NASA PATENT ABSTRACTS BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

JANUARY 1986
### ACCESSION NUMBER RANGES

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This bibliography was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by RMS Associates.
Annotated references to NASA-owned inventions covered by U.S. patents and applications for patent that were announced in *Scientific and Technical Aerospace Reports (STAR)* between July 1985 and December 1985.
This supplement is available as NASA SP-7039(28) SEC 1 from the National Technical Information Service (NTIS), Springfield, Virginia 22161. For information regarding the purchase price (which is subject to change), please write or call NTIS at (703) 487-4650.
INTRODUCTION

Several thousand inventions result each year from the aeronautical and space research supported by the National Aeronautics and Space Administration. The inventions having important use in government programs or significant commercial potential are usually patented by NASA. These inventions cover practically all fields of technology and include many that have useful and valuable commercial application.

NASA inventions best serve the interests of the United States when their benefits are available to the public. In many instances, the granting of nonexclusive or exclusive licenses for the practice of these inventions may assist in the accomplishment of this objective. This bibliography is published as a service to companies, firms, and individuals seeking new, licensable products for the commercial market.

The NASA Patent Abstracts Bibliography (NASA PAB) is a semiannual NASA publication containing comprehensive abstracts and indexes of NASA-owned inventions covered by U.S. patents and applications for patent. The citations included in NASA PAB were originally published in NASA's Scientific and Technical Aerospace Reports (STAR) and cover STAR announcements made since May 1969.

For the convenience of the user, each issue of NASA PAB has a separately bound Abstract Section (Section 1) and Index Section (Section 2). Although each Abstract Section covers only the indicated six-month period, the Index Section is cumulative covering all NASA-owned inventions announced in STAR since 1969. Thus a complete set of NASA PAB would consist of the Abstract Sections of Issue 04 (January 1974) and Issue 12 (January 1978) and the Abstract Section for all subsequent issues and the Index Section for the most recent issue.

The 109 citations published in this issue of the Abstract Section cover the period July 1985 through December 1985. The Index Section references over 4800 citations covering the period May 1969 through December 1985.

ABSTRACT SECTION (SECTION 1)

This PAB issue incorporates the 1975 STAR category revisions which include 10 major subdivisions divided into 74 specific categories and one general category/division. (See Table of Contents for the scope note of each category under which are grouped appropriate NASA inventions.) This new scheme was devised in lieu of the 34 category divisions which were utilized in PAB supplements (01) through (06) covering STAR abstracts from May 1969 through January 1974. Each entry in the Abstract Section consists of a STAR citation accompanied by an abstract and a key illustration taken from the patent or application for patent drawing. Entries are arranged in subject category in order of the ascending NASA Accession Number originally assigned in STAR to the invention. The range of NASA Accession Numbers within each issue is printed on the inside front cover.

Abstract Citation Data Elements: Each of the abstract citations has several data elements useful for identification and indexing purposes, as follows:

NASA Accession Number
NASA Case Number
Inventor's Name
Title of Invention
U.S. Patent Application Serial Number
U.S. Patent Number (for issued patents only)
U.S. Patent Office Classification Number(s) (for issued patents only)

These data elements in the citation of the abstract are depicted in the Typical Citation and Abstract reproduced on the following page and are also used in the indexes.
An aircraft system for increasing the lift drag ratio over a broad range of operating conditions is described. The system positions the engines and nacelles over the wing in such a position that gains in propeller efficiency is achieved simultaneously with increases in wing lift and a reduction in wing drag. Adverse structural and torsional effects on the wings are avoided by fuselage mounted pylons which attach to the upper portion of the fuselage aft of the wings. Similarly, pylon wing interference is eliminated by moving the pylons to the fuselage. Further gains are achieved by locating the pylon surface area aft of the aircraft center of gravity, thereby augmenting both directional and longitudinal stability. This augmentation has the further effect of reducing the size, weight and drag of empennage components. The combination of design changes results in improved cruise performance and increased climb performance while reducing fuel consumption and drag and weight penalties.
INDEX SECTION (SECTION 2)

The Index Section is divided into five indexes which are cross-indexed and are useful in locating a single invention or groups of inventions.

Each of the five indexes utilizes basic data elements: (1) Subject Category Number, (2) NASA Accession Number, and (3) NASA Case Number, in addition to other specific index terms.

**Subject Index:** Lists all inventions according to appropriate alphabetized technical term and indicates the related NASA Case Number, the Subject Category Number, and the NASA Accession Number.

**Inventor Index:** Lists all inventions according to alphabetized names of inventors and indicates the related NASA Case Number, the Subject Category Number, and the NASA Accession Number.

**Source Index:** Lists all inventions according to alphabetized source of invention (i.e., name of contractor or government installation where invention was made) and indicates the related NASA Case Number, the Subject Category Number, and the NASA Accession Number.

**Number Index:** Lists inventions in order of ascending (1) NASA Case Number, (2) U.S. Patent Application Serial Number, (3) U.S. Patent Classification Number, and (4) U.S. Patent Number and indicates the related Subject Category Number and the NASA Accession Number.

**Accession Number Index:** Lists all inventions in order of ascending NASA Accession Number and indicates the related Subject Category Number, the NASA Case Number, the U.S. Patent Application Serial Number, the U.S. Patent Classification Number, and the U.S. Patent Number.

HOW TO USE THIS PUBLICATION TO IDENTIFY NASA INVENTIONS

To identify one or more NASA inventions within a specific technical field or subject, several techniques are possible when using the flexibility incorporated into the NASA PAB.

1. **Using Subject Category:** To identify all NASA inventions in any one of the subject categories in this issue of NASA PAB, select the desired Subject Category in the Abstract Section (Section 1) and find the inventions abstracted thereunder.

2. **Using Subject Index:** To identify all NASA inventions listed under a desired technical subject index term, (A) turn to the cumulative Subject Index in the Index Section and find the invention(s) listed under the desired technical subject term. (B) Note the indicated Accession Number and the Subject Category Number. (C) Using the indicated Accession Number, turn to the inside front cover of the Index Section to determine which issue of the Abstract Section includes the Accession Number desired. (D) To find the abstract of the particular invention in the issue of the Abstract Section selected, (i) use the Subject Category Number to locate the Subject Category and (ii) use the Accession Number to locate the desired invention within the Subject Category listing.

3. **Using Patent Classification Index:** To identify all inventions covered by issued NASA patents (does not include applications for patent) within a desired Patent Classification, (A) turn to the Patent Classification Number in the Number Index of Section 2 and find the associated invention(s), and (B) follow the instructions outlined in (2)(B), and (D) above.
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Copies of U.S. patents may be purchased directly from the U.S. Patent and Trademark Office, Washington, D.C. 20231. When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, preferably by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the Patent and Trademark Office.

NASA patent application specifications are sold in paper copy by the National Technical Information Service at price code A02. Microfiche are sold at price code A01. The US-Patent-Appl-SN-number should be used in ordering either paper copy or microfiche from NTIS.

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NASA inventions, abstracted in NASA PAB, are available for nonexclusive or exclusive licensing in accordance with the NASA Patent Licensing Regulations. It is significant that all licenses for NASA inventions shall be by express written instruments and that no license will be granted or implied in a NASA invention except as provided in the NASA Patent Licensing Regulations.

Inquiries concerning the NASA Patent Licensing Program or the availability of licenses for the commercial use of NASA-owned inventions covered by U.S. patents or pending applications for patent should be forwarded to the NASA Patent Counsel of the NASA installation having cognizance of the specific invention, or the Assistant General Counsel for Patent Matters, Code GP, National Aeronautics and Space Administration, Washington, D.C. 20546. Inquiries should refer to the NASA Case Number, the Title of the Invention, and the U.S. Patent Number or the U.S. Application Serial Number assigned to the invention as shown in NASA PAB.

The NASA Patent Counsel having cognizance of the invention is determined by the first three letters or prefix of the NASA Case Number assigned to the invention. The addresses of NASA Patent Counsels are listed alongside the NASA Case Number prefix letters in the following table.
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DOMESTIC: NASA and NASA-sponsored documents and a large number of aerospace publications are available to the public for reference purposes at the library maintained by the American Institute of Aeronautics and Astronautics, Technical Information Service, 555 West 57th Street, 12th Floor, New York, New York 10019.

EUROPEAN: An extensive collection of NASA and NASA-sponsored publications is maintained by the British Library Lending Division, Boston Spa, Wetherby, Yorkshire, England for public access. The British Library Lending Division also has available many of the non-NASA publications cited in STAR. European requesters may purchase facsimile copy or microfiche of NASA and NASA-sponsored documents, those identified by both the symbols # and * from ESA — Information Retrieval Service European Space Agency, 8-10 rue Mario-Nikis, 75738 CEDEX 15, France.

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PATENT LICENSING REGULATIONS

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION

14 CFR Part 1245

Licensing of NASA Inventions

AGENCY: National Aeronautics and Space Administration.

ACTION: Interim regulation with comments requested.

SUMMARY: The National Aeronautics and Space Administration (NASA) is revising its patent licensing regulations to conform with Pub. L. 96-517. This interim regulation provides policies and procedures applicable to the licensing of federally owned inventions in the custody of the National Aeronautics and Space Administration, and implements Pub. L. 96-517. The object of this subpart is to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

EFFECTIVE DATE: July 1, 1981. Comments must be received in writing by December 2, 1981. Unless a notice is published in the Federal Register after the comment period indicating changes to be made, this interim regulation shall become a final regulation.


FOR FURTHER INFORMATION CONTACT: Mr. John C. Mannix, (202) 755-3954.

SUPPLEMENTARY INFORMATION:

PART 1245—PATENTS AND OTHER INTELLECTUAL PROPERTY RIGHTS

Subpart 2 of Part 1245 is revised to read as follows:

Subpart 2—Licensing of NASA Inventions

Sec.
1245.200 Scope of subpart.
1245.201 Policy and objective.
1245.202 Definitions.
1245.203 Authority to grant licenses.

Restrictions and Conditions
1245.204 All licenses granted under this subpart.

Types of Licenses
1245.205 Nonexclusive licenses.
1245.206 Exclusive and partially exclusive licenses.

