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NASA

PATENT ABSTRACTS

BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

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.
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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AND PATENT APPLICATIONS

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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PUBLIC COLLECTIONS OF NASA DOCUMENTS

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.

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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.
1245.210 Modification and termination of licenses.
1245.211 Appeals.
1245.212 Protection and administration of inventions.

1245.213 Transfer of custody.
1245.214 Confidentiality of information.


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 acquired by the United States Government.

(b) "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.

(c) "NASA Invention" means a Federally owned invention with respect to which NASA maintains custody and administration, in whole or in part, of the right, title, or interest in such invention on behalf of the United States Government.

(d) "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.

(e) "NASA Invention" means a Federally owned invention with respect to which NASA maintains custody and administration, in whole or in part, of the right, title or interest in such invention on behalf of the United States Government.

All licenses granted under this subpart.

Types of Licenses

Nonexclusive licenses.

Exclusive and partially exclusive licenses.

Procedures

Application for a license.

Processing applications.

Notice to Attorney General.

Modification and termination of licenses.

Appeals.

Protection and administration of inventions.

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 licenee 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 licensor 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 [a][1][i] 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) [ii][i][A] and consideration of any written objections received during the period, NASA has determined that:  
[1] The interests of the Federal Government and the public will be best 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;  
[2] 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;  
[3] 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  
[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 that, equally likely, if executed, will best serve the interests of the Government and the public; and  
(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:  
[i] Notice of a prospective license, identifying the invention and prospective licensee, has been published in the Federal Register, providing opportunity for filing written objections
PATENT LICENSING REGULATIONS

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;

(d) 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:

(i) 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;

(ii) A statement as to applicant's capability and intention to fulfill the plan, including information regarding manufacturing, marketing, financial, and technical resources;

(iii) A statement of the fields of use for which applicant intends to practice the invention; and

(iv) 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

(k) Any other information which applicant believes will support a determination to grant the license to applicant.

§ 1245.203 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, 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 § 1245.213.

§ 1245.200 Notice to Attorney General.

A copy of the notice provided for in §§ 1245.203(a)(1)(ii)(A), and 1245.206(b)(1)(ii) 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 sublicensees of record a written notice of intention to modify or terminate the license, and the licensee and any sublicensees 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(a)(1)(ii)(A) or
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.

§ 1245.213 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.

[FR Doc. 81–31030 Filed 10–30–81; 8:45 am]
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 Aeronautics.

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Notes</th>
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<tbody>
<tr>
<td>01</td>
<td>AERONAUTICS (GENERAL)</td>
<td>N.A.</td>
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<tr>
<td>02</td>
<td>AERODYNAMICS</td>
<td>1</td>
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<tr>
<td></td>
<td>Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also 34 Fluid Mechanics and Heat Transfer.</td>
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<tr>
<td>03</td>
<td>AIR TRANSPORTATION AND SAFETY</td>
<td>N.A.</td>
</tr>
<tr>
<td></td>
<td>Includes passenger and cargo air transport operations; and aircraft accidents. For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.</td>
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<tr>
<td>04</td>
<td>AIRCRAFT COMMUNICATIONS AND NAVIGATION</td>
<td>N.A.</td>
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<tr>
<td></td>
<td>Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 17 Spacecraft Communications, Command and Tracking and 32 Communications.</td>
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<tr>
<td>05</td>
<td>AIRCRAFT DESIGN, TESTING AND PERFORMANCE</td>
<td>1</td>
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<td>Includes aircraft simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics.</td>
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<tr>
<td>06</td>
<td>AIRCRAFT INSTRUMENTATION</td>
<td>N.A.</td>
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<tr>
<td></td>
<td>Includes cockpit and cabin display devices; and flight instruments. For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography.</td>
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<tr>
<td>07</td>
<td>AIRCRAFT PROPULSION AND POWER</td>
<td>1</td>
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<tr>
<td></td>
<td>Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.</td>
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<tr>
<td>08</td>
<td>AIRCRAFT STABILITY AND CONTROL</td>
<td>2</td>
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<tr>
<td></td>
<td>Includes aircraft handling qualities; piloting; flight controls; and autopilots. For related information see also 14 Ground Support Systems and Facilities (Space).</td>
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<tr>
<td>09</td>
<td>RESEARCH AND SUPPORT FACILITIES (AIR)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks. For related information see also 14 Ground Support Systems and Facilities (Space).</td>
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</tr>
</tbody>
</table>

