NASA

PATENT ABSTRACTS

BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

JULY 1976

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
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This bibliography was prepared by the NASA Scientific and Technical Information Facility operated for the National Aeronautics and Space Administration by Informatics Information Systems Company.
Annotated references to NASA-owned inventions covered by U.S. patents and applications for patent that were announced in *Scientific and Technical Aerospace Reports (STAR)* between January 1976 and June 1976.
This Supplement is available from the National Technical Information Service (NTIS). Springfield, Virginia 22161, for $3.00. For copies mailed to addresses outside the United States, add $2.50 per copy for handling and postage.
INTRODUCTION

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

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

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

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

The 200 citations published in this issue of the Abstract Section cover the period January 1976 through June 1976. The Index Section contains references to the 2994 citations covering the period May 1969 through June 1976.

ABSTRACT SECTION (SECTION 1)

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

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

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

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

TYPICAL CITATION AND ABSTRACT

NASA SPONSORED DOCUMENT
NASA ACCESSION NUMBER
TITLE
INVENTOR
NASA CASE NUMBER
ABSTRACT

AVAILABLE ON MICROFICHE
SOURCE
US PATENT APPLICATIONS SERIAL NUMBER
AVAILABILITY
COSATI CODE
KEY ILLUSTRATION

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

NOISE SUPPRESSOR FOR TURBO FAN JET ENGINES
Patent Application
Dah Yu Cheng, inventor (to NASA) (Santa Clara Univ.) Filed 13 Feb. 1976 17 p Sponsored by NASA

A noise suppressor for installation on the discharge or aft end of a turbofan engine is described. Within the suppressor are fixed annular airfoils which are positioned to reduce the relative velocity between the high temperature fast moving jet exhaust and the low temperature slow moving air. Within the suppressor nacelle is an exhaust jet nozzle which constrains the shape of the jet exhaust to a substantially uniform elongate shape irrespective of the power setting of the engine. Fixed ring airfoils within the suppressor nacelle have the same salutary effects irrespective of the power setting at which the engine is operated.

NASA
INDEX SECTION(SECTION 2)

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

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

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

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

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

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

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

HOW TO USE THIS PUBLICATION TO IDENTIFY NASA INVENTIONS

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

1. Using Subject Category: To identify all NASA inventions in any one of the subject categories in this issue of NASA PAB, select the desired Subject Category in the Abstract Section (Section 1) and find the inventions abstracted thereunder. For previous NASA PAB issues, the Tables of Contents to Section 2 should be examined as the Subject categories were changed beginning with NASA PAB (07).

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

**PUBLIC AVAILABILITY OF COPIES OF PATENTS AND PATENT APPLICATIONS**

Copies of U.S. patents may be purchased directly from the U.S. Patent Office, Washington, D.C. 20231, for fifty cents a copy.

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

**LICENSES FOR COMMERCIAL USE: INQUIRIES AND APPLICATIONS FOR LICENSE**

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

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

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

Subpart 2—Licenses for Practical Application of Inventions

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

§ 1245.200 Scope of subpart.

§ 1245.201 Definitions.

§ 1245.202 Basic considerations.

§ 1245.203 Licenses for practical application of inventions.

§ 1245.204 Other licenses.

§ 1245.205 Publication of NASA inventions available for license.

§ 1245.206 Application for nonexclusive license.

§ 1245.207 Application for exclusive license.

§ 1245.208 Processing applications for license.

§ 1245.209 Royalties and fees.

§ 1245.210 Reports.

§ 1245.211 Refusals of licenses.

§ 1245.212 Revocation of licenses.

§ 1245.213 Appeals.

§ 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 and which is designated by the Administration as appropriate for the grant of license(s) in accordance with this subpart.

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

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

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

(i) 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.

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

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

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

(g) The "Inventions and Contributions Board" means the NASA Inventions and Contributions Board established by the Administrator of NASA within the Administration in accordance with section 303 of the National Aeronautics and Space Act of 1958 as amended (42 U.S.C. 2457).

§ 1245.202 Basic considerations.

(a) Much of the new technology resulting from NASA sponsored research and development in aeronautical and space activities has application in other fields. Special attention is given to the importance 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 practical 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 to seek exclusive licensees when such licenses will provide the necessary incentive to the licensee to achieve rapid practical application of the invention.

(c) The Administrator, in determining whether to grant an exclusive license, will evaluate all relevant information submitted by applicants and all other persons and will consider the necessity for further technical and market development of the invention, the capabilities of prospective licensees, their proposed plans to undertake the required investment and development, the limitations on 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 to U.S. citizens, or to U.S. citizens and to the extent of the extent possible to U.S. companies. Likewise, preference will be given to small businesses and minority business enterprises, as well as to economically depressed, low income and labor surplus areas.

(d) All licenses for inventions shall be by express written instruments. No license shall be granted express 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 may be granted in accordance with the NASA Foreign Patent Licensing Regulations (§1245.4).

§ 1245.203 Licenses for practical application of inventions.

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

(b) Nonexclusive licenses. (1) Each invention will be made available to responsible applicants for nonexclusive, revocable licensing in accordance with §1245.206, consistent with the provisions of any existing exclusive license.

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

(3) The licensee shall secure the license 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 license. A nonexclusive, revocable license for a special invention, as defined in §1245.201, shall be granted upon written request, to any applicant by the Patent Counsel of the NASA installation having cognizance of the invention.

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

(i) The Administrator has determined that: (a) The invention has not been brought to practical application by a nonexclusive licensee in the fields of use or in the geographical locations covered by the application for the exclusive license, (b) practical application of the invention in the fields of use or geographical locations covered by the application for the exclusive license cannot be achieved expeditiously by the further funding of the invention by the Government or under a nonexclusive license requested by any applicant pursuant to these regulations, and (c) the exclusive license will provide the necessary incentive to the licensee to achieve rapid 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 preceding the filing date or in the case of inventions made in the performance of work under a contract of NASA in the manner specified in section 305(a)(1) or (2) of the National Aeronautics and Space Act of 1958 as amended (42 U.S.C. 2457(a) (1) or (2)), a revocable, nonexclusive, royalty-free license for the practice of such invention, together with the right to grant sublicenses of the same right, may be granted prior to the expiration of the patent term if the Administrator determines that the public interest will best be served by the earlier grant of an exclusive license.

The practice of an invention 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, the District of Columbia, or in any lesser geographic portion thereof.

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

(4) The license shall require the licensee 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 licensee to expend a specified minimum sum of money and/or to take other specified action, 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 U.S. Government and on behalf of any foreign government pursuant to any existing or future treaty or agreement with the United States.

(7) The license may reserve to the Administrator, NASA, under the following circumstances, the right to require the granting of a sublicense to responsible applicant(s) on terms that are considered reasonable by the Administrator, taking into consideration the current need for use of the invention, development and marketing required to achieve practical application of the invention, and other pertinent facts: (1) 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.

The license shall be nontransferable except to the successor of that part of the licensor's business to which the invention pertains.

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

(1) The license may be subject to such other limitations as may be in the public interest.

§ 1245.204 Other licenses.

(a) License to contractor. There is hereby granted to the contractor reporting an invention made in the performance of work under a contract of NASA in the manner specified in section 305(a)(1) or (2) of the National Aeronautics and Space Act of 1958 as amended (42 U.S.C. 2457(a) (1) or (2)), a revocable, nonexclusive, royalty-free license for the practice of such invention, together with the right to grant sublicenses of the same right, may be granted prior to the expiration of the patent term if the contractor was legally obligated to do so at the time the contract was awarded. Such license and right is nontransferable except to the successor of that part of the contractor's business to which the invention pertains.

(b) Miscellaneous licenses. Subject to any outstanding licenses, nothing in this part shall preclude the Administrator from granting other licenses for inventions, when he determines that so doing would provide for an equitable distribution of rights. The following exemplary circumstances wherein such licenses may be granted:

- In consideration of the settlement of an interference;
- In consideration of a release of a claim of infringement; or
- In exchange for or as part of the consideration for a nonexclusive 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 STAR may be purchased from the National Technical Information Service, Springfield, Va. 22151.

§ 1245.206 Application for nonexclusive license.

(a) Submission of application. An application for nonexclusive license under § 1245.203(d) may be submitted to NASA 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. 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:
- Small business firm;
- Minority business enterprise;
- Location in a surplus labor area;
- Location in a low-income urban area; and
- Location in an area designed by the Government as economically depressed.

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

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

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

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

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 and exclusive licenses under §§ 1245.206 and 1245.207 will be reviewed by the Patent Counsel of the NASA installation having cognizance for the Inventions and the NASA Assistant General Counsel for Patent Matters, to determine the conformity and appropriateness of the application for license and the availability of the specific invention for the license requested. The Assistant General Counsel for Patent Matters will forward all applications for license conforming to §§ 1245.208(b) and 1245.207(b) to the Inventions and Contributions Board when the invention is available for consideration of the requested license. Prior to forwarding applications for exclusive licenses to the Inventions and Contributions Board, notice in writing will be given to each nonexclusive licensee for the specific invention for which the application is made. Upon receipt of the notice, the notice will be submitted to the appropriate NASA installation having cognizance for the invention and the NASA Assistant General Counsel for Patent Matters, to determine the conformity and appropriateness of the application for the exclusive license and to provide a nonexclusive licensee with a 30-day period for submitting evidence or other consideration that it is in the public interest to do so.

(b) Recommendations of Inventions and Contributions Board. The Inventions and Contributions Board shall, in accordance with the basic considerations set forth in §§ 1245.202 and 1245.203, evaluate all applications for license forwarded by the Assistant General Counsel for Patent Matters. Based upon the facts presented to the Inventions and Contributions Board in the application and any other facts in its possession, the Inventions and Contributions Board shall recommend to the Administrator: (1) Whether a nonexclusive or exclusive license for the practical application of the invention in accordance with the terms and conditions of the Office of General Counsel...
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, 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.
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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>AERONAUTICS (GENERAL)</td>
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<td>02</td>
<td>AERODYNAMICS</td>
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<td>03</td>
<td>AIR TRANSPORTATION AND SAFETY</td>
<td>N.A.</td>
</tr>
<tr>
<td>04</td>
<td>AIRCRAFT COMMUNICATIONS AND NAVIGATION</td>
<td>1</td>
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<tr>
<td>05</td>
<td>AIRCRAFT DESIGN, TESTING AND PERFORMANCE</td>
<td>N.A.</td>
</tr>
<tr>
<td>06</td>
<td>AIRCRAFT INSTRUMENTATION</td>
<td>N.A.</td>
</tr>
<tr>
<td>07</td>
<td>AIRCRAFT PROPULSION AND POWER</td>
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<tr>
<td>08</td>
<td>AIRCRAFT STABILITY AND CONTROL</td>
<td>2</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)                      | 3      |
For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

13 ASTRODYNAMICS                               | N.A.   |
Includes powered and free-flight trajectories; and orbit and launching dynamics.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE) | N.A.   |
Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.
For related information see also 09 Research and Support Facilities (Air).

15 LAUNCH VEHICLES AND SPACE VEHICLES          | 4      |
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 | 4      |
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  | 5      |
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.
<table>
<thead>
<tr>
<th>Category</th>
<th>Code</th>
<th>Page</th>
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<tbody>
<tr>
<td><strong>19 SPACECRAFT INSTRUMENTATION</strong></td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.</td>
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<tr>
<td><strong>20 SPACECRAFT PROPULSION AND POWER</strong></td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>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.</td>
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<tr>
<td><strong>CHEMISTRY AND MATERIALS</strong></td>
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<tr>
<td>Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.</td>
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<tr>
<td><strong>23 CHEMISTRY AND MATERIALS (GENERAL)</strong></td>
<td>8</td>
<td>8</td>
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<tr>
<td>Includes biochemistry and organic chemistry.</td>
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<tr>
<td><strong>24 COMPOSITE MATERIALS</strong></td>
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<tr>
<td>Includes laminates.</td>
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<tr>
<td><strong>25 INORGANIC AND PHYSICAL CHEMISTRY</strong></td>
<td>9</td>
<td>9</td>
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<tr>
<td>Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.</td>
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<tr>
<td><strong>26 METALLIC MATERIALS</strong></td>
<td>10</td>
<td>10</td>
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<tr>
<td>Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.</td>
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<tr>
<td><strong>27 NONMETALLIC MATERIALS</strong></td>
<td>11</td>
<td>11</td>
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<tr>
<td>Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.</td>
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<tr>
<td><strong>28 PROPELLANTS AND FUELS</strong></td>
<td>13</td>
<td>13</td>
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<tr>
<td>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.</td>
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<tr>
<td><strong>ENGINEERING</strong></td>
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<tr>
<td>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.</td>
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<tr>
<td><strong>31 ENGINEERING (GENERAL)</strong></td>
<td>14</td>
<td>14</td>
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<tr>
<td>Includes vacuum technology; control engineering; display engineering; and cryogenics.</td>
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<tr>
<td><strong>32 COMMUNICATIONS</strong></td>
<td>14</td>
<td>14</td>
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<tr>
<td>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.</td>
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<tr>
<td><strong>33 ELECTRONICS AND ELECTRICAL ENGINEERING</strong></td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>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.</td>
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<tr>
<td><strong>34 FLUID MECHANICS AND HEAT TRANSFER</strong></td>
<td>22</td>
<td>22</td>
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<tr>
<td>Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling. For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.</td>
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<tr>
<td><strong>35 INSTRUMENTATION AND PHOTOGRAPHY</strong></td>
<td>24</td>
<td>24</td>
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<tr>
<td>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.</td>
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<tr>
<td><strong>36 LASERS AND MASERS</strong></td>
<td>34</td>
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<tr>
<td>Includes parametric amplifiers.</td>
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<tr>
<td><strong>37 MECHANICAL ENGINEERING</strong></td>
<td>36</td>
<td>36</td>
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<tr>
<td>Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.</td>
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<td><strong>38 QUALITY ASSURANCE AND RELIABILITY</strong></td>
<td>N.A.</td>
<td>N.A.</td>
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<tr>
<td>Includes product sampling procedures and techniques; and quality control.</td>
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<tr>
<td><strong>39 STRUCTURAL MECHANICS</strong></td>
<td>45</td>
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<tr>
<td>Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.</td>
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<tr>
<td><strong>GEOSCIENCES</strong></td>
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<tr>
<td>Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography. For related information see also Space Sciences.</td>
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</tr>
<tr>
<td><strong>42 GEOSCIENCES (GENERAL)</strong></td>
<td>N.A.</td>
<td>N.A.</td>
</tr>
</tbody>
</table>
43 Earth Resources N.A.
   Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
   For instrumentation see 35 Instrumentation and Photography.

