States. Should the Commission grant relief to Complainant in the form of an exclusion order, Respondents believe that a cease and desist order would provide no additional relief and therefore would not oppose Complainant's request for such relief;

that because painting and spraying robots are produced to order, any discovery conducted during

the discovery portion of the investigation could not have revealed any information regarding particular inventories that could remained current at the time any exclusion order might issue; and that as such, neither complainant nor the staff sought additional information on the existence of commercially-significant inventory that a single robot should be considered commercially significant inventory; and that the high value of the robots means the respondents will be maintaining "a commercially significant inventory of the infringing product." Hence it is argued, as to whatever such inventory might exist at the time any exclusion order is issued, that FANUC seeks the issuance of permanent cease and desist orders pursuant to section 337(f) prohibiting respondents, their affiliates, subsidiaries, divisions, licensees, agents, contractors, other related entities, and their successors and assigns, from:

> importing and selling for importation into the United Stated any covered product or component thereof, except under license from FANUC;
>
> offering for sale, selling, leasing, loaning, distributing, assembling, installing and otherwise transferring any covered product or component thereof, including liquidation of any assembled or unassembled imported inventory held in the United States, expressly including robots which have yet to be "set-up and configured with spray paint application equipment," except under license from FANUC; and
>
> advertising, demonstrating, and marketing any covered product, including soliciting United States OEM manufacturers or agents or distributors for any covered product, except under license from FANUC.

(CBr at 155-157.)

The staff argued that the Commission generally declines to issue cease and desist orders when there is no evidence of domestic inventories of the infringing goods. Certain Microsphere Adhesives, Process for Making Same, and Products Containing Same, Including Self-Stick Repositionable Notes, Inv. No. 337-TA-366, USITC Pub. 2949 Commission Opinion at 21-22,

(January 1996). Hence the staff concluded that there appears to be no reason to deviate from that practice here. (SBr at 63.)

The administrative law judge finds that complainant has not established that respondents maintain commercially significant U.S. inventories of infringing products. Hence the administrative law judge does not recommend the issuance of any cease and desist order.

3. Bond

If the Commission determines to enter an exclusion order and/or cease and desist order, then the affected articles shall still be entitled to entry under bond during the 60-day Presidential review period. The amount of such bond must "be sufficient to protect the complainant from any injury." Commission rule 210.50(a)(3); see also 19 U.S.C. § 1337(j)(3).

Complainant argued that the parties have met, conferred, and agreed that 40% is an appropriate bonding level. (CBr at 157.)

The staff argued that the private parties have stipulated that a 40% bond rate would be appropriate; that staff has no reason to object to this amount; that respondents' responses to the complaint and notice of investigation included information concerning prior importation; that dividing the value of imported robots by their import quantities provides an average price of approximately $61,000 for Yaskawa robots and{ } for robots of Dürr respondents; and that given the limited rate of importation and a 40% bond rate, the proposed bond of 40% appears sufficient to protect complainant during the Presidential review period. (SBr at 63-64.)

In view of the stipulation, if a violation is found, the administrative law judge recommends a 40% bond rate.

XIII. Additional Findings

1. Parties

1. Complainant FANUC Robotics America, Inc. is a Delaware corporation with a principal place of business at Rochester Hills, Michigan. (Amended Complaint ¶ 6.)

2. Respondent Dürr Systems, Inc. is a Michigan corporation with its headquarters in Plymouth, Michigan. (Amended Complaint ¶ 13.1.) On January 1, 2005, in a corporate reorganization, Behr Systems, Inc. (a Michigan corporation) merged into Dürr Industries, Inc., and the resulting company was renamed Dürr Systems, Inc. (Id.)

3. Respondent Dürr AG is a German corporation with a principal place of business in Stuttgart, Germany. (Amended Complaint ¶ 14.) Dürr AG is the parent corporation for all the Dürr respondents. (Id.)

4. Dürr Systems GmbH is a German company with a principal place of business in Stuttgart, Germany. (Amended Complaint ¶ 14.1)

5. Dürr Special Material Handling GmbH is a German company with a principal place of business in Grenzach-Wyhlen, Germany. (Amended Complaint ¶ 14.2)

6. Motoman Inc. is a Delaware company with a principal place of business in West Carrollton, Ohio. (Amended Complaint ¶ 16.)

7. Yaskawa Electric Corporation (Yaskawa) is a Japanese company with a principal place of business in Kitakyushu, Fukuoka, Japan. (Amended Complaint ¶ 15.)

8. Yaskawa is the parent company to Motoman Inc. (Amended Complaint ¶ 16.)

2. Prosecution History

A. Serial No. 06/692,996

9. U.S. Application Serial No. 06/692,996 filed January 22, 1985 (the '996 application) was the first application in the '913 patent prosecution history. (RX-32, FANUC 001388.)

10. Original claims 1 to 17 of the '996 application were directed to an electrically driven robot having pressurized compartments. Original claim 1 referred to a first drive system and a second drive system each including at least "one electric motor." Original claim 2 referred to a first drive system and a second drive system each including one "non-sparking electric motor." (RX-32, FANUC 001414-18.)

11. The original specification and original claims filed in the '996 application did not use the term "non-explosion-proof" to describe the electric motors. (RX-32, FANUC 001399-1426.)

12. The first Office Action, dated January 21, 1986, rejected the original claims (reciting "electric motors") as being obvious over Sugimoto et al. (U.S. Patent No. 4,507,046) (the '046 patent) (RX-13) or Inaba et al. (U.S. Patent No. 4,502,830) (the '830 patent) (RX-19), in view of Dugan et al. (U.S. Patent No. 3,447,000) (the '000 patent) (RX-15). (RX-34, FANUC 001428-32.) The Office Action stated, inter alia:

> It would be obvious to one having ordinary skill in the art to provide pressurized compartments in the base and arms of the robots in the primary references and to mount the motors in these compartments if desiring to use these robots in hazardous environments in view of the teaching of Dugan.

The Examiner in rejecting certain claims, rejected other claims, including original claim 2, which

recited "non-sparking electric motor" stating, inter alia:

> The use of any type of conventional electric motor, including a brushless D.C. motor and an A.C. servo motor, for the electric motors in Sugimoto or Inaba would be an obvious substitution of equivalents.

(RX-32, at D01428-31.)

13. On February 20, 1986, named inventor Akeel sent a letter to applicants' patent counsel Syrowik, in which Akeel stated: "[t]he primary reference here is Dugan's, and his approach for making an electric motor explosion proof. Dugan depends on 'airflow,' and 'passing air through motor to exhaust means.'" (RX-695C, FANUC 047353, emphasis in original). Akeel's February 20, 1986 letter further stated:

> Our approach is to pressurize the whole compartment around all motors and not pass air, or exhaust air, as a normal part of the explosion protection. We do not make the motors explosion proof; but we protect the whole robot including any other electrical equipment and connections inside of it. Further, we protect two separate compartments to allow motor drives to be located nearby the joints they actuate.
>
> On p.5 line 4, we refer to possible use of explosion proof motors, such as Dugan's and explain their disadvantage in weight and need for explosion proof cables and other problems. This addresses the validity of claim #1 of our disclosure, other claims fall in place if #1 passes.
>
> I hope this response will be of help. Please advise me of your response to the examiner and if there is a need for more discussion, and if needed, let us get together as this is difinitely a critical one we must have.

(RX-695C, FANUC 047353.)

14. Applicants, responding to the January 21, 1986 rejection in an amendment dated April 28, 1986, after amending the original claims to recite, for example, enclosed compartment,

argued:

> Briefly, Applicants' invention relates to an electrically driven robot having pressurized compartments within drive motors and other conventional electrical equipment are provided. The robot is especially designed to operate in locations where a possibility of explosion exists. Neither the drive motors themselves nor the cables are made explosion proof. As noted on page 5, line 4 of the specification, use of explosion proof motors such as the explosion proof motor shown by the Dugan reference is not practical because of the weight of such motors and also the need for explosion proof cables as well as other problems. The Dugan reference describes a blender motor and housing wherein air is passed around the motors to thereby make the motor explosion proof.
>
> The independent claims and, consequently, the dependent claims of the present application have been amended to more particularly point out and distinctly claim that both the first and second drive systems operate in an ambient at superatmospsheric pressure within their respective compartments. Furthermore, each of the independent claims further include means for communicating the first and second compartments so that the pressures are maintained within their respective compartments during movement of the arm assembly. Clearly, none of the prior art patents cited by Examiner, taken either alone or in combination, recite such a feature.

(RX-37, FANUC 001442-43.)

15. The Examiner, responding to the April 28, 1986 amendment, in a final office action dated August 12, 1986, maintained his prior art rejections. In maintaining the art rejection, the Examiner stated, inter alia:

> Sugimoto discloses motors mounted in robotic elements and these elements connected to provide a base, arm and wrist structure. For example, note figure 3 and 6. Dugan discloses providing an air tight, pressurized environment for a motor used in a volitile environment. Accordingly it would be obvious to provide sealed compartments in each of the robotic elements of Sugimoto to house their motors or to provide seals between the elements to form one large compartment in view of the teaching of Dugan. One arrangement is deemed to be an obvious equivalent of the other. The means for communicating would be the lines from the compressor or the sealed joints between the elements.

(RX-38, FANUC 001145-51.)

16. Paper No. 8 shows that the Examiner interviewed the inventors on September 18, 1986. (RX-39, FANUC 001452.)

17. On October 1, 1986, applicants filed an amendment in which they attempted to amend the claims. In the amendment, applicants argued:

> The claims of this application have been amended to more particularly point out and distinctly claim two features of the invention as now claimed which are not shown by the prior art, taken either alone or in combination. The first feature comprises means for automatically maintaining the pressures in the first and second compartments within a range of accessible superatmospheric pressures, including the first and second positive pressures. This structural limitation was at least partially provided by original claims 11-15 and is not disclosed in any of the prior art references cited by the Examiner.
>
> The Dugan et al reference is primarily concerned with cooling high-speed electric motors, such as blending motors. There is a need for the free flow of air for cooling a high-speed motor. First and second conduits are provided for supplying air under pressure to the interior of the housing in Dugan as well as means for exhausting the air under pressure from the housing. Dugan et al is not concerned with a range of acceptable superatomspheric pressures and is only concerned if the pressure falls below a predetermined amount.
>
> * * *
>
> The second feature not found by any of the prior art patents, taken either alone or in combination, is that the compartments are relatively large compared to the size of the motors contained therein, so that heat generated by the electric motors during operation thereof is dissipated primarily through radiation.
>
> The use of explosion-proof motors, such as disclosed in Dugan et al, has long been recognized as one way of protecting electrical equipment in a hazardous environment. However, there are numerous disadvantages to the use of explosion-proof motors as noted in the Background Art portion of the present application. Even if the teachings of the Dugan et al patent could be combined

> with the other prior art robot patents cited by the Examiner, there is still a need to supply cooling air across the motor of Dugan et al to comply with the teachings of Dugan et al. Applicants have eliminated this need by providing compartments in the robot which are large enough so that heat generated by the electric drive motors is dissipated primarily through radiation, thereby eliminating the need for an explosion-proof motor. Such motors are more costly and also increase the weight and size of the robot. Such explosion-proof motors also necessitate the use of explosion-proof cables which are also more costly and heavier and are also more unflexible and unyieldly.

The first page of the amendment has a hand-written entry by the Examiner which read "Entry Not Recommended." (RX-40, FANUC 001453-61.)

18. An advisory action issued on October 20, 1986 indicated that the response to the final rejection continues to run. (RX-41, FANUC 001462.)

19. A notice of abandonment is dated January 8, 1987 and states that the reason for abandonment is the filing of "SN 928641 filed Nov. 6, 1986."

B. Serial No. 06/928,641

20. U.S. Application Serial No. 06/928,641 filed November 6, 1986 (the '641 application) was a continuation of the '996 application. (RX-43, FANUC 001465.)

21. In an Office Action dated April 23, 1987, the Examiner repeated his rejections of the claims made in abandoned Serial No. 06/692,996 filed January 22, 1985. (RX-46, FANUC 001477-82.)

22. To overcome the same prior art rejections, on August 6, 1987, and received in the Patent Office on August 10, 1987, the '641 applicants filed a Rule 132 Declaration by the named inventor Akeel and an amendment. (RX-48, FANUC 001485-1636; RX-49, FANUC 001637-48.)

