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This bibliography was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Informatics Information Systems Company.
Annotated references to NASA-owned inventions covered by U.S. patents and applications for patent that were announced in *Scientific and Technical Aerospace Reports (STAR)* between January 1975 and June 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 158 citations published in this issue of the Abstract Section cover the period January 1975 through June 1975. The Index Section contains references to the 2830 citations covering the period May 1969 through June 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 date 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**

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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.
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 invention(s), and (B) follow the instructions outlined in (2)(B), (C), 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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PATENT LICENSING REGULATIONS

Title 14—AERONAUTICS AND SPACE

Chapter V—National Aeronautics and Space Administration

PART 1245—PATENTS

Subpart 2—Patent Licensing Regulations

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

Sec.
1245.200 Scope of subpart.
1245.201 Definitions.
1245.202 Basic considerations.
1245.203 Licenses for practical application of inventions.
1245.204 Other licenses.
1245.205 Publication of NASA Inventions available for license.
1245.206 Application for nonexclusive license.
1245.207 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.

2. Issued under 42 U.S.C. 2457, 2478(b) (3).

§ 1245.200 Scope of subpart.

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

§ 1245.201 Definitions.

For the purpose of this subpart, the following definitions apply:

(a) "Invention" means an invention covered by a U.S. patent or patent application for which the Administrator of NASA holds title on behalf of the United States.

(b) "To practice an invention" means to make or have made, use or have used, sell or have sold, or otherwise dispose of an invention, or to use or have used the process or method comprising the invention.

(c) "Practical application" means the manufacture 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, patented or unpatented, made by the NASA Assistant General Counsel for Patent Matters to be subject to short-form licensing procedures. A Special invention may be designated as a Special invention when a determination is made that:

(1) Practical application has occurred and is likely to continue for the life of the patent and for which an exclusive license is not in force, or

(2) The public interest would be served by the expeditious granting of a nonexclusive license or for practice of the invention by the public.

(e) The "Administrator" means the Administrator of the National Aeronautics and Space Administration, or his designee.

(f) "Government" means the Government of the United States of America.

(g) The "Inventions and Contributions Board" means the NASA Inventions and Contributions Board established by the Administrator of NASA within the Administration in accordance with section 305 of the National Aeronautics and Space Act of 1958 as amended (42 U.S.C. 2457).

§ 1245.202 Basic considerations.

(a) Much of the new technology resulting from NASA sponsored research and development in aeronautical and space activities is being applied in other fields. NASA has special authority and responsibility under the National Aeronautics and Space Act of 1958, as amended (42 U.S.C. 2451), to provide for the widest practical dissemination and utilization of this new technology. In addition, NASA has been given unique requirements to protect the inventions resulting from NASA activities and to promulgate licensing regulations to encourage commercial use of these inventions.

(b) NASA-owned inventions will best serve the interests of the United States when they are brought to practical application in the shortest 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 which manufacturers may be unwilling to risk under a nonexclusive license. It is the policy of NASA to seek exclusive licenses when such licenses will provide the necessary incentive to the licensee to achieve early practical application of the invention.

(c) The Administrator, in determining whether to grant an exclusive license, will evaluate all relevant information submitted by applicants and all other persons and will consider the necessity for further technical and market development of the invention, the capabilities of prospective licensees, their proposals as to undertake the required investment and development, the impact on competitors, and the benefits of the license to the Government and the public. Preference for exclusive license shall be given to U.S. citizens or companies who intend to manufacture or use, in the case of a process, the invention in the United States of America, its territories and possessions. Consideration may also be given to assisting small businesses and minority business concerns 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 and in 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 licensing under § 1245.208, consistent with the provisions of any existing exclusive license.

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

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

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

(5) The license shall extend to the subsidiaries and affiliates of the licensee and shall be nonassignable without approval of the Administrator, NASA, except to the successor of that part of the licensee's business to which the invention pertains.

(c) Short-form nonexclusive licenses. A nonexclusive, revocable license for a special invention, as defined in § 1245.201 (d), shall be granted upon written request, to any applicant pursuant to 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 in determining that the invention has not been brought to practical application by a nonexclusive licensee in the fields of use or geographical locations covered by the application for the exclusive license.

(ii) A practical application of the invention in the fields of use or geographical locations covered by the application for the exclusive license is 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 these regulations, and (c) the exclusive license will provide the necessary incentive to the licensee to achieve the practical application of the invention; and

(ii) Either a notice pursuant to
§ 1245.205 Listing the invention as available for license. An invention has been published in the Federal Register for at least 9 months; or a patent covering the invention has been issued for at least 6 months. However, a limited exclusive license may be granted prior to the periods specified above if the Administrator determines that the public interest will best be served by the earlier grant of an exclusive license.

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

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

(4) The license may provide for the right to grant sublicenses of the same or less scope to the extent the contractor was legally obligated to do so at the time the contract was awarded. Each such license and right is nontransferable except to the successor of that part of the contractor's business to which the invention pertains.

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

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

(7) The license may reserve to the Contractor's business to which the invention pertains.

(9) Subject to the approval of the Administrator, the license may grant the right to one or more applicants to take into consideration the current royalty rates under similar patents and other pertinent facts: (i) To the extent that the Government desires to take or not take any actions, such as may be necessary to fulfill health or safety needs, or for purposes of furthering the Government's interest in the invention; and (ii) to provide the right for the Government to require additional licenses, or for the Government to require the applicant to pay the reasonable royalty rates applicable to the invention.

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

§ 1245.204 Other licenses.

(a) License to contractor. There is hereby granted to the contractor reporting an invention made in the performance of work under a contract of NASA in the manner specified in section 305(a) (1) of 12457(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 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 license was awarded. Such license and right are nontransferable except to the successor of that part of the contractor's business to which the invention pertains.

(b) Miscellaneous licenses. Subject to any other licenses, nothing in this subpart shall preclude the Administrator from granting other licenses for inventions, when he determines that doing so would provide for an equitable distribution of rights. The following exemplify 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 patents.

§ 1245.206 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 the NASA Technical Reports Service (STAR) and other NASA publications.

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

§ 1245.205 Application for nonexclusive license.

(a) Submission of application. An application for nonexclusive license shall be submitted to NASA at any time. An application for nonexclusive license shall be addressed to the NASA Assistant General Counsel for Patent Matters.

(b) Contents of an application for nonexclusive license. In addition to the requirements of § 1245.206(b), an application for a nonexclusive license shall include:

(1) Applicant's status, if any, in any one or more of the following categories:
   (i) Small business firm;
   (ii) Minority business enterprise;
   (iii) Location in a surplus labor area;
   (iv) Location in a low-income urban area; and
   (v) Location in an area designated by the Government as economically depressed.

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

(3) A statement whether the applicant would be willing to accept a license for all or less than all fields of use of the invention, and the applicant's offer to invest that sum and to perform such acts if the license is granted.

(4) A statement indicating the amount of royalty fees or other consideration, if any, the applicant would be willing to accept in order to license the invention.

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

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

§ 1245.208 Processing applications for license.

(a) Initial review. Applications for nonexclusive and exclusive licenses un- under §§ 1245.206(b) and 1245.207 will be re- viewed by the Patent Counsel of the NASA installation having cognizance for the invention and the NASA Assistant General Counsel for Patent Matters, to determine the conformity and appro- priateness of the application for license and the availability of the specific in- vention 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 re- quested license. Prior to forwarding ap- plications for exclusive licenses to the Inventions and Contributions Board, notice in writing will be given to each nonexclusive license which is specified in the license, or if the licensee at any time shall default in making any report required by the license, or shall make any false report, or shall commit any breach of any covenant or agreement therein 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 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 Adminis- trator if in his opinion such revocation is necessary to achieve the earliest practi- cal application of the invention pursuant to an 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.

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, which shall be allowed 30 days after such notice in which to appeal to the Administrator. The Administrator shall review the Board's recommendation and determine whether the license should be revoked either in part or in its entirety. The Administrator shall review the rec- ommendation of the Board and deter- mine 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 have the opportu- nity to be heard before the Inventions and Contributions Board, and to offer evidence in support of his appeal. The decision of the Board on the question of revocation whether the license should be re- vised whether or not in its entirety. The Administrator shall review the rec- ommendation of the Board and deter- mine 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.

§ 1245.211 Revocation of licenses.

(a) Any license granted pursuant to § 1245.205 may be revoked, either in part or in its entirety, if in his opinion the licensee at any time shall fail to use adequate efforts to bring to or achieve practical application of the invention in accordance with the terms of the license, or if the licensee at any
time shall default in making any report required by the license, or shall make any false report, or shall commit any breach of any covenant or agreement therein contained, and shall fail to remedy 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.

§ 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 knowl- edge, or which he may acquire under normal business practice, pertaining to the commercial use that is being made of the invention and such other infor- mation which the Administrator may de- termine pertinent to the licensing pro- gram and which is specified in the license.

§ 1245.211 Revocation of licenses.

(a) Any license granted pursuant to § 1245.205 may be revoked, either in part or in its entirety, 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 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.

§ 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 have the opportu- nity to be heard before the Inventions and Contributions Board, and to offer evidence in support of his appeal. The decision of the Board on the question of revocation whether the license should be re- vised whether or not in its entirety. The Administrator shall review the rec- ommendation of the Board and deter- mine 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.

Any exclusive licensee shall be granted the right to sue at his own expense any party who infringes the rights set forth in his license and covered by the licensed patent. The licensee may join the Gov- ernment, upon consent of the Attorney General, as a party in interest in such suit, but without expense to the Gov- ernment and the licensee shall pay fees and any final judgment or decree that may be rendered against the Govern-
PATENT LICENSING REGULATIONS

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

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

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

JAMES C. FLETCHER, Administrator.

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.

01 AERONAUTICS (GENERAL) N.A.

02 AERODYNAMICS N.A.

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 N.A.

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

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

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION N.A.

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

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

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE 1

Includes aircraft simulation technology.

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

06 AIRCRAFT INSTRUMENTATION 1

Includes cockpit and cabin display devices; and flight instruments.

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

07 AIRCRAFT PROPULSION AND POWER N.A.

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

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

08 AIRCRAFT STABILITY AND CONTROL N.A.

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

09 RESEARCH AND SUPPORT FACILITIES (AIR) 2

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

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

ASTRONAUTICS

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

For related information see also Aeronautics.

12 ASTRONAUTICS (GENERAL) N.A.

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

13 ASTRODYNAMICS N.A.

Includes powered and free-flight trajectories; and orbit and launching dynamics.

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

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

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

15 LAUNCH VEHICLES AND SPACE VEHICLES 3

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

16 SPACE TRANSPORTATION N.A.

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

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

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING N.A.

Includes telemetry; space communications networks; astronautigation; and radio blackout.

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

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 3

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see 54 Man/System Technology and Life Support. For related information see also 05 Aircraft Design, Testing and Performance and 39 Structural Mechanics.
19 SPACECRAFT INSTRUMENTATION N.A.
   For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.

