### ACCESSION NUMBER RANGES

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This bibliography was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by PRC Data Services Company.
An annotated bibliography of NASA-owned inventions covered by U.S. patents and applications for patent that were announced in Scientific and Technical Aerospace Reports (STAR) between January 1980 and June 1980.
This supplement is available as NTISUB/111/093 from the National Technical Information Service (NTIS), Springfield, Virginia 22161 at the price of $8.50 domestic; $17.50 foreign for standing orders. Please note: Standing orders are subscriptions which do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.
INTRODUCTION

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

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

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

For the convenience of the user, each issue of NASA PAB has a separately bound Abstract Section (Section 1) and Index Section (Section 2). Although each Abstract Section covers only the indicated six-month period, the Index Section is cumulative covering all NASA-owned inventions announced in STAR since 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 151 citations published in this issue of the Abstract Section cover the period January 1980 through June 1980. The Index Section contains references to the 3860 citations covering the period May 1969 through June 1980.

ABSTRACT SECTION (SECTION 1)

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

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

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

These data elements in the citation of the abstract as depicted in the Typical Citation and Abstract reproduced below and are also used in the several indexes.

TYPICAL CITATION AND ABSTRACT

NASA SPONSORED DOCUMENT

NASA ACCESSION NUMBER

TITLE

INVENTOR

NASA CASE NUMBER

ABSTRACT

AVAILABLE ON MICROFICHE

SOURCE

US PATENT APPLICATIONS SERIAL NUMBER

AVAILABILITY

COSATI CODE

A method and apparatus for convection control of metallic halide vapor density in a metallic halide laser are described. A reservoir containing copper chloride is heated so that the copper chloride is maintained in a liquid form. The apparatus includes a means for flowing a buffer gas (neon) over the liquid copper chloride to provide a mixture of copper chloride vapor and neon above the liquid copper chloride. A conduit for providing fluid communication between the reservoir containing the copper chloride vapor/neon mixture and the laser is also included. The copper chloride vapor density in the laser is related to the liquid copper chloride temperature and the neon flow rate through the reservoir. Neon is also provided directly to the laser in order to provide a further means of controlling the copper chloride vapor density in the laser.

KEY ILLUSTRATION
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 inventions(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 ($5.00 domestic; $10.00 foreign). Microfiche are sold at price code A01 ($3.50 domestic; $5.25 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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<th>NASA Case Number</th>
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| ARC-xxxxx        | Ames Research Center  
Mail Code: 200-11A  
Moffett Field, California 94035  
Telephone: (415)965-5104 |
| XAR-xxxxx*       | NASA Headquarters  
Mail Code: GP-4 |
| ERC-xxxxx        | Goddard Space Flight Center  
Mail Code: 204  
Greenbelt, Maryland 20771  
Telephone: (301)344-7351 |
| XER-xxxxx        | John F. Kennedy Space Center  
Mail Code: AA-PAT  
Kennedy Space Center, Florida 32899  
Telephone: (305)867-2544 |
| HQN-xxxxx        | Langley Research Center  
Mail Code: 456  
Hampton, Virginia 23365  
Telephone: (804)827-3725 |
| XHQ-xxxxx        | Lewis Research Center  
Mail Code: 500-311  
21000 Brookpark Road  
Cleveland, Ohio 44135  
Telephone: (216)433-6346 |
| GSC-xxxxx        | Lyndon B. Johnson Space Center  
Mail Code: AM  
Houston, Texas 77058  
Telephone: (713)483-4871 |
| XGS-xxxxx        | George C. Marshall Space Flight Center  
Mail Code: CC01  
Huntsville, Alabama 35812  
Telephone: (205)453-0020 |
| KSC-xxxxx        | NASA Resident Legal Office  
Mail Code: 180-601  
4800 Oak Grove Drive  
Pasadena, California 91103  
Telephone: (213)354-2700 |
Chapter V—National Aeronautics and Space Administration

PART 1245—PATENTS

Subpart 2—Patent Licensing Regulations

1. Subpart 2 is revised in its entirety as follows:

Sec. 1245.200 Scope of subpart.
1245.201 Definitions.
1245.202 Basic considerations.
1245.203 Licenses for practical application of inventions.
1245.204 Other licenses.
1245.205 Publication of NASA inventions available for license.
1245.206 Application for nonexclusive license.
1245.207 Notification for exclusive license.
1245.208 Processing applications for licenses.
1245.209 Royalties and fees.
1245.210 Reports.
1245.211 Revocation of licenses.
1245.212 Appeals.
1245.213 Appeals.
1245.214 Address of communications.

Authority: The provisions of this Subpart 2 issued under 42 U.S.C. 2457, 2475(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 U.S. patent or patent application for which the Administrator of NASA holds title on behalf of the United States and which is designated by the Administrator, in accordance with the provisions of this subpart, as available for the grant of license(s) in accordance with this subpart.

(b) "To practice an invention" means to make or have made, use or have used, sell or have sold, or otherwise dispose of according to law any machine, article of manufacture or composition of matter physically embodying the invention, or to use or have used the process or method comprising the invention.

(c) "Practical application" means the manufacture in the case of a composition of matter or product, the use in the case of a process, or the operation in the case of a machine, under such conditions as to establish that the invention is being utilized and that its benefits are reasonably accessible to the public.

(d) "Special invention" means any invention designated by the NASA Assistant General Counsel for Patent Matters to be subject to short-form licensing procedures. An invention may be designated 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.

(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 special 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 possible time. Although NASA encourages the nonexclusive licensing of its inventions to promote competition and achieve their widest possible utilization, the commercial development of certain inventions calls for a substantial capital investment. In the case of products manufactured by companies which may be unwilling to risk under a nonexclusive license. It is the policy of NASA to seek exclusive licenses when such licenses will 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 necessity for further technical and market development of the invention, the capabilities of prospective licensees, their proposed plans to undertake the required investment and development, the impact on competitors, and the benefits of the license to the Government and to the public. Preference for exclusive license shall be given to 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 the necessity to assist small businesses and to address 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 granted either expressly or by implication, for a NASA invention except as provided for in § 1245.203 and 1245.204.

(e) 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).

§ 1245.203 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 licenses for the period provided in § 1245.206, consistent with the provisions of any existing exclusive license.

(2) The duration of the license shall be for a period as set forth in § 1245.206.

(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 and throughout the United States of America, its territories and possessions, Puerto Rico, and the District of Columbia, or in any lesser geographic portion thereof.

(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 written request, to 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 special invention 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 geographical locations covered by the application for the exclusive license is not likely to be achieved expeditiously by the further development of the invention by the Government or under a nonexclusive license requested by any applicant pursuant to these regulations, and (c) the 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 for at least 9 months, the patent, or the invention has been issued for at least 6 months. However, a limited exclusive license may be granted prior to the periods specified if the Administrator determines that the public interest will best be served by the earlier grant of an exclusive license.

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

(3) The exclusive period of the license shall be negotiated, but shall be for less than all fields of use of the invention, 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 licensor to practice the invention or a sublicense within the specified period, and then to achieve practical application of the invention.

(5) The license shall require the licensor to expend a specified minimum sum of money and/or to take other specified actions, within indicated period(s) 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 irreverable nonexclusive right of the Government of the United States to practice and to have practiced the invention throughout the world by or on behalf of the Government of the United States and on behalf of any foreign government pursuant to any existing or future treaty or agreement with the United States.

(7) The license may reserve to the Administrator, NASA, under the following circumstances, the right to require the granting of a sublicense to responsible applicant(s) on terms that are considered reasonable by the Administrator, but subject to negotiation of the current royalty rates under similar patents and other pertinent facts: (1) To the extent that the invention is required for public use, national security, or safety, or may be necessary to fulfill health or safety needs, or (ii) for other purposes stipulated in the license.

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

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

§ 1245.204 Other licenses.

(a) License to contractor. There is hereby granted to the contractor reporting an invention made in the performance of work under a contract of NASA in the manner specified in section 306(a) or (2) of the National Aeronautics and Space Act of 1958 as amended (42 U.S.C. 2457(a) (1) or (2)), a revocable, nonexclusive, royalty-free license for the practice of such invention, together with the right to grant sublicenses of the same scope to the contractor or the contractor was legally obligated to do so at the time the contract was awarded. Such license and right is nontransferable except to the successor of that part of the contractor's business to which the invention pertains.

(b) Miscellaneous licenses. Subject to any outstanding licenses, nothing in this subpart shall be construed to limit or restrict the Administrator from granting other licenses for inventions, when he determines that do so would provide for an equitable distribution of rights. The following circumstances with favorable license may be granted:

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

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

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

§ 1245.205 Publication of NASA inventions available for license.

(a) A notice will be periodically published in the Patent, Copyright, and Trademark 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 nonexclusive license.

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

(b) Contents of an application for an 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 or more of the following categories:

(i) Small business firm;

(ii) Minority business enterprise;

(iii) Location in a surplus labor area;

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

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

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

(3) A statement whether the applicant would be willing to accept a license for all or 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 interests of the United States of America for the Administrator to grant an exclusive license rather than a nonexclusive li-
PATENT LICENSING REGULATIONS

cense and that such an exclusive license should be granted to the applicant.

§ 1245.208 Processing applications for license.

(a) Initial review. Applications for nonexclusive and exclusive licenses under §§ 1245.206 and 1245.207 will be reviewed by the Patent Counsel of the NASA Inventions and Contributions Board, in accordance with the basic considerations set forth in §§ 1245.202 and 1245.203. Initial review shall result in one of the following:

(i) An application for a nonexclusive license shall be granted to the applicant,

(ii) An application for an exclusive license shall be granted to the applicant.

(b) Initial review. Applications for exclusive licenses under §§ 1245.206 and 1245.207 shall be reviewed by the Patent Counsel of the NASA Inventions and Contributions Board, in accordance with the basic considerations set forth in §§ 1245.202 and 1245.203. Initial review shall result in one of the following:

(i) An application for an exclusive license shall be granted to the applicant,

(ii) An application for an exclusive license shall be rejected.

§ 1245.210 Reports.

(a) Normally, a nonexclusive license for the practical application of an invention shall be granted to a U.S. citizen or company which the Administrator determines to be in the best interest of the United States.

(b) An exclusive license for an invention shall be granted to the applicant.

§ 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 such revocation is necessary to achieve the best interest of the United States.

(b) An exclusive license granted pursuant to § 1245.204(a) may be revoked, either in part or in its entirety, by the Administrator if, in his opinion, such revocation is necessary to achieve the best interest of the United States.

(c) An exclusive license granted pursuant to § 1245.204(b) may be revoked, either in part or in its entirety, by the Administrator if, in his opinion, such revocation is necessary to achieve the best interest of the United States.

§ 1245.212 Appeals.

Any person desiring to file an appeal pursuant to § 1245.211(e) shall address the appeal to the Inventions and Contributions Board. Any person filing an appeal shall be afforded an opportunity to be heard before the Inventions and Contributions Board, and to present evidence in support of his appeal.

(c) Appeals. Any person desiring to file an appeal pursuant to § 1245.211(e) shall address the appeal to the Inventions and Contributions Board. Any person filing an appeal shall be afforded an opportunity to be heard before the Inventions and Contributions Board, and to present evidence in support of his appeal.

(d) Appeal. Any person desiring to file an appeal pursuant to § 1245.211(e) shall address the appeal to the Inventions and Contributions Board. Any person filing an appeal shall be afforded an opportunity to be heard before the Inventions and Contributions Board, and to present evidence in support of his appeal.
ment in such suit. The Government shall also have an absolute right to intervene in any such suit at its own expense. The licensee shall be obligated to promptly furnish to the Government, upon request, copies of all pleadings and other papers filed in any such suit and of evidence adduced in proceedings relating to the licensed patent including, but not limited to, negotiations for settlement and agreements settling claims by a licensee based on the licensed patent, and all other books, documents, papers, and records pertaining to such suit. If, as a result of any such litigation, the patent shall be declared invalid, the licensee shall have the right to surrender his license and be relieved from any further obligation thereunder.