**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.

<table>
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<tr>
<th>Section</th>
<th>Title</th>
<th>Notes</th>
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<tr>
<td>12</td>
<td>ASTRONAUTICS (GENERAL)</td>
<td>N.A.</td>
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<tr>
<td></td>
<td>For extraterrestrial exploration see 91 Lunar and Planetary Exploration.</td>
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<tr>
<td>13</td>
<td>ASTRODYNAMICS</td>
<td>N.A.</td>
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<tr>
<td></td>
<td>Includes powered and free-flight trajectories; and orbit and launching dynamics.</td>
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<td>14</td>
<td>GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)</td>
<td>N.A.</td>
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<tr>
<td></td>
<td>Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators. For related information see also 09 Research and Support Facilities (Air).</td>
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<tr>
<td>15</td>
<td>LAUNCH VEHICLES AND SPACE VEHICLES</td>
<td>N.A.</td>
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<tr>
<td></td>
<td>Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.</td>
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<tr>
<td>16</td>
<td>SPACE TRANSPORTATION</td>
<td>N.A.</td>
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<tr>
<td></td>
<td>Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques. For related information see also 03 Air Transportation and Safety and 85 Urban Technology and Transportation.</td>
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<tr>
<td>17</td>
<td>SPACECRAFT COMMUNICATION, COMMAND AND TRACKING</td>
<td>N.A.</td>
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<tr>
<td></td>
<td>Includes telemetry; space communications networks; astronavigation; and radio blackout. For related information see also 04 Aircraft Communications and Navigation and 32 Communications.</td>
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<tr>
<td>18</td>
<td>SPACECRAFT DESIGN, TESTING AND PERFORMANCE</td>
<td>3</td>
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<tr>
<td></td>
<td>Includes spacecraft thermal and environmental control; and attitude control. For related information systems see 54 Man/System Technology and Life Support. For related information see also 05 Aircraft Design, Testing and Performance and 39 Structural Mechanics.</td>
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<tr>
<td>19</td>
<td>SPACECRAFT INSTRUMENTATION</td>
<td>N.A.</td>
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<tr>
<td></td>
<td>For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.</td>
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<tr>
<td>20</td>
<td>SPACECRAFT PROPULSION AND POWER</td>
<td>N.A.</td>
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<tr>
<td></td>
<td>Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also 07 Aircraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.</td>
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<tr>
<td>CHEMISTRY AND MATERIALS</td>
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<tr>
<td>Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.</td>
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<table>
<thead>
<tr>
<th>23 CHEMISTRY AND MATERIALS (GENERAL)</th>
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<tbody>
<tr>
<td>Includes biochemistry and organic chemistry.</td>
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<tr>
<th>24 COMPOSITE MATERIALS</th>
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<tr>
<td>Includes laminates.</td>
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<tr>
<th>25 INORGANIC AND PHYSICAL CHEMISTRY</th>
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<tbody>
<tr>
<td>Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.</td>
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<thead>
<tr>
<th>26 METALLIC MATERIALS</th>
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<tbody>
<tr>
<td>Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.</td>
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<tr>
<th>27 NONMETALLIC MATERIALS</th>
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<tbody>
<tr>
<td>Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.</td>
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<tr>
<th>28 PROPELLANTS AND FUELS</th>
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<tr>
<td>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.</td>
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<tr>
<th>ENGINEERING</th>
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<tr>
<td>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.</td>
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<tr>
<th>31 ENGINEERING (GENERAL)</th>
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<tr>
<td>Includes vacuum technology; control engineering; display engineering; and cryogenics.</td>
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<tr>
<th>32 COMMUNICATIONS</th>
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<tbody>
<tr>
<td>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.</td>
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<tr>
<th>33 ELECTRONICS AND ELECTRICAL ENGINEERING</th>
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<tbody>
<tr>
<td>Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also 60 Computer Operations and Hardware and 76 Solid-State Physics.</td>
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<tr>
<th>34 FLUID MECHANICS AND HEAT TRANSFER</th>
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<tr>
<td>Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling. For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.</td>
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<tr>
<th>35 INSTRUMENTATION AND PHOTOGRAPHY</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
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<tr>
<th>36 LASERS AND MASERS</th>
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<tr>
<td>Includes parametric amplifiers.</td>
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<tr>
<th>37 MECHANICAL ENGINEERING</th>
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<tr>
<td>Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.</td>
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<tr>
<th>38 QUALITY ASSURANCE AND RELIABILITY</th>
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<td>Includes product sampling procedures and techniques; and quality control.</td>
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<tr>
<th>39 STRUCTURAL MECHANICS</th>
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<tr>
<td>Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.</td>
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<tr>
<th>GEOSCIENCES</th>
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<tr>
<td>Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography. For related information see also Space Sciences.</td>
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<tr>
<th>42 GEOSCIENCES (GENERAL)</th>
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<tr>
<td>Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see 35 Instrumentation and Photography.</td>
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<tr>
<th>43 EARTH RESOURCES</th>
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<tr>
<td>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.</td>
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<tr>
<th>45 ENVIRONMENTAL POLLUTION</th>
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<tr>
<td>Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.</td>
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<td>Code</td>
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**LIFE SCIENCES**
- Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

