NASA PATENT ABSTRACTS BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

JANUARY 1979
## 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 1978 and December 1978.
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 May 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 213 citations published in this issue of the Abstract Section cover the period July 1978 through December 1978. The Index Section contains references to the 3512 citations covering the period May 1969 through December 1978.

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
The invention is embodied in a device including:

1. A DC circuit having a pair of terminal plugs, each plug characterized by a first, second, and third terminal.
2. A pair of manually operable switches for connecting the first terminal of each plug to the positive side of a voltage source.
3. A circuit lead connecting the second terminal of each plug to the negative side of said source.
4. A pair of electrical cables adapted to connect the first and second terminals of each plug to an air-start unit.
5. Means for connecting each of the cables between the first terminal of one plug and the third terminal of the other plug of the pair.
6. A second pair of manually operable switches for selectively connecting the third terminal of each plug to the negative side of the voltage source, whereby electrical continuity of each cable of the pair may be examined prior to being connected to an air-start unit.
INDEX SECTION (SECTION 2)

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

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

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

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

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

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

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

HOW TO USE THIS PUBLICATION TO IDENTIFY NASA INVENTIONS

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

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

(2) **Using Subject Index** To identify all NASA inventions listed under a desired technical subject index term, (A) turn to the cumulative Subject Index in the Index Section and find the invention(s) listed under the desired technical subject term. (B) Note the indicated Accession Number and the Subject Category Number. (C) Using the indicated Accession Number, turn to the inside front cover of the Index Section to determine which issue of the Abstract Section includes the Accession Number desired. (D) To find the abstract of the particular invention in the issue of the Abstract Section selected, (i) use the Subject Category Number to locate the Subject Category and (ii) use the Accession Number to locate the desired invention within the Subject Category listing.
(3) Using Patent Classification Index To identify all inventions covered by issued NASA patents (does not include applications for patent) within a desired Patent Classification, (A) turn to the Patent Classification Number in the Number Index of Section 2 and find the associated invention(s), and (B) follow the instructions outlined in (2)(B), and (D) above

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 ($4.00 domestic, $8.00 foreign). Microfiche are sold at price code A01 ($3.00 domestic, $4.50 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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Title 14—AERONAUTICS AND SPACE
Chapter V—National Aeronautics and Space Administration
PART 1245—PATENTS
Subpart 2—Patent Licensing Regulations

1 Subpart 2 is revised in its entirety as follows:
Sec.
1245.200 Scope of subpart.
1245.201 Definitions.
1245.202 Basic considerations.
1245.203 Licenses for practical application of inventions.
1245.204 Other licenses.
1245.205 Publication of NASA inventions available for license.
1245.206 Application for nonexclusive license.
1245.207 Allocation for exclusive license.
1245.208 Processing applications for license.
1245.209 Royalties and fees.
1245.210 Reports.
1245.211 Revocation of licenses.
1245.212 Suspension.
1245.213 Litigation.
1245.214 Address of communications.

Authority The provisions of this Subpart 2 are revised under 42 USC 2467, 2473(b)(3).

§ 1245.200 Scope of subpart.
This Subpart 2 prescribes the terms, conditions, and procedures for licensing inventions covered by US patents and patent applications for which the Administrator of the National Aeronautics and Space Administration holds title on behalf of the United States.

§ 1245.201 Definitions.
For the purpose of this subpart, the following definitions apply:
(a) "Invention" means an invention covered by a US patent or patent application for which the Administrator of NASA holds title on behalf of the United States and which is designated by the Administrator as appropriate for the grant of license(s) in accordance with this subpart.
(b) "To practice an invention" means to make or have made, use or have used, sell or have sold, or otherwise dispose of according to law any machine, article of manufacture or composition of matter physically embodying the invention, or to use or have used the process or method comprising the invention.
(c) "Practical application" means the manufacture in the case of a composition of matter or product, the use in the case of a process, or the operation in the case of a machine, under such conditions as to establish that the invention is being utilized and that its benefits are reasonably accessible to the public.
(d) "Special invention" means any invention designated by the NASA Assistant General Counsel for Patent Matters to be subject to short-form licensing procedures. An invention may be designated a special invention when a determination is made that:
(1) Practical application has occurred and is likely to continue for the life of the patent and for which an exclusive license is not in force, or
(2) The public interest would be served by the expedient granting of a nonexclusive license for practice of the invention by the public.
(e) The "Administrator" means the Administrator of the National Aeronautics and Space Administration, or his designee.
(f) "Government" means the Government of the United States of America.
(g) The "Inventions and Contributions Board" means the NASA Inventions and Contributions Board established by the Administrator of NASA within the Administration in accordance with section 305 of the National Aeronautics and Space Act of 1958 as amended (42 U.S.C. 2457).

§ 1245.202 Basic considerations.
(a) Much of the new technology resulting from NASA sponsored research and development in aeronautical and space activities has application in other fields. NASA has a national authority and responsibility under the National Aeronautics and Space Act of 1958, as amended (42 U.S.C. 2451), to provide for the widest practical dissemination and utilization of this new technology. In addition, NASA has been given unique requirements to protect the inventions resulting from NASA activities and to promulgate licensing regulations to encourage commercial use of these inventions.
(b) NASA-owned inventions will best serve the interests of the United States when they are brought to practical application as quickly as possible. Although NASA encourages the nonexclusive licensing of its inventions to promote competition and achieve their widest possible utilization, the commercial development of certain inventions calls for a substantial capital investment which private manufacturers may be unwilling to risk under a nonexclusive license. It is the policy of NASA to seek exclusive licenses when suitable applicants provide the necessary incentive to the licensee to achieve early practical application of the invention.
(c) The Administrator, in determining whether to grant an exclusive license, will evaluate all relevant information submitted by applicants and all other pertinent information and will consider the necessity for further technical and market development of the invention, the capabilities of prospective licensees, their proposed plans to undertake the required investment and development, the impact on competitors, and the benefits of the license to the Government and to the public. Preference for exclusive license shall be given to US citizens or companies who intend to manufacture or use, in the case of a process, the invention in the United States of America, its territories and possessions. Consideration may also be given to assistance to researches and minority business enterprises, as well as economically depressed, low income and labor surplus areas.
(d) All licenses for inventions shall be by express written instruments.

Authority The provisions of this Subpart 2 are revised under 42 USC 2467, 2473(b)(3).

§ 1245.203 Licenses for practical application of inventions.
(a) General. As an incentive to encourage practical application of inventions, licenses will be granted to responsible applicants according to the circumstances and conditions set forth in this section.
(b) Nonexclusive licenses. (1) Each invention will be made available to responsible applicants for nonexclusive, revocable licensing in accordance with § 1245.206, consistent with the provisions of any existing exclusive license.
(2) The duration of the license shall be for a period as specified in the license.
(3) The license shall require the licensee to achieve the practical application of the invention and to then practice the invention for the duration of the license.
(c) The license may be granted for all less than all fields of use of the invention, and throughout the United States of America, its territories and possessions, Puerto Rico, and the District of Columbia, or in any lesser geographic portion thereof.
(d) The license shall extend to the subsidiaries and affiliates of the licensee and shall be nonassignable without approval of the Administrator, NASA, except to the successor of that part of the licensee's business to which the invention pertains.
(e) Short-form nonexclusive licenses. A nonexclusive, revocable license for a special invention, as defined in § 1245.201(d), shall be granted upon application by any applicant to the Patent Counsel of the NASA installation having cognizance of the invention.
(f) Exclusive licenses. (1) A limited exclusive license may be granted on an invention available for such licensing provided that:
(a) The Administrator has determined that:
(1) The invention has not been brought to practical application by a manufacturer or user in the fields of use or in the geographical locations covered by the application for the exclusive license;
(b) practical application of the invention in the fields of use or in the geographical locations covered by the application for the exclusive license is not likely to be achieved expeditiously by the further funding of the invention by the Government or under a nonexclusive license requested by any applicant pursuant to paragraph (a) and the exclusive license will provide the necessary incentive to the licensee to achieve the practical application of the invention; and
(2) Either a notice pursuant to
§ 1245.205 Listing the invention as available for licensing has been published in the Federal Register or at least 9 months, or a patent covering the invention has been issued for at least 6 months. However, a limited exclusive license may be granted prior to the periods specified above if the Administrator determines that the public interest will best be served by the earlier grant of an exclusive license.

(2) The license may be granted for all or less than all fields of use of the invention, and throughout the United States of America, its territories and possessions, Puerto Rico, and the District of Columbia, or in any lesser geographic portion thereof.

(3) The exclusive period of the license shall be negotiated, but shall be for less than the terminal portion of the patent, and shall be related to the period necessary to provide a reasonable incentive to invest the necessary risk capital.

(4) The license shall require the licensee to practice the invention within a period specified in the license and then to achieve practical application of the invention.

(5) The license shall require the licensee to expend a specified minimum sum of money and/or to take other specified actions, within indicated periods, after the effective date of the license, in an effort to achieve practical application of the invention.

(6) The license shall be subject to at least an irrevocable royalty-free right of the Government of the United States to practice the invention throughout the world by or on behalf of the Government of the United States and on behalf of any foreign government pursuant to any existing or future treaty or agreement with the United States.

(7) The license may reserve to the Administrator, NASA, under the following circumstances, the right to require the granting of a sublicense to responsible applicant(s) on terms that are consistent with the Administrator's policies and procedures. In determining the rights to be reserved, the Administrator shall consider the current royalty rates under similar patents and other factors. (1) To the extent that the invention is required for public use by Government regulation, or (ii) as may be necessary to fulfill health or safety needs, or (iii) for other purposes stipulated in the license.

(8) The license shall not be nontransferable except to the successor of that part of the contractor's business to which the invention pertains.

(9) Subject to the approval of the Administrator, the licensee may grant sublicenses under the license. Each sublicense granted by an exclusive licensee shall make reference to and shall provide for the rights of the sublicensee. Each sublicense shall be subject to the terms of the exclusive license including the rights retained by the Government under the exclusive license. A copy of each sublicense shall be furnished to the Administrator.

(10) The license may be subject to such other conditions as may be in the public interest.

§ 1245.204 Other licenses.

(a) License to contractor. There is hereby granted to the contractor reporting an invention made in the performance of work under a contract of NASA listed in the manner specified in section 305(a) (1) or (2) of the National Aeronautics and Space Act of 1958 as amended (42 U.S.C. 2457(a) (1) or (2)), a revocable, nonexclusive, royalty-free license for the practice of such invention, together with the right to grant sublicenses of the same scope to the extent the contractor was legally obligated to do so at the time the contract was awarded. Such license and right is nontransferable except to the successor of that part of the contractor's business to which the invention pertains.

(b) Miscellaneous licenses. Subject to any outstanding licenses, requiring in this subsection 2 shall preclude the Administrator from granting other licenses for inventions, when he determines that so doing would provide for an equitable distribution of rights. The following exemplary circumstances within which such licenses may be granted are:

(1) In consideration of the settlement of an interference;

(2) In consideration of a release of a claim of infringement;

(3) In exchange for or as part of the consideration for a license under adversely held patent(s).

§ 1245.206 Publication of NASA inventions as available for licensing.

(a) A notice will be periodically published in the Federal Register listing inventions available for licensing. Abstracts of the inventions will also be published in the NASA Scientific and Technical Aerospace Reports (STAR) and other NASA publications.

(b) Copies of pending patent applications for inventions abstracted in STAR may be purchased from the National Technical Information Service, Springfield, Va. 22151.

§ 1245.207 Application for exclusive license.

(a) Submission of application. An application for exclusive license under § 1245.203(d) may be submitted to NASA at any time. An application for exclusive license shall be addressed to the NASA Assistant General Counsel for Patent Matters.

(b) Contents of an application for exclusive license. In addition to the requirements set forth in § 1245.206(b), the application for an exclusive license shall include:

(1) Applicant's status, if any, in any of the following categories: (i) Small business firm,

(ii) Minority business enterprise;

(iii) Location in a surplus labor area;

(iv) Location in a low-income urban area; and

(v) Location in an area designed by the Government as economically depressed.

(2) A statement indicating the time, expenditure, and other acts which the applicant considers necessary to achieve practical application of the invention, and the applicant's offer to invest that sum and to perform such acts if the license is granted.

(3) A statement whether the applicant would be willing to accept a license for less than all fields of use of the invention throughout the United States of America, its territories and possessions, Puerto Rico, or the District of Columbia, or in any lesser geographic portion thereof.

(4) A statement indicating the amount of royalty fees or other consideration, if any, the applicant would be willing to pay the Government for the exclusive license, and

(5) Any other facts which the applicant believes to show it to be in the interests of the United States of America for the Administrator to grant an exclusive license rather than a nonexclusive li-
PATENT LICENSING REGULATIONS

cense and that such an exclusive license should be granted to the applicant.
§ 1245.208 Processing applications for license.
(a) Initial review Applications for nonexclusive and exclusive licenses under §§ 1245.206 and 1245.207 will be reviewed by the Patent Counsel of the NASA Assistant General Counsel for Patent Matters, to determine the conformity and appropriateness and the availability of the specific invention for the license requested. The Patent General Counsel, based upon the facts and after consideration of the requested license, shall forward all applications for license conforming to §§ 1245.206(b) and 1245.207(b) to the NASA Inventions and Contributions Board when the invention is available for consideration of the requested license. Prior to forwarding applica- tions for exclusive licenses to the Inventions and Contributions Board, a notice in writing will be given to each nonexclusive license for the specific invention, requiring a 30 day period for submitting evidence that the practical application of the invention has occurred or is about to occur or, an application for an exclusive license for the invention.

(b) Recommendations of the Inventions and Contributions Board The Inventions and Contributions Board shall, in accordance with the basic considerations set forth in §§ 1245.202 and 1245.208, evaluate all applications for license forwarded by the Assistant General Counsel for Patent Matters which have been presented to the Inventions and Contributions Board in the application and any other facts in its possession, the Inventions and Contributions Board shall recommend to the Administrator whether a nonexclusive or exclusive license should be granted, (2) the identification of the person applying for the license and the invention, and (3) any special terms or conditions of the license.

(c) Determination of Administrator and grant of exclusive licenses—(1) Notice. If the Administrator determines that the best interest of the United States will be best served by the grant of an exclusive license, he will notify the person filing the application that an exclusive license has been approved.

(2) Determination of Administrator and grant of exclusive licenses—(a) Normally, a nonexclusive license for the practical application of an invention to a company will not require the payment of royalties, however, NASA may require other consideration.

(b) An exclusive license for an invention may require the payment of royalties, fees, or other consideration when the licensing circumstances and the basic considerations in § 1245.202, considered together, indicate that it is in the public interest to do so.

§ 1245.210 Reports. A license shall require the licensee to submit periodic reports of his efforts to work the invention. The reports shall contain information within his knowledge, or which he may acquire under normal business practice, pertaining to the commercial use that is being made of the invention and such other information which the Administrator may determine is necessary to the license program and which is specified in the license.

§ 1245.211 Revocation of licenses. (a) Any license granted pursuant to § 1245.203 may be revoked, either in part or in its entirety, by the Administrator in the event that he determines that such a default, false report, or breach within 30 days after written notice thereof has occurred or is likely to occur.

(b) An exclusive license granted pursuant to § 1245.204(a) may be revoked, either in part or in its entirety, by the Administrator if in his opinion the licensee at any time shall fail to use adequate efforts to bring to or achieve practical application of the invention, or if in his opinion the invention pursuant to an application for an exclusive license conforming to §§ 1245.206(b) and 1245.207 will be granted upon the negotiation of the appropriate terms and conditions by the Office of General Counsel.

§ 1245.209 Royalties and fees.

(a) Normally, a nonexclusive license for the practical application of an invention granted to a company will not require the payment of royalties, however, NASA may require other consideration.

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(b) An exclusive license granted pursuant to § 1245.204(a) may be revoked, either in part or in its entirety, by the Administrator if in his opinion the licensee at any time shall fail to use adequate efforts to bring to or achieve practical application of the invention, or if in his opinion the invention pursuant to an application for an exclusive license conforming to §§ 1245.206(b) and 1245.207 will be granted upon the negotiation of the appropriate terms and conditions by the Office of General Counsel.

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§ 1245.211 Revocation of licenses. (a) Any license granted pursuant to § 1245.203 may be revoked, either in part or in its entirety, by the Administrator if in his opinion the licensee at any time shall fail to use adequate efforts to bring to or achieve practical application of the invention, or if in his opinion the invention pursuant to an application for an exclusive license conforming to §§ 1245.206(b) and 1245.207 will be granted upon the negotiation of the appropriate terms and conditions by the Office of General Counsel.

§ 1245.209 Royalties and fees.

(a) Normally, a nonexclusive license for the practical application of an invention granted to a company will not require the payment of royalties, however, NASA may require other consideration.

(b) An exclusive license for an invention may require the payment of royalties, fees, or other consideration when the licensing circumstances and the basic considerations in § 1245.202, considered together, indicate that it is in the public interest to do so.

§ 1245.210 Reports. A license shall require the licensee to submit periodic reports of his efforts to work the invention. The reports shall contain information within his knowledge, or which he may acquire under normal business practice, pertaining to the commercial use that is being made of the invention and such other information which the Administrator may determine is necessary to the license program and which is specified in the license.

§ 1245.211 Revocation of licenses. (a) Any license granted pursuant to § 1245.203 may be revoked, either in part or in its entirety, by the Administrator if in his opinion the licensee at any time shall fail to use adequate efforts to bring to or achieve practical application of the invention, or if in his opinion the invention pursuant to an application for an exclusive license conforming to §§ 1245.206(b) and 1245.207 will be granted upon the negotiation of the appropriate terms and conditions by the Office of General Counsel.

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§ 1245.211 Revocation of licenses. (a) Any license granted pursuant to § 1245.203 may be revoked, either in part or in its entirety, by the Administrator if in his opinion the licensee at any time shall fail to use adequate efforts to bring to or achieve practical application of the invention, or if in his opinion the invention pursuant to an application for an exclusive license conforming to §§ 1245.206(b) and 1245.207 will be granted upon the negotiation of the appropriate terms and conditions by the Office of General Counsel.

§ 1245.209 Royalties and fees.

(a) Normally, a nonexclusive license for the practical application of an invention granted to a company will not require the payment of royalties, however, NASA may require other consideration.

(b) An exclusive license for an invention may require the payment of royalties, fees, or other consideration when the licensing circumstances and the basic considerations in § 1245.202, considered together, indicate that it is in the public interest to do so.
PATENT LICENSING REGULATIONS

The Government shall also have an absolute right to intervene in any such suit at its own expense. The licensee shall be obligated to promptly furnish to the Government, upon request, copies of all pleadings and other papers filed in any such suit and of evidence adduced in proceedings relating to the licensed patent including, but not limited to, negotiations for settlement and agreements settling claims by a licensee based on the licensed patent, and all other books, documents, papers, and records pertaining to such suit. If, as a result of any such litigation the patent shall be declared invalid, the licensee shall have the right to surrender his license and be relieved from any further obligation thereunder.