23. In Akeel's Rule 132 Declaration, Akeel acknowledged the widespread existence of standards governing electrical equipment used in hazardous locations. (RX-48, FANUC 001488, ¶ 17.)

24. In Akeel's Rule 132 Declaration, Akeel also stated that "[t]he use of electric drives in a paint booth environment is regulated by various governments of industrialized nations through generally accepted practices such as: (a) the use of explosion-proof motors or motor enclosures; or (b) the use of enclosures that positively preclude the exposure of the motors and their wiring to the explosive environment." (RX-48, FANUC 001488, ¶ 17).

25. [THERE IS NO FINDING 25]

26. Akeel, in the Rule 132 Declaration received by the Patent Office on Aug. 10, 1987, further stated:

> 18. The use of explosion proof electric motors in robots was successfully attempted as a prototype robot was built and prepared by GMF for certification by Factory Mutual Underwriters. After much effort this approach was abandoned by GMF as impractical because of excessive robot weight, excessive size, flexibility problems associated with the explosion proof cables, and the extreme cost of meeting safety requirements.
>
> 19. GMF responded to market demand for safe electrically powered paint robots by developing its robot model P-150, and exhibiting it for the first time in the U.S.A. at the major industry exhibition, Robots 9, in June 1985, and in Japan in September 1985.

The GMF P-150 Electric Paint Robot

> 20. The challenge in the design of the P-150 robot was the accommodation of safety codes for the use of electric drives in hazardous environments, coupled with the need to meet the dynamic performance and repeatability requirements required by

automotive industry users.

21. The CMF P-150 has an explosion-protective construction utilizing brushless type AC servo motors, which are inherently non-sparking and which are utilized in compartments of the robot which are pressurized with positive pressure.

Patents Cited by the Examiner

22. I have reviewed the United States Patents to Inaba et al 4,502,830 (the '830 Patent), Dugan et al 3, 447,000 (the '000 Patent), Sugimoto et al 4,507,046 (the '046 Patent), Turner; Jr. et al 4,547,120 (the '120 Patent) and Engle 4,260,918 (the '918 Patent) all cited by the Examiner in the prosecution of the above-noted patent application.

23. Three electric servo motors are mounted in a mounting compartment of the robot of the '830 Patent. However, the mounting compartment is not pressurized and, consequently, the '830 patent is no more pertinent than the U.S. Patent to Neumeier 3,247,978 (the '978 Patent) which discloses three electric motors in a manipulator hand in FIGURE 4 thereof. A copy of the Neumeier '978 Patent is attached hereto as Exhibit M.

24.There is no teaching in the '830 Patent to pressurize the inner compartment of its robot, nor is there any teaching that such a robot can be utilized in a hazardous, explosive environment.

25. The '000 Patent discloses an explosion-proof blender motor and housing. Such an explosion-proof motor cannot be considered for use in an electric painting robot due not only to the cost of such motors, but also the weight and size of such motors. Also, such motors necessitate the use of explosion-proof cables which are costly, heavy and relatively inflexible and unwieldy. This approach has proven to be impractical as discussed in paragraph 18 of this Declaration.

26. There is no teaching in any of the cited patents to use the walls of a robot compartment as the housing for an explosion-proof motor.

* * *

30. The novelty disclosed in this application relates to the electrically powered robot construction that's explosion proof. It claims no improvement over state of the art methods of explosion proofing, motor design, or any other component design; hence, patents describing individual components or methods are no more pertinent than publications describing other state of the art components used in this construction such as gears, belts, etc. The application describes an apparatus that is a collection of state of the art components and combination of components, that results in a unique, hence novel, arrangement that accomplishes what no similar arrangement could do in the past.

(RX-48, FANUC 001488-90.)

27. The amendment of August 10, 1987 amended claims 1, 2, 5, and 10, cancelled claim 7, and presented new claims 18, 19, and 20. (RX-49, FANUC 001637-43.)

28. Applicants in the amendment of August 10, 1987, argued:

> The invention of the present application arose as a result of the long-felt need and satisfies the long-felt need. The automotive industry has embraced the P-150 painting robot as not merely a substitute for the prior art hydraulically driven robots, but as a long-awaited improvement thereover.
>
> The issuance of the Dugan et al patent in 1969 failed to provide the stimulus so that those of ordinary skill in the art would recognize the possibility of utilizing an electrically-driven robot in a paint spray environment. Other experts in the robot area besides Mr. Akeel still felt that only hydraulic robots could be used in such an environment, as illustrated in Exhibit H and I to Mr. Akeel's Declaration, which are dated long after the issuance of the Dugan et al patent.
>
> The number and quality of sophisticated purchasers who would purchase the P-150 robot for use in paint spray systems are a further indication of industry recognition wherein advertising is not a significant factor in their purchasing decisions.
>
> The pressurized electric drive robot of the present invention contributed significantly to the success of the P-150 robot to enable the P-150 robot to operate in a hazardous environment. As noted

> in Mr. Akeel's papers labeled as Exhibits F and G, no other factors overshadowed the importance in making the electric robot explosion-proof.
>
> Finally, the evidence of copying by others in the paint spray robot industry is persuasive and perhaps the best evidence of non-obviousness of the present invention.
>
> * * *
>
> Applicants' remarks concerning the prior art are also pertinent here, but it is sufficient to say that the use of explosion-proof motors, in electrically-driven robots was considered long ago and was rejected by the robot industry, including the Assignee of the present invention.
>
> Mr. Akeel's comment (in Paragraph 31) that ". . . if the invention were obvious . . .a solution to the need for an electric painting robot would have been supplied by any one of the numerous painting robot suppliers." This statement finally puts to rest the Examiner's contention that it would be obvious to one of ordinary skill in the art to combine the teachings of the prior art cited by the Examiner to obtain the invention as now claimed.

(RX-49, FANUC 001637-43.)

29. On November 20, 1987, the Examiner finally rejected all of the then-pending claims under § 103 over Inaba or Sugimoto in view of Dugan, because it would have been obvious to "provide pressurized compartments in the base and arms of the robot in Inaba and to mount the motors in these compartments if desiring to use these robots in hazardous environments in view of the teachings of Dugan." The Examiner did not find the 132 Akeel declaration probative on the issue of obviousness. (RX-50, at FANUC 001654-55.)

30. An interview between the Examiner and applicants' counsel was conducted on December 11, 1987. The "Examiner Interview Summary Record" stated that "[n]o agreement was reached. Ageto (U.S. 4,668,146) discussed, together with MPEP2306. An amendment will

be filed, together with additional arguments. Reconsideration will be given at that time." (RX-51, FANUC 001656.)

31. On February 24, 1988, applicants filed in the Patent Office a "Disclosure Statement" concerning "art of which Applicants are aware." (RX-52, FANUC 001657-62.)

32. A document mailed February 24, 1988 indicated that the Examiner considered certain references. The date on the document is "4/20/89" which appears to be an incorrect date (RX-52, FANUC 001663-65.)

33. One February 24, 1988 applicants filed an amendment with new claims which corresponded, in large part, to the claims presented to the Examiner at the December 11, 1987 interview. In the proposed amendment, applicants argued:

> What is common to all of the new claims, however, is that flammable gases or vapors are prevented from entering each compartment formed by a robot part and which has an electric motor encased therein by the cooperative interaction of each such compartment being airtight and maintaining means which automatically maintains a positive pressure within an acceptable range above atmospheric pressure in each such airtight compartment.
>
> None of the prior art patents cited by the Examiner or cited by the Disclosure Statement enclosed herewith disclose this feature. Such cooperative interaction of each such airtight compartment and maintaining means is required to prevent entry of flammable gases and/or vapors into the compartments due to the dynamic movements of the arm assembly relative to its base in an electric robot. The electric robot is thus unique when compared to the relatively static structures (i.e. blender motor and housing, submersible pump and motor housing, etc.) which are sealed and pressurized in the prior art.
>
> Even if the Inaba et al and Dugan patents cited by the Examiner were combined or the Sugimoto and Dugan patents were combined, neither of the resulting structures would fall within the

present claims of the application. For example, the Dugan patent discloses a ventilation-type, internal pressure, explosion-proof blender motor assembly. Each such motor assembly provided within the Inaba et al or Sugimoto robot would require its own pressure detector and air supply lines from an air source thereby increasing the cost and weight of the resulting structure. Furthermore, such additional detectors and air supply lines take up valuable space in the robot. Additionally, a large capacity air supply source would have to be provided wherein the amount of air consumption, is large. As noted at Column 1, lines 37-40 of Dugan, because of their high speed, blending motors must be constantly cooled. Also, the flow of such cooling air must travel in close proximity to the motor. The air must pass through openings 61 and 63 in the motor as noted at Column 2, lines 30-32 of Dugan.

As noted at Column 1, lines 39-54 of the Ageta 4,668,146 patent of the Disclosure Statement, such a combination of a robot and explosion-proof motors has been attempted with the problem noted therein. Also, such a combination was also attempted by the Assignee of the present invention as noted in Mr. Akeel's Declaration at paragraph 18.

This is to be compared with the airtight, pressurized chamber(s) formed by the robot parts of the present invention, wherein only a relatively small capacity air supply source is required for the electric drive motors because of the airtight arrangement provided by the between the moving and non-moving parts of the robot. The airtight arrangement allows the positive pressure to be maintained without an excess of air flow. By providing such airtight compartments, only a single pressure detector is required for the multiple electric motors, the wiring is relatively simple and separate air supply hoses from the air source to the individual motors are not needed.

Pressurizing the entire surrounding robot compartment as suggested by the Examiner teaches away from the Dugan reference for the reasons previously noted and also because there is no need to pressurize the compartment if the motor housings are already pressurized which is required by Dugan. Furthermore, there would no be need to make the compartments airtight since the motor housings are already sealed. The compartments in the moving and non-moving parts of the robots of Inaba et al or Sugimoto would

have to be airtight to obtain the present invention as now claimed. There is no teaching to do this in the references.

(RX-53, FANUC 001670-72.)

34. The Examiner, in an advisory action dated March 2, 1988, stated that applicants' response field February 24, 1988 has been considered but was not deemed to place the application in condition for allowance. Hence the proposed amendment was not entered. (RX-54, FANUC 001675.)

35. By petition dated April 14, 1988, applicants requested a two-month extension of time to respond to the Office Action mailed on November 20, 1987. (RX-55, FANUC 00167.)

36. In a paper filed on May 6, 1988, applicants enclosed, inter alia, a copy of formal papers for File Wrapper Continuation application. (RX-56, FANUC 001679.)

37. On July 6, 1988 the Patent Office issued a notice of abandonment. In the notice the Examiner stated that the "FWC has not, as yet reached the examining groups." (RX-57, FANUC 001690.)

38. A paper filed in the Patent Office on April 14, 1988 was a request for a filing under the file wrapper continuing application procedure. (RX-58, FANUC 001692-99.)

39. A paper filed in the Patent Office on April 14, 1988 was an Information Disclosure Statement which listed some 27 references. (RX-52, FANUC 001700-03.)

C. Serial No. 07/183,452

40. U.S. Serial No. 07/183,452 filed April 14, 1988 (the '452 application) was a continuation of the '641 application. (RX-58, FANUC 001692-99.)

41. On May 26, 1988 applicants filed in the Patent Office an Information Disclosure

Statement listing U.S. Patent No. 4,716,785 to Godai et al. (RX-60, FANUC 001708.)

42. On October 17, 1988, applicants filed an amendment cancelling claims and adding new claims. It was stated:

> Assuming that the prior art previously cited by the Examiner and the Applicants in the prior applications can be combined, what results is a pressurized enclosure type of explosion protection in an industrial robot. There is no teaching in the references to make such a combination. Such a combination, however, would not result in the present invention wherein a communicating means is provided between first and second compartments formed by the robot. Due to such a communicating means it is possible to provide only one pressurizing means for both of the two compartments, thereby reducing cost, weight and volume of the robot and air supply capacity. Pressurizing means is provided in new claim 38 to more particularly point out and distinctly claim that Applicants regard as their invention.

(RX-63, 001723-24.)