**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.

**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.

**NUMERICAL ANALYSIS**
- Includes iteration, difference equations, and numerical approximation.

**THEORETICAL MATHEMATICS**
- Includes topology and number theory.
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 Spaccraft 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
02

AERODYNAMICS

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

N85-25922*# 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
(NASA-CASE-LAR-13286-1; NAS 1.71 :LAR-13286-1;
US-PATENT-APPL-SN-666959) Avail: NTIS HC A02/MF A01

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. NASA

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

N85-29947* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AIRCRAFT ROTOR BLADE WITH PASSIVE TUNED TAB Patent
T. G. CAMPBELL, inventor (to NASA) (Sikorsky Aircraft, Stratford, Conn.) 30 Apr. 1985 10 p Filed 28 Apr. 1983 Sponsored by NASA

07

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 PROPPELLER Patent
(NASA-CASE-LAR-13019-1; US-PATENT-4,533,101;

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.

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
Avail: US Patent and Trademark Office CSCL 21E
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

09 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
V. W. KELLER, R. B. QUEEN, B. R. ELKIN, and W. L. WHITE, inventors (to NASA) 2 May 1985 12 p
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. 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.

Includes biochemistry and organic chemistry.

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

P. M. HERGENROTHER, inventor (to NASA) 9 Apr. 1985 8 p Filed 10 May 1984 148
US-PATENT-CLASS-525-532; US-PATENT-CLASS-528-86)

Avail: US Patent and Trademark Office CSCL 07C

Phenoxys containing pendent ethynyl groups, the process for preparing the same, and the cured resin products obtained therefrom are disclosed. Upon the application of heat, the ethynyl groups react to provide branching and crosslinking with the cure temperature being lowered by using a catalyst if desired but not required. The cured phenoxys containing pendent ethynyl groups have improved solvent resistance and higher use temperature than linear uncrosslinked phenoxy resins and are applicable for use as coatings, films, adhesives, composited matrices and molding compounds.

HEMISPHERICAL LATCHING APPARATUS Patent

K. H. CLARK, inventor (to NASA) 2 Apr. 1985 17 p Filed 23 Jul. 1982 Superseded N82-31398 (20 - 22, p 3093)
(NASA-CASE-MFS-25837-1; US-PATENT-4,508,296;
US-PATENT-APPL-SN-401282; US-PATENT-CLASS-244-158B;
US-PATENT-CLASS-244-118.1; US-PATENT-CLASS-248-503;

An apparatus for securing payloads in a space vehicle such as the space shuttle is described. The apparatus includes many latching assemblies carried by a platform on the vehicle and a like number of latching elements carried by the payload and adapted to mate with the latching assemblies. The novelty of the invention is believed to reside in the use of complementary hemispherical elements which automatically align and engage with one another. This enables a simple but effective mode of operation and avoids the need for hinged linkages and similar moving parts.

