NASA PATENT ABSTRACTS BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

JANUARY 1979

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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This bibliography was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Informatics Information Systems Company
Annotated references to NASA-owned inventions covered by US 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 used 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
TYPICAL CITATION AND ABSTRACT

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<td>(NASA-Case-FRC-10113-1)</td>
<td>The invention is embodied in a device including (1) a DC circuit having a pair of terminal plugs each plug being characterized by a first second and third terminal (2) a pair of manually operable switches for connecting the first terminal of each of the plugs 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 and (6) a second pair of manually operable switches for selectively connecting the third terminal of each plug of the pair 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.</td>
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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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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 exclusive license.
1245.207 Application for nonexclusive license.
1245.208 Processing applications for license.
1245.209 Royalties and fees.
1245.210 Reports.
1245.211 Revocation of licenses.
1245.212 Appeals.
1245.213 Litigation.
1245.214 Address of communications.

Authority The provisions of this Subpart 2 issued under 42 USC 2457, 2473(b) (3).

§ 1245.200 Scope of subpart.

This Subpart 2 prescribes the terms, conditions, and procedures for licensing inventions covered by U.S. 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 patent or patent application for which the Administrator of the National Aeronautics and Space Administration 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 manufacturer 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 as 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 expeditious 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 considerable 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 in the shortest time possible. Although NASA encourages the nonexclusive licensing of its inventions to provide the widest possible utilization, the commercial development of certain inventions calls for a substantial capital investment. Consequently, manufacturers may be unwilling to risk under a nonexclusive license. It is the policy of NASA to seek exclusive licenses when substantial protection is needed to 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 data and will consider the need for further technical and market development of the invention, the capabilities of prospective licensees, their plans to undertake the required investment and development, the impact on competitors, and the benefits of the license to the Government and the public. Preference for exclusive license shall be given to U.S. 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 applications from minorities and to 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. No license shall be expressly or by implication, for a NASA invention except as provided in § 1245.203 and 1245.204 and in any or future treaties or agreements between the United States and any foreign government.

(e) Licenses for inventions covered by NASA-owned foreign patents and patent applications shall be granted in accordance with the NASA Foreign Patent Licensing Regulations (§ 1245.4).

§ 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.

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

(5) 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.

(c) 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 by the Patent Counsel of the NASA installation having cognizance of the invention.

(d) Exclusive licenses. (1) A limited exclusive license may be granted on an invention available for such licensing provided that:

(i) The Administrator has determined that (a) The invention has not been brought to practical application by a knowledgeable licensee 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 furnishing of the invention by the Government or under a nonexclusive license requested by any applicant pursuant to this subpart, and (c) a limited exclusive license will provide the necessary incentive to the licensee to achieve the practical application of the invention; and

(ii) Either a notice pursuant to...
§ 1245.205 listing the invention as available for licensing has been published in the Federal Register at least 9 months prior to the date on which 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 shall include the inventor's business to which the invention pertains.

(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, subsequently, 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 responsibly applicant(s) on terms that are consistent with the terms of the license granted by the Administrator, taking into consideration the current royalty rates under similar patents and other agreements that have been or may be negotiated.

(a) In consideration of the settlement of an interference;
(b) In consideration of a release of a claim of infringement;
(c) In exchange for or as part of the consideration for a license under adversely held patent(s).

§ 1245.205 Publication of NASA inventions applications.

(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.

§ 1245.206 Application for exclusive license.

(a) Submission of application. An application for exclusive license under § 1245.203(b) or a short-form exclusive license for special inventions under § 1245.203(c) shall be addressed to the NASA Patent Counsel of the NASA installation having cognizance over the NASA invention for which a license is desired or to the NASA Assistant General Counsel for Patent Matters.

(b) Contents of an application for exclusive license. An application for exclusive license shall include:

(1) Identification of invention for which license is desired, including the geographical location where the applicant plans to manufacture or use, in the case of a process, the invention; and

(2) A statement indicating the minimum term of years the applicant desires to be licensed.

(c) Contents of an application for a short-form exclusive license. An application for a short-form exclusive license under § 1245.203(c) for a special invention shall include:

(1) Identification of invention for which license is desired, including the NASA patent case number, patent application serial number or patent number, title and date, if known.

(2) Name and address of company or organization applying for license, and

(3) Name and address of representative of applicant to whom correspondence should be sent.

§ 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 one of the following categories:
   (1) Small business firm;
   (2) Minority business enterprise;
   (3) Location in a surplus labor area;
   (4) Location in a low-income urban area; and
   (5) 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, and 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 interest of the United States of America for the Administrator to grant an exclusive license rather than a nonexclusive li-
cense and that such an exclusive license should be granted to the applicant.

§ 1245.208 Processing applications for licenses.

(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 Recommendations having command for the invention and the NASA Assistant General Counsel for Patent Matters, to determine the conformity and appropriateness of the application to the particular circumstances and the availability of the specific invention for the license requested. The Assistant General Counsel, based upon the facts, will forward all applications for license conforming to § 1245.206(b) and 1245.207(b) to the NASA Inventions and Contributions Board when the application is available for consideration of the requested license. Prior to forwarding applications for exclusive licenses to the Board, the Assistant General Counsel shall, in writing, give each nonexclusive licensee the specific invention with a 30-day period for submitting either oral or written application of the invention has occurred or is about to occur, or an application for an exclusive license for the invention.

(b) Recommendations of Inventions and Contributions Board. The Inventions and Contributions Board shall, in accordance with the basic considerations set forth in §§ 1245.202 and 1245.203, evaluate all applications for license forwarded by the Assistant General Counsel for Patent Matters 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 (1) whether a nonexclusive or exclusive license should be granted, (2) the identification and contributions of the applicant for the proposed license, and a statement of any covenant, or agreement contained in, and the availability of the specific invention for the license requested. The Administrator shall review the record of proceedings, any cause, there will be furnished to the license a written notice of intention to revoke the license, and the license will be revoked within 30 days after the written notice, or if the Administrator determines to grant the exclusive license as recommended by the Board if the Administrator determines to grant the exclusive license, the license 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 such 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 of §§ 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 its efforts to work the invention. The reports shall contain information within its knowledge, or which he may acquire under normal business practice, pertaining to the commercial use that is being made of the invention by the licensee together, indicate that it is in the public interest to do so.