43. On December 12, 1988, the Examiner rejected the claimed subject matter stating, inter alia:

> 21. Claims 37, 38 and 44 are rejected under 35 U.S.C. 103 as being unpatentable over Sugimoto et al or Inaba et al in view of Dugan et al.
>
> It would have been obvious at the time of applicant's invention to one having ordinary skill in the art to provide pressurized compartments in the base and arms of the robots in the primary references and to mount their motors therein if desiring to use these robots in hazardous environment in view of the teaching of Dugan to encase an electric motor in a pressurized compartment when using the motor in a hazardous environment.
>
> Applicant's maintaining means for automatically maintaining is consonant with the conventional use of regulators and vents in pressurized systems, and while not explicity expressed systems, and while not explicity expressed in Dugan, the use of such elements would be obvious.

Applicant's means for communicating the first and second compartments with each other and pressurizing means is deemed to comprise no more than a conventional T-shaped valve for supplying two compartments and a compressor, respectively. The arrangements are conventional in fluid systems and language which reads on such arrangements can not serve as s basis for patentiaility.

Regarding claim 44, the use of signals to denote adverse pressure conditions to an operator of any given system is well-known, e.g. an oil light in an automobile, and the use of such a conventional arrangement in either primary reference as modified by Dugan would have been obvious at the time of applicant's invention to one having ordinary skill in the art.

22. Claims 42 and 43 are rejected under 35 U.S.C. 103 as being unpatentable over Sugimoto et al or Inaba et al in view of Dugan et al as applied to claims 37 and 38 above, and further in view of the following acomments [sic].

The use of any type of conventional electric motor, including a brushless D.C. motor and an A.C. servo motor would have been an obvious substitution of equivalents at the time applicant's [sic] invention was made to one having ordinary skill in the art.

(RX-64, FANUC 001725-29.)

44. In an amendment filed on February 9, 1989, applicants argued:

Briefly, none of the prior art patents, taken either alone or in combination, discloses or suggest an electric robot including a cable bundle extending into an airtight first compartment of a base of the robot, wherein one of the cables is connected to operate an electric motor contained therein and another of the cable extends from the airtight first compartment of the base to an airtight second compartment of an arm assembly of the robot to operate an electric motor contained therein and wherein pressurized gas is fed into the first and second compartments which are fluidly communicated to provide pressurized gas which surrounds the electric motors and the cables within the compartments.

Applicants are not merely providing electric motors in

> pressurized robot compartments as suggested by the Examiner. Rather, Applicants have invented the electric robot described above with the base, arm assembly, first and second drive mechanisms, cable bundle, and pressurized compartments recited by the claims.
>
> None of the references of record teach or, in any way, suggest the electric robot now claimed. More specifically, the Sugimoto et al patent discloses a base 21 having an electric motor drive 29a that is exposed to the environment and also has a base motor 34a, as well as including an arm assembly having a motor 40a that drives the forearm 24 and a motor 51a that drives the wrist 26. Dugan et al does disclose a blender whose base or housing 11 receives an electric motor 17 to which pressurized gas is supplied through conduits 57 and 59. Even if the disclosure of the Dugan et al blender is combined with the electric robot of Sugimoto et al for purposes of argument, which Applicants believe would not [sic]an obvious expedient, the result would merely be pressurization of Sugimoto et al's base motors 29a and 34a. There would still be no provision of the electric robot invention now claimed by the present application wherein a cable bundle operates electric motors of first and second drive mechanisms, respectively located within airtight first and second compartments of the robot base and the robot arm assembly.
>
> Likewise, the industrial robot of Inaba et al has each of its electric motors 52, 66, and 68 located within the base 40 as opposed to the electric robot of the present invention wherein the first drive mechanism is located within the pressurized base and the second drive mechanism is located within the pressurized arm assembly with cables of the cable bundle operating these drive mechanisms.

(RX-65, FANUC 001737-39.)

45. The Examiner in an Office Action dated April 27, 1989 rejected claimed subject matter on "newly cited Lehmann in view of Dugan et al." stating that it would be obvious to provide pressurized compartments in the base and arms in Lehmann and to mount the motors in these compartments in view of Dugan et al. The Examiner also stated that the type of electric

motor, i.e. d.c. motor or d.c. servo motor, would have been an obvious matter of design and/or choice. (RX-66, FANUC 001740-45.)

46. In an amendment filed May 22, 1989, applicants argued:

> The Dugan patent reference only teaches the pressurization of a single compartment having an electric motor therein and not the pressurization of multiple compartments in two parts, one of which is mounted for movement on the other. Dugan also fails to teach any communication of pressurized gas between first and second airtight compartments, each of which contains an electric motor.
>
> In fact, none of the prior art patents cited by the Examiner disclose communicating means for communicating pressurized gas between first and second airtight compartments, each of which contains an electric motor. Furthermore, none of the prior art patents, taken either alone or in combination, disclose the now claimed sealing means which help to define the first and second airtight compartments which are communicated and each of which include an electric motor therein. As previously mentioned, the sealing means is important to maintain the pressurized gas about the motors and cables without an excess of gas flow from the pressurized gas supply.

(RX-67, FANUC 001754.)

47. The Examiner in an Advisory Action dated June 7, 1989 stated that applicants' response of May 22, 1989 did not place the application in condition for allowance and the proposed amendment would not be entered. (RX-68 FANUC 01756.)

48. Applicants, in a "preliminary amendment" received by the Patent Office on June 20, 1989, cancelled claims 1-17 and added new claims 18-23. (RX-73, FANUC 001776-85.) New claim 20 corresponds to claim 3 of the '745 patent. (RX-394.)

49. Applicants, in an amendment after final rejection received by the Patent Office on June 23, 1989, argued:

The following remarks refer to the newly cited reference to Lehmann, United States Patent No. 3,606,162. First of all, the robot described in Lehmann is not adapted for use in a "hazardous environment" nor is any robot resulting by combining its teachings with Dugan. That term is defined by Article 500 of NFPA 70 of the Natural Electrical Code and is mentioned at page 4 of the specification. As noted at page 4, electrical equipment to comply with the Article must be placed in pressurized containers or must be made explosion proof. The pressurization of the enclosure entails supplying the enclosure with clean air or an inert gas, with or without continuous flow at sufficient pressure to prevent the entrance of combustible gases or vapors which might occasionally be communicated into the enclosure. The occasional reference in the Lehmann patent to the various enclosures being dustproof is not equivalent to the airtight or hermetically sealed compartments of the present invention as now claimed. Also, there is no teaching in Dugan or Lehmann to supply pressurized gas that surrounds the cables so that the robot can operate in the hazardous environment.

Also, the Lehmann reference fails to disclose sealing means which help to define the airtight compartments within the base or arm assembly. Such a sealing means, as now claimed, maintains pressurized gas surrounding this electric motors and cables without an excess of airflow. This is to be contrasted with the dustproof mechanisms of the Lehmann patent.

Finally, the Lehmann patent fails to disclose a pressurized gas supply, as presently claimed by the present invention.

The Dugan patent references only teaches the pressurization of a single compartment having an electric motor therein and not the pressurization of multiple compartments in two parts, one of which is mounted for movement on the other. Dugan also fails to teach any communication of pressurized gas between first and second airtight compartments, each of which contains an electric motor.

In fact, none of the prior art patents cited by the Examiner disclose communicating means for communicating pressurized gas between first and second airtight compartments, each of which contains an electric motor. Furthermore, none of the prior art patents, taken either alone or in combination, disclose the now claimed sealing means which help to define the first and second

airtight compartments which are communicated and each of which include an electric motor therein. As previously mentioned, the sealing means is important to maintain the pressurized gas about the motors and cables without an excess of gas flow from the pressurized gas supply.

(RX-69, FANUC 001757-62.) The same argument in part is found in the "preliminary amendment" of June 20, 1989. (See RX-73, FANUC 001782-85.)

50. The Examiner on July 17, 1989 issued a notice of allowability allowing claims 47 and 53. Claims 47 and 53 read:

> Claim 47. An electrically driven robot adapted for use in a hazardous environment, comprising:
>
> a base having a first hollow-base section and also having a second hollow-base section mounted for rotational movement on the first base section , and a circular seal that extends between the first and second base sections to cooperate therewith in defining an airtight first compartment;
>
> a first drive mechanism including at least one electric motor received within the airtight first compartment;
>
> an arm assembly including in inner arm mounted for movement on the base and an outer arm mounted for movement on the inner arm, said arm assembly being driven by the first drive mechanism to move the inner and outer arms, and one of said arms of the arm assembly having an airtight second compartment fluidly communicated with the airtight first compartment of the base;
>
> a second drive mechanism including at least one electric motor within the second compartment defined by the arm assembly;
>
> a wrist mechanism mounted on the outer arm of the arm assembly and driven by the second

airtight compartments which are communicated and each of which include an electric motor therein. As previously mentioned, the sealing means is important to maintain the pressurized gas about the motors and cables without an excess of gas flow from the pressurized gas supply.

(RX-69, FANUC 001757-62.) The same argument in part is found in the "preliminary amendment" of June 20, 1989. (See RX-73, FANUC 001782-85.)

50. The Examiner on July 17, 1989 issued a notice of allowability allowing claims 47 and 53. Claims 47 and 53 read:

> Claim 47. An electrically driven robot adapted for use in a hazardous environment, comprising:
>
> a base having a first hollow-base section and also having a second hollow-base section mounted for rotational movement on the first base section , and a circular seal that extends between the first and second base sections to cooperate therewith in defining an airtight first compartment;
>
> a first drive mechanism including at least one electric motor received within the airtight first compartment;
>
> an arm assembly including in inner arm mounted for movement on the base and an outer arm mounted for movement on the inner arm, said arm assembly being driven by the first drive mechanism to move the inner and outer arms, and one of said arms of the arm assembly having an airtight second compartment fluidly communicated with the airtight first compartment of the base;
>
> a second drive mechanism including at least one electric motor within the second compartment defined by the arm assembly;
>
> a wrist mechanism mounted on the outer arm of the arm assembly and driven by the second

drive mechanism;

a cable bundle extending to the first hollow-base section and into the airtight first compartment of the base and having at least one cable connected to the first drive mechanism to operate the electric motor thereof, and said cable bundle including at least one cable that extends through the circular seal of the base and from the airtight first compartment of the base into the airtight second compartment of the arm assembly and being connected to the second drive mechanism to operate the electric motor thereof;

a pressurized gas supply that feeds pressurized gas into the airtight first compartment of the base and thence into the airtight second compartment of the arm assembly to provide pressurized gas that surrounds the electric motors and the cables of the cable bundle within the compartments, whereby the robot is capable of operating in the hazardous environment;' and

communicating means for fluidly communicating the first and second compartments, said pressurized gas supply feeding pressurized gas through said communicating means and into the second compartment.

Claim 53. The robot of claim 47 wherein the other cable of the cable bundle extends through said communicating means and into the second compartment.

(RX-69, FANUC 001757-59.) Claim 47 corresponds to claim 1 of the '745 patent (CX-394) while claim 53 corresponds to claim 2 of the '745 patent.

51. On September 14, 1989, the Patent Office issued a notice of abandonment in which it was stated that the application was abandoned "in view of file wrapper continuation application." (RX-71, FANUC 001766.)

D. Serial No. 07/370,123

52. U.S. Application Serial No. 07/370,123 filed June 20, 1989 (the '123 application) was a continuation of the '452 application. (RX-72, FANUC 001768-75.)

53. A supplemental preliminary amendment was filed on August 7, 1989 which added new claims 24 and 25 and which were said to correspond to allowed claims 47 and 53 in Ser. No. 183,452 filed April 14, 1988. Said claims 47 and 53 were said to have been inadvertently cancelled by the filing of file wrapper continuation Ser. No. 370,123 on June 20, 1989. (RX-74, FANUC 001786-88.)

54. The Examiner in an Office Action dated December 15, 1989 indicated that claims 47 and 53 were allowed. Other claims were rejected as unpatentable over Lehmann in view of Buschor or over Lehmann in view of Buschor and further in view of Dugan et al. (RX-75, FANUC 001790-95.)

55. Applicants, in an amendment filed February 14, 1990 and dated February 12, 1990, presented new claims 57-75 and argued the patentability of the claimed subject matter. (RX-76, FANUC 001790-1825.) Amended claims 57, 58 and 59 correspond to claims 4, 5 and 6 of the '745 patent. (RX-394.) Amended claims 63-70 correspond to claims 7-14 of the '745 patent Amended claim 75 corresponds to claim 15 of the '745 patent.

