**ACCESSION NUMBER RANGES**

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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 1983 and December 1983.
This supplement is available as NTISUB/111/093 from the National Technical Information Service (NTIS), Springfield, Virginia 22161 at the price of $10.00 domestic; $20.00 foreign for standing orders. Please note: Standing orders are subscriptions which do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.
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 167 citations published in this issue of the Abstract Section cover the period July 1983 through December 1983. The Index Section references over 4300 citations covering the period May 1969 through December 1983.

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.
A device for converting light energy into other forms of useful energy such as electrical or chemical energy is described. A photoelectrode is manufactured from a layered chalcogenophosphate (MPX₃) compound employed in a photoelectrochemical cell where M is selected from the group consisting of the transition metal series of elements beginning with scandium (atomic number 21) through germanium (atomic number 32), yttrium (atomic number 39) through antimony (atomic number 51), and lanthanum (atomic number 57) through polonium (atomic number 84); P is phosphorus; and X is selected from the chalogenide series consisting of sulfur, selenium, and tellerium. The photoelectrochemical cell is comprised of a container which retains an acidic electrolyte solution, an MPX₃ photoelectrode, and a counterelectrode. In the preferred embodiment, the photoelectrochemical cell is set up as a photoelectrolysis cell.
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.

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.
PUBLIC AVAILABILITY OF COPIES OF PATENTS AND PATENT APPLICATIONS

Copies of U.S. patents may be purchased directly from the U.S. Patent and Trademark Office, Washington, D.C. 20231, for fifty cents a copy. 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 ($7.00 domestic; $14.00 foreign). Microfiche are sold at price code A01 ($4.50 domestic; $9.00 foreign). The US-Patent-Appl-SN-number should be used in ordering either paper copy or microfiche from NTIS.

LICENSES FOR COMMERCIAL USE: INQUIRIES AND APPLICATIONS FOR LICENSE

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-4, 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. Formal application of license must be submitted on the NASA Form, Application for NASA Patent License, which is available upon request from any NASA Patent Counsel.
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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.

ADDRESS: Mr. John C. Mannix, Director of Patent Licensing, CP-4, NASA, Washington, D.C. 20546

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
1245.210 Notice to Attorney General
1245.211 Modification and termination of license
1245.212 Appeals

1245.213 Transfer of custody
1245.214 Confidentiality of information.

Authority: 35 U.S.C. Sections 207 and 208, 94 Stat. 3023 and 3024

Subpart 2—Licensing of NASA Inventions

§ 1245.200 Scope of subpart.

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

§ 1245.201 Policy and objective.

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

§ 1245.202 Definitions.

(a) “Federally owned invention” means an invention, plant, or design which is covered by a patent, or patent application in the United States, or a patent, patent application, plant variety protection, or other form of protection, in a foreign country, title to which has been assigned to or otherwise vested in 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 which is being utilized and that its benefits are to the extent permitted by law or Government regulations available to the public on reasonable terms.

(d) “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 non-exclusive, 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.

(b) Conditions. Licenses shall contain terms and conditions as to establishment 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.
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 license 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;

(iv) The licensee commits a substantial breach of a covenant or agreement contained in the license.

(10) The license may be modified or terminated, consistent with this subpart, upon mutual agreement of NASA and the licensee.

(11) Nothing relating to the grant of a license, nor the grant itself, shall be construed to confer upon any person any immunity from or defenses under the antitrust laws or from a charge of patent misuse, and the acquisition and use of rights pursuant to this subpart shall not be immunized from the operation of state or Federal law by reason of the source of the grant.

Types of Licenses
§ 1245.205 Nonexclusive licenses.

(a) Availability of licenses. Nonexclusive licenses may be granted under NASA inventions without publication of availability or notice of a prospective license.

(b) Conditions. In addition to the provisions of § 1245.204, the nonexclusive license may also provide that, after termination of a period specified in the license agreement, NASA may restrict the license to the fields of use or geographic areas, or both, in which the licensee has brought the invention to practical application and continues to make the benefits of the invention reasonably accessible to the public. However, such restriction shall be made only in order to grant an exclusive or partially exclusive license in accordance with this subpart.

§ 1245.206 Exclusive and partially exclusive licenses.

(a) Domestic licenses.

(1) Availability of licenses. Exclusive or partially exclusive licenses may be granted on NASA inventions: (i) 3 months after notice of the invention's availability has been announced in the Federal Register; or (ii) without such notice where NASA determines that expeditious granting of such a license will best serve the interests of the Federal Government and the public; and (iii) in either situation, specified in (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)(iii)(A) and consideration of any written objections received during the period, NASA has determined that:

(I) The interests of the Federal Government and the public will best be served by the proposed license, in view of the applicant's intentions, plans, and ability to bring the invention to practical application or otherwise promote the invention's utilization by the public;

(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

(4) The proposed terms and scope of exclusivity are not greater than reasonably necessary to provide the incentive for bringing the invention to practical application or otherwise promote the invention's utilization by the public;

(C) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the country in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with the antitrust laws; and

(D) NASA has given first preference to any small business firms submitting plans that are determined by the agency to be within the capabilities of the firms and as equally likely, if executed, to bring the invention to practical application as any plans submitted by applicants that are not small business firms.

(2) Conditions. In addition to the provisions of § 1245.204, the following terms and conditions apply to domestic exclusive and partially exclusive licenses:

(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(ii) The license shall reserve to NASA the right to require the licensee to grant sublicenses to responsible applicants, on reasonable terms, when necessary to fulfill health or safety needs.

(iii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.

(iv) The license may grant the licensee the right of enforcement of the licensed patent pursuant to the provisions of Chapter 29 of Title 35, United States Code, or other statutes, as determined appropriate in the public interest.

(b) Foreign licenses.

(1) Availability of licenses. Exclusive or partially exclusive licenses may be granted on a NASA invention covered by a foreign patent, patent application, or other form of protection, provided that:

(ii) Notice of a prospective license, identifying the invention and prospective licensee, has been published in the Federal Register, providing opportunity for filing written objections
within a 60-day period and following consideration of such objections;

(ii) NASA has considered whether the interests of the Federal Government or United States industry in foreign commerce will be enhanced; and

(iii) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the United States in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with antitrust laws.

(2) Conditions. In addition to the provisions of § 1245.204, the following terms and conditions apply to foreign exclusive and partially exclusive licenses:

(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(ii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.

(iii) The license may grant the licensee the right to take any suitable and necessary actions to protect the licensed property, on behalf of the Federal Government.

(c) Record of determinations. NASA shall maintain a record of determinations to grant exclusive or partially exclusive licenses.

Procedures

§ 1245.207 Application for a license.

An application for a license should be addressed to the Patent Counsel at the NASA installation having responsibility for the invention and shall normally include:

(a) Identification of the invention for which the license is desired, including the patent application serial number or patent number, title, and date, if known;

(b) Identification of the type of license for which the application is submitted;

(c) Name and address of the person, company, or organization applying for the license and the citizenship or place of incorporation of the applicant;

(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:

(1) A statement of the time, nature and amount of anticipated investment of capital and other resources which applicant believes will be required to bring the invention to practical application;

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

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

(4) A statement of the geographic areas in which applicant intends to manufacture any products embodying the invention and geographic areas where applicant intends to use or sell the invention, or both;

(i) Identification of licenses previously granted to applicant under federally owned inventions;

(j) A statement containing applicant's best knowledge of the extent to which the invention is being practiced by private industry or Government, or both, or is otherwise available commercially; and

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

§ 1245.208 Processing applications.

(a) Applications for licenses will be initially reviewed by the Patent Counsel of the NASA installation having responsibility for the invention. The Patent Counsel shall make a preliminary recommendation to the Director of Licensing, NASA Headquarters, whether to: (1) grant the license as requested, (2) grant the license with modification after negotiation with the licensee, or (3) deny the license. The Director of Licensing shall review the preliminary recommendation of the Patent Counsel and make a final recommendation to the NASA Assistant General Counsel for Patent Matters. Such review and final recommendation may include, and be based on, any additional information obtained from applicant and other sources that the Patent Counsel and the Director of Licensing deem relevant to the license requested. The determination to grant or deny the license shall be made by the Assistant General Counsel for Patent Matters based on the final recommendation of the Director of Licensing.

(b) When notice of a prospective exclusive or partially exclusive license is published in the Federal Register in accordance with § 1245.206(a)(1)(iii)(A) or § 1245.206(b)(1)(i), any written objections received in response thereto will be considered by the Director of Licensing in making the final recommendation to the Assistant General Counsel for Patent Matters.

(c) If the requested license, including any negotiated modifications, is denied by the Assistant General Counsel for Patent Matters, the applicant may request reconsideration by filing a written request for reconsideration within 30 days after receiving notice of denial. This 30-day period may be extended for good cause.

(d) In addition to, or in lieu of requesting reconsideration, the applicant may also appeal the denial of the license in accordance with § 1245.211.

§ 1245.209 Notice to Attorney General.

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

§ 1245.210 Modification and termination of licenses.

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

§ 1245.211 Appeals.

(a) The following parties may appeal to the NASA Administrator or designee any decision or determination concerning the grant, denial, interpretation, modification, or termination of a license:

(1) A person whose application for a license has been denied;

(2) A licensee whose license has been modified or terminated, in whole or in part; or

(3) A person who timely filed a written objection in response to the notice required by § 1245.208(a)(1)(iii)(A) or
1245.206(b)(1)(i) and who can demonstrate to the satisfaction of NASA that such person may be damaged by the Agency action.

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

§1245.212 Protection and administration of inventions.

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

§1245.213 Transfer of custody.

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

§1245.214 Confidentiality of information.

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

James M. Beggs,
Administrator.
October 15, 1981.
[FR Doc. 81-31109 Filed 10-30-81; 8:45 am]
BILLING CODE 7510-01-M

FOREIGN PATENT LICENSING REGULATIONS

Selected NASA inventions are also available for licensing in countries other than the United States in accordance with the NASA Foreign Patent Licensing Regulation (14 C.F.R. 1245.4), a copy of which is available from any NASA Patent Counsel. For abstracts of NASA-owned inventions available for licensing in countries other than the United States, see NASA SP-7038, "Significant NASA Inventions Available for Licensing in Countries Other Than the United States." A copy of this NASA publication is available from NASA Headquarters, Code GP-4, Washington, D.C., 20546.
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24 COMPOSITE MATERIALS 6
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25 INORGANIC AND PHYSICAL CHEMISTRY 7
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For related information see also 77 Thermodynamics and Statistical Physics.
26 METALLIC MATERIALS 10
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.
27 NONMETALLIC MATERIALS 11
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.
28 PROPELLANTS AND FUELS 14
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.
ENGINEERING
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31 ENGINEERING (GENERAL) 15
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35 INSTRUMENTATION AND PHOTOGRAPHY 29
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38 QUALITY ASSURANCE AND RELIABILITY N.A.
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Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
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44 ENERGY PRODUCTION AND CONVERSION 38
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45 ENVIRONMENT POLLUTION 41
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47 METEOROLOGY AND CLIMATOLOGY 42
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48 OCEANOGRAPHY N.A.
Includes biological, dynamic and physical oceanography; and marine resources.
LIFE SCIENCES
Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) 42
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52 AEROSPACE MEDICINE 43
Includes physiological factors; biological effects of radiation; and weightlessness.

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

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

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

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

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

60 COMPUTER OPERATIONS AND HARDWARE 44
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61 COMPUTER PROGRAMMING AND SOFTWARE N.A.
Includes computer programs, routines, and algorithms.