44 Energy Production and Conversion 45
   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 51
   Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

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

47 Meteorology and Climatology 52
   Includes weather forecasting and modification.

48 Oceanography N.A.
   Includes biological, dynamic and physical oceanography; and marine resources.

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

51 Life Sciences (General) 52
   Includes genetics.

52 Aerospace Medicine 52
   Includes physiological factors; biological effects of radiation; and weightlessness.

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

54 Man/System Technology and Life Support 54
   Includes human engineering; biotechnology; and space suits and protective clothing.

55 Planetary Biology N.A.
   Includes exobiology; and extraterrestrial life.

Mathematical and Computer Sciences
   Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 Mathematical and Computer Sciences (General) N.A.

60 Computer Operations and Hardware 55
   Includes computer graphics and data processing.
   For components see 33 Electronics and Electrical Engineering.

61 Computer Programming and Software 57
   Includes computer programs, routines, and algorithms.

62 Computer Systems N.A.
   Includes computer networks.

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

64 Numerical Analysis N.A.
   Includes iteration, difference equations, and numerical approximation.

65 Statistics and Probability N.A.
   Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 Systems Analysis 57
   Includes mathematical modeling; network analysis; and operations research.

67 Theoretical Mathematics N.A.
   Includes topology and number theory.

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

70 Physics (General) N.A.
   For geophysics see 46 Geophysics. For astrophysics see 90 Astrophysics. For solar physics see 92 Solar Physics.
71 ACOUSTICS 58
Includes sound generation, transmission, and attenuation.
For noise pollution see 45 Environment Pollution.

72 ATOMIC AND MOLECULAR PHYSICS 58
Includes atomic structure and molecular spectra.

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

74 OPTICS 58
Includes light phenomena.

75 PLASMA PHYSICS 60
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

76 SOLID-STATE PHYSICS 61
Includes superconductivity.
For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

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

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

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

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

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

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

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

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

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

88 SPACE SCIENCES (GENERAL) N.A.

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

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

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

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

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

GENERAL

99 GENERAL N.A.

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

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.

N76-16014* National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
DEPLOY/RELEASE SYSTEM Patent
David B. Robelen, inventor (to NASA) Issued 6 Jan. 1976
6 p Filed 27 Nov. 1974 Supersedes N75-12195 (13 - 03, p 0287)
An apparatus is disclosed for arresting uncontrollable motions of model aircraft. A signal is used to deploy a parachute when a model aircraft is in a motion, such as a tailspin, from which the operator cannot recover by manipulating the flight surfaces. After the model aircraft is stabilized to a point where the operator can arrest the uncontrollable motion the parachute is jettisoned and normal flight resumed. The deploy and jettison signals may be sent using a single channel of a multi-channel transmitter and are completely independent of each other.

Official Gazette of the U.S. Patent Office

N76-20114* National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
MAGNETIC HEADING REFERENCE Patent
Howell D. Garner, inventor (to NASA) Issued 16 Mar. 1976
12 p Filed 11 Dec. 1974 Supersedes N75-12947 (13 - 04, p 0382)
A magnetometer is used as a magnetic heading reference for a vehicle such as a small aircraft. The magnetometer is mounted on a directional dial in the aircraft in the vicinity of the pilot such that it is free to turn with the dial about the yaw axis of the aircraft. A circuit is included for generating a signal proportional to the northerly turning error produced in the magnetometer due to the vertical component of the earth's magnetic field. This generated signal is then subtracted from the output of the magnetometer to compensate for the northerly turning error.

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

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

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

N76-18117* National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
CASCADE PLUG NOZZLE Patent
Blake W. Corson, Jr., inventor (to NASA) Issued 17 Feb. 1976

An exhaust nozzle for a jet aircraft which provides jet noise suppression is described. The nozzle includes a plurality of coaxial airfoil ring segments which are spaced serially along the longitudinal axis of the nozzle to define a plurality of annular coaxial channels. The diameters of the segments progressively decrease downstream along this axis and the exits of the channels are non-coplanar. The radial depths of the channels are small as compared with the axial distance between adjacent channel exits so that noise is emitted nonsimultaneously from the channel exits as a series of weakened pulses staggered in time. The boattail angles of the outer surfaces of the ring airfoil segments increase in magnitude with increasing distance downstream to reduce drag. Official Gazette of the U.S. Patent Office

08 AIRCRAFT STABILITY AND CONTROL

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

N76-19159§ National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.
TRANSONIC AND SUPERSONIC AIRCRAFT WHEREIN THE PROBLEMS OF ROLL CONTROL AT HIGH ANGLES OF ATTACK ARE MINIMIZED Patent Application

A wing, for aircraft of cropped arrow-type planform with thin leading and side edges, with a pivotable tip to alter the crop angle of the wing during flight is examined. Increasing the crop angle causes the wing side edge to become a trailing edge thereby reducing the wing surface area which the leading edge and side edge shed vortex systems can act against. Increasing the crop angle causes the wing side edge to become a trailing edge thereby reducing the wing surface area which the leading edge and side edge shed vortex systems can act against. This reduction also diminishes the strength of the shed vortex system; decreasing the crop angle cause opposite results. The wing constitutes a roll control device for aircraft of the stated design and is particularly effective at higher angles of attack. NASA

N76-18131§ National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
NOISE SUPPRESSOR FOR TURBO FAN JET ENGINES Patent Application
Dah Yu Cheng, inventor (to NASA) (Santa Clara Univ.) Filed 13 Feb. 1976 17 p Sponsored by NASA

A noise suppressor for installation on the discharge or aft end of a turbofan engine is described. Within the suppressor are fixed annular airfoils which are positioned to reduce the relative velocity between the high temperature fast moving jet exhaust and the low temperature slow moving air. Within the suppressor nacelle is an exhaust jet nozzle which constrains the shape of the jet exhaust to a substantially uniform elongate shape irrespective of the power setting of the engine. Fixed ring airfoils within the suppressor nacelle have the same salutary effects irrespective of the power setting at which the engine is operated. NASA
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).

N76-10148 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

FULL COLOR HYBRID DISPLAY FOR AIRCRAFT SIMULATORS Patent Application

A display for an aircraft simulator is described that produces an image of an air strip accurate in color and in relative light intensity. Components of the system include: a television camera supported over a terrain model simulating an aircraft landing zone; a full spectrum color monitor connected to the camera; lens system for projecting the monitor image onto a lens or screen visually accessible to a trainee in the simulator; a monochromatic calligraphic display; a digital computer for producing a pattern on the display that corresponds to the lights associated with the landing strip on the terrain model; an optical system for projecting the calligraphic image onto same lens so that it is superimposed on the video representation of the landing field; and a servo feedback system responsive to the position and velocity of the servo motors on the gantry frame for producing an input to the computer so that the calligraphically generated signal corresponds in shape, size, and location to the video signal.

N76-15189 National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

METHOD FOR MANUFACTURING MIRRORS IN ZERO GRAVITY ENVIRONMENT Patent

A system for forming large mirror surfaces in zero gravity space environments was described and illustrated. In particular, it relates to methods and apparatus for coating a curved surface in a zero gravity environment with a vaporizable metal to form a mirror. The technique consists in locating a shaped surface in a space orbit, orienting the central axis of the section toward the sun and vaporizing a finite amount of vaporizable metal (in amount calculated to provide a thin layer of metal) onto the surface of the section. A shaped surface can be formed by inflating a plastic to a spherical shape and hardening it. Y.J.A.

N76-13116 National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ROTATING LAUNCH DEVICE FOR A REMOTELY PILOTED AIRCRAFT Patent Application

A method and apparatus for launching a remotely piloted aircraft is described. The aircraft is revolved about a fixed pivot point until a predetermined speed is reached. The vehicle is then released from the launching apparatus. The vehicle is attached to one end of a rotatable arm, the imbalance on the arm being counteracted by a counter weight attached to the opposite end. The counter weight is released from the arm at the same time as the aircraft so as to avoid structural damage to the apparatus caused by rotation in the unbalanced condition. The arm is oriented such that it rotates in a plane inclined obliquely to the local gravitational field of the launch site. The supporting structure for the arm may be made stationary or may be attached to a mobile vehicle for ground transportation.

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.
15 LAUNCH VEHICLES AND SPACE VEHICLES

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

N76-14158* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

ANNULAR MOMENTUM CONTROL DEVICE USED FOR STABILIZATION OF SPACE VEHICLES AND THE LIKE

Patent

An annular momentum storage device for stabilization of space vehicles about two axes perpendicular to the axis of rotation of the annular momentum storage device is described. The body of the vehicle is centrally located within the annulus of an annular shaped rotating inertial mass. Magnetic bearings support the inertial mass and are attached to a toroidal shaped housing which encloses the inertial mass. A linear induction motor is mounted along either the inner or outer periphery of the inertial mass for driving the same. Suitable projecting members are attached between the centrally located body of the vehicle and the housing containing the inertial mass.

Official Gazette of the U.S. Patent Office

17 SPACECRAFT
COMMUNICATIONS, COMMAND AND TRACKING

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

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

N76-13169** National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LINEAR PHASE DEMODULATOR Patent Application

A phase locked type demodulator for a phase modulated wave which may have no carrier power is disclosed. The demodulator has a means for deriving an ac data output signal with a magnitude and a phase indicative of the phase of the modulated wave. A feedback loop responsive to the data output signal restores power to the carrier frequency component to the loop. Preferably, the phase modulator is linear and includes a series inductance-capacitance network, where the capacitor is a voltage controlled varactor. To compensate for nonlinearities in the varactor reactance vs. voltage characteristic, the series circuit is shunted by a properly selected inductance.

NASA

N76-21250* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

POSITION DETERMINATION SYSTEMS Patent

A system for an orbital antenna, operated at a synchronous altitude, to scan an area of a celestial body is disclosed. The antenna means comprises modules which are operated by a steering signal in a repetitive function for providing a scanning beam over the area. The scanning covers the entire area in a pattern and the azimuth of the scanning beam is transmitted to a control station on the celestial body simultaneous with signals from an activated ground beacon on the celestial body. The azimuth of the control station relative to the antenna is known
and the location of the ground beacon is readily determined from the azimuth determinations.

Official Gazette of the U.S. Patent Office

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

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

N76-17185* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE VEHICLE SYSTEM Patent

A space vehicle system is described which consists of an orbiter vehicle having an expendable propellant tank attached to the underside surface. An engine module is retractably supported from the aft end of the orbiter vehicle and extend so as to be in axial alignment with the propellant tank when in operation. After the engine has consumed the propellant, it is retracted into the orbiter vehicle and the tank is jettisoned thus reducing orbiter weight and improving flight characteristics.

Official Gazette of the U.S. Patent Office

N76-14186* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACECRAFT DOCKING AND ALIGNMENT SYSTEM Patent

A spacecraft docking alignment system is provided utilizing a three-dimensional target and screen mounted along the docking axis of one spacecraft and a television camera installed along the docking axis of the other spacecraft. A television display, with attendant electronics, is provided in the other spacecraft for viewing the relative alignment of the two spacecraft by the astronaut in control of the docking maneuver. Both spacecraft may be equipped with targets, screen, camera, and display such that either spacecraft may control the docking maneuver.

Official Gazette of the U.S. Patent Office
19 SPACECRAFT INSTRUMENTATION

For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.

N76-18227* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

MAGNETIC SUSPENSION AND POINTING SYSTEM Patent Application
Willard W. Anderson and Nelson J. Groom, inventors (to NASA)
Filed 27 Feb. 1976 10 p
(NASA-Case-LAR-11889-1; US-Patent-Appi-SN-662182) Avail:
NTIS HC $3.50 CSCL 14B

Apparatus for providing accurate pointing of instruments on a carrier vehicle and for providing isolation of the instruments from the vehicle's motion disturbances is described. The apparatus includes two assemblies, with connecting interfaces, each assembly having a separate function. The first assembly is attached to the carrier vehicle and consists of an azimuth gimbal and an elevation gimbal which provide coarse pointing of the instruments by allowing two rotations of the instruments relative to the carrier vehicle. The second or vernier pointing assembly is made up of magnetic suspension and fine pointing actuators, roll motor segments, and an instrument mounting plate around which a continuous annular rim is attached which provides appropriate magnetic circuits for the actuators and the roll motor segments. The vernier pointing assembly is attached to the elevation gimbal and provides vernier attitude fine pointing and roll positioning of the instruments as well as six degree-of-freedom isolation from carrier motion disturbances.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines, and spacecraft auxiliary power sources.

For related information see also 07 Aircraft Propulsion, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

N76-14190* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

CONTROLLED SEPARATION COMBUSTOR Patent
Albert J. Juhasz and Richard W. Niedzwiecki, inventors (to NASA)
Issued 7 Oct. 1975 5 p Filed 24 May 1973 Supersedes
N73-25816 (11 - 16. p 1955)
US Patent Office CSCL 21H

A short annular combustor utilizing diffuser bleed to control the airflow distribution in a gas turbine engine at various operating conditions is described. Official Gazette of the U.S. Patent Office
ANODE FOR ION THRUSTER Patent Application

A screen anode for an ion thruster is described. The anode is constructed of a woven mesh screen, preferably of a stainless steel wire cloth with a mesh size less than the intergrid gap or openings of the screen grid or accelerator grid systems of the thruster. The screen anode is sputter coated with tantalum as a result of thruster operation. Because of the fineness of the screen anode any spalled material from the tantalum coated anode is in such small dimensions that the spalled pieces cannot interfere with the accelerator, screen grid systems, and the focusing.