§ 1245.214 Address of communications.

(a) Communications to the Assistant General Counsel for Patent Matters in accordance with §§ 1245.206 and 1245.207 and requests for information concerning licenses for NASA inventions should be addressed to the Assistant General Counsel for Patent Matters, Code GP, National Aeronautics and Space Administration, Washington, D.C. 20546.

(b) Communications to the Inventions and Contributions Board in accordance with §§ 1245.208, 1245.211, and 1245.212 should be addressed to Chairman, Inventions and Contributions Board, National Aeronautics and Space Administration, Washington, D.C. 20546.

Effective date The regulations set forth in this subpart 2 are effective April 1, 1972.

JAMES C. FLETCHER, Administrator.

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 CFR 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.
# TABLE OF CONTENTS

Section 1 • Abstracts

## AERONAUTICS

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

For related information see also Astronautics

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### 02 AERODYNAMICS (1)

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

### 03 AIR TRANSPORTATION AND SAFETY (1)

Includes passenger and cargo air transport operations, and aircraft accidents.

For related information see also 16 Space Transportation and 85 Urban Technology and Transportation

### 04 AIRCRAFT COMMUNICATIONS AND NAVIGATION (N.A.)

Includes digital and voice communication with aircraft, air navigation systems (satellite and ground based), and air traffic control.

For related information see also 17 Spacecraft Communications, Command and Tracking and 32 Communications

### 05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE (2)

Includes aircraft simulation technology.

For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics

### 06 AIRCRAFT INSTRUMENTATION (2)

Includes cockpit and cabin display devices, and flight instruments.

For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography

### 07 AIRCRAFT PROPULSION AND POWER (2)

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

For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion

### 08 AIRCRAFT STABILITY AND CONTROL (N.A.)

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

### 09 RESEARCH AND SUPPORT FACILITIES (AIR)

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

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

### ASTRONAUTICS

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

For related information see also Aeronautics

### 12 ASTRONAUTICS (GENERAL) (N.A.)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration

### 13 ASTRODYNAMICS (N.A.)

Includes powered and free-flight trajectories, and orbit and launching dynamics

### 14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) (N.A.)

Includes launch complexes, research and production facilities, ground support equipment, e.g., mobile transporters, and simulators.

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

### 15 LAUNCH VEHICLES AND SPACE VEHICLES (5)

Includes boosters, manned orbital laboratories, reusable vehicles, and space stations

### 16 SPACE TRANSPORTATION (N.A.)

Includes passenger and cargo space transportation, e.g., shuttle operations, and rescue techniques.

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

### 17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING (N.A.)

Includes telemetry, space communications networks, astronautics, and radio blackout.

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

### 18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE (6)

Includes spacecraft thermal and environmental control, and attitude control.

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

### 19 SPACECRAFT INSTRUMENTATION AND NAVIGATION (N.A.)

Includes spacecraft instrumentation and navigation.

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

### 20 SPACECRAFT PROPULSION AND POWER (N.A.)

Includes spacecraft propulsion and power.

For related information see also 28 Propellants and Fuels and 44 Energy Production and Conversion

### 21 SPACECRAFT STABILITY AND CONTROL (N.A.)

Includes spacecraft stability and control.

For related information see also 35 Structural Mechanics

### 22 RESEARCH AND SUPPORT FACILITIES (SPACE) (N.A.)

Includes research and support facilities for space exploration.

For related information see also 14 Ground Support Systems and Facilities (Space)
19 SPACECRAFT INSTRUMENTATION N.A.
For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography

20 SPACECRAFT PROPULSION AND POWER
Includes main propulsion systems and components, e.g., rocket engines, and spacecraft auxiliary power sources
For related information see also 07 Aircraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion

CHEMISTRY AND MATERIALS
Includes chemistry and materials (general), composite materials, inorganic and physical chemistry, metallic materials, nonmetallic materials, and propellants and fuels

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

24 COMPOSITE MATERIALS
Includes laminates

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

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

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

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

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

31 ENGINEERING (GENERAL)
Includes vacuum technology, control engineering, display engineering, and cryogenics

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

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

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

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

36 LASERS AND MASERS
Includes parametric amplifiers

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

38 QUALITY ASSURANCE AND RELIABILITY
Includes product sampling procedures and techniques, and quality control

39 STRUCTURAL MECHANICS N.A.
Includes structural element design and weight analysis, fatigue, and thermal stress
For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance

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

42 GEOSCIENCES (GENERAL) N.A.
43 EARTH RESOURCES
Includes remote sensing of earth resources by aircraft and spacecraft, photogrammetry, and aerial photography
For instrumentation see 35 Instrumentation and Photography

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

45 ENVIRONMENT POLLUTION
Includes air, noise, thermal and water pollution, environment monitoring, and contamination control

46 GEOPHYSICS
Includes aeronomy, upper and lower atmosphere studies, ionospheric and magnetospheric physics, and geomagnetism
For space radiation see 93 Space Radiation

47 METEOROLOGY AND CLIMATOLOGY
Includes weather forecasting and modification

48 OCEANOGRAPHY
Includes biological, dynamic and physical oceanography, and marine resources

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

51 LIFE SCIENCES (GENERAL)
Includes genetics

52 AEROSPACE MEDICINE
Includes physiological factors, biological effects of radiation, and weightlessness

53 BEHAVIORAL SCIENCES
Includes psychological factors, individual and group behavior, crew training and evaluation, and psychiatric research

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT
Includes human engineering, biotechnology, and space suits and protective clothing

55 PLANETARY BIOLOGY
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)

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

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

62 COMPUTER SYSTEMS
Includes computer networks

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

64 NUMERICAL ANALYSIS
Includes iteration, difference equations, and numerical approximation

65 STATISTICS AND PROBABILITY
Includes data sampling and smoothing, Monte Carlo method, and stochastic processes

66 SYSTEMS ANALYSIS
Includes mathematical modeling, network analysis, and operations research

67 THEORETICAL MATHEMATICS
Includes topology and number theory

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

70 PHYSICS (GENERAL)
For geophysics see 46 Geophysics For astrophysics see 90 Astrophysics For solar physics see 92 Solar Physics
71 ACOUSTICS 56
Includes sound generation, transmission, and attenuation
For noise pollution see 45 Environment Pollution

72 ATOMIC AND MOLECULAR PHYSICS 56
Includes atomic structure and molecular spectra

73 NUCLEAR AND HIGH-ENERGY PHYSICS 57
Includes elementary and nuclear particles, and reactor theory
For space radiation see 93 Space Radiation

74 OPTICS N.A.
Includes light phenomena

75 PLASMA PHYSICS 59
Includes magnetohydrodynamics and plasma fusion
For ionospheric plasmas see 46 Geophysics For space plasmas see 90 Astrophysics

76 SOLID-STATE PHYSICS 60
Includes superconductivity
For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers

77 THERMODYNAMICS AND STATISTICAL PHYSICS N.A
Includes quantum mechanics, and Bose and Fermi statistics
For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer

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

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

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

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

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

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

85 URBAN TECHNOLOGY AND TRANSPORTATION 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
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

N78-22026*# National Aeronautics and Space Administration
John F Kennedy Space Center Cocoa Beach, Fla
SYSTEM AND METHOD FOR REFURBISHING AND PROCESSING PARACHUTES Patent Application
Russell T Crowell, inventor (to NASA) Filed 21 Dec 1977
19 p
NTIS HC A02/MF A01 CSCL 13H

A system and method for refurbishing and processing parachutes is described. An overhead monorail conveyor system on which the parachute is suspended for horizontal conveyance is also included. The parachute is first suspended in partially open tented configuration wherein open inspection of the canopy is permitted to remove debris and inspect all areas. Following inspection, the parachute is transported by the monorail conveyor to a washing and drying station with the parachute canopy mounted on the conveyor in a systematic arrangement which permits water and air to pass through the ribbon-like material of the canopy. Following drying of the parachute the chute is conveyed into an interior space where it is finally inspected and removed from the monorail conveyor and laid upon a table for folding. Following folding operations the chute is once again mounted on the conveyor in an elongated horizontal configuration and conveyed to a packing area for stowing the parachute in a deployment bag.

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations and aircraft accidents

For related information see also 16 Space Transportation and 86 Urban Technology and Transportation

N78-25070*# National Aeronautics and Space Administration
Lyndon B Johnson Space Center Houston Tex
HIGH VISIBILITY AIR SEA RESCUE PANEL Patent Application
Jack Namier and Mathew I Radnofsky inventors (to NASA) Filed 16 Dec 1977
10 p
NTIS HC A02/MF A01 CSCL 06G

A system for air sea rescue was developed utilizing a thin film large area easily deployable highly visible buoyant panel which was formed of a substrate having a specific gravity less than sea water and impregnated with a brilliant fluorescent pigment. The panel may be accordion folded for compactness and ease of deployment may have an inflatable periphery to enhance deployment rigidity and buoyancy and may include means for attachment to a floatation device.

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
06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices, and flight instruments.

For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography.

07 AIRCRAFT PROPULSION AND POWER

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

For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.
N78-25090* National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
COUNTER PUMPING DEBRIS EXCLUDER AND SEPARATOR Patent

A dirt separator and excluder for removing entrained debris from gas turbine shaft seals is described. A helical groove pattern is constructed on the rotating shaft with the pumping pattern such that it tends to pump seal pressurizing gas toward the gas turbine seal. A second helical groove pattern is provided on the stationary housing or counter-rotating member coaxial with the shaft and this pattern is designed to provide pumping in the direction opposite to that of the groove pattern on the shaft. Gas with entrained debris entering this grooved area will be subjected to high centrifugal forces due to the swirl motion induced by the groove pattern and the rotation of the shaft. This debris is centrifuged outwardly into the outer groove pattern on the housing or counter-rotating member. Because the outer groove pattern has a pumping direction opposite from that of the seal dirt is pumped away from the seal and can be collected in a suitable debris trap remote from the seal location.

Official Gazette of the U.S. Patent Office

N78-27122* National Aeronautics and Space Administration Lewis Research Center Cleveland Ohio
SUPERCRITICAL FUEL INJECTION SYSTEM Patent Application

A fuel injection system for gas turbines or the like which includes a pair of high pressure pumps which provide fuel and a carrier fluid such as air at pressures above the critical pressure of the fuel was developed. A supercritical mixing chamber mixes the fuel and carrier fluid and the mixture is sprayed into a combustion chamber for burning therein. The use of fuel and a carrier fluid at supercritical pressures promotes rapid mixing of the fuel in the combustion chamber so as to reduce the formation of pollutants and promote cleaner burning.

NASA

N78-31103* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio
GAS PATH SEAL Patent Application

A gas path seal for a turbine engine or compressor is provided. The gas path seal comprises a shroud of material wearable or abradable relative to the material of the turbine or compressor blades and closely spaced from the blade tips. A compliant backing, preferably of several layers of corrugated metal or a compliant...
material covered with a thin layer of ductile material, is provided about the shroud and a rigid mounting surrounds the compliant backing. The novel feature is a compliant backing between the shroud and mounting. As a result normal forces during a blade rub are limited and wear is reduced and the life of the shroud is lengthened for a design of comparable clearance of blade to shroud.

**09 RESEARCH AND SUPPORT FACILITIES (AIR)**

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

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

**N78-33101** National Aeronautics and Space Administration

Lewis Research Center, Cleveland, Ohio

**REDUNDANT DISC** Patent

William N. Barack (GE, Cincinnati), Paul A. Domas (GE, Cincinnati) and Stephen W. Beekman inventors (to NASA) (GE, Cincinnati) 


A rotatable disc is described that consists of parallel plates tightly joined together for rotation about a hub. Each plate is provided with several angularly projecting spaced lands. The lands of each plate are interposed in alternating relationship between the lands of the next adjacent plate. In this manner circumferential displacement of adjacent sectors in any one plate is prevented in the event that a crack develops. Each plate is redundantly sized so that in event of structural failure of one plate, the remaining plates support a proportionate share of the load of the failed plate. The plates are prevented from separating laterally through the inclusion of generally radially extending splines which are inserted to interlock cooperating circumferentially adjacent lands.

**N78-31129** National Aeronautics and Space Administration

Lyndon B Johnson Space Center, Houston, Tex

**MULTI-PURPOSE WIND TUNNEL REACTION CONTROL MODEL BLOCK** Patent

Henry S. Dresser (Rockwell Intern Corp., Downey, Calif.) and Joseph J. Daileda, inventors (to NASA) (Rockwell Intern Corp., Downey, Calif.) 


A reaction control system nozzle block is provided for testing the response characteristics of space vehicles to a variety of reaction control thruster configurations. A pressurized air system is connected with the supply lines which lead to the individual jet nozzles. Each supply line terminates in a compact cylindrical plenum volume, axially perpendicular and adjacent to the throat of the jet nozzle. The volume of the cylindrical plenum is sized.
to provide uniform thrust characteristics from each jet nozzle irrespective of the angle of approach of the supply line to the plenum. Each supply line may be plugged or capped to stop the air supply to selected jet nozzles, thereby enabling a variety of nozzle configurations to be obtained from a single model nozzle block.

15 LAUNCH VEHICLES AND SPACE VEHICLES

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters, manned orbital laboratories, reusable vehicles, and space stations.

N78-25119* National Aeronautics and Space Administration
Marshall Space Flight Center Huntsville Ala
TETHERLINE SYSTEM FOR ORBITING SATELLITES Patent
A system for tethering one orbiting space vehicle to another was designed so that a tetherline between the vehicles is controlled by a motorized reel which in turn is controlled to deploy, retrieve, or maintain a constant line length while effecting a stabilizing influence on the line. This is accomplished by applying a tension to the line which takes into account the instantaneous length of the line, the rate of change of the length of the line, and certain constants which vary depending upon the mode of operation, deployment retrieval, or stationkeeping.

N78-25120* National Aeronautics and Space Administration
Langley Research Center Langley Station Va
SMALL AIR BREATHING LAUNCH VEHICLE Patent
Laurn R. Jackson, William J. Small, John P. Weidner, and James A. Martin inventors (to NASA) Filed 30 May 1978 13 p
An orbit vehicle launch system was designed which includes reusable turbojet propelled booster vehicles releasably connected to a reusable rocket powered orbit vehicle. The coupled orbiter-booster combination takes off horizontally and ascends to staging altitude and speed under booster power with both...
15 LAUNCH VEHICLES AND SPACE VEHICLES

Orbiter and booster wings providing lift. After staging, the booster vehicles fly back to earth for horizontal landing and the orbiter vehicle continues ascending to orbit. The wings of both vehicles are designed to induce vortex lift.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control, and attitude control. For life support systems see 54 Man/System Technology and Life Support. For related information see also 05 Aircraft Design, Testing and Performance and 39 Structural Mechanics.

N78-32168* National Aeronautics and Space Administration Langley Research Center Hampton, Va
HYPERSONIC AIRBREATHING MISSILE Patent Application

A hypersonic airbreathing missile using dual mode scramjet engines for propulsion is described. The fuselage is constructed of a material with a high heat sink capacity and is covered with a thermal protective shield and lined with an internal insulating blanket. The engine airframe integration uses the flat lower portion of the lower fuselage to precompress the air entering the scramjet engines. The precompression of air entering the scramjet inlets increases as the angles of attack. This feature results in a highly maneuverable missile which can accelerate as it banks into a turn.

N78-23141* National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md
ACTIVE NUTATION CONTROLLER Patent Application

An apparatus for controlling nutation motion in a spinning body is described. Features of the apparatus include an angular accelerometer with its input axis perpendicular to the spin axis of the body, a flywheel with an axis of rotation perpendicular to the axis of the accelerometer and to the spin axis of the body, and a motor for driving the flywheel to attenuate or build nutation. The motor is controlled by circuitry that monitors the output of the angular accelerometer and drives the motor clockwise or counterclockwise during predetermined nutation angles synchronized to the zero crossover points of the accelerometer signal and centered about the nutation peaks. The use of an angular accelerometer rather than a linear accelerometer or gyro to monitor nutation enables placement of the nutation control apparatus at any location relative to the spin axis of the body requiring only crude orientation and no calibration.
A lightweight structural member suitable as trusses to be used in the assembly of large structures in space (e.g., solar power satellite) is described, together with a compact, fully automated machine for manufacturing such members in a space environment from compactly stowed sheet material. The rigid, triangular truss is formed of initially flexible, relatively thin rolled sheet material, and includes three parallel tubular columns formed from a strip of sheet material closed upon itself by helical winding. The structural member takes advantage of the space environment, such as low gravitational forces, to utilize construction materials, such as flexible sheet material, and solves the problems of the constraints of manufacturing large space structures such as limited capability for transportation of materials, and stowage of greatest amount of raw material in the most compact form, etc.

A solar array-ion thruster system is described which includes a power control circuit that permits use of the thruster itself in operating the solar array at the maximum power point. The power control circuit connected between the solar array and the ion thruster and receiving voltage and current signals from the former, multiplies the voltage and current signals together to produce a power signal which is differentiated with respect to time. The differentiator output is detected by a zero crossing detector and, after suitable shaping the detector output is phase compared with a clock in a phase demodulator. An integrator receives no output from the phase demodulator when the operating point is at the maximum power point, but is driven toward the maximum power point for non-optimum operation. A ramp generator provides minor variations in the beam current reference signal produced by the integrator in order to obtain the first derivative of power.

A retractable environmental seal for use in sealing the opening of the exit cone for a rocket nozzle was devised. The seal comprises a diaphragm-like cover having a central region adapted to be seated in sealing relation with the periphery of the opening. It is characterized by radially extended failure zones for facilitating a pressure-induced rupture of the cover. A plurality of angularly spaced tension springs is connected with the peripheral portion of the cover for retracting fractured segments of the cover from the opening subsequent to a pressure-induced rupture.
A lightweight pyrogen igniter assembly including an elongated molded plastic tube adapted to contain a pyrogen charge was designed for insertion into a rocket motor casing for ignition of the rocket motor charge. A molded plastic closure cap provided for the elongated tube includes an ignition charge for igniting the pyrogen charge and an electrically actuated ignition squib for igniting the ignition charge. The ignition charge is contained within a portion of the closure cap, and it is retained therein by a noncorrosive ignition pellet retainer or screen which is adapted to rest on a shoulder of the elongated tube when the closure cap and tube are assembled together. A circumferentially disposed metal ring is provided along the external circumference of the closure cap and is molded or captured within the plastic cap in the molding process to provide along with O-ring seals a leakproof rotary joint.