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

64 NUMERICAL ANALYSIS N.A.
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65 STATISTICS AND PROBABILITY N.A.
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66 SYSTEMS ANALYSIS N.A.
Includes mathematical modeling; network analysis; and operations research.

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

PHYSICS
Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
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72 ATOMIC AND MOLECULAR PHYSICS N.A.
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73 NUCLEAR AND HIGH-ENERGY PHYSICS N.A.
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74 OPTICS 47
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75 PLASMA PHYSICS N.A.
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76 SOLID-STATE PHYSICS 50
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77 THERMODYNAMICS AND STATISTICAL PHYSICS N.A.
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For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer.

SOCIAL SCIENCES
Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

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

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

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

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

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

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

88 SPACE SCIENCES (GENERAL) N.A.

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

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

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

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

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

GENERAL

99 GENERAL N.A.

Note: N.A. means that no abstracts were assigned to this category for this issue.
01 AERONAUTICS (GENERAL)

EXPLOSIVELY ACTIVATED EGRESS AREA Patent

A lightweight, add on structure which employs linear shaped pyrotechnic charges to smoothly cut an airframe along an egress area periphery is provided. It compromises reaction surfaces attached to the exterior surface of the airframe's skin and is designed to restrict the skin deflection. That portion of the airframe within the egress area periphery is jettisoned. Retention surfaces and sealing walls are attached to the interior surface of the airframe's skin and are designed to shield the interior of the aircraft during detonation of the pyrotechnic charges.

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

02 AERODYNAMICS

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.

EXPLOSIVELY ACTIVATED EGRESS AREA Patent

A lightweight, add on structure which employs linear shaped pyrotechnic charges to smoothly cut an airframe along an egress area periphery is provided. It compromises reaction surfaces attached to the exterior surface of the airframe's skin and is designed to restrict the skin deflection. That portion of the airframe within the egress area periphery is jettisoned. Retention surfaces and sealing walls are attached to the interior surface of the airframe's skin and are designed to shield the interior of the aircraft during detonation of the pyrotechnic charges.

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

EXTENDED MOMENT ARM ANTI-SPIN DEVICE Patent Application
R. D. WHIPPLE, inventor (to NASA) 27 Jun. 1983 14 p
NASA-CASE-LAR-12979-1; US-PATENT-APPL-SN-508371
Avail: NTIS HC A02/MF A01 CSCL 01A

A device which corrects aerodynamic spin with collapsible boom which extends an aircraft moment arm, and an antispin parachute force that is exerted upon the end of the moment arm to correct intentional or inadvertent aerodynamic spin is described. This configuration effects spin recovery by means of a parachute whose required diameter decreases as an inverse function of the increasing length of the moment arm. The collapsible boom enables the parachute to avoid the aircraft wake without mechanical assistance, retracts to permit steep takeoff, and permits a parachute to correct spin while minimizing associated aerodynamic, structural and in-flight complications.

R. D. WHIPPLE

N83-29173*# National Aeronautics and Space Administration.
Langley Research Center, Hampton, Va.

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE
Includes aircraft simulation technology.
For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics.

N83-27975* National Aeronautics and Space Administration. Hugh
L. Dryden Flight Research Center, Edwards, Calif.

ADAPTER FOR MOUNTING A MICROPHONE FLUSH WITH THE EXTERNAL SURFACE OF THE SKIN OF A PRESSURIZED AIRCRAFT Patent

A mounting device for securing a microphone pick up head flush with respect to the external surfaces of the skin of an aircraft for detecting shock waves passing thereover is described. The mount includes a sleeve mounted internally of the aircraft for capturing and supporting an electronics package having the microphone pick up head attached thereto in a manner such that the head is flush with the external surface of the aircraft skin and a pressure seal is established between the internal and external surfaces of the aircraft skin.

R. B. COHN

N83-29197*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

PIEZOELECTRIC DEICING DEVICE Patent Application
NASA-CASE-LEW-13773-1; US-PATENT-APPL-SN-469867
Avail: NTIS HC A02/MF A01 CSCL 01C

A fast voltage pulse is applied to a transducer which comprises a composite of multiple layers of alternately polarized piezoelectric material. These layers are bonded together and positioned over the curved leading edge of an aircraft wing structure. Each layer is relatively thin and metallized on both sides. The strain produced in the transducer causes the composite to push forward resulting in detachment and breakup of ice on the leading edge of the aircraft wing.

R. C. FINK and B. A. BANKS

FIG. 1

FIG. 1
A device which corrects aerodynamic spin with a parachute that exerts anti-spin forces on an aircraft to effect spin recovery is described. The dual parachute towlines are each attached to the parachute and are attached to the rear fuselage equidistant to and on opposite sides of the aircraft centerline. As the parachute is deployed during spin, the parachute force acts through only the towline, and exerts its force outboard of center on the aircraft. As a result, the parachute exerts not only an anti-spin torque, but additionally causes the aircraft to roll, creating a gyroscopic anti-spin rolling moment. The additional and anti-spin rolling moment facilitates spin recovery by permitting a relatively smaller parachute to accomplish spin recovery equivalent to that of a larger parachute attached to the center of the rear fuselage.

A means is also provided for producing a signal indicative of the magnitude of such displacement as an indication of aircraft heading. Additional means are provided to cause stabilization of the outer roll gimbal whenever the pitch angle of the aircraft passes through a threshold prior to entering vertical flight and destabilization of the outer roll gimbal upon passing through the threshold when departing vertical flight.
to control the clearance between the compressor blades and the compressor casing. The clearance control signal can be modified to accommodate transient characteristics. Other embodiments are disclosed.

An energy recovery system is provided for an aircraft gas turbine engine of the type in which some of the pneumatic energy developed by the engine is made available to support systems such as an environmental control system. In one such energy recovery system, some of the pneumatic energy made available to but not utilized by the support system is utilized to heat the engine fuel immediately prior to the consumption of the fuel by the engine. Some of the recovered energy may also be utilized to heat the fuel in the fuel tanks. Provision is made for multiengine applications wherein energy recovered from one engine may be utilized by another one of the engines or systems associated therewith.

A noise suppressor is disclosed for installation on the discharge or aft end of a turbo fan engine. Within the suppressor are fixed annular airfoils which are positioned to reduce the relative velocity between the high temperature fast moving jet exhaust and the low temperature slow moving air surrounding it. Within the suppressor nacelle is an exhaust jet nozzle which constrains the shape of the jet exhaust to a substantially uniform elongate shape irrespective of the power setting of the engine. Fixed ring airfoils within the suppressor nacelle therefore have the same salutary effects irrespective of the power setting at which the engine is operated.

A wind tunnel model mount system is described for effectively and accurately determining the effects of angle of attack and airstream velocity on a model airfoil or aircraft. The model mount system includes a rigid model attached to a splitter plate which is supported away from the wind tunnel wall by a plurality of flexible rods. Conventional instrumentation is employed to effect model rotation through a turntable and to record model flutter data as a function of the angle of attack versus dynamic pressure.

A memory-based parallel data output controller is described for effectively and accurately determining the effects of angle of attack and airstream velocity on a model airfoil or aircraft. The model mount system includes a rigid model attached to a splitter plate which is supported away from the wind tunnel wall by a plurality of flexible rods. Conventional instrumentation is employed to effect model rotation through a turntable and to record model flutter data as a function of the angle of attack versus dynamic pressure.

Includes telemetry; space communications networks, astronavigation, and radio blackout.

N83-33884*, National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

NOISE SUPPRESSOR FOR TURBO FAN JET ENGINES Patent

A noise suppressor is disclosed for installation on the discharge or aft end of a turbo fan engine. Within the suppressor are fixed annular airfoils which are positioned to reduce the relative velocity between the high temperature fast moving jet exhaust and the low temperature slow moving air surrounding it. Within the suppressor nacelle is an exhaust jet nozzle which constrains the shape of the jet exhaust to a substantially uniform elongate shape irrespective of the power setting of the engine. Fixed ring airfoils within the suppressor nacelle therefore have the same salutary effects irrespective of the power setting at which the engine is operated.

N83-29302**, National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MEMORY-BASED PARALLEL DATA OUTPUT CONTROLLER Patent Application
A memory-based parallel data output controller employs associative memories and memory mapping to decommute multiple channels of telemetry data. The output controller contains a random access memory (RAM) which has at least as many address locations as there are channels. A word counter addresses the RAM which provides as its outputs an encoded peripheral device number and a MSB/LSB-first flag. The encoded device number and a bit counter address a second RAM which contains START and STOP flags to pick out the required bits from the specified word number. The LSB/MSB, START and STOP flags, along with the serial input digital data go to a control block which selectively fills a shift register used to drive the parallel data output bus.

In a method of and apparatus for damping nutation of a spinning spacecraft, spin axis attitude disturbances are substantially reduced by controlling at least one nutation damping gas thruster to fire with nonuniform gas pulses. During the beginning of a nutation control sequence, the duration of successive gas pulses is gradually increased (up pulsed) from zero to a predetermined maximum duration. The duration of successive pulses is then maintained constant for a time period. Finally, at the end of the nutation control sequence, the duration of successive gas pulses is gradually reduced to zero (down pulsed). Up pulsing of the gas thruster is initiated in response to a predetermined maximum nutation angle measured by an accelerometer. Down pulsing of the thruster is initiated in response to a predetermined minimum nutation angle.

Official Gazette of the U.S. Patent and Trademark Office
23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.


The compounds, 1-(Dialkoxyphosphonyl)methyl -1,4- and -1,6-dinitro- and diamino benzenes are prepared by nitrating a (phosphonyl) methyl benzene to produce the dinitro compounds which are then reduced to the diamino compounds. The diamino compounds may be polymerized with dianhydrides or diacyl halides to produce fire resistant polymers.


A carbon coating is vacuum arc deposited on a smooth surface of a target which is simultaneously ion beam sputtered. The bombarding ions have sufficient energy to create diamond bombs. Spalling occurs as the carbon deposit thickens. The resulting diamond like carbon flakes are mixed with a binder or matrix material to form a composite material having improved thermal, electrical, mechanical, and tribological properties when used in aerospace structures and components.


This invention relates to a method of carbonizing polyacrylonitrile fibers by exposing the fibers at an elevated temperature to an oxidizing atmosphere; then exposing the oxidized fibers to an atmosphere of an inert gas such as nitrogen containing a carbonaceous material such as acetylene. The fibers are preferably treated with an organic compound, for example benzoic acid, before the exposure to an oxidizing atmosphere. The invention also relates to the resulting fibers. The treated fibers have enhanced tensile strength.


Cured polyfunctional epoxy resins including tris(hydroxyphenyl)methane triglycidyl ether are toughened by addition of polybrominated polymeric additives having an EE below 1500 to the precur composition. Carboxy terminated butadiene-acrylonitrile rubber is optionally present in the precur mixture as such or as a preformed copolymer with other reactants. Reinforced composites, particularly carbon reinforced composites, of these resins are disclosed and shown to have improved toughness.


An improved coating of gasification catalyst for carbon-graphite fibers is provided comprising a mixture of a polyvalent metal such as calcium and a monovalent metal such as lithium. The addition of lithium provides a lighter coating and a more flexible coating when applied to a coating of a carboxyl containing resin such as polyacrylic acid since it reduces the crosslink density. Furthermore, the presence of lithium provides a glass-like substance during combustion which holds the fiber together resulting in slow, even combustion with much reduced evolution of conductive fragments. The coated fibers are utilized as fiber reinforcement for composites.

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25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also 77 Thermodynamics and Statistical Physics.

