NASA SP-7039(18)
Section 1
Abstracts

NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY, SUPPLEMENT 18, JANUARY 1981 (National Aeronautics and Space Administration) 50 p HC $8.50

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

JANUARY 1981

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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This bibliography was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by PRC Data Services 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 July 1980 and December 1980.
This supplement is available as NTISUB/111/093 from the National Technical Information Service (NTIS), Springfield, Virginia 22161 at the price of $8.50 domestic; $17.50 foreign for standing orders. Please note: Standing orders are subscriptions which do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.
INTRODUCTION

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

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

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

For the convenience of the user, each issue of NASA PAB has a separately bound Abstract Section (Section 1) and Index Section (Section 2). Although each Abstract Section covers only the indicated six-month period, the Index Section is cumulative covering all NASA-owned inventions announced in STAR since May 1969. Thus a complete set of NASA PAB would consist of the Abstract Sections of Issue 04 (January 1974) and Issue 12 (January 1978) and the Abstract Section for all subsequent issues and the Index Section for the most recent issue.

The 120 citations published in this issue of the Abstract Section cover the period July 1980 through December 1980. The Index Section references approximately 3900 citations covering the period May 1969 through December 1980.

ABSTRACT SECTION (SECTION 1)

This PAB issue incorporates the 1975 STAR category revisions which include 10 major subdivisions divided into 74 specific categories and one general category/division. (See Table of Contents for the scope note of each category under which are grouped appropriate NASA inventions.) This new scheme was devised in lieu of the 34 category divisions which were utilized in PAB supplements (01) through (06) covering STAR abstracts from May 1969 through January 1974. Each entry in the Abstract Section consists of a STAR citation accompanied by 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
A method and apparatus for convection control of metallic halide vapor density in a metallic halide laser are described. A reservoir containing copper chloride is heated so that the copper chloride is maintained in a liquid form. The apparatus includes a means for flowing a buffer gas (neon) over the liquid copper chloride to provide a mixture of copper chloride vapor and neon above the liquid copper chloride. A conduit for providing fluid communication between the reservoir containing the copper chloride vapor/neon mixture and the laser is also included. The copper chloride vapor density in the laser is related to the liquid copper chloride temperature and the neon flow rate through the reservoir. Neon is also provided directly to the laser in order to provide a further means of controlling the copper chloride vapor density in the laser.

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FIG. 2

KEY ILLUSTRATION
INDEX SECTION (SECTION 2)

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

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

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

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

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

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

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

HOW TO USE THIS PUBLICATION TO IDENTIFY NASA INVENTIONS

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

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

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

PUBLIC AVAILABILITY OF COPIES OF PATENTS AND PATENT APPLICATIONS

Copies of U.S. patents may be purchased directly from the U.S. Patent and Trademark Office, Washington, D.C. 20231, for fifty cents a copy. When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, preferably by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the Patent and Trademark Office.

NASA patent application specifications are sold in paper copy by the National Technical Information Service at price code A02 ($5.00 domestic; $10.00 foreign). Microfiche are sold at price code A01 ($3.50 domestic; $7.00 foreign). The US-Patent-Appl-SN-number should be used in ordering either paper copy or microfiche from NTIS.

LICENSES FOR COMMERCIAL USE: INQUIRIES AND APPLICATIONS FOR LICENSE

NASA inventions, abstracted in NASA PAB, are available for nonexclusive or exclusive licensing in accordance with the NASA Patent Licensing Regulations. It is significant that all licenses for NASA inventions shall be by express written instruments and that no license will be granted or implied in a NASA invention except as provided in the NASA Patent Licensing Regulations.

Inquiries concerning the NASA Patent Licensing Program or the availability of licenses for the commercial use of NASA-owned inventions covered by U.S. patents or pending applications for patent should be forwarded to the NASA Patent Counsel of the NASA installation having cognizance of the specific invention, or the Assistant General Counsel for Patent Matters, Code GP-4, National Aeronautics and Space Administration, Washington, D.C. 20546. Inquiries should refer to the NASA Case Number, the Title of the Invention, and the U.S. Patent Number or the U.S. Application Serial Number assigned to the invention as shown in NASA PAB.

The NASA Patent Counsel having cognizance of the invention is determined by the first three letters or prefix of the NASA Case Number assigned to the invention. The addresses of NASA Patent Counsels are listed alongside the NASA Case Number prefix letters in the following table. Formal application of license must be submitted on the NASA Form, Application for NASA Patent License, which is available upon request from any NASA Patent Counsel.
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PART 1245—PATENTS

Subpart 2—Patent Licensing Regulations

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

Sec. 1245.200 Scope of subpart.  
1245.201 Definitions.  
1245.202 Basic considerations.  
1245.203 Licenses for practical application of inventions.  
1245.204 Nonexclusive 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.

Authority: The provisions of this Subpart 2 issued under 42 U.S.C. 2457, 2473(b)(3).

§ 1245.200 Scope of subpart.

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

§ 1245.201 Definitions.

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

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

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

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

(d) "Special invention" means any invention designated by the NASA Assistant General Counsel for Patent Matters to be subject to short-form licensing procedures and invention utilization may be designated as a special invention when a determination is made that:

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

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

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

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

(g) The "Inventions and Contributions Board" means the NASA Inventions and Contributions Board established by the Administrator 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 applications and 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 private manufacturers may be unwilling to risk under a nonexclusive license. It is the policy of NASA that 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, the probabilities of undertaking the required investment and development, the impact on competitors, and the benefits of the license to the Government and to the public. Preference for exclusive license shall be given to U.S. citizens or companies who intend to manufacture or use, in the case of a process, the invention in the United States of America, its territories and possessions. Consideration may also be given to assist minority business enterprises, as well as economically depressed, low income and labor surplus areas.

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

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

§ 1245.203 Licenses for practical application of inventions.

(a) General. As an incentive to encourage practical application of inventions, licenses will be granted to responsible applicants according to the circumstances and conditions set forth in this section.

(b) Nonexclusive licenses. (1) Each invention will be made available to responsible applicants for nonexclusive, revocable licensing. In accordance with §1245.204, consistent with the provisions of any existing exclusive license.

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

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

(4) The license may be granted for all or less than all fields of use of the invention 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 may be granted (1), shall be granted, at the request of any applicant 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 licensing provided that:

(i) The Administrator has determined that: (a) The invention has not been brought to practical application by a nonexclusive licensee in the fields of use or in the geographical locations covered by the application for the exclusive license;

(ii) Exclusive license for the invention in the fields of use or geographical locations covered by the application for the exclusive license is not likely to be achieved expeditiously by the further funding of the invention by the Government or under a nonexclusive license requested by any applicant pursuant to §1245.203; and

(iii) The exclusive license will provide the necessary incentive to the licensee to achieve the practical application of the invention and

(ii) Either a notice pursuant to
§ 1245.205 Listing the invention as available for licensing has been published in the FEDERAL REGISTER for at least 9 months; 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, and in any lesser geographic portion thereof.

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

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

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

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

(7) The license may reserve to the Administrator, NASA, under the following circumstances, the right to require the granting of a sublicense to responsible persons or entities that are considered reasonable by the Administrator, taking into consideration the current royalty rates under similar patents and other factors:

(i) To the extent that the invention is required for public use by Government regulation, or (ii) as may be necessary to fulfill health or safety needs, or (iii) for other purposes stipulated in the license.

(8) The license shall be nontransferable except to the successor of that part of the licenisible’s business to which the invention pertains.

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

(10) The license may be subject to such 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 of the United States of America, its territories and possessions, Puerto Rico, and the District of Columbia, and in any lesser geographic portion thereof.

(b) Miscellaneous licenses. Subject to any outstanding licenses, nothing in this subsection 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 exemplary circumstances wherein such licenses may be granted:

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

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

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

§ 1245.205 Publication of NASA inventions available for license.

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

(b) Copies of pending patent applications for inventions abstracted in the STAR may be purchased from the National Technical Information Service, Springfield, Va. 22161.

§ 1245.206 Application for nonexclusive license.

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

(b) Contents of an application for nonexclusive license. An application for nonexclusive license under § 1245.203(b) shall include:

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

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

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

§ 1245.207 Application for exclusive license.

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

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

(1) Applicant’s status, if any, in any one 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

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

(3) 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.

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

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

(6) 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-
license and that such an exclusive license should be granted to the applicant.

§ 1245.208  Processing applications for license.

(a) Initial review. Applications for nonexclusive licenses under §§ 1245.206 and 1245.207 will be reviewed by the Patent Counsel of the NASA installation having cognizance for the Inventions and Contributions Board. The Assistant General Counsel for Patent Matters, to determine the conformity and appropriateness of the application for license and evaluate all applications for the license, request the Inventions and Contributions Board when the invention is available for consideration of the request license. Prior to forwarding applications for exclusive licenses to the Inventions and Contributions Board, notice will be given to each nonexclusive licensee for the specific invention advising of the receipt of the application for the exclusive license and providing each nonexclusive licensee with a 30-day period for submitting either evidence that practical application of the invention, if granted, will be to occur, or an application for an exclusive license for the invention.

(b) Recommendations of Inventions and Contributions Board. The Inventions and Contributions Board shall, in accordance with the basic considerations set forth in §§ 1245.202 and 1245.203, evaluate all applications for licenses forwarded by the Assistant General Counsel for Patent Matters. Based upon the facts presented to the Inventions and Contributions Board, the Inventions and Contributions Board shall recommend to the Administrator:

(1) Whether a nonexclusive or exclusive license should be granted, (2) the identity of the licensee, and (3) any special terms or conditions of the license.

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

(d) Determination of Administrator and grant of exclusive licenses. If the Administrator determines that the best interest of the United States will be served by the granting of an exclusive license, in accordance with the basic considerations set forth in §§ 1245.202 and 1245.203, a notice shall be published in the Federal Register advising the intent to grant the exclusive license, the identification of the invention, special terms or conditions of the proposed license, and a statement that NASA will grant the exclusive license unless within 30 days of the publication of such notice the Inventions and Contributions Board receives in writing any of the following together with supporting documentation:

(i) A statement from any person signing the agreement that it is in the best interest of the United States to grant the proposed exclusive license; and

(ii) An application for a nonexclusive license under such invention, in accordance with § 1245.206(b), in which applicant states that he has already brought or is likely to bring the invention to practical application within a reasonable period.

The Inventions and Contributions Board shall, upon receipt of a written request within the 30-day notice period, grant an extension of 30 days for the submission of the documents designated above.

(2) Recommendation of Inventions and Contributions Board. Upon the expiration of the period required by subparagraph (1) of this paragraph, the Board shall review all written responses to the request for recommendations to the Administrator whether to grant the exclusive license as the Board initially recommended or whether a different form of license, if any, should instead be granted.

(3) Grant of exclusive licenses. The Administrator shall review the Board's recommendations whether the license should be revoked, whether the interest of the United States would best be served by the grant of an exclusive license as recommended by the Board. If the Administrator determines to grant the exclusive license, the license will be granted upon the negotiation of the appropriate terms and conditions by the Office of General Counsel.