§ 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 as determined by the Administrator. Any license for the license of, or if the licensee at any time shall default in making any report required by the license, or shall make any false report, or shall commit any breach of any covenant or agreement therein contained, and shall fail to remedy any such default, false report, or breach within 30 days after written notice thereof, the Administrator may exercise under such invention, in accordance with § 1245.206(b), in which the Administrator determines to grant the exclusive license to the Board or any other court of competent jurisdiction to have been fraudulent, capricious, or arbitrary, or so grossly erroneous as necessary to imply bad faith, or not supported by substantial evidence.

§ 1245.213 Litigation.

An exclusive license shall be granted the right to sue at his own expense any person who infringes the rights set forth in his license and covered by the licensed patent. The licensee may join the Government in any suit against a party who is a party to this agreement in any such suit, but without expense to the Government and the licensee shall pay costs and expenses reasonable in all such suits.
selected NASA inventions are also available for licensing in countries other than the United States in accordance with the NASA Foreign Patent Licensing Regulation (14 C.F.R. 1245.4), a copy of which is available from any NASA Patent Counsel. For abstracts of NASA-owned inventions available for licensing in countries other than the United States, see NASA SP-7038, "Significant NASA Inventions Available for Licensing in Countries Other Than the United States." A copy of this NASA publication is available from NASA Headquarters, Code GP-4, Washington, D.C. 20546.
# 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

### 01 AERONAUTICS (GENERAL) N.A.

### 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) 4

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, astronavigation, 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 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
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) 9
Includes biochemistry and organic chemistry

24 COMPOSITE MATERIALS 10
Includes laminates

25 INORGANIC AND PHYSICAL CHEMISTRY 12
Includes chemical analysis, e.g., chromatography, combustion theory, electrochemistry, and photochemistry
For related information see also 77 Thermodynamics and Statistical Physics

26 METALLIC MATERIALS 15
Includes physical chemical, and mechanical properties of metals, e.g., corrosion, and metallurgy

27 NONMETALLIC MATERIALS 16
Includes physical chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials

28 PROPELLANTS AND FUELS 19
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) 20
Includes vacuum technology, control engineering, display engineering, and cryogenics

32 COMMUNICATIONS 21
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 24
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

34 FLUID MECHANICS AND HEAT TRANSFER 28
Includes boundary layers, hydrodynamics, fluids, mass transfer, and ablation cooling
For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics

35 INSTRUMENTATION AND PHOTOGRAPHY 29
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 33
Includes parametric amplifiers

37 MECHANICAL ENGINEERING 34
Includes auxiliary systems (non-power), machine elements and processes, and mechanical equipment

38 QUALITY ASSURANCE AND RELIABILITY 41
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, hydropower, 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

Section 2 • Indexes

SUBJECT INDEX
INVENTOR INDEX
SOURCE INDEX
NUMBER INDEX
ACCESSION NUMBER INDEX

xv
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.

03 AIR TRANSPORTATION AND SAFETY
Includes passenger and cargo air transport operations and aircraft accidents.
For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.

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
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.

N78-25070* National Aeronautics and Space Administration
Lyndon B. Johnson Space Center Houston Tex
HIGH VISIBILITY AIR SEA RESCUE PANEL Patent Application
Jack Naamer and Matthew I. Radnofsky inventors (to NASA) Filed 16 Dec 1977 10 p
(NASA-Case-MSC-12564-2 US-Patent-Appl-SN-861389) Avail 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.
05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

N78-32086* National Aeronautics and Space Administration
Langley Research Center Hampton Va
SUPersonic TRANSPORT Patent
Paul Coe Jr inventor (to NASA) Issued 6 Jun 1978 7 p
Filed 27 Aug 1976 Supersedes N78 31719 (14 22 p 2826)
(NASA Case-LAR-11932-1 US-Patent-4,093,156
US-Patent-Class-244-46 US-Patent Class 244 218) Avail
US Patent Office CSCL 01C

An aircraft of supersonic transport configuration is described, featuring thrust vectoring in conjunction with wing apex segments' used as canard surfaces during takeoff landing and low-speed flight. The angle of incidence of the wing apex segments, when the segments were functioning as canard surfaces, was variable with respect to the aircraft angle of attack. The wing apex segments furthermore formed a portion of the main wing panel swept leading edge when not functioning as canard surfaces. The combination of thrust vectoring and deployable wing apex segments resulted in increased aircraft range and improved low speed longitudinal stability while providing acceptable takeoff length capabilities. Official Gazette of the U S Patent Office

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.

N78-25089* National Aeronautics and Space Administration
Lewis Research Center, Cleveland, Ohio
GAS TURBINE ENGINE WITH RECIRCULATING BLEED Patent
(NASA Case-LEW-12452-1 US-Patent-4,083,181

Carbon monoxide and unburned hydrocarbon emissions in a gas turbine engine are reduced by bleeding hot air from the engine cycle and introducing it back into the engine upstream of the bleed location and upstream of the combustor inlet. As this hot inlet air is recycled the combustor inlet temperature rises rapidly at a constant engine thrust level. In most combustors this will reduce carbon monoxide and unburned hydrocarbon emissions significantly. The preferred locations for hot air extraction are at the compressor discharge or from within the turbine whereas the preferred reentry location is at the compressor inlet. Official Gazette of the U S Patent Office

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.

N78-25088* National Aeronautics and Space Administration
Hugh L Dryden Flight Research Center Edwards, Calif.
AIR SPEED AND ATTITUDE PROBE Patent Application
Merle A Economu inventor (to NASA) Filed 30 May 1978 13 p
NTIS HC AQ2/MF A01 CSCL 01D

A probe was designed which can be mounted on a data boom and extended in parallel with the longitudinal axis of symmetry of an aircraft to provide local air speed and aircraft attitude intelligence. The probe employs both static pressure and total pressure transducers mounted in a tubular body supported for wind induced angular displacement about an axis normally related to the longitudinal axis of the aircraft. NASA
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 from 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.

