NASA SP-7039 (44)
January 1994

NASA PATENT ABSTRACTS BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY
SECTION 1 ABSTRACTS

NASA STI PROGRAM
SCIENTIFIC & TECHNICAL INFORMATION

ACCESSION NUMBER RANGES

Bibliography Number	*STAR Accession Numbers*
NASA SP-7039 (04) SEC 1	N69-20701 - N73-33931
NASA SP-7039 (12) SEC 1	N74-10001 - N77-34042
NASA SP-7039 (13) SEC 1	N78-10001 - N78-22018
NASA SP-7039 (14) SEC 1	N78-22019 - N78-34034
NASA SP-7039 (15) SEC 1	N79-10001 - N79-21993
NASA SP-7039 (16) SEC 1	N79-21994 - N79-34158
NASA SP-7039 (17) SEC 1	N80-10001 - N80-22254
NASA SP-7039 (18) SEC 1	N80-22255 - N80-34339
NASA SP-7039 (19) SEC 1	N81-10001 - N81-21997
NASA SP-7039 (20) SEC 1	N81-21998 - N81-34139
NASA SP-7039 (21) SEC 1	N82-10001 - N82-22140
NASA SP-7039 (22) SEC 1	N82-22141 - N82-34341
NASA SP-7039 (23) SEC 1	N83-10001 - N83-23266
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NASA SP-7039 (25) SEC 1	N84-10001 - N84-22526
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NASA SP-7039 (30) SEC 1	N86-22537 - N86-33262
NASA SP-7039 (31) SEC 1	N87-10001 - N87-20170
NASA SP-7039 (32) SEC 1	N87-20171 - N87-30248
NASA SP-7039 (33) SEC 1	N88-10001 - N88-20253
NASA SP-7039 (34) SEC 1	N88-20254 - N88-30583
NASA SP-7039 (35) SEC 1	N89-10001 - N89-20085
NASA SP-7039 (36) SEC 1	N89-20086 - N89-30155
NASA SP-7039 (37) SEC 1	N90-10001 - N90-20043
NASA SP-7039 (38) SEC 1	N90-20044 - N90-30170
NASA SP-7039 (39) SEC 1	N91-10001 -N91-21058
NASA SP-7039 (40) SEC 1	N91-21059 - N91-33053
NASA SP-7039 (41) SEC 1	N92-10001 - N92-22095
NASA SP-7039 (42) SEC 1	N92-22096 - N92-34247
NASA SP-7039 (43) SEC 1	N93-10001 - N93-19958
NASA SP-7039 (44) SEC 1	N93-19959 - N93-32425

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NASA PATENT ABSTRACTS BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY
SECTION 1 ABSTRACTS

National Aeronautics and Space Administration
Scientific and Technical Information Program
Washington, DC 1994

This publication was prepared by the NASA Center for AeroSpace Information, 800 Elkridge Landing Road, Linthicum Heights, MD 21090-2934, (301) 621-0390.

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 131 citations published in this issue of the Abstract Section cover the period July 1993 through December 1993. The Index Section references over 5500 citations covering the period May 1969 through December 1993.

ABSTRACT SECTION (SECTION 1)

This *PAB* issue includes 10 major subject divisions separated into 76 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 scheme was devised in 1975 and revised in 1987 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, when appropriate, a key illustration taken from the patent or application for patent. Entries are arranged by subject category in order of the ascending NASA Accession Number originally assigned for *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 are identified in the Typical Citation and Abstract and in the indexes.

INDEX SECTION (SECTION 2)

The Index Section is divided into five indexes. These indexes are cross-indexed and are used to locate a single invention or groups of inventions.

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

Accession Number Index: Lists all inventions in order of ascending 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 with 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 tne 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, (1) use the Subject Category Number to locate the Subject Category and (2) 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 (not including 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.

TYPICAL CITATION AND ABSTRACT

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ACCESSION NUMBER → **N93-30416*#** National Aeronautics and Space Administration. ← CORPORATE SOURCE
Pasadena Office, CA.

TITLE → **VIRTUAL REALITY FLIGHT CONTROL DISPLAY WITH SIX-DEGREE-OF-FREEDOM CONTROLLER AND SPHERICAL ORIENTATION OVERLAY Patent Application**

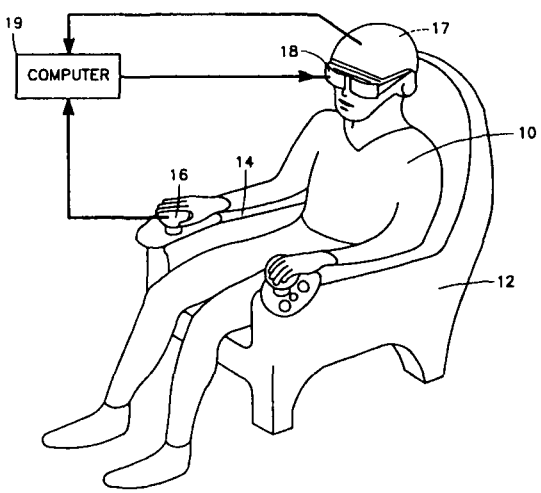
INVENTOR → BRIAN C. BECKMAN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 23 Apr. 1993 31 p