§ 1245.209 Royalties and fees.

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

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

§ 1245.210 Reports.

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

§ 1245.211 Revocation of licenses.

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

(b) Any license granted pursuant to § 1245.204(a) may be revoked, either in part or in its entirety, by the Administrator if in his opinion such revocation is necessary to achieve the earliest practical application of the invention 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.

(c) Before revoking any license granted pursuant to this Subpart 2 for any cause, there will be furnished to the licensee a written notice before the revocation of the license, and the licensee will be allowed 30 days after such notice in which to appeal and request a hearing before the Inventions and Contributions Board on the question of revocation. After a hearing, the Inventions and Contributions Board shall make findings of fact, and its recommendation whether the license should be revoked either in part, in its entirety.

The Administrator shall review the recommendation of the Board and determine whether to revoke the license in part or in its entirety. Revocation of a license shall include revocation of all sublicences which have been granted.

§ 1245.212 Appeals.

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

The procedures to be followed in such matters shall be determined by the Administrator. The Board shall make findings of fact and recommendations with respect to disposition of the appeal. The decision on the appeal shall be made by the Administrator, and such decision shall be final and conclusive, except on questions of law, unless determined by a court of competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence.

§ 1215.213 Litigation.

An 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 Government, upon consent of the Attorney General, as a party complainant in such suit. Without consent of the Government and the licensee shall pay costs and any final judgment or decree that may be rendered against the Govern-
ment in such suit. The Government shall also have an absolute right to intervene in any such suit at its own expense. The licensee shall be obligated to promptly furnish to the Government, upon request, copies of all pleadings and other papers filed in any such suit and of evidence adduced in proceedings relating to the licensed patent including, but not limited to, negotiations for settlement and agreements settling claims by a licensee based on the licensed patent, and all other books, documents, papers, and records pertaining to such suit. If, as a result of any such litigation, the patent shall be declared invalid, the licensee shall have the right to surrender his license and be relieved from any further obligation thereunder.

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

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

JAMES C. FLETCHER,
Administrator.

FOREIGN PATENT LICENSING REGULATIONS

Selected NASA inventions are also available for licensing in countries other than the United States in accordance with the NASA Foreign Patent Licensing Regulation (14 C.F.R. 1245.4), a copy of which is available from any NASA Patent Counsel. For abstracts of NASA-owned inventions available for licensing in countries other than the United States, see NASA SP-7038, "Significant NASA Inventions Available for Licensing in Countries Other Than the United States." A copy of this NASA publication is available from NASA Headquarters, Code GP-4, Washington, D.C., 20546.
TABLE OF CONTENTS
Section 1 • Abstracts

AERONAUTICS
Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).
For related information see also Astronautics.

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<td>01</td>
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<td>AERODYNAMICS</td>
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<td></td>
<td>Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.</td>
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<td>03</td>
<td>AIR TRANSPORTATION AND SAFETY</td>
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<tr>
<td></td>
<td>Includes passenger and cargo air transport operations; and aircraft accidents.</td>
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<td>For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.</td>
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<td>04</td>
<td>AIRCRAFT COMMUNICATIONS AND NAVIGATION</td>
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<tr>
<td></td>
<td>Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.</td>
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<td>05</td>
<td>AIRCRAFT DESIGN, TESTING AND PERFORMANCE</td>
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<tr>
<td></td>
<td>Includes aircraft simulation technology.</td>
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<td>For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics.</td>
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<td>06</td>
<td>AIRCRAFT INSTRUMENTATION</td>
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<tr>
<td></td>
<td>Includes cockpit and cabin display devices; and flight instruments.</td>
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<td>For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography.</td>
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<td>07</td>
<td>AIRCRAFT PROPULSION AND POWER</td>
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<td></td>
<td>Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.</td>
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<td>For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.</td>
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<td>AIRCRAFT STABILITY AND CONTROL</td>
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<tr>
<td></td>
<td>Includes aircraft handling qualities; piloting; flight controls; and autopilots.</td>
<td></td>
</tr>
</tbody>
</table>

09 RESEARCH AND SUPPORT FACILITIES (AIR)
Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.
For related information see also 14 Ground Support Systems and Facilities (Space).

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

12 ASTRONAUTICS (GENERAL) | N.A. |
|       | For extraterrestrial exploration see 91 Lunar and Planetary Exploration. | |
| 13 | ASTRODYNAMICS | N.A. |
|       | Includes powered and free-flight trajectories; and orbit and launching dynamics. | |
| 14 | GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) | 4 |
|       | 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 | N.A. |
|       | Includes boosters; manned orbital laboratories; reusable vehicles; and space stations. | |
| 16 | SPACE TRANSPORTATION | N.A. |
|       | Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques. | |
|       | For related information see also 03 Air Transportation and Safety and 85 Urban Technology and Transportation. | |
| 17 | SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING | N.A. |
|       | Includes telemetry; space communications networks; astronavigation; and radio blackout. | |
|       | For related information see also 04 Aircraft Communications and Navigation and 32 Communications. | |
| 18 | SPACECRAFT DESIGN, TESTING AND PERFORMANCE | N.A. |
|       | 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  N.A.
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) 4
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 7
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

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

28 PROPELLANTS AND FUELS 10
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) 11
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS 12
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 15
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; fluids; mass transfer; and ablation cooling.
For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

35 INSTRUMENTATION AND PHOTOGRAPHY 18
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 20
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 20
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 25
Includes structural element design and weight analysis; fatigue; and thermal stress.

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

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

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

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

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

47 METEOROLOGY AND CLIMATOLOGY
Includes weather forecasting and modification.

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

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

51 LIFE SCIENCES (GENERAL)
Includes genetics.

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

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

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

55 PLANETARY BIOLOGY
Includes exobiology; and extraterrestrial life.

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

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

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

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

62 COMPUTER SYSTEMS
Includes computer networks.

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

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

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

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

67 THEORETICAL MATHEMATICS
Includes topology and number theory.

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

70 PHYSICS (GENERAL)
For geophysics see 46 Geophysics. For astrophysics see 90 Astrophysics. For solar physics see 92 Solar Physics.
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<td>Acoustics</td>
<td>71</td>
<td>Includes sound generation, transmission, and attenuation. For noise pollution see 45 Environment Pollution.</td>
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<tr>
<td>Atomic and Molecular Physics</td>
<td>72</td>
<td>Includes atomic structure and molecular spectra.</td>
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<td>Nuclear and High-Energy Physics</td>
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<td>Includes elementary and nuclear particles; and reactor theory. For space radiation see 93 Space Radiation.</td>
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<td>Optics</td>
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<td>Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.</td>
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<td>Solid-State Physics</td>
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<td>Includes superconductivity. For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.</td>
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<td>Thermodynamics and Statistical Physics</td>
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<td>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.</td>
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<tr>
<td>Social Sciences</td>
<td>80</td>
<td>Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.</td>
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<td>Administration and Management</td>
<td>81</td>
<td>Includes management planning and research.</td>
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<tr>
<td>Documentation and Information Science</td>
<td>82</td>
<td>Includes information storage and retrieval technology; micrography; and library science. For computer documentation see 61 Computer Programming and Software.</td>
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<tr>
<td>Economics and Cost Analysis</td>
<td>83</td>
<td>Includes cost effectiveness studies.</td>
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<tr>
<td>Law and Political Science</td>
<td>84</td>
<td>Includes space law; international law; international cooperation; and patent policy.</td>
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<tr>
<td>Urban Technology and Transportation</td>
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<td>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.</td>
</tr>
<tr>
<td>Space Sciences</td>
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<td>Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation. For related information see also Geosciences.</td>
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<tr>
<td>Astronomy</td>
<td>89</td>
<td>Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.</td>
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<tr>
<td>Astrophysics</td>
<td>90</td>
<td>Includes cosmology; and interstellar and interplanetary gases and dust.</td>
</tr>
<tr>
<td>Lunar and Planetary Exploration</td>
<td>91</td>
<td>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.</td>
</tr>
<tr>
<td>Solar Physics</td>
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<td>Includes solar activity, solar flares, solar radiation and sunspots.</td>
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<tr>
<td>Space Radiation</td>
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<td>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.</td>
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Note: N.A. means that no abstracts were assigned to this category for this issue.
02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.
For related information see also 34 Fluid Mechanics and Heat Transfer.

SYSTEM FOR USE IN CONDUCTING WAKE INVESTIGATION FOR A WING IN FLIGHT Patent
Paul F. Bikle, inventors (to NASA) and Lawrence C. Montoya

A system supported by a wing in flight is described which has a reference total pressure port in spaced relation with a wake as the wake is generated by the wing, a reference static pressure port supported in spaced relation with the wake, and a probe adapted to be displaced along an accurate path through the wake including a total pressure port and static pressure ports. A differential pressure transducer and a pressure switching device are interposed between the ports and the transducer is provided for selectively connecting pairs of the ports to the transducer in opposed relation, whereby a single transducer is utilized to obtain differential pressure measurement for the wake with enhanced accuracy.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.
For related information see also 17 Spacecraft Communications, Command, and Tracking and 32 Communications.

INTERFEROMETRIC LOCATING SYSTEM Patent

A system is described for determining the position of a vehicle or other target that emits radio waves and which is of the type that senses the difference in time of arrival at spaced ground stations of signals from the vehicle to locate the vehicle on a set of intersecting hyperbolas. A network of four ground stations detects the radio emissions from the vehicle and by means of cross correlation derives the relative signal delay at the ground stations from which the vehicle position is deduced. Because the signal detection is by cross correlation, no knowledge of the emission is needed, which makes even unintentional radio noise emissions usable as a locator beacon. By positioning one of the four ground stations at an elevation significantly above the plane of the other three stations, a three dimensional fix on the vehicle is possible.

Official Gazette of the U.S. Patent and Trademark Office
07 AIRCRAFT PROPULSION AND POWER

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

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

N80-26298* National Aeronautics and Space Administration.

Roger A. Craig and Huw O. Pritchard, inventors (to NASA) Issued 27 May 1980 6 p

Continuation of abandoned US Patent Appl. SN-684045, filed 7 May 1976

A turbojet combustor and method for controlling nitric oxide emissions by employing successive combustion zones is described. After combustion of an initial portion of the fuel in a primary combustion zone, the combustion products of the primary zone are combined with the remaining portion of fuel and additional plenum air and burned in a secondary combustion zone under conditions that result in low nitric oxide emissions. Low nitric oxide emissions are achieved by a novel turbojet combustor arrangement which provides flame stability by allowing stable combustion to be accompanied by low nitric oxide emissions resulting from controlled fuel-lean combustion (ignited by the emission products from the primary zone) in a secondary combustion zone at a lower combustion temperature resulting in low emission of nitric oxide.

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

N80-32393* National Aeronautics and Space Administration.

Hugh L. Dryden Flight Research Center, Edwards, Calif.