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.
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. Dems (GE, Cincinnati) and Stephen W. Beekman inventors (to NASA) (GE, Cincinnati)

Issued 27 Jun 1978, 7 p Filed 22 Mar 1976 Sponsered by NASA


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

N78-31239 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. Daieda, inventors (to NASA) (Rockwell Intern Corp., Downey, Calif.)

Issued 30 May 1978, 6 p Filed 11 Feb 1977 Supersedes N77-19077 (15-10, p 1226) Sponsored by NASA


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

Charles C. Rupp and Ralph R. Kissel inventors (to NASA) 11 Apr 1978 6 p Filed 8 Nov 1976 Supersedes N77-11079 (15-02 p 0154)

(NASA-Case-MFS-23564-1 US-Patent-4 083 520
US-Patent-Class-244-161) Avail US Patent Office CSCL 228

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 rate of change of the length of the line and certain constants which vary depending upon the mode of operation deployment retrieval or station keeping.

**N78-25120**

National Aeronautics and Space Administration
Langley Research Center, Hampton Va

* SMALL AIR BREATHING LAUNCH VEHICLE Patent

Liam R. Jackson, William J. Small, John P. Weidner and James A. Martin inventors (to NASA) 30 May 1978 13 p

(NASA-Case-LAR-12250-1 US-Patent-App1-SN-910794) Avail NTIS HC A02/MF A01 CSCL 228

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...
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.

N78-32168* National Aeronautics and Space Administration Langley Research Center Hampton, Va

HYPERSONIC AIRBREATHING MISSILE Patent Application
James L. Hunt, Pierce L. Lawing, and Don C. Marcum Jr inventors (to NASA) Filed 18 Sep 1978 21 p
NTIS HC A02/MF A01 CSCL 16D

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
Henry C. Hoffman and James H. Donohue, inventors (to NASA) Filed 19 Apr 1978 30 p
NTIS HC A03/MF A01 CSCL 22B

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.

N78-23141* National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md

ACTIVE NUTATION CONTROLLER Patent Application
Henry C. Hoffman and James H. Donohue, inventors (to NASA) Filed 19 Apr 1978 30 p
NTIS HC A03/MF A01 CSCL 22B

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.

N78-23141* National Aeronautics and Space Administration Goddard Space Flight Center, Greenbelt, Md

ACTIVE NUTATION CONTROLLER Patent Application
Henry C. Hoffman and James H. Donohue, inventors (to NASA) Filed 19 Apr 1978 30 p
NTIS HC A03/MF A01 CSCL 22B

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 reduces 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.
MOLDED COMPOSITE PYROGEN IGNITER FOR ROCKET MOTORS Patent
Wilbur C Heier and Melvin H Lucy, inventors (to NASA) Issued 28 Mar 1978 10 p Filed 20 Apr 1976 Supersedes N76-29365

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 O-ring seals and leakproof rotary joint.

N78-27178** National Aeronautics and Space Administration
Marshall Space Flight Center Huntsville, Ala
PASSIVE PROPELLANT SYSTEM Patent Application
Donald A Hess (McDonnell Douglas Astronautics Co St Louis Mo), William W Regnier (McDonnell Douglas Astronautics Mo), and Virgil L Jacobs inventors (to NASA) Filed 11 Jul 1978 16 p Sponsored by NASA

The system utilizes a spherical tank structure A separated into two equal volume compartments by a flat bulkhead B. 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

N78-32179 National Aeronautics and Space Administration Pasadena Office Calif
SOLID PROPELLANT MOTOR Patent
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
(NASA-Case-NPO-11458A US-Patent-4 116 131

A case bonded end burning solid propellant rocket motor is described. A propellant with sufficiently low modulus to avoid chamber buckling on cooling from cure and sufficiently high elongation to sustain the stresses induced without cracking is used. The propellant is zone cured within the motor case at high pressures equal to or approaching the pressure at which the motor will operate during combustion. A solid propellant motor with a burning time long enough that its spacecraft would be limited to a maximum acceleration of less than 1 g is provided by one version of the case bonded end burning solid propellant motor of the invention.

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

N78-22155 National Aeronautics and Space Administration Ames Research Center Moffett Field Calif
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

The 1,1,1-traryl 2,2,2-trifluoro ethanes, in which the aryl radicals carry one or more substituents were prepared by condensing trifluoro acetonophenones with substituted aromatic compounds in the presence of catalytic quantities of trifluoro methyl sulfonic acid. The reaction can be carried out under reflux in toluene or for strikingly better results in certain cases, reactants are simply stirred at room temperature for about 24 to 48 hours.
PARTIAL INTERLAMINAR SEPARATION SYSTEM FOR
thin perforated polyester foil disposed between each adjacent
laminae of a composite structure having improved physical property
characteristics. An exemplary composite body was shown 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 of the materials which make up the composite
Although a composite when it is subjected to one or more thermal cycles
reduce the thermal stress produced by unequal expansion of
outer layers, and cause the loss of strength properties of the
composite material. This provides for the control of stresses that
would otherwise unbind the constituents, cause peeling of the
outer layers, and cause the loss of strength properties of the
composite when it is subjected to one or more thermal cycles

An interlamellar separation system for composites is described
where a thin layer of a perforated foil film is interposed between
adjacent laminae of a composite formed from prepreg tapes to
permit laminae adherence through the perforations and produce
a composite structure having improved physical property
characteristics. An exemplary composite body was shown formed
of a plurality of layers of graphite/epoxy tape with a layer of
thin perforated polyester foil disposed between each adjacent
two layers of the prepreg tape. When this layup is cured, the
prepreg epoxy flows through the perforations in foil layer to
effect positive bonding of the prepreg layers. Although the epoxy
does not adhere readily to the polyester separator sheets, the
bonding occurring through the perforations ensures an adequate
lamination for the entire assembly.

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

According to the method of the invention discontinuities are
positively introduced into the interface between layers so as to
reduce the thermal stress produced by unequal expansion of
the materials which make up the composite. Although a plurality of discrete elements could be used to form one of the
layers and thus carry out this purpose, the discontinuities are
preferably produced by simply drilling holes in the metallic matrix
layer or by forming grooves in a grid pattern in this layer. The
apparent novel feature of the invention is the use of geometrical
considerations to introduce discontinuities in the matrix of a
composite material. This provides for the control of stresses that
would otherwise unbind the constituents, cause peeling of the
outer layers, and cause the loss of strength properties of the
composite when it is subjected to one or more thermal cycles.
over a cooled metal roller or by some other means where no electrically conductive path is provided between opposing sides of the dielectric.