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

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

23 CHEMISTRY AND MATERIALS (GENERAL) 5
   Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS 5
   Includes laminates.

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

26 METALLIC MATERIALS 8
   Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS N.A.
   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) 9
   Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 9
   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 11
   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 18
   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 19
   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 31
   Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 34
   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 N.A.
   Includes structural element design and weight analysis; fatigue; and thermal stress.

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

42 GEOSCIENCES (GENERAL) N.A.
43 EARTH RESOURCES 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 40
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) 41
Includes genetics.

52 AEROSPACE MEDICINE 42
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 42
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 43
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 43
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) 44
For geophysics see 46 Geophysics. For astrophysics see 90 Astrophysics. For solar physics see 92 Solar Physics.
71 ACOUSTICS
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 N.A.
Includes elementary and nuclear particles; and reactor theory.
For space radiation see 93 Space Radiation.

74 OPTICS
Includes light phenomena.

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

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

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

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

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

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

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

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

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

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

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

88 SPACE SCIENCES (GENERAL) N.A.

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

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

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

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

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

GENERAL

99 GENERAL N.A.

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

Section 2 • Indexes
SUBJECT INDEX
INVENTOR INDEX
SOURCE INDEX
NUMBER INDEX
ACCESSION NUMBER INDEX

xv
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.

N75-12930* National Aeronautics and Space Administration.
Ames Research Center, Moffett Field, Calif.
INTEGRATED LIFT/DRAG CONTROLLER FOR AIRCRAFT Patent

A system for altering the lift/drag characteristics of powered aircraft to provide a safe means of glide path control includes a control device integrated for coordination action with the aircraft throttle. Such lift/drag alteration devices as spoilers, dive brakes, and the like are actuated by manual operation of a single lever coupled with the throttle for integrating, blending or coordinating power control. Improper operation of the controller is inhibited by safety mechanisms. Official Gazette of the U.S. Patent Office.

06 AIRCRAFT INSTRUMENTATION
Includes cockpit and cabin display devices and flight instruments.
For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography.

N75-12947*# National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
MAGNETIC HEADING REFERENCE Patent Application

The development and characteristics of a magnetometer which is used as a magnetic heading reference for small aircraft are discussed. In addition to providing a heading reference the device also corrects the output of the magnetometer to reduce the amount of northerly turning error. The inputs of the fluidic rate sensor and the rate bridge to the demodulator coils of the instrument are diagrammed. The application of the device to automatic pilots is analyzed. NASA.
RESEARCH AND SUPPORT FACILITIES (AIR)

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

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

N75-11997* National Aeronautics and Space Administration. Pasadena Office, Calif. ANNUAL ARC ACCELERATOR SHOCK TUBE Patent Application

Lewis P. Leibowitz, inventor (to NASA) (JPL) Filed 6 Nov. 1974 22 p (Contract NAS7-100)


The development of an annular arc accelerator shock tube to study the effects of shock entry into planetary atmospheres is reported. A cold gas driver is employed by the shock tube to flow a stream of gas from an expansion section through a high voltage electrode section to a test section thus driving a shock wave in front of it. A glow discharge detects the shock wave and actuates a trigger generator which in turn fires spark-gap switches to discharge a bank of capacitors across a centered cathode and an annular anode in tandem electrode sections as the initial shock wave passes through the anode section from the cathode section thereby depositing energy into the flow gas without the necessity of any diaphragm opening in the gas flow from the expansion section through the electrode sections.

N75-12968* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala. AUTOMATICALLY OPERABLE SELF-LEVELING LOAD TABLE Patent


A self-leveling load table is described which is automatically maintained level by selectively opening and closing solenoid valves for inserting and removing air from chambers under the table. The table is floated in a fluid by nine air chambers beneath the top of the table. These chambers are open at the bottom and four oppositely located chambers are used for leveling the table by having the air increased or decreased by means of a flexible hose. Air bearing pendulums are used for selectively energizing solenoid valves which either apply pressurized air to the chamber or evacuate air from the chamber by means of a vacuum source.

N75-16682* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va. KINESTHETIC CONTROL SIMULATOR Patent


A kinesthetic control simulator is reported that has a flat base upon which rests a support structure having a lower spherical surface for rotation on the base plate with columns which support
a platform above the support structure at a desired location with respect to the center of curvature of the spherical surface. A handrail is at approximately the elevation of the hips of the operator above the platform with a ring attached to the support structure which may be used to limit the angle of tilt. Five degree freedom-of-motion can be obtained by utilizing an air-pad structure for support of the control simulator.

Official Gazette of the U.S. Patent Office

15 LAUNCH VEHICLES AND SPACE VEHICLES

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

N75-13007* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

REMOTE PLATFORM POWER CONSERVING SYSTEM Patent


A system is described where an unattended receiver and transmitter equipped data collection platform is interrogated by a substantially polar orbiting satellite. The method and apparatus involve physically representing the orbit of the satellite and the spin of the planetary body with timers, and using these representations to turn on the platform's receiver only when the satellite should be in radio range of the platform, whereby battery power at the platform is conserved.

Official Gazette of the U.S. Patent Office

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.

N75-14818* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

A DEPLOYABLE FLEXIBLE TUNNEL Patent Application


A pressurized flexible tunnel with equal length cables between the ends of the tunnel is described for use between two vehicles in outer space. The cables are lengthened or shortened by a single winch. The tunnel may be expanded or contracted as required by externally positioned orienting means.

Official Gazette of the U.S. Patent Office

N75-16613* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

VARIABLE DIHEDRAL SHUTTLE ORBITER Patent Application


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.

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

N75-19329  National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.
SPACE VEHICLE Patent
George L. VonPragenau, inventor (to NASA) Issued 18 Feb.
1975 7 p Filed 21 Mar. 1974 Supersedes N74-20541 (12 -
11, p 1355)
(NASA-Case-MFS-22734-1; US-Patent-3,866,863;
US-Patent-Appl-SN-453232; US-Patent-Class-244-162) Avail:
US Patent Office CSCL 22B

A space vehicle having an improved ascent configuration
for use in traveling in space is presented. Components of the
vehicle are: (1) a winged orbiter having an elongated fuselage and
rearwardly directed main engines fixed to the fuselage; (2)
an elongated tank assembly of an improved configuration disposed
forwardly of the fuselage and connected with the main engines
of the vehicle for supplying liquid propellants; and (3) a booster
stage comprising a pair of integrated solid rocket boosters
connected with the orbiter immediately beneath the fuselage and
extended in substantial parallelism.

Official Gazette of the U.S. Patent Office

N75-16624  National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
METHOD OF CONSTRUCTING DISHED ION THRUSTER
GRIDS TO PROVIDE HOLE ARRAYS SPACING COMPENSA-
TION Patent Application
Bruce A. Banks, inventor (to NASA) Filed 20 Jan. 1975
12 p
(NASA-Case-LEW-11876-1; US-Patent-Appl-SN-542157) Avail:
NTIS HC $3.25 CSCL 21C

Hydroforming matched grids for an accelerator system of
an ion thruster is described. The accelerator grid is stretched
prior to hydroforming so that the center-to-center spacing of
the whole array in the accelerator grid is larger than the screen
grid. Stretching of the accelerator grid is done in a manner that
uniformly stretches the grid in all directions in the plane of the
grid. The center-to-center spacings of a photosist pattern for
an array of holes applied to a thin metal sheet are increased by
uniformly stretching the thin metal sheet in all directions along
the plane of the sheet. The uniform stretching is provided by
securely clamping the periphery of the thin sheet and applying an
annular force against the face of the sheet, within the periphery
of the sheet and around the photosist pattern. The technique
is used in the construction of ion thruster grid units wherein
the outer or downstream grid is subjected to uniform stretching
prior to convex molding. The technique provides alignment of
the holes of grid pairs so as to direct the ion beamlets in a
direction parallel to the axis of the grid unit and thereby
provide optimization of the available thrust.

Official Gazette of the U.S. Patent Office
A pair of flat grid blanks are clamped together at their edges with an impervious metal sheet on top. All of the blanks and sheets are dished simultaneously by forcing fluid to inflate an elastic sheet which contacts the bottom grid blank. A second impervious metal sheet is inserted between the two grid blanks if the grids have high percentage open areas. The dished grids are stress relieved simultaneously.

The ferrite memory arrays are made from pre-formed metal conductors for the ferrite arrays. The conductors are made by forming a thin sheet of a metallizing paste of metal alloy powder, drying the paste layer, bisque firing the dried sheet at a first temperature, and then punching the conductors from the fired sheet. During the bisque firing, the conductor sheet shrinks to 58 percent of its pre-fired volume and the alloy particles sinter together. The conductors are embedded in ferrite sheet material and finally fired at a second higher temperature during which firing the conductors shrink approximately the same degree as the ferrite material.
A method for fabricating multi-foil insulation systems is described. Metal foils with protuberances which are capped with ceramic coatings are produced by the method. The coated protuberances provide spacing between the foils, while the ceramic coatings serve as thermal barriers to metallic heat conduction between the foils. Diagrams of the fabricating equipment and the resulting product are developed.

Author
METHOD OF PREPARING WATER PURIFICATION MEMBRANES Patent

Allyl amine and chemically related compounds are polymerized as thin films in the presence of a plasma discharge. The monomer compound can be polymerized by itself or in the presence of an additive gas to promote polymerization and act as a carrier. The polymerized films thus produced show outstanding advantages when used as reverse osmosis membranes.

Official Gazette of the U.S. Patent Office

GROWTH OF GALLIUM NITRIDE CRYSTALS Patent Application

Bulk gallium nitride single crystals are grown by subjecting in the vapor phase, ammonia and a gallium compound selected from the group consisting of gallium trioxide and gallium monochloride, to a reaction temperature in a reaction vessel.

PROCESS FOR MAKING ANHYDROUS METAL HALIDES Patent Application

A process for the preparation and isolation of high purity anhydrous lower valence state metal halides using high energy radiation is reported. The process involves dissolving the corresponding higher valence state metal halide of the desired lower valence state metal halide in an organic liquid, which is selected such that the higher valence state metal halide is soluble and the lower valence state metal halide is insoluble. The solution is subjected to high energy radiation which reduces the higher valence state metal halide to its corresponding lower valence state metal halide, at a temperature in the range of from about 0 C. to about room temperature.
vessel where the eluant is removed. Final analysis of the purified acylated amino acid esters is accomplished by gas-liquid chromatographic techniques.


A method is described to improve the structure and homogeneity of eutectic materials and single crystals. A predetermined amount of segregation is introduced into a molten sample of a composite that exhibits the Soret effect, such amount approximating the amount of segregation resulting from directional solidification of the sample. The molten sample is then directionally solidified starting at the end opposite the end richer in the constituent that would migrate toward the cooler part of a liquid solution of the composite maintained in a temperature gradient. Since solidification commences at the end deficient in such constituent, its migration toward the interface between the solid and liquid during the solidification will compensate for the deficiency. A homogeneous solidification product that is well suited to the production of high temperature eutectic composites, fiber optic strands, and electronic materials is produced.

