NASA PATENT ABSTRACTS BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY

Section 1 • Abstracts

JULY 1984

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
### ACCESSION NUMBER RANGES

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Annotated references to NASA-owned inventions covered by U.S. patents and applications for patent that were announced in *Scientific and Technical Aerospace Reports (STAR)* between January 1984 and June 1984.
This supplement is available as NTISUB/111/093 from the National Technical Information Service (NTIS), Springfield, Virginia 22161 at the price of $10.00 domestic; $20.00 foreign for standing orders. Please note: Standing orders are subscriptions which do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.
INTRODUCTION

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

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

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

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

The 102 citations published in this issue of the Abstract Section cover the period January 1984 through June 1984. The Index Section references over 4300 citations covering the period May 1969 through June 1984.

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 are depicted in the Typical Citation and Abstract reproduced on the following page and are also used in the indexes.
A cooling fluid is injected into a hot flowing gas through a passageway in a wall which contains and is subject to the hot gas. The passageway is slanted in a downstream direction at an acute angle to the wall. A cusp shape is provided in the passageway to generate vortices in the injected cooling fluid thereby reducing the energy extracted from the hot gas for that purpose. The cusp shape increases both film cooling effectiveness and wall area coverage. The cusp may be at either the downstream or upstream side of the passageway, the former substantially eliminating flow separation of the cooling fluid from the wall immediately downstream of the passageway.
INDEX SECTION (SECTION 2)

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

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

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

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

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

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

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

HOW TO USE THIS PUBLICATION TO IDENTIFY NASA INVENTIONS

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

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

2. **Using Subject Index:** To identify all NASA inventions listed under a desired technical subject index term, (A) turn to the cumulative Subject Index in the Index Section and find the invention(s) listed under the desired technical subject term. (B) Note the indicated Accession Number and the Subject Category Number. (C) Using the indicated Accession Number, turn to the inside front cover of the Index Section to determine which issue of the Abstract Section includes the Accession Number desired. (D) To find the abstract of the particular invention in the issue of the Abstract Section selected, (i) use the Subject Category Number to locate the Subject Category and (ii) use the Accession Number to locate the desired invention within the Subject Category listing.

3. **Using Patent Classification Index:** To identify all inventions covered by issued NASA patents (does not include applications for patent) within a desired Patent Classification, (A) turn to the Patent Classification Number in the Number Index of Section 2 and find the associated invention(s), and (B) follow the instructions outlined in (2)(B), and (D) above.
PUBLIC AVAILABILITY OF COPIES OF PATENTS AND PATENT APPLICATIONS

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

NASA patent application specifications are sold in paper copy by the National Technical Information Service at price code A02 ($7.00 domestic; $14.00 foreign). Microfiche are sold at price code A01 ($4.50 domestic; $9.00 foreign). The US-Patent-Appl-SN-number should be used in ordering either paper copy or microfiche from NTIS.

LICENSES FOR COMMERCIAL USE: INQUIRIES AND APPLICATIONS FOR LICENSE

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

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

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

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION

14 CFR Part 1245

Licensing of NASA Inventions

AGENCY: National Aeronautics and Space Administration.

ACTION: Interim regulation with comments requested.

SUMMARY: The National Aeronautics and Space Administration (NASA) is revising its patent licensing regulations to conform with Pub L. 96-517. This interim regulation provides policies and procedures applicable to the licensing of federally owned inventions in the custody of the National Aeronautics and Space Administration, and implements Pub L. 96-517. The object of this subpart is to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

EFFECTIVE DATE: July 1, 1981. Comments must be received in writing by December 2, 1981. Unless a notice is published in the Federal Register after the comment period indicating changes to be made, this interim regulation shall become a final regulation.


FOR FURTHER INFORMATION CONTACT: Mr. John G. Mannix, (202) 755-3954.

SUPPLEMENTARY INFORMATION:

PART 1245—PATENTS AND OTHER INTELLECTUAL PROPERTY RIGHTS

Subpart 2 of Part 1245 is revised to read as follows:

Subpart 2—Licensing of NASA Inventions

Sec. 1245.200 Scope of subpart.
1245.201 Policy and objective.
1245.202 Definitions.
1245.203 Authority to grant licenses

Restrictions and Conditions
1245.204 All licenses granted under this subpart

Types of Licenses
1245.205 Nonexclusive licenses.
1245.206 Exclusive and partially exclusive licenses.

Procedures
1245.207 Application for a license.
1245.208 Processing applications.
1245.209 Notice to Attorney General.
1245.210 Modification and termination of licenses
1245.211 Appeals.
1245.212 Protection and administration of inventions.

1245.213 Transfer of custody
1245.214 Confidentiality of information.


Subpart 2—Licensing of NASA Inventions

§ 1245.200 Scope of subpart.

This subpart prescribes the terms, conditions, and procedures upon which a NASA invention may be licensed. It does not affect licenses which were in effect prior to July 1, 1981. (b) may exist at the time of the Government's acquisition of title to the invention, including those resulting from the allocation of rights to inventions made under Government research and development contracts. (c) are the result of an authorized exchange of rights in the settlement of patent disputes: or (d) are otherwise authorized by law or treaty.

§ 1245.201 Policy and objective.

It is the policy and objective of this subpart to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

§ 1245.202 Definitions.

(a) "Federally owned invention" means an invention, plant, or design which is covered by a patent, or patent application, plant variety protection, or other form of protection in a foreign country, to which NASA maintains custody and administration, in whole or in part, of the right, title or interest in such invention on behalf of the United States Government.

(b) "Federal agency" means an executive department, military department, Government corporation, or independent establishment, except the Tennessee Valley Authority, which has custody of a Federally owned invention.

(c) "NASA Invention" means a Federally owned invention with respect to which NASA maintains custody and administration, in whole or in part, of the right, title or interest in such invention on behalf of the United States Government.

(d) "Small business firm" means a small business concern as defined at section 2 of Pub L. 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration.

(e) "Practical application" means to manufacture in the case of a composition or product, to practice in the case of a process or method, or to operate in the case of a machine or system, and in each case, under such conditions as to establish that the invention is being utilized and that its benefits are to the extent permitted by law or Government regulations available to the public on reasonable terms.

(f) "United States" means the United States of America, its territories and possessions, the District of Columbia, and the Commonwealth of Puerto Rico.

§ 1245.203 Authority to grant licenses.

NASA inventions shall be made available for licensing as deemed appropriate in the public interest. NASA may grant nonexclusive, partially exclusive, or exclusive licenses thereto under this subpart on inventions in its custody.

Restrictions and Conditions

§ 1245.204 All licenses granted under this subpart.

(a) Restrictions. (1) A license may be granted only if the applicant has supplied NASA with a satisfactory plan for development or marketing of the invention, or both, and with information about the applicant's capability to fulfill the plan.

(2) A license granting rights to use or sell under a NASA invention in the United States shall normally be granted only to a licensee who agrees that any products embodying the invention or produced through the use of the invention will be manufactured substantially in the United States.

(b) Conditions. Licenses shall contain such terms and conditions as NASA determines are appropriate for the protection of the interests of the Federal Government and the public and are not in conflict with law or this subpart. The following terms and conditions apply to any license:

(1) The duration of the license shall be for a period specified in the license agreement, unless sooner terminated in accordance with this subpart.

(2) The license may be granted for all or less than all fields of use of the invention or in specified geographical areas or both.

(3) The license may extend to subsidiaries of the licensee or other parties if provided for in the license but shall be nonassignable without approval of NASA, except to the successor of that part of the licensee's business to which the invention pertains.

(4) The license may provide the licensee the right to grant sublicenses under the license, subject to the approval of NASA. Each sublicense shall make reference to the license, including the rights retained by the Government, and a copy of such
sublicense shall be furnished to NASA.
(5) The license shall require the
licensee to carry out the plan for
development or marketing of the
invention, or both, to bring the invention
to practical application within a period
specified in the license, and to continue
to make the benefits of the invention
reasonably accessible to the public.
(6) The license shall require the
licensee to report periodically on the
utilization or efforts at obtaining
utilization that are being made by the
licensee, with particular reference to the
plan submitted.
(7) All licenses shall normally require
royalties or other consideration.
(8) Where an agreement is obtained
pursuant to § 1245.204(a)(2) that any
products embodying the invention or
produced through use of the invention
will be manufactured substantially in
the United States, the license shall recite
such agreement.
(9) The license shall provide for the
right of NASA to terminate the license,
in whole or in part, if:
(i) NASA determines that the licensee
is not executing the plan submitted
with its request for a license and the licensee
cannot otherwise demonstrate to the
satisfaction of NASA that it has taken or
can be expected to take within a
reasonable time effective steps to
achieve practical application of the
invention;
(ii) NASA determines that such action
is necessary to meet requirements for
public use specified by Federal
regulations issued after the date of the
license and such requirements are not
reasonably satisfied by the licensee;
(iii) The licensee has willfully made a
false statement of or willfully omitted a
material fact in the license application
or in any report required by the license
agreement; or
(iv) The licensee commits a
substantial breach of a covenant or
agreement contained in the license.
(10) The license may be modified or
terminated, consistent with this subpart,
upon mutual agreement of NASA and the
licensee.
(11) Nothing relating to the grant of a
license, nor the grant itself, shall be
construed to confer upon any person
any immunity from or defenses under
the antitrust laws or from a charge of
patent misuse, and the acquisition and
use of rights pursuant to this subpart
shall not be immunized from the
operation of state or Federal law by
reason of the source of the grant.