CONTRACT NUMBER → (Contract NAS7-918)

NASA CASE NUMBER AND US PATENT APPLICATION SERIAL NUMBER → (NASA-CASE-NPO-18733-1-CU; NAS 1.71:NPO-18733-1-CU; US-PATENT-APPL-SN-056503) Avail: CASI HC A03/MF A01 ← AVAILABILITY SOURCE

A virtual reality flight control system displays to the pilot the image of a scene surrounding a vehicle or pod having six degrees of freedom of acceleration or velocity control by the pilot and traveling through inertial space, the image itself including a superimposed figure providing the pilot an instant reference of orientation consisting of superimposed sets of geometric figures whose relative orientations provide the pilot an instantaneous feel or sense of orientation changes with respect to some fixed coordinate system. They include a first set of geometric figures whose orientations are fixed to the pilot's vehicle and a second set of geometric figures whose orientations are fixed with respect to a fixed or interstellar coordinate system. The first set of figures is a first set of orthogonal great circles about the three orthogonal axes of the flight vehicle or pod and centered at and surrounding the pilot's head, while the second set of figures is a second set of orthogonal great circles about the three orthogonal axes of a fixed or interstellar coordinate system, also centered at and surrounding the pilot's head. ← ABSTRACT

NASA



← KEY ILLUSTRATION

TABLE OF CONTENTS
Section 1 • Abstracts

N.A. — no abstracts were assigned to this category for this issue.

CHEMISTRY AND MATERIALS

ENGINEERING For related information see also *Physics.*

GEOSCIENCES For related information see also *Space Sciences.*

LIFE SCIENCES

MATHEMATICAL AND COMPUTER SCIENCES

SPACE SCIENCES For related information see also *Geosciences.*

GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs.

Section 2 • Indexes

JANUARY 1994 (Supplement 44)

NASA Patent Abstracts Bibliography

A Semiannual Publication of the National Aeronautics and Space Administration

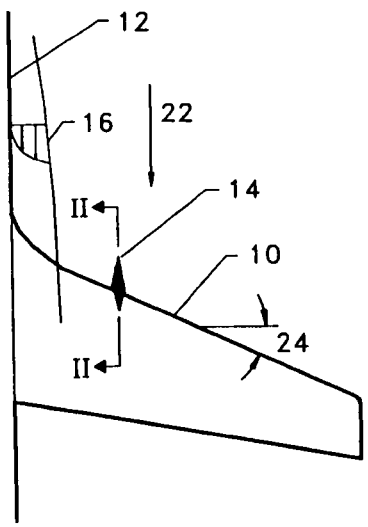
02
AERODYNAMICS

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

N93-22015*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SWEPT WING ATTACHMENT LINE CONTAMINATION FENCE Patent Application
BRUCE J. HOLMES, inventor (to NASA) 13 Dec. 1991 9 p (NASA-CASE-LAR-13400-1; NAS 1.71:LAR-13400-1; US-PATENT-APPL-SN-806066) Avail: CASI HC A02/MF A01

A device for controlling attachment line contamination on an airfoil is presented. A fence is installed on the leading edge of the airfoil in the freestream direction perpendicular to the airfoil, outboard of the fuselage boundary layer. The inboard side of the fence arrests the spanwise movement of the turbulent boundary layer while the laminar boundary layer on the outboard side of the fence eliminates any further turbulent contamination of the attachment line.

NASA



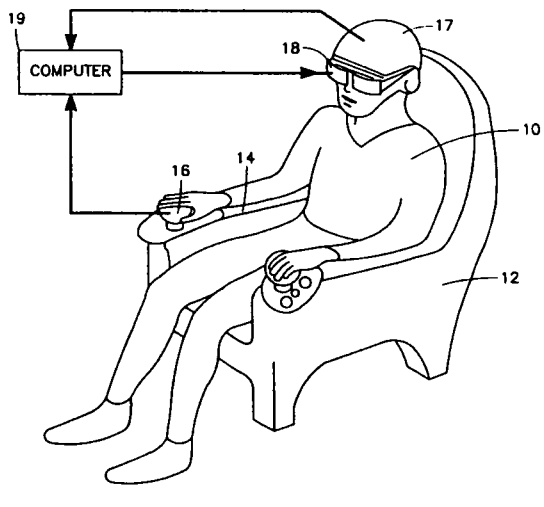
06
AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

N93-30416*# National Aeronautics and Space Administration. Pasadena Office, CA.
VIRTUAL REALITY FLIGHT CONTROL DISPLAY WITH SIX-DEGREE-OF-FREEDOM CONTROLLER AND SPHERICAL ORIENTATION OVERLAY Patent Application
BRIAN C. BECKMAN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 23 Apr. 1993 31 p (Contract NAS7-918)
(NASA-CASE-NPO-18733-1-CU; NAS 1.71:NPO-18733-1-CU; US-PATENT-APPL-SN-056503) Avail: CASI HC A03/MF A01

A virtual reality flight control system displays to the pilot the image of a scene surrounding a vehicle or pod having six degrees of freedom of acceleration or velocity control by the pilot and traveling through inertial space, the image itself including a superimposed figure providing the pilot an instant reference of orientation consisting of superimposed sets of geometric figures whose relative orientations provide the pilot an instantaneous feel or sense of orientation changes with respect to some fixed coordinate system. They include a first set of geometric figures whose orientations are fixed to the pilot's vehicle and a second set of geometric figures whose orientations are fixed with respect to a fixed or interstellar coordinate system. The first set of figures is a first set of orthogonal great circles about the three orthogonal axes of the flight vehicle or pod and centered at and surrounding the pilot's head, while the second set of figures is a second set of orthogonal great circles about the three orthogonal axes of a fixed or interstellar coordinate system, also centered at and surrounding the pilot's head.