APPARATUS FOR MEASURING THE FERRITE CONTENT OF AUSTENITIC STAINLESS STEEL WELD MATERIAL Patent Application

A device is provided for measuring the ferrite content of austenitic stainless steel weld material. The device includes a base plate for rotatably mounting a mechanical vernier member; the mechanical vernier member supports a cantilever beam in a manner to provide vertical positioning of the beam. Suspended from the free end of the beam is a permanent magnet below which is positioned the specimen of austenitic weld material which is to be tested. Strain gauges are provided on the top surface of the beam for measuring the magnetic force between the magnet and weld material by measuring the amount of downward deflection of the beam. The measurement is then converted into a reading which indicates the percentage of ferrite of the weld material in the joint.

DUPLEX ALUMINIZED COATINGS Patent

The surface of a metallic base system is initially coated with a metallic alloy layer that is ductile and oxidation resistant. An aluminide coating is then applied to the metallic alloy layer. The chemistry of the metallic alloy layer is such that the oxidation resistance of the subsequently aluminized outermost layer is not seriously degraded.


**31 ENGINEERING (GENERAL)**

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

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**N75-12161* National Aeronautics and Space Administration.**

**SYSTEM FOR DEPOSITORING THIN FILMS Patent**

Philip W. Tashbar, inventor (to NASA) Issued 12 Nov. 1974

6 p Filed 2 May 1973 Supersedes N73-23770 (11 - 14, p 1697)


A system for depositing a thin film of one material onto another is described. A mass filter is interposed between the source of material being deposited and the object upon which deposition is being made. Official Gazette of the U.S. Patent Office

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**N75-13111* National Aeronautics and Space Administration.**

**EVACUATED, DISPLACEMENT COMPRESSION MOLD Patent**

Wilbur C. Heier, inventor (to NASA) Issued 26 Nov. 1974


A process of molding long thin-wall tubular bodies from thermosetting plastic molding compounds is described wherein the tubular body lengths may be several times the diameters. The process is accomplished by loading a predetermined quantity of molding compound into a female mold cavity closed at one end by a force mandrel. After closing the other end of the female mold with a balance mandrel, the loaded cavity is evacuated by applying a vacuum of from one-to-five mm pressure for a period of fifteen-to-thirty minutes. The mold temperature is raised to the minimum temperature at which the resin constituent of the compound will soften or plasticize and a pressure of 2500 psi is applied. Official Gazette of the U.S. Patent Office

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**32 COMMUNICATIONS**

Includes land and global communications; communications theory; and optical communications.

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

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**N75-13124* National Aeronautics and Space Administration.**

**FINE FREQUENCY MEASUREMENT BY COINCIDENCE DETECTION Patent Application**

Edward Nossen (RCA) and Eugene Richard Starner, inventors (to NASA) (RCA) Filed 13 Sep. 1974 10 p (Contract NAS9-13517)


A method of measuring a desired frequency by comparing it with a standard frequency is reported. The zero crossings of both frequencies are detected. A command pulse is generated at each coincidence and is used to start and stop a pair of frequency counters adapted to count the desired and standard frequencies. A measure of the desired frequency is obtained by multiplying the known standard frequency by the ratio between the desired count and the standard count obtained in the two frequency counters. NASA
An apparatus is described for improving the broad beamwidth characteristics of a turnstile-cup antenna by the use of a truncated cone to replace the conventional cup and by tilting the turnstile arms back toward the base of the cone. The basic invention consists of a truncated cone with slots, turnstile antenna with feed support, and antenna arms tilted back toward the cone base. Directly below and in alignment with each antenna arm is a slot cut into the cone sides, which aids the broad beamwidth characteristics by the parasitic coupling between the antenna arms and the slots. This antenna yields considerably greater beamwidth than the more conventional antennas. Such increased beamwidth gives the antenna, which was used in the Viking altimeter system, relative independence from changes in antenna orientation.

An electrical filter is described for removing noise from voice communications signals. Filtering is accomplished by adding balanced, with respect to a midpoint sample, spaced pairs of the sampled signal values, and then multiplying each pair by a selected filter constant. The signal products thus obtained are summed to provide a filtered version of the original signal.

A differential pulse code modulation encoding and decoding method and apparatus is presented which is capable of transmission with minimum bandwidth, is not affected by data transition density, requires no direct current response of the transmission link, and suffers from minimal ambiguity in resolution of the digital data. Digital data present in a succession of data bit intervals are differentially encoded so that the information is transmitted as a differential change or lack of change of state at bit time transition points during successive data bit intervals. The data to be sent are encoded by causing a transition in signal level changes between successive bit time transition points during successive data bit intervals in response to a first digital data level, which may be either digital '1' or digital '0' in the digital data being encoded. When the alternate digital data level from the first digital data level is present in
the data being encoded, no transition in signal level changes
between successive bit time transition points is present. The
data so encoded is transmitted, received, and decoded in a
decoder.

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; compo-
nents, e.g., tunnel diodes and transistors; microminiaturiza-
tion; and integrated circuitry.

For related information see also 60 Computer Operations
and Hardware and 76 Solid-State Physics.

N75-12195* National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
DEPLOY/RELEASE SYSTEM Patent Application
David B. Robelen, inventor (to NASA) Filed 27 Nov. 1974
12 p
(NASA-Case-LAR-11575-1; US-Patent-Appi-SN-527727) Avail:
NTIS HC $3.25 CSCL 09C

An apparatus is described for arresting uncontrollable motions
of model aircraft. A remotely transmitted signal is used to deploy
a parachute and after the model aircraft motions are stabilized,
a second signal is transmitted which jettisons the parachute
and normal flight resumed. The deploy and jettison signals may
be sent using a single channel of a multi-channel transmitter
and are completely independent of each other.

N75-13139* National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.
PHASE-LOCKED SERVO SYSTEM Patent
Clifford Burdin, inventor (to NASA) (McDonnell-Douglas Corp.,
Huntington Beach, Calif.) Issued 26 Nov. 1974 8 p Filed
26 Oct. 1973 Supersedes N74-11058 (12 - 02, p 0140)
Sponsored by NASA
(NASA-Case-MFS-22073-1; US-Patent-3,851,238;
09A

A phase lock servo system is described for synchronizing
the rotation of a slip ring assembly with the rotation of an air
bearing table so that a minimum of torque will be imparted
through cables extending from the slip ring assembly to the air
bearing table as such is rotated. The system includes two servo
loops. The first servo loop includes a rate gyroscope carried on
the air bearing table which generates a signal through a summing
junction to be compared with a signal coming from a tachometer
coupled to the slip ring assembly. The corrective signal is applied
to a torque motor for rotating the slip ring assembly. The second
servo loop includes a pair of photo detector cells which generate
pulses responsive to the rotation of the air bearing table and
slip ring assembly which are fed through a phase detector, and
a variable gain amplifier to the summing junction circuit to
provide a fine adjustment for rotating the slip ring assembly.

Official Gazette of the U.S. Patent Office

N75-14957* National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.
FOUR PHASE LOGIC SYSTEMS Patent
Howard L. Peterson (Lockheed Missiles and Space Co., Sunnyvale,
Calif.) and Donald K. Kinell, inventors (to NASA) (Lockheed
7 p Filed 17 Apr. 1973 Supersedes N73-21240 11 - 12,
p 1386) Sponsored by NASA
(NASA-Case-MSC-14240-1; US-Patent-3,857,045;
09C

A four-phase logic system is provided which includes at
least four logic networks connected in parallel between a single
power line and a reference potential. A four-phase clock generator
generates four distinct clock signals from a single-phase clock
input at data rate. Each logic network comprises a pair of
complementary metal-oxide-semiconductor integrated transistors
(CMOS). Each metal-oxide-semiconductor transistor (MOST) in
the pair is responsive to a clock signal which turns the transistor
on or off. In each network, there is also at least one MOST
which is responsive to a logic signal. The logic transistor is
connected in cascade with the pair of CMOS's.

Official Gazette of the U.S. Patent Office
HIGHLY EFFICIENT ANTENNA SYSTEM USING A CORRUGATED HORN AND SCANNING HYPERBOLOID REFLECTOR Patent Application

Kenneth A. Green, inventor (to NASA) (Microwave Res. Corp.)
Filed 19 Dec. 1974 16 p Sponsored by NASA Prepared for JPL
(Contracts NAS7-100: JPL-953409)

The characteristics of a horn-reflector antenna system for producing a beam of high efficiency with a spherical aperture phase front and side lobes. A diagram of the antenna is provided to show the antenna construction. The system is insensitive to frequency and polarization changes, and is also insensitive to orientation about the axis of the conical horn for beam scanning. The improved antenna radiation pattern is applicable to communication systems and radar systems requiring low noise.

VARIABLE FREQUENCY INVERTER FOR AC INDUCTION MOTORS WITH TORQUE, SPEED AND BRAKING CONTROL Patent


A variable frequency inverter was designed for driving an ac induction motor which varies the frequency and voltage to the motor windings in response to varying torque requirements for the motor so that the applied voltage amplitude and frequency are of optimal value for any motor load and speed requirement. The slip frequency of the motor is caused to vary proportionally to the torque and feedback is provided so that the most efficient operating voltage is applied to the motor. Winding current surge is limited and a controlled negative slip causes motor braking and return of load energy to a dc power source.

3-5 PHOTOCATHODE WITH NITROGEN DOPING FOR INCREASED QUANTUM EFFICIENCY Patent Application

Lawrence W. James, inventor (to NASA) (Varian Assoc.) Filed 27 Dec. 1974 26 p Sponsored by NASA
(Contract DOT-TSC-95)

Photocathodes are described which improve quantum efficiency by increasing the product of the optical absorption coefficient and the diffusion length of the below-bandgap absorption, without an offsetting reduction in escape probability. The photocathode is supported on a conductive electrode in an infrared image intensifier tube and is made of 3-5 semiconduct or material doped with an acceptor and nitrogen, a column-5 isoelectronic element. This produces a spatially localized energy level at just below the conduction band similar to a donor level at which optical transitions can occur, thus increasing the absorption coefficient without compensation of the acceptor.
It was found that a suitable activation layer on the electron emission surface of the semiconductor material lowers the work function of the photocathode. Emitted electrons are accelerated by a relatively high voltage applied via accelerating electrodes, and focused onto a fluorescent screen.

A connector is described for connecting circuits on different layers of a multilayer printed circuit board through a hole in the board. The connector is a hollow cylindrical conductor made from a resilient material such as beryllium copper or spring steel. A slit in the conductor and a plurality of sharp teeth located on the outside of the conductor extend the full length of the conductor. The conductor has a slightly larger outside diameter than the diameter of the hole. It was found that when the connector is forced into the hole, the springback (resiliency) of the connector forces the teeth against the circuits on the printed circuit board and provides a positive connection between the circuits.