N83-24572* National Aeronautics and Space Administration. Pasadena Office, Calif.
STABILIZED LANTHANUM SULPHUR COMPOUNDS Patent Application
(Contract NAS7-100)

Lanthanum sulfide is maintained in the stable cubic phase form over a temperature range of from 500°C to 1500°C by adding to it small amounts of calcium, barium, or strontium. This compound is an excellent thermoelectric material.

N83-29324* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COOLING BY CONVERSION OF PARA TO ORTHO-HYDROGEN Patent

The cooling capacity of a solid hydrogen cooling system is significantly increased by exposing vapor created during evaporation of a solid hydrogen mass to a catalyst and thereby accelerating the endothermic para-to-ortho transition of the vapor to equilibrium hydrogen. Catalyst such as nickel, copper, iron, or metal hydride gels of films in a low pressure drop catalytic reactor are suitable for accelerating the endothermic para-to-ortho conversion.

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

N83-29325* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A SPILLAGE DETECTOR FOR LIQUID CHROMATOGRAPHY SYSTEMS Patent Application
(Contract NAS9-15328)
(NASA-CASE-MSC-20206-1; US-PATENT-APPL-SN-478129) Avail: NTIS HC A04/MF A01 CSCL 07D

A spillage detector device for use in conjunction with fractionation of liquid chromatography systems which includes a spillage receiving enclosure beneath the fractionation area is described. A sensing device having a plurality of electrodes of alternating polarity is mounted within the spillage receiving enclosure. Detection circuitry, responsive to conductivity between electrodes, is operatively connected to the sensing device. The detection circuitry feeds into the output circuitry. The output circuit has relaying and switching circuitry directed to a solenoid, and alarm system, and a pump. The solenoid is connected to the
A pliable conduit of the chromatography system. The alarm system comprises an audio alarm and a visual signal. A 115 volt power system is interconnected with the pump, the solenoid, the sensing device, and the detection and output circuitry (38). NASA


A method of desulfurization is described in which high sulfur coals are desulfurized by low temperature chlorinolysis of coal in liquid media, preferably water, followed by hydrodesulfurization at a temperature above 500 C. The coals are desulfurized to an extent of up to 90% by weight and simultaneously dechlorinated to a chlorine content below 0.1% by weight. The product coals have lower volatiles loss, lower oxygen and nitrogen content and higher fixed carbon than raw coals treated with hydrogen under the same conditions. Heating the chlorinated coal to a temperature above 500 C. in inert gas such as nitrogen results in significantly less desulfurization.

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


Fire extinguishant composition comprising a mixture of a finely divided aluminum compound and alkali metal, stannous or plumbous halide is provided. Aluminum compound may be aluminum hydroxide, alumina or boehmite but preferably it is an alkali metal dawsonite. The metal halide may be an alkali metal, e.g. potassium iodide, bromide or chloride or stannous or plumbous iodide, bromide or chloride. Potassium iodide is preferred.

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


Alkali metal and ammonium dawsonites can be prepared by a nonaqueous process according to which equimolar quantities of the corresponding hydrogen carbonate and aluminum hydroxide in finely divided state are heated together to a temperature within the range of 150 to 250 C, for a period of 1 to 6 hours under a carbon dioxide pressure within the range of 120 to 360 psig. Carbonates may be used instead of hydrogen carbonates.

Official Gazette of the U.S. Patent and Trademark Office
as a solid.) The vertical column of freely falling droplets enters the splash guard. The condensate can be collected, sent to other towers or recycled. NASA

to form vapors which rise and are hydrocracked and refined to the upper zone before being swept out the outlet by the hot carrier gas. NASA

Coal is catalytically hydropyrolyzed at temperatures of 500 C to 700 C and pressures of 1000 psi to 4000 psi to form a liquefied product comprising gasoline and middle distillate fuel and diesel oils by forming a fluidized bed of coal in hot hydrogen or hydrogen steam gas fed into the bottom inlet of a reactor. Catalyst particles shower downwardly through the upper hydrorefining zone and lower liquefaction zone and are collected in an engager before recycle. As the catalyst particles contact the coal particles within the liquefaction zone in the presence of hydrogen, the coal dissolves...
liquefaction zone in the presence of hydrogen, the biomass dissolves to form vapors which rise and are hydrocracked and refined in the upper zone.

25 INORGANIC AND PHYSICAL CHEMISTRY

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

25 INORGANIC AND PHYSICAL CHEMISTRY

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both types of coatings on certain superalloys in high gas velocity oxidation and thermal fatigue and increased the resistance of certain superalloys to hot corrosion.

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

Carboranylmethylene-substituted cyclophosphazenes which can be thermally polymerized into carboranylmethylene-substituted phosphazene polymers are useful as thermally stable coatings. Due to the characteristics of these polymers in acting as a ligand for transition metals, metallo-carboranyl methylene phosphazene polymers can act as immobilized catalyst systems, and are electrically conductive and superconductive.

N83-28240* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ELASTOMER TOUGHENED POLYIMIDE ADHESIVES Patent

A rubber-toughened addition-type polyimide composition is disclosed which has excellent high temperature bonding characteristics in the fully cured state, and improved peel strength and adhesive fracture resistance physical property characteristics. The process for making the improved adhesive involves preparing the rubber containing amic acid prepolymer by chemically reacting an amine-terminated elastomer and an aromatic diamine with an aromatic dianhydride with which a reactive chain stopper anhydride was mixed, and utilizing solvent or mixture of solvents for the reaction.

27 NONMETALLIC MATERIALS

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

N83-29388* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

METHOD OF FORMING OXIDE COATINGS Patent

This invention is concerned with an improved plating process for covering a substrate with a black metal oxide film. The invention is particularly directed to making a heating panel for a solar collector. A compound is electrodeposited from an aqueous solution containing cobalt metal salts onto a metal substrate. This compound is converted during plating into a black, highly absorbing oxide coating which contains hydrated oxides. This is achieved by the inclusion of an oxidizing agent in the plating bath. The inclusion of an oxidizing agent in the plating bath is contrary to standard electroplating practice. The hydrated oxides are converted to oxides by treatment in a hot bath, such as boiling water. An oxidizing agent may be added to the hot liquid treating bath.

Official Gazette of the U.S. Patent and Trademark Office
ELASTOMER TOUGHENED POLYIMIDE ADHESIVES Patent Application
A rubber toughened addition type polyimide composition having excellent high temperature bonding characteristics in the fully cured state and improved peel strength and adhesive fracture resistance physical property characteristics is disclosed. The process for making the improved adhesive involves preparing the rubber containing amic acid prepolymer by chemically reacting an amine terminated elastomer and an aromatic diamine with an aromatic dianhydride with which a reactive chain stopper anhydride was mixed, and utilizing solvent or mixture of solvents for the reaction. NASA

A SOLVENT RESISTANT, THERMOPLASTIC AROMATIC POLY(IMIDESULFONE) AND PROCESS FOR PREPARING SAME Patent Application
A process for preparing a thermoplastic poly(imidesulfone) is disclosed. This resulting material has thermoplastic properties which are generally associated with polysulfones but not polyimides, and solvent resistance which is generally associated with polyimides but not polysulfones. This system is processable in the 250 to 350 °C range for molding, adhesive and laminating applications. This unique thermoplastic poly(imidesulfone) is obtained by incorporating an aromatic sulfone moiety into the backbone of an aromatic linear polyimide by dissolving a quantity of a 3,3′,4,4′ prime-benzophenone tetracarboxylic dianhydride (BTDA) in a solvent of 3,3′-diamino diphenylsulfone and the product is cured at temperatures under about 300 °C by controlling the available concentration of the maleic end-capped reactant. This control can be achieved by adding sufficient amounts of said maleic reactant, or by chemical modification of either copolymer, so as to either increase Diels-Alder retrogression of the norbornenyl capped reactant and/or holding initiation and polymerization to a rate compatible with the availability of the maleic-capped reactant. NASA

LOW TEMPERATURE CROSS LINKING POLYIMIDES Patent Application
A polyimide is formed by cross linking a prepolymer formed by reacting a polyfunctional ester, a polyfunctional amine, and an end-capping unit. By providing an end-capping unit, the prepolymer is curable at a relatively low temperature of about 175 to 245 °C. NASA

POLYIMIDE RESINS SUITABLE FOR USE AS COMPOSITE MATRIX MATERIALS Patent Application
Bis- and tris-imides derived from tris (m-aminophenyl) phosphine oxides by reaction with maleic anhydride or its derivatives, and addition polymers of such imides, including a variant in which a mono-imide is condensed with a dianhydride and the product is treated with a further quantity of maleic anhydride. Such monomers or their oligomers may be used to impregnate fibers and fabrics which when cured, are flame resistant. Also an improved method of producing tris (m-aminophenyl) phosphine oxides from the nitro analogues by reduction with hydrazine hydrate using palladized charcoal or Raney nickel as the catalyst is described. Official Gazette of the U. S. Patent and Trademark Office

The adherence between a ceramic thermal barrier coating and a metal bond coating is improved by ion sputtering a ceramic film on the bond cost. A ceramic thermal barrier coating is then plasma-sprayed onto this primer film. This improves the integrity and strength of the interface between the plasma-sprayed ceramic layer and metallic bond coat which insures stronger adherence between the metal and the ceramic.

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


The corrosive alkaline surface layer of an epoxy resin product formed by the curing of the epoxy with an aliphatic amine is eliminated by first applying a non-solvent to remove most or all of the free unreacted amine and then applying a layer of a chemical reagent to neutralize the unused amine or amine functional groups by forming a substituted urea. The surface then may be rinsed with acetone and then with alcohol. The non-solvent may be an alcohol. The neutralizing chemical reagent is a mono-isocyanate or a mono-isothiocyanate. Preferred is an aromatic mono-isocyanate such as phenyl isocyanate, nitrophenyl isocyanate and napthyl isocyanate.

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


Poly(phenyquinoxaline) prepolymers containing pendant phenylethynyl and ethynyl groups are disclosed along with the process for forming these polymers. Monomers and the process for producing same that are employed to prepare the polymers are also disclosed.

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


A process for preparing a thermoplastic poly(imidesulfone) is disclosed. This resulting material has thermoplastic properties which are generally associated with polysulfones but not polyimides, and solvent resistance which is generally associated with polyimides but not polysulfones. This system is processable in the 250 to 350 C range for molding, adhesive and laminating applications. This unique thermoplastic poly(imidesulfone) is obtained by incorporating an aromatic sulfone moiety into the backbone of an aromatic linear polyimide by dissolving a quantity of a 3,3',4,4'-benzophenonetetracarbonyl cyanidride (BTDA) in a solution of 3,3'-diaminophenylsulfone and bis(2-methoxyethyl)ether, precipitating the reactant product in water, filtering and drying the recovered poly(amide-acid sulfone) and converting it to the poly(imidesulfone) by heating.

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


An epoxy grout suitable for use in mounting and positioning bearing runner plates used in hydrostatic bearing assemblies for rotatably mounting large radio telescope structures to stationary support pedestals is described. The epoxy grout may be used in original mountings or may be used as part of a replacement system for repairing cavities in existing grout resulting from grout deterioration. The epoxy grout has a relatively short work life and cure time even in the presence of hydraulic oil. The epoxy grout cures without shrinking or sagging to form a grout which is sufficiently strong and durable to provide a grout especially well suited for use under the high pressure loading and close tolerance requirements of large hydrostatic bearing assemblies.