SYNTHESIS OF 2,4,8,10-TETOXASPIRO5,5UNDECANE Patent

(NASA-CASE-ARC-11243-2; US-PATENT-4,528,386;

Avail: US Patent and Trademark Office CSCL 07C

Pentaerythritol is converted to its diformal, 2,4,8,10-tetraoxaspiro5.5undecane, by heating it to a temperature within the range of about 110 to 150 C, for a period of up to 10 minutes, in the presence of a slight excess of paraformaldehyde and of a catalytic quantity of an acid catalyst such as sulfuric acid. The reaction may be carried out in two steps, by forming first the monoformal, then the diformal. In any case, total reaction time is about 10 minutes, and yield of diformal are greater than 90%. Previous processes require hours or days, and often, tedious operating procedures.

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

(NASA-CASE-NPO-16203-1; US-PATENT-4,539,293;

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.

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

Composite structures with a honeycomb core and characterized by lightweight and excellent fire resistance are provided. These sandwich structures employ facesheets made up of bismaleimide-vinyl styrlypyridine copolymers with fiber reinforcement such as carbon fiber reinforcement. In preferred embodiments the facesheets are over-layered with a decorative film. The properties of these composites make them attractive materials of construction for aircraft and spacecraft.
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.
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

N85-29005* National Aeronautics and Space Administration. Pasadena Office, Calif.
CORROSION RESISTANT COATING Patent
A method of coating a substrate with an amorphous metal is described. A solid piece of the metal is bombarded with ions of an inert gas in the presence of a magnetic field to provide a vapor of the metal which is deposited on the substrate at a sufficiently low gas pressure so that there is formed on the substrate a thin, uniformly thick, essentially pinhole-free film of the metal.
Official Gazette of the U.S. Patent and Trademark Office

N85-35253* National Aeronautics and Space Administration. Pasadena Office, Calif.
FLUIDIZED BED DESULFURIZATION Patent
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

N85-35267* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
OXIDATION RESISTANT SLURRY COATING FOR CARBON-BASED MATERIALS Patent
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.

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27
NONMETALLIC MATERIALS

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

N85-29043* National Aeronautics and Space Administration. Pasadena Office, Calif.
STABILIZED UNSATURATED POLYESTERS Patent

An unsaturated polyester, such as propylene glycolmalic acid phthalic acid prepolymer dissolved in styrene is interpolymerized with an ultraviolet absorber and/or an antioxidant. The unsaturated chain may be filled with H or lower alkyl such as methyl and tertiary alkyl such as tertiary butyl. A polymer stable to exposure to the outdoors without degradation by ultraviolet radiation, thermal and/or photooxidation is formed.

Author

N85-34281* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
METAL (2) 4,4',4',4'' PHthaloyClANINE 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.

N85-34282* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS FOR IMPROVING MOISTURE RESISTANCE OF EPOXY RESINS BY ADDITION OF CHROMIUM IONS Patent

A process for improving the moisture resistance properties of epoxidized TGMDA and DGEBA resin system by chemically incorporating chromium ions is described. The addition of chromium ions is believed to prevent the absorption of water molecules.

31
ENGINEERING (GENERAL)

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

N85-29082* National Aeronautics and Space Administration. Pasadena Office, Calif.
RECIPIROCATING MAGNETIC REFRIGERATOR EMPLOYING TANDEM POROUS MATRICES WITHIN A RECIPIROCATING DISPLACER Patent

Disclosed is a method and apparatus for a magnetic refrigeration system. A continuously reciprocating displacer houses at least a 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.

N85-29083* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
INDUCTION HEATING GUN Patent

A device for inductively heating and fusing thermoplastics is presented. It includes an alternating current passing through a tank circuit, the inductor member of the tank circuit is wrapped around a curved pole piece of a ferro-magnetic material. The magnetic flux arising within the inductor coil member flows to the ends of the pole piece and into a screen placed between the materials to be joined. The flux induces a current in the screen, and heat is generated to melt the thermoplastics together. Because only 30 to 150 watts of power are passed through the tank circuit, a wire which will remain cool under operational wattage may be selected, making air or fluid cooling unnecessary.