Procedures
1245.207 Application for a license.
1245.208 Processing applications.
1245.209 Notice to Attorney General.
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1245.211 Appeals.
1245.212 Protection and administration of inventions.

Subpart 2—Licensing of NASA Inventions

§ 1245.200 Scope of subpart.

This subpart prescribes the terms, conditions, and procedures upon which a NASA invention may be licensed. It does not affect licenses which (a) were in effect prior to July 1, 1981; (b) may exist at the time of the Government's acquisition of title to the invention, including those resulting from the allocation of rights to inventions made under Government research and development contracts. (c) are the result of an authorized exchange of rights in the settlement of patent disputes; or (d) are otherwise authorized by law or treaty.

§ 1245.201 Policy and objective.

It is the policy and objective of this subpart to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

§ 1245.202 Definitions.

(a) "Federally owned invention" means an invention, plant, or design which is covered by a patent, or patent application in the United States, or a patent, patent application, plant variety protection, or other form of protection, in a foreign country, title to which has been assigned to or otherwise vested in NASA.

(b) "NASA Invention" means an invention, plant, or design which is covered by a patent, or patent application in the United States Government.

(c) "Federal agency" means an executive department, military department, Government corporation, or independent establishment, except the Tennessee Valley Authority, which has custody of a Federally owned invention.

(d) "Small business firm" means a small business concern as defined at section 2 of Pub. L. 85–536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of these regulations, the size standard for small business concerns involved in Government procurement, contained in 13 CFR 121.3–8, and in subcontracting contained in 13 CFR 121.3–12, will be used.

(e) Practical application" means to manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system; and, in each case, under such conditions as to establish that the invention is being utilized and that its benefits are to the extent permitted by law or Government regulations available to the public on reasonable terms.

(f) "United States" means the United States of America, its territories and possessions, the District of Columbia, and the Commonwealth of Puerto Rico.

§ 1245.203 Authority to grant licenses.

NASA inventions shall be made available for licensing as deemed appropriate in the public interest. NASA may grant nonexclusive, partially exclusive, or exclusive licenses thereto under this subpart on inventions in its custody.

Restrictions and Conditions

§ 1245.204 All licenses granted under this subpart.

(a) Restrictions. (1) A license may be granted only if the applicant has supplied NASA with a satisfactory plan for development or marketing of the invention, or both, and with information about the applicant's capability to fulfill the plan.

(2) A license granting rights to use or sell under a NASA invention in the United States shall normally be granted only to a licensee who agrees that any products embodying the invention or produced through the use of the invention will be manufactured substantially in the United States.

(b) Conditions. Licenses shall contain such terms and conditions as NASA determines are appropriate for the protection of the interests of the Federal Government and the public and are not in conflict with law or this subpart. The following terms and conditions apply to any license:

(1) The duration of the license shall be for a period specified in the license agreement, unless sooner terminated in accordance with this subpart.

(2) The license may be granted for all or less than all fields of use of the invention or in specified geographical areas, or both.

(3) The license may extend to subsidiaries of the licensee or other parties if provided for in the license but shall be nonassignable without approval of NASA, except to the successor of that part of the licensee's business to which the invention pertains.

(4) The license may provide the licensee the right to grant sublicenses under the license, subject to the approval of NASA. Each sublicense shall make reference to the license, including the rights retained by the Government, and a copy of such
sublicense shall be furnished to NASA.  
(5) The license shall require the licensee to carry out the plan for development or marketing of the invention, or both, to bring the invention to practical application within a period specified in the license, and to continue to make the benefits of the invention reasonably accessible to the public.  
(6) The license shall require the licensee to report periodically on the utilization or efforts at obtaining utilization that are being made by the licensee, with particular reference to the plan submitted.  
(7) All licenses shall normally require royalties or other consideration.  
(8) Where an agreement is obtained pursuant to § 1245.204(a)(2) that any products embodying the invention or produced through use of the invention will be manufactured substantially in the United States, the license shall recite such agreement.  
(9) The license shall provide for the right of NASA to terminate the license, in whole or in part, if:  
(i) NASA determines that the licensee is not executing the plan submitted with its request for a license and the licensee cannot otherwise demonstrate to the satisfaction of NASA that it has taken or can be expected to take within a reasonable time effective steps to achieve practical application of the invention;  
(ii) NASA determines that such action is necessary to meet requirements for public use specified by Federal regulations issued after the date of the license and such requirements are not reasonably satisfied by the licensee;  
(iii) The licensee has willfully made a false statement of or willfully omitted a material fact in the license application or in any report required by the license agreement; or  
(iv) The licensee commits a substantial breach of a covenant or agreement contained in the license.  
(10) The license may be modified or terminated, consistent with this subpart, upon mutual agreement of NASA and the licensee.  
(11) Nothing relating to the grant of a license, nor the grant itself, shall be construed to confer upon any person any immunity from or defenses under the antitrust laws or from a charge of patent misuse, and the acquisition and use of rights pursuant to this subpart shall not be immunized from the operation of state or Federal law by reason of the source of the grant.  

Types of Licenses

§ 1245.205 Nonexclusive licenses.  
(a) Availability of licenses.  
Nonexclusive licenses may be granted under NASA inventions without publication of availability or notice of a prospective license.  
(b) Conditions. In addition to the provisions of § 1245.204, the nonexclusive license may also provide that, after termination of a period specified in the license agreement, NASA may restrict the license to the fields of use or geographic areas, or both, in which the licensee has brought the invention to practical application and continues to make the benefits of the invention reasonably accessible to the public. However, such restriction shall be made only in order to grant an exclusive or partially exclusive license in accordance with this subpart.  

§ 1245.206 Exclusive and partially exclusive licenses.  
(a) Domestic licenses.  
(1) Availability of licenses. Exclusive or partially exclusive licenses may be granted on NASA inventions: (i) 3 months after notice of the invention's availability has been announced in the Federal Register; or (ii) without such notice where NASA determines that expeditious granting of such a license will best serve the interests of the Federal Government and the public; and (iii) in either situation, specified in § 1245.206(a)(1)[i][ii][iii] or (ii) of this section only if:  
(A) Notice of a prospective license, identifying the invention and the prospective licensee, has been published in the Federal Register, providing opportunity for filing written objections within a 60-day period;  
(B) After expiration of the period in § 1245.206(a)(1)[i][ii][iii][A] and consideration of any written objections received during the period, NASA has determined that:  
(i) The interests of the Federal Government and the public will best be served by the proposed license, in view of the applicant's intentions, plans, and ability to bring the invention to practical application or otherwise promote the invention's utilization by the public;  
(ii) The desired practical application has not been achieved, or is not likely expeditiously to be achieved, under any nonexclusive license which has been granted, or which may be granted, on the invention;  
(iii) Exclusive or partially exclusive licensing is a reasonable and necessary incentive to call forth the investment of risk capital and expenditures to bring the invention to practical application or otherwise promote the invention's utilization by the public; and  
(iv) The proposed terms and scope of exclusivity are not greater than reasonably necessary to provide the incentive for bringing the invention to practical application or otherwise promote the invention's utilization by the public;  
(C) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the country in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with the antitrust laws; and  
(D) NASA has given first preference to any small business firms submitting plans that are determined by the agency to be within the capabilities of the firms and are equally likely, if executed, to bring the invention to practical application as any plans submitted by applicants that are not small business firms.  
(2) Conditions. In addition to the provisions of § 1245.204, the following terms and conditions apply to domestic exclusive and partially exclusive licenses:  
(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.  
(ii) The license shall reserve to NASA the right to require the licensee to grant sublicenses to responsible applicants, on reasonable terms, when necessary to fulfill health or safety needs.  
(iii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.  
(iv) The license may grant the licensee the right of enforcement of the licensed patent pursuant to the provisions of Chapter 29 of Title 35, United States Code, or other statutes, as determined appropriate in the public interest.  
(b) Foreign licenses.  
(1) Availability of licenses. Exclusive or partially exclusive licenses may be granted on a NASA invention covered by a foreign patent, patent application, or other form of protection, provided that:  
(A) Notice of a prospective license, identifying the invention and prospective licensee, has been published in the Federal Register, providing opportunity for filing written objections.
within a 60-day period and following consideration of such objections;
(ii) NASA has considered whether the interests of the Federal Government or United States industry in foreign commerce will be enhanced; and
(iii) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the United States in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with antitrust laws.

(2) Conditions. In addition to the provisions of § 1245.204, the following terms and conditions apply to foreign exclusive and partially exclusive licenses:
(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.
(ii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.
(iii) The license may grant the licensee the right to take any suitable and necessary actions to protect the licensed property, on behalf of the Federal Government.
(c) Record of determinations. NASA shall maintain a record of determinations to grant exclusive or partially exclusive licenses.

Procedures

§ 1245.207 Application for a license.
An application for a license should be addressed to the Patent Counsel at the NASA installation having responsibility for the invention and shall normally include:
(a) Identification of the invention for which the license is desired, including the patent application serial number or patent number, title, and date, if known;
(b) Identification of the type of license for which the application is submitted;
(c) Name and address of the person, company, or organization applying for the license and the citizenship or place of incorporation of the applicant;
(J) Name, address, and telephone number of representative of applicant to whom correspondence should be sent;
(e) Nature and type of applicant's business, identifying products or services which the applicant has successfully commercialized, and approximate number of applicant's employees;
(f) Source of information concerning the availability of a license on the invention;
(g) A statement indicating whether applicant is a small business firm as defined in § 1245.202(c);
(h) A detailed description of applicant's plan for development or marketing of the invention, or both, which should include:
(1) A statement of the time, nature and amount of anticipated investment of capital and other resources which applicant believes will be required to bring the invention to practical application;
(2) A statement as to applicant's capability and intention to fulfill the plan, including information regarding manufacturing, marketing, financial, and technical resources;
(3) A statement of the fields of use for which applicant intends to practice the invention; and
(4) A statement of the geographic areas in which applicant intends to manufacture any products embodying the invention and geographic areas where applicant intends to use or sell the invention, or both;
(i) Identification of licenses previously granted to applicant under Federally owned inventions;
(j) A statement containing applicant's best knowledge of the extent to which the invention is being practiced by private industry or Government, or both, or is otherwise available commercially; and
(b) Any other information which applicant believes will support a determination to grant the license to applicant.