N78-25138* National Aeronautics and Space Administration Lyndon B Johnson Space Center, Houston, Tex.

CERAMIC FIBER INSULATING MATERIAL AND METHOD OF PRODUCING SAME Patent Application
Ruey Y Lin (Carborundum Co, Niagara Falls, N.Y.) and Edward A Strunk (inventors to NASA) (Carborundum Co, Niagara Falls, N.Y.) Filed 11 Jun 1978 29 p (Contract NAS9-13641)

A Lightweight thermal/acoustical insulation foam based on Fiberfrax alumina-silica ceramic fibers was developed for general insulation applications. The foam, which is lightweight and has good integrity and resiliency, 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.

INTUMESCENTABLATOR COATINGS USING ENDOThERIC FILLERS Patent

An intumescent-ablator coating composition which contains the ammonium salt of 1,4-nitroaniline-2-sulfonic acid or 4,4-dinitrosulfanilamide 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 FLYWHEEL Patent Application

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 the 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.
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 flexibility in fully cured sheets are avoided and application to complex surfaces is facilitated. Improved ablation performance lower density and higher strength are also obtained.
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

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 rubber. Preferred ion transport materials include a salt or a chloride anion of a phosphonium tertiary ammonium or quaternary ammonium cation, a metal oxide, and a silicate or boric acid. NASA
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,
07D

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. The novelty appears to reside in formulations that
can be incorporated in formed polyurethane without adversely
affecting the characteristics thereof.

ON-SITE AMMONIA PLANT Patent Application
Wu Yi-Chien inventor (to NASA) (JPL) Filed 30 Jun 1978
19 p (Contract NAS7-100)
NTIS HC A02/MF A01 CSCL 07D

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.

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

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 improve-
ment in crew safety. The innovation is a series of formulations
based on flame resistant elastomeric binders a thermally stable
(e i.e. to 150 C) source of bromine, metal oxide catalysts/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 the thin elastomeric coating remains on the
surface. Alternatively the foam can be saturated with the liquid
dispersant squeezed to remove excess liquid, and then dried.
This latter procedure yields a foam that is uniformly treated
throughout.
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 and U.S. can be passed over hot iron filings 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
NTIS HC A02/MF A01 CSCL 11F

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 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.

**N78-24333**
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

Fully annealed aluminum sheet is first stretch formed to the complex doubly compound shape of a previously prepared forming die e.g., an ejection seat blowout panel of a shuttlecraft. The part is then marked with a series of grid lines for monitoring later elongation. Thereafter it is solution heat treated and refrigerated to retard hardening. While still soft it is stretched a second time on the same die to induce a modicum of work hardening after which it is aged to the desired stress corrosion resistant temper, preferably the T6 level, to provide the desired hardness and stress corrosion resistance.

**N78-27256**
National Aeronautics and Space Administration
Pasadena Office, Calif

A METHOD OF PREPURIFYING METALLURGICAL GRADE SILICON EMPLOYING REDUCED PRESSURE ATMOSPHERIC CONTROL Patent Application
(Contracts NAS7-100 JPL-95442)
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 and 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.

**N78-27256**
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 Application
Pasupati Sadhukhan (Occidental Res Corp La Verne Calif) and Alexis Bell inventors (to NASA) (Calif Univ, Berkeley) Issued 13 Jun 1978 6 p Filed 19 Jan 1977 Supersedes N77 17178

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 at pressures of about 0.75 to 1.00 torr. Potassium hydroxide to glow discharge sustained in oxygen under the pressure of about 0.75 to 1.00 torr.

US-Patent-Class-423-583

N78-32230* National Aeronautics and Space Administration Langley Research Center Langley Station Va

CRYSTALLINE POLYMIDES Patent Application
Terry L StClair and Anne K StClair inventors (to NASA) Filed 16 May 1978 8 p

A process for preparing higher oxides of the alkali and alkaline earth metals by subjecting the hydroxide of the alkali and alkaline earth metal to a radio frequency discharge sustained in oxygen at pressures of about 0.75 to 1.00 torr.

N78-24360* National Aeronautics and Space Administration

PROCESS FOR CURING EPOXIDES WITH DIAMINES Patent Application
Kazimiera Paciorek inventor (to NASA) (Ultraseals, Inc Irvine Calif) Filed 19 May 1978 34 p

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

HEAT RESISTANT POLYMERS OF OXIDIZED STYRYL-PHOSPHINE Patent Application
Wayne M Phillips inventor (to NASA) (JPL) Filed 19 May 1978 32 p

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

HEAT RESISTANT POLYMERS OF OXIDIZED STYRYL-PHOSPHINE Patent Application
Kazimiera Paciorek inventor (to NASA (Ultraseals, Inc Irvine Calif) Filed 19 May 1978 35 p

N78-25218* National Aeronautics and Space Administration

HIGH TEMPERATURE RESISTANT CERMET AND CERAMIC COMPOSITIONS Patent Application
Wayne M Phillips inventor (to NASA (JPL) Filed 8 Dec 1977 28 p

27 NONMETALLIC MATERIALS

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

N78-22239* National Aeronautics and Space Administration Langley Research Center, Langley Station Va

PROCESS FOR Curing EPOXIDES WITH DIAMINES Patent Application
Terry L StClair and Vernon L Bell, inventors (to NASA) Filed 29 Mar 1978 10 p

Aromatic crystalline polyimides were disclosed that were synthesized from polyamide 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 polyimides.

N78-22240* National Aeronautics and Space Administration

PARTICLES OF HIGH TEMPERATURE RESISTANT METAL OR METAL ALLOY Process for Preparing
Pasupati Sadhukhan (Occidental Res Corp La Verne Calif) and Alexis Bell inventors (to NASA) (Calif Univ, Berkeley) Issued 13 Jun 1978 6 p

A process for preparing particles of high temperature resistant metal or metal alloy by mixing ceramic components applied to a substrate and hot pressed and sintered at temperatures ranging from 1700 to 2000 C at pressures of 1000 to 10000 for a period of 10 to 60 minutes. A ceramic solid solution which was achieved.