A capacitor is described which can be used in environments where the temperature is as high as 1500°C (2732°F). The capacitor comprises a dielectric platelet of BeO which has radially extending tabs. Electrodes of iridium having no more than 10 parts per million (ppm) of oxygen and preferably less than 1 ppm are bonded to the platelet and include end portions which provide contacts. These contacts provide electrical connections when a plurality of capacitors are stacked to obtain increased capacitance. The attachment of the electrodes to the dielectric platelet is achieved by off-sputtering the surfaces of the platelet to obtain a surface texture ratio. The electrodes are then deposited by sputtering procedures to a thickness of 2500 to 4000 angstroms.

A control circuit is described for limiting current surges and the rate of current rise during the application of power to the converter from the power source. The control circuit comprises a control transistor whose collector and emitter are connected to the dc power source and the input to the converter. Control means are connected to the control transistor to increase its conduction after the application of power from the dc power source. A feedback circuit is provided to limit the power necessary to maintain the control transistor in saturation. The control transistor and associated circuitry function as a time variable current limiter in the active region and as a saturated switch in the steady-state mode. Advantages provided by utilization of this control circuit are a simple, reliable, and effective circuit for suppressing turn-on current transients of dc-to-dc power converters, substantial weight, size, and cost reduction; and improved performance.
A system for and method of contact-electrifying a dielectric to determine its electrostatic properties is described. The dielectric is placed in contact with a contact plate means, and connected to a voltage source means to charge the contact plate and to contact-electrify the dielectric. The contact plate means is disconnected from the voltage source and a charge sensor means monitors the rate of decay of the charge on the dielectric. If a conductive path from the contact plate to ground is desired, a lead may be connected between the conductor and ground. Automatic timing and charge monitoring are preferred for maximum accuracy, especially where dielectrics treated with antistatic agents are tested.

An improved pulse stretching circuit comprising: a high speed wide-band amplifier connected in a fast charge integrator configuration; a holding circuit including a capacitor connected in parallel with a discharging network which employs a resistor and an FET; and an output buffer amplifier. Input pulses of very short duration are applied to the integrator charging the capacitor to a value proportional to the input pulse amplitude. After a predetermined period of time, conventional circuitry generates a dump pulse which is applied to the gate of the FET making a low resistance path to ground which discharges the capacitor. When the dump pulse terminates, the circuit is ready to accept another pulse to be stretched. The very short input pulses are thus stretched in width so that they may be analyzed by conventional pulse height analyzers.
A switchable beamwidth antenna includes a concave parabolic main reflecting dish which has a central circular region and a surrounding coaxial annular region. A feed means selectively excites only the central region of the main dish via a truncated subreflector for wide beamwidth or substantially the entire main dish for narrow beamwidth. In one embodiment, the feed means comprises a truncated concave ellipsoid subreflector and separate feed terminations located at two foci of the ellipsoid. One feed termination directly views all of the main dish while the other feed termination, exciting the main dish via the subreflector, excites only the central region because of the subreflector truncation. In another embodiment, the feed means comprises one feed termination and a convex hyperboloid subreflector via which the feed excites the main dish.

A signal conditioning circuit is described including operational amplifier, a variable source of offset potential, and four resistive impedances. The circuit has constant input impedance independent of gain and offset adjustments. Gain change is effected by varying one of the impedances in an amplifier feedback circuit; offset adjustment is effected through variation of the offset potential source.

A method and apparatus is disclosed by which any general purpose external trigger laboratory oscilloscope can be utilized to display alphanumeric characters. Each character to be displayed is composed of a plurality of segments appearing at various segment positions in various segment rows to define a conventional matrix. In between character segments to be displayed, or when no display is desired, the trace is effectively blanked by a vertical clamping voltage so as to position the oscilloscope trace in an off-screen position. The clamping technique of the invention, i.e., biasing the oscilloscope trace to an off-screen position when no character segment is to be displayed; it eliminates the necessity of providing Z-axis modulation to effect blanking.
N75-19519* National Aeronautics and Space Administration. Pasadena Office, Calif.

SYSTEM FOR GENERATING TIMING AND CONTROL SIGNALS Patent

A system capable of generating every possible data frame subperiod and delayed subperiod of a data frame of length of M clock pulse intervals (CPIs) comprised of parallel modulo-m sub i counters is presented. Each m sub i is a prime power divisor of M and a cascade of alpha sub i identical modulo-p sub i counters. The modulo-p sub i counters are feedback shift registers which cycle through p sub i distinct states. Every possible nontrivial data frame subperiod and delayed subperiod is derived and a specific CPI in the data frame is detected. The number of clock pulses required to bring every modulo-p sub i counter to a respective designated state or Count i is determined by the Chinese remainder theorem. This corresponds to the solution of simultaneous congruences over relatively prime moduli.

Official Gazette of the U.S. Patent Office

N75-19521* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

VOLTAGE MONITORING SYSTEM Patent

A description is given of a system for monitoring the voltage at a remote location and determining when the voltage exceeds upper and lower levels. The system includes transmission lines for transmitting the voltage back to a central station and applying such to an amplifier having a pair of outputs. One of the outputs of the amplifier is applied to an oscillograph. The other output is fed through an isolation transformer, a full wave rectifier, to a pair of unijunctional transistor circuits for producing pulses when the voltage exceeds or drops below a predetermined level. These pulses, in turn, energize a relay which turns on the oscillograph for recording the voltages being monitored.

Official Gazette of the U.S. Patent Office

N75-19520* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

DIODE-QUAD BRIDGE CIRCUIT MEANS Patent

A transducer and frequency discriminator circuit is described including a four-terminal circulating diode bridge, a first pair of capacitors connected in series across two terminals of the bridge, and a second pair of capacitors, or other impedance elements, connected in series across the other two terminals of the bridge.
A high voltage dc stepping power supply for sampling a utilization device such as an electrostatic analyzer has a relatively fast settling time for voltage steps. The supply includes a waveform generator for deriving a low voltage staircase waveform that feeds a relatively long response time power supply, deriving a high output voltage generally equal to a predetermined multiple of the input voltage. In the power supply, an ac voltage modulated by the staircase waveform is applied to a step-up transformer and then to a voltage multiplier stack to form a high voltage, relatively poor replica of the input waveform at an intermediate output terminal. A constant dc source, applied to the input of the power supply, biases the voltage at the intermediate output terminal to be in excess of the predetermined multiple of the input voltage.

A power switch is described which operates as a simple saturated switch when the load current is less than a predetermined value, and as a Darlington circuit when an overload or transient condition exists. It comprises a two-stage transistor amplifier connected in a Darlington configuration with a transistor interconnecting the collectors of the transistors, and arranged so that the input transistor and the interconnecting transistor form a compound transistor. By reason of the compound configuration between the transistors, the input impedance of the switch is large and keeps the base current drive of the interstage transistor relatively low. This reduces power losses and increases efficiency.

A starting system is described for bringing a large synchronous motor up to speed to prevent large power line disturbances at the moment the motor is connected to the power line. The system includes (1) a digital counter which generates a count determined by the difference in frequency between the power line and a small current generated by the synchronous motor; (2) a latch which stores the count; and (3) a comparator which compares the stored count with a newly generated count to determine whether the synchronous motor is accelerating or decelerating. Signals generated by the counter and comparator control the current to a clutch that couples a starting motor to the large synchronous motor.
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.

AN IMPROVED HEAT EXCHANGER Patent Application

An improved lightweight heat exchanger is described particularly suited for use in systems having low volume flow, high longitudinal gradient and high effectiveness requirements. The heat exchanger is characterized by a shell of an annular configuration, an endless plate of minimal thickness, and substantially uniform convoluted configuration within the annular shell. A pair of manifolds disposed 180 degrees apart is mounted on the shell in communication with the passages through which countercflowing fluids having different temperatures are simultaneously introduced and extracted from the passageways for achieving a continuous transfer of heat through the convoluted plate.

A combined structural reinforcing element and heat transfer member is disclosed for placement between a structural wall and an outer insulation blanket. The element comprises a heat pipe, one side of which supports the outer insulation blanket, the opposite side of which is connected to the structural wall. Heat penetrating through the outer insulation blanket directly reaches the heat pipe and is drawn off, thereby reducing thermal gradients in the structural wall. The element, due to its attachment to the structural wall, further functions as a reinforcing member.

Official Gazette of the U.S. Patent Office

N75-15902 National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AN IMPROVED HEAT TRANSFER DEVICE Patent Application

A heat transfer device has been developed that is particularly suited for use as an evaporator plate in a diffusion cloud chamber.

N75-16770 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SYSTEM FOR MEASURING REYNOLDS STRESS IN A TURBULENTLY FLOWING FLUID Patent Application
A system is described for measuring momentum flux in a turbulent flowing liquid, and for real time measurement of the Reynolds stress wave and the Reynolds stress. The probe introduced into the turbulent fluid to be measured is capable of generating two electrical signals representative of orthogonal velocity components of the fluid. The probe includes a spherical portion attached to an elongated member supported by a viscoelasticomeric collar. The ac velocity signals generated by the coils are amplified, integrated, multiplied, and divided by the processing circuit. The signal emanating from a divider is displayed on a scope and fed to a meter which responds to the true rms value of the dc and ac components of the Reynolds stress wave. The time averaged output of the meter is the Reynolds stress.

Probe position control simultaneously moves the probe along one axis and moves the pen of the plotter along the abscissa.

A heat exchanger is described which consists of a metal shell containing a porous metal matrix, such as sintered powdered metal, metal fibers, or metal foam. The matrix is metallically bonded or welded to the shell to eliminate high thermal resistance contact points. Cooling fluid flows from the supply, through the conduit, the pump, and the heat exchanger. They density of the porous metal matrix may be made greater to provide additional heat transfer where heat flux is high. Because the increased density will reduce the flow rate of the cooling fluid, an increased diameter may be provided to minimize or eliminate this effect. Both the density of the matrix and the diameter of the shell may be selected to provide the desired heat transfer and the cooling fluid flow rate appropriate to the heat flux variations along the shell.
side plates interposed between the plates. At the junctions of the side plates, and the base and top plates, there are machined-out grooves which act as flexible hinges for attenuating translatory vibrations. A damping material is supported on a pedestal which is carried on the base plate between the side plates. The top of the damping material rests against the bottom surface of the top plate for eliminating the resonant peaks of vibration. NASA

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.

An improved device for producing known changes in both acoustic absorption and phase velocity is reported. The calibration signal arises from an actual change of acoustic parameters, not from an electrical simulation. Thus, changes in ultrasonic time domain decay rates and frequency domain line widths are produced. Therefore, the device is able to simulate not only changes in ultrasonic absorption and phase velocity but also the sensitivity enhancement achieved by the use of ultrasonic resonators. The latter simulation cannot be achieved using electrical calibration techniques.
A report is made on the use of a tunnel injection method and apparatus to measuring trap densities and distribution in dielectric films in metal-dielectric-semiconductor structures. Under applied bias to the transistor gate, carriers (electrons or holes) tunnel into traps in the dielectric film. The resulting space charge tends to change channel conductance. By feeding back a signal from the source contact to the gate electrode, channel conductance is held constant, and by recording the gate voltage as a function of time, trap density can be determined as a function of distance from the dielectric-semiconductor interface. The process is repeated with the gate bias voltage at different levels in order to determine the energy distribution of traps as a function of distance from the interface.