Official Gazette of the U.S. Patent Office

The system utilizes a spherical tank structure separated into two equal volume compartments by a flat bulkhead. Each compartment has four similar gallery channel legs located in the principal vehicle axes ensuring that bulk propellant will contact at least one gallery leg during vehicle maneuvers. The forward compartment gallery channel legs collect propellant and feed it into the aft compartment through communication screens which protrude into the aft compartment. The propellant is then collected by the screened gallery channels in the aft compartment and supplied to the propellant outlet. The invention resides in the independent gallery assembly and screen structure by means of which propellant flow from forward to aft compartments is maintained. Liquid surface tension of the liquid on the screens is used to control liquid flow. The system provides gas-free propellants in low or zero-g environments regardless of axial accelerations and propellant orientation in bulk regions of the vessel.
23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

SYNTHESIS OF MULTIFUNCTION TRIARYLTRIFLUOROETHANES Patent Application
John I. Shafer (JPL) and Harold E. Marsh, Jr inventors (to NASA) (JPL) Issued 26 Sep 1978 8 p Filed 13 May 1970
Sponsored by NASA

Includes laminates.

SYNTHESIS OF MULTIFUNCTION TRIARYLTRIFLUOROETHANES Patent Application
William P. Kray (Talladega Coll, Ala.) and Robert W. Rosser inventors (to NASA) (Talladega Coll, Ala.) Filed 30 Mar 1978 10 p
Sponsored by NASA

IN SITU SELF CROSS-LINKING OF POLYVINYL ALCOHOL BATTERY SEPARATORS Patent Application
Warren H. Philipp, L. C. Hsu, and D. W. Sheibley inventors (to NASA) Filed 19 Apr 1978 13 p
Sponsored by NASA

The method disclosed is used to produce a polyvinyl alcohol sheet material wherein the polyvinyl alcohol is substantially free of 1.2 dipol units and has an acetal self cross-linked structure wherein the acetal content is determined by the 1.2 dipol content in the sheet material prior to cross-linking. The sheet material product exhibits high conductivity and oxidation resistance, as well as minimal distortion of the prefabricated polyvinyl alcohol sheet material.
PARTIAL INTERLAMINAR SEPARATION SYSTEM FOR
thin perforated polyester foil disposed between each adjacent
of a plurality of layers of graphite/epoxy tape with a layer of
a composite structure having improved physical property
adjacent laminae of a composite formed from prepreg tapes to
where a thin layer of a perforated foil film is interposed between
two layers of the prepreg tape. When this layup is cured, the
characteristics. An exemplary composite body was shown formed
by applying a high voltage direct current potential to
plate a corona discharge is induced a slight distance above the
electrically grounded surface. While the material passes over this
region where it is cooled by a stream of air or water bypassing
the discharge is injected into the heated dielectric a small distance
beneath its surface. The moving dielectric passes over or through
a region where it is cooled by a stream of air or water bypassing

METHOD FOR ALLEVIATING THERMAL STRESS DAMAGE
IN LAMINATES Patent Application
C A Hoffman, J W Weeton, and N W Orth, inventors (to NASA) Filed 6 Apr 1978 16 p
NTIS HC AO2/MF AO1 CSCL 11D

A sprayable, low density ablative composition is described consisting essentially of (1) 100 parts by weight of a mixture of
25-65% by weight of phenolic microballoons 0-20% by weight of
glass microballoons 4-10% by weight of glass fibers, 25-45% by
weight of an epoxy-modified polyurethane resin, 2-4% by
weight of a bentonite dispersing aid and 1-2% by weight of an
alcohol activator for the bentonite, (2) 1-10 parts by weight of
an aromatic amine curing agent and (3) 200-400 parts by weight of
a solvent Official Gazette of the U S Patent Office

CHARGE INJECTION METHOD AND APPARATUS OF
PRODUCING LARGE AREA ELECTRETS Patent Application
Edward L Shnver Orville Weaver and Parampukattil K C Pilla
inventors (to NASA) (NAS-NRC) Filed 28 Apr 1978 16 p
NTIS HC AO2/MF AO1 CSCL 11D

A large area homo-charged type electroyt is produced by
continuously passing a roll or sheet of dielectric material through
an oven or over a heated metal roller or metal plate of the
same width as the dielectric material. Emerging from the heater
the material is then passed over a heated electrically conductive
electrically grounded surface. While the material passes over this
plate a corona discharge is induced a slight distance above the
dielectric by applying a high voltage direct current potential to
a wire brush a grid of narrow wires or any other device capable
of sustaining an electric corona discharge. A corona discharge
is produced and due to the slight electrical conductivity of the
heated material some of the electrical plasma produced from
the discharge is injected into the heated dielectric a small distance
beneath its surface The moving dielectric passes over or through
a region where it is cooled by a stream of air or water bypassing

24 COMPOSITE MATERIALS

N78-22162# National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va
PARTIAL INTERLAMINAR SEPARATION SYSTEM FOR
thin perforated polyester foil disposed between each adjacent
of a plurality of layers of graphite/epoxy tape with a layer of
a composite structure having improved physical property
adjacent laminae of a composite formed from prepreg tapes to
where a thin layer of a perforated foil film is interposed between
two layers of the prepreg tape. When this layup is cured, the
characteristics. An exemplary composite body was shown formed
by applying a high voltage direct current potential to
plate a corona discharge is induced a slight distance above the
electrically grounded surface. While the material passes over this
region where it is cooled by a stream of air or water bypassing
the discharge is injected into the heated dielectric a small distance
beneath its surface The moving dielectric passes over or through
a region where it is cooled by a stream of air or water bypassing

N78-25137# National Aeronautics and Space Administration
Marshall Space Flight Center, Huntsville Ala
PRODUCING LARGE AREA ELECTRETS Patent Applica-
tion
Edward L Shnver Orville Weaver and Parampukattil K C Pilla
inventors (to NASA) (NAS-NRC) Filed 28 Apr 1978 16 p
NTIS HC AO2/MF AO1 CSCL 11D

A large area homo-charged type electroyt is produced by
continuously passing a roll or sheet of dielectric material through
an oven or over a heated metal roller or metal plate of the
same width as the dielectric material. Emerging from the heater
the material is then passed over a heated electrically conductive
electrically grounded surface. While the material passes over this
plate a corona discharge is induced a slight distance above the
dielectric by applying a high voltage direct current potential to
a wire brush a grid of narrow wires or any other device capable
of sustaining an electric corona discharge. A corona discharge
is produced and due to the slight electrical conductivity of the
heated material some of the electrical plasma produced from
the discharge is injected into the heated dielectric a small distance
beneath its surface The moving dielectric passes over or through
a region where it is cooled by a stream of air or water bypassing

N78-24290# National Aeronautics and Space Administration
Marshall Space Flight Center, Huntsville Ala
SPRAYABLE LOW DENSITY ABLATOR AND APPLICATION
PROCESS Patent
Max H Sharpe, William E Hill William G Simpson, James M
Carter Edwin L Brown Harry M King, Paul H Schuerer, and
Dawd D Webb, inventors (to NASA) Issued 7 Mar 1978 8 p
Filed 19 Jan 1977 Supersedes N77-15105 (15 - 08, p
US Patent Office CSCL 11D
A lightweight thermal/acoustical insulation foam based on Fiberfrax alumina silica ceramic fibers was developed for general insulation applications. The foam, which is lightweight, has good integrity, resiliency, and can be easily shaped into various forms during fabrication. It is produced by admixing insulating fibers, such as alumina-silica fibers, phenol-formaldehyde fibers, glass fibers, or their mixtures with a surface active agent and soluble organic resinous binder, agitating the mixture to produce a stable, homogenous foam, dewatering the foam, and heat treating the dewatered form to produce a dry, porous, non-fluid foam. One of the significant features of this development is the ability to control the density of the product over a wide range from 0.5 to 1.5 pounds per cubic foot. The process used for generating the foam is applicable to other fibrous materials as well as and can be used with very fine or relatively coarse fibers.

**N78-27180**
National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif.

**INTUMESCENT-ABLATOR COATINGS USING ENDOThE**
MURMIC FILLERS Patent
Paul M. Sawko and Salvatore R. Ricciutelli inventors (to NASA)
Issued 9 May 1978

An intumescent-ablator coating composition which contains the ammonium salt of 1,4-nitroaniline-2-sulfonic acid and 4,4-dinitroso farnilide, a polymeric binder system, and about 5 to 30% weight of an endothermic filler is reported. The filler has a decomposition temperature about or within the exothermic region of the intumescent agent.

**N78-27182**
National Aeronautics and Space Administration
Marshall Space Flight Center, Huntsville, Ala.

**METHOD OF MANUFACTURE OF BONDED FIBER FLY-WHEEL Patent Application**
George M. Weyler, Jr., inventor (to NASA)
Issued 5 Jun 1978

The novelty of this invention is that of effecting curing of the epoxy which bonds the fibers together while the fibers are in a stressed state. It appears that by doing this, a flywheel can be constructed which is capable of being operated at higher rotational speeds enabling a greater storage of energy for a given weight of flywheel.
**24 COMPOSITE MATERIALS**

N78-27184* National Aeronautics and Space Administration
Ames Research Center Moffett Field Calif.

**LOW DENSITY BISMALEIMIDE-CARBON MICROBALLOON COMPOSITES Patent Application**
Demetrios A Kourtides and John A Parker inventors (to NASA) Filed 30 Jun 1978 25 p
NTIS HC A02/MF A01 CSCL 11D

A process is described for constructing a composite laminate structure which exhibits a high resistance to heat and flame. It provides safer interior structures for aircraft and submarine compartments. Composite laminate structures are prepared by the bismaleimide resin preimpregnation of a fiberglass cloth to form a face sheet which is bonded with a bismaleimide hot melt adhesive to a porous core structure selected from the group consisting of polyamide paper and bismaleimide-glass fabric which is filled with carbon microballoons. The carbon microballoons are prepared by pyrolyzing phenolic micro-balloons in the presence of nitrogen. A slurry of the carbon microballoons is prepared to fill the porous core structure. The porous core structure and face sheet are bonded to provide panel structures exhibiting increased mechanical capacities and lower oxygen limit values and smoke density values. NASA

N78-28178* National Aeronautics and Space Administration
Ames Research Center Moffett Field Calif.

**STRUCTURAL WOOD PANELS WITH IMPROVED FIRE RESISTANCE Patent Application**
Paul M Sawko, inventor (to NASA) Filed 28 Jul 1978 13 p
NTIS HC A02/MF A01 CSCL 11D

Wood paneling or other molded wood compositions are prepared from lignocellulosic particles such as finely divided wood chips flour or strands, by bonding such particles with 10 to 33% by weight of a modified novolac resin. The resin prepolymer and a hardening agent such as hexamethylene tetramine are sprayed onto the particles and the mix is hot pressed to form the panel or other article and cure the prepolymer to form the resin. The prepolymer is formed from an alkaryl ether or halide, e.g. 1,4-dimethoxy-methylbenzene, and a phenol. By using the modified resins, panels are formed that have a burn-through time of about 480 seconds as opposed to about 280 seconds when tested under the same condition. The incorporation of certain inorganic fillers into the prepolymer will decrease the flame spread index of panels in which this is done, from less than 200 to 60 to 70. The preferred fillers are ammonium phosphate or a mixture of that with ammonium oxalate. Such panels meet Class 2 standards of the Unified Building Code. NASA

N78-32190* National Aeronautics and Space Administration
Marshall Space Flight Center Huntsville Ala

**CORK-RESIN ABLATIVE INSULATION FOR COMPLEX SURFACES AND METHOD FOR APPLYING THE SAME Patent Application**
Hill M Walker Max H Sharpe inventors (to NASA) and William G Simpson Filed 17 Oct 1978 10 p
NTIS HC A02/MF A01 CSCL 11D

An ablative insulation material is made from a B-stage curable thermosetting resin and finely divided cork. Cork and the selected resin such as a phenolic resin are mixed formed into a block and cured to B-stage. The B-stage cured block is sliced into sheets and the sheets are laid up on the surface being insulated. Final curing of the resin is then performed. By using B-stage cured cork-resin sheets rather than fully cured sheets to the insulated surface problems associated with lack of flexability in fully cured sheets are avoided. Application to complex surfaces is facilitated. Improved ablation performance lower density and higher strength are also obtained. NASA

N78-22186* National Aeronautics and Space Administration
Pasadena Office Calif

**LIQUID REACTANT FEEDER FOR ARC ASSISTED METAL REDUCTION REACTOR Patent Application**
Charles B Wolf (JPL) and Thomas Nolan Meyer, inventors (to NASA) (JPL) Filed 29 Mar 1978 15 p
(Contract NAS7-100)
NTIS HC A02/MF A01 CSCL 07C

The liquid reactant feeder assembly of the invention is suitable for injecting and rapidly dispersing liquid reactant into a high temperature gas stream to enhance turbulence and reaction rate. The recessed disposition of the nozzle tip and the special configuration of the entry ports prevent excessive cooling of the interior surfaces by contacting the relatively cool liquid reactant. Thus undesired condensation and buildup of sodium reductant, sodium chloride, or silicon product is avoided. Liquid feeding is superior to gaseous feeding in that more complete and rapid

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

N78-32189* National Aeronautics and Space Administration
Ames Research Center Moffett Field Calif

**FIBROUS REFRACTORY COMPOSITE INSULATION Patent Application**
Daniel B Leiser (Stanford Univ.) Howard E Goldstein and Marnell Smith, inventors (to NASA) Filed 8 Sep 1978 17 p
NTIS HC A02/MF A01 CSCL 11D

A high temperature insulating material suitable for reusable reentry heat shielding was prepared from silica fibers and aluminosilicate fibers in a weight ratio ranging from 1:19 to 19:1 and about 0.5% to 30% boron oxide based on the total fiber weight. Aluminosilicate fibers and additional free boron oxide up to the 30% limit may be substituted for the aluminosilicate fibers and boron oxide requirements. Small quantities of refractory opacifiers such as silicon carbide may be added. The composites are characterized by the absence of nonfibrous matrix. NASA
dispersion of the reagent occur due to the boiling action of the liquid and by the fact that the liquid will penetrate the axial stream rather than be greatly deflected by it NASA.

A SODIUM STORAGE AND INJECTION SYSTEM Patent Application
A storage and injection system for liquefied sodium having a capability of functioning in a start-up, shut-down, normal operating and emergency mode is described. The system is embodied in a sodium storage and injection system. Atomized liquid sodium was delivered to a chemical reactor employed in the production of solar grade silicon. The system is characterized by a jacketed injection nozzle, adapted to utilize inert gas for atomizing liquefied sodium, connected to a supply circuit for delivering liquefied sodium. The circuit comprises a plurality of interconnectable individually replaceable, sodium containment vessels, a pump interposed between the vessels and the nozzle, and a pressurizing circuit including a source of inert gas connected with the vessel for maintaining the sodium under pressure. By employing the system it is possible to deliver and inject a fine spray of high purity sodium into a chemical reactor. NASA.

APPARATUS FOR EXTRACTION AND SEPARATION OF A PREFERENTIALLY PHOTO-DISSOCIATED MOLECULAR ISOTOPE INTO POSITIVE AND NEGATIVE IONS BY MEANS OF AN ELECTRIC FIELD Patent
Molecules of one and the same isotope were preferentially photodissociated by a laser and an ultraviolet source or by multiphoton absorption of laser radiation. The resultant ions were confined with a magnetic field moved in opposite directions by an electric field extracted from the photodissociation region by means of screening and accelerating grids and collected in ducts. Official Gazette of the U.S. Patent Office.

FORMULATED PLASTIC SEPARATORS FOR SOLUBLE ELECTRODE CELLS Patent Application
Membranes comprising a hydrochloric acid-insoluble sheet of a mixture of a rubber and a powered ion transport material were designed for use in oxidation-reduction (REDOX) electrical accumulator cells. The sheet of thermoplastic rubber and an ion transport material which may be in the form of a film on a flexible substrate such as asbestos or paper was made by dissolving the rubber in a solvent and mixing with the ion transport material which is 20-50 volume percent as compared with 80-50 volume percent rubber. Preferred ion transport materials include a salt or a chloride anion a phosphomum tertiary ammonium or quaternary ammonium cation a metal oxide, and a silicate or boric acid. NASA.
N78-27226* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

TARGETS FOR PRODUCING HIGH PURITY I-123 Patent
James W Blue inventor (to NASA) Issued 9 May 1978 7 p
Filed 4 Sep 1973 Supersedes N74-10476 (12 - 1. p 0060)
Continuation-in-part of abandoned US Patent Appl SN-266927
filed 28 Jun 1972 which is a continuation in-part of US appl
(NASA-Case-LEW-10518-3 US-Patent-4,088 532
US-Patent-Class-176-16 US-Patent-Class-250-400,

Tellurium powder in improved targets is bombarded with a cyclotron beam to produce Xe-123. Flowing gas streams carry the Xe-123 through one cold trap which removes Xe-123 that subsequently decays to I-123. During this bombardment energy is deposited in the target material causing its temperature to rise. Some of the tellurium vaporizes and subsequently condenses on surfaces that are cooler than the vaporization temperature. Provision is made for the repeated bombardment of this condensed tellurium throughout. The novelty appears to reside in formulations that can be incorporated in formed polyurethane without adversely affecting the characteristics thereof.

N78-27232*# National Aeronautics and Space Administration Lyndon B Johnson Space Center Houston Tex

FLAME RETARDANT FORMULATIONS AND PRODUCTS PRODUCED THEREFROM Patent Application
(Contract NAS9-13979)

An elastomeric coating that significantly increases the flame resistance of a flammable polyurethane foam without adversely affecting the desirable physical properties of the foam is presented. The coating does not produce smoke, a very significant improvement in crew safety. The innovation is a series of formulations based on flame resistant elastomeric binders a thermally stable (i.e. to 150°C) source of bromine, metal oxide catalyst/acid acceptors, nitrogen-containing curing agents, phosphorus containing fillers and hydrated fillers. These formulations can be dispersed in organic liquids (such as acetone, MEK or hexane) and then sprayed onto the surface of polyurethane foam. After the liquid is evaporated off, a thin elastomeric coating remains on the surface. This latter procedure yields a foam that is uniformly treated throughout.

N78-27233*# National Aeronautics and Space Administration Pasadena Office, Calif

ON-SITE AMMONIA PLANT Patent Application
Wu Yi-Chien inventor (to NASA) (JPL) Filed 30 Jun 1978 19 p
(Contract NAS7-100)

A small-scale ammonia production system is provided in accordance with this invention that can be operated on a farm or farm cooperative to produce an annual supply of ammonia (about 18 tons) adequate for the average size farm (about 400 acres). The only raw materials in addition to catalyst required for the system are renewable hydrogen from water and nitrogen from air. The source of electrical power can range from wind power to solar thermal or photovoltaic power and to off-peak utility power from renewable sources preferred to provide complete on-site sufficiency. The system generally includes an electrolyzer as a source of hydrogen, an air combustion nitrogen generator and a reactor. A more detailed system is described which illustrates the use of a continuous water stream to produce steam through output which may be utilized for producing power performing work or for heating purposes, such as the heating of farm houses, animal shelters, or greenhouses or for the promotion of anaerobic digestion if a digester is incorporated for the treatment of farm waste for the production of methane. The steam can also be used for the generation of electrical power.

