## ACCESSION NUMBER RANGES

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Annotated references to NASA-owned inventions covered by U.S. patents and applications for patent that were announced in Scientific and Technical Aerospace Reports (STAR) between July 1975 and December 1975.
This Supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, for $3.00. For copies mailed to addresses outside the United States, add $2.50 per copy for handling and postage.
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 Section of Issue 04 (January 1974), the Abstract Section for all subsequent issues, and the Index Section for the most recent issue.

The 180 citations published in this issue of the Abstract Section cover the period July 1975 through December 1975. The Index Section contains references to the 2905 citations covering the period May 1969 through December 1975.

**ABSTRACT SECTION (SECTION 1)**

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

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

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

These data elements appear 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 FROM
PATENT ABSTRACTS BIBLIOGRAPHY

NASA SPONSORED DOCUMENT | AVAILABLE ON MICROFICHE
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NASA ACCESSION NUMBER | N76-16613* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
TITLE | VARIABLE DIHEDRAL SHUTTLE ORBITER Patent Application
INVENTORS | Bernard Spencer, Jr., John W. Wilkey, Jr., and Beverly Z. Henry, Jr., inventors (to NASA) Filed 11 Feb. 1975 10 p
ABSTRACT | An aircraft configuration is described which yields efficient flight at both subsonic and hypersonic speeds and which permits the wings to be protected from the hostile heat environment of orbital reentry. The essential feature is a variable dihedral wing which may be folded out during flight to adjust the aircraft's flight characteristic as the speed decreases. During hypersonic flight the wings are folded upright against the fuselage, while for the lowest speed operation the wings are fully extended in a horizontal manner. Intermediate positions of extension are used for intermediate speed ranges.

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INDEX SECTION (SECTION 2)

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

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

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

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

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

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

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

HOW TO USE THIS PUBLICATION TO IDENTIFY NASA INVENTIONS

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

(1) **Using Subject Category:** To identify all NASA inventions in any one of the subject categories in this issue of NASA PAB, select the desired Subject Category in the Abstract Section (Section 1) and find the inventions abstracted thereunder. For previous NASA PAB issues, the Table of Contents to Section 1 should be examined as the subject categories were changed beginning with NASA PAB(07).

(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 Office 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 Office, Washington, D.C. 20231, for fifty cents a copy.

Copies of pending NASA applications for patent abstracted in NASA PAB are sold by the National Technical Information Service, Springfield, Virginia 22161, at the price shown in the citation. Microfiche are sold at the established unit price of $2.25. When ordering copies of an application for patent from NTIS, the U.S. Patent Application Serial Number listed in the index or shown in the citation for each abstract should be used to identify the desired application for patent.

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, National Aeronautics and Space Administration, Washington, D.C. 20546. Inquiries should refer to the NASA Case Number, the Title of the Invention, and the U.S. Patent Number or the U.S. Application Serial Number assigned to the invention as shown in NASA PAB.

The NASA Patent Counsel having cognizance of the invention is determined by the first three letters or prefix of the NASA Case Number assigned to the invention. The addresses of NASA Patent Counsels are listed alongside the NASA Case Number prefix letters in the following table. Formal application of license must be submitted on the NASA Form, Application for NASA Patent License, which is available upon request from any NASA Patent Counsel.
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Title 14—Aeronautics and Space

Chapter V—National Aeronautics and Space Administration

PART 1245—PATENTS

Subpart 2—Patent Licensing Regulations

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

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

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1245.211 Revocation of licenses.
1245.212 Appeals.
1245.213 Litigation.
1245.214 Address of communications.

AUTHORITY: The provisions of this Subpart 2 issued under 42 U.S.C. 2457, 2457(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 the National Aeronautics and Space Administration holds title on behalf of the United States.

(b) "To practice an invention" 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.

(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 claimed in 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.

(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 803 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 responsibilities under the National Aeronautics and Space Act of 1958, as amended (42 U.S.C. 2451), to provide for the widest practical dissemination and utilization of this new technology. In addition, NASA has been given unique requirements to protect the inventions resulting from NASA activities and to promulgate licensing regulations to encourage commercial use of these inventions.

(b) NASA-owned inventions will best serve the interests of the United States when they are brought to practical application in the shortest time possible. Although NASA encourages the nonexclusive licensing of its inventions to promote competition and achieve their widest possible utilization, the commercial development of certain inventions calls for a substantial capital investment. Manufacturers may be unwilling to risk under such a license, NASA, a Federal agency, may itself 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 will consider the necessity for further technical and market development of the invention, the capabilities of prospective licensees, the proposed plans to undertake the required investment and development, and the impact on competitors. 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 licensing small businesses and minority business enterprises, as well as economically depressed, low income and labor surplus areas.

(d) All licenses for inventions shall be by express written instruments. No license shall be granted either expressly or by implication, for a NASA invention except as provided for in §§ 1245.203 and 1245.204. Any existing or future treaty or agreement between the United States and any foreign government.

§ 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, subject to the provisions of this section.

(2) The duration of the license shall be for a period as specified in the license.

(3) The license shall require the licensee to achieve the practical application of the invention and to then practice the invention for the duration of the license.

(4) The license may be granted for all or less than all fields of use of the invention, 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-term nonexclusive licenses. A nonexclusive, revocable license for a special invention, as defined in § 1245.201, shall be granted upon 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 nonexclusive license 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 funding of the invention by the Government or under a nonexclusive license requested by any applicant pursuant to this Subpart, 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 same manner as specified in section 306(a) (1) or (2) of the National Aeronautics and Space Act of 1958 as amended (42 U.S.C. 2457(a) (1) or (2)), a revocable, nonexclusive, royalty-free license for the practice of such invention, together with the right to grant sublicenses of the same scope to the extent the contractor was legally obligated to do so at the time the contract was awarded. Such license and right is nontransferable except to the successor of that part of the contractor's business to which the invention pertains.

(b) Miscellaneous licenses. Subject to any outstanding licenses, nothing in this subpart shall preclude the Administrator from granting other licenses for inventions, when he determines that do so in the best interest of the public and American industry. Following circumstances wherein such licenses may be granted:

(1) in consideration of the settlement of an interference;
(2) in consideration of a release of a claim of infringement;
(3) in exchange for or as part of the consideration for a license under adversely held patent(s).

§ 1245.205 Publication of NASA inventions available for license.

(a) A notice will be periodically published in the Federal Register listing inventions available for licensing. Abstracts of the inventions will also be published in 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(b) shall be submitted to the NASA Assistant General Counsel for Patent Matters. In addition to the requirements set forth in § 1245.206(b), the application for an exclusive license shall include:

(1) An applicant's status, if any, in 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; and
   (v) Location in an area designed by the Government as economically depressed.

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

§ 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 Assistant General Counsel for Patent Matters to determine the conformity and appropriateness of the application for license and the availability of the specific invention for the license requested. The Assistant General Counsel for Patent Matters will forward all applications for license conforming to §§ 1245.206(b) and 1245.207(b) to the NASA Inventions and Contributions Board when the invention is available for consideration of the requested license. Prior to forwarding applications for exclusive license, the Inventions and Contributions Board, notice in writing will be given to each nonexclusive license applicant advising of the receipt of the application for the exclusive license and providing each nonexclusive licensee with a 30-day period for submitting either evidence that practical application of the invention has occurred or is about to occur or, an application for an exclusive license for the invention.

(b) Recommendations of Inventions and Contributions Board. The Inventions and Contributions Board shall, in accordance with the basic considerations set forth in §§ 1245.202 and 1245.203, evaluate all applications for license forwarded by the Assistant General Counsel for Patent Matters. Based upon the facts presented to the Inventions and Contributions Board in the application and other facts in its possession, the Inventions and Contributions Board shall recommend to the Administrator: (1) Whether a nonexclusive or exclusive license should be granted, (2) the identity of the licensee, and (3) any special terms or conditions of the license.

(c) Determination of Administrator and grant of exclusive licenses. The Administrator shall review the recommendations of the Inventions and Contributions Board and shall determine whether to grant the nonexclusive license as recommended by the Board. If the Administrator determines to grant the license, the license will be granted upon the negotiation of the appropriate terms and conditions by the Office of General Counsel.

§ 1245.209 Royalties and fees.

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

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

§ 1245.210 Reports.

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

§ 1245.211 Revocation of licenses.

(a) Any license granted pursuant to § 1245.203 may be revoked, either in part or in its entirety, by the Administrator if in his opinion the licensee at any time shall default in making any report required by the license, or shall make any false report, or shall commit any breach of any covenant or agreement therein contained, and shall fail to remedy any such default, false report, or breach within 30 days after written notice, or if the patent is deemed unenforceable either by the Attorney General or a final decision of a U.S. court.

(b) Any license granted pursuant to § 1245.204(a) may be revoked, either in part or in its entirety, by the Administrator if in his opinion the best interest of the United States would be served by the granting of an exclusive license for the invention advising of the receipt of the application for exclusive license submitted in accordance with § 1245.207, or the licensee at any time shall breach any covenant or agreement contained in the license, and shall fail to remedy any such breach within 30 days after written notice thereof.

(c) Before revoking any license granted pursuant to this subpart 2 for any cause, there will be furnished to the licensee a written notice of intention to revoke the license, and the licensee will be allowed 30 days after such notice in which to appeal and request a hearing before the Inventions and Contributions Board on the question. After a hearing, the Inventions and Contributions Board shall transmit to the Administrator the record of proceedings, including the findings of fact and recommendations whether the license should be revoked either in part or in its entirety. The Administrator shall review the recommendation of the Board and determine whether to revoke the license in part or in its entirety. Revocation of a license shall include revocation of all sublicences which have been granted.

§ 1245.212 Appeals.

Any person desiring to file an appeal pursuant to § 1245.211(c) shall address the appeal to Chairman, 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 offer evidence in support of his appeal. The procedures in any such matter shall be determined by the Administrator. The Board shall make findings of fact and recommendations with respect to disposition of the appeal. The decision on the appeal shall be made by the Administrator, and such decision shall be final and conclusive, except on questions of law, unless determined by a court of competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence.

§ 1245.213 Litigation.

An exclusive licensee shall be granted the right to sue at his own expense any party who infringes a right that is protected in his license and covered by the licensed patent. The licensee may join the Government, upon consent of the Attorney General, as a party defendant in such suit, but without expense to the Government and the licensee shall pay costs and any final judgment or decree that may be rendered against the Govern-
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 2 are effective April 1, 1972.

JAMES C. FLETCHER, Administrator.

NASA 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.
### 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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#### 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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19 **SPACECRAFT INSTRUMENTATION** 7
For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.

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

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

23 **CHEMISTRY AND MATERIALS (GENERAL)** 8
Includes biochemistry and organic chemistry.

24 **COMPOSITE MATERIALS** 9
Includes laminates.

25 **INORGANIC AND PHYSICAL CHEMISTRY** 10
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.

26 **METALLIC MATERIALS** 10
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 **NONMETALLIC MATERIALS** 11
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 **PROPELLANTS AND FUELS** N.A.
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)** 12
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 **COMMUNICATIONS** 13
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** 17
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** 25
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** 26
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** 36
Includes parametric amplifiers.

37 **MECHANICAL ENGINEERING** N.A.
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** 44
Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

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

42 **GEOSCIENCES (GENERAL)** N.A.
43 EARTH RESOURCES  N.A.
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  N.A.
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS  N.A.
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  N.A.
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)  N.A.
Includes genetics.

52 AEROSPACE MEDICINE  N.A.
Includes physiological factors; biological effects of radiation; and weightlessness.

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

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

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

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

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

60 COMPUTER OPERATIONS AND HARDWARE  N.A.
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.
71 **ACOUSTICS**  N.A.  
Includes sound generation, transmission, and attenuation.  
For noise pollution see 45 Environment Pollution.

72 **ATOMIC AND MOLECULAR PHYSICS**  N.A.  
Includes atomic structure and molecular spectra.

73 **NUCLEAR AND HIGH-ENERGY PHYSICS**  53  
Includes elementary and nuclear particles; and reactor theory.  
For space radiation see 93 Space Radiation.

74 **OPTICS**  54  
Includes light phenomena.

75 **PLASMA PHYSICS**  N.A.  
Includes magnetohydrodynamics and plasma fusion.  
For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

76 **SOLID-STATE PHYSICS**  55  
Includes superconductivity.  
For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

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

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

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

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

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

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

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

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

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

88 **SPACE SCIENCES (GENERAL)**  N.A.