FUEL COMBUSTOR Patent Application

An improved fuel combustor comprised of a chamber with air and fuel inlets and a combination gas outlet is described. The fuel is supplied to a vaporization zone and fuel and air are mixed in a pair of mixing chambers each exemplified by a swirl can. The resultant mixture is directed into a combustion zone within the combustor. Combustion products are exhausted, for example, into a turbine inlet. By use of the heat pipe means some of the heat of combustion is carried back upstream into the swirl cans, to vaporize the fuel as it enters the vaporization zone in the swirl can, thereby improving vaporization and fuel mixing. Fewer pollutants are formed and complete combustion is assisted because of the improved fuel vaporization and better mixing.

METHOD OF CONSTRUCTING DISHED ION THRUSTER GRIDS TO PROVIDE HOLE ARRAY SPACING COMPENSATION Patent

The center-to-center spacings of a photoresist pattern for an array of holes applied to a thin metal sheet are increased by uniformly stretching the thin metal sheet in all directions along the plane of the sheet. The uniform stretching is provided by securely clamping the periphery of the sheet and applying an annular force against the face of the sheet, within the periphery of the sheet and around the photoresist pattern. The technique is used in the construction of ion thruster grid units where the outer or downstream grid is subjected to uniform stretching prior to convex molding. The technique provides alignment of the
holes of grid pairs so as to direct the ion beamlets in a direction parallel to the axis of the grid unit and thereby provide optimization of the available thrust. Official Gazette of the U.S. Patent Office

24 COMPOSITE MATERIALS
Includes laminates.

N76-14203* National Aeronautics and Space Administration. Pasadena Office, Calif.
PREVENTION OF HYDROGEN EMBRITTLEMENT OF HIGH STRENGTH STEEL BY HYDRAZINE COMPOSITIONS Patent

Delayed failure of high strength steel alloys exposed to compositions containing hydrazine is prevented by addition of potassium hydroxide to the composition in an amount at least sufficient to neutralize acidic impurities. The removal of the acidic impurities eliminates evolution of hydrogen and thus avoids hydrogen embrittlement of the high strength steel alloys.

Official Gazette of the U.S. Patent Office

N76-14204* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RECONSTITUTED ASBESTOS MATRIX Patent

An asbestos matrix suitable for use in a fuel cell or electrolysis cell is produced. The cell has a greater porosity and bubble pressure for a given thickness, improved homogeneity, and more uniform thickness. The matrix is produced by first shredding the asbestos, forming a slurry of the asbestos with water or a low boiling hydrocarbon, preferably an alcohol such as methanol, forming a mat by passing the slurry through a properly sized porous plaque with a piece of filter paper on top, drying the mat, and rolling the mat to yield desired thickness and surface finish.

Official Gazette of the U.S. Patent Office
A process is reported for making reinforced matrix composite structures of the type where reinforcing filament is wound on a body and metallic matrix material is electroformed on and between the windings to form each new layer of composite structure. The matrix material is then machined until a new smooth surface is attained on which to precision-wind the next filament convolutions with their flat sides in close contact and with the spacings between convolutions very closely controlled.

A method for fabricating graphite/epoxy laminate from ultrathin graphite/epoxy laminas is described. The method is characterized by forming an uncured laminate comprising a plurality of superimposed, ultrathin graphite/epoxy laminas, the fibers of each lamina being arranged in substantial parallelism and angularly related to the fibers of adjacent laminas. The uncured laminate is interposed between perforated backing laminas for forming a curing package which is vacuum bagged, preheated, and smoothed for removing surface irregularities. The package is subjected to pressure and temperature sufficient for curing the epoxy resin.

A catalytic procedure for increasing the yield of photonically initiated gas phase chemical reactions is described. The procedure involves the extraction of excess energy from unstable excited...
species by contacting the species with the surface of a finely divided solid.

**N76-18245** National Aeronautics and Space Administration.
Pasadena Office, Calif.

AUTOMATED SYSTEM FOR IDENTIFYING TRACES OF ORGANIC CHEMICAL COMPOUNDS IN AQUEOUS SOLUTIONS Patent

An automated system where, under computer control, traces of organic chemical compounds in aqueous solutions are separated into a plurality of families of compounds is described. Several of the families are separated as separate extracts, dissolved in organic solvents. The volume of solvent, containing each extract, is greatly reduced in a separate pre-GC unit, to increase the ratio of extract to solvent volume. The output of each pre-GC unit is supplied to a separate gas chromatograph (GC). The elution times of the peaks, exiting the various GC's, are used in the selection of peaks of interest by the computer based on the comparison of the extract types and the elution times with elution times of known compounds. Compounds are identified by the computer based on their extract types, elution times and the spectral data from the spectrometer.

Official Gazette of the U.S. Patent Office

**N76-14247** National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

NICKEL BASE ALLOY Patent Application

A nickel base superalloy for use at temperatures of 2000 F (1095 C) to 2200 F (1205 C) as a stator vane material in advanced gas turbine engines is described. The alloy has a nominal composition in weight percent of 16 tungsten, 7 aluminum, 1 molybdenum, 2 columbium, 0.3 zirconium, 0.2 carbon and the balance nickel.

**N76-17233** National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

TANTALUM MODIFIED FERRITIC IRON BASE ALLOYS Patent Application

Improved iron based alloys with ferritic body centered cubic microstructures are reported. The alloys are of the Fe-Cr-Al type and have high temperature and oxidation resistance properties in the 800 C to 1040 C range. The application of these alloys to furnace linings and flue stacks was discussed.
27 NONMETALLIC MATERIALS

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

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

The production of cermet compositions for use as cermet seals in thermionic converters and diodes is described. These compositions are comprised of particles of a metal or metal alloy dispersed in a matrix of ceramic material. Composition properties include high oxidation, abrasion, and corrosion resistance, and good thermal shock resistance. The cermet compositions are particularly designed to provide high temperature resistant coatings on stainless steel or molybdenum substrates.
HIGH TEMPERATURE RESISTANT CERMET AND CERAMIC COMPOSITIONS Patent Application
Wayne M. Phillips, inventor (to NASA) (JPL) Filed 20 Nov. 1975 28 p (Contract NAS7-100)
(NASA-Case-NPO-13690-1; US-Patent-Appl-SN-633876) Avail: NTIS HC $4.00 CSCL 11B
The production of cermet compositions for use in thermionic converters and diodes is described. These compositions are comprised of particles of metal or metal alloys dispersed or bonded to a solid solution of the metals or its alloys. Composition qualities include high temperature oxidation, high strength and hardness, and high abrasion and wear resistance. NASA

FIBER MODIFIED POLYURETHANE FOAM FOR BALLISTIC PROTECTION Patent
The patent of an invention dealing with a fiber modified polyurethane foam for ballistic protection was presented. The substance consists of a closed cell, semi-rigid, fiber-loaded, self-extinguishing ballistic resistant foam. It has the properties of retarding penetration of incendiary ballistics, prevention of fire in the void spaces of an aircraft, providing support for the fuel cell and strengthening the airframe. The strength of the foam is enhanced by the fibers being oriented parallel to the surface of the substrate on which the foam is sprayed. The fibers should preferably be made of glass, and other materials may be added such as fire-retardant materials. Details of the chemical composition are given. Y.J.A.

CERMET COMPOSITION AND METHOD OF FABRICATION Patent
A process for producing a cermet composition applicable as electrical insulator seals for thermionic diodes is described. Particles of a high temperature resistant metal or metal alloy are mixed with a ceramic oxide powder and vacuum sealed and sintered under high pressure in a high temperature autoclave operation. Official Gazette of the U.S. Patent Office
N76-15314* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

CERAMIC FIBER INSULATING MATERIAL AND METHODS OF PRODUCING SAME Patent Application
Rueby Y. Lin (Carborundum Co.) and Edward A. Struzik, inventors (to NASA) (Carborundum Co.) Filed 15 Dec. 1975 29 p
(Contract NAS9-13641)
(NASA-Case-MSC-14795-1; US-Patent-Appl-SN-640806) Avail: NTIS HC $4.00 CSCL 11B

A method is presented of producing heat resistant, light-weight insulating nonporous foams by admixing insulating fibers such as alumina-silica fibers, phenol-formaldehyde fibers, glass fibers, or mixtures thereof with a surface active agent and soluble organic resinous binder. The mixture is then agitated to produce a stable homogenous foam. Then the foam is dewatered. The dewatered foam is heat treated to produce a dry porous, nonfluid foam. NASA

N76-16230* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TRANSPARENT FIRE RESISTANT POLYMERIC STRUCTURES Patent

A transparent laminate of epoxy resin and a transparent layer of a polycarbonate including the advantages of both resins, comprise a transparent material. This alters the microstructure and reduces the thermal expansion coefficient of the coating so as to minimize the number of tensile cracks. Official Gazette of the U.S. Patent Office

N76-15314* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

CERAMIC FIBER INSULATING MATERIAL AND METHODS OF PRODUCING SAME Patent Application
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A method is presented of producing heat resistant, light-weight insulating nonporous foams by admixing insulating fibers such as alumina-silica fibers, phenol-formaldehyde fibers, glass fibers, or mixtures thereof with a surface active agent and soluble organic resinous binder. The mixture is then agitated to produce a stable homogenous foam. Then the foam is dewatered. The dewatered foam is heat treated to produce a dry porous, nonfluid foam. NASA

N76-16228* National Aeronautics and Space Administration. Pasadena Office, Calif.

UTILIZATION OF OXYGEN DIFLUORIDE FOR SYNTHESES OF FLUROPOLYMERS Patent

The reaction oxygen difluoride, OF2, with ethylenically unsaturated fluorocarbon compounds is examined. Depending upon the fluorocarbon material and reaction conditions, OF2 can chain extend fluoropolymers, convert functional perfluorovinyl groups to acyl fluoride and/or epoxide groups, and act as a monomer for an addition type copolymerization with dioléfins. Official Gazette of the U.S. Patent Office

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, 26 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

N76-16224 National Aeronautics and Space Administration. Pasadena Office, Calif.

IMPROVED HYDROGEN-RICH GAS GENERATOR Patent Application

A process and apparatus are described for producing a

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, 26 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

N76-16224* National Aeronautics and Space Administration. Pasadena Office, Calif.

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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, 26 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.
hydrogen rich gas from liquid hydrocarbon and water using the partial oxidation steam reforming process. NASA

31 ENGINEERING (GENERAL)

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


An improved helium refrigerator, which includes a means for providing a continuous signal indicative of the reserve cooling capacity of the refrigerator, is disclosed. Official Gazette of the U.S. Patent Office

32 COMMUNICATIONS

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

For related information see also O4 Aircraft Communications and Navigation and 17 Spacecraft Communications, Command and Tracking.


Method and apparatus are presented for producing a phase-modulated waveform having a high degree of linearity between the modulating signal and the phase of the modulated carrier signal. Two signals representing finite odd and even power series transformations of the modulating signal are produced and multiplied with two quadrature components of the input carrier signal, respectively. One of the multiplied signals is subtracted from the other and the resulting signal is hard-limited to produce a phase-modulated output signal. The means for producing the two signals representing the odd and even power series of the modulating signal includes means for varying the coefficients of the two power series. By means of an existing
computer program, the coefficients of the two power series are selected such that there is an extremely high degree of linearity between the modulating signal and the phase of the modulated carrier signal.

SINGLE FREQUENCY, TWO FEED DISH ANTENNA HAVING SWITCHABLE BEAMWIDTH Patent

A switchable beamwidth antenna is described which includes a concave parabolic main reflecting dish which has a central circular region and a surrounding coaxial annular region. A feed means selectively excites only the central region of the main dish via a truncated subreflector for wide beamwidth or substantially the entire main dish for narrow beamwidth. In the embodiment shown, the feed means comprises a truncated concave ellipsoid subreflector and separate feed terminations located at two foci of the ellipsoid. One feed termination directly views all of the main dish while the other feed termination, exciting the main dish via the subreflector, excites only the central region because of the subreflector truncation.

Multichannel Logarithmic RF Level Detector Patent

The invention is a logarithmic RF level detector which can be used to derive gain-weighting signals in an n-channel angle modulation diversity receiving system. The IF signals are sequentially gated into a single logarithmic IF amplifier which compresses the input signal dynamic range by a factor on the order of a hundred to one. The amplifier output signal is detected and then gated back into the n-channels simultaneously with the gating of the signals into the logarithmic amplifier. After being gated back into its channel each signal feeds a low pass filter which passes only the low pass, or zeroth order zone. The signals so derived may then be used to actuate a diversity combination operation.

Horn Antenna Having V-Shaped Corrugated SLOTS Patent
Sponsored by NASA

A corrugated horn antenna is disclosed in which the corrugated surfaces of the antenna are formed by V-shaped slots. The depth of the slots in between 0.3126 and 0.625 wavelengths. For this range of depths the surface impedance is capacitive and operates in a cut-off mode. The V-shaped corrugated slots are more easily machined than previous slots, and the resulting...
An improved low distortion asynchronous receiver, designed to receive balanced differential signals from a transmission line, recover and reconstruct a positive logic level signal from the received signals, and supply a suitable unipolar pulse code modulated (pcm) output waveform to a conventional sync detector/data decoder for further processing is disclosed. A hybrid transformer couples the differential signals appearing on the transmission line into the receiver as a double-ended input referenced to the receiver ground. Each of the two signals is applied to a separate low pass filter network to provide a standard waveform transition characteristic. Each filtered signal is supplied to a threshold detection circuit comprising a differential comparator, a NAND gate and a voltage divider network. The detection circuit provides a stable threshold level for converting the filtered line signal to positive logic levels.

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An antenna system for single or plural beams is described, providing continuously variable beamwidth selectively in one or both of two orthogonal senses, i.e., azimuth and elevation, for either communications or angle-tracking. The system includes two parabolic cylindrical reflectors, which are respectively a main reflector and a sub-reflector; the reflectors are positioned with the focal axes. A point or multibeam (e.g. monopulse) feed is mounted adjacent the main reflector on the focal axis of the sub reflector. Beamwidth is controlled using telescoping sections on the main and sub reflectors to control the size of the surface areas.

A method and apparatus for the automatic, remote measurement of the internal delay time of a transponder at the time of operation is provided. A small portion of the transmitted signal of the transponder is converted to the receive signal frequency of the transponder and supplied to the input of the transponder. The elapsed time between the receive signal locally generated and the receive signal causing the transmission of the transmitted signal is measured, said time being representative of or equal to the internal delay time of the transponder at the time of operation.