N78 33.64*# National Aeronautics and Space Administration Pasadena Office, Calif

COAL DESULFURIZATION Patent Application
George C Hsu inventor (to NASA) (JPL) Filed 16 Feb 1978 11 p
Sponsored by NASA
NTIS HC A02/MF A01 CSCL 07D
Organic sulfur is removed from coal by treatment with an organic solution of iron pentacarbonyl. Organic sulfur compounds can be removed by reaction of the iron pentacarbonyl with coal to generate CO and iron sulfides. The CO gas separated from CO can be passed over hot iron fillings to generate iron pentacarbonyl.

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

N78-22206† National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio
HIGH TOUGHNESS-HIGH STRENGTH IRON ALLOY Patent Application
J R Stephens and W R Witke inventors (to NASA) Filed 13 Dec 1977 12 p
A steel alloy is provided which exhibits excellent strength and toughness characteristics at cryogenic temperatures. The alloy consists essentially of about 10 to 16 percent by weight nickel, about 0.1 to 1.0 percent by weight aluminum, and 0 to about 3 percent by weight of at least one of the following additional elements: copper, lanthanum, niobium, tantalum, titanium, vanadium, yttrium, zirconium, and the rare earth metals, with the balance being essentially iron. The steel alloy is produced by a process which includes using cold rolling at room temperature and subsequent heat treatment at temperatures ranging from 500 to 650°C, and possesses a fracture toughness ranging from 200 to 230 ksi square root of (in) and yield strengths up to 230 ksi.

N78-27256* National Aeronautics and Space Administration Pasadena Office Calif
A METHOD OF PREPURIFYING METALLURGICAL GRADE SILICON EMPLOYING REDUCED PRESSURE ATMOSPHERIC CONTROL Patent Application
William M Ingle (Motorola Inc Phoenix, Ariz), Stephen W Thompson (Motorola Inc Phoenix, Ariz), and Robert E Chaney, inventors (to NASA) (Motorola Inc Phoenix, Ariz) Filed 23 Jun 1978 10 p
(Contracts NAS7-100, JPL-95442) (NASA-Case-NPO-14474-1, US-Patent-App-918537) Avail NTIS HC A02/MF A01 CSCL 11F
A process for use in purification of metallurgical grade silicon was studied. A quartz tube is charged with chunks of metallurgical grade silicon and/or a mixture of such chunks and high purity quartz sand. Impurities from a class of metals including aluminum, boron as well as certain transition metals such as nickel, iron, and manganese are also included. The tube is heated and evacuated to a temperature within a range of 800°C to 1350°C. A stream of gas comprising a reactant such as silicon tetrafluoride, continuously is delivered at low pressures through the charge for causing a metathetical reaction of impurities of the silicon and the reactant to occur for forming a volatile halide and leaving a residue of silicon of improved purity. The reactant may include carbon monoxide gas whereby impurities such as iron and nickel are permitted to react to form volatile carbonyls.

N78-24333† National Aeronautics and Space Administration Lyndon B Johnson Space Center, Houston, Tex
METHOD OF PRODUCING COMPLEX ALUMINUM ALLOY PARTS OF HIGH TEMPER, AND PRODUCTS THEREOF Patent
Irvin J Wilson, inventor (to NASA) (Rockwell International Corp Downey, Calif) Issued 7 Mar 1978 4 p Filed 26 Jul 1976 Supersedes N76-29401 (14 - 20 p 2579) Sponsored by NASA
26 METALLIC MATERIALS

N78-32229* National Aeronautics and Space Administration Ames Research Center Moffett Field Calif

PROCESS FOR PREPARING HIGHER OXIDES OF THE ALKALI AND ALKALINE EARTH METALS Patent

High purity inorganic oxides of the alkali and alkaline earth metals are prepared by subjecting the hydroxide of the alkali and alkaline earth metal to a radio frequency discharge sustained in oxygen under the pressure of about 0.75 to 100 torr

27 NONMETALLIC MATERIALS

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

N78-22231* National Aeronautics and Space Administration Langley Research Center, Langley Station Va

PROCESS FOR CURING EPOXIDES WITH DIAMINES Patent Application

A process for curing epoxides and polyepoxides to produce stronger amine cured resins was developed. Isomeric diamonobenzophenones and diamonobiphenylmethanes which have amine groups located at ortho or meta positions to the carbonyl or methylene groups joining the two benzene rings to cure epoxide resins were used. The diamine selected may be melted dissolved in a low boiling solvent or slurred in powder form into the liquid epoxide prepolymer

N78-24360* National Aeronautics and Space Administration Langley Research Center Langley Station Va

CRYSTALLINE POLYMIDES Patent Application

Homopolymers, copolymers, and terpolymers of a styrene-based monomer were prepared by (1) polymerizing at least one oxidized styrylphosphine monomer selected from the group of (C6H5)2 P(0)N=[P=C6H5]2 C6H4CH=CH2 (C6H5)2 P(0)N=C6H5SO2 C6H4CH=CH2 and (C6H5)2 P(0)N=C6H5SO2 C6H4CH=CH2 and then oxidizing said polymerized styrene monomer with at least one oxidized styrylphosphine monomer selected from the group of (C6H5)2 P(0)N=C6H5SO2 C6H4CH=CH2 and (C6H5)2 P(0)N=C6H5SO2 C6H4CH=CH2 and (C6H5)C3N3[H=P(C6H5)2 C6H4CH=CH2] or (2) polymerizing styrene monomer and then oxidizing said polymerized styrene monomer with an oxidizing agent selected from the group of (C6H5)2 P(0)N=C6H5SO2 C6H4CH=CH2 and (C6H5)2 P(0)N=C6H5SO2 C6H4CH=CH2 and (C6H5)C3N3[H=P(C6H5)2 C6H4CH=CH2] or (2) polymerizing styrene monomer with at least one oxidized styrylphosphine monomer

N78-25216* National Aeronautics and Space Administration Lyndon B Johnson Space Center Houston Tex

HEAT RESISTANT POLYMERS OF OXIDIZED STYRYL-PHOSPHINE Patent Application

Aromatic crystalline polymides were disclosed that were synthesized from polyamide-acid and when heated to 200 to 300 C became cyclized to afford an opaque polymer which by X-ray diffraction of the oriented film exhibited 47 percent crystallinity. Differential scanning calorimetry indicated a melt at 425 C with no glass transition in these crystalline polymides

N78-25217* National Aeronautics and Space Administration Lyndon B Johnson Space Center Houston Tex

HEAT RESISTANT POLYMERS OF OXIDIZED STYRYL-PHOSPHINE Patent Application

Flame resistant non-toxic vinyl polymers which contain phosphazene groups are presented. These polymers did not emit any toxic or corrosive products when they were oxidatively degraded

N78-25218* National Aeronautics and Space Administration Pasadena Office Calif

HIGH TEMPERATURE RESISTANT CERMET AND CERAMIC COMPOSITIONS Patent Application

Particles of high temperature resistant metal or metal alloy are mixed with a mixture of ceramic components applied to a substrate and hot pressed and sintered at temperatures ranging from 1700 to 2000 C at pressures of 1000 to 10 000 psi, for a period of 10 to 60 minutes. A ceramic solid solution which
coats and bonds the metal particles to the ceramic solid solution matrix is formed. Properties of the cermet body include high temperature oxidation resistance, good abrasion and wear resistance, low coefficient of friction, high hardness, and biocompatibility. Areas of application include seals for thermionic converters, production of turbine blades, reentry shields for space vehicles, and medical implants for rebuilding bones and joint structures of the body.

**N78-25219**
National Aeronautics and Space Administration
Pasadena Office Calif
HIGH TEMPERATURE RESISTANT CERMET AND CERAMIC COMPOSITIONS Patent Application
Wayne M. Phillips, inventor (to NASA) (JPL) Filed 8 Dec 1977

A high temperature oxidation resistant cermet having a high hardness is described which can be adapted for use as cermet seals for thermionic converters as well as for turbine blades, reentry shields for space vehicles, and for medical implants for rebuilding bones. The cermet composition is obtained by mixing particles of high temperature resistant metal or metal alloy such as molybdenum with a mixture of ceramic components.

**N78-27278**
National Aeronautics and Space Administration
Ames Research Center Moffett Field Calif
CHELATE-MODIFIED POLYMERS FOR ATMOSPHERIC GAS CHROMATOGRAPHY Patent Application

New polymeric materials were developed to serve as the stationary phase in chromatographic columns. These materials consist of a crosslinked polymer matrix with a divinylbenzene polymer into which was embedded an inorganic complexed ion or chelate, e.g., Co(acacen) which is N,N-ethylene-bis(acetylacetonato)cobalt (II). Organic nitrogenous bases such as pyridine may be incorporated into the chelate-polymer complexes to increase their chromatographic utility. Critical factors in obtaining satisfactory chromatographic performance from the polymer-chelate complexes are identified as (1) the nature and concentration of the nonpolar diluent, n-heptane and ethylbenzene being preferred, (2) completeness of crosslinking of the matrix, (3) the chelate content of the complex, and (4) the nature and concentration of the coordinating organic base employed.

**N78-31232**
National Aeronautics and Space Administration
Ames Research Center Moffett Field Calif
POLYMERIC FOAMS FROM CROSS-LINKABLE POLY-NARYLENEBENZIMIDAZOLES Patent

Foamed cross-linked poly-N-arylenebenzimidazoles are prepared by mixing an organic tetraamine and an ortho substituted aromatic dicarboxylic acid anhydride in the presence of a blowing agent and then heating the prepolymer to a temperature sufficient to complete polymerization and foaming of the reactants. In another embodiment of the process, the reactants are heated to form a prepolymer. The prepolymer is then cured at higher temperatures to complete foaming and polymerization.
**27 NONMETALLIC MATERIALS**

**N78-31233** National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif
BORON TRIFLUORIDE COATINGS FOR THERMOPLASTIC MATERIALS AND METHOD OF APPLYING SAME IN GLOW DISCHARGE Patent
Ronald Michael Kubacki, inventor (to NASA) (Bell and Howell Chicago) Issued 23 May 1978 4 p Filed 17 Jun 1977
Plastic surfaces can be improved physically and optically by treating them with a plasma of boron trifluoride. The trifluoride can be the sole reactant or be part of a mixture also containing an organic monomeric substance such as perfluorobutene-2 or an organosilane. The boron trifluoride-containing coating can also serve as an intermediate coating between the plastic surface and a plasma deposited organic polymer.

Official Gazette of the U.S. Patent Office

**N78-32250** National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif
REACTION CURED GLASS AND GLASS COATINGS Patent
The invention relates to reaction cured glass and glass coatings prepared by reacting a compound selected from the group consisting of silicon tetraboride, silicon hexaboride, other boron silicides, boron and mixtures with a reactive glass frit composed of a porous high silica borosilicate glass and boron oxide. The glassy composites of the present invention are useful as coatings on low density fibrous porous silica insulations used as heat shields and for articles such as reaction vessels that are subjected to high temperatures with rapid heating and cooling and that require resistance to temperature and repeated thermal shock at temperatures up to about 1482°C (2700°F).

Official Gazette of the U.S. Patent Office

**N78-32256** National Aeronautics and Space Administration
Lyndon B. Johnson Space Center, Houston, Tex
HEAT RESISTANT POLYMERS OF OXIDIZED STYRYL-PHOSPHINE Patent
Homopolymers, copolymers and terpolymers of a styrene-based monomer are prepared by polymerizing at least one oxidized styrylphosphine monomer or by polymerizing p-diphenyl phosphinestearylene and then oxidizing the polymerized monomer with an organoazide. Copolymers can also be prepared by copolymerizing styrene with at least one oxidized styrylphosphine monomer. Flame resistant vinyl based polymers whose degradation products are non toxic and non corrosive are obtained.

Official Gazette of the U.S. Patent Office
**28 PROPELLANTS AND FUELS**

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.

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**N78-32281**
National Aeronautics and Space Administration
Langley Research Center Hampton Va

**PROCESS FOR PREPARING THERMOPLASTIC AROMATIC POLYMIDES Patent**

A method of preparing insoluble thermoplastic aromatic polymides is described, having uniquely low softening temperatures by reacting in a suitable solvent an aromatic dihydride and a meta substituted aromatic diamine.

Official Gazette of the U S Patent Office

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**N78-32282**
National Aeronautics and Space Administration
Marshall Space Flight Center Huntsville Ala

**PROCESS FOR SPINNING FLAME RETARDANT ELASTOMERIC COMPOSITIONS Patent**

Flame retardant elastomeric compositions comprised of either spandex type polyurethane having halogen containing polymers incorporated into the polymer chain, conventional spandex type polyurethanes in physical admixture with flame retardant additives or fluorinated elastomeric resins in physical admixture with flame retardant additives were developed. Methods are described for preparing fibers of flame retardant elastomeric materials and manufactured articles as well as nonelastic materials such as polybenzimidazoles, fiberglass and nylons for high oxygen environments.

Official Gazette of the U S Patent Office

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**N78-3328**
National Aeronautics and Space Administration
Pasadena Office Calif

**THERMOPLASTIC RUBBER COMPRISING ETHYLENE-VINYL ACETATE COPOLYMER, ASPHALT AND FLUXING OIL Patent**

A thermoplastic rubber is made from a mixture of between about 10 percent and about 50 percent of asphalt between about 5 percent and about 70 percent of a copolymer of polyethylene and vinyl acetate.

Official Gazette of the U S Patent Office

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**N78-2438**
National Aeronautics and Space Administration
Lewis Research Center Cleveland Ohio

**ATOMIC HYDROGEN STORAGE METHOD AND APPARATUS Patent**

Atomic hydrogen for use as a fuel or as an explosive, is stored in the presence of a strong magnetic field in exfoliated layered compounds such as molybdenum disulfide or an elemental layer material such as graphite. The compound is maintained at liquid helium temperatures and the atomic hydrogen is collected on the surfaces of the layered compound which are exposed during delamination (exfoliation). The strong magnetic field and the low temperature combine to prevent the atoms of hydrogen from recombining to form molecules.

Official Gazette of the U S Patent Office
residue by process steps which include extraction, filtration and distillation. The effects of surfactant on coal conversion product distribution, conversion rate, and filtration time are demonstrated.

**N78-31255** National Aeronautics and Space Administration Pasadena Office, Calif

**NITRAMINE PROPELLANTS Patent**


Nitramene propellents without a pressure exponent shift in the burning rate curves are prepared by matching the burning rate of a selected nitramine or combination of nitramines within 10% of burning rate of a plasticized active binder so as to smooth out the break point appearance in the burning rate curve. Official Gazette of the U.S. Patent Office

**31 ENGINEERING (GENERAL)**

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

**N78-24386** National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt, Md

**METHOD AND APPARATUS FOR SLICING CRYSTALS Patent Application**


A method and apparatus are described for slicing crystals into slices having a thickness on the order of 5 mils. The concept involves slicing a crystal having flat opposed, parallel end faces. This is accomplished by cleaving the crystal while the two opposed parallel end faces are gripped and are being urged apart, so that a sliced portion of the crystal including the first face is pulled away from the remainder of the crystal when the crystal has been cleaved. An important feature of the invention is that the gripped face that is pulled away from the remainder of the crystal is held on the platen by a vacuum.

**N78-24387** National Aeronautics and Space Administration Pasadena Office, Calif

**UNDERGROUND MINERAL EXTRACTION Patent Application**

Charles G. Miller (JPL) and James B. Stephens, inventors (to NASA) Filed 19 Apr 1978 27 p (Contract NAS7-100) NASA-Case-NPO-14140-1 NASA-Case-NPO-14381-1 US-Patent-App-SN-897832) Avail NTIS HC A03/MF A01 CSCL 081

A method is described for mining coal or other minerals from underground seams without requiring personnel underground. The method involves a jet head which emits a high pressure water stream in a coal seam to comminute the coal around the jet heat as it moves along a passage that is cuts in the seam. The jet head is connected to a pipeline that extends along the passage and up to the surface of the earth where a pumper rig pumps water from a water line into the pipeline. The coal slurry resulting from the mixture of water and comminuted coal, flows down an inclined passage to a previously cut drain gallery that carries the slurry to a lifting apparatus so it can be pumped into a slurry pipeline. Each passage cut in the coal seam is formed by advancing the jet head forwardly while the head emits water in a forward direction to cut a pilot hole. Then the jet head retreats along the pilot hole while emitting water sidewardly to comminute coal along a wide passage. The effectiveness of the jet heat in breaking up coal is increased by injecting droplets of an explodeable material into the water stream. The droplet vaporizes to produce an explosion that drives a water slug into cracks in the seam and helps fracture the coal.
A closed cycle refrigeration (CCR) system is disclosed for providing cooling at different parts of a maser. The CCR includes a first station for cooling the maser’s parts except the amplifier portion to 4.5 K. The CCR further includes means with a 3.0 K station for cooling the maser’s amplifier to 3.0 K, and thereby increases the maser’s gain and/or bandwidth by a significant factor. The means which provide the 3.0 K cooling include a pressure regulator, heat exchangers, an expansion valve, and a vacuum pump which cool to cause helium provided from a compressor to liquefy and thereafter expand so as to vaporize. The heat of vaporization for the helium is provided by the maser amplifier which is thereby cooled to 3.0 K.

Official Gazette of the U.S. Patent Office

32 COMMUNICATIONS

Includes land and global communications, communications theory, and optical communications

For related information see also 04 Aircraft Communications and Navigation and 17 Spacecraft Communications, Command and Tracking

The two buffer memories to be transferred to long-term store while the other buffer memory is switched to its store mode to assume the task of temporarily storing subsequent band sweeps. In a second embodiment the roles of the two buffer memories are switched at the end of each heterodyne receiver band sweep for display of successive band sweeps at a faster rate and for automatic long-term store of any band sweep producing an alarm.

N78-22275*# National Aeronautics and Space Administration Langley Research Center, Langley Station, Va

HIGH-TEMPERATURE MICROPHONE SYSTEM Patent Application

Allan J. Zuckerwar, inventor (to NASA) (Old Dominion Univ Research Foundation Norfolk, Va) Filed 28 Apr 1978 22 p

Sponsored by NASA


Apparatus for measuring pressure fluctuations in air or other gases that is suitable for use in areas of elevated temperature is reported. The microphone is modified to decrease the undesirable increase in microphone sensitivity at high temperatures, the connection between the microphone and the carrier electronics is modified to operate as a half-wavelength transmission line and to provide a large temperature gradient between the microphone and carrier electronics, and the carrier electronics is modified by using a voltage controlled oscillator for automatic tuning control thereby permitting control without the addition of capacitors in parallel with the microphone.