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

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

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

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

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

**GENERAL**  
99 **GENERAL**  N.A.

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Note: N.A. means that no abstracts were assigned to this category for this issue.

Section 2 • Indexes

- SUBJECT INDEX
- PERSONAL AUTHOR INDEX
- CORPORATE SOURCE INDEX
- CONTRACT NUMBER INDEX
- REPORT/ACCESSION INDEX
02 AERODYNAMICS
Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also 34 Fluid Mechanics and Heat Transfer.

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

SURFACE FINISHING Patent Application

An airfoil configuration and manufacturing process was designed to reduce or eliminate air turbulence created by surface irregularities in metal due to rivets, wrinkles, and butt-joints. The metal surface of an airfoil was cleaned, then coated with a thin layer of a fluid adhesive over which a sheet of thin plastic film was stretched. Tension was applied to the film and the resultant surface was squeezed to cause the adhesive to conform to the irregularities, remove any bubbles, and smooth out any wrinkles in the film. The adhesive was then allowed to set. The resulting surface is smooth and relatively free of the normal irregularities present in the standard metal airfoil, particularly for low speed aircraft.

SATELLITE AIDED VEHICLE AVOIDANCE SYSTEM Patent

An improved satellite aided vehicle avoidance system is described. The exact range from a protected vehicle to an intruding vehicle with mutual collision heading and velocity is derived without signal transmission by the protected vehicle or use of synchronized time reference devices by a repeated series of signals broadcast from a satellite to all participating vehicles. An improved, reliable, and cost effective system is provided for aiding a vehicle operator to avoid collision with intruding aircraft.

Official Gazette of the U.S. Patent Office

N75-23476* National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.

N75-30132* National Aeronautics and Space Administration.
Pasadena Office, Calif.

Official Gazette of the U.S. Patent Office
05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics.

N76-24718* National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.

INSULATED ELECTROCARDIOGRAPHIC ELECTRODES Patent

An integrated system is disclosed including an insulated electrode and an impedance transformer which can be assembled in a small plastic housing and used for the acquisition of electrocardiographic data. The electrode may be employed without a paste electrolyte and may be attached to the body for extended usage without producing skin reaction. The electrode comprises a thin layer of suitable nontoxic dielectric material preferably deposited by radio frequency sputtering onto a conductive substrate. The impedance transformer preferably comprises an operational amplifier having an FET input stage connected in the unity gain configuration which provides a very low lower cut-off frequency, a high input impedance with a very small input bias current, a low output impedance, and a high signal-to-noise ratio.

An aerodynamically balanced high-lift aircraft is proposed in which the problems of large nose-down pitching moments generated by the flap high-lift forces, the loss of trim lift during high-lift flight and the yawing moments caused by the loss of an engine are solved without the use of large horizontal and vertical tails. A wing is carried by, and bounced on the tips by spaced-parallel fuselages; horizontal tails are mounted only onto the outboard surfaces of the wing-tip fuselages, the centroid-of-lift of the high-lift flaps is located substantially at the center of gravity of the aircraft and the exhausts of the engines are emitted in the vertical plane of symmetry of the aircraft. Yawing moments occurring during flight with an engine inoperative are reduced; the horizontal tails carry an upload and contribute positive trim lift; large nose-down pitching moments generated by the high-lift flaps are minimized and noise levels are reduced.

N76-25915* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SHOULDER HARNESS AND LAP BELT RESTRAINT SYSTEM Patent

A shoulder harness and lap belt restraint system are provided where the lap belt is combined with the shoulder harness so that a single fastening secures both the shoulder strap and the lap belt.

N76-25914* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

HIGH LIFT AIRCRAFT Patent
07 AIRCRAFT PROPULSION AND POWER
Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

N75-24736* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
REVERSED COWL FLAP INLET THRUST AUGMENTOR Patent
An adjustable airfoil is described for varying the geometry of a jet inlet and an ejector inlet in a jet engine for providing thrust augmentation and noise reduction. The airfoil comprises essentially a plurality of segments which are extended radially outward and retracted relative to the longitudinal axis of the engine as a function of a change in the pressure differential between the upstream and downstream surfaces of the airfoil. A servo mechanism responsive to the change in the pressure differential is coupled to the airfoil to extend and retract the airfoil segments to maintain the pressure at a maximum on the downstream side of the airfoil relative to the pressure on the upstream side of the airfoil. At low speeds, such as at take-offs and landings, the airfoil is fully extended while at high speeds it is fully retracted. Official Gazette of the U.S. Patent Office the engine, a centerbody coaxially disposed within the cowl, and means for axially displacing the centerbody within the cowl is described. The cowl and centerbody define a main airflow passageway. In one embodiment, a system for opening and closing the centerbody air inlet is provided by a dual-member centerbody, the forward member of which is displaced axially with respect to the aft member. In a second embodiment, the centerbody air inlet may be opened and closed by means of doors located in the forward wall of a unitary-member centerbody. The air intake system may also be provided with closeable air inlets located in the cowl wall which communicate with cowl auxiliary airflow passageways to provide auxiliary airflow to the engine. Closeable bypass openings are provided which allow control of the normal shock wave within the main airflow passageway.

N75-24768* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW SPEED PHASELOCK SPEED CONTROL SYSTEM Patent
A motor speed control system for an electronically commutated brushless dc motor is provided which includes a phase lock loop with bidirectional torque control for locking the frequency output of a high density encoder, responsive to actual speed conditions, to a reference frequency signal, corresponding to the desired speed. The system includes a phase comparator, which produces an output in accordance with the difference in phase between the reference and encoder frequency signals, and an integrator-digital-to-analog converter unit, which converts the comparator output into an analog error signal voltage. Compensation circuitry, including a biasing means, is provided to convert the analog error signal-voltage to a bidirectional error signal.
voltage which is utilized by an absolute value amplifier, rotational decoder, power amplifier-commutators, and an arrangement of commutation circuitry. Official Gazette of the U.S. Patent Office.

A description is given of a simulator by which an observer, viewing both a target and an object under his control, can practice mating the object with the target. The target replica is coded along one coordinate axis in such a way that the distance of an elemental area on the target along the axis is capable of being remotely readout by a television camera. The code is by way of a variation in color, in brightness or a combination of color or brightness. A third television camera responsive to the code provides information by which a target range signal is generated for each picture element of the scene televised by the target camera. The computer calculates an object range signal for each picture element of the scene televised by the object camera, and a comparator compares range signals for corresponding picture elements of both scenes in order to determine which camera is to be blanked from the monitor in order to create the illusion that one or the other of the target and the object is closer to the observer.
APPARATUS FOR REDUCING AERODYNAMIC NOISE IN A WIND TUNNEL Patent Application

An invention designed to reduce background noise created in the test section of a transonic wind tunnel during aerodynamic testing was described. The novelty of the invention appears to lie in the placing of finely woven mesh screen over perforations formed in the porous wall members of the wind tunnel test section. This virtually eliminates the background noise which has heretofore influenced the aerodynamic measurements taken in transonic wind tunnels.

MATERIAL SUSPENSION WITHIN AN ACOUSTICALLY EXCITED RESONANT CHAMBER Patent

A method is described for positioning an object within a chamber, which is especially useful in performing manufacturing operations under zero gravity conditions. Sound waves are applied within the chamber in different directions and at a frequency for each direction that establishes a standing wave pattern so that the object is automatically urged towards the intersections of the nodes, or locations of minimum pressure.

A DEVICE FOR INSTALLING ROCKET ENGINES Patent Application

A device for installing rocket engines at a severe cant relative to vertical, while maintaining uniform loading at the thrust chamber exit is proposed. The device is characterized by an axially extensible, tiltable pedestal, a lifting platform for supporting a rocket engine at its thrust chamber exit, a mount with a concentric base characterized by a concave bearing surface, a plurality of uniformly spaced legs extended radially from the base, and an annular receiver coaxially aligned with the base and affixed to the distal ends of the legs for receiving the thrust chamber exit. The lifting platform is concentrically related to the pedestal and is coupled to the extended end portion through a convex bearing surface for accommodating a rocking motion of the platform about an axis angularly related to the longitudinal axis of the engine.
pedestal. Mated curved bearing surfaces are employed for coupling a tiltile lifting platform with a pedestal and adapted to support rocket engines at the thrust chamber exits.

**17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING**

Includes telemetry; space communications networks; aeronavigation; and radio blackout. For related information see also 04 Aircraft Communications and Navigation and 32 Communications.

**N75-22365**
National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**TELEMETRY SYNCHRONIZER Patent Application**

A telemetry data synchronizer for achieving phase lock and synchronization of an input signal having a pseudorandom sequence is presented. The apparatus is characterized by a delay lock loop adapted to be responsive to an L format biphase signal having a pseudorandom sequence and utilizing only digital circuitry.

**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.

**N75-27040**
National Aeronautics and Space Administration, Washington, D.C.

**FOLDING STRUCTURE FABRICATED OF RIGID PANELS**

An expandable structure comprised of a plurality of rigid panels constructed in a manner enabling the structure to be mechanically actuated between unexpanded and expanded states is described. The structure is adapted for use in space exploration.
and is designed to provide a rigid protective enclosure for personnel and/or supplies in space.

Official Gazette of the U.S. Patent Office

N75-27041* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
VARIABLE RATIO MIXED-MODE BILATERAL MASTER-SLAVE CONTROL SYSTEM FOR SHUTTLE REMOTE MANIPULATOR SYSTEM Patent
A control system for a remotely operated manipulator system which incorporates a slave arm of substantial length and strength having multiple degrees of freedom at an adequate number of joints to enable the arm to accomplish specified tasks, and a master arm for use by an operator was disclosed. The two are operated by a servo system which provides a variable ratio which is varied dependent on the task required for the slave arm. Gross movements of the slave arm are readily accomplished with small movements of the master. When the manipulator arm is close to the target, the ratio is preferably changed providing better master-arm response to the operator to enable grasping with the manipulator terminal device. Official Gazette of the U.S. Patent Office

N75-29160*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
COMBINED DOCKING AND GRASPING DEVICE Patent Application
A combined docking and grasping manipulator arm device is described. The device is comprised of a single manipulator arm for both docking and for performing general work between orbital vehicles and orbital payloads. NASA

N75-33169*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SUN DIRECTION DETECTION SYSTEM Patent Application
Louis F. Schmidt (JPL) and George D. Pace, Jr., inventors (to NASA) (JPL) Filed 24 Sep. 1975 24 p (Contract NAS7-100) (NASA-Case-NPO-13722-1; US-Patent-App-SN-616472) 'Avail: NTIS HC $3.25 CSCL 17G
A sun sensor detection system is described which includes an illumination detector and a sun angle detector. The illumination detector provides a low resistance output whenever the sun is within a selected field of view and a high resistance output whenever the sun is outside the field of view. The sun angle detector provides an output voltage related to the direction of the sun with respect to the normal direction. The output of the sun angle detector is fed to the attitude control circuitry to control the vehicle attitude with respect to the sun as a function of the output of the sun angle detector. NASA

19 SPACECRAFT INSTRUMENTATION

For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.
20 SPACECRAFT PROPULSION AND POWER

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

NASA
N75-24837* National Aeronautics and Space Administration, Pasadena Office, Calif.
HEAT OPERATED CRYOGENIC ELECTRICAL GENERATOR Patent
An electrical generator useful for providing electrical power in deep space, is disclosed. The electrical generator utilizes the unusual hydrodynamic property exhibited by liquid helium as it is converted to and from a superfluid state to cause opposite directions of rotary motion for a rotor cell thereof. The physical motion of the rotor cell was employed to move a magnetic field provided by a charged superconductive coil mounted on the exterior of the cell. An electrical conductor was placed in surrounding proximity to the cell to interact with the moving magnetic field provided by the superconductive coil and thereby generate electrical energy. A heat control arrangement was provided for the purpose of causing the liquid helium to be partially converted to and from a superfluid state by being cooled and heated, respectively.