A method is presented for locating any person in distress in a selected area on the surface of the earth who has deployed passive radio frequency (RF) reflectors in a predetermined arrangement. A first transparency is made in the spatial frequency domain of an image of the predetermined arrangement of the RF reflectors. The selected area of the surface of the earth is scanned by means of a side-looking radar, on board a satellite or aircraft, to produce radar images. Second transparencies in the conventional image domain are produced from the radar images. It is then determined from the first and second transparencies, by means of complex spatial filtering, if RF reflectors in the predetermined arrangement were deployed in the selected area when scanned by the radar.
In a horn-reflector antenna system for producing a spherical aperture phase front, a corrugated conical horn illuminates a section of a hyperbolic reflector to produce a spherical aperture phase front. This front produces a far field beam with low sidelobes and high beam efficiency. The system is insensitive to frequency and polarization changes, and is also insensitive to orientation about the axis of the conical horn for beam scanning.

33 ELECTRONICS AND ELECTRICAL ENGINEERING

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

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

OPEN LOOP DIGITAL FREQUENCY MULTIPLIER Patent Application

An open loop digital frequency multiplier with a multiplied output synchronized to low frequency clock pulses is described. The system includes a multi-stage digital counter which provides a pulse output as a function of an integer divisor. The integer divisor and the timing or counting cycle of the counter are interrelated to the frequency of a clock input. The counting cycle is controlled by a one-shot multivibrator which, in turn, is driven by a reference frequency input.

FILTERING DEVICE Patent

An electrical filter for removing noise from a voice communications signal is reported: seven sample values of the signal are obtained continuously, updated and subjected to filtering. Filtering is accomplished by adding balanced, with respect to a mid-point sample, spaced pairs of the sampled values, and then multiplying each pair by a selected filter constant. The signal products thus obtained are summed to provide a filtered version of the original signal.

COMPACT-BI-PHASE PULSE CODED MODULATION DECODER Patent

An apparatus is described for extracting and generating a clock pulse train from a pulse coded data train. The apparatus includes a filter circuit for receiving the pulse coded data train, and a first set-reset flip-flop is provided for receiving the signals from the pulse coded train. Coupled to the output of the first flip-flop is a means for generating a triggering pulse responsive to the occurrence of data within the train. A pulse gate is activated.
by the triggering pulse for causing the data from the pulse coded data train to be stored in a second flip-flop. A clock pulse generating means is coupled between the outputs of the first and second flip-flops for generating a continuous stream of clock pulses which are synchronized with the incoming-pulse coded data train.  

**N76-14372** National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.  
**TURNSTILE AND FLARED CONE UHF ANTENNA Patent**  
Donald J. Bottoms (Martin Marietta Corp., Denver) and Theofanis G. Gavrillis, inventors (to NASA) (Martin Marietta Corp., Denver)  
An improvement to the turnstile-cup antenna is described which increases its beamwidth. The improved beamwidth characteristics are attained by tilting the turnstile arms toward slots contained in a truncated cone.  

**N78-14373** National Aeronautics and Space Administration. Pasadena Office, Calif.  
**NONLINEAR NONSINGULAR FEEDBACK SHIFT REGISTERS Patent**  
Four classes of nonlinear nonsingular feedback shift registers (NLFSR) are disclosed. Each NLFSR is assumed to be r stages long and regardless of its class, generates a feedback sequence of length 2r. Each NLFSR of either class 1 or class 2 has a feedback arrangement which is a function of a primitive polynomial of degree r-1. Each register of class 1 includes three nonlinear terms, each one of which is the AND function of a different combination of (r-1) outputs of the first (r-1) stages. Each register of class 2 includes a single nonlinear term which is the AND function of (r-1) outputs of the first (r-1) stages. Each NLFSR in class 3 has a feedback arrangement which is based on a primitive polynomial of degree r-2 and a unique single nonlinear term, while each NLFSR in class 4 has a feedback arrangement which is based on a primitive polynomial of degree r-3 and three nonlinear terms.  

**N76-15373** National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.  
**HIGH TEMPERATURE BERYLLIUM OXIDE CAPACITOR Patent**  
A capacitor suitable for use in environments where the temperature is as high as 1500°C is described. The capacitor is comprised of a BeO wafer which is off-sputtered on each side and an electrode of Iridium on each side which is deposited by sputtering, or ion plating. A barrier layer of BeO is deposited on one or both of the electrodes to prevent diffusion bonding of
the electrodes of adjacent capacitors due to temperature, pressure, and vacuum when several capacitors are stacked.

Official Gazette of the U.S. Patent Office

N76-16331* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

FREQUENCY MEASUREMENT BY COINCIDENCE DETECTION WITH STANDARD FREQUENCY Patent

A method of measuring a desired frequency by comparing it with a standard frequency is disclosed. The zero crossings of both frequencies are detected. A command pulse is generated at each coincidence and is used to start and stop a pair of frequency counters adapted to count the desired and standard frequencies. A measure of the desired frequency is obtained by multiplying the known standard frequency by the ratio between the desired count and the standard count obtained in the two frequency counters. Official Gazette of the U.S. Patent Office

N76-16332* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

HIGH VOLTAGE DISTRIBUTOR Patent

A high voltage distributor which allows the easy connection and disconnection of a high voltage power supply to and from one or more circuits requiring the supply is described. The design configuration features unrestrained pump-out, insulation of the high voltage from ground, and freedom from corona. These features are obtained by mounting a removable retaining rod on one or more insulators, thereby facilitating the support by the retaining rod of a plurality of washers. One of the washers is integrally connected to the high voltage power supply while the remaining washers are integrally connected to the circuits requiring the high voltage. Official Gazette of the U.S. Patent Office

N76-18345* National Aeronautics and Space Administration. Pasadena Office, Calif.

ANALOG TO DIGITAL CONVERTER Patent

An analog-to-digital converter, finding particular application in a multichannel pulse height analyzer, includes means for digitizing the analog input in two conversion steps. To digitize the input to 13 bits, a 7-bit digital to analog converter with a 7-bit up-down counter is used. During the first conversion step which is a coarse conversion, the input V sub i is compared with the DAC output, V sub I and the 7-bits of the counter are set by successive approximation. Thereafter the DAC output is driven twice toward V sub i. The output of an amplifier is stored after each change of the DAC in one of two storage and hold circuits, depending on the polarity of the amplifier output. Then, the content of the 7-bit counter is transferred to the 7 higher
order bits of a 14-bit buffer counter. The fine conversion step is performed by successive approximation.

A network is disclosed for automatically checking the skew and character spacing of digital tape drive systems to indicate out-of-tolerance conditions of those parameters. The network enables a tape drive to check its own recording accuracy as well as that of tapes recorded on other drives. In operation, the first detected pulse of each character triggers a monostable multi-vibrator which locks out further data pulses and initiates a window pulse equal in length to the maximum permissible skew. At the end of the window pulse data pulses may again be received. If a pulse is received after termination of the window pulse, the skew is determined to exceed specifications and a skew error indication is given by the illumination of display light. A similar circuit arrangement is provided for detecting character spacing which is less than the minimum required for unambiguous data reproduction.
cylinders. The support and sealing means for the electrodes is confined to a limited portion of the medial region of the disc so that the remainder of such region can be punctured by a hollow needle to introduce a test sample within the flask.

A system is described for improving the effluent dispersal characteristics of smokestacks subject to relative winds; the system consists of a vortex generating airfoil attached to a smokestack near the stack gas exit. Relative winds passing over the airfoil create strong vortices which entrain and hold together smokestack effluents until the vortices deteriorate. The vortex flow direction and angle of ascension may be controlled in order to achieve optimum effluent dispersal by varying the airfoil angle of attack.

A capacitive transducer and circuit especially suited for making measurements in a high-temperature environment are described. The transducer includes two capacitive electrodes and a shield electrode. As the temperature of the transducer rises, the resistance of the insulation between the capacitive electrode decreases and a resistive current attempts to interfere with the capacitive current between the capacitive electrodes. The shield electrode and the circuit coupled there reduce the resistive current in the transducer. A bridge-type circuit coupled to the transducer ignores the resistive current and measures only the capacitive current flowing between the capacitive electrodes.
phase. A pressure and volume stabilization tube, including an array of pressure relief perforations is projected into the chamber with the perforations adjacent to the entry throat for accommodating a discharge of the fluid, in either gaseous or liquid phases, while a gas inlet and liquid to gas conversion system is provided for the chamber and connected with a source of the fluid for continuously pressurizing the chamber for controlling the pressure of the stream of liquid.

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N76-18364* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

EXHAUST FLOW DEFLECTOR Patent

A deflector is reported for reducing swirling flow spillover occurring when gas flowing through curved ducting attempts to exit into a freestream flow. The deflector is arcuately shaped and positioned upstream and adjacent the exit end of the curved ducting. As the freestream flow travels over the surface of the deflector, it is turned toward the direction of the flow from the exit of the ducting and draws the exiting flow along with it. The drawn exit flow is straightened and strengthened and is able to penetrate into the freestream flow. The ends of the deflector generate vortices which draw along the swirling flow at the sides of the exit end and straighten and strengthen it also.

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HEAT TRANSFER DEVICE Patent
Larry R. Eaton, inventor (to NASA) (McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.) Issued 24 Feb. 1976
An improved heat transfer device particularly suited for use as an evaporator plate in a diffusion cloud chamber. The device is characterized by a pair of mutually spaced heat transfer plates, each being of a planar configuration, having a pair of opposed surfaces defining therebetween a heat pipe chamber. Within the heat pipe chamber, in contiguous relation with the pair of opposed surfaces, there is disposed a pair of heat pipe wicks supported in a mutually spaced relationship by a foraminous spacer of a planar configuration. A wick including a foraminous layer is contiguously related to the external surfaces of the heat transfer plates for uniformly wetting these surfaces.

Official Gazette for the U.S. Patent Office


A system for measuring fluid velocity in a turbulently flowing fluid includes a sensing apparatus for dynamically sensing the mainstream and two orthogonal cross velocity components of the fluid, and a transducer to provide three electrical output signals representative of the velocity components in the mainstream and in the cross directions. Signal processors can be utilized to derive the Reynolds stress wave and the Reynolds stress.


Thermocouples that provide stability and performance reliability in systems involving high temperatures, and vacuums through the use bimetallic sensors are examined. All metal components of the sensor are selected from a group of metals comprising tantalum and rhenium and alloys containing only those two metals. The tantalum, rhenium thermocouple sensor alloys provide bare metal thermocouple sensors with superior vapor pressure compatibilities and performance characteristics. These improved compatibility and physical characteristics sensors result in improvement emf, temperature properties and thermocouple hot junction performance. The thermocouples also exhibit reliability and performance stability in systems involving high temperatures and vacuums and are adaptable to space propulsion and power systems and nuclear environments.
METHOD FOR MAKING A HOT WIRE ANEMOMETER AND PRODUCT THEREOF Patent Application
Volker Mikulla, inventor (to NASA) (NAS-NRC) Filed 10 Nov. 1975 14 p Sponsored by NASA
A hot wire anemometer probe is reported that includes a ceramic body supporting two conductive rods therein in parallel spaced apart relation. The body has a narrow edge surface from which the rods protrude. A probe wire is welded to the rods and extends along the edge surface. Ceramic adhesive secures the probe wire to the surface. A method is described for fabricating the probe wherein the body is molded and precisely shaped by machining techniques before the probe wires are installed.

FOCUSED LASER DOPPLER VELOCIMETER Patent Application
A system for remotely measuring velocities present in discrete volumes of air in which a CO2 laser beam is focused by a telescope at such a volume, a focal volume, and within the focusable range, near field, of the telescope. The back scatter (or reflected light) principally from the focal volume, passes back through the telescope and is frequency compared with the original frequency of the laser; the difference frequency or frequencies represent particle velocities in that focal volume.

MASS SPECTROMETER WITH MAGNETIC POLE PIECES PROVIDING THE MAGNETIC FIELDS FOR BOTH THE MAGNETIC SECTOR AND AN ION-TYPE VACUUM PUMP Patent Application
A mass spectrometer (MS) is reported with magnetic pole pieces which provide the magnetic fields for both the magnetic sector and an ion-type vacuum pump.
35 INSTRUMENTATION AND PHOTOGRAPHY

Vernon L. Alley, Jr. and Austin D. McHatton, inventors (to NASA)
Filed 14 Nov. 1975 20 p
(NASA-Case-LAR-11825-1; US-Patent-App-SN-632112) Avail:
NTIS HC $3.50 CSCL 14B

A description is given of a lightweight flexible device for measuring the maximum strain or elongation of a substance subject to loads. The device can also be used for measuring maximum relative movements between adjacent objects. In particular the device is a self-contained elastic strain gage capable of amplifying strain experienced by the relatively high elastic modulus, low strain, synthetic materials used in parachutes and other stressed fabric structures.

N76-13465* National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
METHOD FOR FABRICATING A MASS SPECTROMETER INLET LEAK Patent Application
Robert F. Harris, inventor (to NASA) Filed 26 Nov. 1975
13 p
(NASA-Case-GSC-12077-1; US-Patent-App-SN-635519) Avail:
NTIS HC $3.50 CSCL 14B

An inlet leak intended for use with a mass spectrometer for measuring chemically reactive species in a hostile environment is disclosed, along with a method of fabricating the leak. The leak includes a length of metal tubing formed of a high melting point material such as Kovar and a length of glass tubing, preferably formed of borosilicate glass inserted within the metal tubing and sealed to the interior surface. The glass tubing is drawn to reduce the leak aperture to a diameter slightly greater than two microns.

N76-14429* National Aeronautics and Space Administration.
Langley Research Center, Langley Station, Va.
STATIC PRESSURE PROBE Patent
Shimer Z. Pinckney, inventor (to NASA) Issued 28 Oct. 1975
5 p Filed 29 Oct. 1974 Supersedes N75-10412 (12 - 01, p 0055)

An improved static pressure probe is described which has a smaller length than conventional static probes with the same diameter, and it requires no compensation for yaw angles of up to 10.