N78-22268*# National Aeronautics and Space Administration Pasadena Office, Calif

AUTOMATIC COMMUNICATION SIGNAL MONITORING SYSTEM Patent Application

Albert J. Bernstein, inventor (to NASA) (JPL) Filed 4 Mar 1977 19 p

(Contract NAS7-100)


A system for automatic monitoring of a communication signal in the RF or IF spectrum utilizes a superheterodyne receiver technique with a VCO to select and sweep the frequency band of interest. A first memory is used to store one band sweep as a reference for continual comparison with subsequent band sweeps. Any deviation of a subsequent band sweep by more than a predetermined tolerance level produces an alarm signal which causes the band sweep data temporarily stored in one of the two buffer memories to be transferred to long-term store while the other buffer memory is switched to its store mode to assume the task of temporarily storing subsequent band sweeps. In a second embodiment the roles of the two buffer memories are switched at the end of each heterodyne receiver band sweep for display of successive band sweeps at a faster rate and for automatic long-term store of any band sweep producing an alarm.
A structure of a circularly polarized thin conformal antenna array which may be mounted integrally with the skin of an aircraft employs microstrip elliptical elements and interconnecting feed lines spaced from a circuit ground plane by a thin dielectric layer. The feed lines are impedance matched to the elliptical antenna elements by selecting a proper feedpoint inside the periphery of the elliptical antenna elements. Diodes connected between the feed lines and the ground plane rectify the microwave power and microstrip filters (low pass) connected in series with the feed lines provide dc current to a microstrip bus. Low impedance matching strips are included between the elliptical elements and the rectifying and filtering elements.

Official Gazette of the U.S. Patent Office

A dual-band limited scan antenna with high gain and large aperture is comprised of a Cassegrainian antenna system with a dual-band phased array feed positioned so that the subreflector of the antenna system is in the near field of the feed thereby enabling the antenna system to be scanned many beamwidths from boresight by phase scanning the feed. The phased array for scanning applications at S-band and X-band includes X-band waveguides in a matrix with S-band crossed-slot waveguides interleaved in the spaces between rows and columns of the X-band waveguides.
is transmitted continuously with the scrambled data for synchronization) are changed before they have had time to repeat. The communication system comprises a master timer, a message encoder/transmitter and a message decoder/receiver and employs an electronically randomized variant of quadraphase modulation and demodulation between two synchronized transceivers. Messages are encoded by using the combined outputs of two pseudo-random-sequence generators which are 41 stage shift register devices.

**N78-25275**
National Aeronautics and Space Administration Pasadena Office Calif
SATELLITE PERSONAL COMMUNICATIONS SYSTEM Patent Application
Norman B. Reilly (JPL) and Joel G. Smith inventors (to NASA) (JPL) Filed 30 May 1978 23 p
(Contract NAS7-100) (NASA-Case-NPO-14480-1 US-Patent-Appl-SN-910707) Avail NTIS HC A02/MF A01 CSCL 17B

A mobile communication system was designed that can be utilized to reliably interconnect large numbers of dispersed mobile units over a wide area such as the continental United States. The system includes a geostationary satellite with a large diameter reflector antenna with a matrix of feed horns for transmitting narrow beams that each cover a specific limited area or sector of the United States. The feed horn matrix also enables the detection of the specific sector from which a transmission is received. This permits the satellite to detect the particular sectors in which a caller and called party are located and to retransmit signals between those utilizing narrow beams that do not cover other sectors of the country. Thus the same frequency band can be utilized in each of many different sectors of the United States utilizing only a moderate band width of the radio frequency spectrum.

**N78-31321**
National Aeronautics and Space Administration Langley Research Center Langley Station Va
REFLEX FEED SYSTEM FOR DUAL FREQUENCY ANTENNA WITH FREQUENCY CUTOFF MEANS Patent

A reflex feed system is described for a dual frequency antenna such as one which transmits and receives both S and X band signals. The dichroic plate, normally employed for directing X band radiation away from the X band horn, is replaced by a flange about the opening of the X band horn.

Official Gazette of the U.S. Patent Office
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.

SYSTEM FOR AUTOMATICALLY SWITCHING TRANSFORMER COUPLED LINES Patent Application
William S Dwinell inventor (to NASA) (Rockwell Intern., Downey, Calif.) Filed 9 Mar 1978 10 p
(Contract NAS9-14000)

A system is provided for automatically controlling transformer coupled alternating current electric lines. The secondary winding of each transformer is provided with a center tap. A switching circuit is connected to the center taps of a pair of secondary windings and includes a switch controller. An impedance is connected between the center taps of the opposite pair of secondary windings. The switching circuit has continuity when the AC lines are continuous and discontinuity with any disconnection of the AC lines. Normally-open switching means are provided in at least one AC line. The switching controller automatically opens the switching means when the AC lines become separated.

SWEEP GROUP DELAY MEASUREMENT Patent

Direct recording of group delay measurements on a system under temperature and stress tests employs modulated carrier frequency sweep over an S or X band. Reference path and test paths to separate detectors utilize a power divider e.g., a directional coupler or a hybrid T junction. An initially balanced phase comparator is swept in frequency by modulated carrier over the band of interest for different conditions of temperature and/or mechanical stress to obtain characteristic group delay curves.

MODULE FAILURE ISOLATION CIRCUIT FOR PARALLELED INVERTERS Patent Application
Satoshi Nagano, inventor (to NASA) (JPL) Filed 9 Feb 1978 13 p
(Contract NAS7-100)

A circuit is proposed which detects current occurring in each module of a multimodule paralleled inverter system and compares it with the average current of all the modules to determine when there is a failure in any one module and to shut down the failing module. Such a failure isolation circuit is useful in power conditioning systems for spacecraft, data processing systems, and the like, and for all forms of solar energy conversion systems.

ELECTRONICS AND ELECTRICAL ENGINEERING

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

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The liquid metal electrical device includes a rotor with a channel for retaining the liquid by tension. The device also includes a stator in the form of a brush partially immersed in the metal. The brush is bidirectionally symmetrical so that whichever direction the rotor turns the probe presents the same physical resistance and affords the same electrical conductivity as a connection between the probe and the rotor.

A technique for analyzing integrated circuits for radiation sensitivity is provided. The method includes applying an intense penetrating radiation beam such as a 30 keV beam from a scanning electron microscope which is narrow enough to irradiate only one component (such as a single transistor) of the circuit at a time. The circuit is operated during irradiation of each component in sequence with a predetermined radiation dose such as 1,000,000 rad until the circuit fails. Then, a new integrated circuit is substituted for the failed one. The beam is narrowed further to cover only a portion of the failed component such as the beam which covers the base emitter junction of the failed transistor and a high radiation dosage is applied to component portions in sequence. In this way, it is possible to determine precisely which portions of which components of a circuit give rise to radiation sensitivity of the circuit.

A field effect transistor is constructed by placing a semiconductor layer on an insulating substrate so that the gate region is separated from source and drain regions. The gate electrode and gate region of the layer are of generally reduced length; the gate region being of greatest length on its surface closest to the gate electrode. This is accomplished by initially creating a relatively large gate region of one polarity and then reversing the polarity of a central portion of this gate region by ion bombardment thus achieving a narrower final gate region of the stated configuration.

An artifact signal attenuator for a pulse rate sensor is described. The circuit for attenuating background noise signals is connected with a pulse rate transducer which has a light source and a detector for light reflected from blood vessels of a living body. The heart signal provided consists of a modulated dc signal voltage indicative of pulse rate. The artifact signal resulting from light reflected from the skin of the body comprises both a constant dc signal voltage and a modulated dc signal voltage. The amplitude of the artifact signal is greater and the frequency less than that of the heart signal. The signal attenuator circuit includes an operational amplifier for canceling the artifact signal from the output signal of the transducer and has the capability of meeting packaging requirements for wrist-watch-size packages.
A test structure for accurately measuring the sheet resistance of the diffused region of a semiconductor during processing is provided. The novel feature is that one of the terminals extends in a closed path around the other terminal so that all current flowing during the resistance measurement flows through only the ring of semiconductor material lying between the terminals.
A substantially constant power level is derived over a predetermined frequency band in each of a plurality of relatively widely spaced power ranges, from a microwave load having a predetermined amplitude versus frequency response, such as an antenna. A microwave source of substantially constant amplitude drives a forward path connected between the source and the load. A feedback path responsive to the microwave power level in the forward path derives a control voltage for the PIN attenuator. The equalizer attenuator drives a linear crystal amplitude detector. Attenuating means included in the forward and feedback paths are selectively connected in circuit to maintain the power level of the microwave input to the amplitude detector substantially constant, even though different power ranges are supplied to the load by the forward path.

which compares the output voltage of the capacitor-diode voltage multiplier to the reference source.

A voltage multiplier having a capacitor-diode voltage multiplying network is disclosed which is fed with voltage pulses from a dc source through a first switching means. Pulses of a second polarity are also supplied through a second switching means to the input of the capacitor-diode voltage multiplier from a second dc source whose voltage is adjustable to change the voltage of the pulses of second polarity. The switching means are alternately rendered conducting by signals from a control circuit. The second dc source may be controlled by a voltage comparator.

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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.

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N78-22328* National Aeronautics and Space Administration
John F. Kennedy Space Center, Cocoa Beach, Fla

PENETRATOR NOZZLE Patent Application
Norms C Gray, Robert M. Senseny (Boeing Aerospace Co., Seattle) and Phillip N. Bolton, inventors (to NASA) (Boeing Aerospace Co., Seattle) Filed 19 Apr 1978 10 p
NTIS HC A02/MF A01 CSCI 20D

A nozzle for use with a fire extinguishing apparatus delivering an extinguishing agent through a barrier surrounding a structure into the interior thereof. The nozzle includes an elongated tubular body which has a pointed penetrating head carried on one end of the tubular body. A source of extinguishing agent is coupled to the opposite end of the tubular body and is fed therethrough and passes through passages adjacent the head for delivering the extinguishing agent to the interior of the structure. A slidable mass is carried on the tubular body on a remote end of the tubular body from the penetrating head. By manipulating the slidable mass and bringing such in contact with an abutment the force imparted to the tubular body causes the head to penetrate the structure.

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N78-25351* National Aeronautics and Space Administration
Lewis Research Center Cleveland, Ohio

FLOW COMPENSATING PRESSURE REGULATOR Patent
US Patent Office CSCI 20D

An apparatus for regulating pressure of treatment fluid during ophthalmic procedures is described. Flow sensing and pressure regulating diaphragms are used to modulate a flow control valve. The pressure regulating diaphragm is connected to the flow control valve to urge the valve to an open position due to pressure being applied to the diaphragm by bias means such as a spring. The flow sensing diaphragm is mechanically connected to the flow control valve and urges it to an opened position because of the differential pressure on the diaphragm generated by a flow of incoming treatment fluid through an orifice in the diaphragm. A bypass connection with a variable restriction is connected in parallel relationship to the orifice to provide for adjusting the sensitivity of the flow sensing diaphragm. A multiple lever linkage system is utilized between the center of the second diaphragm and the flow control valve to multiply the force applied to the valve by the other diaphragm and reverse the direction of the force.

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N78-25360* National Aeronautics and Space Administration
Lyndon B. Johnson Space Center, Houston, Texas

FLEXIBLE PILE THERMAL BARRIER INSULATOR Patent
George Edward Anderson (Rockwell Intern. Downey, Calif.) Donald Maurice Bell (Rockwell Intern. Downey, Calif.) and Jerry Stanley Tesinsky inventors (to NASA) (Rockwell Intern. Downey, Calif.) Issued 7 Mar 1978 5 p Filed 28 Apr 1976 Supersedes N76-23585 (14 - 14 p 1803) Sponsored by NASA
US Patent Office CSCI 20D

A flexible pile thermal barrier insulator included a plurality of upstanding pile yarns. A generally planar backing section supported the upstanding pile yarns. The backing section included a plurality of filler yarns forming a mesh in a first direction. A plurality of warp yarns were looped around said filler yarns and pile yarns in the backing section and formed a mesh in a second direction. A binder prevented separation of the yarns in the backing section.

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Official Gazette of the U.S. Patent Office
35 INSTRUMENTATION AND PHOTOGRAPHY

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

For aerial photography see 43 Earth Resources. For related information see also 06 Aircraft Instrumentation, and 19 Spacecraft Instrumentation.

N78-22346* National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va

FATIGUE FAILURE LOAD INDICATOR Patent Application
Leland A. Imig, William T. Davis, and David C. Davis, inventors (to NASA) Filed 24 Mar 1978 11 p

A device for measuring the load on a fatigue test specimen at the instant the specimen breaks is reported. The invention consists essentially of a conventional fatigue testing machine connected to a fatigue failure load indicator. Alternate tension and compression dc load signals were applied to a summing amplifier by means of an input load signal device. These signals caused a hydraulic cylinder to alternately apply tension and compression loads to the specimen. A load cell was attached to the specimen to produce a voltage proportional to the load on the specimen. This signal was amplified to subtract from the load signals from the input load signal device. A peak detector has its measuring input connected through a closed contact of relays to the output of the amplifier and has its reset input connected through another closed contact of relays to the output of the summing amplifier.
SYSTEM FOR FORMING A QUADRIFID IMAGE COMPRISING ANGULARLY RELATED FIELDS OF VIEW OF A THREE DIMENSIONAL OBJECT Patent Application
Frederick R. Chamberlain, inventor (to NASA) (JPL) Filed 20 Mar 1978 13 p
(Contract NAS7-100)

A system is presented for forming a composite image to be photographed and more particularly to an improved system for forming a quadrifid composite image consisting of separate images of a plurality of angularly related fields of view of a three dimensional object. The present invention is embodied in a system which includes a first, second and third subsystem, and each of which includes a combination of reflecting surfaces adapted to reflect images of orthogonally related fields of view to provide a quadrifid image for a camera. The camera lens, in turn focuses the quadrifid image on a film frame, in the film plane for photographically recording the quadrifid image. By employing the system of the instant invention, a simultaneous photographing of the images of orthogonally related fields of view is facilitated.

POLYMERIC ELECTROLYTIC HYGROMETER Patent

An improved flow-through electrolytic hygrometer is described which utilizes a long lasting oxidation-resistant, hollow fiber formed from persulfonic acid substituted polytetrafluoroethylene having closely spaced noble metal electrodes in contact with the inner and outer surfaces of the fiber. The electrodes are connected in series to a dc voltage supply and an ammeter. As the gas passes through the chamber moisture absorbed into the wall of the fiber is electrolyzed to hydrogen and oxygen by the closely spaced electrodes. The amount of electricity required for electrolysis is proportional to the absorbed moisture and is observed on the ammeter.

REMOTE WATER MONITORING SYSTEM Patent
David C. Grana and David P. Haynes inventors (to NASA) Issued 16 May 1978 11 p Filed 4 Aug 1977 Supersedes N77-28563 (15 - 19, p 254B)

A remote water monitoring system is described that integrates the functions of sampling sample preservation sample analysis data transmission and remote operation. The system employs a floating buoy carrying an antenna connected by lines to one or more sampling units containing several sample chambers. Receipt of a command signal actuates a solenoid to open an intake valve outward from the sampling unit and communicates the water sample to an identifiable sample chamber. Such response to each signal receipt is repeated until all sample chambers are filled in a sample unit. Each sample taken is analyzed by an electrochemical sensor for a specific property and the data obtained is transmitted to a remote sending and receiving station. Thereafter the samples remain isolated in the sample chambers.

NON-DESTRUCTIVE METHOD FOR APPLYING AND REMOVING INSTRUMENTATION ON HELICOPTER ROTOR BLADES Patent

A nondestructive method of applying and removing instrumentation on airfoils is described. Official Gazette of the U.S. Patent Office.
until the sampling unit is recovered and the samples removed for further laboratory analysis.

Official Gazette of the U.S. Patent Office

N78-27385* National Aeronautics and Space Administration Pasadena Office, Calif
VISCOSITY MEASURING INSTRUMENT Patent Application
Samuel P. Feinstein, inventor (to NASA) Filed 23 Jun 1978 16 p
(Contract NAS7-100)

An instrument for measuring the viscosity of coal samples at an elevated temperature such as 500°F is presented when they partially decompose into gases, to aid in the design of equipment for feeding coal into combustion chambers. A preheated cylinder holds a coal sample while a preheated piston presses on the sample to force it through a narrow tube. The cylinder has a concave end wall while the piston has a convex end to increase the surface area of contact with the sample to more rapidly heat the sample. The piston has a seal of compressed carbon material, which self sizes itself to the cylinder to form a seal therewith that prevents the escape of volatiles.

NASA

N78-29421* National Aeronautics and Space Administration Pasadena Office, Calif
MAGNETO-OPTIC DETECTION SYSTEM Patent
George W. Lewicki (JPL) and John E. Guisinger, inventors (to NASA) (JPL) Issued 27 Nov 1973 5p Filed 25 Feb 1972 Spon- sored by NASA

In a magneto-optic readout system, a polarized beam of light from a laser is subjected to the magneto-optical effect of a magnetic record medium and then passed through an analyzer which resolves the beam into two orthogonal vector components so oriented that the two components are of equal amplitude when the angle of rotation due to the magneto-optic effect is zero. Separate photodetectors produce two output signals which are proportional to the amplitudes of the vector components. The two output signals are combined in a differential amplifier through separate logarithmic transfer circuits to produce an output signal proportional to the ratio of the two original detector signals.

Official Gazette of the U.S. Patent Office
A device for measuring the displacement of a vibrating surface is presented. This device is especially useful in determining the displacement of a vibrating nonhomogeneous surface. The novel feature of the invention is the inclusion of a self-contained target with a noncontacting probe. This facilitates measurements of nonhomogeneous surfaces to which it is difficult or impossible to attach fixed targets.

A velocity sensor is described for sensing the speed of a moving conductive body, employing an E-shaped magnetic core, having a pair of spaced Hall effect devices positioned on the end of the central core. The ends of all cores were arranged adjacent to the path of the moving conductive body. The difference in output voltage registered by the two Hall effect devices was indicative of the speed of the conductive body.

The magnetometer is based on the time variation of the magnetic permeability in the magnetic material of its transducer, however, its operation is substantially different from the ordinary flux-gate magnetometer. The transducer uses 0.05 mm diameter plated magnetic wire and is made flat enabling it to make measurements of transverse magnetic fields as close as 0.08 mm from the surface and it has very good spatial resolution because of its small active region of approximately 0.64 mm by 0.76 mm. The magnetometer uses an inexpensive clip-on millimeter for driving and processing the electrical signals and readout. It also utilizes an automatic scanning technique which is made possible by a specially designed transducer holding mechanism that replaces the ink pen on an X-Y recorder.
The invention relates to an instrument for determining the optical constants of a sample material by causing light of various angles of polarization to impinge upon the sample at various angles of incidence and measuring the intensity of the reflected light at various wavelengths. The ratio of the intensity of the reflected light for parallel polarized light to that for perpendicular polarized light at two different angles of incidence can be used to determine the optical constants of the sample. The novel feature of the invention appears to reside in a spectroreflectometer employing coordinated rotating platforms which enable the automatic alignment of the instrument at a wide variety of angles of incidence.