§ 1245.208 Processing applications.
(a) Applications for licenses will be initially reviewed by the Patent Counsel of the NASA installation having responsibility for the invention. The Patent Counsel shall make a preliminary recommendation to the Director of Licensing, NASA Headquarters, whether to: (1) grant the license as requested, (2) grant the license with modification after negotiation with the licensee, or (3) deny the license. The Director of Licensing shall review the preliminary recommendation of the Patent Counsel and make a final recommendation to the NASA Assistant General Counsel for Patent Matters. Such review and final recommendation may include, and be based on, any additional information obtained from applicant and other sources that the Patent Counsel and the Director of Licensing deem relevant to the license requested. The determination to grant or deny the license shall be made by the Assistant General Counsel for Patent Matters based on the final recommendation of the Director of Licensing.
(b) When notice of a prospective exclusive or partially exclusive license is published in the Federal Register in accordance with § 1245.206(a)(1)(iii)(A) or § 1245.206(b)(1)(i), any written objections received in response thereto will be considered by the Director of Licensing in making the final recommendation to the Assistant General Counsel for Patent Matters.
(c) If the requested license, including any negotiated modifications, is denied by the Assistant General Counsel for Patent Matters, the applicant may request reconsideration by filing a written request for reconsideration within 30 days after receiving notice of denial. This 30-day period may be extended for good cause.
(d) In addition to, or in lieu of requesting reconsideration, the applicant may also appeal the denial of the license in accordance with § 1245.211.

§ 1245.280 Notice to Attorney General.
A copy of the notice provided for in §§ 1245.203(a)(1)(iii)(A), and 1245.206(b)(1)(i) will be sent to the Attorney General.

§ 1245.210 Modification and termination of licenses.
Before modifying or terminating a license, other than by mutual agreement, NASA shall furnish the licensee and any sublicensee of record a written notice of intention to modify or terminate the license, and the licensee and any sublicensee shall be allowed 30 days after such notice to remedy any breach of the license or show cause why the license should not be modified or terminated.

§ 1245.211 Appeals.
(a) The following parties may appeal to the NASA Administrator or designee any decision or determination concerning the grant, denial, interpretation, modification, or termination of a license:
(1) A person whose application for a license has been denied;
(2) A licensee whose license has been modified or terminated, in whole or in part; or
(3) A person who timely filed a written objection in response to the notice required by §§ 1245.203(o)(1)(iii)(A) or
1245.206(b)[1][i] and who can demonstrate to the satisfaction of NASA that such person may be damaged by the Agency action.

(b) Written notice of appeal must be filed within 30 days (or such other time as may be authorized for good cause shown) after receiving notice of the adverse decision or determination; including, an adverse decision following the request for reconsideration under § 1245.208(c). The notice of appeal, along with all supporting documentation should be addressed to the Administrator, National Aeronautics and Space Administration, Washington, DC 20546. Should the appeal raise a genuine dispute over material facts, fact-finding will be conducted by the NASA Inventions and Contributions Board. The person filing the appeal shall be afforded an opportunity to be heard and to offer evidence in support of the appeal. The Chairperson of the Inventions and Contributions Board shall prepare written findings of fact and transmit them to the Administrator or designee. The decision on the appeal shall be made by the NASA Administrator or designee. There is no further right of administrative appeal from the decision of the Administrator or designee.

§ 1245.212 Protection and administration of inventions.

NASA may take any suitable and necessary steps to protect and administer rights to NASA inventions, either directly or through contract.

§ 1245.213 Transfer of custody.

NASA having custody of certain Federally owned inventions may transfer custody and administration in whole or in part, to another Federal agency, of the right, title, or interest in any such invention.

§ 1245.214 Confidentiality of information.

Title 35, United States Code, section 209, provides that any plan submitted pursuant to § 1245.207(h) and any report required by § 1245.204(b)(6) may be treated by NASA as commercial and financial information obtained from a person and privileged and confidential and not subject to disclosure under section 552 of Title 5 of the United States Code.

James M. Beggs,
Administrator.
October 15, 1981.

BILLING CODE 7510-01-M
### TABLE OF CONTENTS

**Section 1 • Abstracts**

#### AERONAUTICS
Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also Astronautics.

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#### ASTRONAUTICS
Includes astronautics (general); astrodynamics; ground support systems and facilities (space); launch vehicles and space vehicles; space transportation; spacecraft communications, command and tracking; spacecraft design, testing and performance; spacecraft instrumentation; and spacecraft propulsion and power.

For related information see also Aeronautics.

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For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

For related information see also 03 Air Transportation and Safety and 85 Urban Technology and Transportation.

For related information see also 09 Research and Support Facilities (Air).

For related information see also 04 Aircraft Communications and Navigation and 32 Communications.

For related information see also 05 Aircraft Design, Testing and Performance and 39 Structural Mechanics.

For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.

For related information see also 07 Aircraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

For related information see also 08 Aircraft Stability and Control.

For related information see also 14 Ground Support Systems and Facilities (Space).

For related information see also 15 Launch Vehicles and Space Vehicles.

For related information see also 16 Space Transportation.

For related information see also 17 Spacecraft Communications, Command and Tracking.

For related information see also 18 Spacecraft Design, Testing and Performance.

For related information see also 19 Spacecraft Instrumentation.

For related information see also 20 Spacecraft Propulsion and Power.

For related information see also 54 Man/System Technology and Life Support.

For related information see also 75 Aircraft Design, Testing and Performance.

For related information see also 76 Aircraft Stability and Control.

For related information see also 77 Aircraft Instrumentation.

For related information see also 78 Aircraft Propulsion and Power.

For related information see also 79 Research and Support Facilities (Air).

For related information see also 80 Ground Support Systems and Facilities (Space).

For related information see also 81 Urban Technology and Transportation.
CHEMISTRY AND MATERIALS
Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) 3
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 4
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY 5
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also 77 Thermodynamics and Statistical Physics.

26 METALLIC MATERIALS 6
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS 7
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS N.A.
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

ENGINEERING
Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also Physics.

31 ENGINEERING (GENERAL) 8
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 9
Includes land and global communications; communications theory; and optical communications.
For related information see also 04 Aircraft Communications and Navigation and 17 Spacecraft Communications, Command and Tracking.

33 ELECTRONICS AND ELECTRICAL ENGINEERING 11
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microinamtuization; and integrated circuity.
For related information see also 60 Computer Operations and Hardware and 76 Solid-State Physics.

34 FLUID MECHANICS AND HEAT TRANSFER 15
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

35 INSTRUMENTATION AND PHOTOGRAPHY 17
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see 43 Earth Resources. For related information see also 06 Aircraft Instrumentation and 19 Spacecraft Instrumentation.

36 LASERS AND MASERS 21
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 22
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY N.A.
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS N.A.
Includes structural element design and weight analysis; fatigue; and thermal stress.

GEOSCIENCES
Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also Space Sciences.

42 GEOSCIENCES (GENERAL) N.A.

43 EARTH RESOURCES N.A.
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see 35 Instrumentation and Photography.

44 ENERGY PRODUCTION AND CONVERSION 29
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 85 Urban Technology and Transportation.

45 ENVIRONMENT POLLUTION N.A.
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.
46 GEOPHYSICS  N.A.
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see 93 Space Radiation.

47 METEOROLOGY AND CLIMATOLOGY  N.A.
Includes weather forecasting and modification.

48 OCEANOGRAPHY  N.A.
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES
Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL)  N.A.
Includes genetics.

52 AEROSPACE MEDICINE  30
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES  N.A.
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT  N.A.
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY  N.A.
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES
Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)  N.A.

60 COMPUTER OPERATIONS AND HARDWARE  30
Includes computer graphics and data processing.
For components see 33 Electronics and Electrical Engineering.

61 COMPUTER PROGRAMMING AND SOFTWARE  N.A.
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS  N.A.
Includes computer networks.

63 CYBERNETICS  N.A.
Includes feedback and control theory.
For related information see also 54 Man/System Technology and Life Support.

64 NUMERICAL ANALYSIS  N.A.
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY  N.A.
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS  N.A.
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS  N.A.
Includes topology and number theory.

PHYSICS
Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also Engineering.

70 PHYSICS (GENERAL)  N.A.
For geophysics see 46 Geophysics. For astrophysics see 90 Astrophysics. For solar physics see 92 Solar Physics.

71 ACOUSTICS  31
Includes sound generation, transmission, and attenuation.
For noise pollution see 45 Environment Pollution.

72 ATOMIC AND MOLECULAR PHYSICS  32
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS  N.A.
Includes elementary and nuclear particles; and reactor theory.
For space radiation see 93 Space Radiation.

74 OPTICS  32
Includes light phenomena.

75 PLASMA PHYSICS  N.A.
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

76 SOLID-STATE PHYSICS  34
Includes superconductivity.
For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

77 THERMODYNAMICS AND STATISTICAL PHYSICS  N.A.
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer.
SOCIAL SCIENCES
Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL)  N.A.
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT  N.A.
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE  N.A.
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see 61 Computer Programming and Software.

83 ECONOMICS AND COST ANALYSIS  N.A.
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE  N.A.
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION  36
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see 03 Air Transportation and Safety, 16 Space Transportation, and 44 Energy Production and Conversion.

SPACE SCIENCES
Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also Geosciences.

88 SPACE SCIENCES (GENERAL)  N.A.

89 ASTRONOMY  N.A.
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS  N.A.
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION  N.A.
Includes planetology; and manned and unmanned flights.
For spacecraft design see 18 Spacecraft Design, Testing and Performance. For space stations see 15 Launch Vehicles and Space Vehicles.

92 SOLAR PHYSICS  N.A.
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION  N.A.
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see 52 Aerospace Medicine. For theory see 73 Nuclear and High-Energy Physics.