§ 1245.214 Address of communications.
(a) Communications to the Assistant General Counsel for Patent Matters in accordance with §§ 1245.206 and 1245.207 and requests for information concerning licenses for NASA inventions should be addressed to the Assistant General Counsel for Patent Matters, Code GP, National Aeronautics and Space Administration, Washington, D.C. 20546.
(b) Communications to the Inventions and Contributions Board in accordance with §§ 1245.208, 1245.211, and 1245.212 should be addressed to Chairman, Inventions and Contributions Board, National Aeronautics and Space Administration, Washington, D.C. 20546.

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

JAMES C. FLETCHER,
Administrator.

FOREIGN PATENT LICENSING REGULATIONS

Selected NASA inventions are also available for licensing in countries other than the United States in accordance with the NASA Foreign Patent Licensing Regulation (14 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.

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## RESEARCH AND SUPPORT FACILITIES (AIR)

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

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

## ASTRONAUTICS

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

For related information see also Aeronautics.

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<td>SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING</td>
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For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

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

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

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

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

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

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

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

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

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

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

For related information see also 05 Aircraft Design, Testing and Performance and 39 Structural Mechanics.
19 SPACECRAFT INSTRUMENTATION  N.A.
   For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.

20 SPACECRAFT PROPULSION AND POWER  5
   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)  N.A.
   Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS  6
   Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY  6
   Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
   For related information see also 77 Thermodynamics and Statistical Physics.

26 METALLIC MATERIALS  7
   Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS  8
   Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS  9
   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)  10
   Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS  11
   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  14
   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  19
   Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
   For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

35 INSTRUMENTATION AND PHOTOGRAPHY  20
   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  25
   Includes parametric amplifiers.

37 MECHANICAL ENGINEERING  26
   Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

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

39 STRUCTURAL MECHANICS  31
   Includes structural element design and weight analysis; fatigue; and thermal stress.

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

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

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

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

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

47 METEOROLOGY AND CLIMATOLOGY N.A.
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 N.A.
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 N.A.
Includes exobiology; and extraterrestrial life.

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

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

60 COMPUTER OPERATIONS AND HARDWARE 41
Includes computer graphics and data processing.
For components see 33 Electronics and Electrical Engineering.

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

62 COMPUTER SYSTEMS N.A.
Includes computer networks.

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

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

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

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

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

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

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

N80-20224* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

DETECTION OF THE TRANSITIONAL LAYER BETWEEN LAMINAR AND TURBULENT FLOW AREAS ON A WING SURFACE Patent


A system is disclosed for detecting the laminar to turbulent boundary layer transition on a surface while simultaneously taking pressure measurements. The system uses an accelerometer for producing electrical signals proportional to the noise levels along the surface and a transducer for producing electrical signals proportional to pressure along the surface. The signals generated by the accelerometer and transducer are sent to a data reduction system for interpretation and storage.

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

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

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.

N80-18019* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

RIM INERTIAL MEASURING SYSTEM Patent Application


A strapdown inertial measuring system for measuring angular rate and linear accelerations about a spacecraft is disclosed. The system uses an annular momentum control device (AMCD) as the basic sensor. Features of the device include reliability, zero friction, zero wear, low volume, high momentum to mass ratio, and zero breakout forces. The AMCD is comprised of a rim and several magnetic bearing stations to control the position of the rim in the axial and radial directions. Signals from axial position sensors are used to compute the angular rates about first and second mutually perpendicular axes in the plane of the rim and the linear acceleration along a third axis perpendicular to the first and second axes. Signals from radial position sensors are used to compute the linear accelerations along the first and second axes.

J.M.S.
IMPROVED SUN-SENSING GUIDANCE SYSTEM FOR HIGH-ALTITUDE AIRCRAFT Patent Application
Robert D. Reed, inventor (to NASA) Filed 12 Mar. 1980

A sun sensing guidance system for high altitude aircraft is described. The system is characterized by a disk shaped body mounted for rotation aboard the aircraft in exposed relation to solar radiation and has a plurality of mutually isolated chambers. The photosensors are arranged in facing relation with the chamber openings for receiving incident solar radiation and responsively providing a voltage output. The photosensors are connected in a paired relation through a bridge circuit for providing heading error signals in response to detected imbalances in intensities of solar radiation incident on the photosensors until a nulled relationship is achieved for the disk to the source of radiation.

ACOUSTICALLY SWEPT ROTOR Patent
Fredric H. Schmitz, Donald A. Boxwell, and Rande Vause, inventors (to NASA) Issued 25 Sep. 1979 23 p Filed 8 Sep. 1977

Impulsive noise reduction is provided in a rotor blade by acoustically sweeping the chord line from root to tip so that the acoustic radiation resulting from the summation of potential singularities used to model the flow about the blade tend to cancel for all times at an observation point in the acoustic far field.

A HYDRAULIC ACTUATOR MECHANISM TO CONTROL AIRCRAFT SPOILER MOVEMENTS THROUGH DUAL INPUT COMMANDS Patent Application
Stephen C. Irick, inventor (to NASA) Filed 17 Aug. 1979

A conventional, primary spoiler control system retains its operational characteristics while accommodating a secondary input controlled by a conventional computer system to supplement the settings made by the primary input. This is achieved by interposing springs between the primary input and the spoiler control unit. The springs are selected to have a stiffness intermediate to the greater force applied by the primary control linkage and the lesser resistance offered by the spoiler control unit. Thus, operation of the primary input causes the control unit to yield before the springs, yet, operation of the secondary input, acting directly on the control unit, causes the springs to yield and absorb adjustments before they are transmitted into the primary control system.

MEANS FOR CONTROLLING AERODYNAMICALLY INDUCED TWIST Patent Application
Wolf Elber, inventor (to NASA) Filed 28 Sep. 1979 10 p

A wing twist deformation control mechanism which provides active compensation for aerodynamically induced twist deformation of high aspect ratio wings is described. The twist deformation
control mechanism consists of a torque tube, internal to each wing and rigidly attached near the tip of each wing, and an actuator located in the aircraft fuselage. As changes in the aerodynamic loads on the wings occur, the torque tube is rotated to compensate for the induced wing twist.

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.

N80-18036* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AIR SPEED AND ATTITUDE PROBE Patent
An air speed and attitude probe characterized by a pivot shaft normally projected from a data boom and supported thereby for rotation about an axis of rotation coincident with the longitudinal axis of the shaft is described. The probe is a tubular body supported for angular displacement about the axis of rotation and has a fin mounted on the body for maintaining one end of the body in facing relation with relative wind and has a pair of transducers mounted in the body for providing intelligence indicative of total pressure and static pressure for use in determining air speed. A stack of potentiometers coupled with the shaft to provide intelligence indicative of aircraft attitude, and circuitry connecting the transducers and potentiometers to suitable telemetry circuits are described.
Official Gazette of the U.S. Patent and Trademark Office

N80-18039* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
METHOD AND APPARATUS FOR RAPID THRUST INCREASES IN A TURBOFAN ENGINE Patent
Upon a landing approach, the normal compressor stator schedule of a fan speed controlled turbofan engine is temporarily varied to substantially close the stators to thereby increase the fuel flow and compressor speed in order to maintain fan speed and thrust. This running of the compressor at an off-design speed substantially reduces the time required to subsequently advance the engine speed to the takeoff thrust level by advancing the throttle and opening the compressor stators.
Official Gazette of the U.S. Patent and Trademark Office

N80-21327* National Aeronautics and Space Administration. Lewis Flight Research Center, Edwards, Calif.
ELECTRICAL SERVO ACTUATOR BRACKET Patent
Application
A bracket for an electrical servo actuator is disclosed which was developed particularly for jet engine fuel control valves. Said servo actuator is mounted on a support arm which is allowed to pivot on a bolt through a fixed mounting bracket. The actuator is pivotally connected to the end of the support arm by a bolt which has an extension that passes through a slot in the fixed mounting bracket. An actuator rod extends from the servo actuator.
08 AIRCRAFT STABILITY AND CONTROL

to a crank arm which turns a control shaft. A short linear thrust
of the rod pivots the crank arm through about 90 deg for full-on
control with the rod contracted into the servo actuator, and
full-off control when the rod is extended from the actuator.

NASA

08 AIRCRAFT STABILITY AND
CONTROL

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

N80-18048® National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
THRUST AUGMENTED SPIN RECOVERY DEVICE Patent
Application
Bobby L. Benner, inventor (to NASA) Filed 27 Apr. 1979
15 p
NTIS HC A02/MF A01 CSCL 01C

A lightweight and drag-free yaw control system developed
for a jet propelled aircraft is described. Emphasis is placed on
providing aircraft attitude control at low flight speeds, at high
angles of attack, and during spin. The control system is comprised
of a vertical tail with a thrust augmented rudder and a thrust,
rudder tab. The jet exhaust stream is deflected by the thrust
vectoring rudder tab in a sideward direction to the aircraft,
producing a thrust vectored yawing moment and creating
supercirculation about the vertical tail and thrust augmented
rudder. Supercirculation, a thrust induced aerodynamic phenom-
non, generates lift without increasing drag, enabling the rudder
to provide additional yawing force for attitude control. J.M.S.

18 SPACECRAFT DESIGN, TESTING
AND PERFORMANCE

Includes spacecraft thermal and environmental control;
and attitude control.

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

N80-14182® National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
ANTENNA DEPLOYMENT MECHANISM FOR USE WITH A
SPACECRAFT Patent
William A. Leavy and Charles R. Griffin, inventor (to NASA)
Issued 27 Nov. 1979 9 p. Filed 18 Sep. 1978 Supersedes
N78-32436 (16 - 23, p 3U58W)
(NASA-Case-GSC-12331-1; US-Patent-4,176,360;
Office CSCL 228

A mechanical system is disclosed to deploy an antenna on
a support which may, for example, be a spacecraft. A series
of telescoping tubes are nested one within the other when
the antenna is in a retracted stowed position. The outermost tube
is rigidly attached to the support and the inner tubes are
latched in the stowed position by a caging mechanism. The
antenna is driven toward a deployed position by a dual motor
driven cable which is terminated in a driving tube at the lower
end of the innermost tube, from whence the cable is trained
about pulleys at the tops and bottoms of successively large
tubes of the antenna. The cable is wound on a drum at the
lower end of the antenna and coaxial therewith. During deployment
of the antenna, the drum rotates, thereby reeling in the deployment
cable. The initial movement of the cable causes cam releasing
of the latches in the caging device. Thereafter, the antenna tubes
are extended until the final deployed position of the antenna is
reached. A ratchet attached to the drum prevents reverse rotation
of the drum and locks the antenna in the deployed position
until the ratchet is released.

Official Gazette of the U.S. Patent and Trademark Office
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, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

N80-10278* National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

PASSIVE PROPELLANT SYSTEM Patent
A passive propellant acquisition and feed system is disclosed which acquires and feeds gas-free propellant in low or zero-g environments during orbital maneuvers and retains this propellant under high axially directed acceleration such as may be experienced during launch of a space vehicle and orbit-to-orbit transfer is described. The propellant system includes a dual compartment propellant tank with independent surface tension acquisition channels in each compartment to provide gas-free flow of pressurized liquid propellant from one compartment to the other in one direction only.

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

N80-18097* National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

PRESSURE LIMITING PROPELLANT ACTUATING SYSTEM Patent
A pressure limiting propellant actuating system for simultaneously limiting the output force while maintaining a constant output pressure from the combustion chamber is described. The propellant actuated system includes an outer barrel, outer housing and a combustion chamber. A main piston is movable in the barrel housing when gas pressure is developed in the combustion chamber. A relief piston is concentrically mounted and fixedly movable with the main piston when gas pressure is exerted from the combustion. A relief piston has a force-activated separation mechanism for limiting the output force while simultaneously maintaining constant output pressure on the main piston from the combustion chamber.