The invention relates to a dual acting slit control mechanism for adjusting the collimating slit width and centering of the collimating slit of a mass spectrometer while using only one vacuum penetration. Coaxial shafts each with independent vacuum bellows are used to independently move the entire collimating assembly and to adjust the slit dimension through a parallelogram linkage. The novelty of the invention is in securing two independent control functions through a single insertion in a vacuum barrier with a simple and inexpensive mechanism.

Liquid neon in a container is forced through channels in a zeolite crystal to a low vacuum chamber. An electron beam is directed into the channels to bombard the flowing neon atoms to produce the characteristic excitation of neon at which X-ray photons are emitted. The channels have period changes in their cross sections leading to distributed feedback, so that from the channels in which the neon excitation takes place laser beams
36 LASERS AND MASERS

are emitted. Using an electron beam with a cross section on the order of 1 micron, the combined laser beams emitted from the various channels form an x-ray beam of a cross section comparable to that of the electron beam.

N78-27402 National Aeronautics and Space Administration Pasadena Office, Calif
CHARGE TRANSFER REACTION LASER WITH PREIONIZATION MEANS Patent
James B. Lauderslager (JPL) and Thomas J. Pacala, inventors (to NASA) Issued 9 May 1978 9 p Filed 12 Jul 1976 Supersedes N77-19418 (15 p 1314) Sponsored by NASA
Available from US Patent Office CSCL 20E

37 MECHANICAL ENGINEERING

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

N78-22374 National Aeronautics and Space Administration Langley Research Center, Langley Station, Va
IMPROVED TIRE/WHEEL CONCEPT Patent Application
Philip M. Harper, Sr., inventor (to NASA) (Boeing Commercial Airplane Co., Seattle) Filed 6 Apr 1978 12 p Sponsored by NASA
US-Patent-Appl-SN-893865

A tire and wheel assembly is described in which a low profile pneumatic tire has sidewalls which deflect inwardly under load and a wheel has a rim featuring a narrow central channel and extended rim flanges from the combination. The extended rim flanges support the tire sidewalls under static and dynamic loading conditions to produce a combination particularly suited to aircraft applications.

NASA
A wrench for tightening nuts in tight situations where pipes or the like passing through the nut prevent access by a typical socket wrench, and where the nuts are too close to one another or to other structures to permit the use of an open end wrench (which must be thick to apply high torque) is reported. The primary novel feature is the use of two wrench elements with gaps with the first element engaging a nut and the second surrounding the first to apply torque to it, wherein the second element extends over the gap in the first to prevent expansion of the first element which could cause it to slip on the nut.
AUTOMOTIVE GAS TURBINE FUEL CONTROL Patent
Harold Gold, inventor (to NASA) Issued 14 Mar 1978 14 p
Filed 8 Nov 1976 Supersedes N77-13426 (15 - 04, p 0477)
(NASA-Case-LEW-12785-1 US-Patent-4,078,378,
US Patent Office CSCL 21A
A fuel control system is reported for automotive-type gas
turbines and particularly advanced gas turbines utilizing variable
gap geometry components to improve mileage and reduce pollution
emission. The fuel control system compensates for fuel density
variations, inlet temperature variations, turbine vane actuation
acceleration and turbine braking. These parameters are utilized
to control various orifices, spool valves and pistons.
Official Gazette of the U.S. Patent Office

PORTABLE HEATABLE CONTAINER Patent Application
Lien C Yang, inventor (to NASA) (JPL) Filed 19 Apr 1978
12 p
(Contract NAS7-100)
NTIS HC A02/MF A01 CSCL 13D
A container is described which can be designed to heat its
outer surface as to sterilize it or to heat its inner surface and
any contents within. In a container that self sterilizes its outer
surface the container includes a combustible layer of thermit
type pyrotechnic material which can be ignited to generate
considerable heat. Thin casing around the combustible layer which
is of highly thermally conductive materials such as aluminum
can be heated to a high temperature by the ignited combustible
layer. A buffer layer which may be of metal lies within the
combustible layer and a layer of insulation such as Teflon lies
within the buffer layer to insulate the contents of the container
from the heat. The thicknesses of the thermit type charge of
the combustible layer and of the casing are chosen so that the
amount of heat from the charge heats the casing to a temperature
which is only moderately high to avoid melting the casing.
Official Gazette of the U.S. Patent Office

TOGGLE MECHANISM FOR PINCHING METAL TUBES Patent Application
Edwin O Stengard, inventor (to NASA) Filed 19 May 1978
16 p
NTIS HC A02/MF A01 CSCL 13D
An apparatus is described that uses a toggle mechanism
driven by a stored energy source, for pinching a metal tube and
to maintain the tube in a pinched condition without fracturing
it. The device is applicable to the multiple gas sampling system
for a spectrometer on a Venus probe.
NASA
A mechanical system was designed to capture and/or deploy a device or vehicle having relative motion with respect to another vehicle. The mechanism includes an onboard controlled collapsible iris assembly located at the end of a controlled manipulator system carried by one moving vehicle. The iris assembly, by means of the manipulator system, encircles a probe located on the other moving vehicle, whereupon the iris assembly is activated and one or more iris elements close around the probe thus capturing and axially aligning the other vehicle with the iris assembly. Additionally, a rotator assembly is included for spinning the iris assembly in a manner adapted to engage the probe of a spinning vehicle.

A hot gas engine was designed in which the expander portion is connected to and operates upon an expander crankshaft and the displacer portion is connected to and operable by a separate displacer crankshaft and which crankshafts are synchronized for operation. The engine design inherently produces a compact and rigid hot gas engine construction. Modules of the basic engine component can be assembled in such a way that a very compact high-powered gas engine can be achieved. The engine design also permits the crankcase to adopt more of a cylindrical shape capable of withstanding the high pressures encountered and thus the entire engine including the crankcase can be operated at the same pressure.

A tool was designed for use in joining connectors to shielded cables such as coaxial cables and the like characterized by a conductor coaxial to a metallic shield. The tool comprises a rigid elongated body configured and dimensioned to be received and held in the palm of a user's hand and includes at one end a truncated flaring cone for flaring the shield and a receiver at the other end for holding the central pin element of the connector prior to the usual crimping operation. The tool is used to exert forces to join and seat the central pin element on the central wire and to engage the insulating material to the full extent of its intended engagement.
VARIABLE CONTOUR SECURING SYSTEM Patent


A variable contour securing system has a retaining structure for a member whose surface contains a variable contour. The retaining mechanism includes a spaced array of adjustable spindles mounted on a housing. Each spindle has a base member support cup at one end. A vacuum source is applied to the cups for seating the member adjacent to the cups. A locking mechanism sets the spindles in a predetermined position once the member has been secured to the spindle support cups.

MAGNETIC SUSPENSION AND POINTING SYSTEM Patent


An apparatus is reported for accurate pointing of instruments on a carrier vehicle and for isolation of the instruments from the vehicle's motion disturbances. The apparatus includes two assemblies with connecting interfaces. The first assembly is attached to the carrier vehicle and consists of an azimuth gimbal and an elevation gimbal which provide coarse pointing by allowing two rotations of the instruments relative to the carrier vehicle. The second or vernier pointing assembly is made up of magnetic suspension and fine pointing actuators, roll motor segments, and an instrument mounting plate which provides appropriate magnetic circuits for the actuators and the roll motor segments. The vernier pointing assembly provides attitude fine pointing and roll positioning of the instruments as well as six degree-of-freedom isolation from carrier motion disturbances.

METHOD OF COLD WELDING USING ION BEAM TECHNOLOGY Patent Application


A method is described for cold welding metals in a vacuum using ion beams to prepare the surfaces of metals to be joined. The figure is a schematic diagram of an ion beam apparatus for carrying out the method. An expellant gas is stored in a high pressure tank and delivered to the ion source assembly. The ion source produces a unidirectional beam of gas molecules with uniform energies which, in a vacuum environment, is directed onto each surface to be joined and is sufficiently clean, they are dressed together with pressure adequate to assure that their asperities are brought into intimate contact throughout the area.
to be joined. This process provides a solid state cold weld with metal-to-metal bonding without causing gross deformation due to plastic flow and thinning of the material at the joint. NASA

**REDUNDANT MOTOR DRIVE SYSTEM** Patent Application

John A. Calvert, inventor (to NASA) Filed 4 Aug 1978 15 p
NASA

Two separate gear trains, each including a motor adapted to perform a driving function without backdriving the other are included in a redundant motor drive system. A base supports parallel pillars which in turn supports a shaft having a worm gear affixed. A bearing housing of sleeve-like configuration is concentrically related to the shaft and is supported by the shaft for free rotation. A first and second normally quiescent drive train alternatively activatable is provided for imparting rotation to the bearing housing. Each of the gear trains includes a selectively energizable motor for driving a worm meshed with the worm gear. The motor of the first gear train is mounted on bearing housing while the motor of the second gear train is mounted on the base. Each gear train is adapted to restrain the worm gear against rotation as the worm of the other gear train advances with respect to the worm gear in order to rotate the bearing housing.

**ACTUATOR MECHANISM** Patent

William C. Stange, inventor (to NASA) Issued 6 Jun 1978
(NASA-Case-GSC-11883-2 US-Patent-4,092,874,

An actuator mechanism is described having a frame with a rotatable shaft supported in the frame, a positioning mechanism coupled to the shaft for rotating the shaft in two rotary positions, disposed approximately 180 degrees apart, and a pair of plungers coupled to the shaft. Each plunger is responsive to a control signal for applying bi-directional rotation to the shaft.

**BELT FOR COUPLING DRIVEN MEMBERS** Patent Application

Hossein Bahiman, inventor (to NASA) Filed 22 Aug 1978 10 p
NASA

An invention is offered which relates to drive belts for coupling driving and driven members where the belts cannot be easily replaced. Such belts should be sufficiently flexible to conform to the curvature of the driving and driven members, sufficiently immune to stretching to thereby prevent slippage and sufficiently immune to degradation when subjected to harsh environmental conditions to insure long life of the belt. This invention has potential application in all types of spacecraft using belt drive systems and in environments such as mining and other hazardous situations where belt replacement would be difficult if not impossible.
A FLOTTING NUT RETENTION SYSTEM Patent Application

The nut was secured to an innerretainer plate with the nut aperture being aligned with the inner retainer plate opening. An outer retainer base plate with an opening was placed adjacent to the surface of the inner retainer in such a way that it floats and forms a bearing surface for the inner retainer plate. The radial flow prevents misalignment in high torque applications.

A BELT FOR TRANSMITTING POWER FROM A DRIVING MEMBER TO A DRIVEN MEMBER Patent Application

A belt for transmitting power from one wheel sprocket to another is described for use in spacecraft permanently encased equipment, equipment used in tunnel and mine shafts, and sealed machines. The belt has flexible teeth spaced along the direction of its travel. Each of the teeth has a longitudinal axis transverse to the direction of belt travel. The belt also includes mextensible fasts spaced transversely to the direction of the belt travel. The fasts extend in the direction of belt travel adjacent to the teeth and are looped around preselected numbers of the teeth.

A SPRAY COATING APPARATUS HAVING A ROTATABLE WORKPIECE HOLDER Patent Application

A spray coating apparatus is described for rotating a workpiece relative to a spray station to obtain a uniform coating of the workpiece. The apparatus for rotating the workpiece includes a base support with a rotatable stage for rotation in the horizontal plane and a rotatable stage for rotation in a second plane inclined at an angle to the horizontal plane. The workpiece is rotatable in both of two planes of rotation. The workpiece support is detachable from the first rotatable stage and the workpiece is readily detachable from the workpiece support to facilitate off loading of the spray coated workpiece. The workpiece holder includes a spray guard extending around the periphery of the workpiece to shield that surface of the workpiece where no coating is desired. The two degrees of freedom provided in the rotation of the workpiece relative to the spray station permits the various facets of the ceramic tile to be sequentially rotated into an orthogonal relationship to the spray station for uniform coating.

AN ANTENNA DEPLOYMENT MECHANISM Patent Application

A mechanism is described for the powered deployment of an antenna mast on a spacecraft or the like and for caging or latching the mast in a retracted position. A redundant drive rotates a drum to reel in a cable for deploying a multi-section telescoping antenna mast. The drum is releasably coupled through a fork device for the ratchet serving to lock the antenna mast in a deployed position. A redundant drive rotates a drum to reel in a cable for deploying a multi-section telescoping antenna mast. The drum is releasably coupled through a fork device for the ratchet serving to lock the antenna mast in a deployed position. A rigid terminal tube for the cable drives the mast section toward its deployed position through engagement with tunnel slots in the latch components. The caging mechanism releases and engages automatically by cam action.

NASA
TELESCOPING COLUMNS Patent Application

John T Mazur, inventor (to NASA) (Harris Corp., Melbourne, Fla.) Filed 29 Sep 1978 16 p Sponsored by NASA (Contract NAS1-13943)

A power operated telescoping column is described for the deployment and retraction of a large parabolic antenna for space applications. The column consists of several axially elongated rigid structural sections nested within one another. The outermost and each intermediate section includes several rotatable screws extended longitudinally. Sprockets, rigidly attached to the screws and interconnected by a chain, provide simultaneous rotation of the screws of a single section. Threaded legs are attached at the base end of the section and are oriented to engage the screws of the next outer section. The column is extended and retracted by selectively rotating the screws of the sections with a motor and engagement mechanism. As the screws of one section are rotated, the next inner section is extended or retracted.

43 EARTH RESOURCES

N78-22436* National Aeronautics and Space Administration Goddard Space Flight Center Greenbelt Md
DISTRIBUTED SWITCH DICKE RADIOMETER Patent Application


A radiometer was designed with an array of transducers which simultaneously feed a number of processing channels that are periodically connected to be responsive to noise sources at a predetermined noise temperature. The noise sources are utilized to control the gain of the processing channels to enable each processing channel to derive an output that is an accurate replica of the amplitude and phase of the radiometric signal supplied to it. The array of antenna elements or subapertures transduces electromagnetic energy from a terrestrial or atmospheric region being monitored into electric signals. Output signals from each channel are combined in a beam former that derives one or more signals that are replicas of the radiant energy from subregions of the total region being monitored. The signals derived from the beam former are amplitude detected to derive the required information.
N78-33511*# National Aeronautics and Space Administration
Langley Research Center, Hampton, Va
RADAR TARGET REMOTELY SENSING HYDROLOGICAL
PHENOMENA Patent Application
Wilford E. Sivertson Jr., inventor (to NASA) Filed 22 Sep
1978 18 p
NTIS HC A02/MF A01 CSCL 08H
Apparatus for remotely measuring and accessing water status
at selected locations on the surface of the earth is disclosed A
radar target whose radar cross-section varies as a function of
the height of the water level within the target is described
The target consists essentially of a right circular cylinder with
its central axis perpendicular to the ground level, a flat circular
plate symmetrically attached to the lower end of the cylinder
and parallel to the ground level surface, and a catch basin including
said circular cylinder and said circular plate for catching and
retaining water. The circular cylinder and the flat circular plate
are made from a material (electrical conductor) that reflects radar
signals such as aluminum, copper and stainless steel. The
brightness of the image taken by a radar from a satellite or an
airplane decreases as the level of the water increases. The level
of water in a radar target is indicative of the water status at
the location of that particular radar target. NASA

N78-22468*# National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va
KINE-PAK A SELF-CONTAINED, ELECTRICAL POWER
GENERATOR SYSTEM Patent Application
David C. Grana and Richard T. Wilem, inventors (to NASA) Filed 3
Mar 1978 9 p
NTIS HC A02/MF A01 CSCL 10A
A self contained electrical generator which is powered by
random environmental movement such as wave action is
described. The self contained generator is used in a buoy, or
other devices, to generate electrical power to operate test
equipment or weather observation equipment and eliminate or
reduce the replacement rate of batteries. The generator is
comprised of a rotor, a stator, a helical spring, and a housing

N78-22470*# National Aeronautics and Space Administration
Pasadena Office, Calif
DOUBLE-SIDED SOLAR CELL PACKAGE Patent Applica-
tion
Benjamin Shelpuk, inventor (to NASA) (JPL) Filed 29 Mar
1978 17 p
(Contract NAS7-100) (NASA-Case-NPO-14199-1, NASA-Case-NPO-14200-1,
US-Patent-Appl-SN-891243) Avail NTIS HC A02/MF A01
CSCL 10A
A solar cell array for terrestrial use is described. The solar
cell package consists of a double sided photovoltaic cell having
a metallized P contact and N contact provided on opposite faces
of the cell, a transparent tubular body forming a transparent
enclosure for the cell, a supporting pedestal formed of conductive
metallic material electrically connected with the cell, and a reflector
having a surface disposed in substantially opposed relation with

43 EARTH RESOURCES

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

The rotor is rotated relative to the stator and electrical current
is generated as the armature winding cuts the lines of magnetic
force. The current is supplied to batteries or instruments. NASA
A high efficiency flywheel type energy storage device which comprises an electronically commutated d.c. motor/generator unit having a massive flywheel rotor magnetically suspended around a ring shaped stator is presented. During periods of low energy demand, the storage devices were operated as a motor and the flywheel motor was brought up to operating speed. Energy was drawn from the device functioning as a generator as the flywheel rotor rotated during high energy demand periods.

Official Gazette of the U.S. Patent Office

Low cost polycrystalline silicon solar cells supported on substrates were prepared by depositing successive layers of polycrystalline silicon containing appropriate dopants over supporting substrates of a member selected from the group consisting of metallurgical grade polycrystalline silicon, graphite and steel coated with a diffusion barrier of silica borosilicate phosphosilicate, or mixtures thereof such that p-n junction devices were formed which effectively convert solar energy to electrical energy. To improve the conversion efficiency of the polycrystalline silicon solar cells the crystallite size in the silicon was substantially increased by melting and solidifying a base layer of polycrystalline silicon before depositing the layers which form the p-n junction.