Official Gazette of the U.S. Patent Office

N75-29181*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
A METHOD OF PREPARING AROMATIC POLYMIDES HAVING UNIQUELY LOW SOFTENING TEMPERATURES Patent Application
A method is described of preparing insoluble thermoplastic aromatic polyimides having uniquely low softening or glass transition temperatures by reacting, in a suitable solvent, an aromatic dianhydride, and a meta-substituted aromatic diamine. Official Gazette of the U.S. Patent Office

N75-30256* National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.
PERFLUORO ALKYLENE DIOXY-BIS-(4-PHTHALIC ANHYDRIDES AND OXY-BIS-(PERFLUORALKYLENOEXY-PHTHALIC ANHYDRIDES) Patent
Dianhydrides were found which when reacted with diamines provide polyimides exhibiting excellent thermal, oxidative, and hydrolytic stability and good tensile strength and elongation. These characteristics make the polyimides useful as sealants in advanced aerospace structures. Official Gazette of the U.S. Patent Office

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

NASA
N75-29181*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
A method is described of preparing insoluble thermoplastic aromatic polyimides having uniquely low softening or glass transition temperatures by reacting, in a suitable solvent, an aromatic dianhydride, and a meta-substituted aromatic diamine. Official Gazette of the U.S. Patent Office
24 COMPOSITE MATERIALS

Includes laminates.

N75-28135* National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

METHOD OF PREPARING GRAPHITE REINFORCED ALUMINUM COMPOSITE Patent
Felix P. Laiacona, inventor (to NASA) Issued 15 Jul. 1975 5 p Filed 24 Mar. 1971

A metallic composite made up of an aluminum matrix and high-modulus graphite fibers coated with nickel is presented. The composite was prepared by applying a nickel coating to graphite fiber yarn, aligning the yarn between aluminum sheets in a stacked array and heating the array under pressure to obtain diffusion bonding.

Official Gazette of the U.S. Patent Office

N75-33181* National Aeronautics and Space Administration Lewis Research Center, Cleveland, Ohio.

METHOD OF MAKING AN INSULATION FOIL Patent

An insulating foil particularly adapted for use in a multilayer insulation system is disclosed together with a method of making such insulation. A molten ceramic material such as a refractory oxide is deposited on a plurality of spots on a metal foil to produce protruberances having a ceramic coating. This may be accomplished by plasma spraying the material through an apertured mask placed against the foil. The foil may be in the form of a continuous strip which is advanced to a new position after each flame spraying operation. A cooled backing plate may be disposed against the foil to control the temperature thereof. Hydraulic actuating means may be utilized to actuate the apertured mask to clamp the foil between the mask and the backing plate prior to each flame spraying operation.

Official Gazette of the U.S. Patent Office
25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.

N75-26043* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
VAPOR PHASE GROWTH OF GROUPS 3-5 COMPOUNDS BY HYDROGEN CHLORIDE TRANSPORT OF THE ELEMENTS Patent

A method of forming binary, ternary, and quaternary compounds derived from elements of groups III and V by a hydrogen chloride-hydrogen carrier gas is reported. The gas is separately contacted with the desired elements at elevated temperatures to provide the corresponding subchlorides, which are then transported to a reaction zone for final deposition of the respective elements on a single crystal substrate derived from one or more elements of groups III or V. The rate of flow of the carrier gas over each element is adjusted such that the elements are deposited on the substrate in sufficient amounts to provide the desired binary, ternary, or quaternary compound.

26 METALLIC MATERIALS

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

N75-26087* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A ZIRCONIUM MODIFIED NICKEL-COPPER ALLOY Patent Application

An improved material for use in a catalytic reactor is reported. The material reduces nitrogen oxide from internal combustion engines and is in the form of a zirconium modified, precipitation strengthened nickel-copper alloy. This material has a nominal composition of Ni-30 Cu-0.2 Zr and is characterized by improved high temperature mechanical properties.

N75-27125* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
BRAZING ALLOY BINDER Patent

A binder for brazing alloy compositions in powdered form was designed to form an extrudable paste that can be easily used in extruding, that has a long shelf life, and that provides good brazing paste qualities. The binder is composed of polybutene, ethylene glycol, water, and acrylic solution. In addition to possessing good slump resistance at room temperature, the binder provides adhesion to metallic surface, alloy retention during the brazing cycle, and, when mixed with the alloy to form a paste, is permanently plastic. The binder is not reactive with the brazing alloys and most commonly used base metal materials.

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

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

EDWARD R. BOEDE BER

A silver-base brazing alloy containing palladium, copper, and nickel was developed to provide the following: good wetting capability of the base metal surfaces; no intergranular penetration or erosion of base metals; no stress cracking tendencies; joints with good resistance to crevice corrosion; and, good thermal conductivity. The brazing alloy is comprised of from 80 to 95 weight percent nickel with trace amounts of impurities. The alloy may be prepared by commercial melting practices. Both wire and powder or prepared heats were used for evaluation of the material.

A brazing alloy was designed for use in manual applications (i.e. hand-held, manually operated torches). The brazing alloy consists of disposing the substrate in a closed reactor between two temperature controlled electrodes connected to a power supply. A vacuum is maintained within the closed reactor, causing a monomer gas or a gas mixture of a monomer and a diluent, such as a saturated or unsaturated aliphatic hydrocarbon and nitrogen, can be polymerized to form a dielectric coating having a varying dielectric constant in accordance with this plasma polymerization process. NASA

A method of heat treating age-hardenable nickel-chromium base alloys is presented. The temperature and rate of cooling of the alloys is controlled after being solution heated to produce annealed alloy bodies with a yield strength of 90,000 psi.


A plasma polymerization process for the deposition of a dielectric polymer coating on a substrate is disclosed. The process consists of disposing the substrate in a closed reactor between two temperature controlled electrodes connected to a power supply. A vacuum is maintained within the closed reactor, causing a monomer gas or a gas mixture of a monomer and a diluent to flow into the reactor. A plasma is generated between the electrodes. The dielectric constant of the polymer coating deposited by regulating the gas total and partial pressures, is controlled along with the electric strength and frequency, and the cu current density. A monomer, such as a polar saturated or unsaturated nitrogen-containing compound, or a monomer and diluent, such as a saturated or unsaturated aliphatic hydrocarbon and nitrogen, can be polymerized to form a dielectric coating having a varying dielectric constant in accordance with this plasma polymerization process. NASA

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A silver-base brazing alloy containing palladium, copper, nickel, and silver, and provides both stress cracking resistance and corrosion-resistance when applied to stainless steel base metal. The alloy may be prepared by conventional melt techniques. Both wire and powder or prepared heats were used for evaluation of the material.

A brazing alloy was designed for use in manual applications (i.e. hand-held, manually operated torches). The brazing alloy consists of disposing the substrate in a closed reactor between two temperature controlled electrodes connected to a power supply. A vacuum is maintained within the closed reactor, causing a monomer gas or a gas mixture of a monomer and a diluent, such as a saturated or unsaturated aliphatic hydrocarbon and nitrogen, can be polymerized to form a dielectric coating having a varying dielectric constant in accordance with this plasma polymerization process. NASA

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Porcelain enamel for use as a thermal control coating on high-temperature, nonferrous superalloy substrates is described. It is made up of a high-refractory-content boroaluminum silicate glass frit containing zirconium oxide, lithium-fluoride, alkali metal and alkaline earth oxide-flux, zinc oxide, and a submicron disperse phase of cubic-stabilized zirconium oxide. The coatings exhibit favorable optical properties and a high coefficient of thermal expansion, providing compatibility with substrates of nonferrous superalloys and enabling coated parts of such alloys to withstand severe thermal cycling conditions without cracking.

A process of preparing aromatic polyamide-acids for use as adhesives is described. An equimolar quantity of an aromatic dianhydride is added to a stirred solution of an aromatic diamine in a water or alcohol-miscible ether solvent to obtain a viscous polymer solution. The polymeric-acid intermediate polymer does not become insoluble but directly forms a smooth viscous polymer solution. These polyamic-acid polymers are converted, by heating in the range of 200-300°C and with pressure, to form polyimides with excellent adhesive properties.
field source for orbiting experiments and repels the liquid phase of the cryogen from the vent outlet to reduce venting of the liquid phase of the cryogen. Diamagnetic cryogenic liquids other than helium may also be used.

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.

A noise reduction system that divides the color video signal into its luminance and chrominance components is reported. The luminance component of a given frame is summed with the luminance component of at least one preceding frame which was stored on a disc recorder. The summation is carried out so as to achieve a signal amplitude equivalent to that of the original signal. The averaged luminance signal is then recombined with the chrominance signal to achieve a noise-reduced television signal.

A smoke generator is disclosed which is particularly suitable for mounting on the wing tips of an aircraft and for conducting airflow studies. The device includes a network of thermally insulated tubes for carrying a fluid which is used to produce smoke. The fluid, which need not be combustible, is heated above its vaporization temperature by electric current which is passed through the fluid conduit tubes, so that the tubes serve both as fluid conduits and resistance heating elements. Fluid supply and monitoring systems and electrical control systems are also disclosed.

An improved digital transmitter for transmitting serial pulse code modulation (pcm) data at high bit rates over a transmission line is disclosed. When not transmitting, the transmitter features a high output impedance which prevents the transmitter from loading the transmission line. The pcm input is supplied to a logic control circuit which produces two discrete logic level signals which are supplied to an amplifier. The amplifier, which is transformer coupled to the output isolation circuitry, converts the discrete logic level signals to two high current level, ground isolated signals in the secondary windings of the coupling transformer. The latter signals are employed as inputs to the
isolation circuitry which includes two series transistor pairs operating into a hybrid transformer functioning to isolate the transmitter circuitry from the transmission line.

A speech signal is analyzed by applying the signal to formant filters which derive first, second, and third signals respectively representing the frequency of the speech waveform in the first, second, and third formants. A first pulse train having approximately a pulse rate representing the average frequency of the first formant is derived; second and third pulse trains having pulse rates respectively representing zero crossings of the second and third formants are derived. The first formant pulse train is derived by establishing N signal level bands, where N is an integer at least equal to two. Adjacent ones of the signal bands have common boundaries, each of which is a predetermined percentage of the peak level of a complete cycle of the speech waveform. Normalization was attained in each instance by counting the number of pulses in the first and third pulse trains over the interval required for the pulses in the second train to reach a predetermined number. The resulting normalized pulse trains are supplied to a memory to identify a phoneme in the speech signal or are transmitted as narrow band width signals.

A receiving system for automatically selecting a desired one of two approximately orthogonally polarized signals occupying the same bandwidth, is described. Received signals are provided by any orthomode antenna system at a pair of output ports, i.e., right hand and left hand circular polarizations or two linear polarizations. The received signals are then applied to the inputs of a hybrid junction to produce sum and difference signals. The resulting sum signal at one output port comprises components of the undesired one of two orthogonally polarized signals and is used to coherently detect and dynamically balance out the
undesired signal components that are included at the difference signal port. The desired one of two orthogonally polarized signals is thereby provided at the difference port of the hybrid junction. Feedback loops are used to affect dynamic balancing.

Asynchronously multiplexed sample data sub-systems employ transmission over a single line to a remote synchronizer and demultiplexer. At the remote synchronizer, the data are recovered by synchronizing signals derived from the data itself. A sub-system, or satellite location, supplies continuously sampled binary data along with a satellite identification and synchronizing sequence as a satellite message frame. This information is supplied bit-serially, to a multiplexer junction. The multiplexed satellite information is delivered asynchronously onto a single line transmission channel with other like bit serial satellite message information from other satellite monitoring sites. Such satellite information is transmitted to a central collection and analysis site where it is demultiplexed according to the words and bits that make up a satellite message frame.
range correlation, and azimuth correlation in the analog domain. These radar data processing functions were implemented for single-look or multiple-look imaging radar. NASA

N75-326207*# National Aeronautics and Space Administration, Pasadena Office, Calif.
SPACE COMMUNICATION SYSTEM FOR COMPRESSED DATA WITH A CONCATENATED REED SOLOMON-VITERBI CODING CHANNEL Patent Application
Robert F. Rice (JPL) and Edward E. Hilbert, inventors (to NASA) (JPL) Filed 23 Jun. 1975 40 p (Contract NAS7-100)
A communication system with a concatenated Reed Solomon-Viterbi coding channel for transmitting compressed and uncompressed data from a spacecraft is described. The system portion in the spacecraft includes a data compressor which compresses data from a source. The compressed data is first coded by a Reed Solomon coder and interleaved, followed by a convolutional encoder, whose output is modulated and transmitted by a modulator/transmitter; antipodal PSK-PM modulation of a square-wave subcarrier with S-band or X-band carrier takes place. The signals transmitted from the spacecraft to earth are assumed to be subjected to wideband Gaussian noise. On earth the system includes several deep space network stations, DSN1-DSNn. Each DSN includes a receiver/demodulator which includes a phase locked loop coherent demodulator with 3-bit quantized symbol output, which is decoded by a Viterbi decoder. NASA

N75-32281*# National Aeronautics and Space Administration, Pasadena Office, Calif.
AN IMPROVED FURLABLE ANTENNA Patent Application
Morris A. Barnett, inventor (to NASA) (JPL) Filed 24 Sep. 1975 15 p (Contract NAS7-100)
The antenna is characterized by an actuator comprising an elastomeric member of an annular configuration, and an annular array of uniformly spaced antenna ribs rigidly affixed at the base ends to the actuator and supported for pivotal displacement from a deployed configuration. The ribs are substantially radially extended from the actuator to a furled configuration, and are extended in substantial parallelism with the axis of the actuator. A reflector formed of a flexible mesh material is affixed to the ribs, and a plurality of angularly spaced bearing blocks support

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every radially extended section of the member for rotation about its own centroid. By employing an elastomeric annular member as a deployment actuator, it is possible to achieve deployment of relatively large dish-shaped antenna reflectors in a celestial space environment.

