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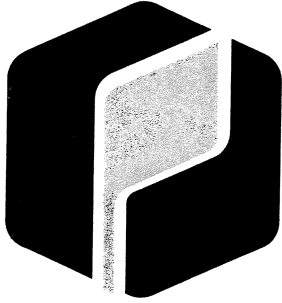
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Precision Castparts Corp.

INDUCTION MELTING OF TITANIUM ALLOY D

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INDUCTION MELTING OF TITANIUM ALLOY D

PATENT SECRECY NOTICE

Material in this publication relating to INDUCTION MELTING OF TITANIUM ALLOY D reveals subject matter contained in U.S. Patent Application Serial No. 815,607 which has been placed under Secrecy Order, and the material must be protected accordingly. The notice is attached.

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Precision
Castparts
Corp.

September 28, 1987

Mailing Address:

4600 S.E. Harney Drive
Portland, Oregon 97206-0898

Telex 36-0992
Telecopier 503-777-7324

Enclosed is a copy of the report documenting work on the induction melting of Alloy D (Alloy C except 1% C).

Please notice that this is proprietary material to PWA and PCC. Information among PWA and PCC employees exists on a need-to-know basis only. These controls are in place to comply with Patent Secrecy Order No. 815,607. A copy of this document is enclosed.

Sincerely,

Jim Barrett
Parts Engineer
Advanced Engineering Group

JB:cc:Ti89759/8451

cc: Ron Erickson
Bill Barice
Steve Soltesz
John Thorne
Jim Barrett



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F-5506

Serial No. 815,607

Filed 01/02/86

MAILED

Applicant DOUGLAS M. BERCIK

Date of Issuance of
Secrecy Order

JUN 25 1986

GROUP 220

SECRECY ORDER

(Title 35, United States Code (1952), Sections 181-188)

NOTICE: To the applicant(s), heirs of applicant(s), and any and all assignees, attorneys and agents, hereinafter designated principals.

This application has been made available to defense agencies for inspection under the provisions of 35 U.S.C. 181, 37 CFR 5.1, copy attached.

The Patent and Trademark Office has been notified by the Armed Services Patent Advisory Board, Department of Defense, Washington, D.C., that disclosure or publication of the subject matter in this application by granting a patent would be detrimental to the national security. The Department of Defense agency that has requested a secrecy order be issued on the subject matter of this application is COMMANDER U.S. ARMY

DEVELOPMENT AND READINESS COMMAND ATTN: DRGGC-LO
(PAT JAMES) 5001 EISENHOWER AVE. ALEXANDRIA, VA 22333

Any questions you may have concerning their request should be directed to them.

Accordingly, this secrecy order is issued pursuant to 35 U.S.C. 181. When a secrecy order issues, the law specifies that the subject matter or any material information relevant to this application, including unpublished details of the invention, shall not be published or disclosed to any person not aware of the invention prior to the date of this order, including any employee of the principals. The law requires that all information material to the subject matter of this application be kept secret, unless written permission to disclose is first obtained from the Commissioner of the Patent and Trademark Office. The penalties for unauthorized disclosure or publication of the invention or relevant material information are described in 35 U.S.C. 182 and 186.

If you believe that certain existing facts or circumstances would render this secrecy order ineffectual, you may contact the above identified Department of Defense agency informally to discuss these facts or formally petition the Commissioner to rescind the order. You may also petition the Commissioner for a permit to disclose or modify the secrecy order stating fully the reason or purpose for disclosure or modification. The law also provides that if an appeal is necessary, it may be taken to the Secretary of the Department of Commerce under the provisions of 37 CFR 5.8.

Any petition or appeal should be addressed to the Commissioner, Patent and Trademark Office, Attention: Licensing and Review, Washington, D.C. 20231.

Secrecy Order

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-2-

Any other application already filed or hereafter filed which contains any significant part of the subject matter of this application falls within the scope of this order. Such other application and the common subject matter should be brought to the attention of the Security Group, Licensing and Review, Patent and Trademark Office, if the other application is not under secrecy order.

If, prior to the issuance of the secrecy order, any significant part of the subject matter or material information relevant to this application has been revealed to any person, the principals must promptly inform such person of the secrecy order and the penalties for improper disclosure. If such part of the subject matter was disclosed to any person in a foreign country or foreign national in the U.S., the principals must not inform such person of the secrecy order, but instead must promptly furnish to the Commissioner of Patents and Trademarks the following information to the extent not already furnished: date of disclosure; name and address of the disclosee; identification of such part; and any authorization by a U.S. government agency to export such part. If the subject matter is included in any foreign patent application or patent, this should be identified.

This order should not be construed in any way to mean that the Government has adopted or contemplates adoption of the alleged invention disclosed in this application; nor is it any indication of the value of such invention.

A copy of Chapter 17, U.S. Code and Part 5 of 37 Code of Federal Regulations is enclosed for your information.

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This secrecy order may be renewed for additional periods of not more than one year upon notice by a government agency that the national interest so requires. You will be notified of any such renewal.

The expiration of or failure to renew this secrecy order does not lessen in any way the responsibility of the principals for the security of the subject matter if subject to the provisions of Executive Order 12356 or the Atomic Energy Act of 1954, as amended, 42 U.S.C., Section 141 et. seq. and 42 U.S.C., Section 2161 et. seq. or other applicable law unless the principals have been expressly notified that the subject patent application has been declassified by the proper authorities and the security markings have been authorized to be canceled or removed.

Please feel free to contact me if you have any questions.