N78-22241* National Aeronautics and Space Administration

PARTICLES OF HIGH TEMPERATURE RESISTANT METAL OR METAL ALLOY Process for Preparing
Pasupati Sadhukhan (Occidental Res Corp La Verne Calif) and Alexis Bell inventors (to NASA) (Calif Univ, Berkeley) Issued 13 Jun 1978 6 p

A process for preparing particles of high temperature resistant metal or metal alloy by mixing ceramic components applied to a substrate and hot pressed and sintered at temperatures ranging from 1700 to 2000 C at pressures of 1000 to 10000 for a period of 10 to 60 minutes. A ceramic solid solution which was achieved.

N78-22242* National Aeronautics and Space Administration

PARTICLES OF HIGH TEMPERATURE RESISTANT METAL OR METAL ALLOY Process for Preparing
Pasupati Sadhukhan (Occidental Res Corp La Verne Calif) and Alexis Bell inventors (to NASA) (Calif Univ, Berkeley) Issued 13 Jun 1978 6 p

A process for preparing particles of high temperature resistant metal or metal alloy by mixing ceramic components applied to a substrate and hot pressed and sintered at temperatures ranging from 1700 to 2000 C at pressures of 1000 to 10000 for a period of 10 to 60 minutes. A ceramic solid solution which was achieved.
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**

**HIGH TEMPERATURE RESISTANT CERMET AND CERAMIC COMPOSITIONS Patent Application**


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.

**N78-27276**

**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 chelated ion or chelate, e.g., Co(acacen) which is N,N-ethylenebis(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**

**POLYMERIC FOAMS FROM CROSS-LINKABLE POLY-NARYLENEBENZIMIDAZOLES Patent**


Foamed cross-linked poly-N-arlylenbenzimidazoles 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.

Official Gazette of the U.S. Patent Office
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.

The invention relates to reaction cured glass and glass coatings prepared by reacting a compound selected from the group consisting of silicon tetrabonded silicon hexabonded 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).

Homopolymers copolymers and terpolymers of a styrene based monomer are prepared by polymerizing at least one oxidized styrylphosphine monomer or by polymerizing p-diphenylphosphystyrene 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.
PROCESS FOR PREPARING THERMOPLASTIC AROMATIC POLYMIDES Patent
(NASA-Case-LAR-11828-1 US-Patent-4094862)
US Patent Office CSCL 11G

A method of preparing insoluble thermoplastic aromatic polyamides 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

PROCESS FOR SPINNING FLAME RETARDANT ELASTOMERIC COMPOSITIONS Patent

Flame retardant elastomeric compositions comprised of either spandex type polyurethane having halogen containing polyols incorporated into the polymer chain conventional spandex type polyurethanes in physical admixture with flame retardant additives or fluoroelastomeric resins in physical admixture with flame retardant additives were developed. Methods are described for preparing fibers of the 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

THERMOPLASTIC RUBBER COMPRISING ETHYLENE-VINYL ACETATE COPOLYMER, ASPHALT AND FLUXING OIL Patent
US Patent Office CSCL 11G

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 30 percent fluxing oil and between about 35 percent and about 70 percent of a copolymer of polyethylene and vinyl acetate.

Official Gazette of the U.S. Patent Office

SURFACTANT-ASSISTED LIQUEFACTION OF PARTICULATE CARBONACEOUS SUBSTANCES Patent Application
NTIS HS A02/MF A01 CSCL 21D

Enhanced and improved quality yields are achieved in coal liquefaction by adding to the coal slurry in solvent a small amount of an oil soluble organic surfactant capable of dispersing the asphaltene particles. The liquefaction system described includes a slurring means having a stirrer in which is formed a slurry of surfactant particulate coal or other carbonaceous substance and solvent. The slurry is converted in the liquefaction reactor under the influence of heat and high pressure hydrogen to a gaseous hydrocarbon product and to a product slurry which is then separated into a light and heavy oil product solvent and coal.

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

Nitramine propellants 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-App1-SN-897832) Avail NTIS HC A03/MF A01 CSCL 08I

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 cut 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 conveys 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 explosive 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 coact 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
THIN CONFORMAL ANTENNA ARRAY FOR MICROWAVE POWER CONVERSIONS Patent
Richard M Dickinson inventor (to NASA) (JPL) Issued 14 Mar 1978 8 p Sponsored by NASA
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.

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 quadruphase 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

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 them 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.
Integrated Circuits Patent Application
Michael Gauthier (JPL) and A G Stanley inventors (to NASA) (JPL) Filed 30 Jun 1978 21 p
(Contract NAS7-100) (NASA-Case-NPO-14350-1 US-Patent-Appl-SN-921627) Avail NTIS HC A02/MF A01 CSCL 09C
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 and 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.

Field Effect Transistor and Method of Construction Thereof Patent
William R Fletner inventor (to NASA) Issued 9 May 1978 6 p Filed 23 Jun 1976 Supersedes N76-26394 (14 - 17 p 2181)
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.

Signal Attenuator Patent Application
John T Polhemus (Martin Marietta Aerospace, Denver, Colo) and Wilbur H Cash, inventors (to NASA) (Martin Marietta Aerospace, Denver, Colo) Filed 26 Jul 1978 10 p (Contract NAS4-2387) (NASA-Case-FRC-11012-1, US-Patent-Appl-SN-928137) Avail NTIS HC A02/MF A01 CSCL 09A
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.

Method for Analyzing Radiation Sensitivity of
Hugh L Dryden Flight Research Center, Edwards, Calif

33 Electronics and Electrical Engineering
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.

Official Gazette of the U.S. Patent Office

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

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Official Gazette of the U.S. Patent Office

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An invention is presented which relates to voltage standards wherein a precise voltage is obtained by observation of the voltage-current characteristics of a Josephson junction across which is applied a microwave signal of a precisely known frequency. The novelty of the invention lies in simplifying the structure significantly wherein a single junction is employed and a quite simple biasing system employed with it.

NASA

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Official Gazette of the U.S. Patent Office
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.

Official Gazette of the U.S. Patent Office

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

PENETRATOR NOZZLE Patent Application
Norman 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 CSCL 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 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.