Official Gazette of the U.S. Patent and Trademark Office
The invention relates to a hot melt adhesive attachment pad for releasably securing distinct elements together and particularly useful in the construction industry or a spatial vacuum environment. The attachment pad consists primarily of a cloth selectively impregnated with a charge of hot melt adhesive, a thermostoil heater and a thermodrum. These components are security mounted in a mounting assembly. In operation, the operator activates the heating cycle transforming the hot melt adhesive to a substantially liquid state, positions the pad against the attachment surface, and activates the cooling cycle solidifying the adhesive and forming a strong, releasable bond.

An improved process for heating a material within a fused silica ampoule by radiation through the wall of the ampoule, while simultaneously passing a cooling gas around the ampoule is described. The radiation passes through a screen of fused silica, thereby increasing the temperature of the material within the ampoule above the strain point of the ampoule, while maintaining the exterior of the ampoule cool enough to prevent rupturing the amp.

A smoke generator is disclosed which is capable of emitting a very thin, laminar stream of smoke for use in high detail flow visualization as well as a larger but less stable "rope" of smoke. The invention consists of a pressure supply, and a fluid supply, which supply a smoke generating fluid to a feed tube. The feed tube is directly heated by electrical resistance from a current supplied by power supply and is regulated by constant temperature controller. A smoke exit hole is drilled in the wall of feed tube. Because the feed tube is heated both before and past the exit hole, no condensation of smoke generating fluid occurs at the smoke exit hole, enabling the production of a very stable smoke filament. The generator is small in size, thereby avoiding wind turbulence in front of the test model.
31 ENGINEERING (GENERAL)

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

N83-27058* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

METHOD FOR MILLING AND DRILLING GLASS Patent

A process for machining glass by placing a rotating carbide working surface under minimum pressure against an area of glass to be worked is described. Concurrently the region between the working surface and the area of glass is wet with a lubricant consisting essentially of a petroleum carrier, a complex mixture of esters and a complex mixture of naturally occurring aromatic oils.

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

N83-29446*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

CURVED CAP CORRUGATED SHEET Patent Application

The invention is a structure for a strong, lightweight corrugated sheet. The sheet is planar or curved and includes a plurality of corrugation segments, each segment being comprised of a generally U-shaped corrugation with a part-cylindrical crown and cap strip, and straight slide walls with secondary corrugations oriented at right angles to said slide walls. The cap strip is bonded to the crown and the longitudinal edge of said cap strip extends beyond edge at the intersection between said crown and said slide walls. The high strength relative to weight of the structure makes it desirable for use in aircraft or spacecraft.

N83-28281*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ELEVATED WATERPROOF ACCESS FLOOR SYSTEM AND METHOD OF MAKING THE SAME Patent Application

An elevated waterproof access floor system having subfloor channels or compartments for power lines, gas lines or the like is adapted such that it can be opened and subsequently resealed without destroying the waterproofing and without destroying its aesthetic appearance. A multiplicity of tiles are supported on a support grid, and a flooring sheet is supported on the tiles. Attachment means are provided to prevent lateral but not vertical movement of the flooring sheet with respect to the tiles so that the flooring sheet can be lifted off the tiles, but when the flooring sheet is supported on the tiles, no lateral slipping will occur. The
BEAM CONNECTOR APPARATUS AND ASSEMBLY Patent
G. F. VON TIEUSENHAUSEN, inventor (to NASA) 3 May 1983
Filed 8 Oct. 1980 Supersedes A81-12283 (19 - 03, p 0032)
(NASA-CASE-MFS-25134-1; US-PATENT-4,381,583;

An apparatus and assembly for connecting beams and like structural members is disclosed which is particularly advantageous for connecting two members which are moved laterally into place. The connector apparatus requires no relative longitudinal movement between the ends of the beams or members being connected to make a connection joint. The apparatus includes a receptacle member and a connector housing carried by opposed ends of the structural member being connected. A spring-loaded connector member is carried by the connector housing which may be released for extension and engagement into the receptacle member.

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

N83-31896* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD AND APPARATUS FOR PRODUCING GAS-FILLED HOLLOW SPHERES Patent
T. G. WANG (JPL, Calif. Inst. of Tech., Pasadena) and D. D. ELLEMAN, inventors (to NASA) (JPL, Calif. Inst. of Tech., Pasadena) 17 Aug. 1982
Filed 18 Sep. 1981 Supersedes N82-26461 (20 - 12, p 2381)
(NASA-CASE-NPO-14596-3; US-PATENT-4,344,787;

A system for forming hollow spheres containing pressurized gas is described which includes a cylinder device containing a molten solid material with a nozzle at its end. A second gas nozzle, lying slightly upstream from the tip of the first nozzle, is connected to a source that applies pressured filler gas that is to fill the hollow spheres. High pressure is applied to the molten metal, as by moving a piston within the cylinder device, to force the molten material out of the first nozzle. At the same time, pressured gas fills the center of the extruded hollow liquid pipe that breaks into hollow spheres. The environment outside the nozzles contains gas at a high pressure such as 100 atmospheres. Gas is supplied to the gas nozzle at a slightly higher pressure such as 101 atmospheres. The pressure applied to the molten material is at a still higher pressure such as 110 atmospheres.

Official Gazette of the U.S. Patent and Trademark Office
The invention relates to methods for making alminate patterns for a resin matrix composite structural component. A sheet of paper is temporarily adhered to a model of the structural component. A pen is positioned on the paper with a spindle touching the model surface opposite the pen. The pen and spindle are moved along the path that maintains the aforementioned contacts. The resulting line traced on paper is a model constant-thickness locus and provides a pattern for a single lamination of resin-impregnated fabric. The steps are repeated to make other patterns and each time the steps are repeated the distance between the tracer and the spindle is changed to correspond to the thickness of a lamination.

A system is provided for forming small accurately spherical objects. Preformed largely spherical objects are supported at the opening of a conduit on the update of hot gas emitted from the opening, so the object is in a molten state. The conduit is suddenly jerked away at a downward incline, to allow the molten object to drop in free fall, so that surface tension forms a precise sphere. The conduit portion that has the opening, lies in a moderate vacuum chamber, and the falling sphere passes through the chamber and through a briefly opened valve into a tall drop tower that contains a lower pressure, to allow the sphere to cool without deformation caused by falling through air.

A thermal barrier coating system was applied to hardware having passageways in the walls connecting apertures in the surface to a gas supply for film cooling. An inert gas, such as argon, is discharged through the apertures during the application of the thermal barrier coating system by plasma spraying. This flow of inert gas reduces both blocking of the holes and base metal oxidation during the coating operation.
A tetrahedral beam that can be compactly stowed, sequentially deployed, and widely manipulated to provide a structurally sound yet highly maneuverable truss structure is comprised of a number of repeating units of tandem tetrahedrons sharing common sides. Fixed length battens are joined into equilateral triangles called batten frames. Apexes of adjacent triangles are interconnected by longerons having mid-point folding hinges. Joints, comprised of gussets pivotably connected by links, permit two independent degrees of rotational freedom between joined adjacent batten frames, and provide a stable structure from packaged configuration to complete deployment. The longerons and joints can be actuated in any sequence, independently of one another. The beam is suited to remote actuation. Longerons may be provided with powered mid-point hinges enabling beam erection and packaging under remote control. Providing one or more longerons with powered telescoping segments permits the shape of the beam central axis to be remotely manipulated so that the beam may function as a remote manipulator arm.

Official Gazette of the U.S. Patent and Trademark Office
A single-frequency multibeam synthetic aperture radar for large swath imaging is disclosed. Each beam illuminates a separate "footprint" (i.e., range and azimuth interval). The distinct azimuth intervals for the separate beams produce a distinct Doppler frequency spectrum for each beam. After range correlation of raw data, an optical processor develops image data for the different beams by spatially separating the beams to place each beam of different Doppler frequency spectrum in a different location in the frequency plane as well as the imaging plane of the optical processor. Selection of a beam for imaging may be made in the frequency plane by adjusting the position of an aperture, or in the image plane by adjusting the position of a slit. The raw data may also be processed in digital form in an analogous manner.

33 ELECTRONICS AND ELECTRICAL ENGINEERING

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.

A pyroelectric detector array and the method for using it are described. A series of holes formed through a silicon dioxide layer forms the mounting fixture for the pyroelectric detector array. A series of nontouching strips of indium are formed around the holes to make contact with the backside electrodes and form the output terminals for individual detectors. A pyroelectric detector strip with front and back electrodes, respectively, is mounted over the strips. Biasing resistors are formed on the surface of the silicon dioxide layer and connected to the strips. A metatized pad formed on the surface of layer is connected to each of the biasing resistors and to the film to provide the ground for the pyroelectric detector array.

COUPLING AN INDUCTION MOTOR TYPE GENERATOR TO A-C POWER LINES Patent Application
F. J. NOLA, inventor (to NASA) 31 Mar. 1983 18 p
(NASA-CASE-MFS-25302-2; US-PATENT-APPL-SN-481086)
Avail: NTIS HC A02/MF A01 CSCL 09A

A system for connecting an induction motor type generator to an A-C power line is described in which an electronic switch is controlled and regulated to turn on at a relatively late point in each half cycle of its operation. The energizing power supplied by the line to the induction motor type generator is decreased and the net power delivered to the line is increased.

N83-24769*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SPLIT-CROSS-BRIDGE-RESISTOR FOR TESTING FOR PROPER FABRICATION OF INTEGRATED CIRCUIT Patent Application
M. G. BUEHLER, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) 26 Jul. 1982 31 p
(NASA-CASE-NPO-16021-1; US-PATENT-APPL-SN-402205)
Avail: NTIS HC A03/MF A01 CSCL 09C
An electrical testing structure and method whereby a test structure is fabricated on, e.g., a large scale integrated circuit wafer along with the circuit components is described. It 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.

**Diagram**

**Power is extracted from plasmons, photons, or other guided electromagnetic waves at infrared to mid-ultraviolet frequencies by inelastic tunneling in metal-insulator-semiconductor-metal diodes. Inelastic tunneling produces power by absorbing plasmons to pump electrons to higher potential. Specifically, an electron from a semiconductor layer absorbs a plasmon and simultaneously tunnels across an insulator into a metal layer which is at higher potential. The diode voltage determines the fraction of energy extracted from the plasmons; any excess is lost to heat.**

**Diagram**

**A traveling wave tube with increased linearity to avoid intermodulation of signals being amplified is described. A traveling electromagnetic wave and an electron beam interact to effect amplification of a radio frequency signal.**

**Diagram**

**Electronic means may be used to generate signals. The system may be used for I-V characteristic measurements of solar arrays as well as for other load control purposes.**

**Diagram**
A power generating system for adjusting coupling an induction motor, as a generator, to an A.C. power line wherein the motor and power line are connected through a triac is described. The triac is regulated to normally turn on at a relatively late point in each half cycle of its operation, whereby at less than operating speed, and thus when the induction motor functions as a motor rather than as a generator, power consumption from the line is substantially reduced.

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

This device of inductively heating and fusing thermoplastics includes an alternating current passing through a tank circuit, the inductor member of the tank circuit being wrapped around a curved pole piece of a ferromagnetic 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 remains cool under operational wattage is selected, making air or fluid cooling unnecessary.
A self-aligning electrical connector device is disclosed as including a receptacle component having a conically contoured interior and a plug component having a correspondingly contoured conical body receivable in the receptacle component. The plug component includes a plurality of spaced conductive ring elements 22 having a mating face and the receptacle component includes a plurality of corresponding spaced conductive ring elements providing mating interface with the mating face of the ring elements of the plug component when connected therewith.

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. Each circuit has a regulator stage. 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 including 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. Each of the other two circuits include oscillator drive stages which, together with isolation transformers provide output signals floating at the high output voltage.