TEN DEGREE KELVIN HYDRIDE REFRIGERATOR Patent Application
J. A. JONES, inventor (to NASA) (JPL, Pasadena, Calif.) 14 Feb. 1985 14 p
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 high-resolution scan is to commence. 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.

A remote television viewing system employing an eye tracker is disclosed, wherein a small region of the image appears in high resolution, and the remainder of the image appears in low resolution. The eye tracker monitors the position of the viewer's line of sight. The eye tracker position data is transmitted to the remote television camera and control. Both the remote camera and television display are adapted to have selectable high-resolution and low-resolution raster scan modes. The position data from the eye tracker is used to determine the point at which the high-resolution scan is to commence. 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.

The network, which is connected to a layer of 134 feed elements that transmit and receive microwaves, consists of a pair of circuit boards parallel to the feed element layer. One of the two boards has 87 dividers that each divide a signal to be transmitted into seven portions, and the other board has 134 combiners that each collect seven transmit signal portions and deliver the sum to one of the feed elements. A similar arrangement is used to handle received signals. The large number of interconnections are made by printed circuit conductors radiating from each of the numerous dividers and combiners, and by providing interconnection pins that interconnect the ends of pairs of conductors lying on the two boards. The printed circuit conductors extend in undulating paths.
that provide maximum separation of conductors to minimize crosstalk.

The TONE CALIBRATED DIGITAL RADIO COMMUNICATION SYSTEM patent application, with F. Davarian as the inventor and assigned to NASA, describes a transmitter for digital radio communication. This transmitter creates a null by balanced encoding of data modulated on an RF carrier, and inserts a calibration tone within the null. The calibration tone coincides in phase and frequency with the transmitted radio frequency output, allowing 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 COMPRESSED PCM VOICE DATA patent application, with F. Byrne as the inventor and assigned to NASA, details a method and apparatus for digitizing audio signals from multiple parties to provide audio communication with minimum interference. The audio signals are converted to a pulse code modulator companded signal for transmission, and then converted to a first eight parallel signal before being fed to a read-only memory (ROM) to produce an eight-bit signal on the output representing the instantaneous sum of the eight-bit parallel signals. This signal is converted to a serial digital for transmission over a single line before being fed through a digital to analog converter at the receiver to produce an audio signal.

The METHOD AND APPARATUS FOR DELTA KAPPA SYNTHETIC APERTURE RADAR MEASUREMENT OF OCEAN CURRENT patent application, with A. Jain as the inventor and assigned to NASA, describes a synthetic aperture radar (SAR) system for measuring ocean current. The SAR signal is compressed to provide image data for different sections of the chirp bandwidth, equivalent to frequencies and a common area for the separate image fields. 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**

R. L. SYDNOR, inventor (to NASA) (JPL, Pasadena, Calif.) 14 May 1985 8 p Filed 30 Nov. 1983

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 reactivity 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 reactivity coupled into the resonant cavity to change its reactivity, and thus correct its resonance frequency. An alternative to using

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**ELECTRONICS AND ELECTRICAL ENGINEERING**

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

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**N85-29142** National Aeronautics and Space Administration. Pasadena Office, Calif.

**MASER CAVITY SERVO-TUNING SYSTEM Patent**

R. L. SYDNOR, inventor (to NASA) (JPL, Pasadena, Calif.) 14 May 1985 8 p Filed 30 Nov. 1983

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 reactivity 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 reactivity coupled into the resonant cavity to change its reactivity, 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.

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**N85-29144**

National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio. **ALKALINE BATTERY CONTAINING A SEPARATOR OF A CROSS-LINKED COPOLYMER OF VINYL ALCOHOL AND UNSATURATED CARBOXYLIC ACID Patent**


A battery separator for an alkaline battery is described. The separator comprises a cross linked copolymer of vinyl alcohol units and unsaturated carboxylic acid units. The cross linked copolymer is insoluble in water, has excellent zincate diffusion and oxygen gas barrier properties and a low electrical resistivity. Cross linking with a polyaldehyde cross linking agent is preferred.