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

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

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.

Official Gazette of the U.S. Patent Office
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.
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.
until the sampling unit is recovered and the samples removed for further laboratory analysis.

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

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**N78-27385** National Aeronautics and Space Administration
Pasadena Office, Calif.

**VISCOSITY MEASURING INSTRUMENT Patent Application**
Samuel P. Femstem, inventor (to NASA) Filed 23 Jun 1978

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.

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

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**N78-29421** National Aeronautics and Space Administration
Pasadena Office, Calif.

**MAGNETO-OPTIC DETECTION SYSTEM WITH NOISE CANCELLATION Patent**
George W. Lewicki (JPL) and John E. Guisinger, inventors (to NASA) (JPL) Issued 27 Nov 1973

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**

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**N78-28411** National Aeronautics and Space Administration
Pasadena Office, Calif.

**MICROCOMPUTERIZED ELECTRIC FIELD METER DIAGNOSTIC AND CALIBRATION SYSTEM Patent**
Larry D Holley and Jerry W Mason, inventors (to NASA) (Federal Electric Corp., Paramus, N. J.) Issued 9 May 1978

A computerized field meter calibration system which includes an apparatus for testing the calibration of field meters normally utilized for measuring electromagnetic field potentials is described. A reference voltage is applied to the field meter for causing signals to be produced on the output terminals thereof. A bank of relays is provided for selectively connecting output terminals of the field meter to a multiplexer by means of a digital voltmeter and an oscilloscope. A frequency-shift-keyed receiver is also connected to one of the terminals of the field meter for transmitting and converting a frequency shift keyed signal to a digital signal which is subsequently applied to the multiplexer.

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**35 INSTRUMENTATION AND PHOTOGRAPHY**

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**N78-28421** National Aeronautics and Space Administration
Pasadena Office, Calif.

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

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Pasadena Office, Calif.

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**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.

An angle detector for determining a transducer’s angular disposition to a capacitive pickup element is described. The transducer comprises a pendulum mounted inductive element moving past the capacitive pickup element. The capacitive pickup element divides the inductive element into two parts L1 and L2, which form the arms of one side of an a-c bridge. Two networks R1 and R2 having a plurality of binary weighted resistors and an equal number of digitally controlled switches for removing resistors from the networks form the arms of the other side of the a-c bridge. A binary counter controlled by a phase detector balances the bridge by adjusting the resistance of R1 and R2. The binary output of the counter is representative of the angle.

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 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 novelty 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 an apparatus for the adjustment of 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 penetration in a vacuum barrier with a simple and inexpensive mechanism.

The invention relates to an assembly of four cascaded reflected-wave masers embodied in a structure are schematically illustrated. Each maser is connected to another maser by a dielectrically loaded four-port waveguide circulator. The first and third ports are connected waveguides loaded with dielectric material, for example magnesium titanate having a dielectric constant equal to 13 in 1/4 inch wide waveguides for a signal at 0 GHz. The second port is connected to a reflected-wave maser by a matching transformer comprised of two rectangular pieces of dielectric material with a sheet of conductive material, such as indium, pressed between them. This transformer couples signal energy between the circulator and the maser, and blocks pumping energy from a source distributed to the masers by a chamber through filters each comprised of a waveguide filled with an aluminum rod. The fourth port of each circulator is connected to a waveguide filled with microwave energy absorbing material.

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 periodic changes in their cross sections leading to distributed feedback, so that from the channels in which the neon excitation takes place laser beams...
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**

A helium-nitrogen laser is described in which energy in the visible range is emitted as a result of charge transfer reaction between helium ions and nitrogen molecules. The helium and nitrogen are present in a gas mixture at several atmospheres pressure with a nitrogen partial pressure on the order of a pair of main discharge electrodes. The gas mixture is preionized to prevent arcing when the discharge pulse is applied. The preionization is achieved by the application of a high voltage across a pair of secondary electrodes which are spaced apart in a direction perpendicular to the spacing direction of the main discharge electrodes and the longitudinal axis of the space in which the gas mixture is contained. Feedback by means of a pair of appropriately spaced mirrors is provided to produce coherent energy pulses at a selected wavelength.

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

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**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**

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.
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.

A paralleled inverter system is described. In such a system, a positive feedback current derived from the total current from all of the modules of the inverter system is applied to the base drive of each of the power transistors of all modules, thereby to provide all modules protection against open or short circuit faults occurring in any of the modules, and force more equal current sharing among the modules during turn-on of the power transistors.
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-4,078,376,
US Patent Office CSCL 21A
A fuel control system is reported for automotive-type gas
 turbines and particularly advanced gas turbines utilizing variable
 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.

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 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.

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 13I
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 ins assembly located at the end of a controlled manipulator system carried by one moving vehicle. The ins assembly by means of the manipulator system encircles a probe located on the other moving vehicle whereupon the ins assembly is activated and one or more ins elements close around the probe thus capturing and axially aligning the other vehicle with the ins assembly. Additionally a rotator assembly is included for spinning the ins assembly in a manner adapted to engage the probe of a spinning vehicle. NASA

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. NASA

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. NASA
37 MECHANICAL ENGINEERING

N78-27423* National Aeronautics and Space Administration
Lyndon B Johnson Space Center, Houston, Tex

VARIABLE CONTOUR SECURING SYSTEM Patent
Paul P Zebus (Rockwell International, Downey, Calif) Poley N
Packer (Rockwell International, Downey, Calif) and Cyrus C
Haynie inventors (to NASA) (Rockwell International, Downey,
Calif) Issued 9 May 1978 8 p Filed 27 Sep 1977 Supersedes
N78-10434 (16-1, p 0064) Sponsored by NASA
(NASA-Case-MSC-16270-1 US-Patent-4088312

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.

Official Gazette of the U S Patent Office

N78-27424* National Aeronautics and Space Administration
Langley Research Center, Langley Station, Va

MAGNETIC SUSPENSION AND POINTING SYSTEM Patent
Willard W Anderson and Nelson J Groom, inventors (to NASA)
Issued 9 May 1978 5 p Filed 17 Jun 1977 Supersedes
N78-10433 (16-1, p 0064) Division of US Patent Appl
SN-662182 filed 27 Feb 1976
(NASA-Case-LAR-11889-2 US-Patent-4088018
US Patent Office CSCL 13I

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 provides coarse pointing by allowing
two rotations of the instruments relative to the carrier vehicle.
The second or vernier pointing assembly is made up of magnetc
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 in all six degree-of-freedom
isolation from carrier motion disturbances.