Official Gazette of the U.S. Patent Office
N78-25527* National Aeronautics and Space Administration
Lewis Research Center Cleveland Ohio
SOLAR CELL COLLECTOR Patent
John C Evans Jr inventor (to NASA) Issued 4 Apr 1978
5 p Filed 22 Feb 1977 Supersedes N77-17564 (15 - 08, p 1052)
(NASA-Case-LEW-12552.1 US-Patent-4 082 569
Patent Office CSCL 10A.
A method is provided for the fabrication of a photovoltaic
device which possesses an efficient collector system for the
conduction of the current generated by incident photons to the
external circuitry of the device
Official Gazette of the U S Patent Office

N78-25525* National Aeronautics and Space Administration
Lewis Research Center Cleveland Ohio
METHOD FOR PRODUCING SOLAR ENERGY PANELS BY
AUTOMATION Patent
John C Evans Jr inventor (to NASA) Issued 18 Apr 1978
11 p Filed 25 Apr 1977 Supersedes N77-22615 (15 - 13,
p 1744)
(NASA-Case-LEW-12541-1, US-Patent-4 084 985
US Patent Office CSCL 10A
A solar cell panel was fabricated by photoetching a pattern
of collector grid systems with appropriate interconnections and
bus bar tabs into a glass or plastic sheet These regions were
then filled with a first, thin conductive metal film followed by a
layer of a mixed metal oxide, such as InAsO or InSnO The
multiplicity of solar cells were bonded between the protective
sheet at the sites of the collector grid systems and a back
electrode substrate by conductive metal filled epoxy to complete
the fabrication of an integrated solar panel
Official Gazette of the U S Patent Office

N78-25530* National Aeronautics and Space Administration
Lewis Research Center Cleveland Ohio
INORGANIC-ORGANIC SEPARATORS FOR ALKALINE
BATTERIES Patent
Dean W Sheibley inventor (to NASA) Issued 18 Apr 1978
4 p Filed 7 Sep 1976 Supersedes N76-31674 (14 - 22,
p 2890)
(NASA-Case-LEW-12649-1 US-Patent-4 085 241
Patent Office CSCL 10C
A flexible separator is reported for use between the electrodes
of Ni-Cd and Ni-Zn batteries using alkaline electrolytes The
separator was made by coating a porous substrate with a battery
separator composition The coating material included a rubber-
based resin copolymer a plasticizer and inorganic and organic
fillers which comprised 55% by volume or less of the coating
as finally dried One or more of the filler materials whether
organic or inorganic is preferably active with the alkaline
electrolyte to produce pores in the separator coating The
plasticizer was an organic material which is hydrolyzed by the
alkaline electrolyte to improve conductivity of the separator
coating
Official Gazette of the U S Patent Office

N78-25531* National Aeronautics and Space Administration
Marshall Space Flight Center Huntsville Ala
METHOD AND APPARATUS FOR CONDITIONING OF
NICKEL-Cadmium BATTERIES Patent
Robert E Kapustka inventor (to NASA) Issued 11 Apr 1978
5 p Filed 24 Nov 1976 Supersedes N77-12511 (15 - 03,
p 0353)
(NASA-Case-MFS-23270.1 US-Patent-4 084 124
Patent Office CSCL 10C
A method and apparatus are described for reconditioning
batteries utilizing a dc-dc converter During a discharge of the
batteries, each cell is monitored by the converter. When the voltage of a cell decreases to a predetermined level a converter will assume the load of this cell and inhibit the voltage from reaching zero thereby preventing voltage reversal of that cell.

Official Gazette of the U.S. Patent Office

44 ENERGY PRODUCTION AND CONVERSION

from an independent source to rebalance the anode and cathode fluids in a REDOX system.

N78-25553* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

SOLAR CELL SYSTEM HAVING ALTERNATING CURRENT OUTPUT Patent Application
J. C. Evans Jr., inventor (to NASA) Filed 9 Jun 1978 11 p
NTIS HC AO2/MF A01 C5C1 10A

A P-N junction solar cell modified by fabricating an integrated circuit inverter on the back of the cell to produce a device capable of generating an alternating current output was developed in another embodiment, integrated circuit power conditioning electronics is incorporated in a module containing a solar cell power supply.

NASA

N78-25555* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

CESIUM THERMIonic CONVERTERS HAVING IMPROVED ELECTRODES Patent Application
James F. Morris, inventor (to NASA) Filed 1 May 1978 9 p
NTIS HC AO2/MF A01 C5C1 10A

A high electric-power output thermionic converter is reported that uses a combination of lanthanum hexaboride emitter and collector electrodes in a cesium medium. The interaction between the lanthanum hexaboride electrodes and cesium vapor which is adsorbed on the lanthanum hexaboride electrodes results in lower emitter and collector work functions to produce a thermionic converter with high current density and voltage output. The lanthanum hexaboride emitter and collector electrodes employed in the cesium thermionic converter can be either in the monocrystalline or polycrystalline state.

NASA

N78-25554* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

ELECTROCHEMICAL CELL FOR REBALANCING REDOX FLOW SYSTEM Patent Application
Lawrence H. Thaller, inventor (to NASA) Filed 9 Jun 1978 12 p
NTIS HC AO2/MF A01 C5C1 10A

Electricity producing cells which utilize reduction and oxidation of anode and cathode fluids are called REDOX cells. The fluids were aqueous solutions of HCI each including a different metal chloride salt and were separated by a membrane which was permeable to certain ions. A provision of a rebalancing cell is provided which utilized gas from undesirable side reactions and/or gases from undesirable side reactions and/or pressure gas from undesirable side reactions and/or pressure gas.

NASA

N78-25556* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio

IMPROVED BACK WALL CELL Patent Application
Henry W. Brandhorst Jr., inventor (to NASA) Filed 24 Apr 1978 13 p
NTIS HC AO2/MF A01 C5C1 10A

Back-wall solar cells are described that consist of a first material of one conductivity type with one face more heavily doped to form a field region to receive radiant energy. A layer of opposite conductivity or a metallic layer forming a Schottky barrier was applied to the opposite face. A grid pattern was used to provide electrical contact to the cell. Separation of the cell from the radiant energy was applied to the region of the heavily doped material for electrical contact.
either the p-n junction or the Schottky diode junction provided for efficient collection of light.

N78-25557*# National Aeronautics and Space Administration
Marshall Space Flight Center Huntsville, Ala
STAINLESS STEEL PANEL FOR SELECTIVE ABSORPTION OF SOLAR ENERGY AND THE METHOD OF PRODUCING SAID PANEL Patent Application
Marion L Roberts Max H Sharpe and Albert C Krupnick inventors (to NASA) Filed 30 May 1978 23 p
(NASA-Case-MFS-23518-3 US-Patent-Appl-SN-910793) Avail NTIS HC A02/MF A01 CSCL 10A
A composite panel is reported that contains a coated metal substrate which absorbs solar energy selectively. The panel consisted either of an aluminum substrate with zinc and nickel layers and an outer coating of nickel oxide or a copper substrate with nickel and nickel oxide layers.

N78-25558*# National Aeronautics and Space Administration
Lewis Research Center Cleveland, Ohio
METHOD FOR FABRICATING SOLAR CELLS HAVING INTEGRAL COLLECTOR GRIDS Patent Application
John C Evans Jr inventor (to NASA) Filed 23 Dec 1977 17 p
(NASA-Case-LEW-12819-2 US-Patent-Appl-SN-863770) Avail NTIS HC A02/MF A01 CSCL 10A
A photovoltaic device was designed which possesses an integral mixed metal oxide coating in which is embedded a metallic network which functions as an efficient collector for electrons set in motion by the photovoltaic process. The metal grid system is formed from the metal elements of the transparent conductive mixed metal oxide coating which is in contact with the oxide coating which constitutes the barrier of the devices with the semiconductor substrate.

N78-25560*# National Aeronautics and Space Administration
Pasadena Office, Calif
A SOLAR ARRAY STRIP AND A METHOD FOR FORMING THE SAME Patent Application
Robert L Mueller (JPL) and Robert K Yasui inventors (to NASA) (JPL) Filed 29 Mar 1978 15 p
(Contract NAS7-100) (NASA-Case-NPO-13652-3 US-Patent-Appl-SN-891358) Avail NTIS HC A02/MF A01 CSCL 10A
A method is provided for forming a flexible solar array strip adapted for storage in a helically wound roll. The method is applicable to automated production techniques where a continuous solar arrays strip may be used economically in converting solar flux to electrical energy.
A solar energy panel support is described upon which silicon cells are arrayed. The cells are wafer thin and of two geometrical types: both of the same area and electrical rating, namely, hexagon cells and hourglass cells. The hourglass cells are composites of half hexagons. A near perfect nesting relationship of the cells achieves a high density packing whereby optimum energy production per panel area is achieved.

An improved solar cell system is reported that utilizes control circuits to switch some of its cells so that they can be either in series or in shunt within the array to match the load for maximum power transfer. Automatic control is provided by a sensor solar cell mounted into the configurable array; its open circuit voltage multiplied by a constant is equal to cell voltage at maximum power point.

The invention relates to a photovoltaic module and more particularly to a photovoltaic module adapted to accommodate passage of solar radiation whereby substantially all energy not used by the cells to produce electricity exits the module. The module includes a planar support panel formed of glass highly pervious to solar radiation, a plurality of contiguously related solar cells of substantially circular configurations, each cell of the plurality being characterized by a silicon wafer having a surface layer defining a P-N junction near one face of the cell, a transparent adhesive bonding each cell of the array to the support panel, a plurality of electrical interconnects connecting the cells in series and electrical leads for connecting the module in an electrical circuit.

An improved solar cell and a method of forming the same is characterized by a semiconductor silicon wafer to P-type material having diffused therein a shallow N-type region. A sintered silver contact affixed to the surface of the N-type region is formulated from silver powder blended with silver metaphosphate for establishing beneath the contact a zone of increased carrier concentration and an aluminum or silver/aluminum alloy contact affixed to the wafer at the outer surface thereof opposite the N-type region. The instant invention provides an improved solar cell characterized by an improved contact affixed to the N-type region thereof which serves to establish a zone of increased carrier concentration without excessive metallization penetration whereby conductivity is enhanced without sacrificing efficiency.

An improved solar cell and method of forming the same is characterized by a semiconductor silicon wafer to P-type material having diffused therein a shallow N-type region. A sintered silver contact affixed to the surface of the N-type region is formulated from silver powder blended with silver metaphosphate for establishing beneath the contact a zone of increased carrier concentration and an aluminum or silver/aluminum alloy contact affixed to the wafer at the outer surface thereof opposite the N-type region. The instant invention provides an improved solar cell characterized by an improved contact affixed to the N-type region thereof which serves to establish a zone of increased carrier concentration without excessive metallization penetration whereby conductivity is enhanced without sacrificing efficiency.

RF beam center location method and apparatus for power transmission system.

The invention relates to a method and apparatus for determining the location of a power transmission beam. The method includes the steps of: emitting a low powered signal from a transmitting antenna; determining the location of the signal; and adjusting the position of the transmitting antenna to bring it into alignment with the power transmission beam.
The receiving element in wireless power transmission systems intercepts the greatest possible portion of the transmitted energy beam. Summing the output energy of all receivers in a planar array makes it possible to determine the location of the center of energy of the incident beam on a receiving array of antenna elements so that the incident beam is in the microwave region.

**44 ENERGY PRODUCTION AND CONVERSION**

**N78-28625**

**National Aeronautics and Space Administration**

**Pasadena Office, Calif**

**DRIVER FOR SOLAR CELL I-V CHARACTERISTIC PLOTS**

**Patent Application**

Gary B. Turner, inventor (to NASA) (JPL) Filed 26 Jul 1978 15 p

(Contract NAS7-100)

(NASA-Case-NPO-14096-1 US-Patent-Appl-SN-928128) Avail NTIS HC A02/MF A01 CSCL 10A

An apparatus for the evaluation of the current versus voltage (I-V) parameter of solar cells is described. The apparatus can be used in laboratory research and production quality control. An I-V graph for a solar cell produced with the driver was illustrated in such a way that the solar cell is driven from a short circuit condition to an open circuit condition. A load line moves to a position A-B through the origin and the approximate center of the knee in the curve, and from there to the final position A'-B'. The rate that the load line moves is constant so that the recording rate from B to B is approximately the same as from B to A'.

**Official Gazette of the U.S. Patent Office**

**N78-31826**

**National Aeronautics and Space Administration**

**Pasadena Office, Calif**

**SOLAR POND**

**Patent**

Charles G. Miller (JPL) and James B. Stephens, inventors (to NASA) (JPL) Issued 30 May 1978 9 p Filed 30 Jun 1977


Shallow pools of liquid to collect low-temperature solar generated thermal energy are described. Narrow elongated trenches, grouped together over a wide area, are lined with a heat-absorbing black liner. The heat-absorbing liquid is kept separate from the thermal energy removing fluid by means such as clear polyethylene material. The covering for the pond may be a fluid or solid. If the covering is a fluid, fire fighting foam continuously generated, or silos are used to keep the surface covering clean and insulated. If the thermal energy removing fluid is a gas a fluid insulation layer contained in a flat polyethylene tubing is used to cover the pond. The side of the tube directed towards the sun is treated to block out ultraviolet radiation and trap in infrared radiation.

**Official Gazette of the U.S. Patent Office**
A solar energy collector system characterized by an improved concentrator for directing incident rays of solar energy on parallel vacuum-jacketed receivers or absorbers is described. Numerous individually mounted reflector modules of a common asymmetrical triangular cross-sectional configuration are supported for independent reorientation. Asymmetric vee-trough concentrators are defined.

A method for chloromolysis of coal is an organic solvent at a moderate temperature and atmospheric pressure has been proven to be effective in removing sulfur particularly the organic sulfur from coal. Chlorine gas is bubbled through a slurry of moist coal in chlorinated solvent. The chlorinated coal is separated, hydrolyzed, and the dechlorinated. Preliminary results of treating a high sulfur (4.77% S) bituminous coal show that up to 70% organic sulfur, 90% inorganic sulfur and 76% total sulfur can be removed. The treated coal is dechlorinated by heating at 500°C. The presence of moisture helps to remove organic sulfur.

A gas turbine powered aircraft auxiliary power system is described which is capable of efficiently supplying all aircraft auxiliary services both in flight and on the ground and is further capable of operating independently of the aircraft main engines. The system employs multiple gas turbine compressor stages, thereby accomplishing cabin pressurization, ventilation and heating.

A floating energy converter is described which uses large volumes of sea water to produce electrical power. In this plant a fluid working medium is pumped to an evaporator where it is heated by a flow of warm surface sea water. The fluid in liquid form boils to a pressurized gas vapor which is routed to drive a turbine that in turn drives a generator for producing electricity. The gas vapor then enters a condenser immersed in cold sea water pumped from lower depths condenses to its original liquid form and then pumped to the evaporator to repeat the cycle. Modular components can be readily interchanged on the ocean thermal unit and inlet pipes for the sea water are provided with means for maintaining the pipes in alignment with the oncoming current. The modular construction allows for the testing of various components to provide a more rapid optimization of a standardized plant.
A hydrogen-oxygen fueled internal combustion engine is described, which utilizes an inert gas such as argon, as a working fluid to increase the efficiency of the engine, eliminate pollution, and facilitate operation of a closed cycle energy system. In a system where sunlight or other intermittent energy source is available to separate hydrogen and oxygen from water, the oxygen and inert gas are taken into a diesel engine into which hydrogen is injected and ignited. The exhaust is cooled so that it contains only water and the inert gas. The inert gas in the exhaust is returned to the engine for use with fresh oxygen while the water in the exhaust is returned to the intermittent energy source for reconversion to hydrogen and oxygen.

The methods and apparatus for automatically and continuously making quantitative determinations of the bacteria present in water samples such as waste water, effluent or fresh water are presented. A bacteria adenosine triphosphate was used to determine the number of live bacteria present and the iron porphyrin assay to determine the total number of bacteria alive and dead present in the sample.
A method for determining the characteristics and amount of microscopic contaminants lodged on a photographed surface was investigated. An image enhanced full color photographic negative and print were taken of the contaminated surface. Three black and white prints were developed subsequently from red, green, and blue separation filter overlays of the color negative. Both the color and three monochromatic prints were then scanned to extract in digital form a profile of any contaminant possibly existing on the surface. The resulting profiles were electronically analyzed and compared with data already stored relating to the known contaminants.

Methods and apparatus are presented for automatically and rapidly performing electrical, chemical, and biological assays for continuous monitoring water quality at a water treatment plant to ascertain the effectiveness of the treatment during the process flow. The invention is transportable in order that a single system may be utilized to service a number of separate or remote wastewater processing facilities.

Method and apparatus are presented for automatically making periodic quantitative determinations of coliform organisms present in water such as waste water effluent or fresh water by using electrochemical techniques based on detection of metabolic hydrogen liberated by the coliform organisms utilizing changes in electrode potentials.
LIFE SCIENCES (GENERAL)

51 TREAD DRUM FOR ANIMALS Patent
Wayne H Howard inventor (to NASA) Issued 9 May 1978
7 p Filed 31 May 1976 Supersedes N76 20485 (14 - 11 p 1394)
(NASA-Case-ARC-10917-1 US-Patent-4 088 094
US Patent Office CSCL 06B

A device for exercising animals such as primates is described which includes a cylindrical housing mounted for rotation about a horizontal axis of revolution and has a cylindrical treadmill portion on which the animal treads while the drum is rotated by means of a motorized drive. The treadmill portion of the drum includes an electrode structure with sectors being independently energizable by means of a commutator and source of potential so that an electrical shock station is created behind a running-in-place station on the moving treadmill. In this manner if the animal should fall behind its running-in-place station it may be shocked by treading on the energized electrode structure.

Official Gazette of the U.S. Patent Office

AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation, and weightlessness

52 BAG FOR STORING WHOLE BLOOD Patent Application
Herman Bank (JPL) and Edward L. Cleland, inventors (to NASA) (JPL) Filed 26 Jun 1976 10 p
(Contract NAS7-100)

The shelf life of stored whole blood may be doubled by adding a buffer which maintains a desired pH level. However this buffer causes CO2 to be generated which, if not removed at a controlled rate will shorten the life of the stored blood. A blood storage container was provided which will permit the CO2 to diffuse into the atmosphere, at a controlled rate thereby maintaining the desired pH value while providing a bag strong enough to permit handling.

COUPLING APPARATUS FOR ULTRASONIC MEDICAL DIAGNOSTIC SYSTEM Patent Application
Robert E. Frazer, inventor (to NASA) (JPL) Filed 15 Nov 1976 10 p
(Contract NAS7-100)

An apparatus is provided for ensuring sonic coupling between transducers and a tissue to be ultrasonically diagnosed, without requiring the tissue to be immersed in a fluid or to be directly contacted by the transducers. The apparatus allows transducers to be moved relative to the tissue being scanned by utilizing a cavity with solid walls to receive the tissue, and by utilizing a vacuum to draw the tissue into intimate contact with the cavity walls.
**PROCESS FOR MANUFACTURING CANNULA** Patent Application
Howard F. Broyles (JPL), Edward F. Cuddihy (JPL), and Jovan Moacanin inventors (to NASA) (JPL) Filed 11 Jul 1977
11 p
Sponsored by NASA
(NASA-Case-NPO-14073-1 US-Patent-Appl-SN-814384) Avail NTIS HC A02/MF A01 CSCL 06B

Manufacturing of a T-shaped cannula is described. The tube was formed of dip-molded materials so that the opposite ends of the cross of the T taper to the smallest diameter. The process included dipping a tapered mandrel into dip-molding material and later removing the coating from the mandrel by dipping it into a swelling fluid which is absorbed by the coating material. A stub with a small diameter was inserted into the short end of the swelled coating as the swelling agent evaporated; the short end of the coating shrank tightly around the stub to form a leak-tight seal.