Types of Licenses
§ 1245.205 Nonexclusive licenses.
(a) Availability of licenses.
Nonexclusive licenses may be granted
under NASA inventions without
publication of availability or notice of a
prospective license.
(b) Conditions. In addition to the
provisions of § 1245.204, the
nonexclusive license may also provide
that, after termination of a period
specified in the license agreement,
NASA may restrict the license to the
fields of use or geographic areas, or
both, in which the licensee has brought
the invention to practical application and
continues to make the benefits of the
invention reasonably accessible to
the public. However, such restriction
shall be made only in order to grant an
exclusive or partially exclusive license
in accordance with this subpart.
§ 1245.206 Exclusive and partially
exclusive licenses.
(a) Domestic licenses.
(1) Availability of licenses. Exclusive
or partially exclusive licenses may be
granted on NASA inventions:
(i) 3 months after notice of the
invention's availability has been
published in the Federal Register;
or
(ii) without such notice where NASA
determines that expeditious
granting of such a license
will best serve the interests of the
Federal Government and the public;
and
(iii) in either situation, specified in
(a)(1)(i) or (ii) of this section only:
(A) Notice of a prospective license,
identifying the invention and the
prospective licensee, has been
published in the Federal Register;
providing
opportunity for filing written objections
within a 60-day period;
(B) After expiration of the period in
§ 1245.206(a)(1)(iii)(A) and
consideration of any written objections
received during the period, NASA has
determined that:
(1) The interests of the Federal
Government and the public will best be
served by the proposed license, in view of
the applicant's intentions, plans, and
ability to bring the invention to practical
application or otherwise promote the
invention's utilization by the public;
(2) The desired practical application
has not been achieved, or is not likely
expeditiously to be achieved, under any
nonexclusive license which has been
granted, or which may be granted, on
the invention;
(3) Exclusive or partially exclusive
licensing is a reasonable and necessary
incentive to call forth the investment of
risk capital and expenditures to bring
the invention to practical application or
otherwise promote the invention's
utilization by the public; and
(4) The proposed terms and scope of
exclusive activity are not greater than
reasonably necessary to provide the
incentive for bringing the invention to
practical application or otherwise
promote the invention's utilization by the
public;
(C) NASA has not determined that
the grant of such license will tend
substantially to lessen competition or
result in undue concentration in any
section of the country in any line of
commerce to which the technology to be
licensed relates, or to create or maintain
other situations inconsistent with the
antitrust laws; and
(D) NASA has given first preference
to any small business firms submitting
plans that are determined by the agency
to be within the capabilities of the firms
and as equally likely, if executed, to
bring the invention to practical
application as any plans submitted by
applicants that are not small business
firms.
(2) Conditions. In addition to the
provisions of § 1245.204, the following
terms and conditions apply to domestic
exclusive and partially exclusive licenses:
(i) The license shall be subject to the
irrevocable, royalty-free right of the
Government of the United States to
practice and have practiced the
invention on behalf of the United States
and on behalf of any foreign government
or international organization pursuant to
any existing or future treaty or
agreement with the United States.
(ii) The license shall reserve to NASA
the right to require the licensee to grant
sublicenses to responsible applicants,
for a reasonable term, and as equally likely,
if executed, to fulfill health or safety needs.
(iii) The license shall be subject to any
licenses in force at the time of the grant
of the exclusive or partially exclusive
license.
(iv) The license may grant the licensee
the right of enforcement of the licensed
patent pursuant to the provisions of
Chapter 29 of Title 35, United States
Code, or other statutes, as determined
appropriate in the public interest.
(b) Foreign licenses.
(1) Availability of licenses. Exclusive
or partially exclusive licenses may be
granted on a NASA invention covered
by a foreign patent, patent application,
or other form of protection, provided
that:
(A) Notice of a prospective license,
identifying the invention and
prospective licensee, has been published in
the Federal Register, providing
opportunity for filing written objections
within a 60-day period and following consideration of such objections;

(ii) NASA has considered whether the interest of the Federal Government or United States industry in foreign commerce will be enhanced; and

(iii) NASA has not determined that the grant of such license will tend substantially to lessen competition or result in undue concentration in any section of the United States in any line of commerce to which the technology to be licensed relates, or to create or maintain other situations inconsistent with antitrust laws.

(2) Conditions. In addition to the provisions of §1245.204, the following terms and conditions apply to foreign exclusive and partially exclusive licenses:

(i) The license shall be subject to the irrevocable, royalty-free right of the Government of the United States to practice and have practiced the invention on behalf of the United States and on behalf of any foreign government or international organization pursuant to any existing or future treaty or agreement with the United States.

(ii) The license shall be subject to any licenses in force at the time of the grant of the exclusive or partially exclusive license.

(iii) The license may grant the licensee the right to take any suitable and necessary actions to protect the licensed property, on behalf of the Federal Government.

(c) Record of determinations. NASA shall maintain a record of determinations to grant exclusive or partially exclusive licenses.

Procedures

§ 1245.207 Application for a license.

An application for a license should be addressed to the Patent Counsel at the NASA installation having responsibility for the invention and shall normally include:

(a) Identification of the invention for which the license is desired, including the patent application serial number or patent number, tile, and date, if known;

(b) Identification of the type of license for which the application is submitted;

(c) Name and address of the person, company, or organization applying for the license and the citizenship or place of incorporation of the applicant;

(d) Name, address, and telephone number of representative of applicant to whom correspondence should be sent;

(e) Nature and type of applicant’s business, identifying products or services which the applicant has successfully commercialized, and approximate number of applicant’s employees;

(f) Source of information concerning the availability of a license on the invention;

(g) A statement indicating whether applicant is a small business firm as defined in §1245.202(c);

(h) A detailed description of applicant’s plan for development or marketing of the invention, or both, which should include:

(1) A statement of the time, nature and amount of anticipated investment of capital and other resources which applicant believes will be required to bring the invention to practical application;

(2) A statement as to applicant’s capability and intention to fulfill the plan, including information regarding manufacturing, marketing, financial, and technical resources;

(3) A statement of the fields of use for which applicant intends to practice the invention; and

(4) A statement of the geographic areas in which applicant intends to manufacture any products embodying the invention and geographic areas where applicant intends to use or sell the invention, or both;

(i) Identification of licenses previously granted to applicant under Federally owned inventions;

(j) A statement containing applicant’s best knowledge of the extent to which the invention is being practiced by private industry or Government, or both, or is otherwise available commercially; and

(k) Any other information which applicant believes will support a determination to grant the license to applicant.

§ 1245.208 Processing applications.

(a) Applications for licenses will be initially reviewed by the Patent Counsel of the NASA installation having responsibility for the invention. The Patent Counsel shall make a preliminary recommendation to the Director of Licensing, NASA Headquarters, whether to: (1) grant the license as requested, (2) grant the license with modification after negotiation with the licensee, or (3) deny the license. The Director of Licensing shall review the preliminary recommendation of the Patent Counsel and make a final recommendation to the NASA Assistant General Counsel for Patent Matters. Such review and final recommendation may include, and be based on, any additional information obtained from applicant and other sources that the Patent Counsel and the Director of Licensing deem relevant to the license requested. The determination to grant or deny the license shall be made by the Assistant General Counsel for Patent Matters based on the final recommendation of the Director of Licensing.

(b) When notice of a prospective exclusive or partially exclusive license is published in the Federal Register in accordance with §1245.206(a)(1)(iii)(A) or §1245.206(b)(1)(i), any written objections received in response thereto will be considered by the Director of Licensing in making the final recommendation to the Assistant General Counsel for Patent Matters.

(c) If the requested license, including any negotiated modifications, is denied by the Assistant General Counsel for Patent Matters, the applicant may request reconsideration by filing a written request for reconsideration within 30 days after receiving notice of denial. This 30-day period may be extended for good cause.

(d) In addition to, or in lieu of requesting reconsideration, the applicant may also appeal the denial of the license in accordance with §1245.211.

§ 1245.209 Notice to Attorney General.

A copy of the notice provided for in §§1245.206(a)(1)(iii)(A), and 1245.206(b)(1)(i) will be sent to the Attorney General.

§ 1245.210 Modification and termination of licenses.

Before modifying or terminating a license, other than by mutual agreement, NASA shall furnish the licensee and any sublicensee of record a written notice of intention to modify or terminate the license, and the licensee and any sublicensee shall be allowed 30 days after such notice to remedy any breach of the license or show cause why the license should not be modified or terminated.

§ 1245.211 Appeals.

(a) The following parties may appeal to the NASA Administrator or designee any decision or determination concerning the grant, denial, interpretation, modification, or termination of a license:

(1) A person whose application for a license has been denied;

(2) A licensee whose license has been modified or terminated, in whole or in part; or

(3) A person who timely filed a written objection in response to the notice required by §§1245.206(a)(1)(iii)(A) or
1245.206(b)(1)(i) and who can demonstrate to the satisfaction of NASA that such person may be damaged by the Agency action.

(b) Written notice of appeal must be filed within 30 days (or such other time as may be authorized for good cause shown) after receiving notice of the adverse decision or determination; including, an adverse decision following the request for reconsideration under § 1245.208(c). The notice of appeal, along with all supporting documentation should be addressed to the Administrator, National Aeronautics and Space Administration, Washington, DC 20546. Should the appeal raise a genuine dispute over material facts, fact-finding will be conducted by the NASA Inventions and Contributions Board. The person filing the appeal shall be afforded an opportunity to be heard and to offer evidence in support of the appeal. The Chairperson of the Inventions and Contributions Board shall prepare written findings of fact and transmit them to the Administrator or designee. The decision on the appeal shall be made by the NASA Administrator or designee. There is no further right of administrative appeal from the decision of the Administrator or designee.

§ 1245.212 Protection and administration of inventions.

NASA may take any suitable and necessary steps to protect and administer rights to NASA inventions, either directly or through contract.

§ 1245.213 Transfer of custody.

NASA having custody of certain Federally owned inventions may transfer custody and administration in whole or in part, to another Federal agency, of the right, title, or interest in any such invention.

§ 1245.214 Confidentiality of information.

Title 35, United States Code, section 209, provides that any plan submitted pursuant to § 1245.207(h) and any report required by § 1245.204(b)(6) may be treated by NASA as commercial and financial information obtained from a person and privileged and confidential and not subject to disclosure under section 552 of Title 5 of the United States Code.

James M. Beggs,
Administrator.
October 15, 1981.