Official Gazette of the U S Patent Office

N78-27425* National Aeronautics and Space Administration
Ames Research Center, Moffett Field, Calif

ROTYPE LEVELING BASE PLATFORM Patent
Robert W Delaplaine and Daniel L Mossolani inventors (to NASA)
Issued 9 May 1978 5 p Filed 2 Nov 1976 Supersedes
N77-10498 (15-1, p 0069)
(NASA-Case-ARC-10989-1 US-Patent-4088291

A leveling apparatus for precise adjustment of a scientific instrument is reported. A base member is provided
having a hollow cylindrical shape. A table for supporting the
instrument rests on the base and has a shaft portion extending
below the table. The upper portion of the shaft fits tightly into
the hollow portion of the base member whereas the lower portion
of the shaft is machined to fit loosely. The lower portion of the
shaft is provided with a groove. Adjusting screws are threaded
through the hollow cylindrical portion and are adapted to enter
the groove. By adjusting the screws, the lower portion of the
shaft is moved in a vertical plane since the shaft is loosely
fitted into the cylinder. The upper portion of the shaft which is
tightly fitted into the upper end of the cylinder causes the cylinder
to deform slightly providing a fulcrum point which allows
the table to be leveled in response to the adjustment of the adjusting
screws.

Official Gazette of the U S Patent Office
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


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 alternately 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 a 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. NASA

**ACTUATOR MECHANISM** Patent


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


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.

NASA
A FLOATING NUT RETENTION SYSTEM
Patent Application

The nut was secured to an inner retainer 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 and 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 inextensible 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 spring biased latching or caging mechanism for the interior mast section includes cam operated latch bolts and cooperating interfitting latch elements mounted for relative movement in the base of mast section. A rigid terminal tube for the cable drives the mast section toward its deployed position. The mechanism also includes a cable drive that releases and engages automatically by cam action.
TELESCOPING COLUMNS Patent Application

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 orientated 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.

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

HYBRID HOLOGRAPHIC NON DESTRUCTIVE TEST SYSTEM Patent

An automatic hybrid holographic non-destructive testing (HNDT) method and system capable of detecting flaws or debonds contained within certain materials are described. The system incorporates the techniques of optical holography, acoustical/optical holography, and holographic correlation in determining the structural integrity of a test object. An automatic processing system including a detector and automatic data processor is used in conjunction with the three holographic techniques for correlating and interpreting the information supplied by the non-destructive systems. The automatic system also includes a sensor which directly translates an optical data format produced by the holographic techniques into electrical signals and then transmits this information to a digital computer for indicating the structural properties of the test object. The computer interprets the data gathered and determines whether further testing is necessary as well as the format of this new testing procedure.
43 EARTH RESOURCES

N78-33511*# National Aeronautics and Space Administration
Langley Research Center Hampton, Va
RADAR TARGET REMOTELY SENSING HYDROLOGICAL
PHENOMENA Patent Application
Wilford E Swetson 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.

N78-22469*# National Aeronautics and Space Administration
Marshall Space Flight Center Huntsville Ala
WIND WHEEL ELECTRIC POWER GENERATOR Patent
Application
John W Kaufman, inventor (to NASA) Filed 24 Feb 1978
16 p
NTIS HC A02/MF A01 CSCL 10A

An electric generator driven by the wind is described. Primary
and auxiliary funnel-type, venturi ducts are mounted upon a
housing for capturing wind currents and conducting the currents
to a bladed wheel connected to generator apparatus. Additional
air flows are also conducted onto the bladed wheel, rotating
the wheel. The auxiliary ducts are disposed at an acute angle
with respect to the longitudinal axis of the housing, and together
with the rotatability of the housing and the ducts, permits capture
of wind currents within a variable directional range.

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.

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 device, 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

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.

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-App1-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
one face of the cell for redirecting light to impinge thereon whereby the cell is subjected to incident radiation at each of the opposite faces thereof. By employing the double sided solar cell supported by a pedestal forming a path for heat and electrical currents the overall efficiency of the array was enhanced.

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
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.

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.

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.

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

LOW VOLTAGE OUTPUTS
TO CHARGER/REGULATOR

TELEMETRY
TO CHARGER/REGULATOR

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 AO1 CSCL 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.

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 AO1 CSCL 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.

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 AO1 CSCL 10A

Electricity producing cells which utilize reduction and oxidation of anode and cathode fluids are called REDOX cells. The fluids were aqueous solutions of HCl 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 from an independent source to rebalance the anode and cathode fluids in a REDOX system.

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 AO1 CSCL 10A

Back-wall solar wells 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 griddcd contact previous to the radiant energy was applied to the region of the heavily doped material for electrical contact. Separate control of
either the p-n junction or the Schottky diode junction provided for efficient collection of light.
**44 ENERGY PRODUCTION AND CONVERSION**

**N78-27515**

**National Aeronautics and Space Administration**
**Pasadena Office Calif**

**HEXAGON SOLAR POWER PANEL** Patent
Irwin Rubin inventor (to NASA) Issued 16 May 1978 5 p
Filed 28 Jul 1976
(NASA-Case-NPO-12148-1 US-Patent-4 089 705
US Patent Office CSCL 10A

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.

**47**

**N78-27520**

**National Aeronautics and Space Administration**
**Lewis Research Center Cleveland Ohio**

**SELF-RECONFIGURING SOLAR CELL SYSTEM** Patent
Application
Robert P Gruber inventor (to NASA) Filed 19 Jun 1978 18 p
NTIS HC A02/MF A01 CSCL 10A

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.

**N78-27541**

**National Aeronautics and Space Administration**
**Pasadena Office Calif**

**AN IMPROVED SOLAR CELL AND METHOD OF FORMING THE SAME** Patent Application
Kenneth R Bube inventor (to NASA) (RCA Corp. Moorestown New Jersey) Filed 30 Jun 1978 8 p
(Contract NAS7-100) Avail
NTIS HC A02/MF A01 CSCL 10A

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. It 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.