NASA



07
AIRCRAFT PROPULSION AND POWER

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

N93-22034* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
MULTI-HEAT ADDITION TURBINE ENGINE Patent
LEO C. FRANCISCUS, inventor (to NASA) and THEODORE A. BRABBS, inventor (to NASA) 9 Feb. 1993 7 p Filed 30 Jan. 1991 Supersedes N91-23180 (29 - 15, p 2381)
(NASA-CASE-LEW-15094-1; US-PATENT-5,184,460; US-PATENT-APPL-SN-647902; US-PATENT-CLASS-60-226.1; US-PATENT-CLASS-60-39.17; INT-PATENT-CLASS-F02K-3/04; INT-PATENT-CLASS-F02K-3/08) Avail: US Patent and Trademark Office

A multi-heat addition turbine engine (MHATE) incorporates a plurality of heat addition devices to transfer energy to air and a plurality of turbines to extract energy from the air while converting it to work. The MHATE provides dry power and lower fuel consumption or lower combustor exit temperatures.

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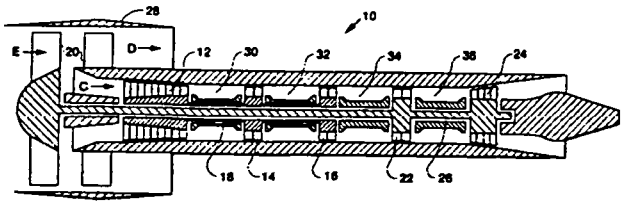


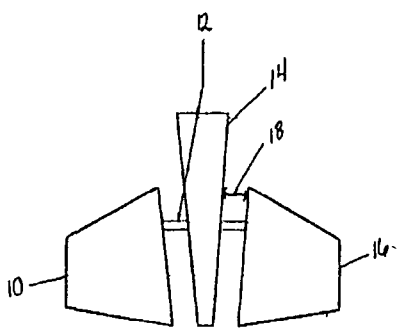
08
AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and auto pilots.

N93-20039*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
APPARATUS AND METHOD FOR IMPROVING SPIN RECOVERY ON AIRCRAFT Patent Application
H. PAUL STOUGH, II, inventor (to NASA) 21 Sep. 1992 13 p (NASA-CASE-LAR-14747-1; NAS 1.71:LAR-14747-1; US-PATENT-APPL-SN-948057) Avail: CASI HC A03/MF A01

Previous research on airplane spinning and recovery has shown that at potential spin conditions (high angles of attack with rotation) the horizontal tail, depending upon its location, can create a wake about the vertical tail and rudder which can adversely affect airplane spin and recovery characteristics. Many methods of altering the tail geometry to modify these interference effects have been investigated for improving airplane spin and recovery characteristics. Examples of changes includes relocation of the horizontal tail, increasing control surface travel, and use of a 'flip tail' that can be rotated to extreme angles for spin recovery. A device is provided which improves the spin recovery characteristics of aircraft which involves attaching the horizontal tail of the aircraft to the aircraft such that a gap remains between the root end of each horizontal tail section and the fuselage or vertical tail of the aircraft. The gaps measure between about 15 and 30 percent of the tail semispan. The gaps may be covered by shields which are released should a spin occur.

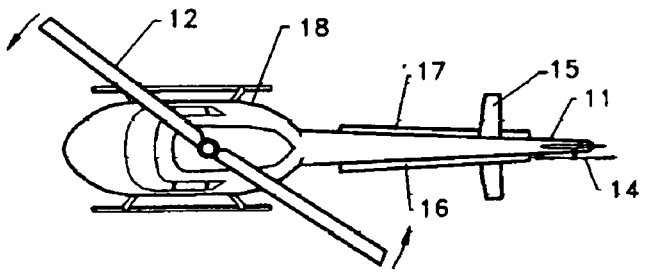
NASA



N93-25998*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
HELICOPTER LOW-SPEED YAW CONTROL Patent
JOHN C. WILSON, inventor (to NASA), HENRY L. KELLEY, inventor (to NASA), and CYNTHIA A. CROWELL, inventor (to NASA) 11 May 1993 6 p Filed 7 Nov. 1991 Supersedes N92-30025 (30 - 20, p 3406)
(NASA-CASE-LAR-14219-1; US-PATENT-5,209,430; US-PATENT-APPL-SN-788908; US-PATENT-CLASS-244-17.19; US-PATENT-CLASS-244-17.11; US-PATENT-CLASS-244-75R; INT-PATENT-CLASS-B64C-27/00) Avail: US Patent and Trademark Office

A system for improving yaw control at low speeds consists of one strake placed on the upper portion of the fuselage facing the retreating rotor blade and another strake placed on the lower portion of the fuselage facing the advancing rotor blade. These strakes spoil the airflow on the helicopter tail boom during hover, low speed flight, and right or left sidewards flight so that less side thrust is required from the tail rotor.