The construction and operation of a magnetometer which uses a superconducting, freely rotatable body sensitive to an incident magnetic field are discussed. The instrument is based on the application of the de-Haas Van Alpen effect to measure the direction and strength of an unknown magnetic field. The device provides intrinsic levitational stability to the measuring sphere, low power requirements, and a simplified unit for use in outer space.

The continuous HCl in-air indicator consists of a tube-like element with an inlet end through which a continuous stream of air containing HCl enters. The air flows downstream from the inlet end and exits at the element's outlet end. First and second space apart photoelectric units are preferably positioned adjacent the inlet and outlet ends, respectively. Ammonia gas is injected into the air to form ammonium chloride particles. The difference between the outputs of the two photoelectric units is an indication of the amount of HCl in the air stream.
A system was developed for testing components contained in a signal conditioning module with a transistor and capacitor included in a circuit. The system includes a housing with a socket into which the module to be tested is plugged. A test switch is provided for selectively connecting a variable load to either a transistor or capacitor in the circuit for testing the operation. A signal generating circuit is provided for generating signals for use in testing the components of the module.
Official Gazette of the U.S. Patent Office

A device, for measuring the density of a bone structure so as to monitor the calcium content, is described. A pair of opposed spaced ultrasonic transducers are held within a clamping apparatus closely adjacent the bone being analyzed. These ultrasonic transducers include piezoelectric crystals shaped to direct signals through the bone encompassed in the heel and finger of the subject being tested. A pulse generator is coupled to one of the transducers and generates an electric pulse for causing the transducers to generate an ultrasonic sound wave which is directed through the bone structure to the other transducer. An electric circuit, including an amplifier and a bandpass filter couples the signals from the receiver transducer back to the pulse generator for retriggering the pulse generator at a frequency proportional to the duration that the ultrasonic wave takes to travel through the bone structure being examined.
Official Gazette of the U.S. Patent Office

An automatic apparatus is described for microbiologically sampling surface using a cotton swab which eliminates human error. The apparatus includes a self-powered transport device, such as a motor-driven wheeled cart, which mounts a swabbing motor drive for a crank arm which supports a swab in the free end thereof. The swabbing motor is pivotably mounted and an actuator rod movable responsive to the cart traveling a predetermined distance provides lifting of the swab from the surface being sampled and reversal of the direction of travel of the cart.
Official Gazette of the U.S. Patent Office

A system is described to measure alignment between interfacing edges of mirror segments positioned to form a segmented mirror surface. It serves as a gauge having a bending beam with four piezoresistive elements coupled across the interfaces of the edges of adjacent mirror segments. The bending beam has a first position corresponding to alignment of the edges of adjacent mirror segments, and it is bendable from the first position in a direction and to a degree dependent upon the relative misalignment between the edges of adjacent mirror segments to correspondingly vary the resistance of the strain gauge. A source of power and an amplifier are connected in circuit with the strain gauge whereby the output of the amplifier varies according to the misalignment of the edges of adjacent mirror segments.
Official Gazette of the U.S. Patent Office
A nondispersive gas analyzing apparatus is described having a chamber for containing gas. An energy source is provided for passing radiant energy through the chamber. Means are also provided for modulating the radiant energy passing through the chamber by modulating the volume at the acoustic resonance frequency of the gas. Signal generating means including a second chamber for containing a gas which is heated by radiant energy emerging from the first chamber. A microphonic means responsive to the resulting pressurization in the second chamber is included for generating a signal.

A magnetometer which uses a single crystal of bismuth selenide is described. The rhombohedral crystal structure of the sensing element is analyzed. The method of construction of the magnetometer is discussed. It is stated that the sensing crystal has a positive or negative Hall coefficient and a carrier concentration of about 10 to the 18th power to 10 to the 20th power per cubic centimeter.

A thermocouple plug that can be installed in a rocket engine wall or other metal plate to measure transient temperatures was developed. A description of the device and drawings of the equipment are provided. The thermocouple wires are located in a pair of narrow holes that lie near the thermocouple end of a plug and the wires are welded to the region of the plug material that lies between the holes.

An apparatus and method for accurate measurement of a fluid mass in real time are described. The system is effective under conditions of reduced gravity and is used for urine collection and measurement during space flight. Diagrams of the device are provided. The system and method can be incorporated into other applications for fluid volume measurement where mixed flow conditions (fluid-gas) exist.
and size of vehicles on roadways in the area. By computer control comparison with a reference transparency wherein areas other than roadways are made opaque and roadways are made clear, scanning is directed solely to roadway regions. Vehicle size analysis is accomplished by means of discrete holographic filters corresponding to selected size vehicles.

N75-13227* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
HIGH TEMPERATURE STRAIN GAGE CALIBRATION FIXTURE Patent Application
Thomas Vranas, inventor (to NASA) Filed 19 Dec. 1974 11 p
An apparatus and a method for calibrating strain gages in both the dead weight and constant deflection modes are described. A diagram of the equipment is provided. A cantilever support arm allows the test unit to slide into a furnace while one end is subjected to bending strain either by hanging weights on it or by deflecting it with a push rod. The dual nature of the fixture permits both tests to be run without change of the test specimen or removal from the furnace. The apparatus permits conducting calibration tests up to a temperature of 1600 F.

N75-15014* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTOMATIC FOCUS CONTROL FOR FACSIMILE CAMERAS Patent
An electronic circuit for controlling the focus of facsimile cameras is described. The circuit consists of balanced a.c. amplifiers, two square law function generators, and a differential amplifier and power drive. The invention includes a method for maintaining the imaging sensor at the expected location of the focal plane as the facsimile camera scans a scene or terrain. A block diagram of the electronic circuitry is provided.
35 INSTRUMENTATION AND PHOTOGRAPHY

N75-15931* National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.
LEAK DETECTOR Patent
James T. Sawyer, inventor (to NASA) Issued 14 Jan. 1975
5 p Filed 5 Mar. 1973 Supersedes N73-18444 (11 - 09.
p 1035)
( NASA-Case-MFS-21761-1; US-Patent-3,859,845;
Patent Office CSCL 14B
A detector for sensing a leaking of fluid pressures is
reported. The detector is characterized by an hermetically sealed
housing confining therewithin a first normalized pressure, a
connector for coupling the housing in direct communication with
a suspected leak established within a substantially sealed body,
an electrical circuit having a first or normalized configuration
and including a pair of circuit completing electrical contacts and
means mounting at least one contact of said pair of contacts
on a flexible wall of the housing supporting the contact for
movement from a first position along a linear path to a second
position in response to an altering of the pressure confined within
the housing for thereby altering the configuration of the circuit.
Official Gazette of the U.S. Patent Office

and the ergometer is a torque sensor and tachometer, which
feed signals to a power computer for subsequent recording. A
speed controller is utilized with the dc motor.
Official Gazette of the U.S. Patent Office

N75-15938* National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
METHOD FOR DETECTING POLLUTANTS Patent Applica-
tion
Robert S. Rogowski, Ralph R. Richards (Old Dominion Univ.),
and Edmund J. Conway, inventors (to NASA) Filed 30 Dec.
1974 14 p
(NASA-Case-LAR-11405-1; US-Patent-Appl-SN-537480) Avail:
NTIS HC $3.25 CSCL 14B
A method is described for detecting and measuring trace
amounts of pollutants of the group consisting of ozone, nitrogen
dioxide, and carbon monoxide in a gaseous environment. A sample
organic solid material that will undergo a chemical reaction with
the test pollutant is exposed to the test environment and heated
in the temperature range of 100-200 C. The chemiluminescence
of the solid organic material is measured and recorded as a
function of concentration of the test pollution and is specific to
the pollutant being tested.

N75-15932* National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.
ERGOMETER CALIBRATOR Patent
Raymond L. Gause, inventor (to NASA) Issued 14 Jan. 1975
p 0169)
( NASA-Case-MFS-21045-1; US-Patent-3,859,840;
An apparatus is presented for accurately calibrating ergome-
tors so that the work rate produced by the particular ergometer
being calibrated is accurate. The apparatus includes a dc motor
which is coupled directly to the ergometer for rotating it at
various speeds. Positioned on the shaft between the dc motor
A laser Doppler velocimeter is described simultaneously measuring localized orthogonal velocity components in a fluid stream without perturbation of the flowfield. A first pair of beams of a first common wavelength and a second pair of beams of a second common wavelength are derived from a single laser source, directed along a single optical axis. The respective beams of each pair of beams are disposed parallel to the axis, symmetrically about the axis, and are positioned orthogonally about the axis relative to each other. The four beams are then focused upon a selected test volume within the flowfield. Light scattered at that point is collected by an appropriate optical system and focused onto photodetectors which develop electrical output signals commensurate with the orthogonal velocity components at the test point.

Planck's function is evaluated from the temperature measurement, and the true absorption coefficient is determined from a divergence-flux relationship independent of scattering and polarization, and without the wavelength limitation. The true emission coefficient is also determined along with the state of radiative equilibrium.

Techniques are described for determining at continuum or spectral line frequencies the true absorption (or emission) coefficients of a medium that simultaneously absorbs (or emits) and scatters incident radiation, and for studying the radiative equilibrium state. The technique measures the variations of net planar flux between pairs of planes spaced apart along each axis of inhomogeneity of the medium. The divergence of flux is determined as the sum of the variations divided by the distance. One plane of each pair is selected to be at the point of interest and, at that point, spherical flux and temperature are measured.

NASA
N75-16807* National Aeronautics and Space Administration. Pasadena Office, Calif.

**WIND SENSOR Patent Application**
James B. Stephens (JPL) and Eric G. Laue, inventors (to NASA) (JPL) Filed 29 Jan. 1975 21 p
(Contract NAS7-100)

This device for sensing the temperature, velocity, and direction of the wind, includes four temperature-dependent crystal oscillators spaced about an axis, a heater centered on the axis, and a screen through which the wind blows to pass over the crystals. In one method of operation, the frequency of the oscillators is taken when the heater is not energized, to obtain the temperature of the wind, and the frequencies of the oscillators are taken after the heater is energized to determine the direction and velocity of the wind. When the heater is energized, the wind causes the downwind crystals to achieve a higher temperature than the upwind crystals, and with the magnitude of the difference indicating the velocity of the wind. NASA electrodes is adjusted by sliding rods with respect to bushings contained within the cylindrical recesses of the ring. The recording leads are coupled to ring electrodes by male connectors.