**N78-28594**

**National Aeronautics and Space Administration**
**Pasadena Office Calif**

**RF BEAM CENTER LOCATION METHOD AND APPARATUS FOR POWER TRANSMISSION SYSTEM** Patent
US Patent Office CSCL 10B
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.

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

A method of fabricating a photovoltaic module transparent to all energy not used by the cells to produce electricity was examined. The method is characterized by the steps of registering a plurality of uniformly dimensioned photovoltaic cells of circular configurations, with a plurality of circular openings formed in a planar tool for affording access to the P contact surface of each of the cells. The N contact surface of alternate cells was connected to the P contact surface of the cells interposed between, removing residue from solder flux.

N78-31826* National Aeronautics and Space Administration Pasadena Office Calif

SOLAR POND Patent

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 siphons are used to keep the surface 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% of the organic sulfur, 90% of the inorganic sulfur and 76% of the 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 is 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.
HYDROGEN-FUELED ENGINE Patent
Eugene A. Lauman (JPL) and Rollins K. Reynolds inventors (to NASA) (JPL) Issued 12 Sep 1978 6 p Filed 27 Aug 1976 Supersedes N77-11398 (15 - 02 p 0200) Sponsored by NASA

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.

METHOD AND APPARATUS FOR CONTINUOUS MEASUREMENT OF BACTERIAL CONTENT OF AQUEOUS SAMPLES Patent Application

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 adenine 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.

N78-22589# National Aeronautics and Space Administration
Lyndon B Johnson Space Center, Houston Tex
WATER QUALITY MONITORING SYSTEM Patent Application
Reuben E Taylor, Richard R Brooks (Boeing Co Houston, Tex.), Gerald D Poel (Boeing Co Houston, Tex.), Eldon L Jeffers (Boeing Co Houston Tex) and Arthur T Linton, inventors (to NASA) (Boeing Co Houston Tex) Filed 4 Apr 1978 29 p

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 AUTOMATED APPARATUS FOR DETECTING COLIFORM ORGANISMS Patent Application
Reuben E Taylor, W Preston Dill (Boeing Co, Houston, Tex), and Eldon L Jeffers, inventors (to NASA) (Boeing Co Houston Tex) Filed 4 Apr 1978 36 p

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.

FLUID SAMPLE COLLECTION AND DISTRIBUTION SYSTEM Patent Application
Richard R Brooks inventor (to NASA) (Boeing Co Houston, Tex) Filed 4 Apr 1978 21 p
(Contract NAS9-13333) (NASA-Case-MSC-16841-1 US-Patent-Appl-SN-893382) HC A02/MF A01 CSCL 06C

Methods and apparatus are presented for automatically and continuously collecting samples from any one of a plurality of sampling points filtering part of the samples collected and delivering both unfiltered and filtered samples to various analyzing sensors in order to determine the quality of the aqueous supply from which the sample is taken through various electrical chemical and biological means.
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 treadway portion on which the animal treads while the drum is rotated by means of a motorized drive. The treadway 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 treadway. 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. One end of the tread drum comprises a transparent wall for unobstructed viewing of the animal being exercised.

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 shelf 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.
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.

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 in 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.

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 is 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.

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.
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
NTIS HC A02/MF A01 CSCL 06B

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 material was removed from the device by removing the closure from the frame while the frame was held immobile on the skin. NASA

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
NTIS HC A02/MF A01 CSCL 06B

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 adapted to be inserted within the medullary cavity of the bone. A biocompatible sleeve provides an interface between the female socket and the skin directly 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 slidably 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. NASA

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 15 p
NTIS HC A02/MF A01 CSCL 04H

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. NASA

N78-31735* National Aeronautics and Space Administration
Ames Research Center, Moffett Field Calif
SPACESUIT MOBILITY JOINTS Patent
Hubert C Vykukal inventor (to NASA)
Issued 30 May 1978 22 p
Filed 23 Dec 1976 Supersedes N77-15641 (15 - 06 p 0789)

Joints for use in interconnecting adjacent segments of an 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
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.

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 spine and reinforced sections of the balloon.
71 ACOUSTICS

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

72 ATOMIC AND MOLECULAR PHYSICS
Includes atomic structure and molecular spectra.
a porous low work function surface ionizer in the production of a high energy neutral beam is shown

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 THERMIonic POWER SOURCE Patent

A control for a power source which includes nuclear fuel interspersed with thermionic converters is described. A power regulator maintains a substantially constant output voltage to a variable load and a control circuit drives a neutron flux regulator in accordance with the current supplied to the power regulator and the neutron flux density in the region of the converters. The control circuit generates a control signal which is the difference between the neutron flux density and a linear function of the current, and drives the neutron regulator in a direction to decrease or increase the neutron flux according to the polarity of the control signal.

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-Appi-SN-664091) Avail NTSI 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 subsequent 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

N78-32848* National Aeronautics and Space Administration
Goddard Space Flight Center Greenbelt Md
METHOD AND APPARATUS FOR SPLITTING A BEAM OF ENERGY Patent

A wedge shaped beam splitting device is described which has a first surface for splitting an incident beam energy into an externally reflected beam and an internally transmitted beam a second surface spaced from the first surface splits the internally transmitted beam into an externally transmitted beam and into an internally reflected beam and intersects the first surface at an angle that impinges the internally transmitted beam on the second surface at an angle of incidence that is less than the minimum angle necessary for substantially total internal reflection and impinges the internally reflected beam on the first surface at an angle of incidence that exceeds the minimum angle necessary for substantially total internal reflection. The device may also be used as a beam combiner.

Official Gazette of the U S Patent Office
of the spectral reflectance data permits quick identification and a solution to be promptly implemented.

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.

Official Gazette of the U.S. Patent Office
High vacuum cleaning of contaminated surfaces such as hydrocarbon containment 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-constructive aperture through the plasma discharge housing and then on to the contaminated surface.
A method of growing a ribbon crystal particularly suited for facilitating automated control of ribbon width is reported. A meniscus of molten semiconductor material attached to a vertical movable seed is lifted at a rate substantially equal to the rate at which the meniscus freezes. The method is characterized by 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.
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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