MULTIPLE PURE TONE ELIMINATION STRUT ASSEMBLY Patent Application

Frank W. Burcham, Jr., inventor (to NASA) Filed 11 Sep. 1980

An acoustic noise elimination assembly is described which has a capability for disrupting the continuity of fields of sound pressures forwardly projected from fans or rotors of a type commonly found in the fan or compressor first stage for airbreathing engines when operating at top speeds in the supersonic range. The assembly includes a tubular cowl defining a duct for delivering an airstream axially into the intake for a jet engine and a sound barrier defined by a plurality of intersecting flat plates or struts, having a line of intersection coincident with a longitudinal axis of the tubular cowl which serves to disrupt the continuity of rotating fields of multiple pure tonal components of noise.

N80-32392* National Aeronautics and Space Administration.

Norman E. Sorensen and Eldon A. Latham, inventors (to NASA) Issued 29 Jul. 1980

A variable area exit nozzle arrangement for an aircraft engine was a substantially reduced length and weight which comprises a number of longitudinally movable radial vanes and a number of fixed radial vanes. The movable radial vanes are alternately disposed with respect to the fixed radial vanes. A means is provided for displacing the movable vanes along the longitudinal axis of the engine relative to the fixed radial vanes which extend across the main exhaust flow of the engine.

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

N80-32393* National Aeronautics and Space Administration.

Hugh L. Dryden Flight Research Center, Edwards, Calif.

MULTIPLE PURE TONE ELIMINATION STRUT ASSEMBLY Patent Application

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NASA
08 AIRCRAFT STABILITY AND
CONTROL
Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N80-22359*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
DECOUPLER PYLON: WING/STORE FLUTTER SUPPRESSOR Patent Application
Weimer A. Reed, III, inventor (to NASA) Filed 28 Mar. 1980 18 p
(NASA-Case-LAR-12468-1; US-Patent-Appl-SN-135057) Avail: NTIS HC A02/MF A01 CSCL 01C
A device for suspending a store from a support such as an aircraft wing is described. It comprises soft-spring means whereby the store pitch mode is decoupled from support modes and a low frequency active control mechanism which maintains store alignment. In the described embodiment, a pneumatic suspension system both isolates the store in pitch and, under conditions of changing mean load, aligns the store with the wing to which it is attached. The device allows the flutter speed of an aircraft flying with an attached store to be increased while reducing the sensitivity of flutter to changes in the pitch inertia and center of gravity location of the store.

N80-24334*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
METRIC HALF-SPAN MODEL SUPPORT SYSTEM Patent Application
Charlie M. Jackson, Jr., Samuel M. Dollyhigh, and David S. Shaw, inventors (to NASA) Filed 30 Apr. 1980 11 p
(NASA-Case-LAR-12441-1; US-Patent-Appl-SN-145210) Avail: NTIS HC A02/MF A01 CSCL 01C
A model support system used to support a model in a wind tunnel test section is described. The model comprises a metric, or measured, half-span supported by a nonmetric, or nonmeasured, half-span which is connected to a sting support. Moments and forces acting on the metric half-span are measured without interference from the support system during a wind tunnel test.

09 RESEARCH AND SUPPORT FACILITIES (AIR)
Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.
For related information see also 14 Ground Support Systems and Facilities (Space).

N80-22369*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
WIND TUNNEL SUPPLEMENTARY MACH NUMBER MINIMUM SECTION INSERT Patent Application
Lana M. Couch, inventor (to NASA) Filed 28 Mar. 1980 12 p
(NASA-Case-LAR-12532-1; US-Patent-Appl-SN-135040) Avail: NTIS HC A02/MF A01 CSCL 01C
A device which changes the Mach number capability of a wind tunnel without permanently altering the existing nozzle of the tunnel is described. An insert is attached to the wall of the existing nozzle expansion area creating a second minimum section upstream of the model test section. The added insert may be removed without complicated and expensive changes to the basic wind tunnel. In the embodiment illustrated, a removable insert is disposed within the wind tunnel nozzle walls with a portion of the flow boundary layer being bled off from the tunnel via a passageway and tunnel exit to reduce the extent of separated flow normally occurring upstream of the insert contraction section.

N80-24336*# National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
WIND TUNNEL SUPPLEMENTARY MACH NUMBER MINIMUM SECTION INSERT Patent Application
Weimer A. Reed, III, inventor (to NASA) Filed 28 Mar. 1980 18 p
(NASA-Case-LAR-12532-1; US-Patent-Appl-SN-135040) Avail: NTIS HC A02/MF A01 CSCL 01C
A device which changes the Mach number capability of a wind tunnel without permanently altering the existing nozzle of the tunnel is described. An insert is attached to the wall of the existing nozzle expansion area creating a second minimum section upstream of the model test section. The added insert may be removed without complicated and expensive changes to the basic wind tunnel. In the embodiment illustrated, a removable insert is disposed within the wind tunnel nozzle walls with a portion of the flow boundary layer being bled off from the tunnel via a passageway and tunnel exit to reduce the extent of separated flow normally occurring upstream of the insert contraction section.
14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

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

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

BIOCENTRIFUGE SYSTEM CAPABLE OF EXCHANGING SPECIMEN CAGES WHILE IN OPERATIONAL MODE Patent Application
Robert R. Belew, inventor (to NASA) Filed 30 Apr. 1980 20 p

A bioresearch centrifuge system for subjecting caged animals to long term centrifugal forces that create gravity conditions aboard orbiting spacecraft is disclosed. The biocentrifuge system is comprised of a centrifuge carrying a plurality of removable and replaceable cages for the animal specimens. Pairs of opposing cages may be removed from the frame while it is rotating, by means of a cage exchanger which rotates concentrically within the centrifuge and the speed of which is controlled independently of the frame speed. An image rotator is provided for selective observation of the rotating animals. The system further includes a waste conveyor system, a food supply system, and a water supply system for each cage for creating a life sustaining environment so that the animals can live in the rotating centrifuge for extended periods. The rotating cage exchanger can also be used to selectively remove containers from various other centrifuges or other rotatable frame structures.

PREPARATION OF PERFLUORINATED IMIDOAMIDOXIMES Patent Application

A method of preparing perfluorinated imidoamidoximes is disclosed. The imidoamidoximes are synthesized by the condensation of a perfluorinated nitrile with a perfluorinated amidoxime in vacuo or in an inert atmosphere at a temperature within the range of about 20 to 70 C for a period of 24 to 240 hours. When both the nitrile and the amidoxime reactants are difunctional, oligomeric or polymeric product are obtained, which, after cyclization of the imidoamidoxime groups to 1,2,4-oxadiazole linkages, yield excellent heat, chemical, and solvent resistant elastomers.

AN IMPROVED SYNTHESIS OF 2,4,8,10-TETROXASPIRO (5,5) UNDECANE Patent Application

Pentaerythritol can be converted to its diformal, 2,4,8,10-tetraoxaspiro (5,5) undecane, by heating it at a temperature within of about 110 to 150 C for a period of up to 10 minutes, in the presence of a slight excess of paraformaldehyde and of a catalytic quantity of an acid catalyst such as sulfuric acid. The reaction may be carried out in two steps, by forming first the monoformal, then the diformal. In any case, total reaction time is about 10 minutes and yield of diformal are greater than 90 percent. Several advantages of the improved process in terms of shortened reaction times, yields labor and energy requirements, adaptability to continuous operation, and overall simplicity and convenience are discussed.
METHOD FOR MAKING PATTERNS FOR RESIN MATRIX COMPOSITES Patent Application

Manuel J. Fontes, inventor (to NASA) Filed 2 Apr. 1980

A method for making laminate patterns for a resin matrix composite structural component is described. A sheet of paper is temporarily adhered to a model of the structural component. A tracer pen is positioned on the paper with an affixed spindle touching the model surface opposite the pen. The pen and spindle are moved along the path that maintains the aforementioned contacts. The resulting line traced on paper is a model constant thickness locus and provides a pattern for a single lamination of resin-impregnated fabric. The steps are repeated to make other patterns and each time the steps are repeated the distance between the tracer and the spindle is changed to correspond to the thickness of a lamination.

CORK-RESIN ABLATIVE INSULATION FOR COMPLEX SURFACES AND METHOD FOR APPLYING THE SAME Patent


A method of applying cork-resin ablative insulation material to complex curved surfaces is disclosed. The material is prepared by mixing finely divided cork with a B-stage curable thermosetting resin, forming the resulting mixture into a block, B-stage curing the resin-containing block, and slicing the block into sheets. The B-stage cured sheet is shaped to conform to the surface being insulated, and further curing is then performed. Curing of the resins only to B-stage before shaping enables application of sheet material to complex curved surfaces and avoids limitations and disadvantages presented in handling of fully cured sheet material.
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also 77 Thermodynamics and Statistical Physics.

Chromatographic materials were developed to serve as the stationary phase of columns used in the separation of atmospheric gases. These materials consist of a crosslinked porous polymer matrix, e.g., a divinylbenzene polymer, into which has been embedded an inorganic complexed ion such as N,N’-ethylene-bis(acetylacetoniminato)-cobalt (2). Organic nitrogenous bases, such as pyridine, may be incorporated into the chelate polymer complexes to increase their chromatographic utility. With such materials, the process of gas chromatography is greatly simplified, especially in terms of time and quantity of material needed for a gas separation.

An electrolytic cell for the conversion of water vapor to oxygen and hydrogen is disclosed. The electrolytic converter includes an anode comprising a foraminous conductive metal base member having a coating thereon of 65-85 weight percent iridium oxide and 15-35 weight percent of a high temperature resin binder. Also included are a matrix member and a cathode, with the matrix member containing an electrolyte and the cathode being substantially inert to the electrolyte. The foraminous metal member is most desirably expanded tantalum mesh, and the cell desirably includes reservoir elements of porous sintered metal in contact with the anode to receive and discharge electrolyte to the matrix member as required. Upon entry of a water vapor-containing airstream into contact with the outer surface of the anode and thence into contact with iridium oxide coating, the water vapor is electrolytically converted to hydrogen ions and oxygen gas produced at the anode to enrich the air stream passing by the anode.

The testing of several candidate perfluorocarbon liquids for the direct fluid contact heat exchange with H2SO4 at about 330°C prior to high temperature decomposition in the oxygen release step of several thermochemical cycles for splitting water into hydrogen and oxygen is described. Among the several liquids tested, only perfluoropropylene oxide polymers having a degree of polymerization from about 10 to 60 were chemically stable and had low miscibility and vapor pressure when tested with sulfuric acid at temperatures from 300°C to 400°C. The thermochemical cycle is outlined.
A method of preparing fluorinated alkyl or alkylether 1,2,4-oxadiazoles is disclosed. The oxadiazoles are synthesized by cyclizing the corresponding alkyl or alkylether imidoylamidoximes in vacuo or in an inert atmosphere at a temperature within the range of 40 to 100°C for a period of 8 to 144 hours in the presence of an acid compound which can accept ammonia to form a salt. The imidoylamidoximes usable in this process may be either polymeric or nonpolymeric. As a result of the low cyclization temperatures, the quality and quantity of the 1,2,4-oxadiazole polymers are better than other disclosed processes.