N76-14430* National Aeronautics and Space Administration.
Pasadena Office, Calif.
STRAIN GAGE MOUNTING ASSEMBLY Patent
Supersedes N73-28495 (11 - 19, p 2300) Sponsored by NASA

A strain gage assembly mounted on a container to monitor its internal pressure is described. A strain gage device is mounted in compression between a pair of mounting collars. The mounting arrangement translates the total strain displacement of the object or container under test between the mounting collars to apply it across the smaller gage length distance thus attaining a mechanical multiplication or amplification.

Official Gazette of the U.S. Patent Office
Static pressure taps or ports are provided in the throat of a supersonic inlet, and signals indicative of the pressure at each of the ports is fed to respective comparators. Means are also provided for directing a signal indicative of the total throat pressure to the comparators. A periodic signal is superimposed on the total throat pressure so that the signal from the static pressure taps is compared to a varying scan signal rather than to total throat pressure only. This type of comparison causes each comparator to provide a pulse width modulated output which may vary from 0% 'time on' to 100% 'time on'. The pulse width modulated outputs of the comparators are summed, filtered, and directed to a controller which operates a bypass valve such as a door whereby air is dumped from the inlet to prevent the shock wave from being expelled out the front.

Official Gazette of the U.S. Patent Office
The patent of an invention dealing with a cosmic dust analyzer was presented. Methods and apparatus are provided which employ ion time-of-flight techniques to determine the composition of a high velocity particle such as a micrometeorite. A charged target electrode formed of two known materials is arranged to intercept the particle, the impact of which creates a discrete plasma of ions of both the known target material as well as the particle matter. A charged collector electrode receives the ions from the target, which tend to travel at a velocity which is approximately a function of their mass only. The fractional ionization for an arbitrary atomic species can be specified by the Saha equation. Given the temperature, the procedure can be reversed to yield the relative abundance of elements in the impacting particle.

Y.J.A.
A thermocouple which may be rolled as a tape until needed and a method of making same are described. Thermoelectrically different metals are applied to a strip of electrically nonconductive material in longitudinally overlapping relationship. Apertures may be provided along the tape in the overlapping region at predetermined intervals. An adhesive material is applied to the side of the tape opposite the thermoelectric metals either before or after the thermoelectric metals are deposited. The tapes may be cut or torn to form a thermocouple device which is ready for application to a body whose temperature is to be monitored or measured.

A dichroic plate is disclosed for passing radiation within a particular frequency band and reflecting radiation outside of that frequency band. The value of the thickness of the plate is selected so that the plate acts as a resonant narrow band pass filter for the desired pass frequency, and the shapes of the apertures in the dichroic plate are selected to compensate for the phase shift caused by the air-plate interface presented to the signals passing therethrough.

A cylindrical, convoluted, flexible bellows is used to form an atomic or molecular storage vessel with constant surface area and surface properties but adjustable volume. When utilized as a storage bulb inside an atomic or molecular frequency standard such as a hydrogen maser, it provides an apparatus for obtaining an extremely accurate measurement of the frequency deviation caused by the interaction of gas atoms (or molecules) with the vessel wall surface.

A method and apparatus for measuring the strength and direction of an unknown magnetic field are disclosed. A freely rotatable suspended superconducting body, such as a sphere, is maintained at a superconducting temperature. A magnetic field to be measured induces super current flow on the sphere's surface. The induced current causes the sphere to rotate at a rate that is proportional to the strength of the field, and the axis of rotation of the sphere aligns with the direction of the magnetic field to be measured. An operator applies current to orthogonal electromagnetic coils arranged relative to the sphere so as to apply variable magnetic fields to the sphere. Varying the current and the resulting fields nulls out the effect of the magnetic field.
to be measured; measurement of the nulling currents indicate the direction and strength of the unknown magnetic field.

Official Gazette of the U.S. Patent Office

N76-16391* National Aeronautics and Space Administration. Pasadena Office, Calif.
SCAN CONVERTING VIDEO TAPE RECORDER Patent
Norman I. Holt, inventor (to NASA) (JPL) Issued 2 Dec. 1975
A video tape recorder with broad bandwidth capabilities for recording color television signals, and which has the capability of playing back the recorded television signals at a scan rate different from that at which the signals were recorded is introduced. The recorder also allows television signals of one scanning standard to be converted to television signals of a second scanning standard.

Official Gazette of the U.S. Patent Office

N76-16392* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CLOCK SETTER Patent
Claude T. Haley, inventor (to NASA) Issued 30 Dec. 1975
4 p Filed 9 Sep. 1974 Supersedes N74-32887 (12 - 22, p 2694)
An apparatus is described for manually adjusting large wall-mounted clocks while the operator remains safely on the floor, comprising a long handled tool which slips over the reset knob of such clocks allowing a downward and twisting motion to adjust the indicated time.

The Official Gazette of the U.S. Patent Office

N76-16393* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MOVING PARTICLE COMPOSITION ANALYZER Patent
A mass spectrometry apparatus for analyzing the composition of moving microscopic particles is introduced. The apparatus includes a capacitor with a front electrode upon which the particles impinge, a back electrode, and a solid dielectric sandwiched between the front and back electrodes. In one embodiment, the
1. **METHOD AND APPARATUS FOR CONTROLLING THE CONTRAST OF A PHOTOGRAPHIC TRANSPARENCY**

Patent Application
Sing H. Lee and Arnold R. Shulman, inventors (to NASA) Filed 30 Dec. 1975

An apparatus and method for controlling the contrast of a photographic transparent image by projecting a coherent beam of optical energy onto the image via an optical cavity are reported. Mirrors are used to trap a collimated laser beam illuminating the transparency so that at least a portion of the beam energy is passed through the transparency plural times. The distance that the light beam travels between the mirrors is controlled as a function of the wavelength of the beam energy to control the phase of light interference in the beam passing through the transparency, thereby controlling the intensity of the beam derived from the mirror downstream of the transparency. The contrast of the transparency is increased or decreased, depending upon whether constructive or destructive interference for the beam energy is provided by the mirror spacing. For a negative input transparency a low to high contrast projected negative or positive image can be obtained.

2. **MINIATURE BIAXIAL STRAIN TRANSDUCER**

Patent Application
Irwin S. Hoffman, inventor (to NASA) Filed 30 Dec. 1975

A reusable miniature strain transducer is described for use in the measurement of static or quasi-static, high level, biaxial strain on the surface of test specimens or structures. Two cantilever arms, constructed by machining the material to appropriate flexibility, are self-aligning and constitute the transducing elements of the device. Used in conjunction with strain gages, the device enables testing beyond normal gage limits for high strains and number of load cycles. The device does not require conversion computations since the electrical output of the strain gages is directly proportional to the strain measured.

3. **A 2 DEGREE/90 DEGREE LABORATORY SCATTERING PHOTOMETER**

Patent Application
W. R. McCluney, inventor (to NASA) Filed 13 Jan. 1976

A scattering photometer was developed for measuring the light scattered by particles in a hydrosol at substantially 2 deg and 90 deg simultaneously. Light from a source is directed by a first optical system into a scattering cell containing the hydrosol under study. Light scattered at substantially 2 deg to the incident beam is focused onto a first photoelectric detector to generate an electrical signal indicative of the amount of scattered light at substantially 90 deg. Light scattered at substantially 2 deg to the incident beam is directed through an annular aperture symmetrically located about the axis of the illuminating beam which is linearly transmitted undeviated through the hydrosol and focused onto a second photoelectric detector to generate an electrical signal indicative of the amount of light scattered at substantially 2 deg.

4. **METHOD AND APPARATUS FOR TENSILE TESTING OF METAL FOIL**

Patent
Orval W. Wade, inventor (to NASA) (Martin Marietta Aerospace, Denver) Issued 17 Feb. 1976

A method for obtaining accurate and reproducible results in the tensile testing of metal foils in tensile testing machines is described. Before the test specimen are placed in the machine, foil side edges are worked until they are parallel and flaw free. The specimen are also aligned between and secured to grip end members. An aligning apparatus employed in the method is comprised of an alignment box with a longitudinal bottom wall and two upright side walls, first and second removable grip end members at each end of the box, and a means for securing the grip end members within the box.
An atmosphere sample is described which includes a very thin filter element with straight-through holes on the order of 1 micron. A sample of air with particles to be examined is driven by means of a pressurized low molecular weight gas, e.g., He, to the filter element front side. A partial vacuum may be present at the back side of the filter element. The pressure differential across the filter element is just below the rupture point of the filter element. Particles smaller than filter holes are deposited on the filter element. When using a filter element of plastic material of a thickness on the order of 10 microns, a stainless steel back-up plate and a diffusion member are used to support the filter element when subjected to a pressure differential on the order of a few hundred atmospheres.

A holographic motion picture camera is reported for producing three-dimensional images by employing an elliptical optical system. There is provided in one of the beam paths (the object or reference beam path) a motion compensator which enables the camera to photograph faster moving objects.
a connecting link including a load cell for measuring stresses as
the pull rod is placed in tension by the actuator. NASA

N76-19405*# National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.
SEMICONDUCTOR PROJECTILE IMPACT DETECTOR
Patent Application
Edward L. Shriver, inventor (to NASA) Filed 11 Mar. 1976
11 p
(NASA-Case-MFS-23008-1; US-Patent-Appl-SN-665734) Avail:
NTIS HC $3.50 CSLC 14B
A semiconductor projectile impact detector is reported for
use in determining micrometeorite presence as well as its flux
and energy. The device comprises a photovoltaic cell which
generates a voltage according to the light and heat emitted by
the micrometeorites upon impact with the cell. A counter and a
peak amplitude measuring device are used to indicate the number
of particles which strike the surface of the cell as well as the
kinetic energy of each of the particles. NASA

N76-19407*# National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.
THERMOCOUPLES OF MOLYBDENUM AND IRIDIUM
ALLOYS FOR MORE STABLE VACUUM-HIGH TEMPERA-
TURE PERFORMANCE Patent Application
James F. Morris, inventor (to NASA) Filed 18 Mar. 1976
14 p
(NASA-Case-LEW-12174-1; US-Patent-Appl-SN-667929) Avail:
NTIS HC $3.50 CSLC 14B
Thermocouples that provide stability and performance
reliability in systems involving high temperatures and vacuums
are presented: the device employs a bimetallic thermocouple
sensor where each metal of the sensor is selected from a group
of metals comprising molybdenum and iridium and alloys
containing only those two metals. The molybdenum, iridium
thermocouple sensor alloys provide bare metal thermocouple
sensors with advantageous vapor pressure compatibilities and
performance characteristics. The compatibility and physical
characteristics of the thermocouple sensor alloys result in improved
emf, temperature properties and thermocouple hot junction
performance. Thermocouples formed of the molybdenum, iridium
alloys are adaptable to space propulsion and power systems
and nuclear environments. NASA

N76-19408*# National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
CAMERA ARRANGEMENT Patent Application
Robert F. Hummer (Santa Barbara Res. Center) and Deane T.
Upton, inventors (to NASA) (Santa Barbara Res. Center) Filed
19 May 1975 21 p
(Contract NAS5-9677)
(NASA-Case-GSC-12032-2; US-Patent-Appl-SN-578700) Avail:
NTIS HC $3.50 CSLC 14E
An aerial vehicle rotating in gyroscopic fashion about one
of its axes is described. An optical system is present at the
rotation site and operates to scan an area below the vehicle in
determined relation to vehicle rotation. A sensing device is
provided to sense the physical condition of the area of scan
and optical means are present to direct the physical intelligence
received from the scan area to the sensing means. Methods are
provided to incrementally move the optical system through a series of steps to effect sequential line scan of the area being viewed and keyed to the rotational rate of the vehicle. NASA

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**35 INSTRUMENTATION AND PHOTOGRAPHY**

**TACHOMETER** Patent Application

A description is given of a tachometer in which sine and cosine signals responsive to the angular position of a shaft as it rotates are each multiplied by like, sine or cosine, functions of a carrier signal, and the products summed: the resulting frequency signal is converted to fixed height and fixed width pulses of a like frequency. These pulses are the integrated, and the resulting dc output is an indication of shaft speed. NASA

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**36 LASERS AND MASERS**

Includes parametric amplifiers.

**COMBINED DUAL SCATTER, LOCAL OSCILLATOR LASER DOPPLER VELOCIMETER** Patent

A laser Doppler velocimeter is described which is capable of effectively measuring two different velocity components of a fluid simultaneously. Such a velocimeter includes a pair of coherent beams of laser light which are focused to an intersection point through which flow particles within the fluid whose velocity is to be measured. Both beams are plane polarized with the plane of polarization of one being rotated normally with respect to the other, which result that the scattered radiation is separable into two different beams respectively corresponding to the two incident beams. Such scattered radiation is Doppler shifted by the moving particles and is collected for conventionally providing a measurement of the velocity of any particle flowing through the intersection point on a path which is generally transverse. The wavelength of the light scattered by the particles from one of the beams is compared to the wavelength of such beam prior to it being Doppler shifted by the moving particles.

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**METHOD AND APPARATUS FOR SPLITTING A BEAM OF ENERGY** Patent Application

An energy beam splitting is described that has a first surface for splitting an incident beam energy into an externally reflected beam and an internally transmitted beam, and a second surface spaced from the first surface for splitting the internally transmitted beam into an externally transmitted beam and into an internally reflected beam. The second surface intersects the first surface so that it impedes the internally transmitted beam on the second surface at an angle of incidence that is less than the minimum angle necessary for substantially total internal reflection. NASA
N76-17384* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A LENGTH CONTROLLED STABILIZED MODE-LOCK ND:YAG LASER Patent Application

John Osmundson, inventor (to NASA) (NAS-NRC) Filed 5 Jan. 1976 19 p Sponsored by NASA

A method and apparatus are described for stabilizing the amplitude and repetition rate of mode-locked Nd:YAG laser pulses by controlling the laser length through a feedback loop. The end mirror of the laser is mounted on a piezoelectric crystal which is dithered at a low frequency. A portion of fundamental 1.06 micrometer laser radiation is converted into its second harmonic frequency, and the average power of the second harmonic frequency is detected by an integrating detector. The amount of the power of the second harmonic frequency depends on the match between the optical length of the laser cavity and the mode-lock frequency. The length is controlled by a feedback loop which compared the output of the second harmonic detector to the piezoelectric crystal dither signal.

N76-18427* National Aeronautics and Space Administration. Pasadena Office, Calif.