[FR Doc. 81-31609 Filed 10-30-81: 8:46 am]
BILLING CODE 7810-01-M

FOREIGN PATENT LICENSING REGULATIONS

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

Section 1 • Abstracts

## AERONAUTICS

Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also Astronautics:

<table>
<thead>
<tr>
<th>Section</th>
<th>01</th>
<th>02</th>
<th>03</th>
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<td>AERONAUTICS (GENERAL)</td>
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<td>AERODYNAMICS</td>
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<td>Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.</td>
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<td>For related information see also 34 Fluid Mechanics and Heat Transfer.</td>
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<td>AIR TRANSPORTATION AND SAFETY</td>
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<td>Includes passenger and cargo air transport operations; and aircraft accidents.</td>
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<td>For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.</td>
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<td>AIRCRAFT COMMUNICATIONS AND NAVIGATION</td>
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<td>Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.</td>
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<td>For related information see also 17 Spacecraft Communications, Command and Tracking and 32 Communications.</td>
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<td>Includes aircraft simulation technology.</td>
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<td>For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics.</td>
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<td>AIRCRAFT INSTRUMENTATION</td>
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<td>Includes cockpit and cabin display devices; and flight instruments.</td>
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<td>For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography.</td>
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<td>AIRCRAFT PROPULSION AND POWER</td>
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<td>Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.</td>
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<td>For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.</td>
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<td>AIRCRAFT STABILITY AND CONTROL</td>
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<td>Includes aircraft handling qualities; piloting; flight controls; and autopilots.</td>
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<td>RESEARCH AND SUPPORT FACILITIES (AIR)</td>
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<td>Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.</td>
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<td>For related information see also 14 Ground Support Systems and Facilities (Space).</td>
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## ASTRONAUTICS

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

For related information see also Aeronautics:

<table>
<thead>
<tr>
<th>Section</th>
<th>12</th>
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<td>Includes powered and free-flight trajectories; and orbit and launching dynamics.</td>
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<td>Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.</td>
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<td>For related information see also 09 Research and Support Facilities (Air).</td>
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<td>Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.</td>
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<td>For related information see also 03 Air Transportation and Safety and 85 Urban Technology and Transportation.</td>
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<td>Includes telemetry; space communications networks; astronavigation; and radio blackout.</td>
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<td>For related information see also 04 Aircraft Communications and Navigation and 32 Communications.</td>
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<td>Includes spacecraft thermal and environmental control; and attitude control.</td>
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<td>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.</td>
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<td>For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.</td>
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<td>Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.</td>
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<td>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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CHEMISTRY AND MATERIALS
Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

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

24 COMPOSITE MATERIALS 6
Includes laminates.

25 INORGANIC AND PHYSICAL
CHEMISTRY 7
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also 77 Thermodynamics and Statistical Physics.

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

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

28 PROPELLANTS AND FUELS N.A.
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

ENGINEERING
Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also Physics.

31 ENGINEERING (GENERAL) N.A.
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS N.A.
Includes land and global communications; communications theory; and optical communications.
For related information see also 04 Aircraft Communications and Navigation and 17 Spacecraft Communications, Command and Tracking.

33 ELECTRONICS AND ELECTRICAL
ENGINEERING 11
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminaturization; and integrated circuity.
For related information see also 60 Computer Operations and Hardware and 76 Solid-State Physics.

34 FLUID MECHANICS AND HEAT
TRANSFER 14
Includes boundary layers; hydrodynamics; fluids; mass transfer; and ablation cooling.
For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

35 INSTRUMENTATION AND
PHOTOGRAPHY 15
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For related photography see 43 Earth Resources. For related information see also 06 Aircraft Instrumentation and 19 Spacecraft Instrumentation.

36 LASERS AND MASERS 18
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING 20
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

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

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

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

42 GEOSCIENCES (GENERAL) N.A.

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

44 ENERGY PRODUCTION AND
CONVERSION 23
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 24
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

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

47 METEOROLOGY AND CLIMATOLOGY N.A.
Includes weather forecasting and modification.

48 OCEANOGRAPHY N.A.
Includes biological, dynamic and physical oceanography; and marine resources.
LIFE SCIENCES
Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) N.A.
Includes genetics.

52 AEROSPACE MEDICINE 25
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 25
Includes human engineering; biotechnology; and space suits and protective clothing.

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

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

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

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

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

62 COMPUTER SYSTEMS N.A.
Includes computer networks.

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

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

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

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

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

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

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

71 ACOUSTICS 26
Includes sound generation, transmission, and attenuation.
For noise pollution see 45 Environment Pollution.

72 ATOMIC AND MOLECULAR PHYSICS 28
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS 28
Includes elementary and nuclear particles; and reactor theory.
For space radiation see 93 Space Radiation.

74 OPTICS N.A.
Includes light phenomena.

75 PLASMA PHYSICS 29
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

76 SOLID-STATE PHYSICS 29
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 30
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

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

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

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

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

GENERAL
99 GENERAL N.A.

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

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

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

N84-11136* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

FAMILY OF AIRFOIL SHAPES FOR ROTATING BLADES Patent

An airfoil which has particular application to the blade or blades of rotor aircraft such as helicopters and aircraft propellers is described. The airfoil thickness distribution and camber are shaped to maintain a near zero pitching moment coefficient over a wide range of lift coefficients and provide a zero pitching moment coefficient at section Mach numbers near 0.80 and to increase the drag divergence Mach number resulting in superior aircraft performance.

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

N84-20495# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

WINGTIP VORTEX PROPELLER Patent Application

A device which increases the energy efficiency and aerodynamic properties of aircraft was developed. A wingtip pusher propeller is positioned aft of the wingtip to rotate in the crossflow of the wingtip vortex. The propeller rotates against the vortex swirl creating additional thrust from and attenuating the wingtip vortex by simultaneously extracting energy from the vortex and converting it to propeller blade-induced thrust. The propeller injects its high energy wake into the vortex axial flow to dissipate the vortex. The device increases aircraft fuel efficiency by simultaneously increasing thrust and decreasing vortex induced drag. By attenuating the vortex, safety to following aircraft is maximized.

N84-12092# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

GEOMETRIES FOR ROUGHNESS SHAPES IN LAMINAR FLOW Patent Application

A passive interface mechanism between upper and lower skin structures, and a leading edge structure of a laminar flow airfoil is described. The interface mechanism takes many shapes. All are designed to be different than the sharp orthogonal arrangement prevalent in the prior art. The shapes of the interface structures are generally of two types: steps away from the centerline of the airfoil with a sloping surface directed toward the trailing edge and, the other design has a gap before the sloping surface. By properly shaping the step, the critical step height is increased by more than 50% over the orthogonal edged step.
Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

**HIGH DYNAMIC GLOBAL POSITIONING SYSTEM RECEIVER**

Patent Application
(Contract NAS7-100)
Avail: NTIS HC A03/MF A01 CSCL 17G

A Global Positioning System (GPS) receiver having a number of channels, receives an aggregate of pseudorange code time division modulated signals. The aggregate is converted to baseband and then to digital form for separate processing in the separate channels. A fast Fourier transform processor computes the signal energy as a function of Doppler frequency for each correlation lag, and a range and frequency estimator computes estimates of pseudorange, and frequency. Raw estimates from all channels are used to estimate receiver position, velocity, clock offset and clock rate offset in a conventional navigation and control unit, and based on the total solution, that unit computes smoothed estimates, for the next measurement interval.

**MAGNETIC HEADING REFERENCE**

Patent

Devices are disclosed for vectorially summing two signals. In a first embodiment, the vectorial summation is implemented by a mechanical sin/cos mechanism in which a crank drives two linear potentiometers out of phase. In a second embodiment, a polarized light resolver generates the sin and cos functions. In a third embodiment, a printed circuit resolver generates the sin and cos functions.
06

AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

N84-20522*# National Aeronautics and Space Administration.
Langley Research Center, Hampton, Va.

AIRCRAFT CONTROL POSITION INDICATOR Patent Application
D. V. DENNIS, inventor (to NASA) 8 Feb. 1984 15 p
(NASA-CASE-LAR-12984-1; US-PATENT-APPL-SN-578387)
Avail: NTIS HC A02/MF A01 CSCL 01D

An aircraft control position indicator was provided that displayed
the degree of deflection of the primary flight control surfaces and
the manner in which the aircraft responded. The display included
a vertical elevator dot/bar graph meter display for indicating
whether the aircraft will pitch up or down, a horizontal aileron
dot/bar graph meter display for indicating whether the aircraft will
roll to the left or the right, and a horizontal rudder dot/bar graph
meter display for indicating whether the aircraft will turn left or
right. The vertical and horizontal display or displays intersect to
form an up/down, left/right type display. Internal electronic display
driver means received signals from transducers measuring the
control surface deflections and determined the position of the
meter indicators on each dot/bar graph meter display. The device
allows readability at a glance, easy visual perception in sunlight
or shade, near-zero lag in displaying flight control position, and is
not affected by gravitational or centrifugal forces.

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.

N84-12193*# National Aeronautics and Space Administration.
Ames Research Center, Moffett Field, Calif.

VISUAL ACCOMMODATION TRAINER-TESTER Patent Application
R. J. RANDLE, JR., inventor (to NASA) 12 Aug. 1983 20 p
(NASA-CASE-ARC-11426-1; US-PATENT-APPL-SN-526741)
Avail: NTIS HC A02/MF A01 CSCL 14B

An apparatus for training of the human visual accommodation
system is presented, specifically, useful for training a person to
voluntarily control his focus to his far point (normally infinity) from
a position of myopia due to functional causes. The functional
causes could be due, for example, to a behavioral accommodative
spasm or the effects of an empty field. The device may also be
used to measure accommodation, the accommodation resting
position and the near and far points of vision.

N84-16221*# National Aeronautics and Space Administration.
Ames Research Center, Moffett Field, Calif.

SIMULATOR SCENE DISPLAY EVALUATION Patent Application
R. F. HAINES, inventor (to NASA) 22 Dec. 1983 15 p
(NASA-CASE-ARC-11504-1; US-PATENT-APPL-SN-565481)
Avail: NTIS HC A02/MF A01 CSCL 14B

An apparatus for aligning and calibrating scene displays in an
aircraft simulator has a base on which all of the instruments for
the aligning and calibrating are mounted. Laser directs beam at
double right prism which is attached to pivoting support on base.
The pivot point of the prism is located at the design eye point
(DEP) of simulator during aligning and calibrating. The objective
lens in the base is movable on a track to follow the laser beam
at different angles within the field of vision at the DEP. An eyepiece
and a precision dioptr are movable into a position behind the
prism during the scene evaluation. A photometer or illuminometer
is pivotable about the pivot into and out of position behind the
eyepiece.