N80-31490 National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
SYNTHESIS OF Dawsonites Patent Application
Robert L. Altman, inventor (to NASA) Filed 14 Aug. 1980 10 p
Avail: NTIS HC A02/MF A01 CSCL 07A

Alkali metal and ammonium dawsonites are prepared by a nonaqueous process where equimolar quantities of the corresponding hydrogen carbonate and aluminum hydroxide in finely divided state are heated together to a temperature within the range of 150 to 250°C for a period of 1 to 6 hours under a carbon dioxide pressure within the range of 120 to 360 psig. Carbonates may be used instead of hydrogencarbonates. A type of dawsonite is provided that can be used in extinguishing fires caused by hot surface ignition of hydrocarbon fuels.

N80-28492 National Aeronautics and Space Administration, Langley Research Center, Hampton, Va.
HEAT TREAT FIXTURE AND METHOD OF HEAT TREATING Patent

A heat treating fixture is disclosed in which the shape of the metal specimen is maintained by cold rolled steel support plates. Glide sheets of stainless steel, coated with boron nitride, in contact with each face of the metal specimens, allow for lateral expansion of the metal specimens without binding. Grooved support bars separate the glide sheets from the upper and lower support plates and allow flow of quenching fluid to the metal specimen.

N80-32484 National Aeronautics and Space Administration, Lewis Research Center, Cleveland, Ohio
HIGH TOUGHNESS-HIGH STRENGTH IRO ALLOY Patent
An iron alloy is provided which exhibits strength and toughness characteristics at cryogenic temperatures. The alloy consists essentially of about 10 to 16 percent by weight nickel, about 0.1 to 1.0 percent by weight aluminum, and 0 to about 3 percent by weight copper, with the balance being essentially iron. The iron alloy is produced by a process which includes cold rolling at room temperature and subsequent heat treatment.

27 NONMETALLIC MATERIALS

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

N80-23452† National Aeronautics and Space Administration. Ames Research Center. Moffett Field, Calif.

REVERSE OSMOSIS MEMBRANE OF HIGH UREA REJECTION PROPERTIES Patent


Polymeric membranes suitable for use in reverse osmosis water purification because of their high urea and salt rejection properties are prepared by generating a plasma of an unsaturated hydrocarbon monomer and nitrogen gas from an electrical source. A polymeric membrane is formed by depositing a polymer of the unsaturated monomer from the plasma onto a substrate, so that nitrogen from the nitrogen gas is incorporated within the polymer in a chemically combined form.

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

N80-24437† National Aeronautics and Space Administration. Lewis Research Center. Cleveland, Ohio.

MODIFICATION OF THE ELECTRICAL AND OPTICAL PROPERTIES OF POLYMERS Patent

Michael J. Mirtich and James S. Sovey, inventors (to NASA) Issued 22 Apr. 1980 4 p Filed 7 Nov. 1978 Supersedes N70-11216 (17 - 02. p 0164)

An electron bombardment argon ion source is used to form textured surfaces on polymide and fluorinated ethylene propylene polymers. This treatment improves the optical and electrical properties so that these polymers may be used in industrial and space applications.

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

N80-24438† National Aeronautics and Space Administration. Lyndon B. Johnson Space Center. Houston, Tex.

HEAT RESISTANT POLYMERS OF OXIDIZED STYRYLPHOSPHINE Patent


A flame resistant, nontoxic polymer which may be used safely in confined locations where there is inadequate ventilation of a strip of ceramic cloth coated, at least along both its longitudinal edges with a room temperature vulcanizable silicone rubber compound with a high emittance colored pigment. The filler may have one or more layers as the gap width requires. Preferred materials are basket-weave aluminoborosilicate cloth, and a rubber compound with silicon tetraboride as the emittance agent and finely divided borosilicate glass containing about 7.5% B2O3 as highly temperature binder. The filler cloth strip or tape is cut to proper width and length, inserted into the gap, and fastened with previously applied drops of silicone rubber adhesive.

N80-23454† National Aeronautics and Space Administration. Ames Research Center. Moffett Field, Calif.

ADJUSTABLE HIGH EMITTANCE GAP FILLER Patent Application

Howard E. Goldstein, Carlos Estrella, Marnell Smith, David A. Stewart, and Daniel B. Leiser (Stanford Univ.) Filed 7 May 1980 17 p

A flexible, adjustable refractory filler is disclosed for filling gaps between ceramic tiles forming the heat shield of a space shuttle vehicle, to protect its aluminum skin during atmospheric re-entry. The easily installed and replaced filler consists essentially
is prepared either by polymerizing compounds having the formula R-N-{(C6H5)2C6H4}CH = CH2 where R is an organic moiety selected from the group of (C6H5)2PO(O), (C6H5)2PO(=O)(C6H5)=O, (C6H5)3C3N3-, or their mixtures, or by reacting a polymer with an organic azide such as diphenylphosphonyl azide, diphenyl phosphoryl azide, 2-azoido-6-diphenyl-5-triazine, 2,4-diazoido-6-phenyl-s-triazine, triethylisilyl azide, triphenylsilyl azide, and phosphazene. The reaction of the styrylphosphine with the organoazide results in the oxidation of the trivalent phosphorus atom to the pentavalent state in the form of an unsaturated P= N linkage known as a phosphazene group.

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

N80-24440* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

HEAT SEALABLE, FLAME AND ABRASION RESISTANT COATED FABRIC Patent Application
(Contract NAS9-13979)

A flexible, lightweight air impermeable coated fabric was developed to replace the flame retardant neoprene coated nylon fabric used as the micrometeorite protection layer in the intravehicular thermomicroetonei garment. The elastomeric compositions are comprised of thermoplastic polyurethane polymer and flame retarding amounts of a filler selected from decabromodiphenyloxide and antimony oxide in a 3:1 weight ratio, and decabromodiphenyloxide, antimony oxide, and ammonium polyphosphate in a 3:1:3 weight ratio. The compounds were dissolved at about 40% solids in tetrahydrofuran. Films cast from the solution were dried and bonded to the fabric under heat and pressure at 400 F. 30 psi with 10 sec dwell time. Either heat or dielectric sealing procedures can be used.

NASA

N80-26448* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

VITRA-VIOLET PROCESS FOR PRODUCING FLAME RESISTANT POLYAMIDES AND PRODUCTS PRODUCED THERBY Patent

Aromatic polyamides with improved nonflammability characteristics are produced by contacting a polyamide substrate with a gaseous medium comprising a minor amount of a halolefinic material and an inert diluent in the presence of light having sufficient energy to effect chemical addition of the haloolefin to the polyamide substrate.

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

N80-25447* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LOW TEMPERATURE CROSS LINKING POLYIMIDES Patent Application
Tito T. Serafini and Peter Delviss, inventors (to NASA) Filed 20 Jun. 1980 14 p


A way of forming a prepolymer polyimide which can be cross-linked at a relatively low temperature is disclosed. Usually a polyimide is formed by cross linking a prepolymer formed by reacting a polyfunctional amine, and an end-capping unit. By providing a styrene derivative end-capping unit, the prepolymer is curable at a temperature of about 175 to 245 C.

NASA

N80-29496* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CASTABLE HIGH TEMPERATURE REFRUCTORY MATERIALS Patent Application
I. Zaplatynsky, inventor (to NASA) Filed 30 Jul. 1980 5 p

A method is disclosed for fabricating ceramic bodies that are both highly refractory and porous. A paste is formed by mixing alumina grain having uniform particle size with colloidal silica that is stabilized with ammonia. After drying, the cast body has sufficient green strength to be handled, and it is transferred to a furnace for curing. A green body prepared in this fashion does not undergo shrinkage during curing nor during prolonged subsequent heating.

NASA

N80-31551* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PHOSPHORUS-CONTAINING BISIMIDE RESINS Patent Application

Fire resistant resins particularly useful for making laminates with inorganic fibers such as graphite fibers are made by condensation of an ethylenically unsaturated cyclic anhydride with bis (diaminophenyl) phosphine oxide, and by addition polymerization of the bisimide so obtained. Up to about 50%, on a molar basis, of benzophenonetetracarboxylic acid anhydride can be substituted for some of the cyclic anhydride to alter the properties of the products. Graphite cloth laminates made with these resins have shown 800 C char yields greater than 70% by weight in nitrogen. Limiting oxygen indexes of more than 10% were determined for these resins.

NASA
27 NONMETALLIC MATERIALS

N80-32514* National Aeronautics and Space Administration. Pasadena Office, Calif.

Production of hydroxylic containing curable liquid hydrocarbon prepolymers by ozonizing a high molecular weight saturated hydrocarbon polymer such as polyisobutylene or ethylene propylene rubber is discussed. The ozonized material is reduced using reducing agents, preferably diisobutyl aluminum hydride, to form the hydroxylic containing liquid prepolymers having a substantially lower molecular weight than the parent polymer. The resulting curable liquid hydroxylic containing prepolymers can be poured into a mold and readily cured, with reactants such as toluene disocyanate, to produce highly stable elastomers having a variety of uses such as binders for solid propellants.

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

N80-32515* National Aeronautics and Space Administration. Pasadena Office, Calif.

A process for preparing dianhydrides that are miscible with hydroxyl prepolymers at moderate temperatures and can cure hydroxyl prepolymers to elastomers at moderate temperatures is disclosed. The dianhydrides are prepared by solution reaction of unreacted dianhydride. The prepolymer dianhydrides are miscible with hydroxyl substituted hydrocarbon prepolymers and cure the prepolymers to polyester-linked elastomers.

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

N80-32516* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

A self-supporting sheet structure comprising a water soluble, noncrosslinked polymer such as polyvinyl alcohol which is capable of being crosslinked by reaction with hydrogen atom radicals and hydroxyl molecule radicals is contacted with an aqueous solution having a pH of less than 8 and containing a dissolved salt in an amount sufficient to prevent substantial dissolution of the noncrosslinked polymer in the aqueous solution. The aqueous solution is then irradiated with ionizing radiation to form hydrogen atom radicals and hydroxyl molecule radicals and the irradiation is continued for a time sufficient to effect crosslinking of the water soluble polymer to produce a water insoluble polymer sheet structure. The method has particular application in the production of battery separators and electrode envelopes for alkaline batteries.

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28 PROPELLANTS AND FUELS

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

For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

N80-23471* National Aeronautics and Space Administration. Pasadena Office, Calif.

A method for the recovery of ammonium perchlorate from waste solid rocket propellant is described wherein the propellant is leached with an aqueous leach solution containing a low concentration of surface active agent while stirring the suspension.

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

N80-26480* National Aeronautics and Space Administration. Pasadena Office, Calif.

An improved process is disclosed for liquefying coal in which coal minerals at high content are utilized as a hydrocracking catalyst. A slurry of 10 to 60% by weight of coal in recycled liquefied coal product which contains 15% to 30% by weight of...
coal minerals, is pressurized with excess hydrogen to a pressure of 2,000 to 4,000 psi and heated to a temperature of 450 to 550 °C. The coal minerals autocatalytically convert coal solids to a low viscosity liquid product and to gas product in high yields while reducing oxygen, nitrogen and sulfur content of the coal product as compared to other coal liquefaction processes under development. NASA

N80-28538* National Aeronautics and Space Administration. Pasadena Office, Calif.