STARK-EFFECT MODULATION OF CO2 LASER WITH NH2D Patent


The molecular stark-effect in NH2D is used to modulate the 10.6 microns, P(20) line of a CO2 laser. A 25 cm cell external to the laser is filled with about equal parts of NH2 and ND3 to a total pressure between 2 and 10 torr. An equilibrium concentration of NH2D as high as 45 percent is rapidly achieved. The cell is biased with a dc field (3.8 + or - 0.1 KV/cm) and modulated with an ac signal of (about 20 V RMS). At a cell pressure of a 4 torr, a modulation depth of 40 percent is achieved.

Official Gazette of the U.S. Patent Office

N76-18428* National Aeronautics and Space Administration. Pasadena Office, Calif.

DIFFUSED WAVEGUIDING CAPILLARY TUBE WITH DISTRIBUTED FEEDBACK FOR A GAS LASER Patent


For use in a waveguide gas laser, a capillary tube of glass or ceramic has an inner surface defining a longitudinal capillary opening through which the laser gas flows. At least a portion of the inner surface is corrugated with corrugations or channels with a periodicity Lambda where Lambda = 1/2 Lambda, Lambda being the laser gas wavelength. The tube includes a diffused region extending outwardly from the opening. The diffused region of a depth d on the order of 1 Lambda to 3 Lambda acts as a waveguide for the waves, with the corrugations producing distributed feedback. The evanescent component of the waves traveling in the diffused region interact with the laser gas in the opening, gaining energy, and thereby amplifying the waves travelling in the diffused region, which exit the diffused region, surrounding the opening, as a beam of wavelength Lambda.

Official Gazette of the U.S. Patent Office

N76-20466* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

WIDEBAND HETERODYNE RECEIVER FOR A LASER COMMUNICATION SYSTEM Patent Application


A wideband heterodyne receiver for a laser communication system is disclosed which includes a front end with a cooled photomixer contained in a hermetically sealed space quality housing designed for wide bandwidth transmission. The photomixer is coupled through a wideband preamplifier to the receiver back end which includes a frequency tracking network and demodulating equipment. The receiver is capable of tracking a doppler frequency shift of 750 MHz, positive or negative, and has an instantaneous intermediate frequency information bandwidth of 400 MHz. The receiver system is also capable of
operating over a wide temperature range and is designed to be suitable for use in outer space communication.

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

N76-11441# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SPRING OPERATED ACCELERATOR AND CONSTANT FORCE SPRING MECHANISM THEREFOR Patent Application
(NASA-Case-ARC-10898-1; US-Patent-Appl-SN-625732) Avail: NTIS HC $4.00 CSCL 131

A spring assembly is described which consists of an elongate piece of flat spring material formed into a spiral and a free running spool. The spring has a distal end that is externally accessible so that when it is drawn along a path, the spring unwinds against a restoring force present in the portion of the spring between the relatively straight condition on the path and a fully wound condition on the spool. When the distal end is released, it is accelerated toward the spool by the force existing at the transition region. In one case, an accelerator may have a carriage for a test load and a pair of the spring assemblies installed to bias the carriage toward the center of a linear path. To cause the carriage to oscillate in a pattern of constant accelerations, the carriage is displaced to a position toward one end of the path and released, whereupon the springs cause the carriage and the load to be accelerated in reciprocation on the path.

N76-13495# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

REEL SAFETY BRAKE Patent Application
Clinton E. Carle, inventor (to NASA) Filed 6 Nov. 1975 24 p.

Brake mechanisms for reel-to-reel tape transport devices is reported, wherein a brake means is mechanically coupled to the hub of each reel by connection to a feeler means sensing the tape being fully wound on either one of the reels.
N76-13496* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

GAS COMPRESSION ANALYSIS Patent Application
Lee S. Terp, inventor (to NASA) (Garrett Corp., Los Angeles) Filed 24 Oct. 1975 17 p (Contract NAS9-10465)

An apparatus is described for transferring gas from a first container to a second container of higher pressure; it consists of a free-piston compressor having a driving piston and cylinder, a smaller diameter driven piston and cylinder, and a rod member connecting the driving and driven pistons for mutual reciprocation in their respective cylinders. A conduit may be provided for supplying gas to the driven cylinder from the first container. Also provided is control apparatus for intermittently introducing gas to the driving piston, from the first container, to compress gas by the driven piston for transfer to the second higher pressure container.

N76-14460* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

EXTERNALLY SUPPORTED INTERNALLY STABILIZED FLEXIBLE DUCT JOINT Patent

An externally supported, internally-stabilized flexible duct joint is described which is particularly suited for use in conducting the flow of fluid between a pair of tubular conduits, at least one of which is supported for motion relative to the other. The joint is characterized by a low-flow loss coefficient and includes a pair of coaxially related terminal sleeves adapted to be coupled with adjacent conduits, and an elongated bellows extended between the terminal sleeves. The bellows is supported against thrust induced extension by linkage including a gimbal ring concentrically related to the mid-span of the bellows and a pair of terminal supports affixed to the terminal sleeves and journaled to the gimbal ring. A bellows stabilizing sleeve is disposed within the bellows for preventing lateral shifting; a support ring is mounted on the stabilizing sleeve and connected to the mid-span of the bellows for connecting the bellows with the stabilizing sleeve.


AN IMPROVED ROTATABLE MASS FOR A FLYWHEEL Patent Application

An improved rotatable mass adapted to be used as a flywheel in energy storage devices is reported. The flywheel is characterized by a plurality of coaxially aligned, contiguous disks mounted on a spin shaft. Each disk is formed of a plurality of woven fibers disposed in a plane transversely related to an axis of rotation with the fibers of alternate disks being continuous throughout their length. The midportion of the fibers of the remaining disks is removed for defining annular voids concentrically related to the spin shaft.
APPARATUS FOR FORMING DISHED ION THRUSTER GRIDS Patent
Bruce A. Banks, inventor (to NASA) Issued 28 Oct. 1975 5 p
Filed 22 Apr. 1974 Supersedes N74-22147 (12 - 13, p 1561)
US-Patent-3.884,797
(NASA-Case-LEW-11694-2; US-Patent-3.914,969:

The patent of an invention dealing with an apparatus for forming dished ion thruster grids was reported. The apparatus consists in an assembly of grid blanks which is separated and covered by impervious metal sheets. The assembly is placed on top of an elastic sheet, and the assembled sheets are clamped at their edges, preventing random slippage and forming an expansible fluid chamber. Pressurized fluid in this chamber inflates the elastic sheet which, in turn, forces the impervious sheets and grid blanks to dish to their natural contour which is approximately hemispheroidal. The impervious sheet between the grid blanks prevents distortion caused by slight misalignment of the holes in the screen and accelerator grids. The dished grids are stress relieved simultaneously in matched dies.

REMOTELY OPERABLE ARTICULATED MANIPULATOR Patent
Ray E. Marlow, inventor (to NASA) (Sperry Rand Corp., Huntsville, Ala.) Issued 2 Dec. 1975 8 p
Filed 23 Dec. 1974 Supersedes N75-14131 (13 - 05, p 0537) Sponsored by NASA
(NASA-Case-MFS-22707-1; US-Patent-3.922,930:

An improved, remotely operable, articulated manipulator is described which includes a plurality of serially connected drive shafts and a grasping device mounted at the distal end of the ultimate drive shaft of a plurality of drive shafts. A plurality of joints includes meshed bevel gears interconnecting the drive shafts, whereby rotary motion is imparted to the grasping device in response to rotation imparted to the drive shafts. Drive tubes concentrically related to the drive shafts impart angular displacement to the drive shafts about axes normally related to the longitudinal axes. A differential includes a multiplicity of driver inputs for selectively rotating the drive shafts and drive tubes about their longitudinal axis.

QUICK DISCONNECT FILTER COUPLING Patent
Fred Jankowski, inventor (to NASA) Issued 7 Oct. 1975 5 p
Filed 30 May 1974 Supersedes N74-26988 (12 - 16, p 1923)
(NASA-Case-MFS-22323-1; US-Patent-3.910,307:

A quick disconnect filter coupling is described for use in coupling a pair of lines together through which fluid passes. The device includes a male cylindrical housing having an enlarged longitudinal bore into which a filter cartridge is removably carried. The filter cartridge includes a filter medium and a check valve. A purge assembly can be attached to the male cylindrical housing for flushing with a cleansing fluid when changing the filter cartridge.

N76-14481 National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

N76-15457 National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.

N76-14483 National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.

Official Gazette of the U.S. Patent Office
REMOTE MANIPULATOR SYSTEM Patent
Donald A. Kugath (GE, Schenectady, N. Y.), Dan H. Dane (GE, Schenectady, N. Y.), and Herman T. Blaise, inventors (to NASA)

A master-slave manipulator system is described which has two master units controlled by the two arms and hands of an operator and two corresponding slave units. Both the master and the slave units have a first arm rotably mounted to the floor at 30 deg from the vertical, a second arm pivoted to it and mounted for rotation, and a third arm pivoted to the second arm. The slave has a pivotally and rotatably mounted gripper unit with manual master has a pivotally mounted gripper unit with manual switch controls. The servomechanism system includes a solid-state control circuit, and flat, helically wound, internal ribbons of wires.

FLUID JOURNAL BEARINGS Patent

A plurality of bearing sectors are mounted on a housing. The sectors function as lobed areas in the bearing to obtain the required lubricant film geometry. Each sector has a pad flexibly mounted on a base with a thin neck which forms a pivot.

LOAD REGULATING LATCH Patent Application

A load regulating mechanical latch is reported that has a pivotally mounted latch element with a hook shaped end and a strike roller engaging laterally open hook for engaging a stationary strike roller. The latch element or hook is pivotally mounted in a clevis end of an elongated latch stem that is adapted for axial movement through an opening in a support plate or bracket mounted to a structural member. A coil spring is disposed over and around the extending latch stem and the lower end of the coil spring engages the support bracket. A thrust washer is removably attached to the other end of the latch stem and engages the other end of the coil spring and compresses the coil spring thereby preloading the spring and the latch element carried by the latch stem.
A process and apparatus is described for producing a hydrogen rich gas from liquid hydrocarbons and water by means of the steam reforming process using a partial oxidation approach.

A method of diffusion bonding and fluxless brazing of aluminum containing components is reported. The aluminum surfaces are freed of any aluminum oxide coating and are coated with a polymeric sealer which can be thermally removed leaving essentially no residue. The polymeric sealer is being removed in a substantially oxygen free environment, and the aluminum components are then being brazed or diffusion bonded without the use of a flux to remove oxide coating.

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

A perforated tube is housed in a chamber in which vacuum is drawn. An air jet is directed into one end of the tube and fiber bundles are fed into the jet which separates and dispenses individual fibers from the bundle, fluffs them, cleanses them of any particulate material, and carries them into the tube. The tube retains the fibers while fiber fragments, undesirably short fibers and particulate matter are drawn by the vacuum and resultant air flow out of the tube through its perforations to a suitable discharge.

A perforated tube is housed in a chamber in which vacuum is drawn. An air jet is directed into one end of the tube and fiber bundles are fed into the jet which separates and dispenses individual fibers from the bundle, fluffs them, cleanses them of any particulate material, and carries them into the tube. The tube retains the fibers while fiber fragments, undesirably short fibers and particulate matter are drawn by the vacuum and resultant air flow out of the tube through its perforations to a suitable discharge.

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A mixing device is provided for an internal combustion engine which simultaneously atomizes liquid fuel, mixes this fuel with an optimal quantity of hydrogen and combines this mixture with a prescribed quantity of air. A throttling mechanism controls the fuel delivery to the engine and also limits the fuel to air equivalence ratio to be predetermined upper bound to inhibit the production of air pollutants and to a lower bound which is above the lean flammability of the mixture.

Official Gazette of the U.S. Patent Office

**N76-18458**

**National Aeronautics and Space Administration.**

**Lewis Research Center, Cleveland, Ohio.**

**PROCESS FOR MAKING ANHYDROUS METAL HALIDES**

Patent


A process for the preparation and isolation of high purity anhydrous lower valence state metal halides is reported that dissolves the corresponding higher valence state metal halide in an organic liquid, which is selected such that the higher valence state metal halide is soluble therein and the lower valence state metal halide is insoluble therein. Subjecting the solution to high energy radiation reduces the higher valence state metal halide to its corresponding lower valence state metal halide, at a temperature in the range of from about 0°C to about room temperature.

Official Gazette of the U.S. Patent Office

**N76-18460**

**National Aeronautics and Space Administration.**

**Pasadena Office, Calif.**

**HYDROGEN-RICH GAS GENERATOR**

Patent Application


A process and apparatus are described for producing hydrogen-rich gas from liquid hydrocarbon and air. The proposed gas generator is portable and produces soot-free hydrogen-rich gas preventing clogging of the carburetor of the internal combustion engine using the product gas. The use of water or steam in the process is eliminated.

NASA
37 MECHANICAL ENGINEERING

MIXING INSERT FOR FOAM DISPENSING APPARATUS Patent
William G. Simpson, inventor (to NASA) Issued 2 Mar. 1976
4 p Filed 12 Jun. 1974 Supersedes N74-26989 (12 - 16, p 1924)
(NASA-Case-MFS-20607-1; US-Patent-3,941,355;

A device for mixing foam ingredients is described. The device comprises an arrangement of lands situated about a cylindrical elongated shaft-like member with each land having a slot. The slots of alternate lands are positioned 180 deg from each other so that as the ingredients flow through the mixing chamber they flow from adjacent one side of the housing to the other dividing as such passes around the shaft-like member.

Official Gazette of the U.S. Patent Office

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N76-19437* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AUGER ATTACHMENT METHOD FOR INSULATION Patent
William C. Schneider, inventor (to NASA) Issued 10 Feb. 1976
4 p Filed 24 Jul. 1974 Supersedes N74-30916 (12 - 20, p 2439)
(NASA-Case-MSC-12615-1; US-Patent-3,936,927;

An auger device is used to attach rigidized surface insulation to a spacecraft. The auger is preferably screwed into an insulation tile which has been prescrewed. The auger combination is then fastened to the spacecraft using an attachment mechanism which penetrates the spacecraft skin and which is secured by a blind end fastener. An alternate method, the auger is incorporated in the insulation tile when the latter is fabricated.