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**N85-29145**

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. **REACTANCELESS SYNTHESIZED IMPEDANCE BANDPASS AMPLIFIER Patent**


An active R bandpass filter network is formed by four operational amplifier stages interconnected by discrete resistances. One pair of stages synthesize an equivalent input impedance of an inductance (L sub eq) in parallel with a discrete resistance (R sub o) while the second pair of stages synthesizes an equivalent input impedance of a capacitance (C sub eq) serially coupled to another discrete resistance (R sub i) coupled in parallel with the first two stages. The equivalent input impedances aggregate to define a tuned resonant bandpass filter in the roll-off regions of the operational amplifiers.

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**N85-29146**

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md. **HIGH VOLTAGE ISOLATION TRANSFORMER Patent**


A high voltage isolation transformer is provided with primary and secondary coils separated by discrete electrostatic shields from the surfaces of insulating spools on which the coils are wound. The electrostatic shields are formed by coatings of a compound with a low electrical conductivity which completely encase the coils and adhere to the surfaces of the insulating spools adjacent to the coils. Coatings of the compound also line axial bores of the spools, thereby forming electrostatic shields separating the spools from legs of a ferromagnetic core extending through the
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
NASA-CASE-GSC-12818-1; US-PATENT-4,517,472;
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.

Author

N85-29150* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ELECTRO-EXPULSIVE SEPARATION SYSTEM Patent Application
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
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.

N85-30201*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

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
crystal employed with this circuit display either a linear frequency change with temperature or a substantial frequency change with temperature.

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.

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.
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.


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. Author


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 flow.
gas. The passageway is slanted in a downstream direction at an acute angle to the wall. A cusp shape is provided in the passageway to generate vortices in the injected cooling fluid thereby reducing the energy extracted from the hot gas for that purpose. The cusp shape increases both film cooling effectiveness and wall area coverage. The cusp may be at either the downstream or upstream side of the passageway, the former substantially eliminating flow separation of the cooling fluid from the wall immediately downstream of the passageway.

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35 INSTRUMENTATION AND PHOTOGRAPHY

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


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 through 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.

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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N85-29213* National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center, Pasadena Office, Calif.

MOISTURE CONTENT AND GAS SAMPLING DEVICE Patent
Sponsored by NASA
Avail. US Patent and Trademark Office CSCL 14B

An apparatus is described for measuring minute quantities of moisture and other contaminants within sealed enclosures such as electronic assemblies which may be subject to large external atmospheric pressure variations. An array of vacuum quality valves is arranged to permit cleansing of the test apparatus of residual atmospheric components from a vacuum source. This purging operation evacuates a gas sample bottle, which is then connected by valve settings to provide the drive for withdrawing a gas sample from the sealed enclosure under test into the sample bottle through a colometric detector tube (Drager tube) which indicates moisture content. The sample bottle may be disconnected and its contents (drawn from the test enclosure) separately subjected to mass spectrograph analysis.

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LOW GRAVITY EXOTHERMIC HEATING/COOLING APPARATUS Patent

R. M. POORMAN, inventor (to NASA) 30 Apr. 1985 7 p
Filed 18 Mar. 1982 Sponsored by NASA
Avail: US Patent and Trademark Office CSCL 14B

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.

OSCILLATING PRESSURE DEVICE FOR DYNAMIC CALIBRATION OF PRESSURE TRANSDUCERS Patent Application

(NASA-CASE-LAR-13094-1; NAS 1.71:LAR-13094-1; US-PATENT-APPL-SN-711551) Avail: NTIS HC A02/MF A01 CSCL 14B

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.

VIBRATION-FREE RAMAN DOPPLER VELOCIMETER Patent Application

R. J. EXTON, inventor (to NASA) 25 Apr. 1985 15 p

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 micro-organisms 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. Author

A fluidic sensor providing a differential pressure signal proportional to the angular velocity of a rotary input is described. In this 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. Author

A fluidic sensor providing a differential pressure signal proportional to the angular velocity of a rotary input is described. In this 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 fluid input port. In this embodiment, the differential pressure signal is found to be approximately linear with the angular velocity of the impeller. Author

An instrument for obtaining quantitative, three-dimensional and tomographic information relating to X-ray and gamma-ray emitting objects and for the orthoscopic viewing of such objects includes a multiple-pinhole aperture plate held spaced from an X-ray or gamma-ray to visible-light converter which is coupled to a visible-light image intensifier. The spacing between the aperture plate and the converter is chosen such that the mini-images of an emitting object formed by the pinholes do not substantially overlap as they impinge on the converter. The output of the image intensifier is digitized by a digitizing camera in terms of position and intensity and fed into a digital computer. The computer may output quantitative information relating to the emitting object directly, such as that relating to tomograms, or provide information in analogue form when coupled with a suitable viewing device to give an orthoscopic, three-dimensional image of the object. Author
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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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.