A power control circuit for a three phase induction motor wherein power factors for the three phases are summed to provide a control signal, and this control signal is particularly filtered and then employed to control the duty cycle of each phase of input power to the motor.

A microphone which is not subject to corrosion is provided by employing carbon granules to sense sound waves. The granules are packed into a ceramic tube and no diaphragm is used. A pair of electrodes, located in the tube adjacent the carbon granules, are coupled to a sensing circuit. Sound waves cause pressure changes on the carbon granules which results in a change in resistance in the electrical path between the electrodes. This change in resistance is detected by the sensing circuit. The
microphone is suitable for use as a leak detection probe in recovery boilers, where it provides reliable operation without corrosion problems associated with conventional microphones.

N83-31952* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

GYROTRON TRANSMITTING TUBE Patent

An RF transmitting tube for the 20 GHz to 500 GHz range comprises a gyrotron and a multistage depressed collector. A winding provides a magnetic field which acts on spent, spinning or orbiting electrons changing their motion to substantially forward linear motion in a downstream direction. The spent electrons then pass through a focuser into the collector. Nearly all of the electrons injected into the collector will remain within an imaginary envelope as they travel forward toward the end collector plate. The apertures in the collector plates are at least as large in diameter as the envelope at any particular axial position.

N83-31954* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD AND DEVICE FOR DETECTION OF A SUBSTANCE Patent

A device is disclosed in which a discharge grid is provided that has a sufficiently high voltage potential across its grid electrodes so that a substance with predetermined characteristics causes an electric spark discharge to occur between electrodes. The electric spark discharge alters the predetermined characteristics of the substance by oxidation and/or vaporization so that the substance is no longer detectable by an electric spark discharge. A means is provided for counting the number of electric spark discharges. This count indicates the concentration of the substance having the predetermined characteristics. One embodiment disclosed detects longitudinally extending carbon fibers suspended in a gaseous medium. Another embodiment provides for the detection of carbon fibers adhesively attached to
a collection tape. The tape is positioned against the discharge grid and a high voltage is periodically applied across the grid electrodes until electric spark discharges no longer occur.

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

**N83-34189** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**ACTIVE LAMP PULSE DRIVER CIRCUIT Patent**
Supersedes N82-10390 (20 - 01, p 0057)


A flashlamp drive circuit is described which uses an unsaturated transistor as a current mode switch to periodically subject a partially ionized gaseous laser excitation flashlamp to a stable, rectangular pulse of current from an incomplete discharge of an energy storage capacitor. A monostable multivibrator sets the pulse interval, initiating the pulse in response to a flash command by providing a reference voltage to a non-inverting terminal of a base drive amplifier; a tap on an emitter resistor provides a feedback signal sensitive to the current amplitude to an inverting terminal of amplifier, thereby controlling the pulse amplitude. The circuit drives the flashlamp to provide a squarewave current flashlamp discharge.

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

**N83-34190** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**HIGH STABILITY AMPLIFIER Patent**


An electrical RF signal amplifier for providing high temperature stability and RF isolation and comprised of an integrated circuit voltage regulator, a single transistor, and an integrated circuit operational amplifier mounted on a circuit board such that passive circuit elements are located on side of the circuit board while the active circuit elements are located on the other side is described. The active circuit elements are embedded in a common heat sink so that a common temperature reference is provided for changes in ambient temperature. The single transistor and operational amplifier are connected together to form a feedback amplifier powered from the voltage regulator with transistor implementing primarily the desired signal gain while the operational amplifier implements signal isolation. Further RF isolation is provided by the voltage regulator which inhibits cross-talk from other like amplifiers powered from a common power supply. Input and output
terminals consisting of coaxial connectors are located on the sides of a housing in which all the circuit components and heat sink are located.

Avail: NTIS HC A02/MF A01 CSCL 09C
A frequency control system makes an initial correction of the frequency of its own timing circuit after comparison against a frequency of known accuracy and then sequentially checks and corrects the frequencies of several voltage controlled local oscillator circuits. The timing circuit initiates the machine cycles of a central processing unit which applies a frequency index to an input register in a modulo-sum frequency divider stage and enables a multiplexer to clock an accumulator register in the divider stage with a cyclical signal derived from the oscillator circuit being checked. Upon expiration of the interval, the processing unit compares the remainder held as the contents of the accumulator against a stored zero error constant and applies an appropriate correction work to a correction stage to shift the frequency of the oscillator being checked. A signal from the accumulator register may be used to drive a phase plane ROM and, with periodic shifts in the applied frequency index, to provide frequency shift keying of the resultant output signal. Interposition of a phase adder between the accumulator register and phase plane ROM permits phase shift keying of the output signal by periodic variation in the value of a phase index applied to one input of the phase adder.

AUTOMATIC OSCILLATOR FREQUENCY CONTROL SYSTEM Patent Application
Avail: NTIS HC A02/MF A01 CSCL 09C
A television camera apparatus is disclosed in which bright objects are attenuated to fit within the dynamic range of the system, while dim objects are not. The apparatus receives linearly polarized light from an object scene, the light being passed by a beam splitter and focused on the output plane of a liquid crystal light valve. The light valve is oriented such that, with no excitation from the cathode ray tube, all light is rotated 90 deg and focused on the input plane of the video sensor. The light is then converted to an electrical signal, which is amplified and used to excite the CRT. The resulting image is collected and focused by a lens onto the light valve which rotates the polarization vector of the light to
an extent proportional to the light intensity from the CRT. The overall effect is to selectively attenuate the image pattern focused on sensor.

N83-36355* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

FOCAL AXIS RESOLVER FOR OFFSET REFLECTOR ANTENNAS Patent

Method and apparatus for determining the focal axis of an asymmetrical antenna such as an offset paraboloid reflector whose physical rim is not coincident with the boundary of the electrical aperture but whose focal point is known is provided. A transmitting feed horn array consisting of at least two feed horn elements is positioned asymmetrically on either side of an estimated focal axis which is generally inclined with respect to the boresight axis of the antenna. The feed horn array is aligned with the estimated focal axis so that the phase centers \( \text{CP}_1, \text{CP}_2 \) of the two feed horn elements are located on a common line running through the focal point \( F \) orthogonally with respect to the estimated focal axis.

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

N83-36357* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ERROR CORRECTION METHOD AND APPARATUS FOR ELECTRONIC TIMEPIECES Patent

A method and apparatus for correcting errors in an electronic digital timepiece that includes an oscillator which has a 2 in. frequency output, an \( n \)-stage frequency divider for reducing the oscillator output frequency to a time keeping frequency, and means for displaying the count of the time keeping frequency. In first and second embodiments of the invention the timepiece is synchronized with a time standard at the beginning of the period of time \( T \). In the first embodiment of the invention the timepiece user observes \( E \) (the difference between the time standard and the timepiece time at the end of the period \( T \)) and then operates a switch to correct the time of the timepiece and to obtain a count for \( E \). In the second embodiment of the invention, the user operates a switch at the beginning of \( T \) and at the end of \( T \) and a count for \( E \) is obtained electronically.

Official Gazette of the U.S. Patent and Trademark Office
34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

N83-27144* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
CURVED FILM COOLING ADMISSION TUBE Patent
Avail: US Patent and Trademark Office CSCL 20D

Effective film cooling to protect a wall surface from a hot fluid which impinges on or flows along the surface is provided. A film of cooling fluid having increased area is provided by changing the direction of a stream of cooling fluid through an angle of from 135 deg. to 165 deg. before injecting it through the wall into the hot flowing gas. The 1 cooling fluid is injected from an orifice through a wall into a hot flowing gas an angle to form a cooling fluid film. Cooling fluid is supplied to the orifice from a cooling fluid source via a turbulence control passageway having a curved portion between two straight portions. The angle through which the direction of the cooling fluid is turned results in less mixing of the cooling fluid with the hot gas, thereby substantially increasing the length of the film in a downstream direction.

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

N83-29625* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MAGNETIC HEAT PUMPING Patent
Avail: US Patent and Trademark Office CSCL 20D

The method employs ferromagnetic or ferromagnetic elements, preferably of rare-earth based material, for example gadolinium, and preferably employs a regenerator. The steps comprise controlling the temperature and applied magnetic field of the element to cause the state of the element as represented on a temperature-magnetic entropy diagram repeatedly to traverse a loop. The loop may have a first portion of concurrent substantially isothermal or constant temperature and increasing applied magnetic field, a second portion of lowering temperature and constant applied magnetic field, a third portion of isothermal and decreasing applied magnetic field, and a fourth portion of increasing temperature and constant applied magnetic field. Other loops may be four sided, with, for example, two isotherms and two adiabats (constant entropy portions.

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

N83-23856* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AUTOMATIC THERMAL SWITCH Patent
Avail: US Patent and Trademark Office CSCL 20D

An automatic thermal switch to control heat flow includes two thermally conductive plates and a thermally conductive switch saddle pivotally mounted to the first plate. A flexible heat carrier is connected between the switch saddle and the second plate. A phase-change power unit, including a piston coupled to the switch saddle, is in thermal contact with the first thermally conductive plate. A biasing element biases the switch saddle in a predetermined position with respect to the first plate. When the phase-change power unit is actuated by an increase in heat transmitted through the first plate, the piston extends and causes the switch saddle to pivot, thereby varying the thermal conduction between the two plates through the switch saddle and flexible heat carrier. The biasing element, switch saddle, and piston can be arranged to provide either a normally closed or normally opened thermally conductive path between the two plates.

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

N83-30957*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AIR MODULATION APPARATUS Patent Application
(NASA-CASE-LEW-13524-1; US-PATENT-APPL-SN-238257)
Avail: NTIS HC A02/MF A01 CSCL 20D

An air modulation apparatus, such as for use in modulating cooling air to the turbine section of a gas turbine engine includes a valve means disposed around an annular conduit, such as a nozzle, in the engine cooling air circuit. The valve means, when in a closed position, blocks a portion of the conduit, and thus
reduces the amount and increases the velocity of cooling air flowing through the nozzle. The apparatus also includes actuation means, which can operate in response to predetermined engine conditions, for enabling opening and closing of the valve. NASA

An apparatus and method are described for measuring physical characteristics of fluid, by placing a drop of the fluid in a batch of a second fluid and passing acoustic waves through the bath. The applied frequency of the acoustic waves is varied, to determine the precise value of a frequency at which the drop undergoes resonant oscillations. The resonant frequency indicates the interfacial tension of the drop in the bath, and the interfacial tension can indicate physical properties of the fluid in the drop.

A thermal switch for controlling the dissipation of heat between a body is described. The thermal switch is comprised of a flexible bellows defining an expansible vapor chamber for a working fluid located between an evaporation and condensation chamber. Inside the bellows is located a coiled retaining spring and four axial metal mesh wicks, two of which have their central portions located inside of the spring while the other two have their central portions located between the spring and the side wall of the bellows. The wicks are terminated and are attached to the inner surfaces of the outer end walls of evaporation and condensation chambers respectively located adjacent to the heat source and heat sink. The inner surfaces of the end walls furthermore include grooves.
35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gauges; 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.


GAS LEVITATOR HAVING FIXED LEVITATION NODE FOR CONTAINERLESS PROCESSING Patent

A method and apparatus is disclosed for levitating a specimen of material in a containerless environment at a stable nodal position independent of gravity. An elongated levitation tube has a contoured interior in the form of convergent section, constriction, and a divergent section in which the levitation node is created. A gas flow control means prevents separation of flow from the interior walls in the region of a specimen. The apparatus provides for levitating and heating the specimen simultaneously by combustion of a suitable gas mixture combined with an inert gas.