GENERAL

99 GENERAL  N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.

Section 2 • Indexes

SUBJECT INDEX
INVENTOR INDEX
SOURCE INDEX
CONTRACT NUMBER INDEX
NUMBER INDEX
ACCESSION NUMBER INDEX
AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

N85-28922*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMBINED RIBLET AND LEBU DRAG REDUCTION SYSTEM Patent Application
M. J. WALSH, J. N. HEFNER, and J. B. ANDERS, inventors (to NASA) 27 Dec. 1984 17 p
CSCL 01A
The invention is a system of flow control devices which result in reduced skin friction on aerodynamic and hydrodynamic surfaces. The devices cause a breakup of large-scale disturbances in the boundary layer of the flow field. The riblet device acts to reduce disturbances near the boundary layer wall by the use of longitudinal striations forming vee-shaped grooves. These grooves are dimensional on the order of the wall vortices and turbulent burst dimensions. The large eddy breakup device is a small strip or airfoil which is suspended in the upper region of the boundary layer. Various physical mechanisms cause a disruption of the large scale vortices. The combination of the devices of this invention result in a substantial reduction in skin friction drag.

AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

N85-35194* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WINGTIP VORTEX PROPELLER Patent
J. C. PATTERSON, JR., inventor (to NASA) 6 Aug. 1985 9 p
Filed 2 Feb. 1984 Supersedes N84-20495 (22 - 11, p 1602)
A device which increases the energy efficiency of aircraft wherein a wingtip pusher propeller is positioned aft of the wingtip
to rotate in the crossflow of the wingtip vortex is presented. The propeller rotates against the vortex swirl creating additional thrust from and attenuating the wingtip vortex by simultaneously extracting energy from the vortex and converting it to propeller blade induced thrust while injecting its high energy wake into the vortex axial flow to dissipate the vortex. The device increases aircraft fuel efficiency by simultaneously increasing thrust and decreasing vortex induced drag. By attenuating the vortex safety to following aircraft is maximized.

PROP ROTATION

VORTEX CIRCULATION

Official Gazette of the U.S. Patent and Trademark Office

N85-35195* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FLOW MODIFYING DEVICE Patent

A swirler for a gas turbine engine combustor is disclosed for simultaneously controlling combustor flow rate, swirl angle, residence time and fuel-air ratio to provide three regimes of operation. A first regime is provided in which fuel-air ratio is less than stoichiometric, NOx is produced at one level, and combustor flow rate is high. In a second regime, fuel-air ratio is nearly stoichiometric, NOx production is less than that of the first regime, and combustor flow rate is low. In a third regime, used for example at highoff, fuel-air ratio is greater than stoichiometric and the combustor flow rate is less than in either of the other regimes.

Author

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.


DOUBLE WINDOW VIEWING CHAMBER ASSEMBLY Patent Application

A viewing chamber which permits observation of a sample retained therein includes a pair of double window assemblies mounted in opposed openings in the walls thereof so that a light beam can directly enter and exit from the chamber. A flexible mounting arrangement for the outer windows of the window assemblies enables the windows to be brought into proper alignment.

Author

07 AIRCRAFT PROPULSION AND POWER

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

09 RESEARCH AND SUPPORT FACILITIES (AIR)
alignment. An electrical heating arrangement prevents fogging of the outer windows whereas desiccated air in the volume between the outer and inner windows prevents fogging of the latter. NASA

PHENOXY RESINS CONTAINING PENDENT ETHYNYL GROUPS AND CURED RESINS OBTAINED THEREFROM Patent

P. M. HERGENROTHER, inventor (to NASA) 9 Apr. 1985 8 p Filed 10 May 1984 Sponsored by NASA

Includes biochemistry and organic chemistry.

HEMISPHERICAL LATCHING APPARATUS Patent


SYNTHESIS OF 2,4,8,10-TETROXASPIRO5,5UNDECANE Patent


PRODUCTION OF BUTANOL BY FERMENTATION IN THE PRESENCE OF COCULTURES OF CLOSTRIDIUM Patent


Sugars are converted to a mixture of solvents including butanol by a fermentation process employing a coculture of microorganisms of the Clostridium genus, one of said microorganisms favoring the production of butyric acid and the other of which converts the butyric acid so produced to butanol. The use of a coculture substantially increases the yield of butanol over that obtained using a culture employing only one microorganism.

Author

Author
A lightweight piston 12 composed of carbon-carbon composites is presented. The use of carbon-carbon composites over conventional materials, such as aluminum, reduces piston weight and improves thermal efficiency of the internal combustion reciprocation engine. Due to the negligible coefficient of thermal expansion and unique strength at elevated temperatures of carbon-carbon, the piston-to-cylinder wall 10 clearance is so small as to eliminate the necessity of piston rings. Use of the carbon-carbon composite piston has the effect of reducing the weight of other reciprocating engine components allowing the piston to run at higher speeds and improving specific engine performance.
The invention relates to mixed bismaleimide/biscitraconimide resins. Mixtures of the two resins produce materials which have better handling, processing or mechanical and thermal properties, particularly in graphite composites, than materials made with the individual resins. The mechanical strength of cured graphite composites prepared from a 1:1 copolymer of such bisimide resins is excellent at both ambient and elevated temperatures. The copolymer mixture provides improved composites which are lighter than metals and replace metals in many aerospace applications.

Polyimide resins suitable for use as composite matrix materials are formed by copolymerization of maleic and norbornenyl endcapped monomers and oligomers. The copolymers can be cured at temperatures under about 300 °C by controlling the available concentration of the maleic end-capped reactant. This control can be achieved by adding sufficient amounts of said maleic reactant, or by chemical modification of either copolymer, so as to either increase Diels-Alder retrogression of the norbornenyl capped reactant and/or holding initiation and polymerization to a rate compatible with the availability of the maleic-capped reactant.

N85-35233* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

THERMAL BARRIER COATING SYSTEM Patent

An oxide thermal barrier coating comprises ZrO3-Yb2O3 that is plasma sprayed onto a previously applied bond coating. The zirconia is partially stabilized with about 124 wt% ytterbia to insure cubic, monoclinic, and tetragonal phases.

N85-28982* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CHEMICAL CONTROL OF NAMIMIDE CURE TEMPERATURE AND RATE Patent

Polyimide resins suitable for use as composite matrix materials are formed by copolymerization of maleic and norbornenyl endcapped monomers and oligomers. The copolymers can be cured at temperatures under about 300 °C by controlling the available concentration of the maleic end-capped reactant. This control can be achieved by adding sufficient amounts of said maleic reactant, or by chemical modification of either copolymer, so as to either increase Diels-Alder retrogression of the norbornenyl capped reactant and/or holding initiation and polymerization to a rate compatible with the availability of the maleic-capped reactant.

Official Gazette of the U.S. Patent and Trademark Office
end-capped monomers and oligomers. The copolymers can be cured at temperatures under about 300°C by controlling the available concentration of the maleic end-capped reactant. This control can be achieved by adding sufficient amounts of said maleic reactant, or by chemical modification of either copolymer, to increase Diels-Alder retrogression of the norbornenyl-capped reactant and/or holding initiation and polymerization to a rate compatible with the availability of the maleic-capped reactant.

Official Gazette of the U.S. Patent and Trademark Office


High sulfur content carbonaceous material, such as coal is desulfurized by continuous fluidized suspension in a reactor with chlorine gas, inert dechlorinating gas and hydrogen gas. A source of chlorine gas, a source of inert gas and a source of hydrogen gas are connected to the bottom inlet through a manifold and a heater. A flow controller operates servos in a manner to continuously and sequentially suspend coal in the three gases. The sulfur content is reduced at least 50% by the treatment.

Official Gazette of the U.S. Patent and Trademark Office


An oxidation resistant coating is produced on carbon-base materials, and the same processing step effects an infiltration of the substrate with silicon containing material. The process comprises making a slurry of nickel and silicon powders in a nitrocellulose lacquer, spraying onto the graphite or carbon-carbon substrate, and sintering in vacuum to form a fused coating that wets and covers the surface as well as penetrates into the pores of the substrate. Optimum wetting and infiltration occurs in the range of Ni-60 w/o Si to Ni-90 w/o Si with deposited thicknesses of 25-100 mg/sq. cm. Sintering temperatures of about 1200°C to about 1400°C are used, depending on the melting point of the
specific coating composition. The sintered coating results in Ni-Si intermetallic phases and SiC, both of which are highly oxidation resistant.

Official Gazette of the U.S. Patent and Trademark Office

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N85-29044* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

DIFFUSELY REFLECTING PAINTS INCLUDING POLYETRAFLUOROETHYLENE AND METHOD OF MANUFACTURE Patent


The invention pertains to a high diffuse, reflective paint comprising an alcohol soluble binder, polytetrafluoroethylene (TFE) and an alcohol for coating a substrate and forming an optical reference with a superior Lambertian characteristic. A method for making the paint by first mixing the binder and alcohol, and thereafter by mixing in outgassed TFE is described. A wetting agent may be employed to aid the mixing process.

Official Gazette of the U.S. Patent and Trademark Office

N85-34280* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FIRE-RESISTANT PHOSPHORUS CONTAINING POLYIMIDES AND COPOLYIMIDES Patent


Phosphorus-containing polyimides and copolyimides are synthesized in a two-step polycondensation reaction from 1-(dialkoxyphosphonylmethyl) 2,4- and 2,6-diaminobenzenes and tetracarboxylic anhydride. The diorgano position of the diorganoxyphosphonyl group includes alkyl, such as ethyl, substituted alkyl, such as 2-chloroethyl, and aryl such as phenyl. The tetracarboxylic anhydrides include compounds such as pyrometallitic dianhydride and benzophenone tetracarboxylic dianhydride. The glass transition temperature (Tg) of the polyimides is reduced by incorporation of the (dialkoxyphosphonylmethyl) groups. The phosphorus-containing copolyimides show a considerably higher degree of fire-resistance as compared to that of the corresponding common polyimides.

Official Gazette of the U.S. Patent and Trademark Office

N85-34281* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

METAL (2) 4,4',4',4" PHTHALOCYANINE TETRAMINES AS CURING AGENTS FOR EPOXY RESINS Patent

27 NONMETALLIC MATERIALS

Metal, preferably divalent copper, cobalt or nickel, phthalocyanine tetraamines are used as curing agents for epoxides. The resulting copolymers have high thermal and chemical resistance and are homogeneous. They are useful as binders for laminates, e.g., graphite cloth laminate.