Official Gazette of the U.S. Patent Office

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N76-19439* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MECHANICAL SEQUENCER Patent Application
(Contract NAS9-1400)

A mechanical sequencer having a rotatable drive shaft is described. The drive shaft has a spline formed. A freely rotatable shaft contains a plurality of rollers, the axis of the freely rotatable shaft having an axis parallel to and offset from the axis of the drive shaft. A drive fitting has an opening, the drive fitting being positioned on the drive shaft spline for rotating the fitting with the shaft. A finger is formed integral with the drive fitting for enabling the fitting to move the rollers and the freely rotatable shaft. A crank structure is positioned in a plane perpendicular to the axis of the drive shaft and the freely rotatable shaft. The crank structure has a drive shaft opening through which the drive shaft passes.

Official Gazette of the U.S. Patent Office

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N76-19440* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HYDROSTATIC BEARING SUPPORT Patent Application
R. E. Cunningham, inventor (to NASA) Filed 2 Mar. 1976
12 p

A hydrostatic bearing support system is provided which comprises a bearing housing having a polygonally configured outer surface which defines at least three symmetrically disposed working faces and a plurality of pressure plates, each of which is disposed relatively opposite a corresponding working face and spaced therefrom to define a gap there between. A hydrostatic support film is created in the gap for supporting the housing in spaced relationship to the pressure plates.

Official Gazette of the U.S. Patent Office

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42
ZERO TORQUE GEAR HEAD WRENCH Patent
Sponsored by NASA
A gear head wrench particularly suited for use in applying torque to bolts without transferring torsional stress to bolt-receiving structures is introduced. The wrench is characterized by a coupling including a socket, for connecting a bolt head with a torque multiplying gear train, provided within a housing having an annulus concentrically related to the socket and adapted to be coupled with a spacer interposed between the bolt head and the juxtaposed surface of the bolt-receiving structure for applying a balancing counter-torque to the spacer as torque is applied to the bolt head whereby the bolt-receiving structure is substantially isolated from torsional stress. As a result of the foregoing, the operator of the wrench is substantially isolated from any forces which may be imposed.
Official Gazette of the U.S. Patent Office

CLOSED LOOP SPRAY COOLING APPARATUS Patent Application
(NASA-Case-LEW-11981-1; US-Patent-Appl-SN-672220) Avail. NTIS HC $3.50 CSCL 131
A closed loop apparatus for spraying coolant against the back of a radiation target is described. The coolant is circulated through a closed loop with a bubble of inert gas being maintained around the spray. Mesh material is disposed between the bubble and the surface of the liquid coolant which is below the bubble at a predetermined level. In a second embodiment no inert gas is used, the bubble consisting of vapor produced when the coolant is sprayed against the target.

TREAD DRUM FOR ANIMALS Patent Application
Wayne H. Howard, inventor (to NASA) Filed 31 Mar. 1976 13 p
A tread drum is described for animals, such as primates. It includes a cylindrical housing mounted for rotation about a horizontal axis of revolution with a cylindrical treadway portion on which the animal treads while the drum is rotated by a motorized drive. The treadway portion of the drum includes an electrode structure with sectors independently energizable by a commutator and source of potential, so that an electrical shock station is created behind a running-in-place station on the moving treadway. In this manner, if the animal should fall behind its running-in-place station, it may be shocked by treading on the energized electrode structure. One end of the tread drum comprises a transparent wall for unobstructed viewing of the animal being exercised.
A dirt separator and excluder is described for removing entrained debris from gas turbine shaft seals. A helical groove pattern is constructed on the rotating shaft with the pumping pattern such that it tends to pump seal pressurizing gas toward the gas turbine seal. A second helical groove pattern is provided on the stationary housing or counter rotating member coaxial with the shaft, and this pattern is designed to provide pumping in the direction opposite from that of the groove pattern on the shaft. Gas with entrained debris entering this grooved area is subjected to high centrifugal forces due to the swirl motion induced by the groove pattern and the rotation of the shaft. This debris is centrifuged outwardly into the outer groove pattern on the housing or counter rotating member. Since the outer groove pattern has a pumping direction opposite from that of the seal, dirt is pumped away from the seal and collected in a suitable debris trap.

A method for making a glass-to-metal seal is disclosed. A domed metal enclosure having a machined seal ring is fitted to a glass post machined to a slight taper and to the desired surface finish. The metal part is then heated by induction in a vacuum. As the metal part heats and expands relative to the glass post, the metal seal ring, possessing a higher coefficient of expansion than the glass post, slides down the tapered post. Upon cooling, the seal ring crushes against the glass post forming the seal. The method results in a glass-to-metal seal with extremely high leak resistance.

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good leak resistance, while the parts are kept clean and free of contaminants.

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.

39 STRUCTURAL MECHANICS

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


CESIUM THERMIonic CONVERTERS HAVING LANTHANUM HEXABORIDE ELECTRODES Patent Application


A high electric-power output thermionic converter is provided for by the combination of lanthanum hexaboride emitter and collector electrodes in a cesium thermionic converter. The interaction between the lanthanum hexaboride electrodes and cesium vapor which is adsorbed on the lanthanum hexaboride electrodes results in lower emitter and collector work functions to produce a thermionic converter having a high current density and voltage output. The lanthanum hexaboride emitter and collector electrodes employed in the cesium diode may conveniently be either in the monocrystalline or polycrystalline state.

A MACHINE FOR USE IN MONITORING FATIGUE LIFE FOR A PLURALITY OF ELASTOMERIC SPECIMENS Patent Application


An improved machine for use in determining the fatigue life for elastomeric specimens is disclosed. The machine is characterized by a plurality of juxtaposed test stations, specimen support means located at each of the test stations for supporting a plurality of specimens of elastomeric material, and means for subjecting the specimens at each station to sinusoidal strain. The strain rate is unique with respect to the strain rate at which the specimens at each of the other stations is subjected to sinusoidal strain.

LOW COST SUBSTRATES FOR POLYCRYSTALLINE SOLAR CELLS Patent Application


Low-cost polycrystalline silicon solar cells supported on substrates are prepared by depositing successive layers of polycrystalline silicon containing appropriate dopants over supporting substrates selected from the group consisting of metallurgical-grade polycrystalline silicon, graphite and steel coated with a diffusion barrier of silica, borosilicate, or phosphosilicate. The p-n junction devices are formed which effectively convert solar energy to electrical energy.

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A panel is described for selectively absorbing solar thermal energy comprised of a metallic substrate, a layer of bright metallic material carried on the substrate, and a solar thermal energy absorbing coating carried on the bright metallic material. A layer of zinc is interposed between the metal substrate and the layer of bright material or the metallic substrate can be anodized for receiving the layer of bright metallic material. Also disclosed is the method for producing the coating which selectively absorbs solar thermal energy. Official Gazette of the U.S. Patent Office
An apparatus developed to activate a battery by inserting an electrolyte into the cells while concurrently making voltage measurements on each cell is described. The battery has a planar top with vertically extending passages providing access to the cells. It also has test points adjacent each cell. A housing is mounted on top of the battery for supplying an electrolyte through sealed passages into the cells while simultaneously checking the voltage of the cells. The electrolyte is forced by pressure into the battery.

N76-14612* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SOLAR CELL SURFACE TREATMENT Patent Application

Henry W. Brandhorst, Jr. and Cosmo R. Barona, inventors (to NASA) Filed 18 Dec. 1975 13 p

A patent application dealing with an improvement to solar cells was presented. The improvement consists in increasing the anti-reflecting properties of silicon solar cells by the formation of grooves on the surface of the cells using a chemical etchant. The novelty of the invention resides not only in the formation of grooves that produce multiple reflection of light to enhance absorption but also the utilization of internal reflection that takes place as a result of the crystallographic orientation of the solar cell. This results in more charge carriers being generated close to the junction region than is possible with conventional solar cells with normal angles of light incidence.

N76-14602* National Aeronautics and Space Administration. Pasadena Office, Calif.

THERMOSTATICALLY CONTROLLED NON-TRACKING TYPE SOLAR ENERGY CONCENTRATOR Patent


A solar energy concentrator composed of an array of cylindrical Fresnel lenses, all of which are fixedly aligned in the east-west direction was developed. Each lens concentrates the sun rays and forms a line image which extends in the east-west direction. Located below the lenses are individual fluid channels which extend in the east-west direction and are spaced apart in the south-north direction. Each line image focuses onto not more than two of the channels which absorb heat of the concentrated sun rays. Each channel has a thermostatically controlled valve which controls fluid flow through the channel to take place only when the channel's temperature and/or the fluid exceed a threshold temperature level.
A patent application dealing with a technique to increase the resistance to damage to silicon solar cells caused by electron bombardment was presented. A non-oxide anti-reflective coating is used with a transparent plastic cover of fluorinated ethylene propylene copolymer over the solar cell. An important advantage results from the use of silicon nitride as the coating material instead of the conventional silicon oxide. Even if the silicon nitride is as susceptible to fluorine attack as the silicon oxide, the silicon nitride will not liberate oxygen to cause embrittlement of the Teflon FEP cover.

A black chrome coating of controlled thickness (0.5 micron to 2.5 microns) which has improved energy absorbing properties is examined. The coating is deposited on a specially prepared metal substrate, and has high absorptivity for visible solar radiation, and low emissivity for infrared radiation.

A control system is presented for a thermionic reactor power source. It maintains a constant load voltage while minimizing emitter temperature variations, in spite of wide and sudden changes in load. The control system includes a neutron flux control circuit, and a separate variable gain power regulator that provides a constant voltage output to the load. The neutron flux control circuit compares the actual neutron flux to a linear function of current supplied by the thermionic converter of the reactor, and uses any difference as an error signal that drives a mechanism which alters the neutron flux. The variable gain regulator always draws enough current from the thermionic converter to supply the load with a constant voltage. Block diagrams of the system are shown.
A thermoelectric power system is described which is particularly adaptable for use in outer space. A nuclear reactor heats a working fluid, which in turn supplies heat to a plurality of thermoelectric generators spaced about a ring-shaped support. A first heat pipe is employed to couple heat between the hot fluid and hot junction of the thermoelectric element of each generator, and a second heat pipe couples heat away from the cold junction of each thermoelectric element. Each of the second heat pipes are elongated flexible units adapted to be folded upon launch and thereafter extended in space to provide a substantial area for the radiation of heat to be discharged.

Official Gazette of the U.S. Patent Office

A pyrolysis system and process for recovering energy from solid waste and other feedstocks containing hydrocarbons such as coal, asphalt, naphtha, cheap crude oils, etc. is described. The process is comprised of the following steps: continuously feeding the feedstock into a pyrolyzer for pyrolysis and gasification; continuously circulating a hot heat transfer agent through the pyrolyzer for promoting pyrolysis and gasification by direct contact with the feedstock; and removing the pyrolysis gases from the pyrolyzer for further energy treatment and use.
ZINC-HALIDE BATTERY WITH MOLTEN ELECTROLYTE Patent

An electrochemical cell is described which uses zinc and either chlorine or bromine as the primary reactants, with a molten, nonaqueous zinc halide electrolyte. During charging of the cell, growth of dendrites on the zinc electrode is controlled by operating the cell continuously or intermittently at a temperature above the melting point of zinc, thereby positively preventing such growth; or by operating at such temperature that incipient dendrites are melted by heat generated by the charging current. That current may be intermittently increased to insure such dendrite control. In a large battery of cells utilizing chlorine as the halogen, excess halogen gas developed during charging of the battery is compressed and liquefied to facilitate external storage, and a large portion of the energy required for compression is recovered upon expansion of the gas during battery discharge.

SOLAR PHOTOLYSIS OF WATER Patent Application

Hydrogen is produced by the solar photolysis of water in a photooxidation vessel in the presence of a water soluble photooxidizable reagent and an insoluble hydrogen recombination catalyst. Simultaneously oxygen is produced in a photoreduction reactor in the presence of an insoluble photoreduction reagent catalyst. When spent, the solution from the first reactor is fed into the second reactor. A reaction occurs in the dark in which the redox reagents are regenerated, and the regenerated photooxidation reagent solution is recycled to the first reactor. The photooxidation reagent is preferably a europium salt, and the associated hydrogen recombination catalyst is a material such as platinum supported on glass beads. The photoreduction catalyst is a bifunctional reagent catalyst including a transition metal salt such as manganese oxychloride covalently bonded to the surface of a high area support such as glass fibers, together with a hydroxyl or chlorohydroxyl decomposition catalyst of high area.

A MOUNT FOR CONTINUOUSLY ORIENTING A COLLECTOR DISH IN A SYSTEM ADAPTED TO PERFORM BOTH DIURNAL AND SEASONAL SOLAR TRACKING Patent Application

The mount is characterized by a rigid, angulated axle having a linear midportion supporting a collector dish, and oppositely extended end portions normally related to the midportion of the axle and received in spaced journals. The longitudinal axis of symmetry for the midportion of the axle is coincident with a diurnal axis paralleling the earth's polar axis. Drive means are provided for periodically displacing the axle about the diurnal axis at a substantially constant rate, while other drive means are provided for periodically indexing the dish through 1 deg about the seasonal axis, once during each of the earth's successive rotations about its polar axis. The position of the dish relative to the axle is thus varied for accommodating seasonal tracking as changes in the angle of inclination of the polar axis occur.
Flexible Formulated Plastic Separators for Alkaline Batteries Patent Application


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

SOLAR HYDROGEN GENERATOR Patent Application

Daniel I. Sebacher and Alexander P. Sabol, inventors (to NASA) Filed 24 Mar. 1976 1 p

An apparatus is disclosed for using solar energy to decompose water molecules into hydrogen and oxygen molecules. Solar energy is concentrated on a globe containing water thereby heating the water to its dissociation temperature. The globe is pervious to hydrogen molecules permitting them to pass through the globe while being essentially impervious to oxygen molecules. The hydrogen molecules are collected after passing through the globe and the oxygen molecules are removed from the globe.