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LAUNCH VEHICLES AND SPACE VEHICLES

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

N84-16231*# National Aeronautics and Space Administration.
Langley Research Center, Hampton, Va.

MISSILE ROLLING TAIL BRAKE TORQUE SYSTEM Patent
Apparatus for simulating varying levels of friction in the bearings of a free rolling tail afterbody on a canard-controlled missile to determine friction effects on aerodynamic control characteristics is described. A ring located between the missile body and the afterbody is utilized in a servo system to create varying levels of friction between the missile body and the afterbody to simulate bearing friction.

A collapsible-expandable truss structure is disclosed which includes two space surface truss layers with an attached core layer. The surface truss layers are composed of several linear struts arranged in multiple triangular configurations. Each linear strut is hinged at its center and hingedly connected at each end to a nodular joint. A passive spring serves as the expansion force to move the folded struts from a stowed collapsed position to a deployed operative final truss configuration. A damper controls the rate of spring expansion for synchronized deployment of the truss as the folded configuration is released for deployment by restraint belts that synchronously extend under the control of motor driven spools.

A device for fastening a temporary replacement heat shield tile to the strain isolation pad of a space vehicle is disclosed. An internally threaded, flanged cylinder is rotatably connected to a threaded brass plug through a flanged aluminum sleeve to form the device. The device is adhesively attached to the replacement tile before using. In using the device, the tile containing the device is placed against the strain isolation pad of the space vehicle such that the flanged portion of the flanged cylinder rests against the strain isolation pad. This flanged portion, which consists of a plurality of 'L' shaped blades, is then rotated into the strain isolation pad. The brass plus is then rotated with respect to the flanged stainless steel cylinder to draw the tile snugly against the strain isolation pad and thus complete the fastening process.

A dual structure aerospace vehicle has an aeroshell structure and an internally disposed separable and reusable integral tank/thrust structure. The tank/thrust structure is insulated for cryogenic fuels and the cavity within aeroshell is insulated from the tank/thrust structure. An internal support ring within the cavity serves as an attachment for lugs on the tank/thrust structure via double hinges. The aft end of tank/thrust structure is provided for synchronizing deployment of the truss as the folded configuration is released for deployment by restraint belts that synchronously extend under the control of motor driven spools.
with rocket engines and exit nozzles with a trunnion supporting the tank/thrust structure within the aeroshell.

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SPACECRAFT PROPULSION AND POWER

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


PROPELSION APPARATUS AND METHOD USING BOIL-OFF GAS FROM A CRYOGENIC LIQUID Patent Application
D. H. BLOUNT, inventor (to NASA) 14 Dec. 1983 12 p
(NASA-CASE-MFS-25946-1; US-PATENT-APPL-SN-561432)
Avail: NTIS HC A02/MF A01 CSCL 21H

The attitude and drag of a space vehicle are controlled by using the helium dewar which contains liquid helium for cooling an experiment package. The helium is heated or vented to keep the temperature between 1.5 and 1.7 degrees K to maintain helium boil-off gas adequate as a propellant without adversely affecting the experiment package which is contained in the helium dewar for protection from solar heating. The apparatus includes an auxiliary heater and a sensor for controlling the temperature of the helium. The boil-off gas propellant is delivered to thruster modules to control vehicle attitude and compensate for drag.

N84-16259* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Cali.

PROCESS FOR PREPARING PHTHALOCYANINE POLYMERS Patent Application
(NASA-CASE-ARC-11511-1; US-PATENT-APPL-SN-565482)
Avail: NTIS HC A02/MF A01 CSCL 07A

Imide linked bisphthalonitrile compounds are prepared by combining a dicyano aromatic diamine and an organic dihydride to produce an amic acid linked bisphthalonitrile compound. The amic acid linked bisphthalonitrile compound is dehydrocyclized to produce the imide linked bisphthalonitrile compounds. The imide linked bisphthalonitrile compounds are polymerized to produce a phthalocyanine polymer by heating the imide linked bisphthalonitrile compound, either alone or in the presence of a metal powder or a metal salt.
includes laminates.

N84-11213* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif. 

FLUOROETHER MODIFIED EPOXY COMPOSITES Patent
R. W. ROSSER (San Jose State Univ.) and M. S. TAYLOR, inventors (to NASA) (San Jose State Univ.) 18 Oct. 1983 5 p Filed 23 Dec. 1982 Supersedes N83-17603 (21 - 08, p 1145) 

Addition of controlled amounts of perfluorinated alkyl ether diacyl fluoride to epoxy resin systems prior to cure results in a formulation which, exhibits improved energy absorbing properties.

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

N84-11214* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

METAL MATRIX COMPOSITE STRUCTURAL PANEL CONSTRUCTION Patent

Lightweight capped honeycomb stiffeners for use in fabricating metal or matrix exterior structural panels on aerospace type vehicles and the process for fabricating same are disclosed. The stiffener stringers are formed in sheets, cut to the desired width and length and brazed in spaced relationship to a skin with the honeycomb material serving directly as the required lightweight stiffeners and not requiring separate metal encasement for the exposed honeycomb cells.

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

N84-15203# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ARC SPRAY FABRICATION OF METAL MATRIX COMPOSITE MONOTAPE Patent Application
Avail: NTIS HC A02/MF A01 CSCL 11D

Arc metal spraying is used to spray liquid metal onto an array of high strength fibers that have been previously wound onto a large drum contained inside a controlled atmosphere chamber. This chamber is first evacuated to remove gaseous contaminants and then backfilled with a neutral gas up to atmospheric pressure. This process is used to produce a large size metal matrix composite monotape.

Official Gazette of the U.S. Patent and Trademark Office
An oxidation resistant coating is produced on carbon-based materials, and the same processing step effects an infiltration of the substrate with silicon containing material. A slurry of nickel and silicon powders in a nitrocellulose lacquer is made, is sprayed onto the graphite or carbon-carbon substrate, and is sintered in vacuum to form a fused coating that wets and covers the surface as well as penetrates into the pores of the substrate. Optimum wetting and infiltration occurs in the range of Ni-60 w/o Si to Ni-90 w/o Si with deposited thicknesses of 25 to 100 mg/sq cm. Sintering temperatures of about 1200 C to about 1400 C are used, depending, on the melting point of the specific coating composition. The sintered coating results in Ni-Si intermetallic phases and SiC, both of which are highly oxidation resistant. The final coating composition can be further controlled by the length of the sintering time.
25 INORGANIC AND PHYSICAL CHEMISTRY

MICRONIZED COAL BURNER FACILITY Patent
N84-16276* National Aeronautics and Space Administration.
Lewis Research Center, Cleveland, Ohio.

A combustor or burner system in which the ash resulting from burning a coal in oil mixture is of submicron particle size is described. The burner system comprises a burner section, a flame exit nozzle, a fuel nozzle section, and an air tube by which preheated air is directed into the burner section. Regulated air pressure is delivered to a fuel nozzle. Means are provided for directing a mixture of coal particles and oil from a drum to a nozzle at a desired rate and pressure while means returns excess fuel to the fuel drum. Means provide for stable fuel pressure supply from the fuel pump to the fuel nozzle.

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26 METALLIC MATERIALS

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

CORROSION RESISTANT COATING Patent Application
S. K. KHANNA (JPL, California Inst. of Tech., Pasadena), A. THAKOOR (JPL, California Inst. of Tech., Pasadena), and R. M. WILLIAMS, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) 30 Sep. 1983 14 p (Contract NAS7-100)
N84-12289*# National Aeronautics and Space Administration.
Pasadena Office, Calif.

A highly corrosive resistant coating for substrates, such as glasses and metal is provided. Amorphous metals are deposited on the substrate by the magnetron sputtering process which is conducted at a very low pressure, such as two micrometers of mercury, to provide on the surface of the substrate a thin, uniformly thick, pinhole-free film of the metal.

NONMETALLIC MATERIALS

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

CRYSOCEN INSULATION STRENGTH AND BOND TESTER Patent Application
P. H. SCHUERER, J. H. EHL, and W. P. PRASTHOFER, inventors (to NASA) 3 Nov. 1983 21 p (Contract NAS7-100)
N84-11297*# National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.

A method and apparatus for testing the tensile strength and bonding strength of sprayed-on foam insulation attached to metal cryogenic fuel tanks is described. A circular cutter is used to cut the insulation down to the surface of the metal tank to form plugs of the insulation for testing ‘in situ’ on the tank. The apparatus comprises an electromechanical pulling device powered by a belt battery pack. The pulling device comprises a motor driving a mechanical pulling structure comprising a horizontal shaft
connected to two bell cracks which are connected to a central member. When the lower end of member is attached to a fitting, which in turn is bonded to a plug, a pulling force is exerted on the plug sufficient to rupture it. The force necessary to rupture the plug or pull it loose is displayed as a digital read-out on screen.

N84-12313* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

POLYMERS OF PHOSPHONYLMETHYL-2,4- AND -2,6-DIAMINO BENZENES AND THE LIKE Patent Application
(NASA-CASE-ARC-11506-1; US-PATENT-APPL-SN-522629)
Avail: NTIS HC A02/MF A01 CSCL 11G

Epoxy polymers resulting from the curing of epoxy materials with diamines such as m-phenylene diamine are deficient with respect to fire and heat resistance. A phosphonyl-methylbenzene is provided and polymerized with a monomer such as an epoxide, or a dihydride. The resulting polymers combine one or more properties of heat resistance, low flammability and high char yield with good mechanical properties such as high tensile strength.

N84-14322* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

ELASTOMER-MODIFIED PHOSPHORUS-CONTAINING IMIDE RESINS Patent
Avail: US Patent and Trademark Office CSCL 11G

Phosphine oxide-containing polyimide resins modified by elastomers, are disclosed which have improved mechanical properties. These products are particularly useful in the production of fiber or fabric-reinforced composites or laminates.