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

Pair of paramagnetic substances each of which is alternately driven into and out of a magnetic field. Two separate bidirectional pumping systems flow helium gas through the displacer and through both paramagnetic substances to create heat exchange conditions at two separate temperature extremes.
A compact hydride absorption refrigeration system with few moving parts for 10 Kelvin operation is disclosed and comprises liquid hydrogen producing means in combination with means for solidifying and subliming the liquid hydrogen produced. The liquid hydrogen is sublimed at about 10 Kelvin. By using a symmetrical all hydrogen redundant loop system, a 10 Kelvin refrigeration system can be operated for many years with only a fraction of the power required for prior art systems.

The video data defining the observed image is encoded in a novel format, wherein in each data field, the data representing the position of the high resolution region of predetermined size appears first, followed by the high resolution zone video data and then the low-resolution region data. As the viewer's line of sight relative to the displayed image changes, the position of the high resolution region changes to track the viewer's line of sight.
that provide maximum separation of conductors to minimize crosstalk.

**TONE CALIBRATED DIGITAL RADIO COMMUNICATION SYSTEM Patent Application**

F. Davarian, inventor (to NASA) (JPL, Pasadena, Calif.) 2 May 1985 23 p

A transmitter for digital radio communication creates a null by balanced encoding of data modulated on an RF carrier, and inserts a calibration tone within the null. It is accomplished by having the calibration tone coincide in phase and frequency with the transmitted radio frequency output, for coherent demodulation of data at the receiver where the tone calibration signal is extracted and used for multipath fading compensation.

**A METHOD AND APPARATUS FOR OPERATING ON COMPANDED PCM VOICE DATA Patent Application**

F. Byrne, inventor (to NASA) 28 Sep. 1984 15 p

A method and apparatus for digitizing audio signals being generated from plurality of parties in order to provide audio communication between the parties with a minimum of interference. Audio signals are converted to a pulse code modulator companded signal for transmitting to a remote location and then converting each of the companded signals to a first eight parallel signal. Each of the eight bit parallel signals from the individual parties are fed to a read-only memory (ROM) causing the ROM to produce an eight bit signal on the output representing the instantaneous sum of the eight bit parallel signals being supplied to the inputs thereof. The eight bit parallel signal appearing on the output of the ROM is converted to a serial digital by a parallel to serial converter for transmitting over a single line to another serial to parallel converter prior to being fed through a digital to analog converter to the receiver for producing the audio signal at the receiver.

**METHOD AND APPARATUS FOR DELTA KAPPA SYNTHETIC APERTURE RADAR MEASUREMENT OF OCEAN CURRENT Patent**

A. Jain, inventor (to NASA) (JPL, Pasadena, Calif.) 2 Apr. 1985 8 p Filed 18 Mar. 1982 Supersedes N82-28502 (20 - 19, p 2673)

A synthetic aperture radar (SAR) employed for delta k measurement of ocean current from a spacecraft without the need for a narrow beam and long observation times. The SAR signal is compressed to provide image data for different sections of the chirp band width, equivalent to frequencies and a common area for the separate image fields is selected. The image for the selected area at each frequency is deconvolved to obtain the image signals for the different frequencies and the same area. A product of pairs of signals is formed, Fourier transformed and squared. The spectrum thus obtained from different areas for the same pair of frequencies are added to provide an improved signal to noise ratio. The shift of the peak from the center of the spectrum is measured and compared to the expected shift due to the phase
velocity of the Bragg scattering wave. Any difference is a measure of current velocity \( v_{o} \) (delta k).

**CLOSED LOOP ELECTROSTATIC LEVITATION SYSTEM**

Patent


An electrostatic levitation system is described, which can closely control the position of objects of appreciable size. A plurality of electrodes surround the desired position of an electrostatically charged object, the position of the objects is monitored, and the voltages applied to the electrodes are varied to hold the object at a desired position. In one system, the object is suspended above a plate-like electrode which has a concave upper face to urge the object toward the vertical axis of the curved plate. An upper electrode that is also curved can be positioned above the object, to assure curvature of the field at any height above the lower plate. In another system, four spherical electrodes are positioned at the points of a tetrahedron, and the voltages applied to the electrodes are varied in accordance with the object position as detected by two sensors.

**POWER CONTROL FOR AC MOTOR Patent**


A motor controller employing a triac through which power is supplied to a motor is described. The open circuit voltage appearing across the triac controls the operation of a timing circuit. This timing circuit triggers on the triac at a time following turn off which varies inversely as a function of the amplitude of the open circuit voltage of the triac.

**MASER CAVITY SERVO-TUNING SYSTEM Patent**


Two collocated, weakly coupled probes, one loop and one dipole, detect the magnetic and electric fields inside a maser cavity. Signals from the probes are compared in phase, and the signal output from the phase detector is applied to a varactor, the reacance of which is coupled into the cavity by a microwave coupler. Alternatively, the varactor may be placed inside the cavity. Any deviation of phase from 90 deg as detected by the phase detector will then produce an error signal that will change the reacance coupled into the resonant cavity to change its reacance, and thus correct its resonance frequency. An alternative to using
two probes is to use a single disk probe oriented to detect both the magnetic and electric fields, and thus provide the error signal directly.
bores. The transformer is able to isolate a high constant potential, applied to one of its coils, without the occurrence of sparking or corona, by coupling the coatings, lining the axial bores to the ferromagnetic core and by coupling one terminal of each coil to the respective coating encasing the coil.

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N85-29147* National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
HIGH VOLTAGE POWER SUPPLY Patent
A high voltage power supply is formed by three discrete circuits energized by a battery to provide a plurality of concurrent output signals floating at a high output voltage on the order of several tens of kilovolts. In the first two circuits, the regulator stages are pulse width modulated and include adjustable resistances for varying the duty cycles of pulse trains provided to corresponding oscillator stages while the third regulator stage includes an adjustable resistance for varying the amplitude of a steady signal provided to a third oscillator stage. In the first circuit, the oscillator, formed by a constant current drive network and a tuned resonant network included a step up transformer, is coupled to a second step up transformer which, in turn, supplies an amplified sinusoidal signal to a parallel pair of complementary poled rectifying, voltage multiplier stages to generate the high output voltage.

Official Gazette of the U.S. Patent and Trademark Office

N85-29160* National Aeronautics and Space Administration.
Ames Research Center, Moffett Field, Calif.
ELECTRO-EXPULSIVE SEPARATION SYSTEM Patent Application
L. A. HASLIM and R. D. LEE, inventors (to NASA) 31 May 1985 51 p
(NASA-CASE-ARC-11613-1; NAS 1.71:ARC-11613-1; US-PATENT-APPL-SN-739792) Avail: NTIS HC A04/MF A01 CSCL 09A
An electro-expulsive system has one or more overlapped conductors, each comprising a flexible ribbon conductor, which is folded back on itself. The conductors are embedded in an elastomeric material. Large current pulses are fed to the conductors from power storage units. As a result of the antiparallel currents, the opposed segments of a conductor are forcefully separated and the elastomeric material is distended. Void in the elastomer aid the separation of the conductor segments. The distention is

Author
almost instantaneous when a current pulse reaches the conductor and the distention tends to remove any solid body on the surface of the elastomeric material.

An electrical testing structure and method is described whereby a test structure is fabricated on a large scale integrated circuit wafer along with the circuit components and has a van der Pauw cross resistor in conjunction with a bridge resistor and a split bridge resistor, the latter having two channels each a line width wide, corresponding to the line width of the wafer circuit components, and with the two channels separated by a space equal to the line spacing of the wafer circuit components. The testing structure has associated voltage and current contact pads arranged in a two by four array for conveniently passing currents through the test structure and measuring voltages at appropriate points to calculate the sheet resistance, line width, line spacing, and line pitch of the circuit components on the wafer electrically.

The method of ultrasonically bonding electrical leads to soft microelectronic substrates such as those which are Teflon-based is discussed. According to the inventive method, an interconnecting element such as a gold-plated copper disc is soldered to the substrate, and an electrical lead thereafter ultrasonically bonded to the interconnecting element. In contrast to the soft substrate, the interconnecting element does not dissipate ultrasonic energy and permits an ultrasonic bond to be formed between the electrical lead and interconnecting elements.

An oscillator circuit for sensing and indicating temperature by changing oscillator frequency with temperature comprises a programmable operational amplifier which is operated on the roll-off portion of its gain versus frequency curve and has its output directly connected to the inverting input to place the amplifier in a follower configuration. Its output is also connected to the non-inverting input by a capacitor with a crystal or other tuned circuit also being connected to the non-inverting input. A resistor is connected to the program input of the amplifier to produce a given set current at a given temperature, the set current varying with temperature. As the set current changes, the gain-bandwidth of the amplifier changes and, in turn, the reflected capacitance across the crystal changes, thereby providing the desired change in oscillator frequency by pulling the crystal. There is no requirement that a
34 FLUID MECHANICS AND HEAT TRANSFER

N85-34333* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD AND APPARATUS FOR TRANSFER FUNCTION SIMULATOR FOR TESTING COMPLEX SYSTEMS Patent

A method and apparatus for testing the operation of a complex stabilization circuit in a closed loop system is presented. The method is comprised of a programmed analog or digital computing system for implementing the transfer function of a load thereby providing a predictable load. The digital computing system employs a table stored in a microprocessor in which precomputed values of the load transfer function are stored for values of input signal from the stabilization circuit over the range of interest. This technique may be used not only for isolating faults in the stabilization circuit, but also for analyzing a fault in a faulty load by so varying parameters of the computing system as to simulate operation of the actual load with the fault.

Offical Gazette of the U.S. Patent and Trademark Office

N85-30202* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

LDV MULTIPLEXER INTERFACE Patent Application

A laser Doppler velocimeter multiplexer interface includes an event pulse synchronizer which synchronizes data pulses from events A, B and C. Clock control is connected to receive timing information on the data pulses from the synchronizer. Displays are connected to receive clock signals from the clock control for indicating a data rate for each of the measured events A, B and C. The display is connected to receive clock signals from the clock control to indicate a coincidence rate between data pulses for any selected combination of the measured events A, B and C. A multiplexer receives the data pulses from the events A, B and C and rate data from the clock control. The multiplexer has output for supplying the data pulses and rate data to a single input of a data processing system. A multiplexer control is connected to supply control signals to the multiplexer for selecting the event data pulses and the rate data for output from the multiplexer.