56. The applicants made the following remarks about their claimed purged and pressurized design on February 12, 1990:

> This brings us to Dugan et al. which is no better than the National Electric Code incorporated by applicants at page 4 of their specification, convenience copy attached hereto as Attachment A. Applicants knew prior to their invention that a robot for a hazardous environment could be built with "explosion-proof

> motors." This is what Dugan et al. did and what the Code calls for. Like Lehmann, Dugan et al. placed his motor in an inner housing and then put the shielded motor in an airtight outer housing. His improvement was to circulate air through the inner housing to cool the motor. The added structure of the inner housing which Dugan used to make his motor "explosion-proof" also made the motor heavier and bulky. This is the solution which applicants knew about when they faced the problem. It is also the solution they sought to avoid by using "non-explosion-proof motor(s)" and "non-explosion-proof cable(s)" in their robot.
>
> * * *
>
> ... Lehmann doesn't suggest any pressurized gas supply to protect or cool his motors. Thus, one would need to completely redesign Lehmann's robot to accommodate the air cooling system of Dugan et al., and there is no guidance in Lehmann on how this should be done or even that it should be done.
>
> Let's assume arguendo (and without such guidance) that one seeks to adapt Lehmann for use in a hazardous or explosive environment (also lacking in Lehmann) and turns first to Dugan et al. for a solution. He substitutes Dugan's motor 17 for Lehmann's motor 12. What he gets is another motor that comes with its own housing - plus holes 61, 63 in the housing to accommodate an air cooling system for the motor - which Lehmann has no need for.... One seeking a compact robot system would turn away from Dugan for this reason also. Simply put, the prior art teaches against the combination.

(RX-76 at FANUC 001810-11, 001812-13.) Attachment A corresponded only to pages 496-7 through 496-15 of CX-5. Page 496-7 of CX-5 is titled "Standard for Purged and Pressurized Enclosure for Electrical Equipment in Hazardous (Classified) Locations NFPA 496-1982" The title page of CX-5 is titled "National Fire Codes 1982 Codes and Standards National Fire Protection Association." CX-5 then has two introductory pages followed by pages 496-1 to 496-41. Hence CX-5 is NFPA 496. In evidence also is CX-3 which is titled "National Electrical Code 1984 NEC National Fire Protection Association Batterymarch Park, Quincy, Ma 02269."

The contents of CX-3 indicated it is NFPA 70 referenced in the '913 patent. (CX-1.)

57. The '123 application claims 63-69 and 71-73 recited "non-explosion-proof electric motors." The other '123 application claims 47, 53-62, 70, and 74-75 recited "electric motors." (Claims 47 and 53 – RX-69; Claims 54-59 – RX-73; Claims 60 and 61 – RX-74; Claims 57-75 – RX-76.) Such was the status of the claims with the amendment filed February 14, 1990.

58. Although claim 70 recited "electric motors" and claim 71 recited "non-explosion-proof electric motors" in a paragraph titled "Claims 70 and 71," applicants in the amendment filed February 14, 1990" asserted that both claims 70 and 71 covered, inter alia, "electric motors." (RX-76, FANUC 001803-04, 001817.)

59. The Examiner in a Final Office action dated May 29, 1990, stated that "[c]laims 47, 53, 56-59, 63-69, 68-70 and 75 are allowed." Since claim 67 is rejected in said Office Action and in view of the recitation on the first page of said rejection, it appears that the Examiner intended to state that claims 47, 53, 56-59, 63-66, 68-70 and 75 are allowed. (RX-77, FANUC 001829-39.)

60. Claims 56-59 are at RX-73, FANUC 001779-81. Claims 63-66, 68-70 and 75 are at RX-76, FANUC 001800-1808. Allowed claim 56 corresponds to claim 3 of the '745 patent. (RX-394.) Allowed claims 63, 64, 65, 66, 67, 68, 69, and 70 correspond to claims 7, 8, 9, 10, 11, 12, 13 and 14 of the '745 patent.

61. The Examiner in the Final Office action of May 29, 1990 rejected claims 71 and 72 over Sugimoto et al in view of Dugan et al and Lehman and also over Inaba et al in view of Dugan et al and Lehman and also over Sugimoto et al in view of Buschor. Claim 71 reads:

71. A robot assembly, comprising:

a plurality of privotally interconnected robot parts relatively movable with respect to each other an adopted for exposure to an explosive atmosphere, each of the robot parts having an airtight chamber formed respectively therein which is movable with respect to another of said airtight chambers when said robot parts move, said airtight chambers being interconnected for fluid communication therebetween;

communicating means for fluidly communicating said airtight chambers;

a non-explosion-proof electric motor encased in one of said airtight chambers for moving said robot parts relatively;

a cable bundle including at least one flexible non-explosion-proof cable that extends from one of said airtight chambers to another of said airtight chambers for connection to said motor and that flexes in response to the relative movement of said robot parts; and

means for supplying gas having a pressure higher than the pressure of the explosive atmosphere to said airtight chambers for surrounding said motor and said cable when said robot parts move.

(RX-76, FANUC 001804.) In rejecting claims 71 and 72 the Examiner stated, inter alia:

Applicant's limitation that the airtight chambers are fluidly communicated is deemed to require no more than one compressor with a conventional valve for supplying a plurality of compartments. These arrangements are conventional in fluid systems and language which reads on such arrangements can not serve as the basis for patentability.

21. Claims 71 and 72 are rejected under 35 U.S.C. 103 as being unpatentable over Inaba et al in view of Dugan et al and Lehmann.

It would have been obvious to one having ordinary skill in the art at the time applicant's invention was made to provide pressurized compartments in the base and arms of the robot in Inaba and to mount the motors in these compartments if desiring to use these robots in hazardous environments in view of the teachings of Dugan.

Regarding applicant's limitation that the air-tight chambers

> are fluidly communicated, the remarks set forth in the preceding paragraph regarding compressors and valves are herein repeated.

As to applicants' arguments in their February 14, 1990 amendment relating to Dugan et al., the Examiner stated in his May 29, 1990 action:

> 28. Applicant's position regarding Dugan is non-persuasive since Dugan vents his motor to permit use of an inexpensive motor. See Dugan, column 2, lines 55 et seq.

(RX-77, FANUC 01829-39.)

62. Applicants, in an amendment after final rejection, filed July 26, 1990 canceled claims 71-74 "without prejudice in order to expedite the allowance of claims remaining in the application." They received "the right to continue prosecution of claims 71-74 in a continuation application." (RX-78, FANUC 001840-44.) Applicants, in the amendment added claims 78-84 and 86 which correspond to claims 16-23 of the '745 patent.

63. In the July 24, 1990 response, applicants cited five additional references. Among these references was the Hoesl, et al Electro-Installation reference which applicants described as relating "to safety engineering standards for operating electric hardware in a hazardous atmosphere." (RX-78, at FANUC 001843.)

64. The Examiner issued a notice of allowability on August 10,1990 stating that claims 47, 53, 56-57, 63-70, 75, 78-84, 86 were allowed. (RX-81, FANUC 001847.)

65. The '123 application issued as U.S. Patent No. 4,984,745 (the '745 patent) on January 15, 1991 (RX-394). While RX-394 is not in evidence, the administrative law judge is taking judicial notice of this patent, which respondents had identified as RX-394.

E. Serial No. 07/613,115

66. U.S. Application Serial No. 07/613,115 filed November 13, 1990 (the '115 application) was a continuation of the '123 application. (RX-87, FANUC 012160-67.) U.S. Serial No. 07/613,115 is at RX-86, RX-87 FANUC 012118-167.

67. Applicants in a preliminary amendment filed November 13, 1990 cancelled claim 1 and added claims 19-36. (RX-88, FANUC 012168-87.) New claims 35 and 36 correspond to claims 6 and 7 of the '218 patent. (RX-88, FANUC 012178-79.)

68. Applicants in the preliminary amendment also pointed out that Dugan's motor is ventilated: "Moreover, Dugan shows a motor requiring ventilation for cooling." (RX-88, FANUC 012185.)

69. Applicants on February 25, 1991 filed an information disclosure statement. (RX-89, FANUC 012188-202.)

70. The Examiner, in an Office Action dated June 3, 1991, rejected claims 8-36 pending in the application. Certain claims were rejected over Sugimoto et al in view of Dugan, Fields and Buschner, the Examiner stating, inter alia, that Dugan discloses providing an air tight pressurized environment for a motor including a sealed motor housing and air conduits, a pump and valves for use in a paint environment. Claims 34 and 35 were rejected on double patenting in view of U.S. Patent No. 4,984,745 (RX-394). (RX-90, FANUC 01219-24.) The first paragraph of said Office Action read:

> Receipt of applicant's four bound books for prior art is acknowledged. Due to the number of references submitted only those initiated on the 1449 forms were considered. Applicants are requested to select the twelve most pertinent nonconsidered references for review by the examiner. Applicants must also

> provide statements as to the particular relevance of each reference selected, together with translations if the references are non-English.

(RX-90, FANUC 012216.)

71. After the Office Action dated June 3, 1991, rejected the claims (RX-90, FANUC 012215-24), the '115 applicants filed an amendment on August 9, 1991, repeating the same arguments about Dugan. (RX-91, FANUC 012225-53.)

72. The '115 applicants then attempted to distinguish the use of Dugan-type ventilated motors in the interior of a robot:

> However, if the skilled practitioner installed Dugan's motor in the Sugimoto robot, he would end up again with nothing more than the admitted prior art - an explosion-proof motor in a heavy, bulky, costly, separate housing.

(RX-91, FANUC 012246-47).

73. Referring to the first paragraph of the Office Action dated June 3, 1991, applicants argued:

> In a response to the Examiner's comment that applicants' four bound books of prior art must be culled to a selection of 12, applicants note that all of the references but 33 have been initiated by the Examiner as considered earlier in his examination of the parent applications to the instance application. Applicants believe it is not unreasonable that the Examiner consider the remaining 32 or at least be made aware of them in view of the following statements as to the relevance of each reference. Translations have been provided where the applicants have them and the remaining references have been characterized, where applicants do not have a translation, to the extent the relevance of reference, as understood by the applicants, is pertinent to the scope of the claims now pending. Some of these patents have U.S. filing dates <u>after</u> applicants' and are accordingly <u>not prior art</u> against the pending claims.
>
> * * *
>
> *<u>Japanese 59-92053</u> has a publication date of May 28, 1984. The inventor is <u>Sagata</u> and relates to a robot provided with a driving motor which is adapted to

be explosion-proof so that the robot may operate in a hazardous environment. Sagata makes their servo motors explosion-proof by adding pipes for supplying a continuous flow of inert gas to and over each motor or other sparking source. The translations of two different translators, Attachments B and C, are provided.

(RX-91, FANUC 01223-4.) Regarding the *, applicants represented:

> Although applicants do not wish to dissuade the Examiner from reviewing any of the references of record, and solely at the Examiner's request, 12 non-considered references have been marked by an asterisk (*). . .

(RX-91, FANUC 012236.)

74. The '115 applicants in the August 9, 1991 amendment submitted a chart detailing the differences between the alleged invention and Sagata:

Differences in Structural Elements	
Claimed Invention	**Sagata**
Non-explosion-proof motors (Special robot structure meets NEC).	Explosion-proof motors (Follows Code).
Non-explosion-proof cables routed internally through robot can flex as compartments move relatively.	Explosion-proof cables inflexible and heavy and cannot be routed internally through robot.
Detects pressure in compartments to provide signal.	Interlock stops electricity if gas flow not available.
Pressurized system quiescent: clean when painting.	Continuously purged-drafty: dusty when painting.
Pressurized system: compartments communicate internally through first and second openings in base & arm assembly.	Continuously purged: gas piped directly to each spark source.
Substantially sealing the first and second openings between compartments: allows internal routing of flexible cables; allows only for leakage and thus conserves usage of inert gas.	Body 10 continuously purged: wastes inert gas.
Pressurized gas supplied to sequentially (1) purge robot, and (2) maintain compartments' pressure to (a) prevent entry of hazardous gas, and (b) compensate for leakage from compartments and openings.	Gas continuously purged.

Pressure maintained within acceptable range in compartments and at openings when compartments move relatively.	Gas continuously purged.

(RX-91, FANUC 012249-50).