SILICONE CONTAINING SOLID PROPELLANT Patent
The addition of a small amount, for example 1% by weight, of a liquid silicone oil to a metal containing solid rocket propellant provides a significant reduction in heat transfer to the inert nozzle walls. Metal oxide slag collection and blockage of the nozzle are eliminated and the burning rate is increased by about 5% to 10% thus improving ballistic performance.
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31 ENGINEERING (GENERAL)

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

N80-32583* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

APPARATUS FOR SUPPLYING CONDITIONED AIR AT A SUBSTANTIALLY CONSTANT TEMPERATURE AND HUMIDITY Patent
The apparatus includes a supply duct coupled to a source of supply air for carrying the supply air therethrough. A return duct is coupled to the supply duct for carrying return conditioned air therethrough. A temperature reducing device is coupled to the supply duct for decreasing the temperature of the supply and return conditioned air. A by-pass duct is coupled to the supply duct for selectively directing portions of the supply and return conditioned air around the temperature reducing device. Another by-pass duct is coupled to the return duct for selectively directing portions of the return conditioned air around the supply duct and the temperature reduction device. Controller devices selectively control the flow and amount of mixing of the supply and return conditioned air.
Official Gazette of the U.S. Patent and Trademark Office

N80-32584* National Aeronautics and Space Administration. Pasadena Office, Calif.

SYSTEM FOR PLOTTING SUBSOIL STRUCTURE AND METHOD THEREFOR Patent
Data for use in producing a tomograph of subsoil structure between boreholes is derived by pacing spaced geophones in one borehole, on the Earth surface if desired, and by producing a sequence of shots at spaced apart locations in the other borehole. The signals, detected by each of the geophones from the various shots, are processed either on a time of arrival basis, or on the basis of signal amplitude, to provide information of the characteristics of a large number of incremental areas between the boreholes. Such information is useable to produce a tomograph of the subsoil structure between the boreholes. By processing signals of relatively high frequencies, e.g., up to 100 Hz, and by closely spacing the geophones, a high resolution tomograph can be produced.
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LIQUID IMMERSION APPARATUS FOR MINUTE ARTICLES Patent Application
An apparatus for immersing minute articles such as integrated circuit chip in an etching solution during manufacture of the chips is described. The apparatus includes a basket having minute fluid passages in its sides and bottom, the passages being dimensioned to overcome buoyancy while allowing complete circulation. Both the basket and lid member are constructed of corrosion resistant material such as Teflon and are dimensioned to provide a friction fit. A holder member including handle portion and support mean is disposed to support and retain the basket while in the solution. The overall combination of the basket, lid, and handle having the features referred to above enable treatment of the chips and avoidance of losses and unnecessary handling.  

E.D.K.

32 COMMUNICATIONS

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

For related information see also 64 Aircraft Communications and Navigation and 17 Spacecraft Communications, Command and Tracking.

N80-23524* National Aeronautics and Space Administration. Pasadena Office, Calif.

DUAL BAND COMBINER FOR HORN ANTENNA Patent

A corrugated horn antenna, adapted to be coupled to a waveguide at its apex for X-band excitation is further adapted to be connected to waveguides through a circumferential slot for S-band excitation at four distinct phases selected for the desired S-band polarization. The circumferential slot is positioned along the axial length of the horn for good mode matching and is provided with an X-band choke in the form of two concentric choke slots. For further improvement in impedance matching, the second (outer) choke slot is divided by plugs into four segments that coincide with waveguide ports for the four distinct phases of the S-band.

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N80-24510* National Aeronautics and Space Administration. Pasadena Office, Calif.

METHOD AND APPARATUS FOR DOPPLER FREQUENCY MODULATION OF RADIATION Patent

A method and apparatus are described for frequency modulating radiation, such as from a laser, for optoacoustic detectors, interferometers, heterodyne spectrometers, and similar devices. Two oppositely reciprocating cats-eye retroreflectors are used to Doppler modulate the radiation. By reciprocally moving both retroreflectors, the center of mass is maintained constant to permit smooth operation at many Hertz. By slightly offsetting the axis of one retroreflector relative to the other, multiple passes of a light beam may be achieved for greater Doppler shifts with the same reciprocating motion of the retroreflectors.

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N80-24511* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

CAVITY-BACKED, MICRO-STRIP DIPOLE ANTENNA ARRAY Patent Application

A flush mounted, microwave band antenna for high performance aircraft and space vehicles is disclosed. Features of the cavity-backed microstrip antenna include: (1) low cost construction; (2) microstrip elements in orthogonal dipole arrangement; and (3) circular polarized sum and difference radiation patterns. The microstrip antenna elements are fed through quadrature hybrids proceeded by a comparator hybrid.

J.M.S.
A tracking generator is slaved to a spectrum analyzer to produce an input signal having a frequency that follows the frequency of the spectrum analyzer sweeping local oscillator. The input signal is gated to a transducer by a transmitter gate to produce ultrasonic waves in the sample. The resulting ultrasonic echoes are converted into electrical signals by the transducer and then gated into the spectrum analyzer by receiver gate. This arrangement produces spectra that are equivalent to shock-exciting the transducer with a true delta function shock excitation.

NASA

A horn antenna that is readily collapsible while not in use is described. A number of different sized annular metal rings are arranged in a sequence such that each ring is larger than the one that precedes it in the sequence. A number of thin flexible electrically conductive members attach successive metal rings together physically and connect them together electrically. Each flexible conductive member is attached to make electrical contact between the exterior surface of a metal ring and the inside surface of an adjacent metal ring in the sequence.

NASA

An antenna array is described which comprises three interferometer pairs of antenna elements with selected spacings made to form a single beam which is readily scannable. All spatial frequencies generated by a signal and intercepted by the array are derived from a signal processing technique applied to the array. The array samples space in the spatial frequency domain while the signal processing technique utilizes real time convolution of functions in the spectral frequency domain. Summation of the appropriate spatial frequencies is equivalent to a Fourier transform operation, yielding the location of the signal source in space. Resolution and freedom from interference of the interferometer system is equal to that of a fully filled array of the same aperture size containing element spacings of one half wavelength. An antenna array system comprising four antenna elements forming six interferometer pairs with a resolution equal to that of a sixteen element array with spacings of one half wavelength is described, as well as other multiples of one quarter wavelength.
aperture plane. Coaxial split-tube baluns are used to drive the
junctions between corresponding slot pairs. Optional cavity
dielectric is provided and a drive coupling arrangement includes
a four port comparator hybrid having sum and difference ports
respectively, for alternate excitation to produce a single lobe or
a double lobe pattern with null. Switching apparatus is provided
to connect a common terminal to either of the ports. NASA

A multiple antenna assembly for communicating electromagnetic
radiation is disclosed. An antenna element stack is
constructed of a plurality of elliptical lamina antenna elements
mutually separated by layers of dielectric material, and separated
from a ground plane by dielectric material. The antenna
assembly is coupled through a feed line in contact with the top
antenna element. A conductor joins the remaining antenna
elements to the ground plane. Each individual antenna element
is operable for communication reception and transmission within
a frequency band determined by the size of the particular antenna
element. The sizes of the antenna elements may be selected to
provide electromagnetic radiation communication over several
distinct frequency bands, or to connect the individual bands into
a broad band.

A compact cryogenically coolable choked waveguide for
low-noise input coupling into a cryogenically cooled device, such
as a maser or parametric amplifier, utilizes coaxial stainless steel
support tubes surrounding the waveguide and connected in
cascade to provide a folded low thermal conduction path. The
edges of the tubes connected are welded.

A single-frequency multibeam synthetic aperture radar for
large swath imaging is disclosed. Each beam illuminates a separate
"footprint" (i.e., range and azimuth interval). The distinct azimuth
intervals for the separate beams produce a distinct Doppler
frequency spectrum for each beam. After range correlation of
raw data, an optical processor develops image data for the different
beams by spatially separating the beams to place each beam of
different Doppler frequency spectrum in a different location in
the frequency plane as well as the imaging plane of the optical
processor. Selection of a beam for imaging is made in the
frequency plane by adjusting the position of an aperture, or in
the image plane by adjusting the position of a slit. The raw
data is processed in digital form in an analogous manner.
33 ELECTRONICS AND ELECTRICAL ENGINEERING

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

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

N80-23559* National Aeronautics and Space Administration. Pasadena Office, Calif.

PASSIVE INTRUSION DETECTION SYSTEM Patent

An intrusion detection system is described in which crystal oscillators are used to provide a frequency which varies as a function of fluctuations of a particular environmental property of the atmosphere, e.g., humidity, in the protected volume. The system is based on the discovery that the frequency of an oscillator whose crystal is humidity sensitive, varies at a frequency or rate which is within a known frequency band, due to the entry of an intruder into the protected volume. The variable frequency is converted into a voltage which is then filtered by a filtering arrangement which permits only voltage variations at frequencies within the known frequency band to activate an alarm, while inhibiting the alarm activation when the voltage frequency is below or above the known frequency band.

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N80-24549* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

ELECTRICALLY CONDUCTIVE PALLADIUM CONTAINING POLYMIDE FILMS Patent Application

A method is described for preparing lightweight, high temperature resistant, electrically conductive, palladium containing, polyimide films for use on aerodynamic and space applications. A palladium (2) ion-containing polymeric acid solution is prepared by reacting an aromatic dihydride with an equimolar quantity of a palladium 2 ion-containing salt or complex. The reactant product is cast as a thin film onto a surface and cured at approximately 300 C to produce a flexible electrically conductive cyclic palladium containing polyimide. The source of palladium ions is selected from the group of palladium 2 compounds consisting of LiPdC14, Pd[Cl(CH3)2]2C12, Na2PdC14, and PdC14.

NASA

N80-25659* National Aeronautics and Space Administration. Edwards, Calif.

PORTABLE DEVICE FOR USE IN STARTING AIR-START-UNITS FOR AIRCRAFT AND HAVING CABLE LEAD TESTING CAPABILITY Patent

A portable device for starting aircraft engines and the like is disclosed. The device includes a lead testing and motor starting circuit characterized by: (1) a direct current voltage source, (2) a pair of terminal plugs connected with the circuit (each being characterized by a first, second, and third terminal) (3) a pair of manually operable switches for connecting the first terminal of each plug to the pair of the positive side of the voltage source, (4) a circuit lead connecting to the second terminal of each plug the negative side of said source, (5) a pair of electrical cables adapted to connect said first and second terminals of each plug to an air-start unit, and means for connecting each.
cable of the pair of cables between the first terminal of one plug and the third terminal of the other plug of the pair, and (6) a second pair of manually operable switches for selectivity connecting the third terminal of each plug of the pair to the negative side of the voltage source.