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

FREQUENCY MODULATED OSCILLATOR Patent Application

Devices for frequency modulation of radio frequency oscillators are described. In particular, a description is given of a frequency modulated push-pull oscillator in which the nonlinear characteristics of varactors producing frequency modulation is compensated for by an opposite nonlinear characteristic of a field effect transistor providing bias to the varactors.

N75-25040* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIGITAL PHASE-LOCKED LOOP Patent

An digital phase-locked loop is provided for deriving a loop output signal from an accumulator output terminal. A phase detecting exclusive OR gate is fed by the loop digital input and output signals. The output of the phase detector is a bi-level digital signal having a duty cycle indicative of the relative phase of the input and output signals. The accumulator is incremented at a first rate in response to a first output level of the phase detector and at a second rate in response to a second output level of the phase detector.

Official Gazette of the U.S. Patent Office

N75-25041* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIODE-QUAD BRIDGE CIRCUIT MEANS Patent

Diode-quad bridge circuit means is described for use as a transducer circuit or as a discriminator circuit. It includes: (1) a diode bridge having first, second, third, and fourth bridge terminals consecutively coupled together by four diodes polarized in circulating relationship; (2) a first impedance connected between the second bridge terminal and a circuit ground; (3) a second impedance connected between the fourth bridge terminal and the circuit ground; (4) a signal source having a first source terminal capacitively coupled to the first and third bridge terminals, and a second source terminal connected to the circuit ground; and (5) an output terminal coupled to the first bridge terminal and at which an output signal may be taken.

Official Gazette of the U.S. Patent Office
Circuitry for maintaining an arc or spark across a spark gap for a desired length of time is described. A high-voltage, direct-current (dc) source is connected in series with a secondary winding of a high-voltage, step-up transformer or coil and a spark gap. The high-voltage source is controlled by a solid state switch which is responsive to a timing device such as a set of ignition contact points or a magnetic pulse generator operating in synchronism with a spark ignition engine. The timing device also provides signals to a current switching circuit which interrupts current flow through a primary winding of the high-voltage coil at the prescribed time that a spark is desired at the spark gap. The control circuit may include both a switch and a multivibrator if the timer is of the pulse generating magnetic type.
A resonant waveguide Stark cell suitable for use in a Stark-modulated microwave spectrometer was developed. The cell is constructed from a short guide of waveguide. A Stark electrode is located inside the wavelength parallel to the broad face of the guide and insulated from the walls of the guide with narrow teflon strips. A reflector with a small coupling iris at its center is located at one end of the cell. This small coupling iris is for passing microwave energy into and out of the cell. At the other end of the cell there is an adjustable waveguide short making the small Stark cell into a tuneable cavity which can be tuned for resonance at selected microwave frequencies. Means are provided for maintaining a gas-tight compartment within the cell, and ports are provided for the introduction of the gas to be analyzed into the gas-tight compartment.

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SOLID STATE CURRENT TRANSFORMER Patent Application


A signal transformation network is described which exhibits a very low input impedance while maintaining a linear transfer characteristic when driven from a voltage source and when quiescently biased in the low microampere current range. In its simplest form, it consists of a tightly coupled two-transistor network in which a common emitter input stage is interconnected directly with an emitter follower stage to provide virtually 100 percent negative feedback to the base input of the common emitter stage. Bias to the network is supplied via the common tie point of the common emitter stage collector terminal and the emitter follower base stage terminal by a regulated constant current source. The output of the circuit is taken from the collector of the emitter follower stage.

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SWITCHABLE BEAMWIDTH MONOPULSE METHOD AND SYSTEM Patent Application


An apparatus for monitoring and analyzing electrical currents produced by lightning strikes is described. The apparatus includes an electrical conductive mast with a circuit coupled to it for generating a dc voltage proportional to a peak current generated in the mast by each lightning strike. Another circuit is coupled to the mast for generating a digital signal representative of the wave shape of the current generated in the mast by each lightning strike, and a third circuit is provided closely adjacent to the mast for producing a reference voltage. Signals are fed into a strip chart recorder making a permanent record of the current produced by the lightning strike.
In a switchable beamwidth monopulse method and system, an antenna is described, comprising a curved reflector and a first set of monopulse feeds positioned in the Airy disk. The second set of monopulse feeds is positioned outside the Airy disk in the region of first bright Airy ring. In narrow beamwidth monopulse operation, monopulse sum and difference channel patterns are obtained from the first set of feeds within the Airy disk. In wide beamwidth monopulse operation, the difference channel pattern is obtained from the second set of feeds in the Airy ring. The sum channel pattern is obtained by attenuating and phase shifting the sum channel signal obtained from the first set of feeds, and adding the resultant to the sum channel signal obtained from the second set of feeds. The difference channel patterns for both narrow and wide beamwidth mode operation are obtained from the second set of feeds.

N75-27249* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MULTIPLE CIRCUIT PROTECTOR DEVICE Patent

An in-line, multiple-circuit protector device was designed to be lightweight, compact, accurate, and readily serviced for fuse replacement. The device has the following components and characteristics: a fuse to be used either as a permanent or a temporary part of a system; a line-fuse protector which can be combined with similar devices to protect a multiple-line circuit; an in-line, multiple-circuit connector with a removable fuse to protect the lines being connected; a protective fuse for multiple-line connector devices in which a capsule fuse element of desired capacity may be incorporated; and, a quick-disconnected fitting with a fuse element capsule having pushfit pin and socket parts for mating with the two parts of the quick disconnect fitting.

N75-27250* National Aeronautics and Space Administration. Pasadena Office, Calif.
VERY HIGH INTENSITY LIGHT SOURCE USING A CATHODE RAY TUBE Patent
A light source which is much brighter and which lasts for a much shorter time period than strobing light sources is described. A cathode ray tube with a faceplate coated with a phosphor with a relatively short persistency, and a cathode with a broad surface area, of the same order of magnitude as the area of the faceplate are utilized. In order to focus electrons onto the faceplate, the cathode is preferably concave, of the 'Pierce cathode' type or of other concave form. A grid is provided to control the application of brief pulses of a high intensity electron beam to the phosphor coating. The screen of the cathode ray tube is saturated with an electron beam of high density and high intensity. A phosphor with a relatively short persistency, for light to decay to less than one-half its maximum brightness, is employed. Where electron beam pulse lengths of 10 to 20 nanoseconds are employed, the total duration of the emitted pulse of light will be less than 40 nanoseconds, or less than one twenty-fifth of a microsecond.

N75-27251* National Aeronautics and Space Administration. Washington, D.C.
TRAVELING WAVE SOLID STATE AMPLIFIER UTILIZING A SEMICONDUCTOR WITH NEGATIVE DIFFERENTIAL MOBILITY Patent
A distributed two-port, traveling-wave solid-state amplifier using the transferred electron mechanism in certain semiconductor
compounds was designed. Electrodes were alloyed to two ends of a specimen of N-type gallium arsenide and two probes were provided, one to inject an AC signal near the most negative point in the field, and the other to extract the amplified signal near the most positive point in the field, with a gain of 2 to 4 dB in the 700 to 1500 mHz frequency range. The amplifier has a region of negative differential mobility in its drift-velocity electric field characteristic as well as means for inhibiting oscillation.

Official Gazette of the U.S. Patent Office

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N75-27252* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

ELECTROLYTIC CELL STRUCTURE Patent

An electrolytic cell is described which consists of a stack of polysulfone plates faced with sheets of platinum. The sheets are bonded by silicone rubber and mechanically secured to their plates by Teflon screws having heads serving as spacers between opposed platinum sheets.

Official Gazette of the U.S. Patent Office

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N75-27261* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

ROTATING JOINT SIGNAL COUPLER Patent Application

A method is described of coupling an electrical signal across the rotating joint of such members as helicopter rotors. A two element capacitor, one element of which rotates with the rotating member and the other element of which is stationary, is used as an integral part of the electrical circuit for such purposes as testing of rotating parts. A rotating capacitor is formed by rotating a circular plate attached to a shaft and a stationary circular plate attached to a stationary member. Together these plates which are appropriately insulated from the members to which they are attached, form a capacitor in the electrical circuit. The electrical circuit for measurement is described in which rotating capacitor isolates the rotating components from the stationary components. The coupler has the ability to transfer information between rotating and stationary portions of an electrical circuit without distortion and without the addition of expensive and critical components.

NASA
A potential induced on the surface of an orbiting spacecraft is neutralized to the potential of a plasma through which the spacecraft is traveling by directing charged particles into the plasma from the spacecraft surface. The induced potential occurs in response to bombardment of the spacecraft surface by ambient charged particles which may be negative or positive. The charged particles directed into the plasma from the surface have the same polarity as the induced potential to provide the neutralization. The invention can be utilized to maintain different, electrically isolated segments of a spacecraft surface at the same potential to prevent electric discharges between the different parts and to protect electric circuits within the spacecraft. The invention can also be utilized to enable charged particle detectors on the surface of a spacecraft to operate more accurately so that the particles are not perturbed by a potential difference between the spacecraft surface and the plasma.

An electronic analog dividing circuit is described which shows accuracy at relatively low denominator (divisor) values. The known exponential characteristic of a diode was used which is that particularly at low forward voltages and currents, the current is an exponential function of the voltage applied across the diode, and the incremental impedance of the diode is inversely proportional to the current through the diode. The diode bias current was made proportional to the desired denominator, and the incremental signal current was applied across the diode as a numerator; the resultant incremental voltage across the diode is proportional to the desired quotient.

A light or radiation source is described in which the light emanates from a high-current electric arc. This source, the vortex-stabilized radiation source, is characterized by high efficiency and arc stability, long electrode life at high power levels, readily-controllable emission, and other advantages.
The transducer includes two capacitive electrodes and a shield electrode. As the temperature of the transducer rises, the resistance of the insulation between the capacitive electrode decreases and a resistive current attempts to interfere with the capacitive current between the capacitive electrodes. The coupling of the shield electrode and the circuit reduces the resistive current in the transducer. A bridge type circuit coupled to the transducer ignores the resistive current and measures only the capacitive current flowing between the capacitive electrodes.
A system is described for manually and automatically coupling video signals from a plurality of cameras to a monitoring apparatus. The system is comprised of a manual mode of operation, a continuous scan mode, a single scan mode, and a hold condition. The scanning mode is controlled by a shift register which is activated at various rates so as to vary the duration that a particular video signal is coupled to the monitoring apparatus. If the system is in the scan mode a push button can be depressed to hold the video signal coupled to the monitoring system until the operator desires to return to the scan cycle. Various logic circuits are utilized in the system for selecting a predetermined scanning sequence, as well as to permit the circuit to be manually operable under control of an operator.

A frequency divider arrangement is reported that can be used for division by an odd number and which provides a symmetrical output. It comprises an exclusive Or gate followed by a divide by 2N counter where (2N-1) equals the odd number. Input to the exclusive Or gate is from a pulse source and from the counter output.

A sub-miniature transducer is described which is suitable for measuring forces at a predetermined location within muscle tissue; it includes a small diameter tube with a slit at the lower end that forms a pair of tines, and a strain gauge fixed within the tube to one of the tines for measuring slight deflections of the tube. The tube can be inserted into muscle tissue to measure forces at a location deep within the tissue and with minimal disturbance to the tissue, and the tube can be turned to any orientation to measure forces in different directions.
of a metal-insulator-embedded-metal-insulator-metal, sandwich structure which can be used in high-density memory arrays.

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N75-31332* National Aeronautics and Space Administration. Pasadena Office, Calif.