N75-19611* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

**AUTOMATIC LIQUID INVENTORY COLLECTING AND DISPENSING UNIT Patent**

A means is provided for automatically collecting waste liquids and for simultaneously feeding these liquids into water recovery processes. The invention includes first and second tanks with first and second two-way solenoid valves associated with each of the tanks. The first solenoid valve is connected to the liquid source and its associated tank so as to allow liquid to flow into the tank when the valve is in its normal position and to allow the liquid to flow out of the tank when the valve is in its actuated position. The second valve is connected to its associated tank and a gas supply so as to allow gas inside the tank to flow out when the valve is in its normal position and to allow gas to flow from the gas supply into the tank when the valve is in its actuated position. Control circuits are included for actuating the two valves associated with the first tank and not actuating the valves associated with the second tank. The first tank is filled and the second tank is emptied.

Official Gazette of the U.S. Patent Office

N75-18536* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

**READOUT ELECTRODE ASSEMBLY FOR MEASURING IMPEDANCE Patent Application**

The invention relates generally to impedance plethysmography and specifically to readout electrodes for a tetra-polar impedance plethysmography system. In a tetra-polar impedance system transmitting ring electrodes are used to apply a low voltage, high frequency current across a body segment of a patient. Readout electrodes enable an output signal to be taken from the zone between the transmitting electrodes. The output signal is representative of the impedance between the readout electrodes, and the impedance is a function of the blood flow in the tested body segment. The main components of the invention are a pair of variable diameter ring electrodes which are connected to a pair of rods by means of bushings contained within the cylindrical recesses. The axial displacement between the ring
VACUUM LEAK DETECTOR Patent

A leak detector for use with high vacuum seals as used in feedthroughs and hatch covers for manned spacecraft and vacuum systems is described. Two thermistors are used, one exposed directly to vacuum and the other exposed to a secondary chamber formed by the seal being monitored and a second auxiliary seal. Leakage into the secondary chamber causes an unbalance of an electrical bridge circuit in which the thermistors are connected.

Official Gazette of the U.S. Patent Office

SPECTROMETER INTEGRATED WITH A FACSIMILE CAMERA Patent

This invention integrates a spectrometer capability with the basic imagery function of facsimile cameras without significantly increasing mechanical or optical complexity, or interfering with the imaging function. The invention consists of a group of photodetectors arranged in a linear array in the focal plane of the facsimile camera with a separate narrow band interference filter centered over each photodetector. The interference filter photodetector array is on a line in the focal plane of the facsimile camera along the direction of image motion due to the rotation of the facsimile camera's vertical mirror. As the image of the picture element of interest travels down the interference filter photodetector array, the photodetector outputs are synchronously selected and sampled to provide spectral information on the single picture element.

Official Gazette of the U.S. Patent Office

INSTRUMENTATION FOR MEASUREMENT OF AIRCRAFT NOISE AND SONIC BOOM Patent

A jet aircraft noise and sonic boom measuring device which converts sound pressure into electric current is described. An electric current proportional to the sound pressure level at a condenser microphone is produced and transmitted over a cable, amplified by a zero drive amplifier and recorded on magnetic tape. The converter is comprised of a local oscillator, a dual-gate field-effect transistor (FET) mixer and a voltage regulator/impedance translator. A carrier voltage that is applied to one of the gates of the FET mixer is generated by the local oscillator. The microphone signal is mixed with the carrier to produce an electrical current at the frequency of vibration of the microphone diaphragm by the FET mixer. The voltage of the local oscillator and mixer stages is regulated, the carrier at the output is eliminated, and a low output impedance at the cable terminals is provided by the voltage regulator/impedance translator.

Official Gazette of the U.S. Patent Office
A meter for detecting tension in elastic bodies, especially in fabric straps employed as tie down straps for stowed objects is presented. The meter is characterized by a pair of elongated arms coupled together for pivotal motion about a common axis in a common plane and a strap receiver located at adjacent ends of the arms for receiving and securing adjacent portions of the strap. The receivers are supported by the arms for motion along intersecting arcs, and motion detection means is located at the opposite ends of the arms for detecting the magnitude of the motion imparted to the receivers as the strap is placed in tension.

An apparatus is described for scanning relatively small near sources of penetrating radiation to obtain the energy distribution thereof, wherein a collimator assembly is interposed between a radiation source and a radiation detector. The collimator assembly has a plurality of plates aligned in parallel planes with respect to a common axis normal to their centers. All the plates have similar random distribution of apertures. All apertures on each plate are the same size. The size of respective plates, the size of the apertures of said respective plates, and the spacing between said respective plates vary precisely according to a predetermined ratio to produce radiation channels which converge to a focal point. The radiation incident to the radiation detector is maximized when the focal point and the radiation source are co-incident.

An apparatus is disclosed for imaging soft X-ray and ultraviolet electromagnetic radiation and charged particles. The apparatus includes a pair of microchannel electron multiplier plates that are connected in a cascaded chevron configuration which intercepts an incident beam of radiation or charged particles which are being imaged. Incident photons or charged particles strike the front surface of the chevron configuration causing emission of electrons. The electrons are accelerated by a voltage gradient and strike the inner side walls of the individual channels which comprise the microchannel electron multiplier plates causing emission of secondary electrons. Accelerated and multiplied secondary electrons impinge upon a resistive anode after they transverse the chevron configuration. A pulse position circuit converts the magnitude or transit time of the currents flowing from the point of impact of the electrons on the resistive anode to four contact electrodes mounted on their periphery of the resistive anode into the spatial coordinates of electron impact.

NASA
A method and apparatus for determining the distribution of particle sizes of a scattering medium of unknown chemical composition is reported. The apparatus, a particle size spectrometer, has a fixed field of view within the forward light scattering cone at an angle between approximately 100 and 200 minutes of arc, a spectral range extending approximately from 0.2 to 4.0 inverse micrometers and a spectral resolution between about 0.1 and 0.2 micrometers. The apparatus is employed to determine the distribution of particle sizes, independently of the chemical composition of the particles, from measurements of incident light.

A method and apparatus are described for measuring the absorptivity of a radiation detector by making the detector an integral part of a cavity radiometer. By substituting the detector for the surface of the cavity upon which the radiation first impinges, a comparison is made between the quantity of radiation incident upon the detector and the quantity reflected from the detector. The difference between the two is a measurement of the amount of radiation absorbed by the detector.

An apparatus and method are described for simultaneously and separately reconstructing the effective spectrum of sizes and refractive indices of scattering particulates of unknown chemical composition embedded in a medium such as a liquid or gas (of any arbitrary number of species). A photometer is used which has a specified narrow field of view along near-forward scattering angles variable between approximately + or - 10 degrees, preferably + or - 7.5 degrees, and an angular resolution of approximately 15 min of arc, or less. It operates at two separate wavelengths, one of which is approximately equal to 0.7 microns, or larger, but less than or equal to the expected minimum particle radius, and the other has a substantially different value from the first by an amount of at least approximately 0.2 to 0.3 microns.
36 LASERS AND MASERS

Includes parametric amplifiers.

A system to be employed by an aircraft for the detection of clear air turbulence is described. The system employs a laser light beam which is directed ahead of the aircraft along the flight path. The portion of the light reflected back to the aircraft by atmospheric aerosol is detected and analyzed for Doppler shift. The velocity and intensity of the turbulence is determined by the type and amount of the light reflected.

Official Gazette of the U.S. Patent Office
A soft X-ray laser is described using channels in a zeolite crystal as distributed feedback (DFB) cavities to produce a laser beam in the X-ray region of the spectrum. The channels have periodic changes in their cross sections such that Bragg-type reflections are generated, leading to DFB of a wave of X-ray photons of \( \lambda = 14.61 \) Å, emitted from neon undergoing the characteristic excitation \( K\alpha_1 \). Cold neon is forced by a pressure differential through the crystal's channels in one direction, while a beam of electrons sufficient in kinetic energy is directed into the channels opposite the neon flow, to excite the neon to emit the X-ray photons at \( \lambda = 14.61 \) Å. Using an electron beam with a cross section on the order of 1 micron, an X-ray beam of comparable cross section is emitted from channels of the zeolite crystal in which the excitation of neon takes place.

A description is given of an improved capillary tube in a waveguide gas laser, in which at least a portion of the tube’s opening, defined by its inner surface, is corrugated to provide distributed feedback. The tube also has a diffused region which acts as a waveguide for the waves. The evanescent component of the waves travelling in the diffused region interact with laser gas in the opening causing an energy increase which in turn amplify waves travelling in the region.
N75-19652* National Aeronautics and Space Administration, Pasadena Office, Calif.

DEEP TRAP, LASER ACTIVATED IMAGE CONVERTING SYSTEM Patent

Receiving an optical image on the surface of a photoconducting semiconductor is presented, storing the image in deep traps of the semiconductor, and later scanning the semiconductor with a laser beam to empty the deep traps, thereby producing a video signal. The semiconductor is illuminated with photons of energy greater than the band gap producing electron-hole pairs in the semiconductor which subsequently fill traps in energy from the band edges. When the laser beam of low energy photons excites the trapped electrons and holes out of the traps into the conduction and valence bands, a photoconductivity can be observed.

Official Gazette of the U.S. Patent Office

N75-19653* National Aeronautics and Space Administration, Washington, D.C.

LASER SYSTEM WITH AN ANTIRESONANT OPTICAL RING Patent

Various applications of an antiresonant ring, consisting of a beam splitter and a number of optical reflectors, are described. With a beam splitter having a transmission coefficient and a reflection coefficient, an optical beam incident on the beam splitter along a first axis is split into two components which circulate around the ring in opposite directions. They are recombined to reflect back the beam along the first axis, with none of the beam power being directed along a second axis. The ring can be part of the cavity of two otherwise independent lasers, with two separate laser mediums external to the ring, or with a multi-wavelength laser medium in the ring. The ring together with a second-harmonic generation crystal and a dispersive phase shifter in the ring can generate the second harmonic of an optical beam.

Official Gazette of the U.S. Patent Office

N75-19654* National Aeronautics and Space Administration, Goddard Space Flight Center, Greenbelt, Md.

DUALY MODE LOCKED Nd:YAG LASER Patent

A dually mode locked laser system is disclosed; the laser system is of the general type including a laser cavity defined by a pair of at least partially reflecting mirrors with a laser material disposed in the cavity. A loss modulator mode locking element and a phase modulator mode locking element are disposed in the laser cavity in optical series with one another. Modulation drive signals are provided for each mode locking element such that each element produces an output pulse train of substantially the same repetition rate and where the output pulse train is in a timed interrelationship such that the pulses pass through both mode locking elements without being extinguished. The loss mode locker is driven at a low level so that relaxation oscillations do not occur and forces the pulses generated by the phase mode locker to maintain a constant phase relative to the mode lock drive signal. The laser system can be run both open loop and with a phase lock stabilization feedback loop.

Official Gazette of the U.S. Patent Office
LASER HEAD FOR SIMULTANEOUS OPTICAL PUMPING OF SEVERAL DYE LASERS Patent
Peter B. Mumola and Belton T. McAlexander, inventors (to NASA)

The invention is a laser head for simultaneous pumping several dye lasers with a single flash lamp. The laser head includes primarily a multi-elliptical cylinder cavity with a single flash lamp placed along the common focal axis of the cavity and with capillary tube dye cells placed along each of the other focal axes of the cavity. The inside surface of the cavity is polished. Hence, the single flash lamp supplies the energy to the several dye cells.