R.J.F.

FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
reactor with electric isolation. Heat from a high temperature heat pipe is transferred through a vacuum or a gap filled with electrically nonconducting gas to a cooler heat pipe. If the receiver requires greater thermal power density, geometries are used with larger heat pipe areas for transmitting and receiving energy than the area for conducting the heat to the thermionic converter. In this way the heat pipe capability for increasing thermal power densities compensates for the comparative low thermal power densities through the electrically nonconducting gap between the two heat pipes. Official Gazette of the U.S. Patent and Trademark Office.

N85-29180 National Aeronautics and Space Administration, Johnson (Lyndon B.) Space Center,
MONOGROOVE HEAT PIPE DESIGN: INSULATED LIQUID CHANNEL WITH BRIDGING WICK Patent
Avail: US Patent and Trademark Office CSCL 20D
A screen mesh artery supported concentrically within the evaporator section of a heat pipe liquid channel retains liquid in the channel. Continued and uniform liquid feed to the heat pipe evaporation section (20) during periods of excessive heat transfer is assured. The overall design provides high evaporation and condensation film coefficients for the working fluid by means of the circumferential grooves in the walls of the vapor channel, while not interfering with the overall heat transport capability of the axial groove. The design has particular utility in zero-g environments.

N85-33433 National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio,
VORTEX GENERATING FLOW PASSAGE DESIGN FOR INCREASED FILM COOLING EFFECTIVENESS Patent
It is an object of the invention to provide a film cooling apparatus of increased effectiveness and efficiency. In accordance with the invention, a cooling fluid is injected into a hot flowing gas through a passageway in a wall which contains and is subject to the hot
35 INSTRUMENTATION AND PHOTOGRAPHY

Additional guard wires lie at opposite ends of the electrolytic sheet, and currents pass through them to avoid moisture buildup at the ends of the main wire coil.

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35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

N85-29212* National Aeronautics and Space Administration.
Pasadena Office, Calif.

TRACE WATER SENSOR Patent
Sponsored by NASA
Avail: US Patent and Trademark Office CSCL 14B

A solid electrolytic type hygrometer is described, which operates with high reliability while providing rapid and sensitive response. A gold foil electrode is wrapped about a hollow glass cylinder, a sheet of hydroscopic-electrolytic material is wrapped about the foil, and a wire is wound around the outside of the electrolytic sheet. Moisture passing between wire turns can be absorbed by the electrolytic material, and then dissociated by current passed by the electrodes through the electrolytic material. The cylinder has a slit extending along its length, to allow resilient expansion to press the sheet of electrolytic material firmly against the electrodes. The wire turns lie against one another to cause rapid dissociation of moisture throughout the electrolytic material.
A low gravity exothermic heating/cooling apparatus is disclosed for processing materials in space which includes an insulated casing and a sample support carried within the casing which support a sample container. An exothermic heat source includes a plurality of segments of exothermic material stacked one upon another to produce a desired temperature profile when ignited. The sample container is arranged within the core of the stacked exothermic heating material. Igniters are spaced vertically along the axis of the heating material to ignite the exothermic material at spaced points to provide total rapid burn and release of heat. To rapidly cool and quench the heat, a source of liquid carbon dioxide is provided which is conveyed through a conduit and a metering orifice into a distribution manifold where the carbon dioxide is gasified and dispersed around the exothermic heating material and the sample container via tubes for rapidly cooling the material sample.

A method and apparatus for obtaining dynamic calibrations of pressure transducers is presented. A calibration head, a flexible tubing and a bellows enclose a volume of air at atmospheric pressure with a transducer to be calibrated subject to the pressure inside the volume. All of the other apparatus applies oscillations to the bellows causing the volume to change thereby applying oscillating pressures to the transducer whereby the transducer can be calibrated. A method and apparatus unaffected by vibrational environments for obtaining measurements using Raman Doppler Velocimetry is described. Two laser beams, a pump beam and a probe beam, are focused by a lens to a point in a flow. A lens collimates the two beams. A beam splitter dumps beam and the other beam is reflected by a corner cube back to lens. The other lens then focuses the beam back to the point. The reflected beam and the backward and forward scattering at the point are detected by a detector and processed by a boxcar averager. The lens and corner cube combination, called a retrometer ensure that the measurements are unaffected by vibrations.
A microbial detection system that automatically collects, incubates, and enumerates the microorganisms within a water sample in a few hours, then sterilizes the system in order to prepare the system for another sample, is disclosed. Initially, the system is sterilized and then purged to remove residual organisms from the previous test. The sample is collected in accumulator until it reaches a predetermined level when intake valve is opened forcing the sample into incubator. The growth media is then introduced into incubator and the system is incubated for a duration dependent on the number of test organisms. Finally, the sample is dumped and the entire process is repeated for a new sample. The sample intake valve employs a unique combination of concentric dome valves and valve stems which are solenoid operated. The concentric dome valves provide a fluid intake port capable of reliable sterilization between sample intakes.

A fluidic sensor providing a differential pressure signal proportional to the angular velocity of a rotary input is described. In one embodiment the sensor includes a fluid pump having an impeller coupled to a rotary input. A housing forming a constricting fluid flow chamber is connected to the fluid input of the pump. The differential pressure signal measured across the flow restrictive input is relatively noise free and proportional to the square of the angular velocity of the impeller. In an alternative embodiment, the flow chamber has a generally cylindrical configuration and plates having flow restrictive apertures are disposed within the chamber downstream from the housing port. In this embodiment, the differential pressure signal is found to be approximately linear with the angular velocity of the impeller.
N85-30282* National Aeronautics and Space Administration.
Langley Research Center, Hampton, Va.

DUAL DIFFERENTIAL INTERFEROMETER Patent
Avail: US Patent and Trademark Office CSCL 14B

A dual two-beam differential interferometer that measures both the amplitude and orientation of propagating, broadband surface acoustic waves is disclosed. Four beams are focused on a surface. The four reflected beams are separated into two pairs. The two pairs are detected to produce two signals that are used to compute amplitude and orientation.

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N85-34373* National Aeronautics and Space Administration.
Pasadena Office, Calif.

INSTRUMENTATION FOR SENSING MOISTURE CONTENT OF MATERIAL USING A TRANSIENT THERMAL PULSE Patent

Instrumentation for sensing moisture content of material using a transient thermal pulse is comprised of a sensing probe having a sensing element in the form of a ribbon excited by a constant current pulse from a source to increase the temperature and therefore the resistance of the ribbon linearly. Moisture in web material will limit the increase of temperature during the pulse in proportion to the moisture content. This increase in temperature produces a proportional increase in resistivity which is measured with a Wheatstone bridge as a change in voltage displayed by a measurement display unit. The probe is glued in a shallow groove of a Lucite bar and connected to copper pins embedded in the bar.

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N85-30286# National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.

IMPROVED FLUID FLOW METER FOR MEASURING THE RATE OF FLUID FLOW IN A CONDUIT Patent Application
CSCL 14B

A fluid flow rate meter is described. A tube fluid flow rate meter is comprised of a reservoir divided by flexible diaphragms into two separate, isolated compartments except for an orifice in the diaphragm. An incoming tube opens into a compartment and an outgoing tube opens into a compartment. An orifice is sized to allow maximum tube fluid flow. Opposing compression springs are secured within the two compartments with a bias diaphragm on opposite sides of orifice to maintain the orifice in a given position when the tube fluid pressure is zero. A tapered element is centered in, and extends through the orifice into the compartment leaving an annular opening between the element and the perimeter of orifice whose size varies as the diaphragm flexes with changes in tube fluid pressure to change the fluid flow through the opening. A light source directs light upon an element which scatters the light through the opening into the compartment. The light detector in the compartment senses the scattered light and generates a signal indicating the amount of fluid flow.

R.J.F.
The output current from a metastable ionization detector (MID) is applied to a modulation voltage circuit. An adjustment is made to balance out the background current, and an output current, above background, is applied to an input of a strip chart recorder. For low level concentrations, i.e., low detected output current, the ionization potential will be at a maximum and the metastable ionization detector will operate at its most sensitive level. When the detected current from the metastable ionization detector increases above a predetermined threshold level, a voltage control circuit is activated which turns on a high voltage transistor which acts to reduce the ionization potential. The ionization potential applied to the metastable ionization detector is then varied so as to maintain the detected signal level constant. The variation in ionization potential is now related to the concentration of the constituent and a representative amplitude is applied to another input of said strip chart recorder.

An improved mechanical extensometer is described for use with a constant load creep test machine. The dead weight of the extensometer is counterbalanced by two pairs of weights connected through a pulley system and to rod extension and leading into the furnace where the test sample is undergoing elevated temperature (above 500 F.) tensile testing. Novel gripper surfaces, conical tip and flat surface are provided in each sampling engaging platens to reduce the grip pressure normally required for attachment of the extensometer to the specimen and reduce initial specimen bending normally associated with foil-gage metal testing.

A system is described for remote absorption spectroscopy of trace species using a diode laser tunable over a useful spectral region of 50 to 200 cm\(^{-1}\) by control of diode laser temperature over range from 15 K to 100 K, and tunable over a smaller region of typically 0.1 to 10 cm\(^{-1}\) by control of the diode laser current over a range from 0 to 2 amps. Diode laser temperature and current set points are transmitted to the instrument in digital form and stored in memory for retrieval under control of a microprocessor during measurements. The laser diode current is determined by a digital to analog converter through a field effect transistor for a high degree of ambient temperature stability, while the laser diode temperature is determined by set points entered into a digital to analog converter under control of the microprocessor. Temperature of the laser diode is sensed by a sensor diode to provide negative feedback to the temperature control circuit that responds to the temperature control digital to analog converter.