75. With regard to Sagata, the '115 applicants in the August 9, 1991 amendment stated:

> Applicants knew prior to their invention that a robot for a hazardous environment could be built with "explosion-proof" motors. This is what Sagata did and what the Code calls for. Thus, Sagata follows the Code by making their servomotors explosion-proof by adding pipes for supplying a continuous flow of inert gas to and over each motor or other sparking source. Such pipe-motor combinations do not suggest that non-explosion-proof motors could be combined in articulated, hollow-arm, electrically driven robots to create a robot specifically designed for painting or other explosive environment. The plurality of pipes and nozzles to carry and direct the flow of air to each motor adds to the cost, weight and size of the robot. Sagata has none of applicants' technical advantages.

(RX-91, FANUC 012251).

76. In remarks to overcome Sagata, applicants in the August 9, 1991 amendment distinguished their claimed invention from the motors made explosion-proof by adding pipes for supplying gas to and over each motor. (RX-91, FANUC 012251.)

77. Applicants, in the amendment filed August 9, 1991 as to Dugan et al further stated:

> This brings us to Dugan et al which is no better than the National Electrical Code incorporated by applicants at page 4 of their specification.
>
> Applicants knew prior to their invention that a robot for a hazardous environment could be built with "explosion-proof"motors. This is what Dugan et al did and what the Code calls for. Thus, Dugan et al placed his motor in an inner housing and then put the shielded motor in an airtight outer housing. His

> improvement was to circulate air through the inner housing to cool the motor. The added structure of the inner housing which Dugan used to make his motor "explosion-proof" also made the motor heavier and bulky. This is the solution which applicants knew about when they faced the problem. It is also the solution they sought to avoid by using "non-explosion-proof motor(s)" and "non-explosion-proof cable(s)" in their robot.

(RX-91, FANUC 012244-45.) The same argument was made by applicants in a preliminary amendment filed November 13, 1990. (RX-88, FANUC 012183.) Also complainant's CFF467 appears to quote the same language. However a portion of the quote is inaccurate. For example in the first quoted paragraph, supra, complainant adds at end the phrase "convenience copy attached hereto as Attachment A." Such is not found at FANUC 012244.

78. On August 12, 1991, applicants filed a transmittal letter which included a terminal disclaimer. (RX-92, FANUC 012262.)

79. The Examiner on January 3, 1992 rejected claims 19-36, which includes a rejection of claims 19-29 as being unpatentable over Sagata in view of "Turner, Jr. (U.S. patent 4,547,120)." (RX-94, FANUC 012274-84.)

80. In the January 3, 1992 Office Action, the Examiner further rejected the claims under 35 U.S.C. § 112, second paragraph, as being indefinite in reciting the term "non-explosion-proof electric motor:"

> It is unclear what applicants intend their phrase "non-explosion-proof electric motor" in claims 19, 20, 30, 32 and 36 to mean and how this structurally differs from an explosion proof motor and what basis they use to conclude on page 25 of their amendment filed 8/12/91 that the Japanese reference 59-92053 uses explosion-proof motors. Applicant's specification appears to be disclosing no more than placing an electric motor in a container and pressurizing the container. However, this is exactly one of the arrangements they state on page 4, line 8-13,

> that the code requires and is exactly what Dugan and the Japanese reference are doing. The code appears to further require the use of an explosion proof motor if the motors [sic] is not placed in a pressured container. It appears this means placing the electric motor in a heavy casing without pressurization. None of applicants, Dugan or the Japanese reference as [sic] this.
>
> In conclusion, Dugan and the Japanese reference place their motors in a pressured container as applicants do. It is unclear how applicants conclude their motor is non-explosion proof and those in Dugan and the Japanese reference are explosion proof since they are all contained in pressurized containers.

(RX-94, FANUC 012277-78).

81. In the amendment dated March 16, 1992, applicants stated as follows with respect to the § 112 rejection:

> Applicants concede the need for further clarification and supplement their earlier explanation as follows. In short, the prior art sought to follow the Code as to each component of the manufactured product, whereas applicants choose not to follow this obvious route but to design the whole robot itself into an unobvious combination which will accept components thereof irrespective of their individual compliance with the Code while maintaining compliance as to the robot as a whole.
>
> Thus, Dugan applies the Code to individual non-explosion proof motors to make them individually explosion proof. Sagata neither uses explosion proof motors, nor makes them explosion proof. Sagata just blows air/gas at the source of sparking such as the brushes in a DC motor....
>
> In contrast, and in addition to other features, the combination of the applicants' invention applies the Code to individually pressurize relatively moving compartments that can contain components such as motors, cables.... Applicants' invention does not make any individual motor explosion proof a la Dugan or what may be understood from the meager, and indefinite teaching of Sagata. Furthermore, Sagata does not even indicate adequate knowledge about the Code or reference it in explaining his method of protection.

(RX-95, at FANUC 12299-12300 (emphasis in original).)

82. In the Amendment dated March 16, 1992, applicants argued:

> Applicants respond as follows to show that each reference teaches a separate item without any teaching of how the elements should be correlated or combined.
>
> Sugimoto: Motors inside robot arms
>
> Dugan: Pressurized and purged motor
>
> Fields: Uses pressurized undersea cable conduits to keep water out
>
> Buschor: Uses an inert gas
>
> Applicants comment as follows
>
> It appears that the patentability issue is confused by the terminology of 'explosion-proof motor.' It may be stated that the term is applied to an electric motor housed individually in an enclosure that either contains explosion or prevents ignition. A strong enclosure that contains an internal ignition without exploding makes the motor explosion-proof; a lighter or weaker box or enclosure that is purged and pressurized according to Code prevents ignition from being initiated and makes a motor explosion-proof. Applicants' use of "non-explosion-proof motor" means that the motor is not protected in its own merit by any of these two approaches. Applicants' invention uses "non-explosion-proof motors" and applies the Code, in addition to other novel features, to make the whole robot explosion-proof and suitable for use in explosive environments.
>
> * * *
>
> If an argument is made that each individual motor enclosure is made fluidly communicated with all other as well as cable conduits, the Code, Attachment B, requires according to [R]ule 2-2.4 (a), (b), and (c), that other provisions be made which adds complexity and cost and could render the robot inoperative.
>
> In contrast, the invention's novel features makes it possible to apply the Code to the robot, not to individual motors, in a manner

> that accommodates the particulars of a robot construction which includes relatively moving parts, and not jeopardize its performance flexibility or add prohibitive cost.

(RX-95, FANUC 012303-05.) In the March 20, 1992 amendment applicants presented amended claims 20, 21, 30, 33, 34, and 37 which correspond to claims 1, 2, 3, 4, 5, and 8 of the '218 patent. (RX-95, FANUC 012288-012297.) Attachment B to the March 16, 1992 Amendment is a copy of NFPA 496-1982. (RX-95, FANUC 012265-70; Nof, Tr. at 972.)

83. In the March 16, 1992 amendment applicants in addition stated:

> The application of the Code is well known and applied by the prior art to make conventional motors explosion-proof, such as Dugan's. There is no known prior robot art that houses multiple motors and their power supplying cables in multiple relatively moving compartments that are pressurized and purged to meet Code requirements, and be additionally protected by control elements that assures the safety of their operation in a hazardous atmosphere.
>
> The invention allows a robot powered by an electric power source, with its potential sparking capability, to operate in an explosive atmosphere with a minimum of weight, cost, and complexity and at the highest level of reliability. The prior art of robot construction had discounted such novelty and powered the robots with intrinsically safe, non-sparking power sources, such as hydraulics and pneumatics. Only Sagata suggests the use of electrical drives but his lack of reference to, and obvious conflict with, the Code, renders his method inoperative in an explosive environment despite his claim of applicability.

(RX-95, at FANUC 012305-12306.)

84. Applicants in the March 16, 1992 amendment stated as to Sagata, inter alia:

> Sagata also misapplies the Code and shuts off the electric power when the gases stop flowing. The Code, on the other hand, requires the electric power to be shut off when gases flow beyond a limit that maintain a minimum pressure of 25 Pa. inside the protected cavities. No minimum flow is required by Code (NFPA 496, Article 2-2.3.1, and Figure 2-5.6). The Code thus provides safety by maintaining the pressure inside the cavities above a

> specified limit that assures no entry of explosive gases to the inside of the protected cavities. An indication of flow in Sagata does not assure maintenance of pressure, as gases could be escaping from faulty outlets, hence, Sagata is not safe. Therefore, Sagata's method is not suitable for robot operation in a hazardous environment which is the field addressed by applicants' invention.

Applicants concluded that while the only relevant reference to an electric robot for use in a hazardous environment was Sagata, applicants' remarks show why the claimed invention is not obvious in view of Sagata. (RX-95, FANUC 012307-09.)

85. On March 20, 1992 applicants filed an "information disclosure statement" citing Japanese applications. (RX-96, FANUC 012313-18.)

86. The Examiner issued a Final Office action on June 25, 1992. In that action he allowed claims 33, 34 and 35. Claims 33 and 34 are identical to claims 4 and 5 of U.S. Patent No. 5,421,218 (RX-395) which issued on June 6, 1995 from Serial No. 613,115. RX-395 is not in evidence. The Examiner rejected claims 19, 20, 21, 30, 31, 36 and 37 as being unpatentable over Sugimoto et al in view of Dugan, Fields and Buschor as applied in his first Office Action. He further rejected claims 30 and 36 as being anticipated by Sagata and claims 19-29 as being unpatentable over Sagata in view of Turner Jr. (RX-97, FANUC 012319-26.)

87. On July 29, 1992, the Examiner issued an "Examiner Interview Summary Record." (RX-98, FANUC 012348.)

88. The '115 applicants filed an amendment after final on August 4, 1992, asserting:

> 15. Dugan applies the code to individual non-explosion-proof motors to make them, individually, explosion-proof. Applicants chose not to design each component according to code but to design the whole robot itself into a combination of components that need not, individually, comply with code.

(RX-99, FANUC 012366 (emphasis in the original).) As seen from the foregoing, applicants did

not capitalize the "C" of "code".

89. In an advisory action dated August 26, 1992, the Examiner stated that the August 4, 1992 response did not place the application in condition for allowance. (RX-100, FANUC 012374.)

90. On September 22, 1992 an "Examiner Interview Summary Record" issued which stated that applicant will be filing another amendment to obviate the 35 U.S.C. 112 problems in claims 19, 23, 24, 25 for purposes of appeal. (RX-101, FANUC 012375.)

91. On September 18, 1992, applicants filed an amendment after final action amending claims 19, 23, 14 and 25. (RX-102, FANUC 012376-8.)

92. The Examiner, in an advisory action dated September 25, 1992, stated that the September 18, 1992 amendment will be entered upon filing an appeal. (RX-104, FANUC 812380.)

93. After an Advisory Action dated August 26, 1992 (RX-100, FANUC 012374), and another amendment after final on September 21, 1992 (RX-102, FANUC 012376-78), applicants filed an appeal brief on November 13, 1992, again asserting:

> Applicants knew prior to their invention that a robot for a hazardous environment could be built with "explosion-proof" motors. This is what Dugan et al did and what the Code calls for. Thus, Dugan et al mounted his motor 17 within an airtight housing 11, 13. His improvement was to circulate air continuously, in a "closed" system, through the housing to "constantly" cool or ventilate the motor. The added structure of the housing which Dugan used to make his motor "explosion-proof" also made the motor heavier and bulky. This is the solution which Applicants knew about when they faced the problem. It is also the solution they sought to avoid by pressurizing the movable robot compartments so that "non-explosion-proof motor(s)" and "non-explosion-proof cable(s)"

could be used in their robot.

(RX-105, FANUC 012399-400.)

94. In the appeal brief dated November 13, 1992, with respect to individually pressurized robots, applicants stated "[o]ne skilled in the art would understand 'individually pressurized' in the context of the total specification to mean that rather than pressurize the robot compartments internally, each compartment could be separate from one another and provided with separate or individual tubes or hoses to pressurize each compartment individually." (RX-105, at FANUC 012387.)