INDICATOR PROVIDING CONTINUOUS INDICATION OF THE PRESENCE OF A SPECIFIC POLLUTANT IN AIR Patent

Charles G. Miller (JPL) and Ralph E. Bartera, inventors (to NASA) Filed 7 Nov. 1974 5 p

A continuous HCI in-air indicator was developed which consists of a tube-like element with an inlet end through which a continuous stream of air containing HCI enters. The air flows downstream from the inlet end and exits the element's outlet end. Positioned between the element's inlet and outlet ends are first and second spaced apart photoelectric units, which are preferably positioned adjacent the inlet and outlet ends, respectively. Ammonia gas is injected into the air flowing through the element, at a position between the two photoelectric units. The ammonia gas reacts with the HCI in the air to form ammonium chloride particles. The difference between the outputs of the two photoelectric units is an indication of the amount of HCI in the air stream.
Includes weather forecasting and modification.

**AUTOMATED SINGLE-SLIDE STAINING DEVICE** Patent Application
Judd R. Wilkins and Stacey M. Mills, inventors (to NASA) Filed 29 Oct. 1975 18 p

A simple apparatus and method is disclosed for making individual single Gram stains on bacteria inoculated slides to assist in classifying bacteria in the laboratory as Gram-positive or Gram-negative. The apparatus involves positioning a single inoculated slide in a stationary position and thereafter automatically and sequentially flooding the slide with increments of a primary stain, a mordant, a decolorizer, a counterstain and a wash solution in a sequential manner.
N76-14757* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

MEDICAL SUBJECT MONITORING SYSTEMS Patent

Medical monitoring systems allowing the monitored subject freedom of movement are described. The outputs of the sensors are suitably amplified and conditioned to provide the necessary voltage levels for the multiplexers in the analog-to-digital (A/D) converters. The measured phenomena are displayed at a remote monitoring and control station. The entire system includes a bio-belt linked by optically coupled transmission and reception links to a data acquisition unit (DUA) having a central station function of controlling and displaying the output from the bio-belt.

Official Gazette of the U.S. Patent Office

N76-19785* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.

THERAPEUTIC HAND EXERCISER Patent

A cyclic therapeutic hand exerciser based on inflation and deflation of structural members is described. A straightening and a bending motion is imparted to the fingers as air pressure inflates a splint-like upper member. The fingers are then straightened and upon deflation of the splint-like member and inflation of a wrist pouch a flap is tightened pulling the fingertips down and curling the fingers in toward the palm.

Official Gazette of the U.S. Patent Office
54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

N76-13770*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
EMERGENCY DESCENT DEVICE Patent Application
Robert R. Selew, inventor (to NASA) Filed 16 Oct. 1975 17 p
A descent device is provided for emergency descent from tall structures and for lowering objects from high elevations such as a hovering helicopter. The device includes a rotating spool having a cable wound thereon for descent and a rotation-retarding vane member which rotates in a fluid cylinder. An adjustable bypass is provided for the fluid as the vane member rotates therein so that the speed of descent can be adjustably controlled.

N76-15792*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HIGH VISIBILITY AIR SEA RESCUE PANEL Patent Application
Jack Naimer and Mathew I. Radnofsky, inventors (to NASA) Filed 17 Dec. 1975 10 p
A system for air sea rescue utilizing a thin film, large area, easily deployable, highly visible, buoyant panel which is formed of a substrate having a specific gravity less than sea water and impregnated with a brilliant fluorescent pigment is described. The panel may be accordion folded for compactness and ease of deployment, may have an inflatable periphery to enhance deployment, rigidity, and buoyancy and may include means for attachment to a flotation device.
A percutaneous connector device for facilitating the passage of electrical signals from an external source through the skin of a patient to internal portions of the body such as muscles and nerves is described. The connector device includes a bio-compatible shell having an enlarged disk shaped portion for being implanted below the skin of the patient. The shell has a first and second electrically conductive post upon which a plug means can be readily connected and disconnected. A modified form of the invention utilizes a unipolar connector that is adapted to be plugged into a shell implanted below the skin of a patient. Both of the connector devices are designed so as to be separated when a predetermined force is applied to the implanted bio-compatible shell.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see 33 Electronics and Electrical Engineering.

N76-13781* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

BINARY TO BINARY CODED DECIMAL CONVERTER Patent
Application

A converter is described in which a binary coded input signal is converted to a binary coded decimal signal having N decades by employing N four bit shift registers. The bits of the input signal are sequentially supplied, in order, to the least significant position of the register for the units decade, with the most significant bit of the input signal being applied to the units register first. Each of the registers includes a right shift-parallel load mode control input terminal. In response to the sum of the values stored in each register and the binary value 0011 being less than the binary value 1000, the mode control input terminal is activated to shift the register contents one bit to the right. In response to the sum being greater than 1000, the mode control input terminal is activated to load the sum into the register. A binary one is loaded into the least significant bit position of the register for the adjacent higher decade in response to the sum being greater than 1000.
A priority interrupt system is described. In the system, designed to accommodate up to n interrupts of different priority levels, each of the registers is of n bits, with the orders of the bits in the registers corresponding to the priority levels of the different interrupts. The highest order set bit in the push pop register indicates the priority level of the interrupt for which a subroutine is executed. Any lower order set bit indicates in priority level of an interrupt for which a subroutine was previously started and interrupted to service a subsequently received interrupt of a higher priority level. The subroutines are structured so that when a subroutine is completed the highest order set bit in the push pop register is reset and the controlled computer automatically returns to complete the subroutine associated with the next highest order set bit in the push pop register.

Two-dimensional digital computers and computer devices are operated in parallel on rectangular arrays of digital radiant energy optical signal elements which are arranged in ordered rows and columns. Logic gate devices receive two input arrays and provide an output array having digital states dependent only on the digital states of the signal elements of the two input arrays at corresponding row and column positions. The logic devices include and array of photoconductors responsive to at least one of the input arrays for either selectively accelerating electrons to a phosphor output surface, applying potentials to an electroluminescent output layer, exciting an array of discrete radiant energy sources, or exciting a liquid crystal to influence crystal transparency or reflectivity.
A system is described for sharing a memory in a fault-tolerant computer. The memory is under the direct control and monitoring of error detecting and error diagnostic units in the fault-tolerant computer. This computer verifies that data to and from the memory is legally encoded and verifies that words read from the memory at a desired address are, in fact, actually delivered from that desired address. The means are provided for a second processor, which is independent of the direct control and monitoring of the error checking and diagnostic units of the fault-tolerant computer, and to share the memory of the fault-tolerant computer. Circuitry is included to verify that: (1) the processor has properly accessed a desired memory location in the memory; (2) a data word read out from the memory is properly coded; and (3) no inactive memory was erroneously outputting data onto the shared memory bus.

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

Includes sound generation, transmission and attenuation.

For noise pollution see 45 Environment Pollution.

N76-19888*# National Aeronautics and Space Administration. Pasadena Office, Calif.

ACOUSTIC ENERGY SHAPING Patent Application
Taylor G. Wang (JPL) and Daniel D. Elleman, inventors (to NASA) (JPL) Filed 13 Feb. 1976 10 p
(Contract NAS7-100)
(NASA-Case-NPO-13802-1; US-Patent-Appl-SN-658133) Avail: NTIS HC $3.50 CSCL 20A

A suspended mass is shaped by melting all or a selected portion of the mass and applying acoustic energy in varying amounts to different portions of the mass. In one technique for forming an optical waveguide slug, a mass of oval section is suspended and only a portion along the middle of the cross-section is heated to a largely fluid consistency. Acoustic energy is applied to opposite edges of the oval mass to press the unheated opposite edge portions together so as to form bulges at the middle of the mass. In another technique for forming a ribbon of silicon for constructing solar cells, a cylindrical thread of silicon is drawn from a molten mass of silicon, and acoustic energy is applied to opposite sides of the molten thread to flatten it into a ribbon.

DEUTERIUM PASS THROUGH TARGET Patent
Donald L Alger, inventor (to NASA) Issued 2 Dec. 1975 7 p
Filed 27 Aug. 1974 Supersedes N74-32719 (12 - 22. p 2672)

A neutron emitting target for use in neutron generating apparatus including a deuteron source and an accelerator vacuum chamber, comprised of a tritium-containing target layer, a deuteron accumulation layer, and a target support containing passages providing communication between the accumulation layer and portions of the surface of the support exposed to the accelerator vacuum chamber is described. With this arrangement, deuterons passing through the target layer and implanting in and diffusing through the accumulation layer, diffuse into the communicating passages and are returned to the accelerator vacuum chamber. Continuous removal of deuterons from the target in conventional water cooled neutron generating apparatus is provided. Preferably, the target is provided with thin barrier layers to prevent undesirable tritium diffusion out of the target layer, as well as deuteron diffusion into the target layer.

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72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N76-15860* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

74 OPTICS

Includes light phenomena.

N76-13909*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

PROJECTION SYSTEM FOR DISPLAY OF PARALLAX AND PERSPECTIVE Patent Application
Robert L. Kurtz, inventor (to NASA) Filed 6 Nov. 1975 9 p

A projection system for the display of parallax and perspective of a three-dimensional image on a two-dimensional screen using holography was described. The system consists in projecting a reference beam in a sequence of several projections at selected angles of perspective through the hologram; the resulting images from the hologram are directed onto a mirror which is coordinately
titled to reflect them onto a screen where they appear as a single three-dimensional image.

APPARATUS FOR SIMULATING OPTICAL TRANSMISSION LINKS Patent
Michael W. Fitzmaurice and Mona Tycz, inventors (to NASA)

A space-to-space or space-to-earth optical transmission link is simulated by positioning a linear optical modulator between an optical carrier source and a receiver for the carrier. The optical modulator is driven by an analog signal having random variations indicative of characteristics of the transmission link, as derived from an analog computer circuit. The analog computer circuit is responsive to a Gaussian random analog source. For space-to-space transmission, transmitter pointing jitter is a dominant noise source and is simulated by deriving a beta statistical variation from the analog computer. For space-to-earth transmission, atmospheric scintillation is a dominant noise source and is simulated by driving the modulator with one of (1) a log normal, (2) Rayleigh, or (3) Ricean output of the analog computer circuit.

ELECTRONIC OPTICAL TRANSFER FUNCTION ANALYZER Patent
Edwin E. Klingman, III, inventor (to NASA)

An image dissector tube is reported whose positioning coils serve as an image element addressing means. The system is usable with any optical system including visible light, other electromagnetic radiation or charged particles (ion or electrons) so long as the image dissection means is responsive to the beam in question. The optical system under test produces a real image at the image dissection surface of the image dissector means in order for readily evaluable data to be obtained. The entire system is preferably computer controlled in order to obtain the necessary data quickly and accurately and to calculate the optical transfer function of the optical system under test on line. With this system both the modulation transfer function and the phase transfer function may be calculated. The digital computer can control the analyzer in any of several modes.

OPTICAL CONVERSION METHOD Patent Application
William E. Perry, inventor (to NASA) Filed 21 Jan. 1976 15 p
(NASA-Case-MSC-12618-1; US-Patent-Appl-SN-651007) Avail: NRS HC $3.50 CSCL 20F

A method for converting an optical system is described which employs an electrooptic device in conjunction with a pair of crossed polarizing devices between an activated mode and a deactivated mode. The optical system may be used as a neutral density filter, a selective color filter, or a light shutter, as applied to a television camera. The electrooptic device and the polarizing analyzer are fixed with respect to the television camera, and the first polarizing device is selectively positioned in, or removed from, the optical path of the optical system to activate or deactivate it. Where the optical system is used as a selective color filter to produce light beams of alternating colors in a field sequential color television system, deactivation of the optical system renders the television a black-and-white system.

Lyndon B. Johnson Space Center, Houston, Tex.

OPTICAL CONVERSION METHOD Patent Application
A method and apparatus is described for determining the density of a reference gas in an unknown gas. The apparatus is comprised of:

1. A chamber for containing a gas including a reference gas at a known partial density.
2. A chamber for containing a gas including a sample of the reference gas at an unknown partial density.
3. A source of radiant energy.
4. A chopper wheel comprised of gas cells containing a sample of the reference gas and gas cells containing a gas excluding the reference gas.

The path length of the radiant energy in the chambers is modulated and the radiant energy and the position of the chopper cells with respect to the radiant energy path are sensed providing a signal proportional to the density of the reference gas in the unknown gas sample.
the narrow end of the coil are beads which are engaged by the plasma to be accelerated to hypervelocities for simulating meteoroids.

Official Gazette of the U.S. Patent Office

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A METHOD AND APPARATUS FOR CONTINUOUSLY PROCESSING A SINGLE CRYSTALLINE RIBBON IN A REDUCED GRAVITY ENVIRONMENT

Patent Application

Hans U. Walter, inventor (to NASA) (Ala. Univ., Huntsville) Filed 10 Nov. 1975 14 p

Sponsored by NASA


A method and apparatus is described for continuously producing an uncontaminated single crystalline sheet of material of a controlled thickness having substantially optically flat surfaces. The method is performed in a reduced gravitational environment, such as outer space. A polycrystalline sheet of material is fed through a chamber with a heating element which progressively melts a transverse strip of the material as it is moved through the chamber. A single crystalline seed is positioned closely adjacent the molten zone for transforming the polycrystalline material into a single crystalline foil. The heating element has curved ends and terminates short of the opposed edges of the polycrystalline sheet.

NASA

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Trap densities in dielectric films are determined by tunnel injection measurements when the film is incorporated in an insulated-gate field effect transistor. Under applied bias to the transistor gate, carriers (electrons or holes) tunnel into traps in the dielectric film. The resulting space charge tends to change channel conductance. By feeding back a signal from the source contact to the gate electrode, channel conductance is held constant, and by recording the gate voltage as a function of time, trap density can be determined as a function of distance from the dielectric-semiconductor interface. The process is repeated with the gate bias voltage at different levels in order to determine the energy distribution of traps as a function of distance from the interface.

Official Gazette of the U.S. Patent Office
Section 1 - Abstracts

This bibliography is issued in two sections: Section 1 - Abstracts, and Section 2 - Indexes. This issue of the Abstract Section cites 200 patents and applications for patent introduced into the NASA scientific and technical information system during the period of January 1976 through June 1976. Each entry in the Abstract Section consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or application for patent. This issue of the Index Section contains entries for 2994 patent and application for patent citations covering the period May 1969 through June 1976. The Index Section contains five indexes — subject, inventor, source, number and accession number.
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