DOPED JOSEPHSON TUNNELING JUNCTION FOR USE IN A SENSITIVE IR DETECTOR Patent
A superconductive tunneling device having a modified tunnel barrier capable of supporting Josephson tunneling current is provided. The tunnel barrier located between a pair of electrodes includes a molecular species which is capable of coupling incident radiation of a spectrum characteristic of the molecular species into the tunnel barrier. The coupled radiation modulates the known Josephson characteristics of the superconducting device. A superconductive tunneling device can be tuned or made sensitive to a particular radiation associated with the dopant molecular species. Semiconductor material can be utilized as the molecular species to provide an increased selective bandwidth response. Appropriate detector equipment is utilized to measure the modulation of any of the Josephson characteristics such as critical current, voltage steps, Lambe-Jaklevic peaks and plasma frequency.

Official Gazette of the U.S. Patent Office

N75-32323# National Aeronautics and Space Administration. Pasadena Office, Calif.

DISTRIBUTED FEEDBACK ACOUSTIC SURFACE WAVE OSCILLATOR Patent Application
Charles Elachi, inventor (to NASA) (JPL) Filed 12 Sep. 1975 17 p

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.

N75-26282* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

FLUID CONTROL APPARATUS AND METHOD Patent
A container for controlling and separating fluids and gases without using seals between movable parts is disclosed. The method works by placing the container in orbit about a circular path and holding it at a fixed orientation; the orbit of the container is orbiting, causing the liquids and gases present to separate even when in a zero gravity environment. Flexible conduits provide for flow of liquids or gases to and from the interior of the container.

Official Gazette of the U.S. Patent Office
N75-32309* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

APPARATUS FOR MEASURING A SORBATE DISPERSED IN A FLUID STREAM Patent Application

An apparatus for measuring a sorbate dispersed or dissolved in a fluid stream was constructed. The apparatus is composed of an oscillator for generating an alternating current signal, an acoustic transmission line for disposition in the fluid stream, and an elongated body with a surface capable of sorbing an amount of the sorbate to be measured representative of the concentration in the fluid stream. The body is also capable of propagating acoustic energy along its length from one end portion to another end portion; the propagated acoustic energy is damped in amplitude and shifted in phase so that the change in amplitude or phase is proportional to the amount of sorbate sorbed by the surface. Two transducers and a comparator are also part of the system. One transducer converts ac signals to acoustic energy while the other converts the acoustic energy to an electrical signal at the other end of the body. The comparator compares the electrical signal to the ac signal and develops an output signal corresponding to the difference between the two; the output signal is indicative of the concentration of the sorbate in the fluid system. NASA

N75-33342* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

FILTER REGENERATION SYSTEMS Patent

A system is described for regenerating a filter in a fluid flow line where the filter normally retains particulate matter entrained in the fluid flow in one direction. The system involves a filter structure in which reverse or back flow through the filter will dislodge particulate matter from a filter element in the filter. Entrained particulate in the fluid back flow is passed to a vortex separator which separates by centrifugal forces and densities, the particulate from the fluid. The cleansed fluid is passed through a separate filter and can be returned to the system. The system for using the separator and separate filter in conjunction with the system filter can take the various forms including: embodiments where an independent pump is employed and the system filter is releasably coupled with separator, the separate filter, and the pump in a closed loop, and embodiments where the fluid from

the system is diverted by valves to reverse through the system filter and output to the system from the separate filter.

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In infrared spectroscopy utilizing an interferometer, position stepping of the optical path difference in the interferometer must be accomplished quite rapidly. This is accomplished by applying a drive signal to the moveable mirror in the interferometer. As the mirror moves in response to this drive signal, effectively getting closer to the new null point, the drive signal is gradually reduced, in response to detected reference laser fringes. At the new null position, the drive signal will effectively be zero. A binary up/down counter drives a digital/analog converter (DAC). The output from the DAC is supplied to the mirror moving means. The fringes generated by a reference laser are detected as the mirror moves, causing the up/down counter to be decremented to its null count, thereby reducing the output of the DAC.

Method and apparatus for measuring the number of layers of a web material of known thickness wound on a storage or take-up reel were developed based on the principle that, at a relatively large radius, the loci of layers of a thin web wound on the reel approximate a family of concentric circles having radii respectively successively increasing by a length equal to the web thickness, t. The difference in circumferences between adjacent web layers is substantially constant and equal to $2\pi t$. Tachometer pulses are generated in response to linear movement of the web and reset pulses are generated in response to rotation of the reel. A digital circuit, responsive to the tachometer and reset pulses, generates data indicative of the layer number of any layer of the web and of position of the web within the layer without requiring numerical interpolation.

An atmosphere sampler includes a very thin filter element with straight-through holes on the order of 1 micron. A sample of air with particles to be examined is driven by means of a pressurized low molecular weight gas, e.g., He to the filter element front side. A partial vacuum may be present at the back side of the filter element. The pressure differential across the filter element is just below the rupture point of the filter element. By admixing a low molecular weight gas as the carrier gas with the air sampler, the velocity is maximized for the particular pressure differential across the filter element.
A Fourier spectropolarimeter was designed for use in a laboratory in determining high-resolution spectra of the four Stokes' parameters, providing the intensity and complete state of polarization of light reflected from, and transmitted through a scattering sample in a cell. A single linear polarizer-analyzer of variable orientation, and specially arranged mirrors is used. The mirrors are employed to switch between modes using three mirrors in each mode. Mirrors are paired for compensated (zero net) polarizing effect between them, and the third one introduces the same uncompensated polarizing effect in all three modes. The polarization interferograms can be recorded with the spectral resolution provided by the interferometer.

A single-axis sun sensor consists of a cylinder of an insulating material on which at least one pair of detectors is deposited on a circumference of the cylinder, was disclosed. At any time only one-half of the cylinder is illuminated so that the total resistance of the two detectors is a constant. Due to the round surface on which the detectors are deposited, the sensor exhibits a linear wide angle of ± or -50 deg to within an accuracy of about 2%. By depositing several pairs of detectors on adjacent circumferences, sufficient redundancy is realized to provide high reliability. A two-axis sensor is provided by depositing detectors on the surface of a sphere along at least two orthogonal great circles.

Temperature change of a substrate such as a microelectronic component is sensed and detected by means of a mixture of a weak molecular complex of an electron donor compound such
as an organic amine and an electron acceptor compound such as nitroaromatic compound. The mixture is encapsulated in a clear binder such as a vinyl resin.

Official Gazette of the U.S. Patent Office

N75-25123* National Aeronautics and Space Administration. Pasadena Office, Calif.

SERVO-CONTROLLED INTRAVITAL MICROSCOPE SYSTEM
Patent

A microscope system is described for viewing an area of a living body tissue that is rapidly moving, by maintaining the same area in the field-of-view and in focus. A focus sensing portion of the system includes two video cameras at which the viewed image is projected, one camera being slightly in front of the image plane and the other slightly behind it. A focus sensing circuit for each camera differentiates certain high frequency components of the video signal and then detects them and passes them through a low pass filter, to provide a focus signal whose magnitudes represent the degree of focus. An error signal equal to the difference between the focus signals, drives a servo that moves the microscope objective so that an in-focus view is delivered to an image viewing/recording camera.

Official Gazette of the U.S. Patent Office

N75-25127* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

HIGH SPEED DATA MONITORING APPARATUS
Patent Application
Manfred N. Wirth, inventor (to NASA) Filed 12 May 1975 22 p

High speed data monitoring apparatus is described for displaying the bit pattern of a selected portion of a block of transmitted data comprising a shift register for receiving the transmitted data and for temporarily containing the consecutive data bits. A programmable sync detector monitors the contents of the shift register and generates a sync signal when the shift register contains a predetermined sync code. A counter is used for counting the data bits input to the shift register after the sync signal is generated and for generating a count complete...
signal when a selected number of data bits were input to the register. A data storage device stores the contents of the shift register at the time the count complete signal is generated.

**INSTRUMENTATION AND PHOTOGRAPHY**

![Diagram of a circuit](image)

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**N75-25134**

National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

**MAGNETIC TAPE HEAD FUNCTION SWITCHING SYSTEM**

**Patent Application**

Patrick H. Cudmore, inventor (to NASA) Filed 12 May 1975 17 p


A magnetic head function switching network for use with high density, bidirectional tape recording systems is disclosed. A first embodiment of the system includes a dedicated erasing head and a pair of recording-reproducing heads, the functions of which may be alternated. A second embodiment of the invention includes a dedicated reproducing head and a pair of recording-erasing heads, the functions of which may be alternated. The system is suitable for use with high density reel-to-reel recorders of the type used in scratch pad memories for computer and similar systems, especially those adapted for use in satellite systems.

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**N75-26334**

National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**GAS CHROMATOGRAPH INJECTION SYSTEM**

**Patent**


An injection system for a gas chromatograph is described which uses a small injector chamber (available in various configurations). The sample is placed in the chamber while the chamber is not under pressure and is not heated, and there is no chance of leakage caused by either pressure or heat. It is injected into the apparatus by changing the position of a valve and heating the chamber, and is volatilized and swept by a carrier gas into the analysis apparatus.

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**N75-27328**

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

**REAL TIME, LARGE VOLUME, MOVING SCENE HOLOGRAPHIC CAMERA SYSTEM**

**Patent**


A holographic motion picture camera system is described which produces resolution of front surface detail. The system utilizes a beam of coherent light and means for dividing the beam into a reference beam for direct transmission to a conventional film transport, and three reflection signal beams for transmission to the film transport by reflection from the three orthogonal sides of a moving scene. The system is arranged so that critical parts of the system are positioned on the foci of three interrelated mathematically-derived ellipses. The camera has the theoretical capability of producing motionpicture holograms of an object moving at speeds as high as 900,000 cm/sec.
INSTRUMENTATION AND PHOTOGRAPHY


An apparatus and method are described for analyzing or calibrating the vibratory motion characteristics of a transducer utilizing the Mossbauer effect. The energy and density are sampled at preselected times with reference to the alternating motion of a Mossbauer gamma ray source attached to the transducer.

Official Gazette of the U.S. Patent Office


The impact position of cosmic dust, micrometeoroids and other similar outer space particles is detected with an array including a multiplicity of mutually insulated, metal electrode strips, a first group of which has parallel, longitudinal axes at right angles to a second group of the strips. Also provided is a delay line having a multiplicity of taps, each of which is connected to one of the strips. The delay times between adjacent taps of the delay line are approximately the same. One end of the delay line is terminated with a resistor having a value substantially equal to the characteristic impedance of the delay line. The
arrival time at a delay line output terminal of pulses induced in the delay line in response to particle impact is determined relative to the occurrence time of a further pulse derived in response to the impact. Circuitry is provided to separate pulses induced in the line from different strips, even though there are substantially simultaneous impacts on the different strips.

Official Gazette of the U.S. Patent Office

A device is described for automatic, real time monitoring of carbon monoxide and for providing a continuous read out of the concentration of carbon monoxide. The monitoring device includes two Y-cut, temperature sensitive quartz crystals which are encapsulated in a helium filled can. One of the cans containing a quartz crystal is surrounded by a wire mesh which carries a thin layer of hopcalite coating. The hopcalite is used for oxidizing the carbon monoxide, and the resulting heat of the reaction is detected by the temperature sensitive crystal. Each crystal is driven by a conventional crystal controlled oscillator circuit with a constant frequency bias of a few hundred Hz. The frequencies of the two oscillator circuits are fed into a conventional mixer circuit which beats the frequencies together and produces a single net frequency which is the difference between the two frequencies. The net frequency signal is converted to a dc analog voltage signal which is then fed into a suitable display device.

Improvements in instrumentation suitable for measuring aircraft noise and sonic booms are reported. A converter produces an electric current proportional to the sound pressure level at a condenser microphone. The electric current is transmitted over a cable and amplified by a zero drive amplifier. The converter consists of a local oscillator, a dual gate field effect transistor (FET) mixer and a voltage regulator/impedance translator. The local oscillator generates a carrier voltage that is applied to one of the gates of the FET mixer. The FET mixer mixes the microphone signal with the carrier to produce an electrical current at the frequency of vibration of the microphone diaphragm. The voltage regulator/impedance translator regulates the voltage of the local oscillator and mixer stages, eliminates the carrier at the output, and provides a low output impedance at the cable terminals. The improvements include automatic tuning compensation against changes in static microphone capacitance and means for providing a remote electrical calibration capability.