**OPTICAL PROBE** Patent Application
Robert E. Frazer inventor (to NASA) (JPL) Filed 6 Mar 1978
11 p
Sponsored by NASA
(NASA-Case-NPO-14247-1 US-Patent-Appl-SN-883383) Avail NTIS HC A02/MF A01 CSCL 06B

A rectal probe which provides a view to the side of the probe end instead of just a straight-ahead view is disclosed. The probe includes a ring-shaped window and a reflective coating on a lens located near the window. The reflective coating directs light passing through the window towards the eye piece end of the probe. The probe includes a fiber optic bundle. The reflective coating and lenses focus the light onto the end of the fiber optic bundle. Another set of lenses focuses light from in front of the probe onto the center of the fiber optic bundle.

**URINE COLLECTION DEVICE** Patent Application
Roger B. Michaud inventor (to NASA) (Martin Marietta Corp Denver Colo.) Filed 30 May 1978
27 p
Contract NAS9-14796)
(NASA-Case-MSC-16433-1 US-Patent-Appl-SN-910992) Avail NTIS HC A03/MF A01 CSCL 06B

The invention relates to a urine collection device particularly adapted to the female anatomy. The device is designed for use primarily by incontinent women but also has application in those circumstances which preclude access to normal bathroom facilities for example where the woman is bed-ridden or in an occupation which demands long periods at a duty station or in protective clothing (pilots or astronauts). The device successfully overcomes many of the problems associated with present devices such as absorbent garments (akin to diapers or sanitary napkins) external receptacles strapped to the body and catheters which problems usually include leakage, urine contact with the body, discomfort, infection interference with freedom of movement and limitations on choice of clothing.

**MICRO-FLUID EXCHANGE COUPLING APPARATUS** Patent Application
John E. Johnson (San Francisco Univ. Calif.) and Paul F. Swartz inventor (to NASA). Filed 16 Oct 1978
13 p
(NASA-Case-ARC-11114-1 US-Patent-Appl-SN-951422) Avail NTIS HC A02/MF A01 CSCL 06B

In a microfluid exchange apparatus for exchanging fluid with an organ, such as the trachea or a blood vessel of a small animal, a syringe needle is provided for penetrating the fluid conduit of the animal. The syringe needle is coupled to a plenum chamber having an inlet and outlet port. The plenum chamber is coupled to the syringe needle via the intermediary of a standard quick disconnect coupling fitting. The plenum chamber is carried at the end of a drive rod which is coupled to a micrometer drive head. The micrometer drive head is slidably and pivotably coupled to a pedestal for adjusting the height and angle of inclination of the needle relative to a reference base support. The needle is positioned adjacent to the incised trachea or a blood vessel of a small animal and the micrometer drive head is operated for penetrating the fluid conduit of the animal.

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53 AEROSPACE MEDICINE
54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering, biotechnology, and space suits and protective clothing.

N78-22720# National Aeronautics and Space Administration
Ames Research Center Moffett Field, Calif
SWEAT COLLECTION CAPSULE Patent Application
John E Greenleaf and Robert W Delaplaine inventors (to NASA)
Filed 19 Apr 1978 10 p

A sweat collection capsule permitting quantitative collection of sweat is described. The capsule was comprised of a frame held immobile on the skin, a closure secured to the frame and absorbent material located next to the skin in a cavity formed by the frame and the closure. The absorbent materials was removed from the device by removing the closure from the frame while the frame was held immobile on the skin.

N78-22721# National Aeronautics and Space Administration
John F Kennedy Space Center Cocoa Beach, Fla
A PROSTHESIS COUPLING Patent Application
Vert Mooney (Rancho Los Amigos Hospital Rehabilitation Center Downey Calif.), James B Reswick (Rancho Los Amigos Hospital Rehabilitation Center Downey, Calif.), Charles W Bright, and Lester J Owens inventors (to NASA)
Filed 9 Feb 1978 11 p

A coupling for use in apparatus for connecting a prosthesis to a bone of a stump of an amputated limb is presented. The apparatus includes a tubular female socket having an open lower end and adapted to be inserted within the intermedullary cavity of the bone. A biocompatible sleeve provides an interface between the socket and the skin below the opening in the socket. A lock pin is carried by the prosthesis and has a stem portion adapted to be coaxially disposed and slideably within the tubular female socket for securing the prosthesis to the stump. The coupling is constructed of resilient material with one end thereof being attached to the socket and the other end thereof being attached by any suitable material to the biocompatible sleeve.

N78-30821# National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va
A SEAT CUSHION TO PROVIDE REALISTIC ACCELERATION CUES FOR AIRCRAFT SIMULATOR PILOTS Patent Application
Billy R Ashworth inventor (to NASA)
Filed 26 Jul 1978 10 p

A seat cushion for providing realistic acceleration cues to aircraft simulator pilots is presented. The novel feature of the invention appears to lie in the simulation of the events that happen in a seat cushion during actual flight to impact acceleration cues to the pilot. Also the novel controller has the ability to control the air pressure with sufficient response time and smoothness to adequately drive the seat cushion. Prior controllers were unable to adequately do this.

N78-31735# National Aeronautics and Space Administration
Ames Research Center, Moffett Field Calif
SPACESUIT MOBILITY JOINTS Patent
Hubert C Vykukal inventor (to NASA)
Superseded N77-15641 (15 - 06 p 0789)
Issued 30 May 1978 22 p

Joints for use in interconnecting adjacent segments of a hermetically sealed spacesuit which have low torques, low leakage and a high degree of reliability are described. Each of the joints is a special purpose joint characterized by substantially constant volume and low torque characteristics. Linkages which restrain the joint from longitudinal distension and a flexible, substantially impermeable diaphragm of tubular configuration spanning the distance between pivotally supported annuli are featured. The diaphragms of selected joints include rolling convolutions for balancing the joints, while various joints include wedge-shaped sections which enhance the range of motion for the joints.

Official Gazette of the U.S. Patent Office
54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

N78-31738* National Aeronautics and Space Administration
Ames Research Center, Moffett Field Calif
SPACESUIT TORSO CLOSURE Patent
Bruce W. Webbon and Hubert C. Vykukal, inventors (to NASA)
A simple economical and reliable entry closure is described for joining opposite halves of a torso section for a pressure suit in a manner which simplifies self-donning. A single coupling joins coaxially aligned, axially separable tubular segments of a hard spacesuit along an angulated zone of separation, adapted to be mated in an hermetically sealing relation. A releasable C section clamp secures the members in their mated relationship.

Official Gazette of the U S Patent Office

N78-32720* National Aeronautics and Space Administration
Lyndon B. Johnson Space Center Houston Tex
CONDITION SENSOR SYSTEM AND METHOD Patent
The condition sensor system comprises a condition detector which produces a pulse when a parameter of the monitored condition exceeds a desired threshold. A resettable condition counter counts each pulse. A resettable timer is preset to produce a particular time frame. The counter produces a condition signal when the accumulated number of pulses within the time frame is equal to or greater than a preset count. Control means responsive to the incoming pulses and to the condition signal control output signals that control utilization devices. After a suitable delay the last detected pulse simultaneously resets the pulse counter and the timer and prepares them for sensing another condition occurrence within the same time frame. The invention has particular utility in the process of detecting rocking motions of blind people. A controlled audible bio-feedback signal is provided which constitutes a warning to the blind person that he is rocking.

Official Gazette of the U S Patent Office

N78-32721* National Aeronautics and Space Administration
Washington, D C
COOLING SYSTEM FOR REMOVING METABOLIC HEAT FROM AN HERMETICALLY SEALED SPACESUIT Patent
Bruce W. Webbon, Hubert C. Vykukal and Bill A. Williams inventors (to NASA) Issued 20 Jul 1978 8 p Filed 23 Dec 1976 Supersedes N77-14743 (15 - 05 p 0681)
(NASA-Case-ARC-11059-1, US-Patent-4,095,593
An improved cooling and ventilating system is described for removing metabolic heat waste gases and water vapor generated by a wearer of an hermetically sealed spacesuit. The cooling system was characterized by a body suit having a first circuit for simultaneously establishing a cooling flow of water through the thorax and head sections of the body suit. Circulation patches were included mounted in the thorax section and head section of the body suit. A second circuit for discharging the flow of gas throughout the spacesuit and a disconnect unit for coupling the circuits with a life support system externally related to the spacesuit were provided.

Official Gazette of the U S Patent Office

N78-32724* National Aeronautics and Space Administration
Marshall Space Flight Center Huntsville Ala
PNEUMATIC INFLATABLE END EFFECTOR Patent Application
Keith H. Clark and James D. Johnston inventors (to NASA)
22 Sep 1978 11 p
(NASA-Case-MFS-23696-1, US-Patent-Appl-SN-945044) Avail NTIS HC A02/MF A01 CSCL 05H
An invention is presented which relates to an end effector for use on the end of a remotely controlled manipulator arm of a robot or teleoperator device. The end effector grasps an object by being inflated after insertion into an open area of the object. Novelty of the invention is believed to reside in the use of a balloon-type inflatable end member for a remote manipulator and in the inflatable and reinforced sections of the balloon.

Official Gazette of the U S Patent Office
71 ACOUSTICS

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

The ultrasonic angular frequency, equal to the conductivity frequency where the conductivity frequency is the conductivity divided by the dielectric permittivity. When connected in a receiver circuit one of the electrodes of the transducer is placed as a reference for the electronics and the other electrode is connected through amplifier means to a signal processing system. An external backing material matched to the acoustic impedance of the crystal is attached to one electrode.

N78-22859*# National Aeronautics and Space Administration Pasadena Office, Calif

ACOUSTIC DRIVING OF ROTOR Patent Application
Hilda Kanber (JPL), Isadore Rudnick (JPL), and Taylor G Wang inventors (to NASA) (JPL) Filed 5 Jul 1977 9 p
(Contract NAS7-100)
NTIS HC A02/MF A01 CSCL 20A

The object of the invention is to provide a system for utilizing sound to rotate a suspended object, with large and controlled torque. An enclosure of square cross-section is utilized together with transducers at walls which are at right angles to each other. A circuit drives the transducers at the same frequency but at a constant phase difference such as 90 deg. This causes rotation of air molecules and therefore rotation of a shaft which extends through the enclosure, as a first order effect. The torque or speed of rotation are controlled by controlling the intensity at which the transducers are driven. The major novel feature of this invention is the driving of two transducers on orthogonal walls of an enclosure of square cross-section, at the same frequency but at a constant phase difference, to produce torque as a first order effect.

N78-29871*# National Aeronautics and Space Administration Langley Research Center Langley Station, Va

A PHASE INSENSITIVE ULTRASONIC TRANSDUCER Patent Application
Joseph S Heyman inventor (to NASA) Filed 26 Jul 1978 16 p
NTIS HC A02/MF A01 CSCL 20A

An ultrasonic transducer that is phase insensitive includes a cadmium sulfide crystal with two electrodes attached. The crystal is annealed for a period of time and at a temperature to provide substantially maximum acoustic attenuation at the operating frequency of the transducer. This is done by making

N78-24906*# National Aeronautics and Space Administration Pasadena Office, Calif

NEGATIVE ION SOURCE Patent Application
Raymond Goldstein (JPL) and James E Graf inventors (to NASA) (JPL) Filed 28 Apr 1978 15 p
(Contract NAS7-100)
NTIS HC A02/MF A01 CSCL 20H

This invention relates to an improved negative ion source and more particularly to a system including said ionizer in combination with dissociator separator and neutralizing means for providing an energetic neutral beam for a controlled thermonuclear reactor (CTR). The negative ion source is in accordance with this invention includes a porous ionizer material configured such that the neutral source gas flows through it rather than impinging on it. The material can be configured as a porous plug rolled foil or bundle of wires. The material is in the form of a high work function material such as nickel, tungsten, or tantalum coated with a film of low work function material such as CsO BaO/SrO. By using such a configuration an increased portion of the source gas such as deuterium is ionized while the negatively excited deuterium ion beam is better collimated and has a higher current density. A complete system employing
73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles, and reactor theory

For space radiation see 93 Space Radiation

N78-29913* National Aeronautics and Space Administration Pasadena Office Calif
CONTROL FOR NUCLEAR THERMIC POWER SOURCE Patent

N78-32890* National Aeronautics and Space Administration Pasadena Office Calif
MULTISPECTRAL IMAGING AND ANALYSIS SYSTEM Patent Application
Alexander F H Goetz (JPL) and Frederick P Landauer, Jr, inventors (to NASA) (JPL) Filed 5 Mar 1976 15 p (Contract NAS7-100) (NASA-Case-NPO-13691-1 US-Patent-Appl-SN-664091) Avail NTIS HC A02/MF A01 CSCL 20F The invention concerns a system for collecting and processing in real time incident spectral reflectance data while the system is airborne The novelty of the present invention appears to reside in the capability of having spectral reflectance data collected and analyzed in real time aboard an airborne craft Such capability is not only more economical from the standpoint of data processing but further, and perhaps more importantly, eliminates the common delay of several months between collection of the data and analysis thereof Hence, the subject invention permits data analysis to be timely as well as prompt The importance of such capability is exemplified by the potential use of the invention for detecting oil spills or algal growth wherein prompt analysis
of the spectral reflectance data permits quick identification and a solution to be promptly implemented.

N78-22891*| National Aeronautics and Space Administration
Pasadena Office, Calif
VELOCITY SERVO FOR CONTINUOUS SCAN FOURIER INTERFERENCE SPECTROMETER Patent Application
Rudolf A. Schmider inventor (to NASA) (JPL) Filed 24 Feb 1978 12 p
(Contract NAS7-100)
NTIS HC AO2/MF AO1 CSCL 20F
The invention relates to interferometers utilizing double-pass retroreflectors and more particularly to an improvement in a continuous scan interferometer using an open-loop lead-screw drive system. The novelty of the invention resides in the arrangement for driving the lead screw in an open loop and in providing reference fringe detection for the purpose of producing a compensation signal for any deviation of the actual scan rate from a desired scan rate.

An edge having a sharpness of less than 2 and preferably about 0.3 micron can be formed on a wedge shaped piece of optical material in a relatively short period of time without breaking the edge, peeling the optical material away from the edge or forming an uneven edge. The technique described involves placing the optical device in a holding mechanism and grinding one surface until it is so-planar with the surface of the holding mechanism. The surfaces of both the optical device and the holding mechanism are then polished with felt until the optical surface adjacent to the holder has an edge of sharpness of less than 2 micron. Optical materials formed in this manner will be used as beam splitters in the ultraviolet spectropolarimeter to be flown on the Solar Maximum Mission.

Light from a source is imaged by a lens onto a surface so that the energy from the source is concentrated into a spot. As the spot across the surface is scanned the surface moves relative to the point of perfect focus. When the surface moves away from perfect focus the spot increases in size, while the total energy in the spot remains virtually constant. The lens then reimages the light reflected by the surface onto two detectors through two different sized apertures. The light energy going to the two detectors is separated by a beam splitter. This second path of the light energy through the lens further defocuses the spot but as a result of the different sizes of the apertures in each light detector path the amount of defocus for each is different. The ratio of the outputs of the two detectors which are indicative of the contour of the surface is obtained by a divider.
A low temperature plasma polymerization process is described for applying an optical plastic substrate such as a polymethyl methacrylate lens with a single layer abrasive resistant coating to improve the durability of the plastic.
High vacuum cleaning of contaminated surfaces such as hydrocarbon contamination films can be accomplished by a plasma cleaning device which includes a plasma discharge housing to permit generation of a plasma in an environment having a higher pressure than the surface which is to be cleaned. A ground electrode and a radio frequency electrode partially surround a quartz plasma tube for the introduction of an ionizable gas. These electrodes ionize the gas and help generate the plasma. This plasma flows through a non-constrictive aperture through the plasma discharge housing and then on to the contaminated surface.

Official Gazette of the U.S. Patent Office

An improved apparatus for examining the crystal lattice of a semiconductor wafer utilizing X-ray diffraction techniques was presented. The apparatus is employed in a method which includes the step of recording the image of a wafer supported in a bent configuration conforming to a compound curve, produced through the use of a vacuum chuck provided for an X-ray camera. The entire surface thereof is illuminated simultaneously by a beam of incident X-rays which are projected from a distant point-source and satisfy conditions of the Bragg Law for all points on the surface of the wafer.

Official Gazette of the U.S. Patent Office

An invention is presented that is directed to controlling the orientation of anomalies such as twinning defects in crystal silicon ribbon for use in fabricating solar cells on a commercial basis. The novelty of the invention resides in the use of a starting seed crystal having a specific (110) crystallographic plane and <112> crystallographic direction determinate by conventional X-ray diffraction techniques in order that anomalies occur parallel to the length of the ribbon. Without such seed crystal, anomalies occur randomly and in an uncontrolled manner and as much as five feet of ribbon crystal may be grown before the anomalies stabilize in the preferred orientation.

Official Gazette of the U.S. Patent Office
A method of growing a ribbon crystal particularly suited for facilitating automated control of ribbon width. Patent Application

Theodore F. Ciszek, inventor (to NASA) [IBM Hopewell Junction, N.Y.] Filed 28 Apr 1978 18 p

(Contracts NAS7-100, JPL-841A4)

NTIS HC A02/MF A01 CSCL 20L

A method of growing a ribbon crystal is reported wherein a meniscus of molten semiconductor material attached to vertical movable seed is lifted at a rate substantially equal to the rate at which the meniscus freezes. The method is characterized by the steps of continuously sensing the brightness of the growth region of the ribbon in selected areas across the width for detecting changes in brightness intensity. Modifying the temperature of the meniscus and the pulling speed in response to changes detected in the intensity controls ribbon geometry.

NASA
This bibliography is issued in two sections: Section 1 - Abstracts, and Section 2 - Indexes. This issue of the Abstract Section cites 213 patents and applications for patent introduced into the NASA scientific and technical information system during the period of July 1978 through December 1978. 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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EUROPEAN

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<td>NASA SP–7041</td>
<td>EARTH RESOURCES</td>
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<td>Remote sensing of earth resources by aircraft and spacecraft</td>
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<td>NASA SP–7043</td>
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<td>Energy sources, solar energy, energy conversion, transport, and storage</td>
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<td>Program, contract, and personnel management, and management techniques</td>
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