95. The Board in its decision mailed April 25, 1994 found as follows with respect to the Sagata reference:

> In Sagata there is disclosed a compartmented robot with electrically movable joints, for use in a hazardous (painting environment). Sagata tells us its control system (control box 16) and robot main outer shell (10 in Figure 2, made up of the base and arms 3, 4, Figure 1) are configured to be "nearly airtight." Sagata also teaches us the pressurized application of an inert gas to the body compartment and control box and each part where there is a possibility of spark ignition. It is clear to us that one of ordinary skill in this art would have appreciated the teaching of Sagata is the application of pressurized inert gas to and around to the electrical motors which are non-explosion proof at a pressure above the ambient because it is to be continuously forced out of the robot body into the ambient and thus preventing entry of the hazardous ambient environment into the robot body. Sagata states the robot body is "nearly airtight" which in our view corresponds to the "substantially airtight" compartmented, relatively movable robot parts as claimed. As stated, Sagata forces the inert gas through and out of the system to purge and to maintain the air in the body when the robot is in use. This teaches the pressure is above the pressure of the hazardous use environment and is maintained at such elevated pressure. Claim 30 on appeal does not require a closed or sealed system. A system may be airtight and still exhaust in inert gas. This is the same as an acknowledged leak in appellants' system with flow and pressure maintained to compensate for the

"leak."

> The step or elements enumerated "read on" the steps or elements recited in appellants' claims, thus the method of claim 30 is anticipated (35 U.S.C. § 102(b)).
>
> However with respect to claim 36, while we find Sagata to teach the airtight compartments and pressurized compartment housing the electric motor above the pressure of the hazardous environment and even the individually pressurized compartments at 11', 11" and 11'", to the extent required by the appealed claim, we do not find in Sagata the teaching of housing non-explosion-proof wiring in an airtight conduit from a power source outside the hazardous environment or the supplying the non-ignitable gas to said compartment and said conduit from the outside gas source. Accordingly, we find Sagata does not anticipate claim 36.

(RX-112, at FANUC 012642-12644 (emphasis in original).) With regard to the rejection of claims 19-29 over Sagata and Turner the Board did find that Sagata does suggest certain of the claimed elements. See RX-112, at FANUC 012646-50.

96. The Board, in its decision mailed April 25, 1994, concluded as follows:

> The decision of the examiner rejecting claim 36 under 35 U.S.C. § 112, first paragraph; claims 20 and 37 under 35 U.S.C. § 112, second paragraph; claims 19-21, 30, 31, 36 and 37 under 35 U.S.C. § 103 over Sugimoto, Dugan, Fields and Buschor; claim 36 under 35 U.S.C. § 102(a) over Sagata and claims 20 and 21 under 35 U.S.C. § 103 over Sagata and Turner is reversed.
>
> The decision of the examiner rejecting claims 19 and 22-29 under 35 U.S.C. § 103 and claim 30 under 35 U.S.C. § 102(a) is affirmed.

(RX-112, FANUC 012632 -54.)

97. The Board, in its April 25, 1994 decision, reversed the Examiner's obviousness rejections that relied on Dugan in a combination stating, inter alia:

> Turning now to the rejection of appealed claims 19-21, 30,

> 31, 36 and 37 under 35 U.S.C. § 103 over Sugimoto, Dugan, Fields and Buschor; we will not sustain the rejection. It is our view that, while particular individual elements, components or concepts making up appellants' invention may have been known in the prior art, there is lacking any basis in the collection of references relied upon by the examiner and in the prior art as a whole which would have motivated the artisan to bring this diverse collection together to arrive at the appellants' claimed invention, the examiner's rationale to the contrary notwithstanding.
>
> * * *
>
> Here there is no suggestion in these prior art disclosures which would have motivated the artisan to apply to the robot of Sugimoto, which is not concerned with hazardous environment use or apparently with light weight, a pressurized motor environment system such as that of Dugan over other arrangements such as explosion proof motor.

(RX-112 at FANUC 12644-45.)

98. The '115 application claims 20, 21, 30 and 33-37 issued in U.S. Patent No. 5,421,218. (RX-395.) The administrative law judge has taken judicial notice of RX-345 which was identified by respondents but is not in evidence.

F. Serial No. 08/343,228

99. Application Serial No. 08/343,228 filed on November 22, 1994 ("the '228 application") was a continuation of the '115 application. (RX-127, FANUC 003856-63.)

100. The '228 application issued as U.S. Patent No. 6,477,913 on November 12, 2002 (the '913 patent) which is the patent in issue. (RX-8.)

101. In a preliminary amendment filed November 22, 1994, the '228 applicants continued the prosecution of claims 19 and 22-30 of the '115 application whose rejections were sustained by the Board in the prior '115 application. (RX-131, FANUC 003864-73.) In the

preliminary amendment applicants presented, inter alia, claims 47, 48, 49 and 50 which became claims 27, 28, 29 and 30 and which correspond to claims 10, 11, 12 and 13 of the '913 patent. (CX-1).

102. With respect to rejected claims 19 and 22-30 of the '115 application, new claims 38-51 were and those claims were renumbered by the Examiner to be new claims 18-31 (RX-132) of the '228 application with renumbered claims 27, 28, 29, 30 later further renumbered to be claims 10, 11, 12 and 13 which correspond to patent claims 10, 11, 12 and 13 in issue. (RX-131; CX-1.)

103. New claims 47, 48, 49, 50 originated in the preliminary amendment filed November 22, 1994 in the '115 application and later were renumbered to claims 27, 28, 29 and 30 and eventually became claims 10, 11, 12 and 13 of the '913 patent. (RX-131, FANUC 003868-71.)

104. The specification of the '913 patent is the same as that of the '745 and '218 patents, all of which are part of the prosecution history. (CX-1; CX-103; CX-104.)

105. On February 9, 1995, applicants filed a "Declaration under 37 C.F.R. § 1.131 Of Prior Invention To Overcome Cited Publications." The declaration, signed by named inventor Akeel, stated:

> 8. Prior to May 28, 1984, I conceived in this country the application of pressurized inert gas to and around electrical motors which are non-explosion-proof at a pressure above the ambient in relatively moving compartments of a robot, thus preventing entry of the hazardous ambient environment into the robot body.

(RX-130, FANUC 003727-4131.)

106. An Office Action issued on June 20, 1995, rejecting the claims 18-31 under 35 U.S.C. § 102 over Sagata, and under 35 U.S.C. §103 over the combination of Sagata (RX-11) and Turner (USP 4,547,120) (RX-21), the combination of Lehmann (RX-16), Buschor (RX-17), and Fields (USP 4,149,935) (RX-18), the combination of Sugimoto (RX-13), Clarke (USP 4,278,046) (RX-20), Fields, and Buschor, and the combination of Lehmann, Buschor, Fields, and Dugan. (RX-132, FANUC 003874-83.)

107. In the Office Action of June 20, 1995, in rejecting claims 27, 28 and 29 over Sugimoto et al in view of Clark et al, Fields et al and Buschor, the Examiner stated:

> Sugimoto discloses motors mounted in robotic elements and these elements connected to provide a base, arm and wrist structure. For example, note figure 3 and 6.
>
> Clarke teaches using a robot in a hazardous environment.
>
> Fields teaches providing an air tight robot structure in a hazardous environment and passing air through the structure from a remote source to avoid danger. See Fields, column 13, lines 1-10.
>
> Buschor discloses the use of inert gas as the medium in a hazardous system.
>
> It would have been obvious to use the robot in Sugimoto in a hazardous environment in view of the teaching in Clarke and to provide a sealed system as claimed by applicants' in view of the teaching in Fields. It would further have been obvious to use inert gas in view of the teaching in Buschor.

(RX-132, FANUC 003879.) As seen from the foregoing, the Examiner dropped Dugan et al as prior art with respect to any motor element.

108. In the Office Action of June 20, 1995, claims 18-31 were rejection on double patenting over the claims of U.S. Patent No. 4,984,745. (RX-395.) The Examiner stated that

"[a]lthough the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims are broader versions of the patented claims and would prohibit practice of the patented invention once their terms expired of allows." (RX-132, FANUC 003880.)

109. The Office Action of June 20, 1995 found the 131 affidavit not "persuasive." The Examiner did suggest that applicants specifically point out the particular parts of the exhibits which support each claimed feature of the invention. (RX-132, FANUC 003881.)

110. Applicants filed a Supplemental Rule 131 Declaration by Akeel on December 20, 1995 in which Akeel supplemented his February 9, 1995 declaration in response to the "Examiner's suggestion." (RX-137, FANUC 003895-3908.)

111. Applicants, in an amendment filed December 20, 1995, amended claims 18, 19, 27 and 28 and added new claims 32-41. New claims 32-41 are substantially identical to claims 15-24 of the '913 patent. (RX-139, FANUC 003927-53.) In said amendment claims 18, 19, 32, 33, 34, 35, 36, 37, 38, 39, 40 and 41 correspond to claim 1, 2, 15, 16, 17, 18, 19, 20, 21, 22, 23, and 24 of the '913 patent. (CX-1; (RX-139, FANUC 003928-34.)

112. Applicants, in the amendment filed December 20, 1995, as to Clark, argued:

> Clarke uses a paint spraying apparatus in a hazardous environment, but objects to the Examiner's characterization of each apparatus as a "robot." The shortcoming of Clarke is its use of heavy, bulky, code-dictated motors rather than Applicants' lightweight, compact, non-explosion-proof electric motors. Clarke, for instance, states that "Each of the spray guns 17 and 18 is driven in its reciprocating stroke by a certified flame proof motor [and] . . . [t]he motor used to raise and lower the arm 19 on the top spray gun machine is pneumatically operable." (Column, 3 and 4, lines 18 to 3, respectively.)

(RX-139, FANUC 003943.)

113. Applicants, in the amendment filed on December 20, 1995, characterized the Office Action of June 20, 1995 as follows:

> In the Office Action, the Examiner rejected claims 30 and 31 under 35 U.S.C. § 112, first paragraph, rejected claim 27 under 35 U.S.C. § 102(a) as being anticipated by Japanese Patent Application No. 59-92053 (JP '053); rejected claims 18-26 and 28-31 under 35 U.S.C. § 103 as being unpatentable over JP '053 and Tuner, Jr. et al (U.S. Patent No. 4,547,120); rejected claims 19-24 and 26-29 under 35 U.S.C. § 103 as being unpatentable over Lehmann (U.S. Patent No. 3,606,162), Buschor (U.S. Patent No. 4,555,216), and Fields et al. (U.S. Patent No. 4,149,935); rejected claims 18-24 and 26-29 under 35 U.S.C. § as being unpatentable over Sugimoto et al. (U.S. Patent No. 4,507,046), Clarke (U.S. Patent No. 4,278,046); Fields et al., and Buschor; rejected claim 25 under U.S.C. § 103 as being unpatentable over Lehmann, Buschor, Fields et al., and Dugan et al. (U.S. Patent No. 3,447,000); and rejected claims 18-31 as being unpatentable over the claims of U.S. Patent No. 4,984,745 under the doctrine of obviousness-type double-patenting.

(RX-139, FANUC 003934.)

114. Applicants, in the amendment filed on December 20, 1995 as to the Examiner's rejection of claims 19-24 and 26-29 under 35 U.S.C. § 103 stated, inter alia:

> The Examiner states:
>
> > It would have been obvious to one having ordinary skill in the art at the time of Applicants' invention desiring to enhance the safety of Lehmann's device to provide openings between the sections and a source of inert gas at a high pressure to the interior of Lehmann structure in view of the teachings in Buschor (column 5, lines 1735) and to provide a source and controls in Lehmann outside of the harzardous environment in view of the teaching in Fields.

First, the robot described in Lehmann is not adapted for use in a "hazardous environment" nor is any robot resulting by combining the teachings with Buschor or Fields et al. The term "hazardous environment" is defined by Article 500 of NFPA 70 of the National Electrical Code and is mentioned at page 4 of the specification. As noted at page 4, to comply with the Article, electrical equipment must be placed in pressurized containers or must be made explosion-proof. The pressurization of the enclosure entails supplying the enclosure with clean air or inert gas, with or without continuous flow at sufficient pressure to prevent the entrance of combustible gases or vapors which might be communicated into the enclosure. The occasional reference in Lehmann to the various enclosures being dust-proof is not equivalent to the airtight compartments of the present invention as now claimed. That the Lehmann structure is not designed to be immersed in a hazardous environment is evidenced by the fact that the controller is in the same environment presumably safe for workers who operate the controller, and Figure 4 depicts the robots in a production line from which Applicants infer the environment is controlled to avoid having the robots subjected to hazardous vapors.