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

N80-14188* National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio.

SUPERCHARGED TOPPING ROCKET PROPELLANT FEED SYSTEM Patent
A rocket propellant feed system utilizing a bleed turbopump to supercharge a topping turbopump is presented. The bleed turbopump is of a low pressure type to meet the cavitation requirements imposed by the propellant storage tanks. The topping turbopump is of a high pressure type and develops 60 to 70 percent of the pressure rise in the propellant.

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

N80-18090*
CORROSION RESISTANT THERMAL BARRIER COATING

Patent Application
S. R. Levine, R. A. Miller, and P. E. Hodge, inventors (to NASA)
Filed 31 Oct. 1979 8 p
(NASA-Case-LEW-13088-1; US-Patent-Appl-SN-089779) Avail:
NTIS HC A02/MF A01 CSCL 11D

A thermal barrier coating system was developed to protect
the surfaces of metal components, gas turbines, and other heat
engine parts that are exposed to fuels contaminated with metallic
impurities which are normally corrosive to previously known
metallic coatings. The coating system includes a metal alloy
bond coating, the alloy containing nickel, cobalt, iron, or a
combination of these metals. The system also includes a corrosion
resistant thermal barrier oxide coating containing at least one
alkaline earth silicate. The preferred oxides are calcium silicate,
barium silicate, magnesium silicate, or a combination of these
silicates.

CATALYSTS FOR POLYIMIDE FOAMS FROM AROMATIC
ISOCYANATES AND AROMATIC DIANHYDRIDES Patent
inventors (to NASA) Issued 4 Dec. 1979 5 p
Filed 24 Feb. 1978
(NASA-Case-ARC-11107-1; US-Patent-4,177,333;
Patent and Trademark Office CSCL 07D

Polyimide foam products having greatly improved burn-
through and flame-spread resistance are prepared by the reaction
of aromatic polyisocyanates with aromatic dianhydrides in the
presence of metallic salts of octoic acid. The salts, for example
stannous octoate, ferric octoate and aluminum octoate, favor
the formation of imide linkages at the expense of other possible
reactions.

METHOD AND MEANS FOR HELIUM/HYDROGEN RATIO
MEASUREMENT BY ALPHA SCATTERING Patent
A. Bruce Whitehead (JPL) and Thomas A. Tombrello, inventors
(to NASA) (JPL) Issued 18 Mar. 1980 8 p
Filed 7 Nov. 1978
(NASA-Case-NPO-14079-1; US-Patent-4,194,115;
Office CSCL 07D

An apparatus for determining helium to hydrogen ratios in
a gaseous sample is presented. The sample is bombarded with
alpha particles created by a self contained radioactive source
and scattering products falling within a predetermined forward
scattering angular range impact a detector assembly. Two
detectors are mounted in tandem, the first completely blocking
the second with respect to incident scattering products. Alpha
particle/hydrogen or alpha particle/helium collisions are identified
by whether scattering product impacts occur simultaneously in
both detectors or only in the first detector. Relative magnitudes
of the two pulses can be used to further discriminate against
other effects such as noise and cosmic ray events.
A thermal reactor for pyrolytically decomposing silane gas into liquid silicon and hydrogen gas is presented. A water cooled injection probe introduces the silane tangentially into a reaction chamber heated well above the decomposition temperature of silane. An outer downwardly moving vortex containing the liquid silicon and an inner upwardly moving vortex containing hydrogen gas are formed. The liquid silicon deposits into the interior walls of the reaction chamber to form an equilibrium skull layer which flows to the bottom of the reaction chamber where it is removed. The hydrogen gas is removed from the top of the reaction chamber by a vortex finder.
26 METALLIC MATERIALS

in adhesion of the titanium carbide coating to the substrate results from the presence of both titanium nitride and a nitride of the substrate in the interfacial region. NASA

N80-19237* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

METHOD OF FORMING DYNAMIC MEMBRANE ON STAINLESS STEEL SUPPORT Patent Application J. L. Gaddis (Clemson Univ., S.C.) and Craig A. Brandon, inventors (to NASA) (Clemson Univ., S.C.) Filed 7 Feb. 1980 10 p

Sponsored by NASA

A method for forming a membrane on a porous stainless steel substrate is disclosed. The stainless steel substrate is prepared from sintered, powdered stainless steel and contacted with an aqueous nitrate solution of a suitable polyvalent metal such as iron, zirconium, tin, or thorium. Contact between the substrate and the aqueous nitrate solution is maintained until the flow rate diminishes indicating that the hydrous metal oxide membrane has formed. Variables affecting the process include the applied pressure, the pore size, and the concentration of the aqueous nitrate solution. The advantage of the method is that membranes are formed on stainless steel substrates without corroding the stainless steel. Membranes deposited on the surface of porous substrates are used in hyperfiltration to remove contaminating chemicals from aqueous solutions by reverse osmosis. Such reverse osmosis membranes are used in desalination and other water purification equipment, and may have application in textile industries for separating dyes from aqueous solvents.

J.M.S.

27 NONMETALLIC MATERIALS

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

N80-10358* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.


A process is described for preparing flame resistant, nontoxic vinyl polymers which contain phosphazene groups and which do not emit any toxic or corrosive products when they are oxidatively degraded. Homopolymers, copolymers, and terpolymers of a styrene based monomer are prepared by polymerizing at least one oxidized styrylphosphine monomer from a group of organic azides, or by polymerizing p-diphenylphosphinostyrene and then oxidizing that monomer with an organoazide from the group of (C6H5)2P(O)N3, (C6H5)2P(O)1N3, (C6H5)2C3N3(N3), and (C6H5)C3N3(N3)2. Copolymers can also be prepared by copolymerizing styrene with at least one oxidized styrylphosphine monomer. Official Gazette of the U.S. Patent and Trademark Office

N80-10381* National Aeronautics and Space Administration. Pasadena Office, Calif.


Sponsored by NASA
(NASA-Case-NPO-14315-1; US-Patent-App1-SN-900659) Avail: NTIS HC A02/MF A01 CSCL 07C

The production of synthetic hydrocarbon liquid fuel from latex rich plants is reported. The pyrolysis of high isoprene latex plants such as Guayule, or extracts thereof, in a molten inorganic salt at temperatures above 300 C is described. The pyrolysis process is examined using a number of inorganic salts and a reactor is described for the hydrogen fuel production.

A.W.H.

N80-16158* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.


Aromatic crystalline polyimides are disclosed that are synthesized from polyamide-acid and when heated to 200 C to 300 C become cyclized to afford an opaque polymer. X-ray diffraction of the unoriented film exhibited 47 percent crystallinity. Differential scanning calorimetry reveals a melt at 425 C with no glass transition in these crystalline polyimides. Official Gazette of the U.S. Patent and Trademark Office

N80-16163* National Aeronautics and Space Administration. Pasadena Office, Calif.

(Contract NAS7-100)
A continuous process is described for producing strong, lightweight structures for use as solar sails for spacecraft propulsion by radiation pressure. A thin reflective coating, such as aluminum, is applied to a rotating cylinder. A nylon mesh, applied over the aluminum coating, is then coated with a polymerizing material such as a para-xylylene monomer gas to polymerize as a film bound to the mesh and the aluminum. An emissivity increasing material such as chromium or silicon is applied to the reverse side of the substrate. NASA

**N80-21532** National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**CARBORANYLCYCLOTRIPHOSPHAZENES AND THEIR POLYMERS Patent Application**

Larry L. Fewell, Harry Rex Alcock (Pennsylvania State Univ., University Park), John Philip OBrien (Pennsylvania State Univ., University Park), and Angelo George Sopelianos. inventors (to NASA) (Pennsylvania State Univ., University Park) Filed 12 Mar. 1980

**N80-18161** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

**ALUMINUM ION-CONTAINING POLYIMIDE ADHESIVES**

An improvement of addition polyimides wherein an essentially solventless, high viscosity laminating resin is synthesized from low-cost liquid monomers is presented. The improved process takes advantage of a reactive, liquid plasticizer such as monooctylphthalate which is used in lieu of an alcohol solvent, and helps solve a major problem of maintaining good prepreg tack and conform to a desired shape during the layup process. This improvement results in both longer life of the polymer prepreg and conform to a desired shape during the layup process. NASA

**N80-10374** National Aeronautics and Space Administration. Pasadena Office, Calif.

**START UP SYSTEM FOR HYDROGEN GENERATOR USED WITH AN INTERNAL COMBUSTION ENGINE Patent**

John Houseman (JPL) and Donald J. Cerini. inventors (to NASA) (JPL) Issued 5 Jul. 1977

**28 PROPELLANTS AND FUELS**

Includes rocket propellants, igniters, and oxidizers, storage and handling, and aircraft fuels.

For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.
A hydrogen generator provides hydrogen rich product gases which are mixed with the fuel being supplied to an internal combustion engine for the purpose of enabling a very lean mixture of that fuel to be used, whereby nitrous oxides emitted by the engine are minimized. The hydrogen generator contains a catalyst which must be heated to a predetermined temperature before it can react properly. To simplify the process of heating up the catalyst at start-up time, either some of the energy produced by the engine such as engine exhaust gas, or electrical energy produced by the engine, or the engine exhaust gas may be used to heat up air which is then used to heat the catalyst.

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

A coal pump is provided in which solid coal is heated in the barrel of an extruder under pressure to a temperature at which the coal assumes plastic properties. The coal is continuously extruded, without static zones, using, for example, screw extrusion preferably without venting through a reduced diameter die to form a dispersed spray. The dispersed coal may be continuously injected into vessels or combustors at any pressure up to the maximum pressure developed in the extrusion device. The coal may be premixed with other materials such as desulfurization aids or reducible metal ores so that reactions occur, during or after conversion to its plastic state. Alternatively, the coal may be processed and caused to react after extrusion, through the die, with liquid oxidizers, whereby a coal reactor is provided. Alternative utilization of the device may be to secure continuous pyrolysis of the coal or to feed the extruded coal into furnaces operating at pressures near ambient.
A method is provided for altering the size of tetrafluoroethylene tubing which is only available in limited combination of wall thicknesses and diameter. The tetrafluoroethylene tubing is slid onto an aluminum mandrel to which the ends of the tubing are clamped. The tubing and mandrel are placed in a supporting coil which is then positioned in an insulated steel pipe. The steel pipe is normally covered with a fiber glass insulator to smooth out temperature distribution therein. The entire structure is then placed in an oven which heats the tetrafluoroethylene tubing and shrinks it to the outer dimension of the aluminum mandrel. After cooling, the aluminum mandrel is removed from the newly sized tetrafluoroethylene tubing by a conventional chemical milling process.

A self-calibrating threshold detector for use with receivers is described. The threshold detector is adapted to receive an incoming transmitted signal carrying a prescribed code. The detector comprises a single demodulating channel which includes a mixer having one input receiving the incoming signal and another input receiving a local replica code. The detector relates generally to signal detecting systems and more particularly to receivers employing an auxiliary detector for detecting the arrival of an expected transmitted signal by correlating the phase of a local phase coded signal, produced by a local replica generator, with the phase of the transmitted signal.
only synthesize a narrow beam but also aim the beam in azimuth and elevation.

**N80-14281** National Aeronautics and Space Administration. Pasadena Office, Calif.

**ELECTROMAGNETIC POWER ABSORBER Patent**

A structure is presented with a surface portion of dielectric material which passes electromagnetic radiation and with a portion below the surface which includes material that absorbs the radiation, the face of the structure being formed with numerous steep ridges. The steepness of the dielectric material results in a high proportion of the electromagnetic energy passing through the surface for absorption by the absorbing material under the face and has very steep protuberances supporting the absorbing and dielectric materials.