MECHANICAL ENGINEERING

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

AN IMPROVED PORTABLE PEENING GUN Patent
Application
Vincent P. Caruso and Elbert J. Minter, inventors (to NASA)
Filed 6 Nov. 1974 14 p

An improved portable peening gun is described which is characterized by a pneumatic motor, an axially reciprocable hammer to be driven by the motor from an initial position along a linear path, and an improved peening head which includes an axially reciprocable rod bundle coaxially aligned with the hammer and disposed within the path. The improved head includes a plurality of peening rods, each being characterized by an anvil defined at one end for receiving the hammer upon impacting engagement, and a peening surface defined at the other end which conforms to a segment of a sphere having a radius substantially equal to one-half the thickness of the rod. A barrel for supporting the rod bundle for axial reciprocation is included, along with a helical spring disposed within the barrel for urging the bundle in displacement toward its initial position.

An improved portable peening gun is described which is characterized by a pneumatic motor, an axially reciprocable hammer to be driven by the motor from an initial position along a linear path, and an improved peening head which includes an axially reciprocable rod bundle coaxially aligned with the hammer and disposed within the path. The improved head includes a plurality of peening rods, each being characterized by an anvil defined at one end for receiving the hammer upon impacting engagement, and a peening surface defined at the other end which conforms to a segment of a sphere having a radius substantially equal to one-half the thickness of the rod. A barrel for supporting the rod bundle for axial reciprocation is included, along with a helical spring disposed within the barrel for urging the bundle in displacement toward its initial position.
FLANGED MAJOR MODULAR ASSEMBLY JUG Patent Application
Meyer M. Gilman, inventor (to NASA) (Rockwell Intern. Corp.)
Filed 25 Oct. 1974 30 p

The invention presents methods and means for attaching flanges to three-dimensional frameworks, called major modular assembly jigs, the word major implying a structure of some size while modular is intended to connote that two or more jigs are to be assembled to make a complete tooling and assembly jig. The overall assembly of modules provides working platforms and reference points and plates for the assembly and tool operation upon such large structures as spacecraft, aircraft, sea-going vessels and rail cars.

METHOD OF MAKING AN EXPLOSIVELY WELDED SCARF JOINT Patent
Lawrence J. Bement, inventor (to NASA) Issued 22 Oct. 1974 4 p Filed 1 Nov. 1972 Supersedes N73-14480 (11 - 05, p 0652)

A method is presented for obtaining a bond joint between thin metal members without the addition of a bonding agent. The method yields bond strengths comparable to the parent metal. The method comprises overlapping the materials at the edges and bonding them by explosive welding while also making use of the explosive force to shape the materials into an essentially planar configuration.

METHOD OF PROTECTING THE SURFACE OF A SUBSTRATE Patent
Michael A. Gedwill, inventor (to NASA) and Salvatore J. Grisaffe Issued 26 Nov. 1974 5 p Filed 16 Oct. 1972 Supersedes N73-10502 (11 - 01, p 0061)

The surface of a metallic base system is initially coated with a metallic alloy layer that is ductile and oxidation resistant. An aluminide coating is then applied to the metallic alloy layer. The chemistry of the metallic alloy layer is such that the oxidation resistance of the subsequently aluminized outermost layer is not seriously degraded.
an electrically conductive surface is carried adjacent to the other end. The supporting block maintains the spring steel member in compression so that a constant pressure is applied to the conductive end of the spring steel member and the leather wiper. The leather wiper is saturated with a lubricating oil for maintaining the resistance wire clean as the movable arm is manipulated.

Official Gazette of the U.S. Patent Office

N75-13266* National Aeronautics and Space Administration. Pasadena Office, Calif.
GENEVA MECHANISM Patent Application
An improved Geneva mechanism is characterized by a driven star-wheel having a segmented cam-follower surface. Star-wheel driver includes a restraining cam having a segmented cam surface for engaging the cam-follower surface of the star-wheel and antifriction rollers pinned to the restraining cam for engaging the cam-follower surface.

Official Gazette of the U.S. Patent Office

N75-14131½ National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A REMOTELY OPERABLE ARTICULATED MANIPULATOR Patent Application
The manipulator includes a plurality of serially connected drive shafts, having a grasping device mounted at the distal end of the ultimate drive shaft of the plurality. A plurality of joints is also included with meshed pairs of beveled gears 61 and 70 interconnecting the drive shafts. A plurality of drive tubes are concentrically related to the drive shafts and interconnected through meshed level gears for imparting angular displacement.

NASA
an internal surface defining an annulus for concentrically receiving the body. An external surface of a frusto-conical configuration and an elongated sleeve are described.

N75-15050* National Aeronautics and Space Administration. Pasadena Office, Calif.

COMBINED PRESSURE REGULATOR AND SHUTOFF VALVE Patent

A remotely operable pressure regulator and shutoff valve particularly suited for achieving high resolution and flow control, and positive shutoff is described. The valve is characterized by a spring-loaded ball coaxially aligned with a fluid port to be sealed, a spring-loaded pintle extended through the port into engagement with the ball, for controlling the position, a spring-loaded diaphragm for controlling the position of the pintle, and an axially displaceable spring supported by a movable stop which, in turn, is repositioned by a selectively operable stepper motor. Thus, the pressure-response characteristics for the valve can be varied through a selective repositioning of the stop.

Official Gazette of the U.S. Patent Office

N75-15992* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

BONDING OF SAPPHIRE TO SAPPHIRE BY EUTECTIC MIXTURE OF ALUMINUM OXIDE AND ZIRCONIUM OXIDE Patent

Bonding of an element comprising sapphire, ruby or blue sapphire to another element of such material with a eutectic mixture of aluminum oxide and zirconium oxide is discussed. The bonding mixture may be applied in the form of a distilled water slurry or by electron beam vapor deposition. In one embodiment the eutectic is formed in situ by applying a layer of zirconium oxide and then heating the assembly to a temperature above the eutectic temperature and below the melting point of the material from which the elements are formed. The formation of a sapphire rubidium maser cell utilizing eutectic bonding is shown.

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

N75-18994* National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
PRELOAD TORQUE LIMITING SHAFT COUPLING Patent Application
Wayne A. Harmening, inventor (to NASA) (RCA) Filed 17 Jan.
1975 8 p
(Contract NAS1-9000)
(NASA-Case-LAR-11398-1; US-Patent-App1-SN-541822) Avail:
NTIS HC $3.25 CSCL 131

A torque limiting spring for a rotating shaft system which
acts bidirectionally and is preloaded is examined. The spring is
a split circular ring compressed into cavities on facing surfaces
of matching shafts. The spring is preloaded by varying the width
of a tang in the shaft cavity relative to the split in the spring.

N75-18579* National Aeronautics and Space Administration.
Pasadena Office, Calif.
SHOCK ABSORBING MOUNT FOR ELECTRICAL COMPONENTS Patent
Robert F. Dillon, Jr. (JPL) and Robert C. Mayne, inventors (to
Superseded N73-31445 (09 - 16. p 2677) Sponsored by
NASA
(NASA-Case-NPO-13253-1; US-Patent-3,863,881;
US Patent Office CSCL 20/11

A shock mount for installing electrical components on circuit
boards is described. The shock absorber is made of viscoelastic
material which interconnects the electrical components. With this
system, shocks imposed on one component of the circuit are
not transmitted to other components. A diagram of a typical
circuit is provided.

N75-18574* National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC BEARING Patent
Philip A. Studer, inventor (to NASA) Issued 11 Feb. 1975
p 2628)
(NASA-Case-GSC-11079-1; US-Patent-3,865,442;
US Patent Office CSCL 131

A magnetic bearing is described which includes a pair of
coaxial, toroidal, and permanent magnets having axially directed
poles. Like poles of the permanent magnets are adjacent to
each other, whereby the permanent magnets have a tendency
to be urged apart along the common axis. An electromagnet is
wound coaxially with the permanent magnets in such a manner
that the poles are axially directed. Between the poles of each
permanent magnet there is a low magnetic reluctance circuit
including two series air gaps. Between the poles of the
electromagnet a low reluctance path including only one air gap
of each of the low magnetic reluctance circuits is provided.
The low reluctance path for the electromagnet includes a ring axially
translatable relative to the permanent magnets. The ring forms
opposite faces of the air gaps in the magnetic circuits for each
permanent magnet.

N75-18576* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
FLUID SEAL FOR ROTATING SHAFTS Patent Application
Lawrence P. Ludwig, inventor (to NASA) Filed 19 Feb. 1975
14 p
(NASA-Case-LEW-11676-1; US-Patent-App1-SN-5511844) Avail:
NTIS HC $3.25 CSCL 11A

An improved fluid seal for a rotating shaft is provided which
includes an inner annular ring or runner adapted to be secured
to the rotating shaft and a composite sealing ring which is
keyed to the inner ring and includes a radial sealing surface.
An outer, nonrotating, annular ring or housing which is concentric-
ally disposed with respect to the runner and sealing ring, includes
a radial sealing surface which sealingly engages the sealing surface
of the sealing ring. A circular wave spring, which is anchored
to the housing and is disposed between the composite sealing
ring and a snap ring secured to the housing, provides an axial
force which forces the two sealing surfaces into sealing contact.
MECHANICAL ENGINEERING

The waves of the spring act as individual hydrodynamic bearings, and the axial force is transmitted across an oil film. This eliminates rubbing contact and the need for a separate thrust bearing.

NASA

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N75-19683* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

GRAIN REFINEMENT CONTROL IN TIG ARC WELDING Patent


A method for controlling grain size and weld puddle agitation in a tungsten electrode inert gas welding system to produce fine, even grain size and distribution is disclosed. In the method the frequency of dc welding voltage pulses supplied to the welding electrode is varied over a preselected frequency range and the arc gas voltage is monitored. At some frequency in the preselected range the arc gas voltage will pass through a maximum. By maintaining the operating frequency of the system at this value, maximum weld puddle agitation and fine grain structure are produced.

Official Gazette of the U.S. Patent Office

N75-19684* National Aeronautics and Space Administration. Pasadena Office, Calif.

MULTITARGET SEQUENTIAL SPUTTERING APPARATUS Patent


The development and characteristics of a sputtering apparatus are discussed. A potential difference is applied between the cathode and anode to produce a plasma for each target which is sputtered by accelerated ions within the plasma. The process of sputtering for various materials is described. Diagrams of the unit are provided.

Official Gazette of the U.S. Patent Office


LATCHING DEVICE Patent


A latching device is suited for use in establishing a substantially motionless connection between a stationary receiver and a movable latching mechanism. The latching mechanism includes a pivotally supported restraining hook continuously urged into a capturing relationship with the receiver, characterized by a spring-biased pawl having a plurality of aligned teeth. The teeth are seated in the surface of the throat of the hook and positionable into restraining engagement with a rigid restraining shoulder projected from the receiver.