N84-14323* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

HOT MELT RECHARGE SYSTEM Patent
D. J. PROGAR, inventor (to NASA) 13 Dec. 1983 7 p Filed 24 Mar. 1982 Supersedes N82-26464 (20-17, p 2381)
Avail: US Patent and Trademark Office CSCL 11A

A package assembly is described for precisely positioning a charge of hot melt adhesive onto an attachment pad or point of use. The adhesive is heated to softening or melt temperature (280 F to 325 F) and thereafter cooled to resolidifying temperature. A single sided pressure-sensitive polyimide film tape serves with another film strip to protect a sandwiched adhesive strip until use and to hold the adhesive in precise position until thermally bonded to its point of use. Tab ends serve as aids in stripping tapes and from the adhesive charge.

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HEAT SEALABLE, FLAME AND ABRASION RESISTANT COATED FABRIC Patent
Avail: US Patent and Trademark Office CSCL 11G

Flame retardant, abrasion resistant elastomeric compositions are disclosed which are comprised of thermoplastic polyurethane polymer and flame retarding amounts of a filler selected from decabromodiphenylexoxide and antimony oxide in a 3:1 weight ratio, and decabromodiphenylhexoxide, antimony oxide, and ammonium phosphate in a 3:1:3 weight ratio respectively. Heat sealable coated fabrics employing such elastomeric compositions as coating film are produced by dissolving the elastomeric composition to form a solution, casting the solution onto a release paper and drying it to form an elastomeric film. The film is then bonded to a woven, knitted, or felted fabric.

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

N84-15271* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

HOT MELT RECHARGE SYSTEM Patent Application
D. J. PROGAR, inventor (to NASA) 26 Aug. 1983 11 p
(NASA-CASE-LAR-12881-2; US-PATENT-APPL-SN-526755)
Avail: NTIS HC A02/MF A01 CSCL 11A

A package assembly is described for precisely positioning a charge of hot melt adhesive onto an attachment pad or a point of use. The adhesive is heated to softening or melt temperature (280 F - 325 F) and thereafter cooled to resolidifying temperature. A single sided pressure sensitive polyimide film tape serves with another film strip to protect the sandwiched adhesive strip until use and to hold the adhesive in precise position until thermally
bonded to its point of use. Tab ends serve as aids in stripping tapes from the adhesive charge. NASA

form copolymers with bismaleimides which have good fire retardancy and decreased brittleness. The cure temperatures of the copolymers are substantially below the cure temperatures of the bismaleimides alone. Reinforced composites made from the cured copolymers are disclosed as well. NASA

DSC OF BISMALIMEIDE AND VST/BISMALIMEIDE COPOLYMERS

N84-16340*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMINE TERMINATED BISASPARTIMIDES, PROCESS FOR PREPARATION THEREOF, AND POLYMERS THEREOF Patent Application

Amine terminated bisaspartimides, especially 4,4 prime-bis (N(2)-4-(4-aminophenoxy) phenylaspartimido) diphenylmethane are prepared by a Michael-type reaction of an aromatic bismaleimide and an aromatic diamine in an aprotic solvent. These bisaspartimides are thermally polymerized to yield tough, resinous polymers crosslinked through -NH- groups. Such polymers are useful in applications requiring materials with resistance to change at elevated temperatures, e.g., as lightweight laminates with graphite cloth, molding material prepregs, adhesives and insulating material. NASA

N84-16341*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS FOR IMPROVING MOISTURE RESISTANCE OF EPOXY RESINS BY ADDITION OF CHROMIUM IONS Patent Application

A resin product useful as an adhesive, composite or casting resin and the process for its preparation are described which result in improved flexural strength mechanical property characteristics. This improved flexural strength is attained with little or no change in density, thermal stability or moisture resistance by chemically incorporating 1.2 to 10.6% by weight Co(III) ions in an epoxidized resin system. NASA

N84-20700*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS FOR IMPROVING MOISTURE RESISTANCE OF EPOXY RESINS BY ADDITION OF COBALT IONS Patent Application

A resin product useful as an adhesive, composite or casting resin and the process for its preparation are described which result in improved flexural strength mechanical property characteristics. This improved flexural strength is attained with little or no change in density, thermal stability or moisture resistance by chemically incorporating 1.2 to 10.6% by weight Co(III) ions in an epoxidized resin system. NASA

N84-20702*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIRE RESISTANT POLYMERS BASED ON 1-(DIALKOXYPHOSPHONYLMETHYL)-2,4- AND -2,6-DIAMINOBENZENES Patent Application
Diacylhalides are reacted with 1-(dialkoxy or di-haloalkoxyphosphonyl)methyl)-2,4- and 2,6- diamino benzenes to produce polyamides which have desirable heat and fire resistance properties.

**ELECTRONICS AND ELECTRICAL ENGINEERING**

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

**HYBRID POWER SEMICONDUCTOR SWITCH Patent Application**

D. Y. CHEN, inventor (to NASA) 30 Sep. 1983 11 p

The voltage rating of a bipolar transistor may be greatly extended while at the same time reducing its switching time by operating it in conjunction with FETs in a hybrid circuit. One FET is used to drive the bipolar transistor and an inductive load. Both FETs are turned on or off by a single drive signal of load power, the second FET upon ceasing conduction, rendering one power electrode of the bipolar transistor open. Means provided to dissipate currents which flow after the bipolar transistor is rendered nonconducting.

**ADDITIVE FOR ZINC ELECTRODES Patent**


A zinc electrode for alkaline cells includes up to about ten percent by weight of Ba(OH)2.8H2O with about five percent being preferred. The zinc electrode may or may not be amalgamated with mercury.

**ELECTRICAL SELF-ALIGNING CONNECTOR Patent**


A self-aligning electrical connector device includes a receptacle component having a conically contoured interior and a plug component having a correspondingly contoured conical body receivable in the receptacle component. The plug component has a number of spaced conductive ring elements with a mating face and the receptacle component includes corresponding spaced conductive ring elements providing mating interface with the mating face of the ring elements of the plug component when connected to it. Each ring element of the receptacle component has several segmented portions which deflect downwardly when the plug component is inserted. A biasing force is asserted against the face of the ring elements of the plug component providing positive

**33 ELECTRONIC AND ELECTRICAL ENGINEERING**

single input junction common to both stages. The network provides independent adjustment of center frequency, bandwidth and voltage gain. The insertion of a positive feedback loop between the stages provides a very narrow bandwidth network. The addition of back to back zener diodes between the common input node and ground converts the network into an oscillator.

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electrical contact and connection between the ring elements of the components.

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CONTROL SYSTEM FOR AN INDUCTION MOTOR WITH ENERGY RECOVERY Patent

A control circuit for an induction motor powered system is disclosed in which a power factor controlled servo loop is used to control, via the phase angle of firing of a triac, the power input to the motor, as a function of load placed on the motor by machinery of the powered system. Then, upon application of torque by this machinery to the motor, which tends to overspeed the motor, the firing angle of the triac is automatically set to a fixed, and relatively short, firing angle.

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

N84-16452* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LADDER SUPPORTED RING BAR CIRCUIT Patent

An improved slow wave circuit especially useful in backward wave oscillators includes a slow wave circuit in a waveguide. The slow wave circuit is comprised of rings disposed between and attached to respective stubs. The stubs are attached to opposing sidewalls of the waveguide. To the end that opposed, interacting magnetic fields will be established to provide a very high coupling impedance for the slow wave structure, axially orientated bars are connected between rings in alternate spaces and adjacent to the attachment points of stubs. Similarly, axial bars are connected between rings in the spaces which do not include bars and at points adjacent to the attachment of bars.

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

N84-15395*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
VIDEO PROCESSOR FOR AIR TRAFFIC CONTROL BEACON SYSTEM Patent Application
F. BYRNE, inventor (to NASA) 28 Sep. 1982 10 p

Avail: NTIS HC A02/01 MF A01 CSCL 09C
A circuit is disclosed for use in a transponder located in an aircraft or the like for identifying a true side lobe suppression signal being transmitted by a ground located transmitted system. The true side lobe suppression signal includes at least pulses P1 and P2. The circuit causes the transponder to produce a reply signal upon the amplitude of the P1 pulse being a predetermined ratio to said P2 pulse. The circuit includes a pair of transistors with a capacitor connected to the output of the second transistor. The pulses P1 and P2 are supplied to the base electrode of the first transistor. Pulse P1 turns on the two transistors and charges the capacitor to a predetermined level so that when the second pulse P2 arrives, it does not turn on a transistor when it is equal to or less than the first pulse P1.

NASA
The active circuit elements are embedded into the bores of the side. A common heat sink is located adjacent the circuit board, with the active circuit elements located on one side of a circuit board and the passive circuit elements located on the opposite side. Temperature stability is provided by a heat sink which slows the effect of ambient temperature changes. The object of the invention is to provide an improved converter for converting one direct current voltage to another. A plurality of phased square wave voltages are provided from a ring counter through amplifiers to a like plurality of output transformers. Each of these transformers has two windings, and S(1) winding and an S(2) winding. The S(1) windings are interconnected in series, then the S(2) windings are connected in series, and finally, the two sets of windings are connected in series. One of six SCRs is connected between each two series connected windings to a positive output terminal and one of diodes is connected between each set of windings of a zero output terminal. By virtue of this configuration, a quite high average direct current voltage is obtained, which varies between full voltage and two-thirds full voltage rather than from full voltage to zero. Further, its variation, ripple frequency, is reduced to one-sixth of that present in a single configuration, a quite high average direct current voltage is obtained, which varies between full voltage and two-thirds full voltage rather than from full voltage to zero. Further, its variation, ripple frequency, is reduced to one-sixth of that present in a single phase system. Application to raising battery voltage for an ion propulsion system is mentioned.

A trigger control circuit is provided for producing firing pulses for the thyristor of a thyristor control system such as a power factor controller. The control circuit overcomes thyristor triggering problems involved with the current lag associated with controlling inductive loads and utilizes a phase difference signal, already present in the power factor controller, in deriving a signal for inhibiting generation of a firing pulse until no load current is flowing from the preceding half cycle and thereby ensuring that the thyristor is triggered on during each half cycle.