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



09
RESEARCH AND SUPPORT FACILITIES (AIR)

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

N93-24601* National Aeronautics and Space Administration. Pasadena Office, CA.
MOTION MEASUREMENT OF ACOUSTICALLY LEVITATED OBJECT Patent
JOHN L. WATKINS, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and MARTIN B. BARMATZ, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 20 Apr. 1993 5 p Filed 25 Feb. 1991
(NASA-CASE-NPO-18191-1-CU; US-PATENT-5,203,209; US-PATENT-APPL-SN-660380; US-PATENT-CLASS-73-505; INT-PATENT-CLASS-G01P-13/04) Avail: US Patent and Trademark Office

A system is described for determining motion of an object that is acoustically positioned in a standing wave field in a chamber. Sonic energy in the chamber is sensed, and variation in the amplitude of the sonic energy is detected, which is caused by linear motion, rotational motion, or drop shape oscillation of the object. Apparatus for detecting object motion can include a microphone coupled to the chamber and a low pass filter connected to the output of the microphone, which passes only frequencies below the fre-

quency of sound produced by a transducer that maintains the acoustic standing wave field. Knowledge about object motion can be useful by itself, can be useful to determine surface tension, viscosity, and other information about the object, and can be useful to determine the pressure and other characteristics of the acoustic field.

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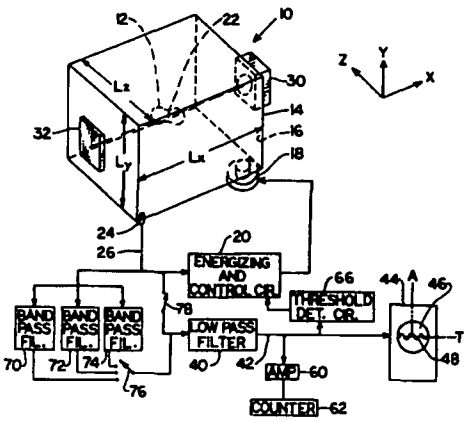

N93-25996* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

NOZZLE DIFFUSER FOR USE WITH AN OPEN TEST SECTION OF A WIND TUNNEL Patent

P. STEPHEN BARNA, inventor (to NASA) 18 May 1993 9 p Filed 8 Aug. 1991 Supersedes N91-32149 (29 - 24, p 3963) (NASA-CASE-LAR-14424-1-SB; US-PATENT-5,211,057; US-PATENT-APPL-SN-743468; US-PATENT-CLASS-73-147; INT-PATENT-CLASS-G01M-9/00) Avail: US Patent and Trademark Office

The nozzle diffuser has an inlet in fluid communication with the narrowed inlet of an open test chamber in a conventional wind tunnel. The nozzle diffuser has a passageway extending from its inlet to an outlet in communication with the open test section. The passageway has an internal cross sectional area which increases from its inlet to its outlet and which may be defined by top and bottom isosceles trapezoid walls of a particular flare angle and by isosceles trapezoid side walls of a different flare angle. In addition, a collector having a decreasing internal cross sectional area from inlet to outlet may be provided at the opposite end of the test chamber such that its outlet is in communication with a diffuser located at this outlet.

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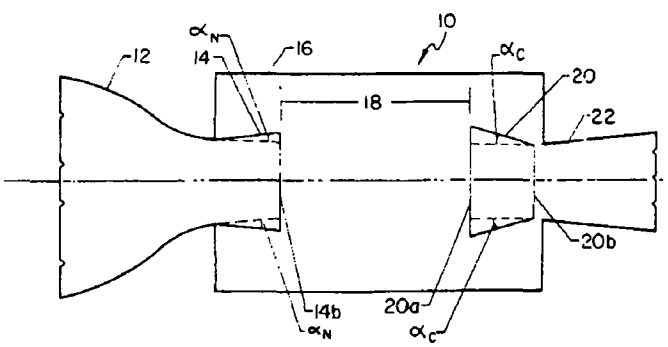


14

GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

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

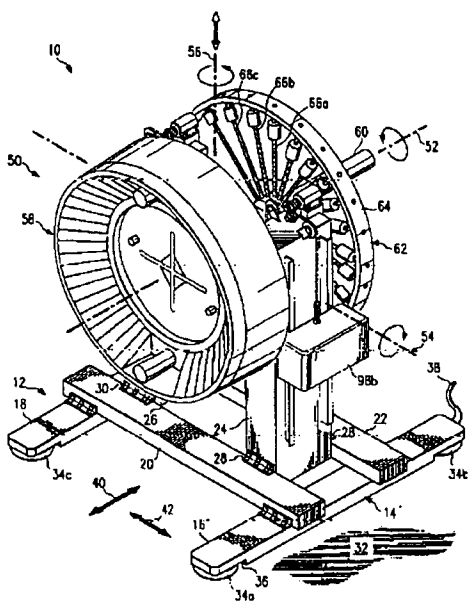
N93-22016*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