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A g-load measuring apparatus for facilitating pilot control of g-load during maneuvering and to provide an indication of g-load constraint violations is proposed. The apparatus includes processing means for receiving the components of the linear acceleration and angular velocity of the aircraft and for generating the first output signal indicative of the critical velocity of the aircraft and a second output signal indicative of the instantaneous maneuvering velocity of the aircraft. Indicating means are connected to the processing means for receiving the two output generated signals such that the relative magnitude of
creating a second beam radiation path through the sample cell identical to a first beam except for the length, alternating the beam through the two paths, and minimizing the detected pressure difference for the two paths while the beam wavelength is tuned away from the absorption lines of the sample. Then with the beam wavelength tuned to the absorption line of any constituent of interest, the pressure difference is a measure of trace amounts of the constituent. The same detector may also be used for measuring the absorption coefficient of known concentrations of absorbing gases.

A procedure is reported for increasing the sensitivity of an opto-acoustic absorption detector in order to measure trace amounts of constituent gases in a sample. The procedure involves
**N75-30503** National Aeronautics and Space Administration.  
Lewis Research Center, Cleveland, Ohio.  
**FLOW MEASURING APPARATUS Patent**  
Paul R. Prokopius, inventor (to NASA) Issued 12 Aug. 1975  
8 p Filed 28 Feb. 1974 Supersedes N74-18101 (12-09, p.1050)  
(NASA-Case-LEW-12078-1; US-Patent-3,898,882;  
Apparatus for measuring the mass flow rates of the components comprising a binary gas mixture is provided. This is accomplished by directing a binary fluid or gas through a fluidic humidity sensor and then through a calorimeter which increases the temperature of the flowing binary gas. Electrical signals provided by the fluidic humidity sensor, the flow calorimeter, and a power supply which energizes or heats the calorimeter are operated in a predetermined manner to provide an output signal indicative of the mass flow rate of one of the binary gases. Thus, the mass flow rate of the other gas is allowed to be determined since the total mass flow rate is previously calculated by the instrument and is the output of operating module 19.  
Official Gazette of the U.S. Patent Office

**N75-30516** National Aeronautics and Space Administration.  
Langley Research Center, Langley Station, Va.  
**BINOCULAR ATTACHMENT Patent Application**  
William H. King, inventor (to NASA) Filed 28 Aug. 1975 9 p  
(NASA-Case-LAR-11782-1; US-Patent-Appl-SN-608482) Avail:  
NTIS HC $3.25 CSCL 14B  
Apparatus for superimposing numerical information on the field of view of binoculars and applicable in the flying of radio-controlled model airplanes is described. Airspeed and angle of attack are sensed by sensors attached to the model airplane, telemetered to ground, and converted to numerical form. An optical system is used to display the numerical information in the field of view of the binoculars used to track the model airplane. The numerical information is focused at infinity by collimating lens enabling the user to see the object and numerical information without refocusing his eyes.  
NASA

**N75-30504** National Aeronautics and Space Administration.  
Lyndon B. Johnson Space Center, Houston, Tex.  
**FAULT TOLERANT CLOCK APPARATUS UTILIZING A CONTROLLED MINORITY OF CLOCK ELEMENTS Patent**  
William M. Daly (MIT, Cambridge) and John F. McKenna, Jr., inventors (to NASA) (MIT, Cambridge) Issued 19 Aug. 1975  
10 p Filed 26 Apr. 1973 Supersedes N73-22386 (11-13, p 1528) Sponsored by NASA  
(NASA-Case-MSC-12531-1; US-Patent-3,900,741;  
A fault-tolerant clock apparatus is presented for use in digital logic systems. The apparatus maintains output pulses during component failures.  
Official Gazette of the U.S. Patent Office

**N75-31418** National Aeronautics and Space Administration.  
Marshall Space Flight Center, Huntsville, Ala.  
**METHOD OF AND MEANS FOR TESTING A TAPE RECORD/PLAYBACK SYSTEM Patent Application**  
(Contract NAS8-21812)  
(NASA-Case-MFS-22671-2; US-Patent-App1-SN-561956) Avail:  
NTIS HC $3.25 CSCL 14B
A test set for communications systems is described which includes a pseudo-noise sequence generator providing a test signal that is fed to a pair of signal channels. The first channel includes a spectrum shaping filter and a conditioning amplifier. The second channel includes a variable delay circuit, a spectrum shaping filter matched to the first filter, and an amplifier. The output of the first channel is applied to the system under test. The output of the system and the output of the second channel are compared to determine the degree of distortion suffered by the test signal due to the communications system.

N75-32426* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
METALLIC HOT WIRE ANEMOMETER AND METHOD FOR FABRICATING THE SAME Patent Application
Fred R. Lemos, inventor (to NASA) Filed 5 Sep. 1975 13 p

A hot wire anemometer is described which has a body formed of heat resistant metal such as an alloy very high in nickel content. The body supports a probe wire in a moving air stream and is mechanically arranged so that the probe wire is disposed in a V groove in the body; the V groove contains a high temperature ceramic adhesive that partially encompasses the downstream side of the probe wire. Mechanical and electrical connection to the probe wire is achieved through conductive support rods which were constructed of the same high temperature metal, insulation between the body and the conductor rods being provided by an oxide coating. The oxide coating insulates the conductor rods from the body, mechanically fixes the conductors within the body, and maintains its integrity at elevated temperatures to which a hot wire anemometer is typically subjected. A method for forming the anemometer structure is included which employs conventional machining procedures combined in a novel sequence. NASA

N75-33367* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
METEOROID IMPACT POSITION LOCATOR AID FOR MANNED SPACE STATION Patent

Meteoroid impacts in space vehicles are located by coating the metallic interior wall of the space vehicle with a thin layer of a coating material having contrasting color to that of the vehicle interior wall. The coating is capable of flaking or chipping off when an impacting meteoroid deforms said wall.

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

N75-33369* National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
SELF-SUPPORTING STRAIN TRANSDUCER Patent
Ira S. Hoffman, inventor (to NASA) Issued 23 Sep. 1975
p 1790)
(NASA-Case-LAR-11263-1; US-Patent-3,906,788;
US Patent Office CSCL 14B
A strain transducer is described for use in the measurement
of static or quasi-static high strain levels at stress concentration
points in holes in flat plates. Cantilever springs constructed by
machining the material to appropriate flexibility, permit self-
alignment, and constant contact with the test specimen. Used
in conjunction with a strain gage or other transducer, it enables
testing far beyond the strain gage's normal limits for high
strains and number of load cycles.

Official Gazette of the U.S. Patent Office

36 LASERS AND MASERS
Includes parametric amplifiers.

N75-27364* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
HIGH POWER LASER APPARATUS AND SYSTEM Patent
John C. Evans, Jr. and Henry W. Brandhorst, Jr., inventors (to
NASA) Issued 8 Jul. 1975 7 p Filed 29 Jul. 1968
(NASA-Case-XLE-2529-2; US-Patent-3,894,289;
US-Patent-Class-331-94.5A; US-Patent-Class-240-4.1B) Avail:
NTIS HC $3.25 CSCL 20E
A high-power, continuous-wave laser was designed for use
in power transmission and energy-collecting systems, and for
producing incoherent light for pumping a laser material. The
laser has a high repetitive pulsing rate per unit time, resulting
in a high-power density beam. The laser is composed of xenon
flash tubes powered by fast-charge capacitors flashed in
succession by a high-speed motor connected to an automobile-
type distributor.

N75-30524* National Aeronautics and Space Administration.
Pasadena Office, Calif.
ELECTRIC POWER GENERATION SYSTEM DIRECTORY
FROM LASER POWER Patent
Katsunori Shimada, inventor (to NASA) (JPL) Issued 12 Aug.
1975 7 p Filed 27 Mar. 1974 Supersedes N74-19702 (12 -
p 1150) Sponsored by NASA
(NASA-Case-NPO-13308-1; US-Patent-3,899,696;
20E
A pool of liquid cesium is spaced apart from a collector in
an enclosed vessel. A laser beam is directed to the liquid cesium
pool. The beam is focused to provide sufficient laser power density
at the liquid cesium surface to vaporize some of the liquid cesium
and ionize the vaporized cesium, and thereby form cesium ions
and free electrons. The work function of the collector is different
from that of cesium. When the work function is higher, the
formed ions are attracted to the collector, and the electrons are
attracted by the collector and liquid cesium respectively when the work

36 LASERS AND MASERS
Includes parametric amplifiers.

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Lewis Research Center, Cleveland, Ohio.
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from that of cesium. When the work function is higher, the
formed ions are attracted to the collector, and the electrons are
attracted by the collector and liquid cesium respectively when the work
function of the collector is less than that of cesium. Thus, a potential difference is generated by the liquid cesium pool and the collector, sufficient to apply electric power to a load.

A gasdynamic laser which utilizes the infrared vibration-rotation transitions of a diatomic gas such as carbon monoxide, is reported.

An inert gas-copper vapor laser is described which consists of a multichamber structure, in which inert gases are heated and mixed with copper powder which is then vaporized, and an inert gas-copper vapor mixture is established in a plenum chamber. The inert gas copper vapor mixture, referred to as the lasant, passes from the plenum chamber through a nozzle into a laser chamber. Positioned in the laser chamber are a pair of spaced apart mirrors and a pair of spaced apart electrodes which together form a cylindrical laser cavity through which the lasant flows. One or both electrodes are comb-shaped. Each comb-shaped electrode consists of a plurality of equal length wires, all of which are connected together at a common terminal. The ends of the wires define tips which are equally spaced apart in a direction parallel to the cavity axis and are equally spaced therefrom. Current discharge due to a current pulse applied to the electrodes takes place at the wires tips. Each electrode is protected by a boron nitride electrode protective member which is slotted so that only the tips of the wires are exposed to the opposite electrode and to the hot plasma flowing between the electrodes through the laser cavity.

A distributed feedback laser that is capable of being continuously tuned and/or scanned is disclosed. The laser is capable of being operated in a continuous wave mode as well as a pulsed mode. A lasing medium and an acoustic transducer are mounted on a substrate to have acoustic waves produce periodic mechanical distortions of the lasing medium to cause corresponding periodic disturbances of the index of refraction of the lasing material. Conventional means of excitation of the lasing medium such as by electron bombardment, laser illumination, and application of electrical current, may be used.

A distributed feedback laser that is capable of being
A high-speed, self-acting circumferential type shaft seal for use in turbine engines is disclosed. One or more conventional circumferential ring seals having a central aperture are mounted in a housing. In three of the four embodiments of the invention, a helical groove and one or more dam seals are cut in the inner cylindrical surface of the one or more ring seals. In a fourth embodiment, two or more lift pads are disposed in surface contact with the inner cylindrical surface of the seal rings. To the outside of the lift pads, two dam seals are cut in the inner cylindrical surface of two of the ring seals. In each of the embodiments, a net outward radial force was produced during rotation of the turbine causing the ring seals to lift out of contact with the turbine shaft to minimize wear of the ring seals.

Official Gazette of the U.S. Patent Office
A Stirling cycle heat engine is described in which displacer motion is controlled as a function of the working fluid pressure and a substantially constant pressure. The heat engine includes an auxiliary chamber at the constant pressure, and an end surface of a displacer-piston is disposed in the auxiliary chamber. During the compression portion of the engine cycle when the fluid pressure rises above the constant pressure, the displacer forces the working fluid to pass from the cold chamber to the hot chamber of the engine. During the expansion portion of the engine cycle the heated working fluid in the hot chamber does work by pushing down on the engine’s drive piston. As the working fluid pressure drops below the constant pressure, the displacer forces most of the working fluid in the hot chamber to pass through the regenerator to the cold chamber. The engine is easily combinable with a refrigeration section to provide a refrigeration system in which the engine’s single drive piston serves both the engine and the refrigeration section.

MOTION RESTRAINING DEVICE Patent Application
Allen G. Ford, inventor (to NASA) (JPL) Filed 30 Apr. 1975
(Contract NAS7-100)

A motion-restraining device for dissipating at a controlled rate, the force of a moving body was developed. The device is characterized by a drive shaft adapted to be driven in rotation by a moving body and employs a three-stage motion-multiplying gear train. The force of a moving body may be without resorting to the use of conventional motion-control devices such as escape wheels, two arm pallets, and comparable components. NASA

ULTRASONICALLY BONDED VALUE ASSEMBLY Patent

A valve apparatus capable of maintaining a fluid-tight seal over a relatively long period of time by releasably bonding a valve member to its seat is described. The valve member is bonded or welded to the seat and then released by the application of the same energy to the bond joint. The valve member is held in place during the bonding by a clamping device. An appropriate force device can activate the opening and closing of the valve member. Various combinations of material for the valve member and valve seat can be utilized to provide an adequate sealing bond. Aluminum oxide, stainless steel, inconel, tungsten carbide as hard materials and copper, aluminum, titanium, silver, and gold as soft materials are suggested.