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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.
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.

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

A daze fastener system for connecting two or more structural elements wherein the structural elements and fastener parts have substantially different coefficient of thermal expansion physical property characteristics is employed in this invention. By providing frusto-conical abutting surfaces between the structural elements and fastener parts any differences in thermal expansion/contraction between the parts is translated to sliding motion and avoids deleterious thermal stresses in the connection. An essential feature for isotropic homogeneous material connections is that at least two sets of mating surfaces are required wherein each set of mating surfaces have line element extensions that pass through a common point.

The linear motion valve is described. The valve spool employs magnetically permeable rings, spaced apart axially, which engage a sealing assembly having magnetically permeable pole pieces in magnetic relationship with a magnet. The gap between the ring and the pole pieces is sealed with a ferrofluid. Depletion of the ferrofluid is minimized.
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.

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A peristaltic pump is disclosed which includes a roller assembly on which is mounted a series of pump rollers. As the roller assembly is rotated by a drive gear the pump rollers are driven in reverse rotation by means of a stationary ring gear and pump roller gears. An upper pressure shoe plate and a lower pressure shoe plate are positioned above sets of flexible tubing. The tubing is sandwiched between the pressure shoe plates and the pump rollers. A highly compact pump is provided having twice as many fluid channel lines as is conventional. The peristaltic pump device may be remotely operated by means of a rotary actuator which rotates a driving hub, to move the shoe plates by means of eccentric mounted links. The pressure shoe plates may be moved by the rotary actuator to a loaded position in which the fluid lines are pinched by the pump rollers and fluid is pumped to an unloaded position in which the fluid lines are maintained in an undeformed, uncrimped configuration so that no creases or crimps are set into the fluid lines during periods of prolonged non-use.

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 bellows 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.

NON-BACKDRIVEABLE FREE WHEELING COUPLING Patent Application

W. R. LLEWELLIN, inventor (to NASA) 22 Apr. 1985 11 p Sponsored by NASA

A rotary coupling for connecting a driven part to a source of rotary force is described. This device transmits rotary force in one direction only and disengages to permit the driven part to free wheel when the input member is stopped and precludes the backdriving of rotary force from output member to input member. The coupling includes an input member having a splined shaft, a coupling member connected to the splined shaft, and a co-axial output member. The coupling member and the output member having complementary sets of axially facing clutch teeth. Guides in the form of helical grooves on the coupling member and spring loaded followers acting with the guides affect them engagement and disengagement of the clutch teeth by moving the coupling member toward and away from output member, the followers and guides themselves disengaging to permit free wheeling of output member when input member is stopped.
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. The mechanism was designed for the shuttle orbiter/external tank connection device.
SELF-LOCKING MECHANICAL CENTER JOINT Patent
Avail: US Patent and Trademark Office CSCL 131

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.

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MULTISTAGE SPENT PARTICLE COLLECTOR AND A METHOD FOR MAKING SAME Patent
B. T. EBIHARA, inventor (to NASA) 2 Jul. 1985 7 p Filed 30 Sep. 1983 Supersedes N84-12447 (22 - 03, p 0376)

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

DAMPING SEAL FOR TURBOMACHINERY Patent Application

A damping seal between a high speed rotor member and stator member that separates pressurized fluid compartments is described. It is characterized by the rotor member having a smooth outer surface and the stator member having its bore surface roughened by a plurality of pockets or depressions.

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**

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.

**N85-33499**
National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

**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.

**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.

**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.
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.

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.
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.

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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.

Official Gazette of the U.S. Patent and Trademark Office
non-recursive, moving, smoothing averaging technique, equivalent to applying a polynomial regression calculation to the data set.