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

A high frequency oscillator circuit is described. The circuit uses a low cost junction type field effect transistor (T sub 1) with a tuned circuit connected to its gate. The frequency of operation is determined by the tuned circuit and the capacitance reflected from the source to the gate. The transistor is matched to the frequency of operation so that this frequency falls within the roll-off portion of the transistor's transconductance versus frequency curve, above the 3 db point in frequency. Phase shifting necessary to sustain oscillation occur to the operation of the transistor in the roll off portion of the curve and the addition of a phase shifting network (R sub 1 C) at the source. The resulting oscillator is small, stable, linear, and inexpensive.

Apparatus is described for converting a radiant energy image into corresponding electrical signals including an image converter. The image converter includes a substrate of semiconductor material, an insulating layer with a processing circuit connected to each of the conductive stripes for detecting the modulated voltages generated in a first embodiment of the invention, a modulated light stripe, perpendicular to the conductive stripes scans the image converter. The resulting modulated signals generated on the conductive stripes are detected by the processing circuits to produce signals that represent the image focused on the image converter. In a second embodiment of the invention a second insulating layer is deposited over the conductive stripes, and a second series of parallel transparent conductive stripes perpendicular to the first series is on the second insulating layer. A different frequency current signal F sub n is applied to each of the second series of conductive stripes, and a modulated image is applied to the image converter. The resulting signals detected by the processing circuits represent the image.

An active notch filter having independently adjustable notch frequency, width, and depth is provided by three equal capacitors connected in series with an operational amplifier (connected in a voltage follower configuration), a potentiometer across the series connected capacitors for notch depth adjustment, and a potentiometer (for notch frequency connected across the center capacitor); with its tap connected to receive a voltage feedback signal from a variable voltage divider comprised of another potentiometer for notch width. Adjusting the voltage divider potentiometer will independently set the notch width, and adjusting the tap on the potentiometer across the center capacitor will independently adjust the notch frequency of the filter. A second operational amplifier connected in a voltage follower configuration may be used to connect the voltage divider output to the adjustable tap of the potentiometer across the center capacitor.
DIGITAL DEMODULATOR Patent Application


A digital demodulator for converting pulse code modulated (PCM) data from phase-shift key (PSK) to non-return-to-zero (NRZ-L) and to bio phase (BiO-L) is described. The demodulator is composed of standard integrated logic circuits. The key to the demodulation function is a pair of cross coupled one shot multivibrators which, with a flip-flop produce the NRZ-L. In order to maintain the superconducting material at a temperature of approximately 4 degrees Kelvin. Characteristics of the thus cooled superconducting material minimizes RF losses within the gyrocon, and allows the power gain of a conventional gyrocon to be increased from approximately 13 db to 54 db, and its efficiency from 82 percent to 92 percent. NASA

ELECTRICAL SELF-ALIGNING CONNECTOR Patent Application


A self aligning electrical connector device including a receptacle component having a conically contoured interior and a plug component having a correspondingly contoured conical body receivable in the receptacle component is disclosed. The plug component includes a plurality of spaced conductive ring elements having a mating face and the receptacle component includes a plurality of corresponding spaced conductive ring elements providing mating interface with the mating face of the ring elements of the plug component when connected therewith. Each ring element of the receptacle component includes a plurality of segmented portions which deflect downwardly when the plug component is inserted therein to assert a biasing force against the face of the ring elements of the plug component providing positive electrical contact and connection between the ring elements of the components. NASA
33 ELECTRONICS AND ELECTRICAL ENGINEERING

33 ELECTRONICS AND ELECTRICAL ENGINEERING

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

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

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

N80-24572* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
HEAT EXCHANGER AND METHOD OF MAKING Patent
Anthony Fortini and John M. Kazaroff, inventors (to NASA) Issued 29 Apr. 1980 6 p Filed 30 Nov. 1977
US Patent No-4.108.241
A heat exchange of increased effectiveness is disclosed. A porous metal matrix is disposed in a metal chamber or between walls through which a heat-transfer fluid is directed. The porous metal matrix has internal bonds and is bonded to the chamber

N80-23679* National Aeronautics and Space Administration.
Pasadena Office, Calif.
CONTROL MEANS FOR A SOLID STATE CROSSBAR SWITCH Patent Application
Tage O. Anderson, inventor (to NASA) (JPL) Filed 29 Sep. 1980 20 p
(Contract NAS7-100)
A control system for a solid state crossbar switch is described which allows a number of switch control and interrogation functions to be implemented by time sharing related circuitry. The crossbar switch includes a number of X ports and Y ports. Each X-Y port intersection designates a specific X-Y intersection latch which controls a number of associated switches for interconnecting one set of data lines associated with the X port to another set of data lines associated with the Y port. The control system continuously and sequentially addresses each of the X-Y intersection latches at a 10 megahertz rate. During this continual and sequential addressing, the control circuitry includes a capability for (1) interrogating each intersection latch for determining which are in a set condition; (2) ensuring that only one X-Y intersection latch is set on an X row and Y column defining that latch; (3) resetting all of the X-Y intersection latches; and (4) determining which of the X-Y intersection latches are in a set condition. NASA

N80-22661* National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
AN IMAGE READOUT DEVICE WITH ELECTRICALLY VARIABLE SPATIAL RESOLUTION Patent Application
Harry F. Benz, inventor (to NASA) Filed 28 Mar. 1980 12 p
The use of a standing acoustic wave charge storage device as an image readout device is described. A frequency f sub 1 is applied to the storage transfer device to create a traveling electric field in the device in one direction along a straight line. A second frequency f sub 2 which is a harmonic of f sub 1, has the same amplitude, and is phase stable with f sub 1 and is applied to the charge transfer device to create a traveling electric field in the opposite direction. Consequently, a standing wave is created along the straight line. When an image is focussed on the charge transfer device, light is stored in the wells of the standing wave. When the frequency f sub 2 is removed, the stored charges are moved to an output terminal. This terminal is connected to a utilization device where the received charges represent the image on the surface of the charge transfer device along a projection of the straight line. NASA
Cooled Echelle Grating Spectrometer Patent
Reinhard Beer, inventor (to NASA) (JPL) Issued 27 May 1980

A cooled echelle grating spectrometer for detecting wavelength between one micron and fifteen microns is disclosed. More specifically, the spectrometer has a cross-dispersing grating for ordering infrared energy and an echelle grating for further ordering of the infrared energy. Ordered radiation from the echelle grating is sensed by a detecting means. Also disclosed is the use of a Schmidt camera for focusing the further ordered radiation from the echelle grating onto a detector array having individual detectors dispersed on a plane which substantially corresponds to a curved focal plane of the Schmidt camera. A spectrometer constructed according to the teachings of the present invention will continuously cover the spectrum between one micron and fifteen microns and have a resolution of 0.1/cm.

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

Dual Acting Slit Control Mechanism Patent

A dual acting control system for mass spectrometers is described, which permits adjustment of the collimating slit width and centering of the collimating slit while using only one vacuum penetration. Coaxial shafts, each with independent vacuum bellows are used to independently move the entire collimating assembly or to adjust the slit dimension through a parallelogram linkage.

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

Low Intensity X-Ray and Gamma-Ray Imaging Spectrometer Patent

An imaging spectrometer includes a shield which is opaque to visible light and transparent to X-ray or gamma-ray photons, and a scintillator which converts the X-ray or gamma-ray photons to visible-light photons. An input fiber optics plate guides the visible-light photons in the same spatial position to a photodiode which receives the photoelectrons and intensifies them. The intensified electrons are then converted to visible-light photons by an output phosphor screen. An output fiber optics plate guides the visible-light photons in the same spatial position to a digitizing video camera and a digital information processor.
35 INSTRUMENTATION AND PHOTOGRAPHY

which indicates the spatial position, number, and efficient energy of the incoming X-ray or gamma ray photons.

NASA

N80-31774# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FILM ADVANCE INDICATOR Patent Application


A film advancement indicator which includes an optical sensor that detects the rotational movement of a disc that rotates only when the film advances is described. When the film does not advance an indicator light is activated. A counter is included in the electronic circuit to determine the number of film frames advanced.

NASA

N80-22703# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

OPEN ENDED RATCHET TYPE TUBING CUTTER Patent Application

Anthony S. Girala, inventor (to NASA) Filed 9 Apr. 1980 19 p

(NASA-Case-MSC-18538-1; US-Patent-App-SN-138944) Avail:

A self-clamping tube and piping cutting tool requiring limited angular motion is described. It includes a handle attached to a C-shaped housing and has an opening sized to admit a pipe. Rotatably mounted within the housing is a C-shaped tool body carrying a set of clamping and support rolls and an edged cutting roll. These rolls contact a pipe at three circumferential points. Cutter advancing means advance the cutting roll toward the support rollers. The support rolls and cutting roll are rotatable independently of the C-shaped housing. A one way ratchet mechanism disposed between the C-shaped housing and the C-shaped tool body permits operation by movement in one rotational direction about the pipe axis. In another embodiment, the tool body is rotated by a power driven mechanism. In addition, an automatic cutter advancing means can be provided.

NASA

36 LASERS AND MASERS

Includes parametric amplifiers.

N80-24602# National Aeronautics and Space Administration. Pasadena Office, Cali.

COHERENTLY PULSED LASER SOURCE Patent Application

Jack S. Margolis, inventor (to NASA) (JPL) Filed 15 May 1980 12 p

(NASA-Case-NPO-150040) Avail:

An electronically controllable apparatus is described which modulates a continuous wave laser beam so as to produce an output beam consisting of coherent "pulses" that are electronically controllable as to both pulse repetition rate and pulse width. The apparatus includes two acoustic devices positioned so that the laser beam passes through them in sequence, and an apparatus for passing sound waves through the devices to frequency shift the laser radiation as well as to diffract it. Each acoustic device generates sound waves containing a group of frequencies which result in spaced pulses. The spreading of a laser beam which emanates from the first acoustic device is countered by the second acoustic device to produce a collimated, coherently pulses, laser beam.

NASA

37 MECHANICAL ENGINEERING

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

N80-22703# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

OPEN ENDED RATCHET TYPE TUBING CUTTER Patent Application

Anthony S. Girala, inventor (to NASA) Filed 9 Apr. 1980 19 p

(NASA-Case-MSC-18538-1; US-Patent-App-SN-138944) Avail:

A self-clamping tube and piping cutting tool requiring limited angular motion is described. It includes a handle attached to a C-shaped housing and has an opening sized to admit a pipe. Rotatably mounted within the housing is a C-shaped tool body carrying a set of clamping and support rolls and an edged cutting roll. These rolls contact a pipe at three circumferential points. Cutter advancing means advance the cutting roll toward the support rollers. The support rolls and cutting roll are rotatable independently of the C-shaped housing. A one way ratchet mechanism disposed between the C-shaped housing and the C-shaped tool body permits operation by movement in one rotational direction about the pipe axis. In another embodiment, the tool body is rotated by a power driven mechanism. In addition, an automatic cutter advancing means can be provided.

NASA
A mathematical end joint system, useful for the transverse connection of strut elements to a common mode is described. Included are node joint half with semicircular tongue and groove and a strut joint half with semicircular tongue and groove. The two joint halves were engaged transversely and the connection was made secure by the inherent physical property characteristics of locking latches or by a spring-actioned shaft. A quick release mechanism is also described which provides rapid disengagement of the joint halves.