Kenneth W. Cagle
Director, Special Laws Administration Group

Enclosures: Chapter 17, 35 U. S. Code and 37 CFR



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Permit Docket _____ Petition _____

Serial No. 815,607

Applicant DOUGLAS M. BERCZIK

Title MELTING AND CASTING OF BETA TITANIUM ALLOYS

Assignee

MAILED

JUN 25 1986

GROUP 220

PERMIT

(Title 35, United States Code (1952), Sections 181-188)

The order of secrecy in the above application is modified to permit:

SEE ATTACHMENT

This modifying permit may be revoked in whole or in part by appropriate notice. Where disclosure to individuals, as such, is authorized such individuals must be informed of the order of secrecy and the penalties for unauthorized disclosure. Any disclosure here-in authorized is subject to: The prohibitions of any classified government contract, the consent of the owner of the subject matter, and the safeguarding of the invention against publication or unauthorized disclosure in this country or elsewhere by all reasonable and due precautions including abandonment of foreign applications when necessary.


Kenneth C. Case
Director, Special Laws
Administration Group

See attachment PTO-243

Serial No. 815,607

A. To permit disclosure, for legitimate business purposes, of the subject matter of the application to U.S. citizens or to persons who are both lawfully admitted into the United States for permanent residence and are located in the United States (provided, such U.S. citizen or person is furnished with a copy of the Secrecy Order and modifications thereof and informed that the Secrecy Order is applicable), except that such disclosure is not authorized through

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P.O. Box 109600
West Palm Beach, FL 33410-9600
(305) 840-2000

Government Products Division

September 15, 1986

Precision Castparts Corp.
Titanium Facility
4600 S. E. Harney Drive
Portland, OR 97206

Attention: Tracy Hart

Re: Purchase Orders for Pratt & Whitney Alloy C and Alloy C+.
Material Specifications PWA 1270, PWA 1271, PWA 1272 and PWA 1273

Gentlemen:

Please be advised that United Technologies Corporation, parent of Pratt & Whitney, ("P&W") has received a Secrecy Order from the U.S. Patent and Trademark Office on one of its patent applications relating to "Alloy C" and "Alloy C+". A Secrecy Order is a notification that the particular patent application contains vital subject matter, the disclosure of which might be detrimental to national security. Violators of a Secrecy Order can be subject to penalties including a \$10,000 fine and two years imprisonment.

Prior to receipt of the Secrecy Order, you received P&W purchase orders which contained information which is now restricted from disclosure, specifically, the composition of these alloys. Please be aware that as a recipient of such information you are now also subject to the restrictions of the Secrecy Order and liable for violation thereof. You must carefully read the Secrecy Order, give copies to your employees who have had access to information about these alloys, and advise them that the information about these alloys, and even the existence of the Secrecy Order, must be kept secret. This particular Secrecy Order has a Special Permit attached permitting disclosure for legitimate business purposes. However, please contact us before you disclose any information or transfer any material outside your organization. If you have a Non-disclosure Agreement with P&W, the restrictions on disclosing information in that agreement continue to apply to information relating to Alloy C and Alloy C+, in addition to the requirements of the Secrecy Order.

Since the alloy compositions are covered by a Secrecy Order, steps must be taken to control scrap material. We will be in touch with you to work out details of scrap control and disposition.

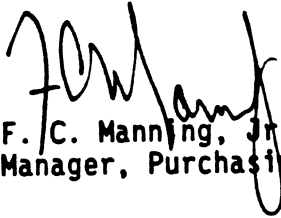
Any purchase orders you receive which have "PATENT SECRECY ORDER - SN815,607 APPLIES" marked on the face of the order are subject to the Secrecy Order attached and you must take all necessary steps to comply. It is likely that other Secrecy Orders (which may have different requirements) relating to this area of technology may be received in the future and you will promptly be notified if this occurs.

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Please acknowledge receipt of this letter by signing below and promptly returning one copy to:

United Technologies Corporation
Pratt & Whitney Government Products Division
P.O. Box 109600
West Palm Beach, Florida 33410-9600

Attention: Purchasing Services, Patrick Wiener
M/S 705-03



F. C. Manning, Jr.
Manager, Purchasing and Material Handling

Receipt Acknowledged:

By: _____

Company: _____

Date: _____

D-87-130

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**Induction melting of
Titanium Alloy D**

**Prepared for
Kurt Bonner
Project Engineer 8th Stage stator
PWA-FL**

**By
Jim Barrett
Precision Castparts Corporation
September 18th, 1987**

ABSTRACT

The purpose of induction melting Alloy-C (except 1% carbon) is to enhance the fill characteristics in thin crosssections such as blade shapes, etc.

To determine the feasibility of this, a two phase test program was incorporated. This would allow for initial process optimization of casting parameters, developing a significant data base at these conditions, and later an attempt of casting an production part.

Eight non-concentric rings will be run in a designed experiment with the following three variables:

1. Mold Superheat
2. Mold Temperature
3. Hold Time

Four test bars on each mold will provide mechanical testing response, along with a determination of carbon pick-up, and visual results comparing fill on each ring.

The following results were noted:

- * From the visual results the pouring parameters to optimize fill should be:
 1. + Level of Superheat
 2. + Level of Mold Preheat
 3. - Level of Hold Time
- * The surface reaction layer varied from 0.002" to 0.005".
- * Carbon was picked up from casting. High superheat and long hold times allowed for most diffusion.
- * Carbon level had a direct effect on ductility of the material; more carbon less ductility.

To prove optimum mechanical properties the following parameters will be used on Phase 2 of this program:

1. - Level of Superheat
2. + Level of Mold Preheat
3. - Level of Hold Time

Carbon levels and pour rate are variables that should be monitored for future pours. These will have a significant effect on ductility and fill characteristics.