An improved mechanical extensometer is described for use with a constant load creep test machine. The dead weight of the extensometer is counterbalanced by two pairs of weights connected through a pulley system and to rod extension and leading into the furnace where the test sample is undergoing elevated temperature (above 500 F.) tensile testing. Novel gripper surfaces, conical tip and flat surface are provided in each sampling engaging platens to reduce the grip pressure normally required for attachment of

N85-34374* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. MODULATED VOLTAGE METASTABLE IONIZATION DETECTOR Patent

N85-29264* National Aeronautics and Space Administration. Pasadena Office, Calif. DIGITAL CONTROL OF DIODE LASER FOR ATMOSPHERIC SPECTROSCOPY Patent

N85-34375* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va. TENSILE TESTING APPARATUS Patent

36 LASERS AND MASERS Includes parametric amplifiers.
A laser power supply system for exciting high power electric discharge gas lasers is described in which separate pulses are utilized to avalanche ionize the gas within the laser and then produce a sustained discharge to cause the gas to emit light energy. A pulsed voltage source is used to charge a storage device such as a distributed capacitance. A transmission line or other suitable electrical conductor connects the storage device to the laser. A saturable inductor switch is coupled in the transmission line for containing the energy within the storage device until the voltage level across the storage device reaches a predetermined level, which level is less than that required to avalanche ionize the gas. An avalanche ionization pulse-generating circuit is coupled to the laser for generating a high voltage pulse of sufficient amplitude to avalanche ionize the laser gas. Once the laser gas is avalanche ionized, the energy within the storage device is discharged through the saturable inductor switch into the laser to provide the sustained discharge.

An arrangement for damping the resonance in a laser diode is described. This arrangement includes an additional layer which together with the conventional laser diode form a structure (35) of a bipolar transistor. Therein, the additional layer serves as the collector, the cladding layer next to it as the base, and the active region and the other cladding layer as the emitter. A capacitor is connected across the base and the collector. It is chosen so that at any frequency above a certain selected frequency which is far below the resonance frequency the capacitor impedance is very low, effectively shorting the base to the collector.

A method for driving a two phase turbine characterized by an output shaft having at least one stage including a bladed rotor connected in driving relation with the shaft is described. A two phase fluid is introduced into one stage at a known flow velocity and caused to pass through the rotor for imparting angular velocity thereto. The angular velocity of the rotor is maintained at a value such that the angular velocity of the tips of the blades of the rotor is a velocity equal to at least 50% of the velocity of the flow of the two phase fluid.
A self contained spray application is developed for one handed operation in a zero gravity vacuum environment by a free flying astronaut not attached to any spacecraft. This spray applicator eliminates contamination of the operator by back spray. This applicator includes a rigid accumulator containment of a fluid within a flexible bladder the fluid being urged out of the accumulator under pressure through a spray gun. The spray gun includes a spring loaded lockable trigger which controls a valve. When in an open position, the fluid passes through the valve into the ambient environment in the form of a spray. A spray shield is provided which directs the flow of the spray from the applicator by trapping errant particles of spray yet allowing the passage of escaping gases through its material.
An improvement of a precision manipulator for use in ultrahigh vacuum (UHV) system with sample transfer capability in which a spring loaded thermocouple and a heater electrode are both in direct contact with the transferred sample is discussed. The thermocouple and heater electrode assembly are mounted concentric with a sample receiving block on the end of an offset manipulator. Hence, when a sample is transferred from an introduction chamber into the UHV chamber, it contacts the spring loaded thermocouple and then seats a heater electrode. Cooling by a copper plate and a strap combined with the resistance heating capability allow sample temperatures over the range of 150 to 1750 K while positioned in front of any diagnostic instrument in the UHV system and while taking data with these instruments.

A system is described for performing a mechanical release function exhibiting low shock. This system includes two pyrotechnic detents fixed mounted in opposing axial alignment within a cylindrical housing having two mechanical bellows. Two mechanical bellow assemblies, each having one end hermetically bonded to the housing and the other to the respective actuator pin extending from either end of the housing, ensure that all outgassing and contamination from the operation of the pyrotechnic devices will be contained within the housing and bellows. The pin on one end of the assembly is fixed mounted and supported, via a bolt or ball and socket joint so that when the charge corresponding to that pin ignites, the entire assembly will exhibit rectilinear movement, including the opposing pin providing the unlatching motion.
ALIGNMENT AND ASSEMBLY TOOL FOR VERY LARGE DIAMETER CYLINDERS Patent Application

J. H. EHL, inventor (to NASA) 31 May 1985 18 p

A tool used to accurately align and hold very large diameter cylinders together for weld assembly is described. The tool has a U-shaped main body with a horizontal top section and two legs, which are attached to the end of top section and extend outward and downward. Horizontal bottom sections extend outward from the bottoms of legs. The tool has one inner jackscrew and one outer jackscrew on each side of its center, extending downward from top section. Each of the two bottom sections has an attached side clamp for clamping the alignment tool to two opposing skin stringers of cylinders. The jackscrews are adjusted to bring the edges of the ring into precise alignment with the ends of the two large cylinders and so that both joints may be welded around their full circumference.
An object of the invention is to provide variable damping for resonant vibrations which may occur at different rotational speeds in the range of rpms in which a rotating machine is operated. A variable force damper in accordance with the invention includes a rotating mass carried on a shaft which is supported by a bearing in a resilient cage. The cage is attached to a support plate whose rim extends into an annular groove in a housing. Variable damping is effected by tabs of electrically conducting nonmagnetic material which extend radially from the cage. The tabs at an index position lie between the pole face of respective C shaped magnets. The magnets are attached by cantilever spring members to the housing.

A releasable support device is described which is comprised of a hollow body with a sleeve extending transversely there-through for receiving the end of a support shank. A slider-latch, optionally lubricated, extends through side recesses in the sleeve to straddle the shank, respectively, in latched and released positions. The slider-latch is slid from its latched to its unlatched position by a pressure squib whereupon a spring or other pressure means pushes the shank out of the sleeve. At the same time, a follower element is lodged in and closed the hole in the body wall from which the shank was discharged. The mechanism was designed for the shuttle orbiter/external tank connection device.

A device for fastening a temporary replacement heat shield tile to the strain isolation pad of a space vehicle is disclosed. An internally threaded, flanged cylinder is rotatably connected to a threaded brass plug through a flanged aluminum sleeve to form the device. The device is adhesively attached to the replacement tile before using. In using the device, the tile containing the device is placed against the strain isolation pad of the space vehicle such that the flanged portion of the flanged cylinder rests against the strain isolation pad. This flanged portion, which consists of a plurality of L shaped blades, is then rotated into the strain isolation pad. The brass plug is then rotated with respect to the flanged stainless steel cylinder to draw the tile snugly against isolation pad and thus complete the fastening process.
A device for connecting, rotating and locking together a pair of structural half columns is described. The device is composed of an identical pair of cylindrical hub assemblies connected at their inner faces by a spring loaded hinge; each hub assembly having a structural half column attached to its outer end. Each hub assembly has a spring loading locking ring member movably attached adjacent to its inner face and includes a latch member for holding the locking ring in a rotated position subject to the force of its spring. Each hub assembly also has a hammer member for releasing the latch on the opposing hub assembly when the hub assemblies are rotated together. The spring loaded hinge connecting the hub assemblies rotates the hub assemblies and attached structural half columns together bringing the inner faces of the opposing hub assemblies into contact with one another.

N85-33489* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. MULTISTAGE SPENT PARTICLE COLLECTOR AND A METHOD FOR MAKING SAME Patent

A description is given of a spent particle collector which maintains structural integrity when raised to a high temperature although constructed of materials having widely different coefficients of expansion. The collector is comprised of one or more axisymmetric stages, each stage comprising a subassembly. A subassembly includes an inner pyrolytic graphite ring, a transition ring, a ceramic insulator ring and an outer metal ring which forms part of the wall of the collector. Each transition is of a ductile metal having high thermal conductivity and is provided with an annular sputter shield wall extending toward the source of spent particles and, where necessary, a trough in the other surface to enclose the sputter shield of the next adjacent transition ring. A plurality of radial extending slots are provided in a transition ring to form segments which are retained in their position by the sputter shield. Official Gazette of the U.S. Patent and Trademark Office
37 MECHANICAL ENGINEERING

**N85-33490**  National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

**DUAL CLEARANCE SQUEEZE FILM DAMPER Patent**
D. P. FLEMING, inventor (to NASA)  9 Jul. 1985  8 p Filed 5 Apr. 1984  Supersedes N84-22562 (22 - 13, p 1932)

A dual clearance hydrodynamic liquid squeeze film damper for a gas turbine engine is described. Under normal operating conditions, the device functions as a conventional squeeze film damper, using only one of its oil films. When an unbalance reaches abusive levels, as may occur with a blade loss or foreign object damage, a second, larger clearance film becomes active, controlling vibration amplitudes in a near optimum manner until the engine can be safely shut down and repaired.

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**N85-34401**  National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

**VARIABLE LENGTH STRUT WITH LONGITUDINAL COMPLIANCE AND LOCKING CAPABILITY Patent**

A variable length strut device is illustrated for connecting two associated structures which includes an outer load bearing shell, a drive assembly, a length varying compliance assembly positioned by drive assembly, and a strut rod locking assembly. The load bearing shell includes a connecting part adapted for connection to a first associated structure. A strut connection rod has a connecting part adapted for connection to a second associated structure and a distal end having a piston driver slidably carried in a housing of compliance assembly. Two compliance pistons act in opposing directions on the piston driver to provide longitudinal compliance in a compliance mode of operation. Locking assembly includes locking balls which are urged in a locking ring as locking bolt is urged to the left by fluid pressure. Microswitches sense the displacement of pistons away from the internal ring to bring the pistons to a neutral position wherein the pistons are in contact with the internal ring when it is desired to do so as affected by a control source.

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**N85-34402**  National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

**OXIDIZING SEAL FOR A TURBINE TIP GAS PATH Patent**

The sealing of the gas path in a gas turbine engine at the blade tips is improved by maintaining a minimum clearance between the rotor blade tips and the gas path seal. This is accomplished by taking advantage of an increase in volume during controlled oxidation of certain intermetallic compounds which have high melting points. The increase in volume closes the clearance subsequent to a rub between the blades and the seal. Thus, these compounds re-form the tip seal surface to assure continued engine efficiency.