**N80-16261** National Aeronautics and Space Administration. Pasadena Office, Calif.

**ANTENNA FEED SYSTEM FOR RECEIVING CIRCULAR POLARIZATION AND TRANSMITTING LINEAR POLARIZATION Patent Application**
Boris L. Seidel (JPL) and Dan A. Bathker, inventors (to NASA) (JPL) Filed 30 Oct. 1979 13 p. (Contract NAS7-100)

An invention is described which provides for receiving a circularly polarized signal from an antenna feed connected to orthogonally spaced antenna elements. It also provides for transmitting a linearly polarized signal through the same feed without switches, and without suffering a 3 dB polarization mismatch loss, using an arrangement of hybrid junctions. The arrangement is comprised of two dividing hybrid junctions, each connected to a different pair of antenna elements and a summing hybrid junction. In one version, a receiver is connected to the summing hybrid junction directly. A diplexer is used to connect a transmitter to only one pair of antenna elements. In another version, designated left and right circularly polarized (LCP and RCP) transmitters are connected to the summing hybrid junction by separate diplexers, and separate LCP and RCP sensitive receivers are connected to the diplexers in order to transmit linearly polarized signals using all four antenna elements while receiving circularly polarized signals as before. An orthomode junction and horn antenna may replace the two dividing hybrid junctions and antenna feed.

**N80-18252** National Aeronautics and Space Administration. Pasadena Office, Calif.

**HIGH-SPEED DATA LINK FOR MODERATE DISTANCES AND NOISY ENVIRONMENTS Patent**

A full duplex, high speed data link is described which comprises identical modules at each site for communication over coaxial cables. Each module having a digital frequency modulation (DFM) transmitter with an first-in-first-out (FIFO) data buffer for data from a digital system to be transmitted over a cable and a receiver with an FIFO data buffer for data received for a digital system at the other end of the cable. Data words are preceded by a sync word which enables the receiver. Every word transmitted, including the sync word is stored in the FIFO data buffer. This arrangement using FIFO buffers allows for asynchronous
transmission of data with receipt of the data beginning with the very first bit of the sync word.

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

N80-18253* National Aeronautics and Space Administration. Pasadena Office, Calif.

RADIO FREQUENCY ARRAYING METHOD FOR RECEIVERS Patent

A method and apparatus for increasing the signal to noise ratio of a receiving facility for coherent frequency reception by arraying receiving systems using separate antennas for each, or one antenna for all systems are presented. One system is operated with a carrier tracking loop to provide a first local oscillator frequency for the first and all other systems arrayed, with individual tracking loops in all other systems operated at IF for tracking out any phase differences due to separate group delays using an adjustable phase shifter for a second reference to compensate for different group delays in the antenna and low noise amplifier of each of the other systems. The second IF output of all systems is summed into the first system. This technique may also be used when two systems are arrayed to an antenna designed for circular or linear polarization diversity reception to effectively provide the same signal to noise ratio for both polarized signal transmission channels that would result from matched polarization. An arrangement adapted to high rate telemetry reception is disclosed. With additional components, the same arrangement is adapted to provide low rate telemetry reception as well.

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

N80-18261# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A FLUORESCENT RADIATION CONVERTER Patent

A fluorescent radiation converter having a substantially undoped optically transparent substrate and a waveshifter coating deposited on at least one portion of substrate for absorption of radiation and conversion thereof to fluorescent radiation is described. The coating is formed of substantially 1000 g/liter of a solvent, 70 to 200 g/liter of an organic polymer, and 2 to 25 g/liter of at least one organic fluorescent dye. The incoming incident radiation impinges on the coating and enters therein. Radiation is absorbed by the fluorescent dye and is reemitted as a longer wavelength radiation. Advantages of the fluorescent radiation converter in the areas of liquid crystal displays, scintillation counters, and in photovoltaic conversion techniques are discussed.

NASA

N80-20448* National Aeronautics and Space Administration. Pasadena Office, Calif.

SATELLITE PERSONAL COMMUNICATIONS SYSTEM Patent

Voice channel communication between low power mobile stations dispersed over a large area is provided by a system which includes a geostationary satellite utilizing a large UHF antenna that can receive a transmission from a caller and retransmit it over any one beam of a matrix of narrow beams, so the chosen beam covers an area in which a designated called party is located. A single up-link control channel occupying a narrow frequency band, can be utilized to receive dial up signals from a caller, and another single down link control channel can be utilized to ring up the called party located anywhere within the continental United States. The satellite antenna includes a matrix of feed horns that not only direct the beams in a controlled matrix onto the area of the continental United States, but also permit detection of the region from which the caller's signal is transmitted and the region from which the called party's answer is received, to enable the interconnection of signals

Official Gazette of the U.S. Patent and Trademark Office
received from these two regions. The system is particularly useful for rural areas.

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MEMORY BASED FRAME SYNCHRONIZER Patent Application
James K. Niswander and Raymond J. Stattel, inventors (to NASA) Filed 12 Mar. 1980 23 p

The memory frame synchronizer is comprised of a serial to parallel converter to convert a serial input data stream to a constantly changing parallel data output. This provides a data format which can be easily and dynamically changed. The process is accomplished using programmable memory arrays to perform the functions of the sync word recognizer and of the counter decoding logic. The parallel data output is supplied to programmable sync word recognizers each consisting of multiplexer and random access memory (RAM). The multiplexer is connected to both the parallel data output and an address bus. The RAM is used as an associative memory or decoder and is programmed with the pattern of binary 1's and 0's necessary to identify a specific sync word.

USE OF GLOW DISCHARGE IN FLUIDIZED BEDS Patent Application
Theodore Wydeven, Peter C. Wood (San Jose State Univ. Foundation, Calif.), E. Vernon Ballou (San Jose State Univ. Foundation, Calif.), and Leroy A. Spitze, inventors (to NASA) (San Jose State Univ., Calif.) Filed 26 Oct. 1979 15 p

Static charges and agglomeration of particles in a fluidized bed system are minimized by maintaining in at least part of the bed a radio frequency glow discharge. This approach is eminently suitable for processes in which the conventional charge removing agents, i.e., moisture or conductive particle coatings, cannot be used. The technique is applied here to the disproportionation of calcium peroxide diperoxyhydrate to yield calcium superoxide, an exceptionally water and heat sensitive reaction.

METHOD OF MAKING V-MOS FIELD EFFECT TRANSISTORS Patent Application
Murzban D. Jhabvala, inventor (to NASA) Filed 5 Sep. 1979 12 p

A method of making V-MOS field effect transistors is disclosed. A masking layer is first formed over a surface of a crystalline substrate. An aperture is formed in the masking layer to expose the surface of the substrate. An anisotropic etchant is applied to the exposed surface so that a groove having a decreasing width with increasing depth is formed. The etch is not allowed to go to completion, with the result that a partially formed V-shaped groove is formed. Ions are accelerated through the aperture for implantation in the crystalline substrate in the lower portion of the partially formed V-shaped groove. An
anisotropic etchant is reapplied to the partially formed V-shaped groove, and the etch is allowed to go to completion. NASA

N80-14330* National Aeronautics and Space Administration. Pasadena Office, Calif.

MULTIPLE ANODE ARC LAMP SYSTEM Patent

A high-intensity xenon arc lamp having a plurality of separate anodes axially disposed in a symmetrical pattern which spaced a discharge gap from a common cathode is presented.

N80-14332* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD FOR ANALYZING RADIATION SENSITIVITY OF INTEGRATED CIRCUITS Patent

A method for analyzing the radiation sensitivity of an integrated circuit is described to determine the components. The application of a narrow radiation beam to portions of the circuit is considered. The circuit is operated under normal bias conditions during the application of radiation in a dosage that is likely to cause malfunction of at least some transistors, while the circuit is monitored for failure of the irradiated transistor. When a radiation sensitive transistor is found, then the radiation beam is further narrowed and, using a fresh integrated circuit, a very narrow beam is applied to different parts of the transistor, such as its junctions, to locate the points of greatest sensitivity.

N80-14338* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

LOW TEMPERATURE LATCHING SOLENOID Patent Application

A magnetically latching solenoid is disclosed which includes a pull-in coil and a delatching coil. Each of the coils is constructed with a combination of wire materials, including materials of low temperature coefficient of resistivity, to enable the solenoid to be operated at cryogenic temperatures while maintaining sufficient coil resistance. An armature is springbiased toward a first position that may extend beyond the field of force of a permanent magnet. When voltage is temporarily applied across the pull-in magnet, the induced electromagnetic forces overcome the spring force and pull the armature to a second position within the field of the permanent magnet, which latches the armature in the pulled-in position. Application of voltage across the delatching coil induces electromagnetic force which at least partially temporarily nullifies the field of the permanent magnet at the armature, thereby delatching the armature and allowing the spring to move the armature to the first position.

N80-14334* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

15
A torque control electromechanical torquing device of a type where a variable clearance occurs between a rotor and field is presented. A Hall effect device senses the field present, which would vary as a function of spacing between field and rotor, and the output of the Hall effect device controls the power applied to the field so as to provide a well-defined field and thus a controlled torque to the rotor which is well defined.

A voltage feed-through apparatus, having reduced partial discharge, has an electrical conductor and an electrical terminal connected thereto. A semiconductor sleeve surrounds the conductor for reducing the electric field concentration at the metallic conductor surface and consequently reducing the partial discharge occurrences. An insulator sleeve encircles the semiconductor sleeve. A metallic sleeve surrounds a portion of the terminal. Another insulator is connected to the metallic sleeve and surrounds a portion of the insulator sleeve forming a space therebetween. Another metallic sleeve spaced from the first metallic sleeve surrounds a portion of the other insulator.

A coaxial switch capable of operating in a vacuum with high RF power in the 1.2 GHz range without multipactor breakdown, and without relying on pressurization with an inert gas is described. The RF carrying conductors of the switch are surrounded with a high grade solid dielectric, thus eliminating any gaps in which electrons can accelerate.

A system in which the characteristics of a microwave power transmission beam are controlled in accordance with power distribution profiles altered due to the detected presence or entrance of an object into the beam which causes changes that are perceived in various received, reflected and scattered power distribution profiles resulting over various receiving elements of the system is presented. The system comprises a microwave power beam radiator array, a microwave power beam receiving antenna array, the radiator array in one embodiment being located on an orbiting spacecraft and the receiving array being located at a ground station. Another embodiment provides a ground...
based transmitting array and a receiving array aboard an aircraft or airship.

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

**LIQUID METAL SLIP RING Patent Application**


(NASA-Case-LEW-12277-3; US-Patent-Appl-SN-106190) Avail: NTIS HC A02/MF A01 CSCL 09A

The liquid metal slip ring described comprises a rotor in the form of a range about an axis and a stator, the rotor being rotatable relative to the stator. The rotor has a channel in which the liquid metal is retained during operation by surface tension. The stator comprises a brush or probe which is partially immersed in the metal in the channel and is bidirectionally symmetrical so that whichever direction the rotor turns the probe presents the same physical resistance and affords the same electrical conductivity as a connection between the probe and the rotor.

Author

**A LINEAR MAGNETIC MOTOR/GENERATOR Patent Application**

Philip A. Studer, inventor (to NASA) Filed 7 Feb. 1980 27 p


A linear magnetic motor/generator is described which uses magnetic flux to provide mechanical motion or electrical energy.

The linear magnetic motor/generator includes an axially movable actuator mechanism. A permanent magnet mechanism defines a first magnetic flux path which passes through a first end portion of the actuator mechanism. Another permanent magnet mechanism defines a second magnetic flux path which passes through a second end portion of the actuator mechanism. A drive coil defines a third magnetic flux path passing through a third central portion of the actuator mechanism. The invention has potential applications on all types of spacecraft requiring the use of a motor or generator, or in environments requiring long life with minimum maintenance. Presently the invention is to be used in cryogenic refrigerators aboard future spacecraft.