APPARATUS FOR SIMULATING AN EXOATMOSPHERIC STRUCTURE Patent Application

ROBERT LYNN HARVEY, inventor (to NASA) 17 Feb. 1993 40 p (NASA-CASE-MSC-21975-1; NAS 1.71:MSC-21975-1; US-PATENT-APPL-SN-018844) Avail: CASI HC A03/MF A01

Apparatus for simulating an exoatmospheric structure, such as a spin stabilized satellite, in an environment subject to gravitational forces is presented. The apparatus includes a floating structure which is pivotally and rotationally supported upon a gimballed bearing structure positioned adjacent to the center of mass of the floating structure and suspended upon a support structure. The floating structure is translatable in either vertical direction relative to the supporting structure upon a vertically movable suspension system connected to the supporting structure. The supporting structure is provided with bearing assemblies which are adapted to engage a supporting surface for permitting freedom of movement of the supporting structure over the supporting structure in any direction.

NASA



N93-24598* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

SUSPENSION DEVICE FOR LOW-FREQUENCY STRUCTURES Patent

MENG-SANG CHEW, inventor (to NASA), JER-NAN JUANG, inventor (to NASA), and LI-FARN YANG, inventor (to NASA) 4 May 1993 9 p Filed 28 Mar. 1991 supersedes N91-28184 (29 - 20, p 3289) (NASA-CASE-LAR-14272-1-CU; US-PATENT-5,207,110; US-

PATENT-APPL-SN-678553; US-PATENT-CLASS-73-866.4; US-PATENT-CLASS-73-865.6; US-PATENT-CLASS-248-328; US-PATENT-CLASS-434-34; INT-PATENT-CLASS-B64G-7/00) Avail: US Patent and Trademark Office

A suspension device is provided for simulating the free-free boundary conditions of space for a low frequency structure. A support cable is connected at one end to the test structure and is vertically guided by a guiding ring. The other end of the cable is connected to a cam having an outer circumference which supports the cable. A drive axle passes through the cam center of rotation and is rotatably journalled in a suitable manner to a rigid structure. Two torsion springs are provided about the drive axle. One end of each spring is connected to a respective face of the cam and the other end is connected to the fixed support. The cam is shaped and the torsion springs selected such that Wr(sub (t)) = T(sub s(t)), wherein W is the weight of the test structure; r(sub (t)) is the instantaneous moment arm defined as the perpendicular distance from the rotational center of the cam to the cable at time t, and T(sub s(t)) is the total spring torque exerted by the two springs on the cam at time t. The test structure is accordingly vertically suspended by the cable and the instantaneous moment arm compensates for any increased spring torque arising from a vertical displacement of the test structure to simulate space conditions.

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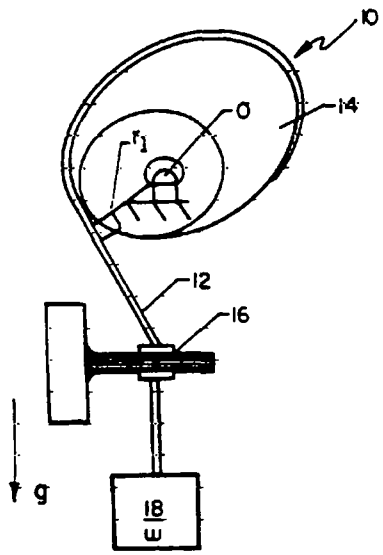

16
SPACE TRANSPORTATION

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

N93-20115* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SHUTTLE ORBITER WITH TELESCOPING MAIN PROPULSION UNIT AND PAYLOAD Patent
IAN O. MACCONOCHIE, inventor (to NASA) 2 Mar. 1993 6 p Filed 7 Aug. 1991 Supersedes N92-10035 (30 - 1, p 8) (NASA-CASE-LAR-13586-1; US-PATENT-5,190,246; US-PATENT-APPL-SN-743469; US-PATENT-CLASS-244-54; US-PATENT-CLASS-244-118.1; US-PATENT-CLASS-244-118.2; US-PATENT-CLASS-244-172; INT-PATENT-CLASS-B64D-27/02) Avail: US Patent and Trademark Office

An improved Space Shuttle with variable internal volume is provided. The Space Shuttle Orbiter includes a telescoping main propulsion unit. This main propulsion unit contains the main rocket engines and fuel tanks and telescopes into the Space Shuttle. A variable cavity is located between this unit and the crew compartment. Accordingly, the positioning of the telescoping main propulsion unit determines the volume of the variable cavity. Thus, the volume of the variable length of the entire Space Shuttle may be increased or decreased to achieve desired configurations for optimal storage. In one embodiment of the invention, the payload also telescopes within the variable cavity.