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METHOD AND APPARATUS FOR SUPERCOOLING AND SOLIDIFYING SUBSTANCES Patent

An enclosure provides a containerless environment in which a sample specimen is positioned. The specimen is heated in the containerless environment, and the specimen melt is dropped through the tube in which it cools by radiation. The tube is alternatively backfilled with an inert gas whereby the specimen melt cools by both radiation and convection during its free fall. During the free fall, the sample is in a containerless, low-gravity environment which enhances supercooling in the sample and prevents sedimentation and thermal convection influences. The sample continues to supercool until nucleation occurs which is detected by silicon photovoltaic detectors. The sample solidifies after nucleation and becomes completely solid before entering the detachable catcher. The amount of supercooling of the
specimen can be measured by knowing the cooling ratio and determining the time for nucleation to occur.

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

N83-29651* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

INSTRUMENT FOR DETERMINING COINCIDENCE AND ELAPSE TIME BETWEEN INDEPENDENT SOURCES OF RANDOM SEQUENTIAL EVENTS Patent

An instrument that receives pulses from a primary external source and one or more secondary external sources and determines when there is coincidence between the primary and one of the secondary sources is described. The instrument generates a finite time window (coincidence aperture) during which coincidence is defined to have occurred. The time intervals between coincidence apertures in which coincidences occur are measured.

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N83-29654* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

SECURABLE BEARING STRESS-STRAIN INDICATOR Patent Application

The invention relates to a stress-strain indicator for indicating torque on a fastening member or other tensile structure. The device is particularly useful in the continued monitoring of torque on the bolts incorporated in pressure vessels and other high stress structures. The device indicates torque by utilizing the principles of stress-strain; a given stress on a bolt will result in a calculable amount of strain (stretching) within the shaft of the bolt. A test pin, therefore, is inserted through an axial bore in the bolt and is anchored with respect to the bolt at a point along its length. A washer is positioned between a flange of the test pin and the bolt head; the washer and the flange are separated by a space. Torque on the bolt changes its length; the length change causes axial displacement of the test pin with the resultant progressive elimination of the space until the washer is secured at the calibrated torque.

Official Gazette of the U.S. Patent and Trademark Office
A system for attenuating the inherent vibration associated with a mechanical refrigeration unit employed to cryogenically cool sensitive instruments used in measuring chemical constituents of the atmosphere is described. A modular system including an instrument housing and a reaction bracket with a refrigerator unit floated there between comprise the instrumentation system. A pair of evacuated bellows that 'float' refrigerator unit and provide pressure compensation at all levels of pressure from seal level to the vacuum of space. Vibration isolators and when needed provide additional vibration damping for the refrigerator unit. A flexible thermal strap (20 K) serves to provide essentially vibration free thermal contact between cold tip of the refrigerator unit and the instrument component mounted on the IDL mount. Another flexible strap (77 K) serves to provide vibration free thermal contact between the TDL mount thermal shroud and a thermal shroud disposed about the thermal shaft.

An intrusion monitoring system includes an array of seismic sensors, such as geophones, arranged along a perimeter to be monitored for unauthorized intrusion as by surface movement or tunneling. Two wires lead from each sensor to a central monitoring station. The central monitoring station has three modes of operation. In a first mode of operation, the output of all of the seismic sensors is summed into a receiver for amplification and detection. When the amplitude of the summed signals exceeds a certain predetermined threshold value an alarm is sounded. In a second mode of operation, the individual output signals from the sensors are multiplexed into the receiver for sequentially interrogating each of the sensors.
JOINING LEAD WIRES TO THIN PLATINUM ALLOY FILMS


A two step process of joining a lead wire to .000002 m thick platinum alloy film which rests upon an equally thin alumina insulating layer which is adhered to a metal substrate is described. Typically the platinum alloy film forms part of a thermocouple for measuring the surface temperature of a gas turbine airfoil. In the first step the lead wire is deformed 30 to 60% at room temperature while the characteristic one million ohm resistance of the alumina insulating layer is monitored for degradation. In the second step the cold pressed assembly is heated at 865 to 1025 C for 4 to 75 hr in air. During the heating step any degradation of insulating layer resistance may be reversed, provided the resistance was not decreased below 100 ohm in the cold pressing.

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.

DUAL LASER OPTICAL SYSTEM AND METHOD FOR STUDYING FLUID FLOW Patent


A dual laser optical system and method is disclosed for visualization of phenomena in transport substances which induce refractive index gradients such as fluid flow and temperature gradients in fluids and gases. Two images representing mutually perpendicular components of refractive index gradients may be viewed simultaneously on screen. Two lasers having wave lengths in the visible range but separated by about 1000 angstroms are utilized to provide beams which are collimated into a beam containing components of the different wave lengths. The collimated beam is passed through a test volume of the transparent substance. The collimated beam is then separated into components of the different wave lengths and focused onto a pair of knife edges arranged mutually perpendicular to produce and project images onto the screen.
A mode locked laser system including a laser device and its peripheral components is utilized for deriving two mutually phase locked optical wavelength signals and one phase locked microwave CW signal which respectively traverse the same distance measurement path. Preferably the optical signals are comprised of pulse type signals. Phase comparison of the two optical wavelength pulse signals is used to provide a measure of the dry air density while phase comparison of one of the optical wavelength pulse signals and the microwave CW signal is used to provide a measure of the wet or water vapor density of the air. From these measurements is computed in means of the distance to be measured corrected for the atmospheric dry and water vapor densities in the measurement path.

The transmitter for a portable system for the remote detection of methane gas leaks and concentrations includes two lasers, tuned respectively to a wavelength coincident with a strong absorption line of methane and a reference wavelength which is weakly absorbed by methane gas. The lasers are aimed at a topographical target along a system axis and the beams successively interrupted by a chopper wheel. The system receiver includes a spherical mirror for collecting the reflected laser radiation and focusing the collected radiation through a narrowband optical filter onto an optical detector. The filter is tuned to the wavelength of the two lasers, and rejects background noise to substantially improve the signal-to-noise ratio of the detector. The output of the optical detector is processed by a lock-in detector synchronized to the chopper, and which measures the difference between the first wavelength signal and the reference wavelength signal.

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36 LASERS AND MASERS

**N83-35350** National Aeronautics and Space Administration. Pasadena Office, Calif.

**RESONANT ISOLATOR FOR MASER AMPLIFIER Patent**

An isolator is described for use in a low noise maser amplifier, which provides low loss across a wide bandwidth and which can be constructed at moderate cost. The isolator includes a train of garnet or ferrite elements extending along the length of a microwave channel parallel to the slow wave structure, with the elements being of staggered height, so that the thin elements which are resonant to the microwaves are separated by much thicker elements. The thick garnet or ferrite elements reduce the magnetic flux passing through the thin elements to permit altering of the shape of the thin elements so as to facilitate their fabrication and to provide better isolation with reduced loss, by increasing the thickness of the thin elements and decreasing their length and width.

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37 MECHANICAL ENGINEERING

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

**N83-26078** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**VARIABLE SPEED DRIVE Patent**

A variable speed drive wherein a first embodiment is comprised of a pivotally mounted prime mover coupled to a rotary fluid output device, such as a fan or pump, through a variable and fixed pulley drive arrangement is described. The pivotal position of the prime mover and accordingly the pitch diameter of position variable pulley means is controlled in accordance with fluid motor means coupled to the prime mover. This is actuated in response to a fluid feedback control signal derived from a sensed output of the rotary fluid output device. The pivotal motion of the prime mover imparts an arcuate motion to the variable pulley means which effects a speed variation of the rotary fluid output device in accordance with the variation of the pitch diameter ratio of opposing variable and fixed pulley means.

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

**N83-28450** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

**FULLY PLASMA-SPRAYED COMPLIANT BACKED CERAMIC TURBINE SEAL Patent Application**

This invention is concerned with a seal having a high temperature abradable lining material encircling the tips of turbine blades in turbomachinery. The invention is particularly directed to maintaining the minimum operating clearance between the blade tips and the lining of a high pressure turbine. A low temperature easily decomposable material, such as a polymer, in powder form is blended with a high temperature oxidation resistant metal powder. The two materials are simultaneously deposited on a substrate formed by the turbine casing. Alternately, the polymer powder may be added to the metal powder during plasma spraying. A
bond coating is then applied to the metal-polymer composite. A ceramic layer forming a shroud is deposited on the bond coating. The polymer additive mixed with the metal is then completely volatilized to provide a porous layer between the ceramic layer and the substrate.

N83-29706*# National Aeronautics and Space Administration.
Langley Research Center, Hampton, Va.
DAZE FASTENERS Patent Application
L. R. JACKSON, R. C. DAVIS, and A. H. TAYLOR, inventors (to NASA) 17 May 1983 18 p
(NASA-CASE-LAR-13009-1; US-PATENT-APPL-SN-495380)
Avail: NTIS HC A02/MF A01 CSCL 13E

A daze fastener system is disclosed for connecting two or more structural elements wherein the structural elements and fastener parts have substantially different coefficient of thermal expansion physical property characteristics. 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 in which each set of mating surfaces has line element extensions that pass through a common point.

N83-29707*# National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.
PORTABLE 90 DEG PROOF LOADING DEVICE Patent Application
(NASA-CASE-MSC-20250-1; US-PATENT-APPL-SN-491113)
Avail: NTIS HC A02/MF A01 CSCL 13I

A hydraulically actuated device is described for applying a test load to a bearing or the like to prove the integrity of its mounting or staking within a bore in a housing such as a gear case. To accommodate limited access situations, the device is constructed in a right angle configuration in which a hydraulic cylinder applies axial pressure to a first thrust rod assembly which includes a first thrust rod through a threaded spindel driving a linearly translated cam. A cam follower wheel transfers the translation to a second thrust rod assembly which includes a horizontal shaft and a spindle within a cross-arm housing portion and a tubular housing portion. The same second thrust direction applies the bearing loading in either of two directions depending upon the shape of the interface parts. The interface parts can bear on the bearing from either side with respect to the bearing mounting structural part.

N83-29708*# National Aeronautics and Space Administration.
Pasadena Office, Calif.
CENTRIFUGAL-RECIPROCATING COMPRESSOR Patent Application
W. H. HIGA, inventor (to NASA) 23 Jul. 1982 27 p
(NASA-CASE-NPO-14597-2; US-PATENT-APPL-SN-401288)
Avail: NTIS HC A03/MF A01 CSCL 13I

A centrifugal compressor includes at least one pair of cylinders arranged in coaxial alignment and supported for angular displacement about a common axis of rotation normally bisecting a common longitudinal axis of symmetry for the cylinders. The cylinders are characterized by ported closures located at the mutually remote ends thereof through which the cylinders are charged and discharged, and a pair of piston heads seated within
the cylinders and supported for floating displacement in compressive strokes in response to unidirectional angular displacement imparted to the cylinders. Author elements having electromagnets for establishing vernier x and y axis control. The magnetic bearing system has possible use in connection with a long life reciprocating cryogenic refrigerator that may be used on the space shuttle. J.D.H.


A variable length strut device is disclosed for connecting two associated structures which includes an outer load bearing shell, a drive assembly, a length varying compliance assembly positioned by a drive assembly, and a strut rod locking assembly. The load bearing shell includes a connecting part adapted for connection to one associated structure. A strut connection rod has a connecting part adapted for connection to another associated structure and a distal end with a piston driver slidably carried in a housing. Two pistons act in opposing directions on the piston driver to provide longitudinal compliance in a compliance mode of operation. The locking assembly includes locking balls which are urged in a locking ring where 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 in which the pistons are in contact with the internal ring when it is desired to do so as effected by a control source. NASA

N83-32067* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.