A floating nut retention system includes a nut with a central aperture. An inner retainer plate has an opening which is fixedly aligned with the nut aperture. An outer retainer member is formed of a base plate having an opening and a surface adjacent to a surface of the inner retainer plate. The outer retainer member includes a securing mechanism for retaining the inner retainer plate adjacent to the outer retainer member. The securing mechanism enables the inner retainer plate to float with respect to the outer retainer number, while simultaneously forming a bearing surface for inner retainer plate.

A method of holding two separate metal pieces together for welding is described including the steps of overlapping a portion of one of the metal pieces on a portion of the other metal piece, encasing the overlapping metal piece in a compressible device, drawing the compressible device into an enclosure, and compressing a portion of the compressible device around the overlapping portions of the metal pieces for holding the metal pieces under constant and equal pressure during welding. The preferred apparatus for performing the method utilizes a support mechanism to support the two separate metal pieces in an overlapping configuration; a compressible device surrounding the support mechanism and at least one of the metal pieces, and a compressing device surrounding the compressible device for compressing the compressible device around the overlapping portions of the metal pieces, thus providing constant and equal...
pressure at all points on the overlapping portions of the metal pieces. Official Gazette of the U.S. Patent and Trademark Office

**HERMETIC SEAL FOR A SHAFT** Patent Application
Frank Lombardi, inventor (to NASA) (JPL) Filed 30 May 1980
13 p

An hermetic seal for a linear rod with a portion projected axially through a port in a wall for a pressure chamber and supported for omnidirectional motion. The seal is characterized by a resilient, impervious, cylindrical body concentrically and integrally fixed to a shaft comprising a linear ordered array of annular flutes. A section integrally fixed to the wall of the chamber and concentrically related to the port comprises a second linear ordered array of annular flutes. A third section interposed between the first and second sections and integrally in coaxial alignment with them comprises an annular ordered array of linear flutes concentrically related to the shaft, which allows axial, angular, and pivoted motion of the rod. NASA

**FULLY PLASMA-SPRAYED COMPLIANT BACKED CERAMIC TURBINE SEAL** Patent Application
R. C. Bill, inventor (to NASA) Filed 30 Apr. 1980 7 p

To maintain the minimum operating clearances between the blade tips and the lining of a high pressure turbine, a low temperature easily decomposable material, such as a polymer, in powder form is blended with a high temperature oxidation resistant metal powder. The two materials are simultaneously deposited on a substrate formed by the turbine casing. Alternately, the polymer powder may be added to the metal powder during plasma spraying. A ceramic layer is then deposited directly onto the metal-polymer composite. The polymer additive mixed with the metal is then completely volatilized to provide a porous layer between the ceramic layer and the substrate. Thermal stresses are reduced by virtue of the resulting porous structure which affords a cushion effect. By using plasma spraying for depositing both the powders of the metal and polymer material, as well as the ceramic powder, no brazing is required. NASA

**COMPOSITE SEAL FOR TURBOMACHINERY** Patent

A gas path seal suitable for use with a turbine engine or compressor is provided. A shroud wearable or abradable by the abrasion of the rotor blades of the turbine or compressor shrouds the rotor blades. A compliant backing surrounds the shroud. The backing is a compliant material covered with a thin ductile layer. A mounting fixture surrounds the backing. Official Gazette of the U.S. Patent and Trademark Office
A low compression turbocharged diesel engine is described in which the turbocharger can be operated independently of the engine to power auxiliary equipment. Fuel and air are burned in a catalytic combustor to drive the turbine wheel of the turbine section which is initially caused to rotate by the starter motor. By opening a flapper valve, compressed air from the blower section is directed to the catalytic combustor when it is heated and expanded, serving to drive the turbine wheel and also to heat the catalytic element. To start the engine, one valve is closed, combustion is terminated in the catalytic combustor, and another valve is then opened to utilize air from the blower for the air driven motor. When the engine starts, the constituents in its exhaust gas react in the catalytic element and the heat generated provides additional energy for the turbine section.

A method is disclosed for driving a two-phase turbine characterized by an output shaft having at least one stage including a bladed rotor connected in driving relation with the shaft. A two-phase fluid is introduced into the stage at a known flow velocity and caused to pass through the rotor in order to impart angular velocity. The speed of the rotor is controlled so that the angular velocity of the blade tips is equal to at least 50% of the velocity of the flow of the two-phase fluid.

A circumferential shaft seal is described which comprises two sealing rings held to a rotating shaft by means of a surrounding elastomeric band. The rings are segmented and are of a rigid sealing material such as carbon or a polyimide and graphite fiber composite.
SYSTEM FOR SLICING SILICON WAFERS Patent


An improved system is described which has at least one endless band saw blade that is characterized by a continuously regenerated cutting edge and is unidirectionally driven along a pair of courses extended in mutual parallelism through a cutting station located near the midportion of the courses. The blade is supported at the cutting station by pairs of guides continuously rotated through less than 360 deg of angular displacement during each cutting operation in order to continuously regenerate the blade supporting surfaces of the guides. Blade wobble is thus substantially eliminated.

APPROPRIATE FOR SEQUENTIALLY TRANSPORTING CONTAINERS Patent Application

Jerry L. Hudgins, inventor (to NASA) Filed 11 Jul. 1980 20 p

An apparatus for transferring and manipulating a plurality of containers in a sequence is disclosed including a mechanical manipulator arm having a gripping device which automatically picks up a container at a fixed pickup position and transfers it to a processing station. At a processing station, the container is loaded with silicon wafers and thereafter returned to the pickup and return station. A plurality of the containers may be processed in sequence from the fixed pickup position by providing a movable carriage upon which container pedestal platforms are supported, at least one of which is an elevator platform. Sensing switches may be provided for sensing movements of the arm, carriage, and elevator platform whereby the entire apparatus may be controlled automatically avoiding the need to handle the wafers manually to reduce the possibility of contamination.

FREE PISTON REGENERATIVE HOT GAS HYDRAULIC ENGINE Patent


A displacer piston which is driven pneumatically by a high-pressure or low-pressure gas is included in a free-piston regenerative hydraulic engine. Actuation of the displacer piston circulates the working fluid through a heater, a regenerator and a cooler. The present invention includes an inertia mass such as a piston or a hydraulic fluid column to effectively store and supply energy during portions of the cycle. Power is transmitted from the working fluid to a hydraulic fluid across a diaphragm or lightweight piston to achieve a hydraulic power output. The displacer piston of the present invention may be driven pneumatically, hydraulically or electromagnetically. In addition, the displacer piston and the inertia mass of the present invention may be positioned on the same side of the diaphragm member or may be separated by the diaphragm member.
39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.


N80-25693* National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
HEATING AND COOLING SYSTEM Patent Application
Leland Imig and Mickey R. Gardner, inventors (to NASA) Filed 30 Apr. 1980 13 p
(NASA-Case-LAR-12393-1; US-Patent-App-SN-145208) Avail:
NTIS HC A02/MF A01 CSCL 20K

An apparatus capable of cyclic heating and cooling of a test specimen undergoing fatigue testing is disclosed. Cryogenic fluid is passed through a block clamped to the specimen to cool the block and the specimen. Heating cartridges penetrate the block to heat the block and the specimen to very hot temperatures. Control apparatus is provided to alternately activate the cooling and heating modes to effect cyclic heating and cooling between very hot and very cold temperatures. The block is constructed of minimal mass to facilitate the rapid temperature change thereof.

NASA
Energy Production and Conversion

Reflectometers are detected and jointly registered to determine when an interface between coal and shale is being cut through.

For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 85 Urban Technology and Transportation.

**N80-24741** National Aeronautics and Space Administration, Pasadena Office, Calif.

**Method of Mitigating Titanium Impurities Effects in P-Type Silicon Material for Solar Cells** Patent

An economical way to reduce the deleterious effects of titanium, one of the impurities present in metallurgical grade silicon material, is disclosed. By adding copper to approximately the same concentration level of the titanium during the melting process, the conversion efficiency will be restored to about 99.3% of what it would have been if the single crystal silicon had been grown free of titanium impurities.

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

**N80-29834** National Aeronautics and Space Administration, Langley Research Center, Hampton, Va.

**Natural Turbulence Electrical Power Generator** Patent

An energy conversion apparatus is disclosed in which a stator, fixed to a watertight housing, is coupled to a rotor by a helical spring which suspends the rotor from the housing. Natural turbulence of a fluid, such as water or air, causes acceleration of the housing, and hence, acceleration of the stator. Inertia of the rotor, coupled to the stator through the helical spring and the housing, causes relative motion, both longitudinal and rotational, between the stator and the rotor. The rotational motion between the rotor, and the stator is used to generate electrical current. Official Gazette of the U.S. Patent and Trademark Office
**INDUCED JUNCTION SOLAR CELL AND METHOD OF FABRICATION**

Patent

Joseph Maserjian (JPL), Shy Shiuin Chern (JPL), and Seung P. Li, inventors (to NASA) (JPL) issued 16 May 1978 9 p Filed 15 Jun. 1976 Sponsore by NASA


An induced junction solar cell is fabricated on a p-type silicon substrate by first diffusing a grid of criss-crossed current collecting n+ stripes and thermally growing a thin SiO2 film, and then, using silicon-rich chemical vapor deposition (CVD), producing a layer of SiO2 having inherent defects, such as silicon interstices, which function as deep traps for spontaneous positive charges. Ion implantation increases the stable positive charge distribution for a greater inversion layer in the p-type silicon near the surface. After etching through theoxide to parallel collecting stripes, a pattern of metal is produced consisting of a set of contact stripes over the exposed collecting stripes and a diamond shaped pattern which functions as a current collection bus. Then the reverse side is metallized.

**IMPROVING THE EFFICIENCY OF SILICON SOLAR CELLS CONTAINING CHROMIUM**

Patent Application

Amal M. Salama, inventor (to NASA) (JPL) Filed 11 Sep. 1980 16 p (Contract NAS7-100)


Efficiency of silicon solar cells containing about 10 to the 15th power atoms/cu cm of chromium is improved about 26% by thermal annealing of the silicon wafer at a temperature of 200 C to form chromium precipitates having a diameter of less than 1 Angstrom. Further improvement in efficiency is achieved by scribing laser lines onto the back surface of the wafer at a spacing of at least 0.5 mm and at a depth of less than 13 micrometers to preferentially precipitate chromium near the back surface and away from the junction region of the device. This provides an economical way to improve the deleterious effects of chromium, one of the impurities present in metallurgical grade silicon material.

**AUTOMOTIVE ABSORPTION AIR CONDITIONER UTILIZING SOLAR AND MOTOR WASTE HEAT**

Patent Application

Zenon Popinski, inventor (to NASA) (JPL) Filed 30 Jul. 1980 15 p (Contract NAS7-100)


An absorption cycle air conditioning system for use as a space cooling system in an electrically powered motor vehicle is disclosed. The system is of a lightweight design and has a capability for achieving vehicular space cooling with minimal attendant power requirements. The system is adapted to utilize solar and motor waste heat.