Official Gazette of the U.S. Patent Office
HOLE CUTTER Patent
An adjustable hole cutter is described for use in forming circular openings in workplaces. The hole cutter is characterized by a mount of a substantially planar configuration, positionable into a plane paralleling the working plane of a selected workplace. It also contains a shaft for imparting rotary motion to the mount about an axis of rotation normally related to the working plane, a plurality of stabilizing struts for resiliently supporting the mount in parallelism with the working plane as rotary motion is imparted thereto, a drill bit for drilling a pilot hole concentric with the axis of rotation, and an elongated cutting tool adjustably seated within a radially extended slot.

PROCESS FOR MAKING SHEETS WITH PARALLEL PORES OF UNIFORM SIZE Patent
Processes for making sheets with parallel pores of uniform size are described. In one form, the process comprises the steps of extruding a slurry formed of short, nonmetallic filament pieces, a metal powder, water, and a plasticizer through an orifice to align the filament pieces parallel to one another; cutting the extrusion into suitable sections; stacking the sections in parallel in a refractory container; compacting the stack; heating the stack in a reducing atmosphere; compacting while hot, if necessary; slicing, at right angles to the longitudinal axis of the original sections, the thusly formed billet into sheets; and leaching out the filament pieces in each sheet. In an alternate form, a continuous filament was used. The continuous filament is drawn through a slurry containing metal powder which may include a solder, water and a plasticizer rather than being extruded through an orifice. In a still further form, the continuous coated filament is wound onto a suitably shaped spool.
A gas-lubricated thrust bearing is described which employs relatively rigid inwardly cantilevered spokes carrying a relatively resilient annular member or annulus. This annulus acts as a beam on which are mounted bearing pads. The resilience of the beam mount causes the pads to accept the load and, with proper design, responds to a rotating thrust-transmitting collar by creating a gas film between the pads and the thrust collar. The bearing may be arranged for load equalization thereby avoiding the necessity of gimbal mounts or the like for the bearing. It may also be arranged to respond to rotation in one or both directions.
A remote-operated combination plasma torch and shutoff valve is described which may be employed to control the attitude of a satellite and which is characterized by high efficiency and extreme gas economy. A satellite-propulsion apparatus is discussed of the type, in which a multiplicity of bursts of power are employed to maintain the vessel oriented in space. It was adapted to prevent or minimize loss of propellant at the beginning and end of each power burst and to maintain the increased efficiency of the arc-jet propulsion system as compared to other propulsion systems.

A laminate thermal control coating for spacecraft comprised of a layer of solar radiation stable film, a layer of particulate radiation stable film applied to the upper surface of the solar radiation stable film, and a layer of reflecting material applied to the lower surface of the solar radiation stable film is proposed. The coating experiences no increase in solar radiation absorbance upon exposure to particulate or solar radiation as the particulate radiation is substantially absorbed in the particulate radiation stable layer. The solar radiation partially absorbed by the particulate radiation stable layer is transmitted by the solar radiation stable film to the reflecting material which reflects it back through the laminate and into space.

A thermally powered rotary actuator is disclosed which is used for positioning a shaft in first and second positions which are disposed 180 degrees apart. A pair of heat extensible springs are attached to the shaft and to the frame of the rotary actuator for selectively rotating the shaft from one of its two positions to the other position upon the application of heat to one of the heat extensible springs. The heat extensible springs are preferably constructed from the alloy 55-Nitinol. In the preferred embodiment, a detent mechanism is provided for locking the rotatable shaft in its two rotary positions.

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A thermally powered rotary actuator is disclosed which is used for positioning a shaft in first and second positions which are disposed 180 degrees apart. A pair of heat extensible springs are attached to the shaft and to the frame of the rotary actuator for selectively rotating the shaft from one of its two positions to the other position upon the application of heat to one of the heat extensible springs. The heat extensible springs are preferably constructed from the alloy 55-Nitinol. In the preferred embodiment, a detent mechanism is provided for locking the rotatable shaft in its two rotary positions.
An improved fifth wheel for a tractor trailer rig is described. The wheel is characterized by a first subassembly including a wear plate adapted to be mounted on a downwardly facing surface of a trailer with a normally projected king pin. A second subassembly is adopted to be pivotally mounted on an upwardly facing surface of a tractor and brought into contiguous relation with the first subassembly. A receiver is included for capturing the king pin and safety means responsive to a failure of the king pin or its latching mechanism for joining the first subassembly with the second subassembly.

A drilled ball bearing is disclosed which has a pair of projections machined or otherwise formed from the inner surface of each of the cage pockets. These projections prevent misorientation of the openings of the drilled passages of the balls with respect to the surfaces of the inner and outer races. The machining of the projections from the inner surface of each of the cage pockets forms a unitary one piece structure which has improved resistance to fragmentation caused by either thermal or vibrational effects when compared to conventional two piece anti-tipping cage assemblies.
SYSTEM FOR ENHANCING TOOL-EXCHANGE CAPABILITIES OF A PORTABLE WRENCH Patent

An improved system for enhancing the tool-exchange capabilities of a portable wrench is described. The system is characterized by a sleeve telescopically received by the housing of a wrench motor. A pressure-responsive catch supported by the sleeve is included for alternately grasping and releasing tools coaxially aligned with the wrench and seated within a tool receptacle.

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VARYING DENSITY COMPOSITE STRUCTURE Patent Application

An apparatus is disclosed which has a cellular core filled with material formed into stratified layers of varying density. The thermal, acoustic, or aesthetic characteristics of the composite structure thus produced may be tailored to suit a variety of design conditions. The method for producing the variable density composite structure is described.

A thermal insulation attaching means Patent Application

An isolation arrangement is reported for attaching tiles of insulating material to the surface of a structure sought to be protected against extreme temperatures of the nature expected to be encountered by the space shuttle orbiter. The insulating tiles are each affixed to an isolation pad formed of closely arranged randomly oriented fibers by means of a silicone resin adhesive.
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.

PHOTOVOLTAIC CELL ARRAY Patent Application

A construction technique for making high density solar cell arrays at lowered costs is presented. Closely spaced filaments of silicon are prepared to have a continuous layer-type semiconductor junction formed by creating an internal P-type conductivity region and outer N-type conductivity region. Electrical output connections are made to the P and N layer regions by means of P bus members and N bus members. The filaments of silicon and connecting buses are appropriately woven to form what is regarded as a solar cell blanket with an effective density of 100 to 1,000 photocells per square inch.

MECHANICAL THERMAL MOTOR Patent Application

A mechanical thermal motor was designed for converting thermal energy, such as solar energy, into mechanical motion for driving a pump. The thermal motor uses heated fluid produced by solar energy coming directly from the sun or through other fluid heaters. The motor includes a stationary core supported on a base structure. A cylindrical disc plate is carried adjacent a lower portion of the inner core and extends radially. An inner concentric cylinder encircles the inner core and is fixed by a number of radially extending spokes. An outer concentric cylinder encircles the inner concentric cylinder, and a spiral tube is coiled in the space between the two cylinders. The reciprocating motion of the spiral tube as it expands and contracts on the outer concentric cylinder is used as the input drive to a pump.

SOLAR POND Patent Application

Solar ponds were designed for the purpose of collecting low-temperature thermal energy on a large scale. The shallow pools include a number of narrow, elongated, grouped trenches with heat-absorbing black liners, and containing either a brine solution or plain water, depending on the means used to remove the thermal energy from the pond. The heat-absorbing liquid is kept separate from the thermal energy removing fluid by means such as transparent fluid or solid.
A fixed, linear, ground-based primary reflector is described which has an extended curved-sawtooth contoured surface covered with a metallized polymeric reflecting material. It reflects solar energy to a movably supported collector that is kept at the concentrated line focus of the reflector primary. The primary reflector was constructed by a process utilizing freeway paving machinery. The solar energy absorber is preferably a fluid-transporting pipe. Efficient utilization leading to high temperatures from the reflected solar energy was obtained by cylindrical shaped secondary reflectors that direct off-angle energy to the absorber pipe. Refocusing secondary reflectors which cause a series of discrete spots of highly concentrated solar energy to fall on the fluid-transporting pipe were used to obtain higher temperature levels. A seriatim arrangement of cylindrical secondary reflector stages and spot-forming reflector stages produces a high temperature solar energy collection system of greater efficiency.

A thermal energy storage system is proposed for converting a fluid such as water, into a superheated vapor for driving a turbine. An energy storage device is provided for storing thermal energy from the vapor to be utilized should the pressure of the vapor fall below a predetermined value. The energy storage device includes a storage tank with stacked vertical compartments containing metallic spheres filled with metal alloy for storing the thermal energy and a fluid reservoir below the stacked compartments.
A solar energy vapor (Freon) powered system for generating electrical energy is described in which a portion of the heat absorbed from the sun in daylight is stored for use during darkness by a thermal capacitor. A mass of Pyrene, having a high thermal capacity, liquifies when heat is applied to it and goes through a solidification process to provide a heat output. A highly efficient solar boiler is constructed utilizing an anodized titanium surface and a particular combination of shaped boiler tubes and complementary reflectors. The overall efficiency of the system is further improved by a unique arrangement of heat recovery devices.

A rechargeable cell or battery is described which minimizes the shape change of the zinc anode. The ionic conductivity of the paths between the electrodes is controlled so that ion flow is greatest at the edges of the electrodes and least at the centers reducing migration of the zinc ions from the edges to the center of the anode. Several embodiments of the invention are presented and discussed.

A device for the detection of pollutant gas molecules in the atmosphere is described. A laser source excites the atmospheric area which contains the pollutants to be analyzed. The laser beam causes the pollutants to fluoresce and emit a return-signal.
to the detector. The detector includes a gas cell that contains a compartment filled with the pollutant to be studied. This compartment absorbs the fluorescence from the reflected pollutant signal received at the detector. Another compartment is provided in the gas cell and the fluorescence of the reflected pollutant signal passes unimpeded through this second compartment. A difference measuring circuit detects the difference in output signals from the two compartments in order to obtain a signal indicative of the magnitude of the pollutant being analyzed.

Rotary plant growth accelerating apparatus for increasing plant yields by effectively removing the growing plants from the constraints of gravity and increasing the plant yield per unit of space is described. The apparatus is comprised of cylindrical plant beds supported radially removed from a primary axis of rotation, with each plant bed being driven about its own secondary axis of rotation and simultaneously moved in a planetary path about the primary axis of rotation. Each plant bed is formed by an apertured outer cylinder, a perforated inner cylinder positioned coaxially, and rooting media disposed in the space between. A rotatable manifold distributes liquid nutrients and water to the rooting media through the perforations in the inner cylinders as the plant beds are continuously rotated by suitable drive means.

N75-21921 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

IMPROVED METHOD OF DETECTING AND COUNTING BACTERIA Patent Application

An improved method is provided for determining bacterial levels, especially in samples of aqueous physiological fluids. The method depends on the quantitative determination of bacterial adenosine triphosphate (ATP) in the presence of nonbacterial ATP. Bacterial ATP is released by cell rupture and is measured by an enzymatic bioluminescent assay. A concentration technique is included to make the method more sensitive. It is particularly useful where the fluid to be measured contains an unknown or low bacteria count.

N75-26629 National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

APPLICATION OF LUCIFERASE ASSAY FOR ATP TO ANTIMICROBIAL DRUG SUSCEPTIBILITY TESTING Patent Application

A method is described for measuring the susceptibility of bacteria to antimicrobial agents by utilizing the bioluminescent reaction between adenosine triphosphate (ATP) and luciferase-luciferin mixtures. The bacterium is cultured in a growth medium and the amount of ATP in a sample of the bacterium is determined by measuring the amount of luminescent light emitted when the bacterial ATP is reacted with a luciferase-luciferin mixture. A fresh sample of the bacterium is then subjected to an antibiotic agent and the amount of bacterial ATP is assayed after the antibiotic treatment in the same manner. The ATP index is determined from the values obtained from the assay procedures.

N75-25503 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ROTARY PLANT GROWTH ACCELERATING APPARATUS Patent
52 AEROSPACE MEDICINE
Includes physiological factors; biological effects of radiation; and weightlessness.