A linear magnetic bearing system having electromagnetic vernier flux paths in shunt relation with permanent magnets, so that the vernier flux does not traverse the permanent magnet, is described. Novelty is believed to reside in providing a linear magnetic bearing having electromagnetic flux paths that bypass high reluctance permanent magnets. Particular novelty is believed to reside in providing a linear magnetic bearing with a pair of axially spaced...
N83-36482* National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.

APPARATUS FOR ACCURATELY PRELOADING AUGER
ATTACHMENT MEANS FOR FRANGIBLE PROTECTIVE
MATERIAL Patent
A. M. LOVELACE (Rockwell International Corp., Downey, Calif.)
and K. E. WOOD, inventors (to NASA) (Rockwell International
Superseded N81-24446 (19 - 15, p 2063) Sponsored by NASA
(NASA-CASE-MSC-18791-1; US-PATENT-4,407,165;
US-PATENT-APPL-SN-248746; US-PATENT-CLASS-73-862.54;
US-PATENT-CLASS-29-446; US-PATENT-CLASS-81-55;
Office CSCL 09!

Apparatus for preloading a spring loaded threaded member is
described. The apparatus is formed of three telescoping tubes.
The innermost tube has means to prevent rotation of the threaded
member. The middle tube is threadedly engaged with the threaded
member and by axial movement applies a preload thereto. The
outer tube engages a nut which may be rotated to retain the
threaded member in axial position to maintain the preload.

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N83-36484*# National Aeronautics and Space Administration.
Pasadena Office, Calif.

ROTARY STEPPING DEVICE WITH MEMORY METAL
ACTUATOR Patent Application
R. S. JAMIESON, inventor (to NASA) (JPL, California Inst. of Tech.,
Pasadena) 15 Jul. 1983 12 p
(Contract NAS7-100)
(NASA-CASE-NPO-15482-1; US-PATENT-APPL-SN-526739)
Avail: NTIS HC A02/MF A01 CSCL 13I

A rotary stepping device includes a rotatable shaft which is
driven by means of a coiled spring clutch which is alternately
tightened to grip and rotate the shaft and released to return it to
a resting position. An actuator formed of a memory metal is used
to pull the spring clutch to tighten it and rotate the shaft. The
actuator is activated by heating it above its critical temperature
and is returned to an elongated configuration by means of the
force of the spring cloth.

NASA

N83-36485*# National Aeronautics and Space Administration.
Pasadena Office, Calif.

MEMORY METAL ACTUATOR Patent Application
C. F. RUOFF, inventor (to NASA) (JPL, California Inst. of Tech.,
Pasadena) 26 Aug. 1983 17 p
(Contract NAS7-100)
(NASA-CASE-NPO-15960-1; NASA-CASE-NPO-16120-1;
US-PATENT-APPL-SN-527613) Avail: NTIS HC A02/MF A01
CSCL 13I

A mechanical actuator can be constructed by employing a
plurality of memory metal actuator elements in parallel to control
the amount of actuating force. In order to facilitate direct control
by digital control signals provided by a computer or the like, the
actuating elements may vary in stiffness according to a binary

37 MECHANICAL ENGINEERING
relationship. The cooling or reset time of the actuator elements can be reduced by employing Peltier junction cooling assemblies in the actuator.

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

A method and apparatus for making in-situ measurements of flow resistivity on the Earth’s ground surface is summarized. The novel feature of the invention is two concentric cylinders, inserted into the ground surface with a measured pressure applied to the surface inside the inner cylinder. The outer cylinder vents a plane beneath the surface to the atmosphere through an air space. The flow to the inner cylinder is measured thereby indicating the flow from the surface to the plane beneath the surface.

44 ENERGY PRODUCTION AND CONVERSION

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.
ENERGY PRODUCTION AND CONVERSION

does not require different materials for each frequency band, and sunlight is directly converted to electricity in an efficient manner by extracting more energy from the more energetic photons.

N83-27344*  National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ZIRCONIUM CARBIDE AS AN ELECTROCATALYST FOR THE CHROMOUS-CHROMIC REDOX COUPLE Patent

Zirconium carbide is used as a catalyst in a REDOX cell for the oxidation of chromous ions to chromic ions and for the reduction of chromic ions to chromous ions. The zirconium carbide is coated on an inert electronically conductive electrode which is present in the anode fluid of the cell.

Official Gazette, U.S. Patent and Trademark Office

N83-28574*  National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

SOLAR DRIVEN LIQUID METAL MHD POWER GENERATOR Patent

A solar energy collector focuses solar energy onto a solar oven which is attached to a mixer which in turn is attached to the channel of a MHD generator. Gas enters the oven and a liquid metal enters the mixer. The gas/liquid metal mixture is heated by the collected solar energy and moves through the MHD generator thereby generating electrical power. The mixture is then separated and recycled.

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

N83-28574*  National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STIRLING CYCLE CRYOGENIC COOLER Patent

A long lifetime Stirling cycle cryogenic cooler particularly adapted for space applications is described. It consists of a compressor section centrally aligned end to end with an expansion section, and respectively includes a reciprocating compressor piston and displacer radially suspended in interconnecting cylindrical housings by active magnetic bearings and has adjacent reduced clearance regions so as to be in noncontacting relationship therewith and wherein one or more of these regions operates as clearance seals. The piston and displacer are reciprocated in their housings by linear drive motors to vary the volume of respectively adjacent compression and expansion spaces which contain a gaseous working fluid and a thermal regenerator to effect Stirling cycle cryogenic cooling.

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

N83-29804*  National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HIGH THERMAL POWER DENSITY HEAT TRANSFER APPARATUS PROVIDING ELECTRICAL ISOLATION AT HIGH TEMPERATURE USING HEAT PIPES Patent

This invention is directed to transferring heat from an extremely high temperature source to an electrically isolated lower temperature receiver. The invention is particularly concerned with supplying thermal power to a thermionic converter from a nuclear 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. The heat pipe is used to cool the nuclear reactor while the heat pipe is connected
thermally and electrically to a thermionic converter. 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 comparatively low thermal power-densities through the electrically nonconducting gap between the two heat pipes.

A cross-linked polyvinyl alcohol battery separator is described. A particulate filler, inert to the alkaline electrolyte of an alkaline battery, is incorporated in the separator in an amount of 1 to 20% by weight, based on the weight of the polyvinyl alcohol, and is dispersed throughout the product. Incorporation of the filler enhances performance and increases cycle life of alkaline batteries when compared with batteries containing a similar separator not containing filler. Suitable fillers include titanates, silicates, zirconates, aluminates, wood flour, lignin, and titania. Particle size is not greater than about 50 microns.

Sugars are converted to a mixture of solvents including butanol by a fermentation process employing a co-culture of microorganisms of the cloridium 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 co-culture substantially increases the yield of butanol over that obtained using a culture employing only one microorganism.
unreactive with the electrode. The mixture comprises at least one first filler material having a surface area of greater than 25 sq meters/gram, at least one second filler material having a surface area of 10 to 25 sq meters/gram. The volume of the mixture of filler materials is less than 45% of the total volume of the fillers and the binder. The filler surface area per gram of binder is about 20 to 60 sq meters/gram, and the amount of plasticizer is sufficient to coat each filler particle.

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A high voltage multijunction solar cell comprises a number of discrete voltage generating regions, or unit cells, which are formed in a single semiconductor wafer and are connected together so that the voltages of the individual cells are additive. The unit cells comprise doped regions of opposite conductivity types separated by a gap. The method includes forming V-shaped grooves in the wafer and orienting the wafer so that ions of one conductivity type can be implanted in one face of the groove while the other face is shielded. A metallization layer is applied and selectively etched away to provide connections between the unit cells.

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A process for providing a thermal control solar stable surface coating for aluminum surfaces adapted to be exposed to solar radiation wherein selected values within the range of 0.10 to 0.72 thermal emittance (epsilon sub tau) and 0.2 to 0.4 solar absorptance (alpha sub S) are reproducibly obtained by anodizing the surface area in a chromic acid solution for a selected period of time. The rate voltage and time, along with the parameters of initial epsilon sub tau and alpha sub S, temperature of the chromic acid solution, acid concentration of the solution and the material anodized determines the final values of epsilon/tau sub and alpha sub S. 9 Claims, 5 Drawing Figures.

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A high temperature stable and solar radiation stable thermal control coating is described which is useful either as such, applied directly to a member to be protected, or applied as a coating on a re-useable surface insulation (RSI). It has a base coat layer and an overlay glass layer. The base coat layer has a high emittance, and the overlay layer is formed from discrete, but sintered together glass particles to give the overlay layer a high scattering coefficient. The resulting two-layer space and thermal control coating has an absorptivity-to-emissivity ratio of less than 0.4 at room temperature, with an emittance of 0.8 at 1200 F. It is capable of exposure to either solar radiation or temperatures as high as 2000 F without significant degradation. When used as a coating on a silicea substrate to give an RSI structure, the coatings of this invention show significantly less reduction in emittance after long term convective heating and less residual strain than prior art coatings for RSI structures.

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N83-25217* National Aeronautics and Space Administration. Pasadena Office, Calif. MOBILE SAMPLER FOR USE IN ACQUIRING SAMPLES OF...
TERRESTRIAL ATMOSPHERIC GASES Patent

Samples of terrestrial atmospheric gasses from a free body of such gasses using a device characterized by a plurality of tubular bodies adapted to be mounted in side by side relation on a motorized highway vehicle in mutual parallelism with the axis of the normal path of travel for the vehicles. Each of the bodies is of a cylindrical configuration and has an axial opening at each of its opposite ends through which a linear flow path is defined. A pair of pivotally supported, spring-biased sealing caps is mounted adjacent to the ends of the body and continuously urged into a hermetic sealing relationship. A restraint for securing the caps against spring-urged pivotal displacement, includes a separable, normally tensioned line interconnecting the caps and an operable release mechanism for simultaneously releasing the caps for spring-urged displacement. A hot wire cutter is included for separating the line, whereby samples of air are trapped in the body as the caps are spring-driven to assume an hermetically sealed relation with the openings defined in each of the opposite ends of the body.

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51 LIFE SCIENCES (GENERAL)
Includes genetics.
N83-27569* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RAPID, QUANTITATIVE DETERMINATION OF BACTERIA IN WATER Patent

A bioluminescent assay for ATP in water borne bacteria is made by adding nitric acid to a water sample with concentrated bacteria to rupture the bacterial cells. The sample is diluted with sterile, deionized water, then mixed with a luciferase-luciferin mixture and the resulting light output of the bioluminescent reaction is measured and correlated with bacteria present. A standard and a blank also are presented so that the light output can be correlated to bacteria in the sample and system noise can be subtracted from the readings. A chemiluminescent assay for iron porphyrins in water borne bacteria is made by adding luminol reagent to a water sample with concentrated bacteria and measuring the resulting light output of the chemiluminescent reaction.

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47 METEOROLOGY AND CLIMATOLOGY
Includes weather forecasting and modification.
N83-32232* National Aeronautics and Space Administration. Pasadena Office, Calif.
CLOUD COVER SENSOR Patent

An apparatus is described which provides a numerical indication of the cloudiness at a particular time of a day. The apparatus includes a frame holding several light sensors such as photovoltaic cells, with a direct sensor mounted to directly face the Sun and indirect sensors mounted to face different portions of the sky not containing the Sun. A light shield shields the direct sensor from most of the sky except a small portion containing the Sun, and also shields each of the indirect sensors from direct sunlight. The relative values of the outputs from the direct and indirect sensors, enables the generation of a numerical indication of the degree of cloudiness at a particular time of day.