33 ELECTRONIC AND ELECTRICAL ENGINEERING

HIGH STABILITY BUFFERED PHASE COMPARATOR Patent

A low noise RF signal phase comparator comprised of two high stability driver buffer amplifiers driving a double balanced mixer which operate to generate a beat frequency between the two RF input signals coupled to the amplifiers from the RF sources is described. The beat frequency output from the mixer is applied to a low noise zero crossing detector which is the phase difference between the two RF inputs. Temperature stability is provided by mounting the amplifiers and mixer on a common circuit board with the active circuit elements located on one side of a circuit board and the passive circuit elements located on the opposite side. A common heat sink is located adjacent the circuit board. The active circuit elements are embedded into the bores of the heat sink which slows the effect of ambient temperature changes and reduces the temperature gradients between the active circuit elements, thus improving the cancellation of temperature effects. The two amplifiers include individual voltage regulators, which increases RF isolation.

PULSED THYRISTOR TRIGGER CONTROL CIRCUIT Patent

A trigger control circuit is provided for producing firing pulses for the thyristor of a thyristor control system such as a power factor controller. The control circuit overcomes thyristor triggering problems involved with the current lag associated with controlling inductive loads and utilizes a phase difference signal, already present in the power factor controller, in deriving a signal for inhibiting generation of a firing pulse until no load current is flowing from the preceding half cycle and thereby ensuring that the thyristor is triggered on during each half cycle.

ELECTRODES FOR SOLID STATE DEVICES Patent
The invention relates to coated metal powders and to dispersions of such powders in liquid vehicles forming screenable, sinterable pastes for use in forming electrodes on photovoltaic devices. The primary nickel or copper metal particles are provided with a carrier of lower melting sintering metals such as 1-20% by weight, of a non-oxidizing metal such as lead or tin. The powdered metal systems operate on the basis of fusing together by way of eutectic alloying. As the paste is heated during firing the organic binder is first vaporized. An eutectic of the base metal (copper) and coating (tin) forms at the intersections of the base metal grains. This eutectic dissolves the grains and as the temperature is raised above the eutectic temperature, more of the base metal is dissolved. While the temperature is held at the higher value, the much smaller amount of sintering metal disappears as the eutectic dissolves and diffuses into the base metal until the composition of the eutectic is so enriched with base metal that it no longer has the eutectic properties and it solidifies. In this high temperature solidification, the base metal grains become thoroughly alloyed together and will not separate at the eutectic temperature (a lower temperature than their solidification by diffusion). T.M.

A constant-output atomizer includes a body which has a generally frustoconical expansion nozzle for producing an air jet when a supply of pressurized air is connected to the nozzle upstream of the throat of the nozzle. A liquid feed line supplies liquid to be atomized by the air jet, and the body includes a groove which opens into the diffusor section of the nozzle downstream of the throat for conducting liquid from the feed line to the nozzle. The groove which extends in a direction perpendicular to the axis of the nozzle, and radially with respect to it, has a depth approximately equal to half the axial length of the nozzle. Liquid, conducted by capillary action in the groove to the nozzle, is atomized into a fine mist by the air jet in the nozzle; and the groove eliminates fluctuations in spray order.

**FLUID MECHANICS AND HEAT TRANSFER**

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
A cooling fluid is injected into a hot flowing gas through a passageway in a wall which contains and is subject to the hot gas. The passageway is slanted in a downstream direction at an acute angle to the wall. A cusp shape is provided in the passageway to generate vortices in the injected cooling fluid thereby reducing the energy extracted from the hot gas for that purpose. The cusp shape increases both film cooling effectiveness and wall area coverage. The cusp may be at either the downstream or upstream side of the passageway, the former substantially eliminating flow separation of the cooling fluid from the wall immediately downstream of the passageway.
A ride quality meter is disclosed that automatically transforms vibration and noise measurements into a single number index of passenger discomfort. The noise measurements are converted into a noise discomfort value. The vibrations are converted into single axis discomfort values which are then converted into a combined axis discomfort value. The combined axis discomfort value is corrected for time duration and then summed with the noise discomfort value to obtain a total discomfort value.

On a beryllium-copper ring are four strain gages which are electrically connected in Wheatstone bridge fashion to output instrumentation. Tabs are bonded to a balloon or like surface where strain on the surface causes bending of the ring. An electrical signal is provided through the gages proportional to the surface strain. A one-half ring segment, as placed on a sheet of beryllium-copper for chem-mill etch formation prior to bending and welding of a pair of the segments to form a ring structure, is illustrated.

A spent particle collector is comprised of one or more axisymmetric stages, each stage comprising a subassembly having an inner pyrolytic graphite ring, a transition ring, a ceramic insulator ring, and an outer metal ring which forms part of the wall of the collector. Each transition ring is of a ductile metal having high thermal conductivity and is provided with an annual sputter shield wall extending toward the source of spent particles and, where necessary, a trough in the other surface to enclose the sputter shield of the next adjacent transition ring. Radial extending slots are provided in a transition ring to form segments which are retained in their position by the sputter shield. This arrangement with the ceramic ring outwardly of the transition ring keeps the latter in contact with the inner pyrolytic graphite ring. This multistage collector can be assembled with high accuracy. The collector is attached by welding to a flange attached to a source of spent particles such as a traveling wave tube.

A multiple channel high data rate pressure sensing device is disclosed for use in wind tunnels, spacecraft, airborne, process control, automotive, etc., pressure measurements. Data rates in excess of 100,000 measurements per second are offered with inaccuracies from temperature shifts less than 0.25% (nominal) over a temperature span of 55 C. The device consists of thirty-two solid state sensors, signal multiplexing electronics to electronically address each sensor, and digital electronic circuitry to automatically correct the inherent thermal shift errors of the pressure sensors and their associated electronics.
A device used in the optical alignment of machinery to maintain a measuring scale in the proper position for optical readings to be taken is described. The device consists of a block containing a notch in the shape of an inverted "v" and a rotatable plug positioned over the centerline of notch. The block is placed on the object to be aligned, the notch allows the block to be securely placed upon flat or curved surfaces. A weighted measuring scale is inserted through plug so that it contacts the object to be aligned. The scale and plug combination can be rotated so that the scale faces an optical aligning instrument. The instrument is then used in conjunction with the scale to measure the distance of the machinery from a reference plane.

An apparatus and method for destructively removing particles from a flowing gas containing the particles is described. In the specific embodiments disclosed the apparatus is adapted to remove carbon particles from diesel engine exhaust products. The exhaust products are directed to a predetermined location where they are rapidly vaporized and combine with oxygen in the exhaust products to form carbon dioxide. Vaporization in one embodiment is effected by a discharge grid located within an exhaust conduit, the grid by additional heating elements. A heat transfer plate provides a means by which heat may be extracted from the furnace and conducted away through liquid cooled jackets. By varying the input of heat via the booster heater and output of heat via the heat transfer plate, a desired thermal gradient profile may be provided.

A high gradient directional solidification furnace is disclosed which includes eight thermal zones throughout the length of the furnace. In the hot end of the furnace, furnace elements provide desired temperatures. These elements include Nichrome wire received in a grooved tube which is encapsulated by an outer alumina core. A booster heater is provided in the hot end of the furnace which includes toroidal tungsten/rhenium wire which has a capacity to put heat quickly into the furnace. An adiabatic zone is provided by an insulation barrier to separate the hot end of the furnace from the cold end. The cold end of the furnace is defined through the use of additional heating elements. A heat transfer plate provides a means by which heat may be extracted from the furnace and conducted away through liquid cooled jackets. By varying the input of heat via the booster heater and output of heat via the heat transfer plate, a desired thermal gradient profile may be provided.

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being chosen so that alternate conductors defining the grid are
spaced apart a distance approximately 125 times the mean
diameter of the particles to be removed. A voltage differential of
approximately 690 volts is applied across adjacent conductors.

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A rack for laboratory bottles and jars for chemicals and
medicines was designed to provide the maximum strength and
security to the glassware in the event of a significant earthquake.
The rack preferably is rectangular and may be made of a variety
of chemically resistant materials including polypropylene,
polycarbonate, and stainless steel. It comprises a first plurality
of parallel vertical walls, and a second plurality of parallel vertical
walls perpendicular to the first plurality of walls. These intersecting
vertical walls comprise a self-supporting structure without a bottom
which sits on four legs. The top surface of the rack is formed by
the top edges of all the vertical walls, which are not parallel but
are skewed in three dimensions.

A mechanical extensometer for use with a constant load creep
test machine is disclosed in which the dead weight of the
extensometer is counterbalanced by two pairs of weights connected
through a pulley system to rod extensions leading into the furnace
where test sample is undergoing elevated temperature (above 500
F) tensile testing. Gripper surfaces, conical tip and flat surface,
are provided in each sample engaging platens to reduce the grip
pressure normally required for attachment of the extensometer to
the specimen and reduce initial specimen bending normally
associated with foil-gage metal testing.

A light-activated semiconductor device usable as an
opto-electronic switch, pulse generator or optical detector is
provided. A semiconductor device is disclosed which provides
back-to-back metal-thin oxide-silicon (MTOS) capacitors. Each
capacitor includes a thin, light-absorptive aluminum electrode which
overlies a thin oxide layer and a lightly doped region implanted in
an intrinsic silicon substrate.

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overlies a thin oxide layer and a lightly doped region implanted in
an intrinsic silicon substrate.
LASER RESONATOR Patent

An optical resonator cavity configuration has a unitary mirror with oppositely directed convex and concave reflective surfaces disposed into one fold and concertedly reversing both ends of a beam propagating from a laser rod disposed between two total internal reflection prisms. The optical components are rigidly positioned with perpendicularly crossed virtual rooflines by a compact optical bed. The rooflines of the internal reflection prisms, are arranged perpendicularly to the axis of the laser beam and to the optical axes of the optical resonator components.