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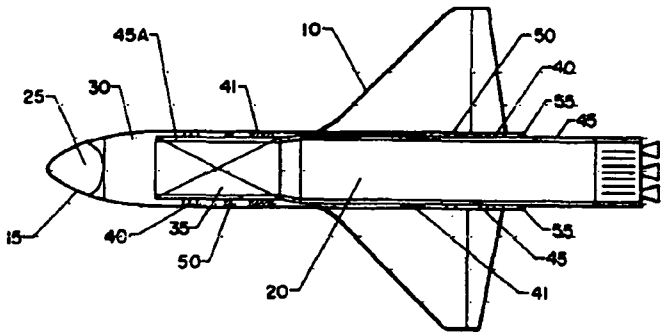


18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

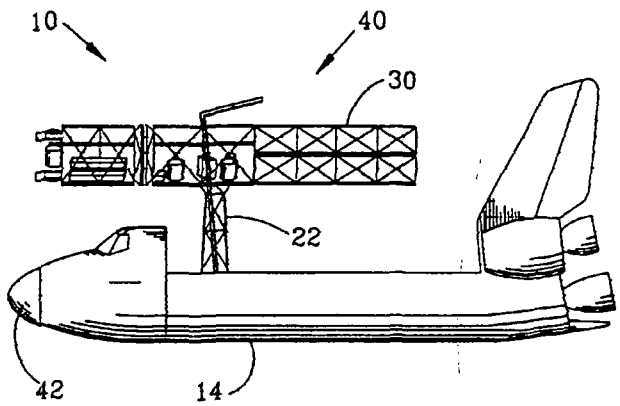
Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls.

N93-20042*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
PRE-INTEGRATED TRUSS SPACE STATION AND METHOD OF ASSEMBLY Patent Application
TIMOTHY E. PELISCHEK, inventor (to NASA), EDGAR O. CASTRO, inventor (to NASA), GREGG A. EDEEN, inventor (to NASA), DAVID A. HAMILTON, inventor (to NASA), JON B. KAHN, inventor (to NASA), JAMES B. MCDEDE, inventor (to NASA), KORNEL NAGY, inventor (to NASA), JOHN V. RIVERS, inventor (to NASA), IRENE E. VERINDER, inventor (to NASA), DONALD C. WADE, inventor (to NASA) et al. 24 Dec. 1992 23 p
(NASA-CASE-MSC-22015-1; NAS 1.71:MSC-22015-1; US-PATENT-APPL-SN-996763) Avail: CASI HC A03/MF A01

The present invention is directed to methods and apparatus relating to design, construction, integration and assembly of a space station. The present invention uses pre-integrated open (unpressurized) truss segments for modular construction of the space station. Each segment includes a truss structure and utility subsystem which may be fully assembled and tested on Earth. The segments may be latched together on orbit using a remote latching system. Utility subsystems, such as solar panels and radiators, are pre-integrated into the appropriate truss segment, and are deployable

from the respective truss segment on orbit. Rails run lengthwise along the assembled truss. The rails may be used with a mobile transporter for translating truss segments with respect to the spacecraft as part of the space station assembly process. The rails may also be used with a mobile transporter for carrying crew personnel, a robotic arm, and other equipment. With the present invention, the EVA time required for assembly as Space Station Freedom is markedly reduced.

NASA



20
SPACECRAFT PROPULSION AND POWER

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

N93-28324*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ROCKET ENGINE NOZZLE ATTENUATOR Patent Application
DAVID A. LEWIS, inventor (to NASA) (Pratt and Whitney Aircraft, West Palm Beach, FL.) 27 Jan. 1993 11 p
(NASA-CASE-MFS-28739-1; NAS 1.71:MFS-28739-1; US-PATENT-APPL-SN-010034) Avail: CASI HC A03/MF A01

The function of a rocket engine nozzle is to expand the hot engine exhaust gases down to ambient pressure, transforming thermal energy to directed kinetic energy in order to produce thrust. Considering nozzle design, there is an optimum nozzle shape and length, the bell-shaped or contour nozzle. The reason for this specific contour is that the nozzle must be designed in such a manner that the expansion shock waves emanating from the nozzle throat region coincide, and thus diminish the compression effects accompanying the reorientation of flow in the center region of the expansion section. A rocket nozzle must absorb a variety of loads caused by such shocks due to thermal expansion and contraction, as well as shocks from sudden pressurization at startup, and flight accelerations. A rocket engine nozzle is provided which is capable of attenuating nozzle vibrations generated therein during use. The nozzle includes an annular closed chamber surrounding the nozzle adjacent to its gas exhaust end. Within the chamber is a dense but unrestricted particulate mass capable of undergoing frictional move ment within the chamber.

NASA

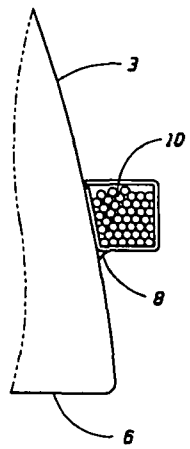


Fig. 2

N93-28424*# National Aeronautics and Space Administration. Pasadena Office, CA.
THREE-GRID ACCELERATOR SYSTEM FOR AN ION PROPULSION ENGINE Patent Application
JOHN R. BROPHY, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 20 May 1993 15 p
(Contract NAS7-918)
(NASA-CASE-NPO-18391-1-CU; NAS 1.71:NPO-18391-1-CU; US-PATENT-APPL-SN-066829) Avail: CASI HC A03/MF A01

Apparatus for an ion engine comprises a three-grid accelerator system with the decelerator grid biased negative of the beam plasma. This arrangement substantially reduces the charge-exchange ion current reaching the accelerator grid at high tank pressures, which minimizes erosion of the accelerator grid due to charge-exchange ion sputtering, known to be the major accelerator grid wear mechanism. An improved method for life testing ion engines is also provided using the disclosed apparatus. In addition, the invention can also be applied in materials processing.