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A method and apparatus are disclosed for determining the concentration of coliform bacteria in a sample. The sample containing the coliform bacteria is cultured in a liquid growth medium. The cultured bacteria produce hydrogen and the hydrogen is vented to a second cell containing a buffer solution in which the hydrogen dissolves. By measuring the potential change in the buffer solution caused by the hydrogen, as a function of time, the initial concentration of bacteria in the sample is determined. Alternatively, the potential change in the buffer solution can be compared with the potential change in the liquid growth medium to verify that the potential change in the liquid growth medium is produced primarily by the hydrogen gas produced by the coliform bacteria.

An apparatus is described for moving a probe that engages moving living tissue such as a heart or an artery that is penetrated by the probe, which moves the probe in synchronism with the tissue to maintain the probe at a constant location with respect to the tissue. The apparatus includes a servo positioner which moves a servo member to maintain a constant distance from a sensed object while applying very little force to the sensed object, and a follower having a stirrup at one end resting on a surface of the living tissue and another end carrying a sensed object adjacent to the servo member. A probe holder has one end mounted on the servo member and another end which holds the probe.

A bio-medical flow sensor including a packageable unit of a bottle, tubing and hypodermic needle which can be pre-sterilized and is disposable. The tubing has spaced apart tubular metal segments. The temperature of the metal segments and fluid flow therein is sensed by thermistors and at a downstream location heat is input by a resistor to the metal segment by a control electronics. The fluids flow and the electrical power required for the resistor to maintain a constant temperature differential between the tubular metal segments is a measurable function of fluid flow through the tubing. The differential temperature measurement is made in a control electronics and also can be used to control a flow control valve or pump on the tubing to maintain a constant flow in the tubing and to shut off the tubing when air is present in the tubing.
Measuring apparatus for determining changes in the volume of limbs or other body extremities by determining the cross-sectional area of such limbs may comprise a transmitter including first and second transducers for positioning on the surface of the limb at a predetermined distance there between, and a receiver including a receiver crystal for positioning on the surface of the limb. The distance between the receiver crystal and the first and second transducers are represented by respective first and second chords of the cross-section of the limb and the predetermined distance between the first and second transducers is represented by a third chord of the limb cross section.
A multiport memory architecture is disclosed for each of a plurality of task centers connected to a command and data bus. Each task center includes a memory and a plurality of devices which request direct memory access as needed. The memory includes an internal data bus and an internal address bus to which the devices are connected, and direct timing and control logic comprised of a 10-state ring counter for allocating memory devices by enabling AND gates connected to the request signal lines of the devices. The outputs of AND gates connected to the same device are combined by OR gates to form an acknowledgement signal that enables the devices to address the memory during the next clock period. The length of the ring counter may be effectively lengthened to any multiple of ten to allow for more direct memory access intervals in one repetitive sequence. One device is a network bus adapter which serially shifts onto the command and data bus, a data word (8 bits plus control and parity bits) during the next ten direct memory access intervals after it has been granted access. The NBA is therefore allocated only one access in every ten intervals, which is a predetermined interval for all centers. The ring counters of all centers are periodically synchronized by DMA SYNC signal to assure that all NBAs be able to function in synchronism for data transfer from one center to another.

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Sonic levitation apparatus is disclosed which includes a sonic transducer which generates acoustical energy responsive to the level of an electrical amplifier. A duct communicates with an acoustical chamber to deliver an oscillatory motion of air to a plenum section which contains a collimated hole structure having a plurality of parallel orifices. The collimated hole structure converts the motion of the air to a pulsed, unidirectional stream providing enough force to levitate a material specimen. Particular application to the production of microballoons in low gravity environment is discussed.

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by moving it in a corresponding manner back to the first end of the chamber. The transducers for levitating and moving the object may be all located at the cool first end of the chamber.

A system is described for use with acoustically levitated objects, which enables close control of rotation of the object. One system includes transducers that propagate acoustic waves along the three dimensions (X, Y, Z) of a chamber of rectangular cross section. Each transducer generates one wave which is resonant to a corresponding chamber dimension to acoustically levitate an object, and additional higher frequency resonant wavelengths for controlling rotation of the object. The three chamber dimensions and the corresponding three levitation modes (resonant wavelengths) are all different, to avoid degeneracy, or interference, of waves with one another, that could have an effect on object rotation. Only the higher frequencies, with pairs of them having the same wavelength, are utilized to control rotation, so that rotation is controlled independently of levitation and about any arbitrarily chosen axis.

A method is described for removing bubbles from a liquid bath such as a bath of molten glass to be used for optical elements. Larger bubbles are first removed by applying acoustic energy resonant to a bath dimension to drive the larger bubbles toward a pressure well where the bubbles can coalesce and then be more easily removed. Thereafter, submillimeter bubbles are removed by applying acoustic energy of frequencies resonant to the small bubbles to oscillate them and thereby stir liquid immediately about the bubbles to facilitate their breakup and absorption into the liquid.

An acoustic levitation system is described, with single acoustic source and a small reflector to stably levitate a small object while the object is processed as by coating or heating it. The system includes a concave acoustic source which has locations on opposite sides of its axis that vibrate towards and away from a focal point to generate a converging acoustic field. A small reflector is located near the focal point, and preferably slightly beyond it, to create an intense acoustic field that stably supports a small object near the reflector. The reflector is located about one-half wavelength from the focal point and is concavely curved to a
radius of curvature (L) of about one-half the wavelength, to stably support an object one-quarter wavelength (N) from the reflector.

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Acoustical levitation of an object within a portion of a chamber is heated to a high temperature, while a driver at the opposite end of the chamber is maintained at a relatively low temperature. The cold end of the chamber is constructed so it is telescoped to vary its length and the entire chamber. The chamber remains resonant to a normal mode frequency, and the pressure at the hot end of the chamber is maximized. The precise length of the chamber at any given time, is maintained at an optimum resonant length by a feedback loop. The feedback loop includes an acoustic pressure sensor at the hot end of the chamber. The output is delivered to a control circuit of the motor that varies the length of the chamber to a level where the sensed acoustic pressure is a maximum.

Author

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Author

A sensor for measuring flow direction and airspeed is disclosed that is suitable, because of its small size, for rapid instrumentation of research airplanes. A propeller driven sphere rotating at a speed proportional to airspeed presents a reflective target to an electro-optical system. The duty cycle of the resulting electrical output is proportional to yaw angle and the frequency is proportional to airspeed.

Author

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Author
An optical system used in a spacecraft to observe a remote surface and provide a spatial and spectral image of this surface is disclosed. The system includes aspheric and spherical mirrors aligned to focus at a first optical 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 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.

A device used in the optical alignment of machinery to maintain a measuring scale in the proper position for optical readings to be taken is described. The device consists of a block containing a notch in the shape of an inverted 'v' and a rotatable plug positioned over the centerline of notch. The block is placed on the object to be aligned, the notch allows the block to be securely placed upon flat or curved surfaces. A weighted measuring scale is inserted through plug so that it contacts the object to be aligned. The scale and plug combination can be rotated so that the scale faces an optical aligning instrument. The instrument is then used in conjunction with the scale to measure the distance of the machinery from a reference plane.

An X-ray mirror assembly capable of reflecting X-rays at a normal incident angle is described as well as a method for its production. The mirror assembly includes multi-layers of a high-and low-refractive index material on an extremely smooth substrate such as a silicon wafer. Approximately 152 layers of alternatively a spacer material and a heavy metal, in a thickness range of 1 nanometer, is placed on a silicon wafer. The wafer substrate can be subsequently bent around its periphery by a bending assembly to create a concave configuration. The resulting mirror assembly is capable of focusing normal-incidence X-ray radiation, for example, of 4.5 nanometers with a reflection of 6% or greater.
Two mutually coherent light beams formed from a single monochromatic light source were directed to a reflecting surface of a rotatable object. They were reflected into an imaging optical lens having a focal plane optically at infinity. A series of interference fringes were formed in the focal plane which were translated linearly in response to angular rotation of the object. Photodetectors were located adjacent the focal plane to detect the fringe translation and output a signal in response to the translation. The signal was fed to a signal processor which was adapted to count the number of fringes detected and develop a measure of the angular rotation and direction of the object.

An apparatus and method for pulling optical glass fibers in a containerless environment is the levitation furnace in which a specimen is levitated and melted. A reflector unit, carried in the interior of the furnace, includes a reflector disposed centrally about the acoustical axis of the levitator. The reflector unit has a circular shroud of insulation and a hollow copper sleeve for receiving a cooling medium. A fiber pulling bore is formed centrally in the reflector unit surrounded by the cooling jacket to enhance solidification and fiber formation. A starting fiber strand is introduced into the melt and pulled outwardly through the bore whereby the specimen fiber is started and formed as it is pulled through. As a continuous process, a movable secondary reflector captures a supplemental specimen pellet then transfers it to the melt. This may be repeated as a continuous process as pellets are inserted through a port.
76 SOLID-STATE PHYSICS

Includes superconductivity.
For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

N83-30268*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAAS SCHOTTKY BARRIER PHOTO-RESPONSIVE DEVICE AND METHOD OF FABRICATION Patent Application
(NASA-CASE-GSC-12816-1; US-PATENT-APPL-SN-507625)
Avail: NTIS HC A02/MF A01 CSCL 20L

A gallium arsenide photo-responsive device is provided with an intermediate, transparent layer of a refractory metal or alkaline earth metal forming a tenacious bond between a non-hydroscopic oxide layer and a noble metal Schottky barrier layer. The device has a gallium arsenide substrate with a predetermined type conductivity and a gallium arsenide epitaxial layer with the same type conductivity but a lower charge carrier concentration grown on the substrate. The oxide layer is formed to cover the epitaxial layer, and the transparent metal layer followed by the noble metal layer are deposited upon the oxide layer. An interdigitated ohmic contact is then formed upon the noble metal layer.

N83-34796* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PIEZOELECTRIC COMPOSITE MATERIALS Patent
Avail: US Patent and Trademark Office CSCL 20L

A laminated structural devices has the ability to change shape, position and resonant frequency without using discrete motive components. The laminate may be a combination of layers of a piezoelectrically active, nonconductive matrix material. A power source selectively places various levels of charge in electrically conductive filaments imbedded in the respective layers to produce various configurations in a predetermined manner. The layers may be electrically conductive having imbedded piezoelectrically active filaments. A combination of layers of electrically conductive material may be laminated to layers of piezoelectrically active material.

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N83-35888* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD OF INCREASING MINORITY CARRIER LIFETIME IN SILICON WEB OR THE LIKE Patent
Avail: US Patent and Trademark Office CSCL 20L

N83-35888* National Aeronautics and Space Administration. Pasadena Office, Calif.
METHOD OF INCREASING MINORITY CARRIER LIFETIME IN SILICON WEB OR THE LIKE Patent
Avail: US Patent and Trademark Office CSCL 20L
A silicon dendrite is grown as a ribbon forming two silicon crystal layers which are separated by an interface layer which contains a large number of defects. Significant increase of minority carrier lifetime with homogeneous distribution at the outer surfaces of the two silicon crystal layers is achieved by processing the web in an atmosphere of a selected gas, e.g., oxygen, nitrogen or an inert gas, for about 30 minutes to several hours at a temperature preferably on the order of 900 to 1200°C.

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This bibliography is issued in two sections: Section 1 - Abstracts, and Section 2 - Indexes. This issue of the Abstract Section cites 167 patents and applications for patent introduced into the NASA scientific and technical information system during the period of July 1983 through December 1983. Each entry of the Abstract Section consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or application for patent.
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