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DISCHARGE CELL FOR OPTOGALVANIC SPECTROSCOPY HAVING ORTHOGONAL RELATIONSHIP BETWEEN THE PROBE LASER AND DISCHARGE AXIS Patent Application

A method and apparatus for an optogalvanic spectroscopy system is presented. Orthogonal geometry exists between the axis of a laser probe beam and the axis of a discharge created by a pair of spaced apart and longitudinally aligned high voltage electrodes. The electrodes are movable to permit adjustment of the location of a point in the discharge which is to be irradiated by a laser beam crossing the discharge region. The cell dimensions are selected so that the cross section of the discharge region is substantially comparable in size to the cross section of the laser beam passing orthogonally through the discharge region. E.A.K.

MASER CAVITY SERVO-TUNING SYSTEM Patent Application

Two collocated, weakly coupled probes, one loop and one dipole, detect the magnetic and electric fields inside a maser cavity. Signals from the probes are compared in phase, and the signal output from the phase detector is applied to a varactor, the reactance of which is coupled into the cavity by a microwave coupler. Alternatively, the varactor may be placed inside the cavity. Any deviation of phase from 90 deg as detected by the phase detector will then produce an error signal that will change the reactance coupled into the resonant cavity to change its reactance, and thus correct its resonance frequency. An alternative to using two probes is to use a single disk probe oriented to detect both the magnetic and electric fields, and thus provide the error signal directly.
A solar pumped laser is described in which the lasant is a gas that will photodissociate and lase when subjected to sunrays. Sunrays are collected and directed onto the gas lasant to cause it to lase. Applications to laser propulsion and laser power transmission are discussed.

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**37 MECHANICAL ENGINEERING**

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

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A hand held guide for manually positioning a work piece between the anvil rib and tool of a hot die stamping press is described. A groove completed by interchangeable cover plates attached at one end of the guide conforms to a cross sectional dimension relationship. A spring maintains the force against the wedge member.

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common to similar workpieces and, with a force fit, retentively
holds each of the workpieces.

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N84-12492* National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, Md.
UNIDIRECTIONAL FLEXURAL PIVOT Patent
H. BAHIMAN, inventor (to NASA) 20 Sep. 1983 5 p Filed 16
(NASA-CASE-GSC-12622-1; US-PATENT-4,405,184;
Avail: US Patent and Trademark Office CSCL 131

A pair of generally coaxial mutually rotatable cylindrical outer
ring members are held in spaced-apart relationship by three
parallelogram-shaped, relatively thin, flexible, flat planar spring
elements. These spring elements are substantially inextensible in
length and are joined to the inside of the outer ring members and
held in position by arcuate inner ring segments, three for each
outer ring members, which respectively span an arc of substantially
120. The parallelogram shape of the spring elements provides a
slanted interconnection between the outer ring members. The
direction of slant, moreover, determines in which direction the
spring elements can flex or bend unidirectionally to relieve the
compression stress imparted thereto by any mutual angular rotation
of the outer ring members.

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N84-16560* National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, Ala.
CLAMP-MOUNT DEVICE Patent
K. H. CLARK, inventor (to NASA) 27 Dec. 1983 5 p Filed 14
Aug. 1981 Supersedes N82-11470 (20 - 02, p 0207)
(NASA-CASE-MFS-25510-1; US-PATENT-4,422,609;
Avail: US Patent and Trademark Office CSCL 131

A clamp-mount device is disclosed for mounting equipment to
an associated I-beam and the like structural member of the type
having oppositely extending flanges wherein the device comprises
a base and a pair of oppositely facing clamping members carried
diagonally on the base clamping flanges therebetween and having
flange receiving openings facing one another. Lock means are
carried diagonally by the base opposite the clamping members
locking the flanges in the clamping members. A resilient hub is
carried centrally of the base engaging and biasing a back side of
the flanges maintaining tightly clamped and facilitating use on
vertical as well as horizontal members. The base turns about the
hub to receive the flanges within the clamping members. Equipment
may be secured to the base by any suitable means such as bolts
in openings. Slidable gate latches secure the hinged locks in an
upright locking position. The resilient hub includes a recess opening
A method is disclosed for joining segments of the skin of an aircraft. The ends of the skin are positioned in close proximity or abutt each other. The skin is of constant thickness throughout the joint and is sandwiched between splice plates, which taper in thickness from the last to the first bolt rows in order to reduce the stiffness of the splice plate and thereby reduce the load transfer at the location where bypass loads are highest. The last row of bolts are in the thin end of the splice plates, and the first row of bolts are in the thick portion of the splice plate. The thicker portions of the splice plates also overlap the ends of the skin segments. Joint load is maximized by minimizing the bearing area at the splice plate location where the splice plate is thinnest, while maximizing the bypass load in the net skin section at the same location. Simultaneously, the bearing load in both the skin and the splice plate is maximized in the area where the splice plate is thickest.

A particle generating system is described which is capable of breaking up agglomerations of particles and producing a cloud of uniform, submicron-sized particles at high pressure and high flow rates. This is achieved by utilizing a tubular structure which has injection microslits on its periphery to accept and disperse the desired particle feed. By supplying a carrying fluid at a pressure of approximately twice the ambient pressure of the velocimeter’s settling chamber, the microslits operate at choked flow conditions. The shearing action of this choked flow is sufficient to overcome interparticle bonding forces, thereby breaking up the agglomerates of the particles feed into individual particles.
the jaw in a latching position. In the latching position, the noses of the jaws are under the flanges of the spool. NASA

Falling catalyst particles to form a methane gas product which is recovered after separation in separator. NASA

In combination with a reactor for a coal utilization system, a pressure letdown device accepts from a reactor, a polyphase fluid at an entrance pressure and an entrance velocity, and discharges the fluid from the device at a discharge pressure substantially lower than the entrance pressure and at a discharge temperature and a discharge velocity substantially equal to the entrance temperature and entrance velocity. The device is characterized by a series of pressure letdown stages including several symmetrical baffles, disposed in coaxially nested alignment. In each baffle several ports or apertures of uniform dimensions are defined. The number of ports or apertures for each baffle plate is unique with respect to the number of ports or apertures defined in each of the other baffles. The mass rate of flow for each port is a function

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.

N84-12635*# National Aeronautics and Space Administration. Pasadena Office, Calif.

FLUIDIZED BED GASIFICATION OF BIOMASS TO METHANE Patent Application

Biomass particles are pelletized in pelletizer. The pellets form a fluidized bed of biomass in hot steam gas fed into the bottom inlet of a reactor. Catalyst particles shower downwardly through the reactor and are collected in an engager before recycle. The biomass particles are pyrolyzed to form char which is gasified by the steam to form CO and H2 gas. This gas reacts with the

N84-14583* National Aeronautics and Space Administration. Pasadena Office, Calif.

PRESSURE LETDOWN METHOD AND DEVICE FOR COAL CONVERSION SYSTEMS Patent

In combination with a reactor for a coal utilization system, a pressure letdown device accepts from a reactor, a polyphase fluid at an entrance pressure and an entrance velocity, and discharges the fluid from the device at a discharge pressure substantially lower than the entrance pressure and at a discharge temperature and a discharge velocity substantially equal to the entrance temperature and entrance velocity. The device is characterized by a series of pressure letdown stages including several symmetrical baffles, disposed in coaxially nested alignment. In each baffle several ports or apertures of uniform dimensions are defined. The number of ports or apertures for each baffle plate is unique with respect to the number of ports or apertures defined in each of the other baffles. The mass rate of flow for each port is a function
44 ENERGY PRODUCTION AND CONVERSION

of the area of the port, the pressure of the fluid as applied to the
port, and a common pressure ratio established across the ports.

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INCREASED VOLTAGE PHOTOVOLTAIC CELL Patent
Application
B. ROSS (JPL, California Inst. of Tech., Pasadena), D. B. BICKLER
(JPL, California Inst. of Tech., Pasadena), and B. D. GALLAGHER,
 inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) 8
Feb. 1984 10 p
(Contract NAS7-100)
(NASA-CASE-NPO-16155-1; US-PATENT-APPL-SN-578390)
Avail: NTIS HC A02/MF A01 CSCL 10A

A prior art solar cell which includes a silicon substrate and a
silicon layer which are oppositely doped, one being p-doped and
one being n-doped, is improved by including a second layer of
silicon carbide on the first silicon layer. Preferably, the silicon
carbide layer has the same type of doping as the silicon layer
beneath it. The second layer increases the width of the depletion
zone formed between the substrate and the first layer so that the
voltage across the depletion zone can increase to a higher level
and thus increase the voltage and efficiency of the photovoltaic
cell. The carbon-containing second layer is desirable because a
crystalline carbon such as silicon carbide is largely transparent to
sunlight and allows large amounts of photons to pass through to
produce a large current.

THERMIONIC-PHOTOVOLTAIC ENERGY CONVERTER Patent
Application
D. L. CHUBB, inventor (to NASA) 15 Feb. 1984 10 p
(NASA-CASE-LEW-14077-1; US-PATENT-APPL-SN-580573)
Avail: NTIS HC A02/MF A01 CSCL 10A

A thermionic photovoltaic energy conversion device comprised
of a thermionic diode mounted within a hollow tubular photovoltaic
converter is described. The thermionic diode maintains a cesium
discharge for producing excited atoms that emit line radiation in
the wave length region of 850 nm to 890 nm. The photovoltaic
converter is a silicon or gallium arsenide photovoltaic cell having
bandgap energies in this same wavelength region for optimum
cell efficiency.

METHOD FOR TREATING WASTEWATER USING
MICROORGANISMS AND VASCULAR AQUATIC PLANTS
Patent
B. C. WOLVERTON, inventor (to NASA) 15 Nov. 1983 7 p
Filed 28 Dec. 1981 Supersedes N82-25335 (20 - 16, p 2214)
US Patent and Trademark Office CSCL 13B

A method for treating wastewater compresses subjecting the
wastewater to an anaerobic setting step for at least 6 hours and
passing the liquid effluent from the anaerobic settling step through
a filter cell in an upflow manner. There the effluent is subjected
first to the action of anaerobic and facultative microorganisms,
and then to the action of aerobic microorganisms and the roots
of at least one vascular aquatic plant.