NASA

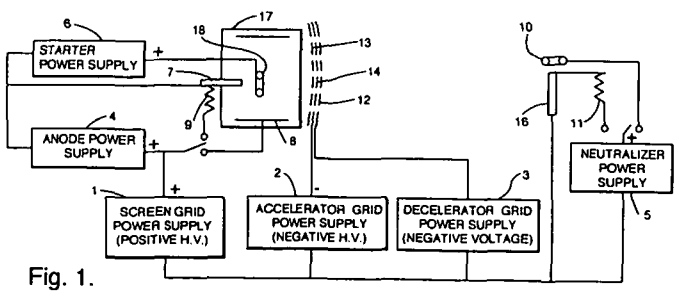
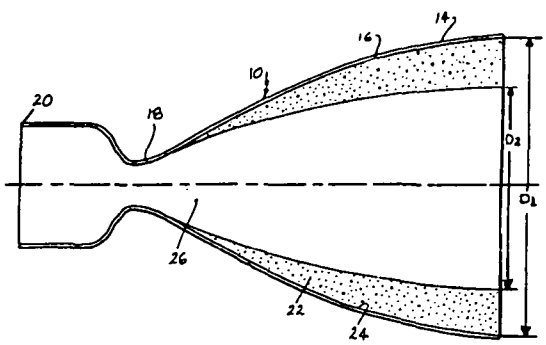


Fig. 1.

N93-28950*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
ALTITUDE COMPENSATING ABLATIVE STIFFENING BAND FOR ROCKET MOTOR NOZZLES Patent Application
J. LYNN BROWN, *inventor (to* NASA) *(Pratt and Whitney Aircraft,* West Palm Beach, FL.), VAUGHN W. MCINTIRE, JR., inventor (to NASA) (Pratt and Whitney Aircraft, West Palm Beach, FL.), LESLIE A. CLONTZ, inventor (to NASA) (Pratt and Whitney Aircraft, West Palm Beach, FL.), RICHARD J. PECKHAM, inventor (to NASA) (Pratt and Whitney Aircraft, West Palm Beach, FL.), ALAN B. C. DIXON, inventor (to NASA) (Pratt and Whitney Aircraft, West Palm Beach, FL.), and JAMES C. WEST, inventor (to NASA) (Pratt and Whitney Aircraft, West Palm Beach, FL.) 19 Mar. 1993 8 p
(NASA-CASE-MFS-28728-1; NAS 1.71:MFS-28728-1; US-PATENT-APPL-SN-034452) Avail: CASI HC A02/MF A01

A rocket motor nozzle with an ablative internal structural member which provides rigidity to the rocket motor both prior to and during motor operation is described. The rocket motor nozzle of the present invention includes an outer shell which converges to a throat and then diverges to form an entrance. An ablative stiffening band, secured to the inner surface of the nozzle and extending from the aft portion of the nozzle to the throat, is contoured to allow the exhaust gases to flow smoothly through a central longitudinal opening in the band.

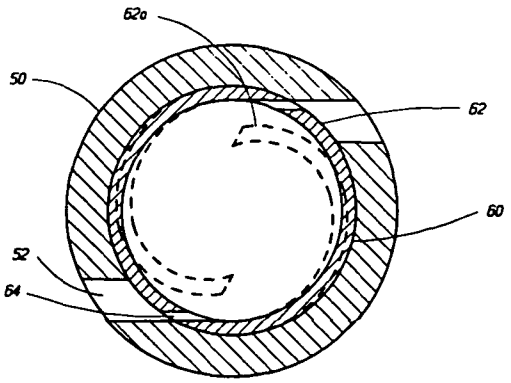
NASA



N93-29847*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
LIQUID FUEL INJECTION ELEMENTS FOR ROCKET ENGINES Patent Application
GEORGE B. COX, JR., inventor (to NASA) (Pratt and Whitney Aircraft, West Palm Beach, FL.) 27 Jan. 1993 17 p
(NASA-CASE-MFS-28547-1; NAS 1.71:MFS-28547-1; US-PATENT-APPL-SN-010037) Avail: CASI HC A03/MF A01

Thrust chambers for liquid propellant rocket engines include three principal components. One of these components is an injector which contains a plurality of injection elements to meter the flow of propellants at a predetermined rate, and fuel to oxidizer mixture ratio, to introduce the mixture into the combustion chamber, and to cause them to be atomized within the combustion chamber so that even combustion takes place. Evolving from these injectors are tube injectors. These tube injectors have injection elements for injecting the oxidizer into the combustion chamber. The oxidizer and fuel must be metered at predetermined rates and mixture ratios in order to mix them within the combustion chamber so that combustion takes place smoothly and completely. Hence tube injectors are subject to improvement. An injection element for a liquid propellant rocket engine of the bipropellant type is provided herein which *includes tangential fuel metering orifices, and a plurality of oxidizer* tube injection elements whose injection tubes are also provided with *tangential oxidizer entry slots and internal reed valves.*