Official Gazette of the U.S. Patent Office
An internally supported, flexible duct joint for use in conducting fluids under relatively high pressures in systems where relatively large deflection angles must be accommodated is presented. The joint includes a flexible tubular bellows and an elongated base disposed within the bellows. The base is connected through radiating struts to the bellows near mid-portion and to each of the opposite end portions of the bellows through a pivotal connecting body. A motion-controlling linkage is provided for linking the connecting bodies, whereby angular displacement of the joint is controlled and uniformity in the instantaneous bend radius of the duct is achieved as deflection is imposed.

Official Gazette of the U.S. Patent Office
A solar energy concentrator is described which comprises an array of cylindrical Fresnel lenses, all of which are fixedly aligned in the East-West direction. Each lens concentrates the sun rays and forms a line image which extends in the East-West direction. Below the lenses are individual fluid channels which extend in the East-West direction and are spaced apart in the South-North direction. Each line image focuses onto two of the channels which absorb heat of the concentrated sun rays. Each channel has a thermostatically controlled valve for regulating fluid flow through the channel.
lifting of the inoculating element. An electrical control system, including limit microswitches, enables automatic control of the actuator motor and return of the carriage to the initial position after inoculating is completed.

Lifting of the inoculating element.

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A reverse osmosis process for the purification of water is presented wherein a saline solution is placed under pressure against a polymeric membrane supported by a microporous inert support. Salt and other impurities collect on one side of the membrane and purified water on the other. The membrane is made by a process wherein an allyl amine or similar compound is polymerized as a thin film in the presence of a plasma discharge. These films showed outstanding properties as reverse osmosis membranes. The membranes are formed essentially in the absence of air under conditions where few, if any, defects are produced. The most outstanding feature of the membranes is that they can be stored under ordinary ambient, dry conditions.

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An improved orthopedic (orthotic) arm joint that can be used in various joint of mechanical arms is described. The arm joints includes a worm, which is coupled to an electric motor for rotating a worm gear carried within a rotatable housing. The worm gear is supported on a thrust bearing and the rotatable housing is supported on a radial thrust bearing. A bolt extends through the housing, bearings, and worm gear for securing the device together. A potentiometer extends through the bolt, and

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is coupled to the rotatable housing for rotating therewith, so as to produce an electrical signal indicating the angular position of the rotatable housing. Official Gazette of the U.S. Patent Office

N75-13534 National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SELF-CONTAINED BREATHING APPARATUS Patent Application

A self-contained breathing apparatus with automatic redundant fluid pressure controls is presented along with a self-contained breathing apparatus having a facemask respirator, automatic redundant fluid pressure controls, and a fluid-actuated alarm. The automatic redundant pressure controls provide alternate lines of fluid communication in the event of failure of the primary pressure reducer or depletion of the supply of gas to a low level. A fluid-actuated alarm, located in the facemask to avoid wasteful exhausting of the gas, signals either depletion of the supply of gas or a failure closed condition of the primary reducer.

N75-13531 National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CIRCUIT FOR DETECTING INITIAL SYSTOLE AND DIXOTIC NOTCH Patent

Circuitry is disclosed for processing an arterial pressure waveform to produce during any one cycle a pulse corresponding to the initial systole and a pulse corresponding to the dicrotic notch. In a first channel, an electrical analog of the arterial pressure waveform is filtered and then compared to the original waveform to produce an initial systole signal. In a second channel, the analog is differentiated, filtered, and fed through a gate controlled by pulses from the first channel to produce an electrical pulse corresponding to the dicrotic notch.

Official Gazette of the U.S. Patent Office

N75-13638 National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AUTOMATIC BIOWASTE SAMPLING Patent Application

A sampling system for acquiring biowaste samples in a space craft is reported; the automatic biowaste system for sampling and disposal of feces and vomitus includes a storage container and an associated seat. The storage container has a slide valve which is releasably locked in positions placing the seat into and out of communication with the container. A passage from the seat leads to a rotating platform with peripherally located vertical tines. The rotating platform disperses waste radially. A retrievable, porous sampling strip is insertable about the periphery of the rotating platform and is retractable into a separate sampling container. The sampling strip is retrievable into a plastic storage container for subsequent analysis.
MINIATURE MUSCLE DISPLACEMENT TRANSDUCER Patent Application
Cyril Feldstein (JPL), Jules V. Osher (JPL), Gilbert W. Lewis (JPL), Robert H. Silver (JPL), and Edward N. Duran, inventors (to NASA) (JPL) Filed 27 Dec. 1974 13 p (Contract NAS7-100)

A miniature transducer, is described for use in sensing muscle displacement. Essentially this invention consists of a curved beam of high elastic compliance. The beam is connected at its ends to two prongs, which have sharpened tips insertable into a muscle. A very sensitive strain gauge is bonded to the beam at the point of greatest curvature. As the muscle contracts or expands, the spacing between the prongs changes, thereby changing the beam curvature which produces changes in the output signal across output lines of the strain gauge.

MULTI-COMPUTER MULTIPLE DATA PATH HARDWARE EXCHANGE SYSTEM Patent Application
Tage O. Anderson, inventor (to NASA) Filed 6 Nov. 1974 41 p
(Contract NAS7-100)

Improvements made in multiple data path switching exchanges for multi computer preprocessing systems are reported.

CONTINUOUS FOURIER TRANSFORM METHOD AND APPARATUS Patent

An input analog signal to be frequency analyzed is separated into N number of simultaneous analog signal components each identical to the original but delayed relative to the original by a successively larger time delay. The separated and delayed analog components are combined together in a suitable number of adders and attenuators in accordance with at least one component product of the continuous Fourier transform and analog signal matrices to separate the analog input signal into at least one of its continuous analog frequency components of bandwidth $1/N$ times the bandwidth of the original input signal. The original analog input signal can be reconstituted by combining the separate analog frequency components in accordance with the component products of the continuous Fourier transform and analog frequency component matrices. The continuous Fourier transformation is useful for spectrum analysis, filtering, transfer function synthesis, and communications. Official Gazette of the U.S. Patent Office
PHYSICS (GENERAL)

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

N75-163071 National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD AND APPARATUS FOR GENERATING COHERENT RADIATION IN THE ULTRAVIOLET REGION AND ABOVE BY USE OF DISTRIBUTED FEEDBACK Patent Application
Melvin M. Saffren, inventor (to NASA) (JPL) Filed 17 Dec. 1974 19p

Helium in the superfluid state was found to emit copious amounts of radiation in the ultraviolet region when excited by an electron stream. Conventional laser action using mirrors is impossible in superfluid helium because there are no mirrors that will reflect VUV radiation. By utilizing the method of distributed feedback, the superfluid helium can be made to lase. The photons leave the superfluid helium at right angles to the information coupled with associated bearing information was then used to provide continuous target fixes.

Author (GRA)

OPTICS

Includes light phenomena.

N75-12732 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

METHOD OF FORMING APERTURE PLATE FOR ELECTRON MICROSCOPE Patent

An electron microscope is described with an electron source a condenser lens having either a circular aperture for focusing a solid cone of electrons onto a specimen or an annular aperture for focusing a hollow cone of electrons onto the specimen. It also has objective lens with an annular objective aperture, for focusing electrons passing through the specimen onto an image plane. A method of making the annular objective aperture using electron imaging, electrolytic deposition and ion etching techniques is included.

Official Gazette of the U.S. Patent Office
A method and apparatus for measuring, at a remote location, the concentration and velocity of SO2 in plume from a smokestack is disclosed. An ultraviolet video system views the plume against the background sky at wavelengths where SO2 molecules absorb light. The result is a real time display of the plume coupled with means for measuring the SO2 concentration at any point in the plume and at any time desired. In addition, means are provided in combination with the ultraviolet video system for measuring the velocity of the SO2 in the plume.

A method is detailed to determine the density of particles wherein the closing velocity is known between the impacting particles and a plate of known material. Either the shock wave velocity or the material velocity produced in the plate upon impact by an unknown material particle is determined and compared with the corresponding shock wave or material velocity that would be produced by different known material particles having the same closing velocity upon impact with the plate. The unknown material particle density is derived by obtaining a coincidence of the shock wave velocity or material velocity conditions initially produced upon impact between the known material plate and one of the different material particles and from the fact that shock wave velocity and material velocity are ordered on the impacting particle material density alone.

A method is detailed to determine the density of particles wherein the closing velocity is known between the impacting particles and a plate of known material. Either the shock wave velocity or the material velocity produced in the plate upon impact by an unknown material particle is determined and compared with the corresponding shock wave or material velocity that would be produced by different known material particles having the same closing velocity upon impact with the plate. The unknown material particle density is derived by obtaining a coincidence of the shock wave velocity or material velocity conditions initially produced upon impact between the known material plate and one of the different material particles and from the fact that shock wave velocity and material velocity are ordered on the impacting particle material density alone.
CONDENSATE REMOVAL DEVICE FOR HEAT EXCHANGER

Patent

A set of perforated tubes disposed at the gas output side of a heat exchanger, in a position not to affect the rate of flow of the air or other gas is described. The tubes are connected to a common manifold which is connected to a sucking device. Where it is necessary to conserve and recirculate the air sucked through the tubes, the output of the manifold is run through a separator to remove the condensate from the gas. The perforations in the slurper tubes are small, lying in the range of 0.010 inch to 0.100 inch. The tubes are disposed in contact with the surfaces of the heat exchanger on which the condensate is precipitated, whether fins or plates, so that the water may be directed to the tube openings by means of surface effects, together with the assistance of the air flow. Only about 5 percent of the air output need be thus diverted, and it effectively removes virtually all of the condensate. Official Gazette of the U.S. Patent Office

SELF-REGULATING PROPORTIONALLY CONTROLLED HEATING APPARATUS AND TECHNIQUE Patent

A self-regulating proportionally controlled heating apparatus and technique is provided wherein a single electrical resistance heating element having a temperature coefficient of resistance serves simultaneously as a heater and temperature sensor. The heating element is current-driven and the voltage drop across the heating element is monitored and a component extracted which is attributable to a change in actual temperature of the heating element from a desired reference temperature, so as to produce a resulting error signal. The error signal is utilized to control the level of the heater drive current and the actual heater temperature in a direction to reduce the noted temperature difference. The continuous nature of the process for deriving the error signal feedback information results in true proportional control of the heating element without the necessity for current-switching which may interfere with nearby sensitive circuits, and with no cyclical variation in the controlled temperature. Official Gazette of the U.S. Patent Office
This bibliography is issued in two sections: Section 1 - Abstracts, and Section 2 - Indexes. This issue of the Abstract Section cites 158 patents and applications for patent introduced into the NASA scientific and technical information system during the period of January 1975 through June 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 2830 patent and application for patent citations covering the period May 1969 through June 1975. The Index Section contains five indexes — subject, inventor, source, number and accession number.
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