Author

**COUPLED CAVITY TRAVELING WAVE TUBE WITH VELOCITY TAPERING Patent Application**

Denis J. Connolly, inventor (to NASA) Filed 20 Feb. 1980 16 p

(NASA-Case-LEW-12296-1; US-Patent-Appl-SN-122966) Avail: NTIS HC A02/MF A01 CSCL 09A

A coupled cavity traveling wave tube is described which has a velocity taper, i.e., gradual velocity reduction, which affords beam wave resynchronization and thereby enhances efficiency. The required wave velocity reduction is achieved by reducing the resonant frequencies of the individual resonant cavities as a function of the distance from the electron gun through changes in the internal cavity dimensions. The required changes in cavity dimensions are accomplished, for example, by gradually increasing the cavity radius or decreasing the gap length from cavity to cavity.
An electricity producing cell of the reduction-oxidation (REDOX) type is described. The cell is divided into two compartments by a membrane, each compartment containing a solid inert electrode. A ferrous/ferric couple in a chloride solution serves as a cathode fluid which is circulated through one of the compartments to produce a positive electric potential disposed therein. A chromic/chromous couple in a chloride solution serves as an anode fluid which is circulated through the second compartment to produce a negative potential on an electrode disposed therein. The electrode is an electrically conductive, inert material plated with copper, silver or gold. A thin layer of lead plates onto the copper, silver or gold layer when the cell is being charged, the lead ions being available from lead chloride which was added to the anode fluid. If the REDOX cell is then discharged, the current flows between the electrodes causing the lead to deplate from the negative electrode and the metal coating on the electrode will act as a catalyst to cause increased current density.
34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

N80-18338*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AUTOMATIC THERMAL SWITCH Patent Application
Lawrence D. Wing and Joseph W. Cunningham, inventors (to NASA) Filed 30 May 1979 23 p

An automatic heat flow control switch consisting of a thermal transfer plate pivotally mounted between two thermally conductive plates is described. A phase change power unit which includes a plunger is in contact with one of the conductive plates. When the unit is actuated by an increase in heat transmission, the plunger extends and pivots the transfer plate to vary the thermal conduction. An element connected to the transfer plate biases the transfer plate in a predetermined position with respect to the conductive plates. The biasing element, transfer plate, and piston can be arranged to provide either a closed or open thermally conductive path. The switch is to be used to control the temperature of electronic instruments in the Space Shuttle equipment bays.

N80-21671*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AUTOMATIC THERMAL SWITCH Patent Application
Joseph W. Cunningham and Lawrence D. Wing, inventors (to NASA) Filed 21 Dec. 1979 23 p
(NASA-Case-GSC-12553-1; US-Patent-Appl-SN-106192) Avail: NTIS HC A02/MF A01 CSCL 09A

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

CONTROLLED OVERSPRAY SPRAY NOZZLE Patent Application
Willibald P. Prasthofer, inventor (to NASA) Filed 29 Feb. 1980 16 p

A nozzle for suppressing overspray of multingredient ablative materials is described. The nozzle includes a cylindrical inlet which converges to a restricted throat. A curved juncture between the cylindrical inlet and the convergent portion, with a predetermined radius of curvature, affords unrestricted and uninterrupted flow of the ablative material. A divergent bell shaped chamber and an adjustable nozzle exit are utilized which provide a highly effective spray pattern for suppressing overspray to an acceptable level and producing a homogeneous jet of material that adheres well to the substrate.

NASA
**35 INSTRUMENTATION AND PHOTOGRAPHY**

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

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

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**SMALL CONDUCTIVE PARTICLE SENSOR Patent Application**

Israel Taback, inventor (to NASA) (Bionetics Corp., Hampton, Va.) Filed 28 Aug. 1979 14 p Sponsored by NASA

This invention is an electrostatic conductive fiber detector for use in detecting, counting and measuring the length of fibers down to 0.1 mm and below with increased accuracy and reliability over prior art devices. It can be used for detection of fibers suspending in a flowing gas, in a nonflowing gas, or in a vacuum and its accumulated counts over a period of time is essentially unaffected by velocity of the fibers being detected.

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**DISPLACEMENT PROBES WITH SELF-CONTAINED EXCITING MEDIUM Patent**


A transducer that combines a noncontacting displacement probe with a self-contained target is described. The target is held in position against a vibrating surface by a housing which also supports the noncontacting probe. The target vibrates with the surface and the probe senses the vibrations of the target.

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**OPTICAL GYROSCOPE SYSTEM Patent Application**

Willis C. Goss (JPL) and Raymond Goldstein, inventors (to NASA) (JPL) Filed 22 Dec. 1978 35 p Sponsored by NASA

An optical gyroscope is disclosed which has high accuracy at both slow and fast rotation rates. The gyroscope operates alternately in two modes, one mode utilizing an added 90 deg phase shift and the other employing no added phase shift, to provide high sensitivity for a wide range of rotation rates. A novel beam splitter is used which first lets the beam pass through, and is later energized to cause the returned beam to be reflected.

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**FARADAY ROTATION MEASUREMENT METHOD AND APPARATUS Patent Application**

Milton H. Brockman, inventor (to NASA) (JPL) Filed 21 Dec. 1979

A Faraday measuring apparatus utilized in conjunction with the specific receiver array provides a means for comparing the phase of a reference signal in the receiver array to the phase of the light beam is maintained by keeping all fiber portions in curvature.
a tracking loop signal related to the incoming signal, and comparing the phase of the reference signal to the phase of the tracking signal shifted in phase by 90 degrees.

MULTI-CHANNEL TEMPERATURE MEASUREMENT AMPLIFICATION SYSTEM Patent Application
James R. Currie, inventor (to NASA) Filed 29 Nov. 1979 19 p
A multichannel temperature amplification system for solar energy applications is presented. Differential thermocouple outputs are sequentially amplified by a common amplifier and compared with a reference temperature signal in an offset correction amplifier. A poled output signal is provided when a differential output is of a discrete level.

VISCOSITY MEASURING INSTRUMENT Patent
A method and apparatus are provided for enabling the measurement of the viscosity of substances, especially those containing volatiles at elevated temperatures, with greater accuracy and at less cost than before. The apparatus includes a cylinder with a narrow exit opening at one end and a piston which closely slides within the cylinder to apply force against a sample in the cylinder to force the sample through the exit opening. In order to more rapidly heat a sample the ends of the cylinder and piston are tapered and the sample is correspondingly tapered, to provide a large surface to volume ratio. A corresponding coal sample is formed by compressing particles of coal under high pressure in a mold of appropriate shape. Official Gazette of the U.S. Patent and Trademark Office

MULTI-CHANNEL TEMPERATURE MEASUREMENT AMPLIFICATION SYSTEM Patent Application
James R. Currie, inventor (to NASA) Filed 29 Nov. 1979 19 p
A multichannel temperature amplification system for solar energy applications is presented. Differential thermocouple outputs are sequentially amplified by a common amplifier and compared with a reference temperature signal in an offset correction amplifier. A poled output signal is provided when a differential output is of a discrete level.

N80-18358* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
STATIC PRESSURE ORIFICE SYSTEM TESTING METHOD AND APPARATUS Patent
A method and apparatus are presented for pressure testing the static pressure orifices and associated connections used in wind tunnels. A cylindrical module, having in one end an open hemispherical calibration pressure chamber separated from and surrounded by an annular vacuum chamber is placed over the orifice of the system to be tested. O-rings ensure seating and a vacuum seal between the chambered end of the module and the surface around the orifice: one O-ring separates the outer chamber from the outside environment. Ports lead from each of the chambers out the other end of the module to tubes connected to a control box consisting of calibration pressure and vacuum supply lines, bleeder valves, and gauges.

N80-18355* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DISTRIBUTED-SWITCH DICKE RADIOMETERS Patent
A radiometer on an orbiting spacecraft is described which derives high spatial resolution information from terrestrial and atmospheric regions. The N elements or subapertures on the spacecraft transduce electromagnetic energy into electric signals. Many or all of the elements are simultaneously illuminated by
electromagnetic energy radiated from the same region. Identical, parallel processing channels are responsive to the N elements. Each of the channels includes a variable gain amplifier responsive to the signal transduced by its corresponding array elements. The gain of each amplifier is controlled as a function of the output difference when the channel is connected periodically to each of a pair of Dicke noise sources, such as resistors maintained at predetermined temperatures.

Official Gazette of the U.S. Patent and Trademark Office
HIGH TEMPERATURE PENETRATOR ASSEMBLY WITH BAYONET PLUG AND RAMP-ACTIVATED LOCK Patent Application

A penetrator assembly adaptable to the very high temperature environment encountered in space vehicle atmospheric reentry is disclosed. Features of the assembly include a bayonet plug and a ramp activated lock, eliminating threaded surfaces which are subject to oxidation and subsequent failure. Columbium base metal with a silicide coating is used and provision is made for safety wiring of the ramping washers against unintended rotation in place. Application of the penetrator assembly to a high temperature, pressure probe, orifice installation for a space vehicle is illustrated.

ATTACHING OF STRAIN GAGES TO SUBSTRATES Patent

A method and apparatus for attaching strain gages to substrates is described. A strain gage having a backing plate is attached to a substrate by using a foil of brazing material between the backing plate and substrate. A pair of electrodes that are connected to a current source, are applied to opposite sides of the backing plate, so that heating of the structure occurs primarily along the relatively highly conductive foil of brazing material. Field installations are facilitated by utilizing a backing plate with wings extending at an upward incline from either side of the backing plate, by attaching the electrodes to the wings to perform the brazing operation, and by breaking off the wings after the brazing is completed.

Official Gazette of the U.S. Patent and Trademark Office
A velocity servo for continuous scan Fourier interference spectrometer is described. The servo uses an open spectrometer of the double pass retroreflector type having two cat’s eye retroreflectors. The servo uses an open loop, lead screw drive system for one retroreflector with compensation for any variations in speed of drive of the lead screw provided by sensing any variation in the rate of reference laser fringes, and producing an error signal from such variation used to compensate by energizing a moving coil actuator for the other retroreflector optical path, and energizing (through a highpass filter) piezoelectric actuators for the secondary mirrors of the retroreflectors.

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

An apparatus is described for controlling nutation motion in a spinning body, comprised of 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 centered about the nutation peaks. The motor drive is phased to damp nutation motion to zero for stabilization. To increase the noise immunity of the system, when the output of the accelerometer falls below a threshold level, the circuitry operates in an open loop, beat mode where data representing the last accelerometer signal that exceeded that threshold level is stored, and the motor drive is controlled by the stored data. In a second version, the motor is controlled to supply a predetermined amount of nutation motion to a body undergoing testing on a spin table for energy dissipation evaluation. In each version, 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.

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

An apparatus is described for destructively detecting the presence of a substance having predetermined characteristics is disclosed. A discharge grid is provided having a sufficiently high voltage potential across its grid electrodes so that the substance having the predetermined characteristics will cause an electric spark discharge to occur between electrodes. The electric spark discharge alters the predetermined characteristics of the substance by oxidation and/or vaporization so that the substance is no longer detectable by an electric spark discharge. A means for counting the number of electric spark discharges is provided. A count
provides an indication of the concentration of the substance having the predetermined characteristics.) NASA

36 LASERS AND MASERS

Includes parametric amplifiers.

N80-14384* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LASER APPARATUS Patent

A laser apparatus having a pump laser device for producing pump laser energy upon being excited is disclosed. The pump laser device has a resonating cavity for oscillating and amplifying the pump laser energy. A source laser device is used for producing source laser energy upon being excited by the pump laser energy. The source laser device has a resonating cavity for oscillating and amplifying the source laser energy. The source laser’s resonating cavity is coupled with a portion of the pump laser’s resonating cavity.