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ENVIRONMENT POLLUTION

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

METHOD FOR TREATING WASTEWATER USING
MICROORGANISMS AND VASCULAR AQUATIC PLANTS Patent
B. C. WOLVERTON, inventor (to NASA) 15 Nov. 1983 7 p
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wastewater to an anaerobic setting step for at least 6 hours and
passing the liquid effluent from the anaerobic settling step through
a filter cell in an upflow manner. There the effluent is subjected
first to the action of anaerobic and facultative microorganisms,
and then to the action of aerobic microorganisms and the roots
of at least one vascular aquatic plant.

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

PROSTHETIC OCCLUSIVE DEVICE FOR AN INTERNAL PASSAGEWAY Patent

An occlusive device is disclosed for surgical implant to occlude the lumen of an internal organ. The device includes a cuff having a backing collar and two isolated cuff chambers. The fluid pressure of one chamber is regulated by a pump/valve reservoir unit. The other chamber is unregulated in pressure but its fluid volume is adjusted by removing or adding fluid to a septum/reservoir by means of a hypodermic needle. Pressure changes are transmitted between the two cuff chambers via faying surfaces which are sufficiently large in contact area and thin as to transmit pressure generally without attenuation. By adjusting the fluid volume of the septum, the operating pressure of the device may be adjusted to accommodate tubular organs of different diameter sizes as well as to compensate for changes in the organ following implant without reoperation.

METHOD FOR THERMAL MONITORING SUBCUTANEOUS TISSUE Patent Application

A noninvasive accurate method for measuring the temperature of tissue beneath the surface of a living body is described. Ultrasonic signals are directed into beads of a material inserted into the tissue with a syringe. The reflected signals indicate the acoustic impedance or resonance frequency of the beads which in turn indicates the temperature of the tissue. A range of temperatures around the melting temperature of the material can be measured by this method.

LOW X-RAY ABSORPTION ANEURISM CLIPS Patent Application

An X-ray transparent and biological inert medical clip for treating aneurisms and the like is disclosed as well as a process for its production. A graphite reinforced composite film is molded into a unitary structure having a pair of hourglass like cavities which are hinged together with a pair of jaws for grasping the aneurism extending from the wall of one cavity. A silicone rubber pellet is disposed in the other cavity to exert a spring force through the hinge area to normally bias the jaws into contact with each other.

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

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NASA
ABSORBENT PRODUCT AND ARTICLES MADE THEREFROM

Patent

A multilayer absorbent product for use in contact with the skin to absorb fluids is described. The product has a water pervious facing layer for contacting the skin, and a first fibrous wicking layer overlaying the water pervious layer. A first container section is defined by inner and outer layers of a water pervious wicking material in between a first absorbent mass and a second container section defined by inner and outer layers of a water pervious wicking material between what is disposed a second absorbent mass, and a liquid impermeable/gas permeable layer overlaying the second fibrous wicking layer.

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METHOD AND APPARATUS FOR SIMULATING GRAVITATIONAL FORCES ON A LIVING ORGANISM

Patent

A method and apparatus for simulating gravitational forces on a living organism wherein a series of negative pressures are externally applied to successive length-wise sections of a lower limb of the organism. The pressures decreasing progressively with distance of said limb sections from the heart of the organism. A casing defines a chamber adapted to contain the limb of the organism and is rigidified to resist collapse upon the application of negative pressures to the interior of the chamber. Seals extend inwardly from the casing for effective engagement with the limb of the organism and, in cooperation with the limb, subdivide the chamber into a plurality of compartments each in negative pressure communicating relation with the limb.

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ACOUSTICS

Includes sound generation, transmission, and attenuation.

APPARATUS AND METHOD FOR JET NOISE SUPPRESSION

Patent

A method and apparatus for jet noise suppression through control of the static pressure of the jet and control of the rate of entrainment of ambient fluid into the jet downstream of the exhaust nozzle is disclosed. The momentum flux over an extended region of the jet is regulated, affecting Reynolds stresses in the jet and the spreading angle of the jet. Static pressure is controlled through a long hollow, porous nozzle plug centerbody which may be selectively vented to ambient conditions, connected to a vacuum source, or supplied with fluids of various densities for injection into the stream. Sound in the jet may be channeled along the
nozzle plug centerbody by injecting coolant such as a cryogenic fluid throughout the center-body into the jet.

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N84-16940* National Aeronautics and Space Administration. Pasadena Office, Calif.
CONTACTLESS PELLET FABRICATION Patent

A small object is coated by holding it in the pressure well of an acoustic standing wave pattern, and then applying a mist of liquid coating material at low velocity into the pressure well. The pressure gradient within the well forces the mist particles to be pushed against the object. A lower frequency acoustic wave also can be applied to the coated object, to vibrate it so as to evenly distribute the coated material. The same lower frequency vibrations can be applied to an object in the shape of a hollow sphere, to center the inner and outer surfaces of the sphere while it remains suspended.

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N84-16949*# National Aeronautics and Space Administration. Pasadena Office, Calif.
VIBRATING-CHAMBER LEVITATION SYSTEMS Patent Application
M. B. BARMATZ (JPL, California Inst. of Tech., Pasadena), J. L. ALLEN (JPL, California Inst. of Tech., Pasadena), and D. GRANETT, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) 11 Dec. 1983 11 p (Contract NAS7-100)
(NASA-CASE-NPO-16147-1; US-PATENT-APPL-SN-559988) Avail: NTIS HC A02/MF A01 CSCL 20A

An acoustic levitation system is provided by applying a single frequency from a transducer into a resonant chamber surrounding the object. The chamber walls are angled so they converge in an upward direction. When an acoustic standing wave pattern is applied between the top and bottom of the chamber, a levitation surface within the stabilizer does not lie on a horizontal plane, but instead is curved with a lowermost portion near the vertical axis of the chamber. As a result, an acoustically levitated object is urged by gravity towards the lowermost location on the levitation surface, so the object is kept away from the side walls of the chamber.

A housing, forming a chamber, is mounted on an acoustic transducer. The transducer shakes the entire housing up and down, so that, at a proper resonant frequency, a standing wave pattern is set up in the chamber to levitate an object. The resonant frequency can be the lowest one whose wavelength equals twice the height of the chamber, or any multiple of that frequency. For a rectangular chamber, a single frequency can be used to hold an object along three dimensions by orienting the chamber so that all three axes are tilted from the vertical. In a largely cylindrical chamber, an object can be held at a particular position by curving the axis of the cylinder. The object then lies at the lowest position along the axis. A heated chamber can be vibrated by a colder transducer by using a horn to connect them.

NASA
A method that provides an impression profile in a reference standard material utilized in inspecting critically stressed components with pulsed ultrasound was described. A die stamp having an I letter was used to impress the surface of a reference material. The die stamp was placed against the surface and struck with an inertia imparting member to impress the I in the reference standard material. Upset may appear on the surface as a result of the impression and is removed to form a smooth surface. The stamping and upset removal is repeated until the entire surface area of a depth control platform on the die stamp uniformly contacts the material surface. The I impression profile in the reference standard material is utilized for reflecting pulsed ultrasonic beams for inspection purposes. NASA application of the system to ion implantation is mentioned.
A tactile sensor comprises an array of cells which are covered by an elastic membrane, having an exposed surface which is adapted to come in contact with an object. Light is conducted to each cell from a light source by an optical fiber which terminates at the cell. Reflected light from the cell is conducted by an optical fiber to a light processor, which senses changes in the light received thereby from an ambient level whenever an object comes in contact with the membrane surface above the cell.

An optical cell which has the capability of containing chemicals under high temperature and high pressure yet has flat optical windows allowing light to pass through the cell without distortion is presented. The cell may be embodied as a high pressure discharge tube in a high pressure gas laser, with windows polished to the Brewster angle.

An integrating sphere, comprised of a uniform diffusely reflecting spherical cavity, has mutually transverse input and output ports. A linear sample transport mechanism is secured to the sphere so that the multiple samples can be brought into registration with the input port, one at a time, without having to open or disassemble the apparatus when a change of a sample is desired. A vacuum tight seal provided between the cavity and transport mechanism maintains the integrity of a vacuum generated within the sphere when it is attached to the source of optical energy. The device is utilized, for example, to test the emissive characteristic such as the relative fluorescence quantum efficiency of a dye sample placed in the path of a monochromatic optical energy source coupled to the input port while having a light detector coupled to the output port.

A hollow cathode apparatus is described, which is rapidly and reliably started. An ignitor positioned upstream from the hollow cathode, generates a puff of plasmas that flows with the primary gas to be ionized through the cathode. The plasma puff creates a high voltage breakdown between the downstream end of the cathode and a keeper electrode, to heat cathode to an electron-emitting temperature.

Includes magnetohydrodynamics and plasma fusion.

Includes superconductivity.
A method and apparatus are disclosed for growing in a gravitational field a microscopic crystal from a solution. The solution is held in a vertical chamber which is relatively thin, the thin being generally perpendicular to the vertical. There is a substrate crystal disposed at either the upper or lower end of the chamber and the crystal grows from this substrate crystal in one direction. The temperature conditions of the solution are controlled so that, as the crystal forms, the effects of buoyant convection within the solution are minimized. This is accomplished in two different ways depending upon whether the crystal is grown from the upper or lower end of the chamber. When grown from the upper end of the chamber, the temperature of the solution is controlled so that it remains essentially isothermal so that there is essentially no heat loss from the solution. When the crystal is grown from the lower end of the chamber, the temperature of the solution is controlled so that there is a differential in temperature throughout the solution which provides a positive thermal gradient within the chamber.

During sputter deposition, nitrogen gas is introduced into the system as a dopant to the extent of no more than about 1% of total gaseous or plasma mixture. Following deposition of the CdS film, the film is annealed in an inert gas, such as argon, at a temperature ranging from about 300 C to about 425 C. Photosensor layers or films so prepared, and liquid crystal light valves embodying such photosensors, exhibited significantly reduced image retention times (negative memory) while retaining acceptable photosensitivity.

Author
Abstracts are provided for 102 patents and patent applications entered into the NASA scientific and technical information system during the period January 1984 through June 1984. Each entry consists of a citation, an abstract, and in most cases, a key illustration selected from the patent or patent application.
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