* * *

Sugimoto et al, however, does not even suggest that any gas be supplied to protect his motors. Thus, one would need to completely redesign Sugimoto et al's robot to accommodate the certified flameproof motors of Clarke, and there is no guidance in Sugimoto et al. on how this should be done or even that it should be done. More importantly, the "pressurizing means" in Applicants' robot assembly is for supplying sufficient non-ignitable gas to the motor compartment at a pressure above the hazardous environment:

> i) to prevent the entrance of gases from the hazardous environment to said compartment and to compensate for any leakage from the compartments, and, if desired; and
>
> ii) to purge such gases if they're already in the compartment before the compartment is pressurized.

> This result is certainly not an obvious extension of Clarke's teaching that certified flameproof motors be used and paint spraying apparatus, or Buschor's teaching that his chamber may be a partial vacuum, or Fields et al.'s teaching that the electrical conductors for motors in an underwater inspecting apparatus be carried in air pressurized conduits to seal water from the conductors whereby to avoid use of special components. Thus, Fields et al. may protect against electrical shorts – but not explosions.
>
> Assuming arguendo (and without such guidance) that one seeks to adapt Sugimoto et al. for use in a hazardous or explosive environment (also lacking in Sugimoto et al.) and turns first to Clarke for a solution. He substitutes Clarke's certified flameproof motor or pneumatic motor for Sugimoto et al's motors 6, 10, and 14. What he gets are code-dictated motors which make the robot heavy and bulky. Applicants believe the skilled practitioner would look at Sugimoto et al. and logically conclude that Clarke's motors are not an acceptable substitute because the requirements of the Code could be expected to add bulk, weight and expense to each motor needed. Simply put, the prior art teaches against the combination.

(RX-319, FANUC 003938-39, 003946-47.)

115. In an Patent Office communication dated April 1, 1996, the Examiner informed applicants that the December 20, 1995 response was incomplete and indicated that applicants had one month to complete the response. (RX-142, FANUC 003989.)

116. In an "Examiner Interview Summary Record" dated April 11, 1996, in was stated that the "Examiner reiterated the need for applicants to point out the claim language which defines over the art of record." (RX-143, FANUC 003990.)

117. On April 29, 1996, applicants filed a supplemental response. (RX-144, FANUC 003991-97.)

118. The Examiner in an Office Action dated August 19, 1996, rejected claims 18-41

on double patenting in view of the '745 patent and on prior art. Dugan et al was only relied on by the Examiner with respect to claim 25, the Examiner stating that it would have been obvious to provide a pressure detecting means in view of Dugan. (RX-145, FANUC 003998-4006.)

119. On January 21, 1997, applicants filed a notice of appeal from the Examiner's final rejection of claims 18-41. (RX-147, FANUC 004008.)

120. The Examiner's Answer was dated October 29, 1997. In the answer the Examiner, inter alia withdrew his rejections of claims 18-41 on Sagata Japanese Patent Application No. 59-92053 in view of "appellants' arguments set forth on pages 13-20 in the brief." (RX-154, FANUC 004326.) Such action eliminated the rejection on claim 31 which became claim 14 of the '913 patent in issue. (RX-131, FANUC 003871.) The Examiner did reiterate his double patenting rejection of claims 18-41 over the claims of U.S. Patent No 4,984,745. (RX-395.) Applicants' appeal brief at 17-20 extensively argued that Sagata is not prior art. See RX-152, FANUC004202-4205.

121. Applicants in the appeal brief characterized claim 31 as further reciting venting means for relieving excess pressure above the maximum predetermined limit in the compartments, the "venting means of claim 31 ... intentionally placed in the robot so as to better control the purge rate and the path through which hazardous gases are expelled from the robot. Page 14, lines 7-17." (RX-151, FANUC 004031.) Applicants in the appeal brief, as to the rejection of claims 18-26, 28-34, 36, 38, 40 and 41 under 35 U.S.C. § 103 over JP '053 in view of Turner, Jr. et. al., argued that the Examiner had refused to acknowledge that the invention of the claimed robot and method occurred prior to the date JP '053 was published. (RX-151, FANUC 004222-23.)

122. The Board in a decision (DECISION) mailed January 9, 2002, as for the double patenting rejection, stated that appellants were not appealing the rejection and have offered to submit a terminal disclaimer. (RX-166, FANUC 004070.)

123. The oard in its DECISION stated that appellants' "invention relates to electrically driven robots adapted for use in hazardous ambients and, in particular, electrically driven robots which can operate in an environment containing flammable gases or vapors (specification, page 1)." (RX-166, FANUC 004468.)

124. The DECISION characterized the following rejections on art:

> (2) Claims 18-24, 26-29 and 32-41 under 35 U.S.C. § 103 as being unpatentable over Sugimoto in view of Clarke, Fields and Buschor;
>
> (3) Claims 19-24, 26-29 and 35-41 under 35 U.S.C. § 103 as being unpatentable over Lehmann in view of Buschor and Fields;
>
> (4) Claims 25 under 35 U.S.C. § 103 as being unpatentable over Lehmann in view of Buschor, Fields and Dugan.

(RX-166, FANUC 004469.)

125. Claims 18-29 and 32-41 on appeal are set forth in appendix A of applicants' appeal brief. (RX-151, FANUC 004243-4251.) Contrasting the claims on appeal with the claims of the '913 patent, appealed claims 18-29 of the DECISION correspond respectively to patent claims 1-12, while appealed claims 32-41 of the DECISION correspond respectively to patent claims 15-24. (CX-1.) The claims in issue are claims 10, 11, 12, 14, 18, 19, 20, 21, 22, 23 and 24 as well as claim 13. Patent claims 10, 11, 12, 14, 18, 19, 20, 21, 22, 23 and 24 correspond respectively to claims 27, 28, 29 and 31, 36, 35, 37, 38, 39, 40 and 41 on appeal in the DECISION. Patent claim 13 in issue was not on appeal because the Examiner had found a claim

that corresponded to patent claim 13 allowable. (See also RX-131, FANUC 003868-71; RX-139, FANUC 003928-53; CX-1.)

126. The DECISION reversed all the art rejections made by the Examiner. (RX-166, FANUC 004482.)

127. The following is the portion of the DECISION reversing the Examiner (RX-166, FANUC 004470-004482):

> Rejection (2)
>
> Sugimoto, the examiner's primary reference in this ground of rejection, pertains to an electrically driven articulated industrial robot. The robot arm comprises a plurality of interconnected arm portions, each having one or more motors, and a series of gear trains interconnecting the motors to an adjacent arm portion to effect relative movement about various axes. Sugimoto is silent as to whether the motors and cables used are non-explosion-proof motors and cables, whether the compartments for the motors comprise airtight. chambers, whether the compartments for the motors are in fluid communication, whether the compartment for the motors are subjected to a positive pressure relative to ambient to prevent the entrance of ambient gases into the chambers, and what type of environment the robot is intended to be used in. The examiner relies upon Sugimoto for a showing of "motors mounted in robotic elements and these elements connected to provide a base, arm and wrist structure" (answer, page 5).
>
> Clarke pertains to a paint spraying apparatus having an automatic control means comprising two parts. The first part provides programmable control means for determining a desired sequence of operation, and the second part provides means for determining the position of the spray gun. An objective of Clarke is the provision of the second part of the control means within the hazardous atmosphere of the paint spraying booth itself (column 1, line 39, through column 2, line 2). The examiner relies on Clarke for its teaching of using a robot in a hazardous environment.
>
> Fields is directed to pressurized cabling and junction boxes for a nuclear reactor vessel inspection apparatus. In pertinent part,

Fields discloses (Figure 2) a submersible inspection apparatus 14 for inspecting the welds of a nuclear reactor vessel, 10. With further reference to Figures 3, 9 and 23, the inspection apparatus includes a manipulator arm 26 having a series of arm portions mounted for movement relative to one another, and an overall control system 30 (Figure 23) wherein the apparatus includes an assortment of motors, resolvers and cabling (paragraph spanning columns 4 and 5). Of interest to the examiner is Fields' use of a pressurized underwater junction box 208 and conduits (Figures 15 and 23) to route cabling from the control system 30 to the arm portions of the manipulator arm. As explained by Fields at column 12, line 23, through column 13, line 10, the use of pressurized junctions and conduits avoids the need for using specialized equipment particularly suited for an underwater operating environment: According to the examiner, Fields "teaches providing an air tight robot structure in a hazardous environment and passing air through the structure from a remote source to avoid danger" (answer, page 5).

Buschor relates to a work piece positioning mechanism comprising a movable arm 12 having a plurality of joints for moving semiconductor wafers and similar work pieces which are prone to damage by contamination. Flexible bellows and. tubing surround the joints of the mechanism so that grease or metal particles from the joints do not contaminate the work pieces. The flexible bellows provide one or more sealed chambers for the joints. As explained by Buschor at column 6, lines 23-27, "[a] pressure different than atmospheric is maintained in the sealed chambers. This pressure may either be less than atmospheric, i.e., a partial vacuum, or it may be greater than atmospheric, such as nitrogen or other inert gas under pressure." The examiner relies on Buschor for its teaching of using an inert gas as the medium in a hazardous system.

With respect to claims 18, 19, 27-29, 35, 37 and 39, the independent claims under rejection, the examiner's [sic] states (answer, page 5):

> It would have been obvious to use the robot in Sugimoto in a hazardous environment in view of the teaching in Clarke and Fields and to provide a sealed system as claimed by applicant's [sic] in view of the teaching in Fields. It would further have been

> obvious to use inert gas in view of the teaching in Buschor.

The examiner further states on page 9 of the answer that Clarke is utilized "only for its teaching that robots can be used in hazardous environments" and that Buschor is used "only for its teaching of using an inert gas in a robot arm."

Further enlightenment as to the examiner's position is found on pages 8 and 9 of the answer, wherein the examiner explains:

> . . . Fields is utilized for his teaching of providing an airtight robot structure in a hazardous environment and passing air through the structure from a remote source to avoid danger. . . . The motivation to combine in the instant rejection comes from both the teaching in Fields and the dictates of the code. The Board's attention is directed to appellant's [sic, appellants'] comments on page 34 of their brief wherein it is stated that the code required the use of pressurized containers or explosion proof containers. See page 34, lines 16, 17, of the brief. [Footnote 4] This dictate which is common knowledge to one having ordinary skill in the art, would be sufficient motivation to an artisan to use the system in Fields in the robot of Sugimoto to prevent a hazard if desiring to use the robot in a hazardous environment. Appellant[s] would have the Board [believe] that it was their idea to use pressurize[d] containers and also their idea to use a pump, conduit, seals and housings connected together to avoid a hazardous environment from reaching wiring and motors. However, Fields teaches and the code dictates the first and Fields teaches the second.

[Footnote 4 supra reads:

> We consider the examiner's reference here to "the code" and "the dictates of the code" as being directed to the discussion on pages 4 and 5 of appellant's specification as to how artisans have in the past addressed certain code requirements governing the use of electrical equipment in hazardous environments.]

Like appellants, after reviewing the combined teachings of the applied references, we find no basis in the applied prior art that would appear to have suggested the claimed subject matter defined in independent claims 18, 19, 27-29, 35, 37 and 39 to a person having ordinary skill in the art. As alluded to above, Sugimoto is deficient in many respects when compared to the subject matter called for in the independent claims under rejection. For example, the robot arm of Sugimoto is not disclosed as being adapted for exposure to an explosive or hazardous atmosphere, as called for in one form or another in each of claims 18, 19, 27-29, 35, 37 and 39. Also, Sugimoto's robot arm is not disclosed as being provided with airtight chambers having fluid communication therebetween (claims 18, 19, 28), or non-explosion-proof electric motors and/or cabling (claims 18, 28, 29, 35, 37), or gas supply means connected to chambers for supplying gas thereto at a pressure above atmospheric or ambient (claims 18, 19, 28, 29, 35, 37). In addition, Sugimoto is not directed to a method of driving compartmented robot arm parts by non-explosion-proof motors housed in airtight compartments by supplying clear air or inert gas to the compartments at a pressure above ambient (claim 27), or to a method of operating a robot in an explosive environment by providing clean air, an inert gas, or other non-ignitable gas at a pressure higher than the explosive environment to first and second compartments each having a non-explosion-proof motor (claim 39). In short, Sugimoto appears to disclose little more than a basic, unembellished robot arm upon whose framework the examiner seeks to reconstruct the claimed subject matter.