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

N80-16321* National Aeronautics and Space Administration. Langley Research Center. Langley Station, Va.

LASER DOPPLER VELOCITY SIMULATOR Patent

A method and apparatus for inducing a Doppler frequency shift in a reference beam laser velocimeter light beam to simulate target velocity are described. The light beam is passed through a rotating refractive transparent block positioned between two reference points along the beam which results in a continuous change in the light beam optical path length between the reference points according to a known function. The velocity indicated by the laser velocimeter is compared to the known simulated velocity function for velocimeter testing and calibration.

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DIELECTRIC-LOADED WAVEGUIDE CIRCULATOR FOR CRYOGENICALLY COOLED AND CASCADED MASER WAVEGUIDE STRUCTURES Patent

A dielectrically loaded four port waveguide circulator is used with a reflected wave maser connected to a second port between first and third ports to form one of a plurality of cascaded maser waveguide structures. The fourth port is connected to a waveguide loaded with microwave energy absorbing material. The third (output signal) port of one maser waveguide structure is connected by a waveguide loaded with dielectric material to the first (input) port of an adjacent maser waveguide structure, and the second port is connected to a reflected wave maser by a matching transformer which passes the signal to be amplified into and out of the reflected wavemaser and blocks pumping energy in the reflected wave maser from entering the circulator. A number of cascaded maser waveguide structures are thus housed in a relatively small volume of conductive material placed within a cryogenically cooled magnet assembly.

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N80-18380* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LASER MEASURING SYSTEM FOR INCREMENTAL ASSEMBLIES Patent Application

N80-18380* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LASER MEASURING SYSTEM FOR INCREMENTAL ASSEMBLIES Patent Application
Incremental assemblies such as wire-wrapped frame assemblies used in spark chambers and the like are precisely measured using a system which includes a laser, an interferometer, and a retroreflector. A light source and a photodetector are located adjacent to the incremental assembly and mounted on a movable carriage. The interferometer is also mounted on the movable carriage, while the laser and retroreflector are positioned at either end of the carriage track. The carriage is moved along one edge of the incremental assembly between the retroreflector and the laser, and as the carriage is moved, the light from the light source to the photodetector is interrupted. This produces a trigger command to a control unit which in turn causes a distance measurement to be made. A printout is provided for each sampling trigger command to list such items as ideal position, actual position and amount of error.

A high power metallic halide (CuCl) laser capable of providing 300 watts of output power is disclosed. More specifically it is a laser amplification system and a heat exchanger in a closed loop system. In addition, a molecular dissociation apparatus is provided at the input to the laser amplifier for dissociating the copper chloride into copper atoms and ions and chlorine atoms and ions. The dissociation apparatus includes a hollow cathode tube and an annular ring spaced apart from the tube end. A voltage differential is applied between the annular ring and the hollow cathode tube so that as the copper chloride flows therethrough, it is dissociated into copper and chlorine atoms and ions. The dissociation apparatus includes a hollow cathode tube and an annular ring spaced apart from the tube end. A voltage differential is applied between the annular ring and the hollow cathode tube so that as the copper chloride flows therethrough, it is dissociated into copper and chlorine atoms and ions.

A sodium storage and injection system for delivering atomized liquid sodium to a chemical reactor employed in the production of solar grade silicon is disclosed. The system is adapted to accommodate start-up, shut-down, normal and emergency operations, and is characterized by (1) a jacketed injection nozzle adapted to atomize liquefied sodium and (2) a supply circuit connected to the nozzle for delivering the liquefied sodium. The supply circuit is comprised of a plurality of 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 vessels for maintaining the sodium under pressure.

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

fuse together around the screen. After cooling, the wires are capable of carrying electric current along the now-joined thermoplastics. The novel feature of the invention is the inclusion of conductive elements in an inductive heating fastener. NASA

N80-11468* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

INDUCTION HEATING GUN Patent Application
John D. Buckley, Robert J. Swaim, and Robert L. Fox, inventors (to NASA) Filed 24 Aug. 1979 14 p

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

N80-11469* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

ONE STEP DUAL PURPOSE JOINING TECHNIQUE
John D. Buckley, Robert J. Swaim, and Robert L. Fox, inventors (to NASA) 30 Aug. 1979 8 p

A fastener to be used between two organic matrix composite objects for induction heating and joining purposes was developed. The fastener is comprised of a wire screen made of a high resistance, low reluctance material such as carbon steel. Selected wires of copper or similar conductive material, are integrated within the screen; these wires are insulated in a sheath 20 of enamel or similar oxidation-resistant, high temperature sustaining material. When placed between two sheets of thermoplastic, the screen may be used for induction heating and fusing of the thermoplastic. Upon application of inductive heating technique, the wires become hot and cause the thermoplastic to melt and fuse together around the screen. After cooling, the wires are capable of carrying electric current along the now-joined thermoplastics. The novel feature of the invention is the inclusion of conductive elements in an inductive heating fastener. NASA

N80-12414* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

MODIFIED FACE SEAL FOR POSITIVE FILM STIFFNESS Patent Application
Izhak Etsion (Technion-Israel Inst. of Technol., Haifa) and Abraham Lipshitz, inventors (to NASA) (Technion-Israel Inst. of Technol., Haifa) Filed 7 Nov. 1979 7 p Sponsored by NASA (NASA-Case-LEW-12989; US-Patent-Application-SN-092145) Avail: NTIS HC A02/FA01 CSCL 11A

An invention to improve the film stiffness of a face seal without increasing the sealing and dam area is described. The improved sealing apparatus has a primary seal ring in the form of a nose piece. A spring forces a sealing surface on the seal into sealing contact with a seat to form a face seal. A circumferential clearance seal is formed in series with this face seal by a lip on the nose piece. The width of the surface of the lip is substantially the same as the width of the sealing surface on the face seal. Also, the clearance between the surface on the lip and the shaft is substantially the same as the spacing between the face sealing surfaces on the face seal when the shaft is rotating. The circumferential clearance seal restricts the flow of fluid from a main cavity to an intermediate cavity with a resulting pressure drop. The hydrostatic opening is strongly dependent on the face seal clearance, and the desired axial stiffness is achieved.


APARATUS FOR ELECTROLYTICALLY TAPERED OR CONTOURED CAVITIES Patent
An electrolytic machining apparatus for forming tapered or contoured cavities in an electrically conductive and electrochemically erodible piece is presented. It supports the workpiece and an electrode for movement relatively toward each other and has means for pumping an electrolyte between the workpiece and the electrode.

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Electrophoretic fractional elution apparatus which has a column with a rotating seal joint is described. A thin jet of eluting buffer is directed across the lumen of the electrophoretic column in a direction perpendicular to that of electrophoretic migration. Either the content of the column is rotated with respect to the stationary jet, or the jet is rotated with respect to the column. The system may employ electrophoresis either in free solution or in packed columns.

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

N80-14400* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

A sealing apparatus is described which serves both pressure and thermal sealing functions between adjacent and relatively movable elements of relatively large surfaces. The sealing apparatus has the flexibility required for large movable surfaces, and can accommodate moderate variations in the gap between such surfaces which may be affected by thermal distortion. Sealing is accomplished with a nonabrasive, low frictional material, creating as little resistance as possible to movement of control members and minimal wear and damage to surface coatings.

NASA

N80-18339* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

A sealing apparatus is described which serves both pressure and thermal sealing functions between adjacent and relatively movable elements of relatively large surfaces. The sealing apparatus has the flexibility required for large movable surfaces, and can accommodate moderate variations in the gap between such surfaces which may be affected by thermal distortion. Sealing is accomplished with a nonabrasive, low frictional material, creating as little resistance as possible to movement of control members and minimal wear and damage to surface coatings.

NASA
A spiral wound seal for effecting a seal between two surfaces is described. The seal consists of a strip of gasket material wound into a groove machined into one of the surfaces. The gasket strip is wider than the groove is deep such that a portion of the gasket material protrudes from the groove. The seal is effected by clamping the second surface onto the first surface and thereby compressing the protruding gasket material. NASA


PRECISION RECIPROCATING FILAMENT CHOPPER Patent Application

A chopper for cutting multifilament line is described in which the pull-pull motion of a double edged sliding blade driven by dual solenoids, provides a chop on each motion. The line is fed by a pair of rollers one of which is driven. The chopped line length and chop rate are independently controlled. A jet airstream is provided to dispense chopped lengths of line. NASA


FLARED TUBE ATTACH SYSTEM Patent Application

A flared tube connection is described. It can be disassembled and assembled in a nondestructive manner without wasting, discarding, or damaging any of its parts or any portion of the associated tubing and parts to which it is joined, and features a split ferrule which may be installed or removed in situ and used to couple fluid lines without the necessity of a permanently installed coupling nut. NASA


INTERNAL COMBUSTION ENGINE WITH ELECTROSTATIC DISCHARGING FUELS Patent Application

An internal combustion engine system is disclosed in which a mixture of air and fuel droplets which are electrostatically charged to a selected polarity, e.g., negative, is fed to the engine's chambers. The fuel droplets are of uniform size in the micron range, and tend to be uniformly distributed in each chamber. Each chamber includes an electrode which, at a particular point in the engine's cycle of operation, is electrically connected to a potential of a polarity opposite the polarity of the fuel droplets' charge to initiate electrostatic discharging of the droplets. The discharging produces sparks which initiate the combustion of the fuel droplets. Due to electrically insulating matter in the chambers' walls the charged droplets prior to combustion are heat leak is presented. The compound suspension strap is made from a unidirectional fiberglass epoxy composite material with an ultimate tensile strength and fatigue strength which are approximately doubled when the material is cooled to a cryogenic temperature. Official Gazette of the U.S. Patent and Trademark Office.
repelled away from the walls to minimize combustion quenching.

A method for arresting a moving body using steel cables that elongate to absorb kinetic energy is presented. A sleeve surrounding the cables protects them from chafing and provides an energy absorbing system should the cables fail.

**N80-18398**
National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.
**THERMAL BARRIER SEAL Patent Application**
Milo Surbat (Rockwell International Corp., Downey, Calif.) and John O. Kane, inventors (to NASA) (Rockwell International Corp., Downey, Calif.) Filed 10 Mar. 1980 16 p Sponsored by NASA.
(NASA-Case-MSC-18390-1; US-Patent-Appl-SN-092170) Avail: NTIS HC A02/MF A01 CSCL 11A

A thermal barrier for providing thermal sealing in an elongated space of varying width between adjacent surfaces of first and second members mounted for at least limited movement relative to each other is disclosed. The barrier may include an elongated envelope formed by an elongated sheet of fibrous material centrally and longitudinally folded to provide trailing and leading edges of the barrier. An elongated rigid support plate, the contour of which conforms to the contour of the adjacent surface of one of the members, may be enclosed in the envelope. An elongated core may be confined within the envelope near its leading edge between the rigid support plate and the inner surface of the other side of the envelope. The core is deformable to accommodate the varying width of the elongated space while still maintaining thermal sealing contact between the barrier and the adjacent surfaces of the first and second members.

**N80-18400**
National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
**GAS PATH SEAL Patent Application**

A gas path seal suitable for use with a turbine engine or compressor is described. A shroud wearable or abradable by the abrasion of the rotor blades of the turbine or compressor shrouds the rotor blades. A compliant backing surrounds the shroud. The backing is a yielding deformable porous material covered with a thin ductile layer. A mounting fixture surrounds the backing.