Official Gazette of the U.S. Patent and Trademark Office
A pair of spool valves are described which are balanced between pressures of reactant gases supplied to a fuel cell power plant. The pressure differences are controlled between the gases so as to maintain those pressures substantially in the proportions necessary for operation of the fuel cell.

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A photovoltaic cell, such as a solar cell, is provided which has a higher output voltage than prior cells. The improved cell includes a substrate of doped silicon, a first layer of silicon disposed on the substrate and having opposite doping, and a second layer of silicon carbide disposed on the first layer. The silicon carbide preferably has the same type of doping as the first layer.

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A stable density-stratification solar pond for use in the collection and storage of solar thermal energy including a container having a first section characterized by an internal wall of a substantially cylindrical configuration and a second section having an internal wall of a substantially truncated conical configuration surmounting the first section in coaxial alignment therewith, the second section of said container being characterized by a base of a diameter substantially equal to the diameter of the first section and a truncated apex defining a solar energy acceptance opening is discussed. A body of immiscible liquids is disposed within the container and comprises a lower portion substantially filling the first section of the container and an upper portion substantially filling the second section of the container, said lower portion being an aqueous based liquid of a darker color than the upper portion and of a greater density. A protective cover plate is removably provided for covering the acceptance opening.

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A photovoltaic cell, such as a solar cell, is provided which has a higher output voltage than prior cells. The improved cell includes a substrate of doped silicon, a first layer of silicon disposed on the substrate and having opposite doping, and a second layer of silicon carbide disposed on the first layer. The silicon carbide preferably has the same type of doping as the first layer.

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A thermionic photovoltaic energy conversion device comprises a thermionic diode mounted within a hollow tubular photovoltaic converter. The thermionic diode maintains a cesium discharge for producing excited atoms that emit line radiation in the wavelength region of 850 nm to 890 nm. The photovoltaic converter is a silicon or gallium arsenide photovoltaic cell having bandgap energies in this same wavelength region for optimum cell efficiency.

A noninvasive accurate method for measuring the temperature of tissue beneath the surface of a living body is described. Ultrasonic signals are directed into beads of a material that are inserted into the tissue with a syringe. The reflected signals indicate the acoustic impedance or resonance frequency of the beads which in turn indicates the temperature of the tissue. A range of temperatures around the melting temperature of the material can be measured by this method.

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A non-recursive, moving, smoothing averaging technique, equivalent to applying a polynomial regression calculation to the data set.

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The stabilizer does not lie on a horizontal plane, but instead is curved with a lowermost portion near the vertical axis of the chamber. As a result, an acoustically levitated object is urged by gravity towards the lowermost location on the levitation surface, so the object is kept away from the side walls of the chamber.

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A method is described which uses acoustic energy to separate particles of different sizes, densities, or the like. The method includes applying acoustic energy resonant to a chamber containing a liquid or gaseous medium to set up a standing wave pattern that includes a force potential well wherein particles within the well are urged towards the center, or position of minimum force potential. A group of particles to be separated is placed in the chamber, while a non-acoustic force such as gravity is applied, so that the particles separate with the larger or denser particles moving away from the center of the well to a position near its edge and progressively smaller lighter particles moving progressively closer to the center of the well. Particles are removed from different positions within the well, so that particles are separated according to the positions they occupy in the well.

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includes atomic structure and molecular spectra.

An electron gun is used with a mirror electrostatic field to produce zero or near zero velocity electrons by forming a turning point in their trajectories. A gas capable of attaching zero or near zero velocity is introduced at this turning point, and negative ions are produced by the attachment or dissociative attachment process. Operation may be continuous or pulsed. Ions thus formed are extracted by a simple lens system and suitable biasing of grids.

A method and apparatus for detecting submillimeter or IR radiation is disclosed. A rare gas, such as xenon, is supplied at its ground state via a pressurized cylinder and an adjustable leak valve into a cryogenically cooled detection area. The ground state of xenon is double photon excited to a particularized level of the Rydberg series by a resonance lamp and a laser. The doubly excited gas is then further excited by the radiation to be measured. A field ionization and an ion measurement indicative of the radiation intensity is achieved.

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second focal plane a distribution pattern in which preselected groupings of the components are dispersed over essentially equal spacing intervals.

Author

N85-29749* National Aeronautics and Space Administration. Pasadena Office, Calif.

OPTICAL FIBER COUPLING METHOD AND APPARATUS Patent
Avail: US Patent and Trademark Office CSCL 20F

Systems are described for coupling a pair of optical fibers to pass light between them, which enables a coupler to be easily made, and with simple equipment, while closely controlling the characteristics of the coupler. One method includes mounting a pair of optical fibers on a block having a large hole therein, so the fibers extend across the hole while lying adjacent and parallel to one another. The fibers are immersed in an etchant to reduce the thickness of cladding around the fiber core. The fibers are joined together by applying a liquid polymer so the polymer-air interface moves along the length of the fibers to bring the fibers together in a zipper-like manner, and to progressively lay a thin coating of the polymer on the fibers.

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N85-34629* National Aeronautics and Space Administration. Pasadena Office, Calif.

RANGING SYSTEM WHICH COMPARES AN OBJECT REFLECTED COMPONENT OF A LIGHT BEAM TO A REFERENCE COMPONENT OF THE LIGHT BEAM Patent

A system is described for measuring the distance to an object by comparing a first component of a light pulse that is reflected off the object with a second component of the light pulse that passes along a reference path of known length, which provides great accuracy with a relatively simple and rugged design. The reference path can be changed in precise steps so that it has an equivalent length approximately equal to the path length of the light pulse component that is reflected from the object. The resulting small difference in path lengths can be precisely determined by directing the light pulse components into opposite ends of a detector formed of a material that emits a second harmonic light...
output at the locations where the opposite going pulses past simultaneously across one another.

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POSITION

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The purity and perfection of a semiconductor is improved by depositing a patterned mask of a material impervious to impurities of the semiconductor on a surface of a blank. When a layer of semiconductor is grown on the mask, the semiconductor will first grow from the surface portions exposed by the openings in the mask and will bridge the connecting portions of the mask to form a continuous layer having improved purity, since only the portions overlying the openings are exposed to defects and impurities.

Author


Crystals of high morphological quality are grown by dissolution of a substance to be grown into the crystal in a suitable solvent under high pressure, and by subsequent slow, time-controlled reduction of the pressure of the resulting solution. During the reduction of the pressure interchange of heat between the solution and the environment is minimized by performing the pressure reduction either under isothermal or adiabatic conditions.

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A method to determine the potential of zero charge of an unpowdered semiconductor material is presented. The
semiconductor material is used as the working electrode of a standard three electrode photoelectrochemical cell. The onset potential of the semiconductor material is measured at several different cell temperatures. The slope of the graph of onset potential versus temperature is used to compute the potential of zero charge.

A method for growing a high purity, low defect layer of semiconductor is described. This method involves depositing a patterned mask of a material impervious to impurities of the semiconductor on a surface of a blank. When a layer of semiconductor is grown on the mask, the semiconductor will first grow from the surface portions exposed by the openings in the mask and will bridge the connecting portions of the mask to form a continuous layer having improved purity, since only the portions overlying the openings are exposed to defects and impurities. The process can be reiterated and the mask translated to further improve the quality of grown layers.

A method and apparatus are described which facilitate the growing of silicon ribbon. A container for molten silicon has a pair of passages in its bottom through which filaments extend to a level above the molten silicon, so as the filaments are pulled up they drag up molten silicon to form a ribbon. A pair of guides surround the filaments along most of the height of the molten silicon, so that the filament contacts only the upper portion of the melt. This prevents the filament from touching the melt and contaminating it. This arrangement

A system and method for monitoring the state of a crystal which is suspended in a solution is described which includes providing a light source for emitting a beam of light along an optical axis. A collimating lens is arranged along the optical axis for collimating the emitted beam to provide a first collimated light beam consisting of parallel light rays. By passing the first collimated light beam through a transparent container, a number of parallel light rays are deflected off of the surfaces of said crystal being monitored according to the refractive index gradient to provide a deflected beam of deflected light rays. A focusing lens is arranged along the optical axis for focusing the deflected rays towards a desired focal point. A band is created at one edge of the image of the crystal which indicates the state of change of the surface of the crystal being monitored.
also enables a higher melt to be used without danger that the molten silicon will run out of any bottom hole.

URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

N85-34722* National Aeronautics and Space Administration.
Pasadena Office, Calif.

SHUTTLE CAR LOADING SYSTEM Patent
E. R. Collins, Jr., inventor (to NASA) (JPL, Pasadena, Calif.)

A system is described for loading newly mined material such as coal, into a shuttle car, at a location near the mine face where there is only a limited height available for a loading system. The system includes a storage bin having several telescoping bin sections and a shuttle car having a bottom wall that can move under the bin. With the bin in an extended position and filled with coal the bin sections can be telescoped to allow the coal to drop out of the bin sections and into the shuttle car, to quickly load the car. The bin sections can then be extended, so they can be slowly filled with more while waiting another shuttle car.

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N85-33826* National Aeronautics and Space Administration.
Johnson (Lyndon B.) Space Center,

LIQUID CRYSTAL LIGHT VALVE STRUCTURES Patent
N. J. Koda, inventor (to NASA) (Hughes Aircraft Co., Los Angeles, Calif.)

An improved photosensor film and liquid crystal light valves embodying said film is provided. The photosensor film and liquid crystal light valve is characterized by a significant lower image retention time while maintaining acceptable photosensitivity. The photosensor film is produced by sputter depositing CdS onto an ITO substrate in an atmosphere of argon/H2S gas while maintaining the substrate at a temperature in the range of about 130 C to about 200 C and while introducing nitrogen gas into the system to the extent of not more than about 1% of plasma mixture. Following sputter deposition of the CdS, the film is annealed in an inert gas at temperatures ranging from about 300 C to about 425 C.

NASA
Abstracts are provided for 109 patents and patent applications entered into the NASA scientific and technical information system during the period July 1985 through December 1985. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application.
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