As to the secondary references, Fields does not appear to be particularly concerned with potential explosions from a sparking motor or cable, which may explain why Fields makes no mention of whether the motors used therein are explosion-proof motors or non-explosion-proof motors. Concerning Buschor, its teaching at column 6, lines 23-26, that the sealed chambers thereof may be maintained at a pressure that is either less than atmosphere (i.e., partial vacuum) or greater than the atmosphere is no clear teaching of keeping hazardous (explosive) gases out so that non-explosion-proof motors and cabling may be utilized. In addition, as aptly noted by appellants on page 31 of the main brief, Buschor does not even include motors or cables in the arm itself. Finally, Clarke's principle concern for placing a part of the programmable control within the hazardous atmosphere of the paint spraying booth itself would appear to be of little relevance to

the obviousness issue at hand.

We agree with the examiner that it would have been obvious, as a general principle, based upon code requirements for example, to adapt the robot arm of Sugimoto for use in an explosive environment. However, the examiner has not adequately explained, and it is not apparent to us, where suggestion is found in Fields or the other secondary references relied upon, or in the discussion on pages 4 and 5 of appellants' specification of certain code requirements governing the use of electrical equipment in hazardous environments; for what we perceive to be the extensive modifications of Sugimoto that would be required in order to arrive at the claimed subject matter. In addition, the examiner's rejection is deficient in that it does not specifically point out the differences between the appealed claims and Sugimoto, or how Sugimoto is to be modified, or how the modified Sugimoto robot arm would meet the limitations of the various independent claims included in this ground of rejection. In this regard, the examiner's broad statement that it would have been obvious "to use the system in Fields in the robot of Sugimoto to prevent a hazard if desiring to use the robot [of Sugimoto] in a hazardous environment" (answer, page 8) is not sufficient.

In our opinion, given the disparate nature of the applied reference teachings, the suggestion to combine them in the particular manner necessary to meet the limitations of appellants' claims is provided only via the hindsight accorded one who first viewed appellants' invention. This, of course, is not permissible. As our Court of review indicated in In re Fritch, 972 F.2d 1260, 1266 n.15, 23 USPQ2d 1780, 1783-84 n.15 (Fed. Cir. 1992), it is impermissible to use the claimed invention as an instruction manual or "template" to piece together isolated disclosures and teachings of the prior art so that the claimed invention is rendered obvious.

In light of the foregoing, we shall not sustain the standing § 103 rejection of claims 18-24, 26-29 and 32-41 as being unpatentable over Sugimoto in view of Clarke, Fields and Buschor.

Rejection (3)

Lehmann, the examiner's starting point in this ground of rejection, is directed to a programmable spraying apparatus for automatically applying a uniform coating to work pieces of

> complicated shape. The apparatus includes a spray gun 1 mounted in a carrier head 2 for rocking movement about a horizontal axis, a vertically adjustable lifting stand 4 supporting the carrier head, and a horizontally adjustable base 5 for supporting the lifting stand. Motors are provided for moving the above component relative to one another, said motors being under the control of a programmable control device 9. Protective housings 7, 16 and bellows 17 seal the components of the apparatus in a dust-tight manner (column 4, lines 6-9).

In rejecting claims 19-24, 26-29 and 35-41 as being unpatentable over Lehmann in view of Buschor and Fields, the examiner states (answer, page 6):

> It would have been obvious to one having ordinary skill in the art at the time'of applicants' invention desiring to enhance the safety of Lehmann's device to provide openings between the sections and a source of inert gas at a high pressure to the interior of [the] Lehmann structure in view of the teaching in Buschor (column 6, lines 17-35) and Fields (column 13, liens 1-10) and to provide a source and controls in Lehmann outside t he hazardous environment in view of the teaching of Fields.

The examiner further explains the rejection on pages 9 and 10 of the answer as follows:

> First[,] the robot in Lehmann is used in the same type of environment in which appellants' [sic] intend to use their robot, i.e., a painting environment. Thus it is used in a hazardous environment. Second[,] Buschor teaches using a high pressure inert gas to prevent a mixing between the environment and the inside of the robot. See Buschor, column 6, lines 17-35. Third, Fields teaches using high pressure, conduits, seals and boxes, all connected in series, to prevent the environment from invading the wiring and motors of the robot arms. See Fields, column 13, lines 1-10. Further Fields also uses a control located outside the hazardous environment. It is the examiner's position that one of ordinary skill in the art would modify the robot in Lehmann as claimed by appellants if

desiring to enhance the safety of Lehmann's robot in view of the teachings in Buschor and Fields.

Our main difficulty with the examiner's proposed combination is the lack of any recognition in the combined teachings of the applied references of utilizing component parts of the robot arm to provide a pressurized environment for non-explosion-proof motors and cabling, which we perceive to be the core principle of appellants' invention. In this regard, even if we assume that the environment in which Lehmann's apparatus operates is a hazardous environment, there is no basis for concluding that the housings for the various components and motors are substantially airtight, as called for in independent claims 19, 27 and 28. Moreover, there also is no basis for concluding that Lehmann's motors are non-explosion-proof motors, as called for in independent claims 27-29, 35, 37, 39. In addition, there is no basis for concluding that the chambers formed by the various housing and bellows of Lehmann are in fluid communication, as required by independent claims 19, 28 and 29. As to Buschor, the thrust of this reference is the provision of flexible bellows and tubing around the arm components to keep grease and metal particles from the arm joints in, so as prevent contamination of .the work pieces, rather than to keep gases or vapors of a hazardous environment out, so as to combat potential explosions from a sparking motor or cable. It is for this reason that we are in accord with appellants' argument to the effect that Buschor's teaching at column 6, lines 23-26, that the sealed chambers thereof may be maintained at a pressure either above or below atmospheric is not a clear teaching of keeping hazardous (explosive) gases out so that non-explosion-proof motors and cabling may be utilized. Furthermore, Buschor does not disclose motors housed in the arm itself, much less non-explosion-proof motors housed in the arm. Fields, being an underwater weld-inspection device, also does not appear to be concerned with potential explosions in a hazardous environment.

Based on our analysis of the applied reference teachings, it is once again our opinion that the only suggestion for combining selected pieces from the applied references together in a manner that would result in the subject matter of the appealed claims is through the luxury of hindsight accorded one who first viewed the appellants' disclosure. It follows that we shall not sustain the standing § 103 rejection of claims 19-24, 26-29 and 35-41 as being unpatentable over Lehmann in view of Buschor and Fields.

Rejection (4)

The examiner's rejection of claim 25 as being unpatentable over Lehmann, Buschor, Fields and further in view of Dugan also

> is not well taken. Simply put, the additional teachings of the Dugan reference applied in this rejection do not render obvious what we have found to be lacking in Lehmann, Buschor and/or Fields. The rejection of claim 25 therefore shall not be sustained.

(RX-166, FANUC 004470-82.)

128. Rejection (4) of the DECISION was the only rejection in which the Examiner used Dugan et al and involved only claim 25. Appealed claim 25 corresponds to patent claim 8 which is not in issue. (RX-151, FANUC 004246, CX-1.) The DECISION did not sustain the Examiner's rejection. (RX-166, FANUC 004482.)

129. The DECISION found that the robot arm in independent claims 27-29 (patent claims 10-12 in issue), independent claim 35 (patent claim 18 in issue) independent claims 37 and 39 (patent claims 20 and 22 in issue) is adapted for exposure to an explosive or hazardous atmosphere in one form or another. It also found that independent claim 28 (patent claim 11 in issue) provides for airtight chambers having fluid communication therebetween; that independent claims 28, 29, 35 and 37 (patent claims 11, 12, 18 and 20 in issue) have non-explosion-proof electric motors and/or cabling; that independent claims 28, 29, 35, 37 (claims 11, 12, 18 and 20 in issue) have a gas supply means connected to chamber for supplying gas thereto at a pressure above atmospheric or ambient; that method claim 27 (patent claim 10 in issue) is directed to a method of driving compartmented robot arm parts by non-explosion-proof motors housed in airtight compartments by supplying clear air or inert gas to the compartments at a pressure above ambient; that method claim 39 (patent claim 22 in issue) is to a method of operating a robot in an explosive environment by providing clean air, an inert gas, or other non-ignitable gas at a pressure higher than the explosive environment to first and second compartments each having a

non-explosion-proof motor. (RX-166, FANUC 004475.)

130. The DECISION perceived that the core principle of the claimed invention involves utilizing component parts of the robot arm to provide a pressurized environment for non-explosion-proof motors and cabling. (RX-166, FANUC 004480.) It found that independent claims 27 and 28 (claims 10 and 11 in issue) have housings for the various components and motors which are substantially airtight; that independent claims 27-29, 35, 37 and 39 (patent claims 10-12, 18, 20 and 22 in issue) call for non-explosion-proof motors; and that independent claims 28 and 29 (patent claims 11 and 12) have chambers formed by housings in fluid communication. (RX-166 FANUC 004480.)

131. The DECISION found that the claimed subject matter on appeal involves "keeping hazardous (explosive) gases out so that non-explosion-proof motors and cabling may be utilized and "non-explosion-proof motors housed in the arm." (RX-166 FANUC 004481.)

132. The DECISION rejected a Fields reference "being an underwater weld-inspection device ... [because it] does not appear to be concerned with potential explosions in a hazardous environment." (RX-166 FANUC 004481.)

133. The '913 patent issued on November 12, 2002. (CX-1.)

CONCLUSIONS OF LAW

1. The Commission has in rem jurisdiction and in personam jurisdiction.

2. There has been an importation of certain accused electric robots and components thereof, which are the subject of the alleged unfair trade allegations.

3. An industry does exist in the United States, as required by subsection (a)(2) of section 337, that exploits certain electric robots and components thereof that are covered by the '913 patent.

4. Respondents' accused products do not infringe any of the asserted claims.

5. The asserted claims of the '913 patent are not invalid.

6. The '913 patent is enforceable.

7. There is no violation of section 337.

8. If the Commission should find a violation, the record supports issuance of limited exclusion orders, and a 40 percent bond rate during the Presidential review period.

ORDER

Based on the foregoing, and the record as a whole, it is the administrative law judge's Final Initial Determination that there is no violation of section 337 in the importation into the United States, sale for importation, and the sale within the United States after importation of certain electric robots and components thereof. It is also the administrative law judge's recommendation that, if the Commission should find a violation, limited exclusion orders should issue and a 40 percent bond rate should be imposed, during the Presidential review period.

The administrative law judge hereby CERTIFIES to the Commission his Final Initial and Recommended Determinations together with the record consisting of the exhibits admitted into evidence. The pleadings of the parties filed with the Secretary and the transcript of the pre-hearing conference and the hearing, are not certified since they are already in the Commission's possession in accordance with Commission rules.

Further it is ORDERED that:

1. In accordance with Commission rule 210.39, all material heretofore marked in camera because of business, financial and marketing data found by the administrative law judge to be cognizable as confidential business information under Commission rule 201.6(a) are 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 final initial and recommended determinations which contain bracketed confidential business information to be deleted from any public version of said determinations no later than January 13, 2006. Any such bracketed version shall not be served by fax on the administrative law judge. If no such bracketed version is received from a party it will mean that

the party has no objection to removing the confidential status, in its entirety, from these initial and recommended determinations.

3. The initial determination portion of the Final Initial and Recommended Determinations, issued pursuant to Commission rule 210.42(h)(2), shall become the determination of the Commission forty-five (45) days after the service thereof, unless the Commission within that period shall have ordered its review of certain issues therein or by order has changed the effective date of the initial determination portion. The recommended determination portion, issued pursuant to Commission rule 210.42(a)(1)(ii), will be considered by the Commission in reaching a determination on remedy and bonding pursuant to Commission rule 210.50(a).

Paul J. Luckern
Administrative Law Judge

Issued: December 19, 2005

CERTAIN ELECTRIC ROBOTS AND COMPONENT PARTS THEREOF

Investigation No. 337-TA-530

CERTIFICATE OF SERVICE

I, Marilyn R. Abbott, hereby certify that the attached **Public Version Final Initial and Recommended Determinations** was served by hand upon Commission Investigative Attorney Kevin Baer, Esq. and upon the following parties via first class mail, and air mail where necessary, on March 10, 2006.

Marilyn R. Abbott, Secretary
U.S. International Trade Commission
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