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.

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.

An acoustic levitation system is provided for acoustically levitating an object by applying a single frequency from a transducer into a resonant chamber surrounding the object. The chamber includes a stabilizer location along its height, where the side walls of the chamber are angled so they converge in an upward direction. When an acoustic standing wave pattern is applied between the top and bottom of the chamber, a levitation surface within the stabilizer does not lie on a horizontal plane, but instead is curved with a lowermost portion near the vertical axis of the chamber.
GENERATION OF INTENSE NEGATIVE ION BEAMS Patent Application
(Contract NAST-816)
CSCL 20H

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.

DOUBLE PHOTON EXCITATION OF HIGH-RYDBERG ATOMS AS A LONG-LIVED SUBMILLIMETER DETECTOR Patent Application
A. CHUTJIAN, inventor (to NASA) (JPL, Pasadena, Calif.) 21 Feb. 1985 15 p
(Contract NAS7-100)
CSCL 20H

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.

OPTICAL SYSTEM Patent
(21 - 14, p 2320) Sponsored by NASA

Disclosed is an optical system used in a spacecraft to observe a remote surface and provide a spatial and spectral image of this surface. The optical system includes aspheric and spherical mirrors aligned to focus at a first focal plane an image of the surface, and a mirror at this first focal plane which reflects light back on to the spherical mirror. This spherical mirror collimates the light and directs it through a prism which disperses it. The dispersed light is then focused on an array of light responsive elements disposed at a second focal plane. The prism is designed such that it disperses light into components of different wavelengths, with the components of shorter wavelengths being dispersed more than the components of longer wavelengths to present at the
second focal plane a distribution pattern in which preselected groupings of the components are dispersed over essentially equal spacing intervals.

N85-29750* National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,

LIGHT TRANSMITTING WINDOW ASSEMBLY Patent

This invention provides a light transmitting assembly that can, at will, be changed from a state of transparency to one of translucency. It comprises two parallel spaced apart panes of transparent material, such as glass, with a film of polytetrafluoroethylene, which is inherently translucent or opaque, disposed between. The assembly is rendered transparent by introducing a fluid into the assembly to substantially cover a surface of the film; the liquid having a refractive index corresponding to the refractive index of the film. The translucency is restored by removing the fluid.

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

OPTICAL FIBER COUPLING METHOD AND APPARATUS Patent

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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LOW DEFECT, HIGH PURITY CRYSTALLINE LAYERS GROWN BY SELECTIVE DEPOSITION Patent


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

N85-30922* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

METHOD FOR DETERMINING THE POINT OF ZERO ZETA POTENTIAL OF SEMICONDUCTOR Patent


A method to determine the potential of zero charge of an unpowdered semiconductor material is presented. The
A 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 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 the 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.

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 melt, so that the filament contacts only the upper portion of the melt. This permits a filament to be used which tends to contaminate the melt if it is in long term contact with the melt. This arrangement
also enables a higher melt to be used without danger that the molten silicon will run out of any bottom hole.

SHUTTLE CAR LOADING SYSTEM Patent
E. R. COLLINS, JR., inventor (to NASA) (JPL, Pasadena, Calif.)
(NASA-CASE-NPO-15949-1; US-PATENT-4,537,554;

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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LIQUID CRYSTAL LIGHT VALVE STRUCTURES Patent
(NASA-CASE-MSC-20036-1; US-PATENT-4,522,469;

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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TEXAS STATE LIBRARY
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P.O. Box 12927—Cap. Sta.
Austin, TX 78753
(512) 471-2996

TEXAS TECH UNIV. LIBRARY
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UTAH STATE UNIVERSITY
Merrill Library, UMC 30
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MILWAUKEE PUBLIC LIBRARY
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Milwaukee, WI 53233
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Government Publications Library
State Historical Society
Madison, WI 53706
(608) 262-2702

WYOMING STATE LIBRARY
Supreme Ct. & Library Bld.
Cheyenne, WY 82002
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IOWA STATE LIBRARY
Information Services Branch
Centennial Building
Springfield, IL 62706
(217) 782-5185

NEBRASKA LIBRARY COMM.
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Lincoln, NE 65508
(402) 471-2045

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