**N80-18399**
National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
**MOVING BODY VELOCITY ARRESTING LINE Patent Application**

A method for arresting a moving body using steel cables that elongate to absorb kinetic energy is presented. A sleeve surrounding the cables protects them from chafing and provides an energy absorbing system should the cables fail.
A circumferential shaft seal in which the seal elements are capable of adequate response to shaft motion is described. The seal is comprised of two sealing rings held to a rotating shaft by means of a surrounding elastomeric band. The rings are segmented and have an inner diameter dimensioned so that the segments can slidably and sealably engage the shaft. Alternative embodiments of the seal concept are described and suggestions for component materials are given.

A handtool for facilitating the removal of printed circuit cards is described. The device is adapted to sit on spaced, parallel rail surfaces of a card rack having a plurality of printed circuit cards. The device includes a cylindrical bar adapted to sit on the rail surfaces of the rack, a blade projected radially from the bar adapted to be received beneath a card rail, and a handle affixed to the bar in diametric opposition to the blade for facilitating manipulation of the blade for unplugging and lifting the card at its rail.

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

Bursts of signals at different frequencies are induced into substructure, adjacent to a borehole. The return signals from each burst of signals are normalized to compensate for the attenuation, experienced by more distant return signals. The peak amplitudes of return signals, above a selected level, are cut off.
and an average signal is produced from the normalized amplitude-
limited return signals of each burst. The averaged signals of the
return signals of all the signal bursts at the different frequencies
are processed to provide a combined signal, whose amplitude is
related to the microfracture density of the substructure adjacent
to the borehole.

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43 EARTH RESOURCES

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

N80-14423 National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.
COAL-SHALE INTERFACE DETECTION SYSTEM Patent
Richard A. Campbell, Jerry L. Hudgins, Paul W. Morris, Harry
Reid, Jr., and Joe E. Zimmerman, inventors (to NASA) Issued
12 Jun. 1979 9 p Filed 3 Nov. 1977
Office CSCL 08H
A coal-shale interface detection system for use with coal
cutting equipment consists of a reciprocating hammer on which
an accelerometer is mounted to measure the impact of the hammer
as it penetrates the ceiling or floor surface of a mine. A pair of
reflectometers simultaneously view the same surface. The outputs
of the accelerometer and reflectometers are detected and jointly
registered to determine when an interface between coal and
shale is being cut through.

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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.

N80-12549 National Aeronautics and Space Administration.
Pasadena Office, Calif.
SCHOTTKY BARRIER SOLAR CELL AND METHOD OF
FABRICATION Patent Application
Richard J. Stirn (JPL) and Yea-chuan M. Yeh, inventors (to NASA)
(JPL) Filed 13 Nov. 1979 33 p
(Contract NAS7-100)
NTIS HC A03/MF A01 CSCL 10A
A Schottky barrier solar cell is described which consists of a
thin substrate of low cost material with at least the top surface
of the substrate being electrically conductive. A thin layer of
heavily doped n-type polycrystalline germanium, with crystalline
sizes in the submicron range, is deposited on the substrate after
a passivation layer is deposited on the substrate to prevent
migration of impurities into the polycrystalline germanium on a
substrate of low-cost conductive material. Then, the polycrystalline
Germanium is recrystallized to increase the crystal sizes in the germanium layer to not less than 5 microns, and preferably considerably more. It serves as a base layer on which a thin layer of gallium arsenide is vapor-epitaxially grown to a selected thickness. Then, a thermally-grown oxide layer of a thickness of several tens of angstroms is formed on the gallium arsenide layer.

**N80-14472** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.  
**SELF-RECONFIGURING SOLAR CELL SYSTEM Patent**  
(NASA-Case-LEW-12586-1; US-Patent-4,175,249;  
A self-reconfiguring solar cell array is disclosed wherein some of the cells are switched so that they can be either in series or in shunt within the array. This feature of series or parallel switching of cells allows the array to match the load to achieve maximum power transfer. Automatic control is used to determine the conditions for maximum power operation and to switch the array into the appropriate configuration necessary to transfer maximum power to the load.  
Official Gazette of the U.S. Patent and Trademark Office

ALUMINIUM OR COPPER SUBSTRATE PANEL FOR SELECTIVE ABSORPTION OF SOLAR ENERGY Patent

A method for making panels which selectively absorb solar energy is disclosed. The panels are comprised of an aluminum substrate, a layer of zinc thereon, a layer of nickel over the zinc layer and an outer layer of solar energy absorbing nickel oxide or a copper substrate with a layer of nickel thereon and a layer of solar energy absorbing nickel oxide distal from the copper substrate.

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SOLAR ENERGY CONTROL SYSTEM Patent Application
James R. Currie, inventor (to NASA) Filed 29 Nov. 1979 18 p
(NASA-Case-MFS-25287-1; US-Patent-Appl-SN-098570) Avail: NTIS HC A02/MF A01 CSCL 10A

A solar energy control system for a hot air type solar energy heating system wherein thermocouples are arranged to sense the temperature of a solar collector, a space to be heated, and a top and bottom of a heat storage unit is described. Pertinent thermocouples are differentially connected together, and these are employed to effect the operation of dampers, a fan, and an auxiliary heat source. In accomplishing this, the differential outputs from the thermocouples are amplified by a single amplifier by multiplexing techniques. Additionally, the amplifier is corrected as to offset by including as one multiplex channel a common reference signal.

NASA

N80-18550* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD OF FABRICATING A PHOTOVOLTAIC MODULE OF A SUBSTANTIALLY TRANSPARENT CONSTRUCTION Patent

A method characterized by the steps of positioning a plurality of uniformly dimensioned photovoltaic cells in registered relation with a plurality of openings formed in a planar tool is disclosed. The method allows access to the P contact surface of each of the cells. The steps of the method are: (1) connecting the N contact surface of alternate cells to the P contact surface of the cells interposed therebetween, (2) removing therefrom residue of solder flux, (3) applying to the N contact surfaces of the cells a transparent adhesive, (4) placing a common transparent cover plate in engaged relation with the adhesive, (5) placing a film over the circular openings for hermetically sealing the openings, and (6) establishing a vacuum between the film and the cover plate.

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

N80-18551* National Aeronautics and Space Administration. Pasadena Office, Calif.

DRIVER FOR SOLAR CELL I-V CHARACTERISTIC PLOTS Patent

A bipolar voltage ramp generator which applies a linear voltage through a resistor to a solar cell for plotting its current versus voltage (I-V) characteristic between short circuit and open circuit conditions is disclosed. The generator has automatic stops at the end points. The resistor serves the multiple purpose of providing a current sensing resistor, setting the full-scale current value, and providing a load line with a slope approximately equal to one, such that it will pass through the origin and the approximate
center of the I-V curve with about equal distance from that center to each of the end points.

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N80-18562* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

SOLAR CELL ANGULAR POSITION TRANSDUCER Patent

An angular position transducer utilizing photocells and a light source is disclosed. The device uses a fully rotatable baffle which is connected via an actuator shaft to the body whose rotational displacement is to be measured. The baffle blocks the light path between the light source and the photocells so that a constant semicircular beam of light reaches the photocells. The current produced by the photocells is fed through a resistor, a differential amplifier measures the voltage drop across the resistor which indicates the angular position of the actuator shaft and hence of the object.

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N80-18565* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

FLEXIBLE FORMULATED PLASTIC SEPARATORS FOR ALKALINE BATTERIES Patent Application

A flexible separator for alkaline batteries is disclosed. The separator is comprised of a coating which is applied to a nonwoven porous substrate such as sheets or mats of asbestos or other materials which are inert with respect to the alkaline electrolyte of the battery. The coating material comprises a polyphenylene oxide polymer, an organic additive and inorganic, and organic fillers which comprise 55% by volume or less of the coating material. Preferably, at least one inorganic filler material which is reactive with the electrolyte is included to produce desirable pores in the coating. The organic additive is a polymeric polyester material which is hydrolyzed by the alkaline electrolyte to improve conductivity of the coating.

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N80-18567* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CATALYST SURFACES FOR THE CHROMOUS/CHROMIC REDOX COUPLE Patent Application
Jose D. Giner (Giner, Inc.) and Kathleen J. Cahill, inventors (to NASA) Giner, Inc. Filed 27 Jul. 1979 15 p Sponsored by NASA

An electricity producing cell of the reduction-oxidation type is disclosed. The cell is divided into two compartments by a membrane and each compartment contains a solid inert electrode. A ferrous/ferric couple in a chloride solution serves as a cathode fluid which is circulated through one of the compartments to produce a positive electric potential disposed therein. A chromic/chromous couple in a chloride solution serves as an anode fluid which is circulated through the second compartment to produce a negative potential on an electrode disposed therein. The electrode is an electrically conductive, inert material plated with copper, silver or gold. A thin layer of lead plates onto the copper, silver or gold layer when the cell is being charged, the lead ions being available from lead chloride which has been added to the anode fluid. If the REDOX cell is then discharged, the current flows between the electrodes causing the lead to deplate from the negative electrode and the metal coating on the electrode will act as a catalyst to cause increased current density.
PORTABLE HEATABLE CONTAINER Patent
Lien C. Yang, inventor (to NASA) Issued 18 Mar. 1980

A container is provided which can be designed to heat its outer surface to sterilize it, or to heat its inner surface and any contents therewithin. In a container that self sterilizes its outer surface, the container includes a combustible layer of thermite-type pyrotechnic material which can be ignited to generate considerable heat, and a thin casing around the combustible layer which is of highly thermally conductive materials such as aluminum which 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.

WIND WHEEL ELECTRIC POWER GENERATOR Patent
John W. Kaufman, inventor (to NASA) Issued 4 Mar. 1980
8 p Filed 24 Feb. 1978 Supersedes N78-22469 (16 - 13, p 2137)

Wind wheel electric power generator apparatus includes a housing rotatably mounted upon a vertical support column. Primary and auxiliary funnel-type, venturi ducts are fixed onto the housing for capturing wind currents and conducting to a bladed wheel adapted to be operatively connected with the generator apparatus. Additional air flows are also conducted onto the bladed wheel; all of the air flows positively effecting rotation of the wheel in a cumulative manner. The auxiliary ducts are disposed at an acute angle with respect to the longitudinal axis of the housing, and this feature, together with the rotatability of the housing and the ducts, permits capture of wind currents within a variable directional range.

AMPLIFIED WIND TURBINE APPARATUS Patent Application
William N. Myers and inventors (to NASA) and Leopold A. Hein Filed 12 Mar. 1980
16 p
(NASA-Case-MFS-23830-1; US-Patent-Appl-SN-129780) Avail: NTIS HC A02/MF A01 CSCL 10A

An amplified wind turbine apparatus is disclosed wherein ambient inlet air is prerotated in an air rotation chamber having a high pressure profile. A second rotation chamber adjacent and downstream of the turbine has a low pressure core profile whereby flow across the turbine is accelerated and thereafter exits the turbine apparatus through a draft anti-interference device. The draft device eliminates interference with ambient winds at the outlet of the turbine apparatus. Pivotable vanes controlled in response to prevailing wind direction admit air to the chambers and aid in imparting rotation.
45 ENVIRONMENT POLLUTION
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N80-14679* National Aeronautics and Space Administration. Pasadena Office, Calif.

OZONATION OF COOLING TOWER WATERS Patent
Continuous ozone injection into water circulating between a cooling tower and heat exchanger with heavy scale deposits inhibits formation of further deposits, promotes flaking of existing deposits, inhibits chemical corrosion and controls algae and bacteria.

OFFICIAL GAZETTE OF THE U.S. PATENT AND TRADEMARK OFFICE

N80-19664*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

AUTOMATED SYRINGE SAMPLER Patent Application
The invention is housed within a housing and positionable within a test fluid medium where a pump causes continuous test fluid flow therethrough via inlet filters and a conduit. A plurality of sampling devices are disposed on a rack slidably received in the housing and are responsive to a remote signal received through an antenna to a receiver to activate circuitry elements. When activated the circuitry provides power individually, collectively or selectively to servomechanisms thereby moving the actuator arm and its attached jawed bracket supporting an evacuated tube toward stationary needle. The septum is punctured by the open end of the needle contained within the protective sleeve and a sample of the fluid test medium in the conduit flows through the needle and is transferred to the tube.