**TOROIDAL CELL AND BATTERY**

Patent Application


A toroidal cell is disclosed which includes a wound core disposed within a pair of toroidal channel shaped electrodes separated by nylon insulator. The shape of the case electrodes of this cell allows one doughnut shaped surface and the inner cylindrical case wall to be used as an electrode and a second planar doughnut shaped surface and the outer cylindrical case wall to be used as another electrode. Connectors may be used to stack two or more toroidal cells together by connecting the entire surface area of the electrode of one cell to the entire surface area of the electrode of a second cell. The central cavity of each toroidal cell may be used as a conduit for pumping a fluid through the toroidal cell to thereby cool the cell.
46 GEOPHYSICS

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

For space radiation see 93 Space Radiation.

N80-24906* National Aeronautics and Space Administration.
Pasadena Office, Calif.

GEODETICAL ASSESSMENT PROBE Patent

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

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N80-26992* National Aeronautics and Space Administration.
Pasadena Office, Calif.

CLOUD COVER SENSOR Patent Application
Eric G. Laue, inventor (to NASA) (JPL) Filed 27 Jun. 1980 11 p (Contract NAS7-100)

An apparatus is described which provides a numerical indication of the cloudiness at a particular time of a day. The apparatus includes a frame holding several light sensors such as photovoltaic cells, with a direct sensor mounted to directly face the Sun and indirect sensors mounted to face different portions of the sky not containing the Sun. A light shield guards the direct sensor from most of the sky except a small portion containing the Sun, and also shields each of the indirect sensors from direct sunlight. The relative values of the outputs from the direct and indirect sensors enables the generation of a numerical indication of the degree of cloudiness at a particular time of day.

N80-27067* National Aeronautics and Space Administration.
Lyndon B. Johnson Space Center, Houston, Tex.

METHOD AND AUTOMATED APPARATUS FOR DETECTING COLIFORM ORGANISMS Patent

Method and automated apparatus are disclosed for determining the time of detection of metabolically produced hydrogen by coliform bacteria cultured in an electroanalytical cell from the time the cell is inoculated with the bacteria. The detection time data provides bacteria concentration values. The apparatus is sequenced and controlled by a digital computer to discharge a spent sample, clean and sterilize the culture cell, provide a bacteria nutrient into the cell, control the temperature of the nutrient, inoculate the nutrient with a bacteria sample, measures...
the electrical potential difference produced by the cell, and measures the time of detection from inoculation.

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

N80-27072* National Aeronautics and Space Administration, Pasadena Office, Calif.
SIMULTANEOUS MUSCLE FORCE AND DISPLACEMENT TRANSDUCER Patent

A myocardial transducer for simultaneously measuring force and displacement within a very small area of myocardium is disclosed. The transducer comprised of an elongated body forked at one end to form an inverted Y shaped beam with each branch of the beam constituting a low compliant tine for penetrating the myocardium to a predetermined depth. Bonded to one of the low compliance tines is a small piezoresistive element for converting a force acting on the beam into an electrical signal. A third high compliant tine of the transducer, which measures displacement of the myocardium in a direction in line with the two low compliant tines, is of a length that just pierces the surface membrane. A small piezoresistive element is bonded to the third tine at its upper end where its bending is greatest. Displacement of the myocardium causes a deformation in curvature of the third tine, and the second small piezoresistive elements bonded to the surface of its curved end converts its deformation into an electrical signal.

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

AN IMPLANTABLE ELECTRICAL DEVICE Patent Application

A fully implantable and self-contained therapeutic device for stimulating the regeneration of severed nerves by electrical energy is disclosed. The device is composed of a flexible electrode array for surrounding damaged nerves and a signal generator for driving the electrode array with periodic electrical impulses of nanosecond magnitude to induce regeneration of the damaged nerves. NASA
A low noise electrode suited for sensing electrocardiograms when chronically and subcutaneously implanted in a free ranging subject is described. The electrode comprises a pocket shaped electrically conductive member with a single entrance adapted to receive body fluids. The exterior of the member and the entrance region is coated with electrical insulation so that the only electrolyte/electrode interface is within the member, remote from artifact-generating tissue. Cloth straps are bonded to the member to permit the electrode to be sutured to tissue and to provide electrical lead flexure relief.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing

For components see 33 Electronics and Electrical Engineering.

A measurement system for simultaneously measuring torque and angular flexure in a pressure suit joint. One end of a joint under test is held rigid, and a torque transducer is pivotably supported on the other movable end of the joint. A potentiometer is attached to the transducer by an arm. The wiper shaft of the potentiometer is gripped by a reference arm that rotates the wiper shaft the same angle as the flexure of joint. A signal, generated by the potentiometer, is representative of the joint flexure angle, and a compensation circuit converts the output of the transducer to a signal representative of joint torque.
MINIATURE CYCLOTRON RESONANCE ION SOURCE USING SMALL PERMANENT MAGNET Patent

A source of hydrogen ions is disclosed and includes a chamber having at one end a cathode which provides electrons and through which hydrogen gas flows into the chamber. Screen and accelerator grids are provided at the other end of the chamber. A baffle plate is disposed between the cathode and the grids and a cylindrical baffle is disposed coaxially with the cathode at the one end of the chamber. The cylindrical baffle is of greater diameter than the baffle plate to provide discharge impedance and also to protect the cathode from ion flux. An anode electrode draws the electrons away from the cathode. The hollow cathode includes a tubular insert of tungsten impregnated with a low work function material to provide ample electrons. A heater is provided around the hollow cathode to initiate electron emission from the low work function material.

N80-24149* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METHOD OF FORMING A SHARP EDGE ON AN OPTICAL DEVICE Patent

A sharp edge is formed on an optical device by placing the optical device in a holding mechanism; grinding one surface so that it and a surface of the holding mechanism are co-planar; and polishing both the surface of the optical device and the surface of the holding mechanism with felt until an edge on the surface of the optical device adjacent to the surface of the holding mechanism obtains a desired sharpness.

N80-27163* National Aeronautics and Space Administration. Pasadena Office, Calif.
ATOMIC AND MOLECULAR PHYSICS
Includes atomic structure and molecular spectra.
A constant magnification optical tracking system is disclosed wherein a traveling objective lens maintains a fixed relationship to an object to be optically tracked. The objective lens is chosen to provide a collimated light beam oriented in the direction of travel of the moving object. A reflective surface is attached to the traveling objective lens for reflecting an image of the moving object to the lens. The moving object is maintained at the focal point of the traveling objective lens. A motor and control means is provided for maintaining the traveling objective lens in a fixed relationship relative to a free falling object, thereby keeping said object at the focal point and centered on the axis of the traveling objective lens throughout its entire free fall path.
radiation reflected by a rotating scan-mirror is focused by a concave primary telescope mirror and collimated by a second concave mirror. The collimated beam is split by a dichroic filter which transmits radiant energy in the infrared spectrum and reflects visible and near infrared energy. The long wavelength beam is filtered and focused on an infrared detector positioned in a cryogenic environment. The short wavelength beam is dispersed by a pair of prisms, then projected on an array of detectors also mounted in a cryogenic environment and oriented at an angle relative to the optical path of the dispersed short wavelength beam.

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A FIBER OPTIC TRANSMISSION LINE STABILIZATION APPARATUS AND METHOD Patent Application

George F. Lutes (JPL) and Kam Y. Lau, inventors (to NASA) (JPL) Filed 17 Sep. 1980 31 p

A reference signal of RF frequency modulates 85 micrometer wavelength optical transmitter whose output passes through an optical filter and a voltage controller phase shifter such that the output of the phase shifter is provided to the fiber optic transmission line. At the receiving end of the fiber optic transmission line, the signal is demodulated and used to modulate a 1.06 micrometer optical transmitter. The output signal from the 1.06 micrometer optical transmitter is provided to the same fiber optic transmission line and passes through the voltage controlled phase shifter to a phase error detector. The phase of the modulation of the 1.06 micrometer wavelength signal is compared to the phase of the reference signal by the phase error detector which provides a phase control signal related to the phase difference. This control signal is provided to the voltage controlled phase shifter which alters the phase of both optical signals passing through until a predetermined phase relationship between modulation on the 1.06 micrometer signal and the reference signal is obtained.

A susceptor particularly suited for use in growing a ribbon crystal employing edge defined film fed growth techniques is described. The susceptor includes a die through which a melt is drawn for forming a crystal ribbon. This is combined with a coolant delivery system characterized by a pair of jets for directing a stream of fluid coolant along a path extended to impinge on the ribbon.

MEANS FOR GROWING RIBBON CRYSTALS WITHOUT SUBJECTING THE CRYSTALS TO THERMAL SHOCK-INDUCED STRAINS Patent


A susceptor particularly suited for use in growing a ribbon crystal employing edge defined film fed growth techniques is described. The susceptor includes a die through which a melt is drawn for forming a crystal ribbon. This is combined with a coolant delivery system characterized by a pair of jets for directing a stream of fluid coolant along a path extended to impinge on the ribbon.
the susceptor in close proximity with the die in nonincident relation with the crystal being grown.

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METHOD OF GROWING A RIBBON CRYSTAL PARTICULARLY SUITED FOR FACILITATING AUTOMATED CONTROL OF RIBBON WIDTH Patent
Theodore F. Ciszek, inventor (to NASA) (IBM, Poughkeepsie, N.Y.)

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

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CRYSTAL CLEAVING MACHINE Patent Application
John S. J. Benedicto and Frederick C. Hallberg, inventors (to NASA) Filed 29 Aug. 1980 19 p

A machine is disclosed for cleaving hard crystals with precision and uniformity. It includes a vertical axis positioning control means for an adjustable spring tension guided hammer mechanism employed to strike an anvil and thereby generate a crystal cleaving shock wave transmitted to a cleaving blade. An underlying crystal holding fixture with horizontal position control means includes a zero reference stop face for the crystal and opposing spring loaded clamping and vertical positioning elements which are precisely guided. The crystal is restrained only to the extent that it remains in an ideal position for cleaving until the shock wave begins to propagate along a cleavage plane. Thus the shock wave forces that separate the crystal are balanced and the light restraining force used to hold the crystal allows it to splay apart with minimal shock wave damping.

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Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see O3 Air Transportation and Safety, 16 Space Transportation, and 44 Energy Production and Conversion.

IMPROVED LOW-DRAG GROUND VEHICLE PARTICULARLY SUITED FOR USE IN SAFELY TRANSPORTING LIVE STOCK Patent Application
Edwin J. Saltzman, inventor (to NASA) Filed 5 Aug. 1980 15 p

A low drag truck consisting of a tractor trailer rig characterized by a rounded forebody and a protective fairing for the gap conventionally found to exist between the tractor and the trailer is described. The truck is particularly suited for establishing an attached flow of ambient air along the vehicle surfaces by utilizing a forward facing, ram air inlet and duct and a plurality of submerged inlets and outflow ports which communicate with the trailer for continuously flushing heated gasses from the trailer as the rig is propelled at highway speeds.

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