N75-33640* National Aeronautics and Space Administration.
OPHTHALMIC LIQUIFACATION PUMP Patent

A surgical tissue macerating and removal tool is disclosed wherein a rotating member having a cutting tip is utilized. When the instrument is to be used in an eye, a treatment fluid is supplied to the operative site and a first pump is provided to evacuate macerated material and treatment fluid from the eye. The rotating member may be disposed in a support tube having an aperture and communication with the first pump to provide for discharge of the macerated material and used treatment fluid. A second pump means is provided on the rotating member to provide a counter flow of treatment fluid into the space between the rotating member and the support tube. The second pump may provide additional support for the rotating member. Means is also provided for axially positioning rotating member to increase or decrease cutting action.

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

N75-21948* National Aeronautics and Space Administration.
METHOD AND SYSTEM FOR IN VIVO MEASUREMENT OF BONE TISSUE Patent Application

Methods and apparatus are provided for radiologically determining the bone mineral content of living human bone tissue independently of the concurrent presence of adipose and other soft tissues. A target section of the body of the subject is irradiated with a beam of penetrative radiations of preselected energy to determine the attenuation of such beam with respect to the intensity of each of two radiations of different predetermined energy levels. The resulting measurements are then employed to determine bone mineral content.

N75-25594* National Aeronautics and Space Administration.
IODINE GENERATOR FOR RECLAIMED WATER PURIFICATION Patent Application

49
An electro-chemical iodine valve was designed to be operated by an electrical current in response to detection of iodine levels in the water supply. Additional iodine is injected into the water system in precise and controlled amounts so that a preset residual concentration of iodine in the water supply may be maintained. The iodine generator includes a sensor which electronically detects the iodine level in the water, and produces a correction current control. The correction current control causes the electro-chemical iodine valve to release iodine from the iodine accumulator into the iodine dispenser. The valve operates at a power of 10 mWatts and the system uses recycled water.

NASA N75-27768® National Aeronautics and Space Administration. Pasadena Office, Calif.

COOPERATIVE MULTIAxis SENSOR FOR TELEOPERATION OF ARTICLE MANIPULATING APPARATUS Patent

Apparatus for grasping an article under remote control is provided with a sensor comprised of a photodetecting cell divided into four quadrants to define X and Y coordinates and a light emitting diode on a Z axis normal to the X and Y axes. Two additional light emitting diodes are equally spaced on each side of the first diode along the X axis of the sensor. The diodes are sequentially energized and images of the diodes are reflected by a target comprising two plane mirrors and a corner retroreflector mounted on the article to produce signals from the cells which, when combined and nulled, will align X, Y, and Z axes of the sensor with corresponding axes Xr, Yr, and Zr of the target, and also decrease the distance between the sensor and the mirror to a predetermined value.


MULTIPARAMETER VISION TESTING APPARATUS Patent

Compact vision testing apparatus is described for testing a large number of physiological characteristics of the eyes and visual system of a human subject. The head of the subject is inserted into a viewing port at one end of a light-tight housing containing various optical assemblies. Visual acuity and other refractive characteristics and ocular muscle balance characteristics of the eyes of the subject are tested by means of a retractable phoroptor assembly carried near the viewing port and a film cassette unit carried in the rearward portion of the housing (the latter selectively providing a variety of different visual targets which are viewed through the optical system of the phoroptor assembly). The visual dark adaptation characteristics and absolute brightness threshold of the subject are tested by means of a
A projector assembly which selectively projects one or both of a variable intensity fixation target and a variable intensity adaptation test field onto a viewing screen located near the top of the housing.

N75-27760* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

REFERENCE APPARATUS FOR MEDICAL ULTRASONIC TRANSDUCER Patent

A portable miniature ultrasonic transducer positioning apparatus is described; the apparatus has a transducer receiving sleeve coupled to a pair of orthogonally orientated, independently pivotable yokes. The yokes are pivotably mounted to a base member. A pair of potentiometers are coupled to the axes of the yokes and to a dual meter sleeve position indicator for indicating, with respect to the axes of the yokes, the angular position of a probe slidably fitted in the sleeve. An oscilloscope or similar signal display device is coupled to the probe for providing signal readout for use in ultrasonic cardiology oscilloscope studies. As an option, a ball lever assembly is provided for remotely controlling yoke position and the angular position of the sleeve and a probe fitted to it.

N75-27761* National Aeronautics and Space Administration. Pasadena Office, Calif.

HEAT STERILIZABLE PATIENT VENTILATOR Patent

An improved heat-sterilizable patient ventilator is disclosed. The device is characterized by a ported center-body, a shell formed of heat sterilizable material mounted on the center-body and defining a hermetically sealed reservoir for confining under positive pressure a mixture of bacteria-free gas, and a pneumatic circuit including an oxygen delivery jet coupled with an absolute filtration system for delivering bacteria-free mixture of gases to the reservoir.

N75-32766* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AUTOMATIC FLUID DISPENSER Patent Application

An apparatus for dispensing fluid to test animals according to a time schedule is disclosed. Fluid automatically flows to individual dispensing units at predetermined times from a fluid supply and is available only for a predetermined interval of time after which an automatic control causes the fluid to drain from the individual dispensing units. Fluid deprivation continues until
the beginning of a new cycle when the fluid is once again automatically made available at the individual dispensing units.

An actuator device is provided for moving an artificial leg of a person having a prosthesis replacing an entire leg and hip joint. The device includes an articulated hip joint assembly carried by the natural leg and a second articulated hip joint assembly carried by the prosthesis. The energy created from the movement of the natural leg is transferred by a compressible fluid from the first hip joint assembly to the second hip joint assembly for moving the artificial leg.

An improved load handling device particularly suited for use as an escape device for high altitude structures is reported. The device is characterized by a vertically oriented base, adapted to be mounted near a selected opening of a building or the like, having mounted thereon a capstan including a drum supported for rotation. A storage reel is mounted on the base in spaced relation with the drum. A flexible line is stored in a variable number of turns on the storage reel and wound about the drum in a fixed number of turns for suspending loads attached. A double acting dashpot restrains the drum against load induced rotation.

An apparatus is described for cyclic therapeutic exercise of incapacitated hands. It alternately imparts a straightening and bending motion to the fingers by the use of a splint-like inflatable member attached to the top of the hand and a lower pouch in the palm of the hand which pulls a flap tight around the fingertips. The basic operation of the invention in straightening the fingers is described. The upper pouch is inflated causing the fingers, which are attached to it by finger loops, to be straightened. When the upper pouch is deflated through a valve, the lower pouch is inflated, and this pulls a flap tight around the fingertips.
causing them to bend. Alternate inflation and deflation of the upper and lower pouches is accomplished by a pumping system, which, by use of a cycling valve, assures one pouch is always being deflated while the other is being inflated.

**70 PHYSICS (GENERAL)**

For geophysics see 46 Geophysics. For astrophysics see 90 Astrophysics. For solar physics see 92 Solar Physics.

**N75-26789**

*ANTI-GRAVITY DEVICE Patent Application*


An educational toy useful in demonstrating fundamental concepts regarding the laws of gravity is described. The device comprises a sphere 10 of radius $r$ resting on top of sphere 12 of radius $R$. The center of gravity of sphere 10 is displaced from its geometrical center by distance $D$. The dimensions are so related that $D(R+r)/r$ is greater than $r$. With the center of gravity of sphere 10 lying on a vertical line, the device is in equilibrium. When sphere 10 is rolled on the surface of sphere 12 it will return to its equilibrium position upon release. This creates an illusion that sphere 10 is defying the laws of gravity. In reality, due to the above noted relationship of $D$, $R$, and $r$, the center of gravity of sphere 10 rises from its equilibrium position as it rolls a short distance up or down the surface of sphere 12.

**N75-22108**

*NONEQUILIBRIUM RADIATION NUCLEAR REACTOR Patent Application*


An externally moderated thermal nuclear reactor is disclosed which is designed to provide output power in the form of electromagnetic radiation. The reactor is a gaseous fueled nuclear cavity reactor device which can operate over wide ranges of temperature and pressure, and which includes the capability of processing and recycling waste products such as long-lived transuranium actinides. The primary output of the device may be in the form of coherent radiation, so that the reactor may be utilized as a self-critical nuclear pumped laser.

**N75-30876**

*PROTECTED ISOTOPE HEAT SOURCE Patent*


A radioactive isotope capsule is disposed in a container (heat shield) which will have a single stable trim attitude when reentering the earth's atmosphere and while falling to earth. The center of gravity of the heat source is located forward of the midpoint.
between the front face and the rear face of the container. The capsule is insulated from the front face of the container but not from the rear surface of the container.

Official Gazette of the U.S. Patent Office

74 OPTICS

Includes light phenomena.

N75-22119* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

WINDOW DEFECT PLANAR MAPPING TECHNIQUE Patent Application
Fred R. Minton (Rockwell Intern.) and Uel O. Graham, inventors (to NASA) (Rockwell Intern.) Filed 14 Mar. 1975 10 p (Contract NAS9-14000)

A method of window defect planar mapping is presented. The windows are edge lighted by fiber optics and light sensitive contact paper is applied to the surface of the windows. When the light source is activated, the windows are illuminated, and the light sensitive paper is exposed. A photographic record of window defects is provided upon subsequent chemical development of the light sensitive paper.

N75-28871* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

OPTICAL NOISE SUPPRESSION DEVICE AND METHOD Patent Application

Disclosed is a device and method for suppression of optical noise in an optical spatial filtering system using highly coherent light. In the disclosed embodiment, input photographic film to be processed in the system, and output photographic film to be exposed, are each mounted on lateral translation devices. During application of the coherent light for exposure of the output film, the two translation devices are moved in synchronism by a motor-driven gear and linkage assembly. The ratio of the resulting output film translation to the input film translation is equal to the magnification of the optical data processing system. The noise pattern associated with the lenses and other elements in the optical processing system remains stationary while the image producing light moves laterally through the pattern with the output film, thus averaging out the noise effect at the output film.

Dissert. Abstr.
An invention for a lightweight solar reflector assembly having a glass cellular substrate and a method of forming the reflector assembly was described. The novelty of the invention appears to reside in the method of forming a large low cost reflective surface for use in a solar concentrator or antenna. The invention also includes the reflective component combination of a lamina glass reflective surface and a lightweight cellular glass substrate having the same coefficient of thermal expansion to provide a high quality optical reflective surface.

A technique is described for stabilizing the gate threshold potential at room temperature of a radiation subjected MOS field effect device with a semiconductor substrate, and insulating layer of oxide on the substrate, and a gate electrode disposed on the insulating layer. Boron is introduced into the insulating oxide immediately adjacent the semiconductor-insulator interface. The concentration of boron in the oxide layer is maintained at 10 atoms/cm³. Radiation induced positive gate charge accumulations which would cause shifting of the gate threshold potential of a radiation subjected MOS device, and render the device unstable and inoperative are reduced.

Disclosed is a method and system for obtaining electronic chroma signals with a single scanning type image device by optically producing a color multiplexed light signal using an arrangement of dichroic filter stripes. A two layer filter system is used to color modulate external light which is then detected by an image pickup tube. The resulting time division multiplexed electronic signal from the pickup tube is converted by a decoder into a green color signal, and a red/blue multiplexed signal, which is demultiplexed to produce red and blue color signals. The three primary color signals are capable of being encoded as standard NTSC color signals.

A method of growing or refining bulk single crystals, particularly crystals of semiconductor materials useful in the manufacture of solid state electronic components, is reported. A principle difficulty in the crystallization of such materials is that of obtaining crystals of a desired maximum size. The procedure described solves this problem by growing crystals in a base
material that is suspended, positioned, and shaped as a containerless melt by wetting forces in an environment substantially free of gravity.

A process for forming crystalline films in a weightless environment is reported. The surface of a liquid melt is expanded by injecting a quantity of gas and then subsequently cooled in steps until crystallization to a predetermined configuration is obtained. Cooling takes place at a rate proportional to the rate of film expansion.
This bibliography is issued in two sections: Section 1 - Abstracts, and Section 2 - Indexes. This issue of the Abstract Section cites 180 patents and applications for patent introduced into the NASA scientific and technical information system during the period of July 1975 through December 1975. Each entry in the Abstract Section consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or application for patent. This issue of the Index Section contains entries for 2905 patent and application for patent citations covering the period May 1969 through December 1975. The Index Section contains five indexes -- subject, inventor, source, number and accession number.
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