N80-12642*# National Aeronautics and Space Administration. Pasadena Office, Calif.

GEOLOGICAL ASSESSMENT PROBE Patent Application
A probe is described which can be installed in a side hole that extends from a bore hole in the earth, to assess the permeability of the strata surrounding the borehole. The probe is elongated and has seals spaced the walls of the side hole to form chambers sealed from one another. A tracer fluid injector on the probe can inject a tracer fluid into one of the chambers, while a tracer fluid detector located in another chamber can detect the tracer fluid, to thereby sense the permeability of the strata surrounding the side hole. The probe can include a train of modules, with each module having an inflatable packer which is inflated by the difference between the borehole pressure and the strata pressure.

46 GEOPHYSICS
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

N80-17079* National Aeronautics and Space Administration. Pasadena Office, Calif.

BOREHOLE GEOLOGICAL ASSESSMENT Patent
A method and apparatus are discussed for performing geological assessments of a formation located along a borehole, and a boring tool that bores a pair of holes into the walls of the borehole and into the surrounding strata along with a pair of probes which are installed in the holes. One of the probes applies an input such as a current or pressured fluid, and the other probe senses a corresponding input which it receives from the strata.

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46 GEOPHYSICS

N80-14603 National Aeronautics and Space Administration, Pasadena Office, Calif.

SYSTEM FOR REAL-TIME CRUSTAL DEFORMATION MONITORING Patent

A system is described for use in detecting earth crustal deformation using an RF interferometer technique for such purposes as earthquake predictive research and eventual operational predictions. A lunar based RF transmission or transmissions from earth orbiting satellites are received at two locations on Earth, and a precise time dependent phase measurement is made of the RF signal as received at the two locations to determine two or three spatial parameters of the antenna relative positions. The received data are precisely time tagged and land-line routed to a central station for real-time phase comparison and analysis. By monitoring the antenna relative positions over an extended period of months or years, crustal deformation of the Earth can be detected.

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51 LIFE SCIENCES (GENERAL)
Includes genetics.

N80-11756 National Aeronautics and Space Administration, Langley Research Center, Hampton, Va.

INDIRECT MICROBIAL DETECTION Patent Application
Judd R. Wilkins, inventor (to NASA) Filed 17 Aug. 1979 18 p
(NASA-Case-LAR-12520-1; US-Patent-Appl-SN-067596) Avail: NTIS HC A02/MF A01 CSCL 06C

The 'invention' disclosed is an indirect microbial detection method. The growth of microorganisms in a sample is detected and monitored by culturing microorganisms in a growth medium and detecting a change in potential between two electrodes separated from the microbial growth by a barrier which is permeable to charged particles but microorganism impermeable.

NASA

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

N80-18667 National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

OCEANIC WAVE MEASUREMENT SYSTEM Patent

An oceanic wave measured system is disclosed wherein wave height is sensed by a barometer mounted on a buoy. The distance between the trough and crest of a wave is monitored by sequentially detecting positive and negative peaks of the output of the barometer and by combining (adding) each set of two successive half cycle peaks. The timing of this measurement is achieved by detecting the period of a half cycle of wave motion. Official Gazette of the U.S. Patent and Trademark Office

N80-16714 National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Tex.

METHOD AND APPARATUS FOR ELIMINATING LUMINOL INTERFERENCE MATERIAL Patent

A method and apparatus for removing porphyrins from a fluid sample which are unrelated to the number of bacteria present
in the sample and prior to combining the sample with luminol reagent to produce a light reaction is disclosed. The method involves a pre-incubation of the sample with a dilute concentration of hydrogen peroxide which inactivates the interfering soluble porphyrins. Further, by delaying taking a light measurement for a predetermined time period after combining the hydrogen peroxide-treated water sample with a luminol reagent, the luminescence produced by the reaction of the luminol reagent with ions present in the solution, being short lived, will have died out so that only porphyrins within the bacteria which have been released by rupturing the cells with the sodium hydroxide in the luminol reagent, will be measured. The measurement thus obtained can then be related to the concentration of live and dead bacteria in the fluid sample.

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


A method for separating biological cells by suspending a mixed cell population in a two-phase polymer system is described. The polymer system consists of droplet phases with different surface potentials for which the cell populations exhibit different affinities. The system is subjected to an electrostatic field of sufficient intensity to cause migration of the droplets with an attendant separation of cells.

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

N80-14684* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.


A method and apparatus is described for safely reducing abnormally high intraocular pressure in an eye during a predetermined time interval. This allows maintenance of normal intraocular pressure during glaucoma surgery. A pressure regulator of the spring-biased diaphragm type is provided with additional bias by a column of liquid. The hypodermic needle can be safely inserted into the anterior chamber of the eye. Liquid is then bled out of the column to reduce the bias on the diaphragm of
the pressure regulator and, consequently, the output pressure of the regulator. This lowering pressure of the regulator also occurs in the eye by means of a small second bleed path provided between the pressure regulator and the hypodermic needle.

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DIALYSIS SYSTEM Patent

The improved hemodialysis system utilizes a second polymeric membrane having dialyzate in contact with one surface and a urea decomposition solution in contact with the other surface. The membrane selectively passes urea from the dialyzate into the decomposition solution, while preventing passage of positively charged metal ions from the dialyzate into the solution and ammonium ions from the solution into the dialyzate.

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APPARATUS FOR ENDOSCOPIC EXAMINATION Patent

An endoscope is having a propulsion mechanism and at least one transmitter at the distal end transmitting bursts of energy waves (radio frequency or ultrasonic) for tracking the position of the distal end through the use of two or more transducers on the anterior or lateral surfaces of a patient is described. The propulsion mechanism which consists of two radially expandable bladders separated by an axially expandable bellows with only the forward bladder attached to the distal end is discussed. Alternate mechanisms are reported. A sheath on the endoscope which includes material having a sharp melting point slightly above body temperature so that the sheath is made flexible at selected sections by applying current to separate heating wires in the sections of the sheath is described.

Official Gazette of the U.S. Patent and Trademark Office
N80-18691* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

INDUCTION POWERED BIOLOGICAL RADIOSONDE Patent

An induction powered implanted monitor for epidurally measuring intracranial pressure and telemetering the pressure information to a remote readout is disclosed. The monitor utilizes an inductance-capacitance (L-C) oscillator in which the C comprises a variable capacitance transducer, one electrode of which is a small stiff pressure responsive diaphragm. The oscillator is isolated from a transmitting tank circuit by a buffer circuit and all electric components in the implanted unit except an input and an output coil are shielded by a metal housing.

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SMOOTHING FILTER FOR DIGITAL TO ANALOG CONVERSION Patent

An electronic filter comprised of three active filter sections (A, B, C) is provided to smooth the stepped signal from a digital to analog converter. The first section has a noninverting low pass filter transfer function, and the second has an inverting transfer function designed to pass a narrow frequency band centered at the step frequency of the stepped output signal with sharp cutoff on either side of that narrow band. The third section adds the noninverted output of the first section to the inverted output of the second section. This third section has a lead lag transfer function designed to reduce the phase angle between the signal at its output terminal and the stepped signal at the input of the first section.

NASA

N80-10799* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

PORTABLE BREATHING SYSTEM Patent

A semiclosed-loop rebreathing system is discussed for use in a hostile environment. A packed bed regenerative heat exchanger providing two distinct temperature humidity zones of breathing gas with one zone providing cool, relatively dry air and the second zone providing hot, moist air is described.

A.W.H.

N80-21987* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MEMORY-BASED PARALLEL DATA OUTPUT CONTROLLER Patent Application

A memory-based parallel data output controller which employs associative memories and memory mapping to decommutate multiple channels of telemetry data is described. The output controller contains a random access memory (RAM) addressed by a word counter which outputs an encoded peripheral device number and a most/least significant bit (MSB/LSB)-first flag.
The device number and a bit counter address a second RAM which contains START and STOP flags to pick out the required bits. The MSB/LSB, START and STOP flags, and the serial input data go to a control block which selectively fills a shift register used to drive the parallel data output bus. A strobe pulse enables a decoder to select the appropriate peripheral device. A microcomputer connected to an address bus can be used to set the contents of the RAMs via multiplexers using the technique of memory mapping.

An ion source using the cyclotron resonance principle is presented. A miniaturized ion source device in an air gap of a small permanent magnet with a substantially uniform field in the air gap of about 0.5 inches is described. The device and permanent magnet are placed in an enclosure which is maintained at a high vacuum into which a sample gas is introduced. A discussion of how the invention avoids the problem of getting the ion beam coupled into the utilization system is presented.

A wide angle optical field flattening system for a multispectral scanner is described which provides a large field angles and high resolution at low f-numbers. The system utilizes a basic optical element in the form of a first flat surface of a reflecting element which directs a ray bundle to a second spherical surface. The second spherical surface reflects the bundle to a field flattener coating on a third spherical surface located intermediate of the first flat surface and the second spherical surface. The third spherical surface forms an exit ray bundle on a flattened image plane with a lower f-number than that reflected from the field flattener coating. The exit ray bundle is passed through a filter and is detected by a detector.
through a coating to the image plane and to a sensing or scanning surface.

A method and apparatus for projecting and focusing parallel laser light beams from a laser Doppler velocimeter on a target area is presented. The system which includes three lenses is described. Two lenses work together as a fixed afocal lens combination. The third lens is a movable scanning lens. Parallel laser beams travel from the velocimeter through the scanning lens and through the afocal lens combination and converge. The constant focal volume and crossbeam angle which are maintained during the scan are discussed.

An apparatus is described for indicating the instantaneous angular deflection of an object about a selected axis without mechanical contact with the object. Light from a light source is transmitted through a flat refractor to a converging lens which focuses the light through another flat refractor onto a differential photocell. The first flat refractor is attached to the object such that when the object is deflected about the selected axis the refractor is also deflected about that axis. The two flat refractors are identical and they are placed an equal distance from the converging lens as are the light source and the photocell. The output of the photocell which is a function of image displacement is fed to a high gain amplifier that drives a galvanometer which rotates the second flat refractor. The second refractor is rotated so that the image displacement is very nearly zero making the galvanometer current a measure of the deflection of the object about the selected axis.

A method and apparatus is disclosed for frequency modulating radiation, such as from a laser, for optoacoustic detectors, interferometers, heterodyne spectrometers, and similar devices using two oppositely reciprocating cat's-eye retro-reflectors to Doppler modulate the radiation. By reciprocally moving both retroreflectors, the center of mass is maintained constant to permit smooth operation at many Hertz. By slightly offsetting the axis of one retroreflector relative to the other, multiple passes a light beam may be achieved for greater Doppler shifts with
the same reciprocating motion of the retroreflectors. A Doppler shift of \(2(v/c)V_0\) occurs for each pass. NASA

**METHOD AND APPARATUS FOR SLICING CRYSTALS**


The crystal slicing method is described as follows. A crystal is sliced in a plane parallel to flat, opposed parallel end faces of the crystal. The end faces of the crystal are gripped by a pair of opposed, perforated platens of a pair of vacuum chambers, one of which is translatable relative to the other. A blade cuts the crystal through the desired plane. A spring biases one of the vacuum chambers away from the other vacuum chamber while both of the faces are gripped by the vacuum chambers and the blade is cleaving the crystal. A sliced portion of the crystal gripped by one of the vacuum chambers is pulled away from the remainder of the crystal gripped by the second vacuum chamber when the crystal was cleaved by the blade through the plane. Official Gazette of the U.S. Patent and Trademark Office
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