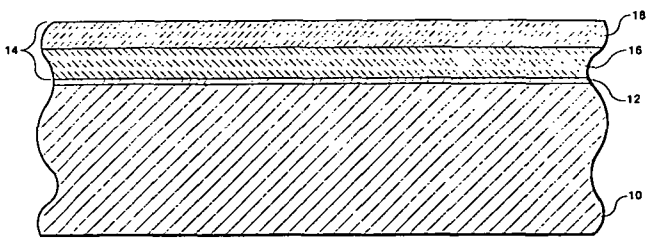
NASA



N93-31295*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
REUSABLE CRYOGENIC LIQUID ROCKET PROPELLANT TANK Patent Application
WILLIAM T. FREEMAN, inventor (to NASA), IAN O. MACCONOCHIE, inventor (to NASA), CHARLES A. BREINER, inventor (to NASA), and CHARLES F. BRYAN, JR., inventor (to NASA) 12 Jul. 1993 11 p
(NASA-CASE-LAR-14172-1; NAS 1.71:LAR-14172-1; US-PATENT-APPL-SN-090838) Avail: CASI HC A03/MF A01

A reusable liquid rocket propellant tank is provided. The tank consists of a composite outer shell, a foam-filled honeycomb sandwich insulation layer bonded to the inner surface of the composite shell and a collapsible inner lining which may be removed from the outer shell for inspection and replacement.

NASA



23

CHEMISTRY AND MATERIALS (GENERAL)

N93-23077*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
POLYBENZOXAZOLES VIA AROMATIC NUCLEOPHILIC DISPLACEMENT Patent Application
PAUL M. HERGENROTHER, inventor (to NASA), JOHN W. CONNELL, inventor (to NASA), and JOSEPH G. SMITH, JR., inventor (to NASA) (Akron Univ., OH.) 10 Apr. 1992 20 p
(NASA-CASE-LAR-14606-1-CU; NAS 1.71:LAR-14606-1-CU; US-PATENT-APPL-SN-867864) Avail: CASI HC A03/MF A01

Polybenzoxazoles (PBO) are heterocyclic macromolecules which were first synthesized in a two-step process by the initial formation of aromatic diacid chlorides with bis(o-aminophenol)s through solution condensation of aromatic diacid chlorides with bis(o-aminophenol)s followed by thermal cyclodehydration. Since then several methods have been utilized in their synthesis. The most common synthetic method for PBO involves a polycondensation of bis(o-aminophenol)s with aromatic diacid diphenyl esters. Another preparative route involves the solution polycondensation of the hydrochloride salts of bis(o-amino phenol)s with aromatic diacids in polyphosphoric acid. Another synthetic method involves the initial formation of poly(o-hydroxy amide)s from silylated bis (o-aminophenol)s with aromatic diacid chlorides followed by thermal cyclodehydration to PBO. A recent preparative route involves the reaction of aromatic bisphenols with bis(fluorophenyl) benzoxazoles by the displacement reaction to form PBO. The novelty of the present invention is that high molecular weight PBO of new chemical structures are prepared that exhibit a favorable combination of physical and mechanical properties.

NASA

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COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

N93-20040*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
FIBER-REINFORCED MONOCLINIC CELSIAN MATRIX COMPOSITE MATERIAL Patent Application
N. P. BANSAL, inventor (to NASA) and J. A. DICARLO, inventor (to NASA) 7 Dec. 1992 5 p
(NASA-CASE-LEW-15269-1; NAS 1.71:LEW-15269-1; US-PATENT-APPL-SN-986399) Avail: CASI HC A01/MF A01

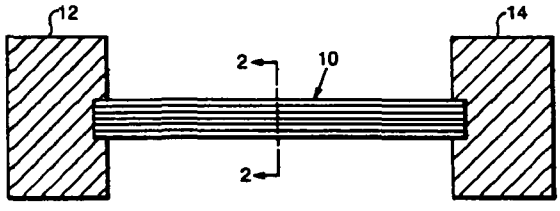
A hyridopolysilazane-derived ceramic fiber reinforced monoclinic celsian phase barium aluminum silicate glass-ceramic matrix composite material is prepared by ball-milling an aqueous slurry of BAS glass powder and fine monoclinic celsian seeds. The fibers improve the mechanical strength and fracture toughness. These fibers further provide superior dielectric properties.

NASA

N93-20568*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
HEAT TRANSFER DEVICE Patent Application
BRUCE A. BANKS, inventor (to NASA) and J. R. GAIER, inventor (to NASA) 10 Feb. 1993 11 p
(NASA-CASE-LEW-14162-4; NAS 1.71:LEW-14162-4; US-PATENT-APPL-SN-017402) Avail: CASI HC A03/MF A01

Gas derived graphite fibers generated by the decomposition of an organic gas are joined with a suitable binder. This produces a high thermal conductivity composite material which passively conducts heat from a source, such as a semiconductor, to a heat sink. The fibers may be intercalated. The intercalate can be halogen or halide salt, alkaline metal, or any other species which contributes to the electrical conductivity improvement of the graphite fiber. The fibers are bundled and joined with a suitable binder to form a high thermal conductivity composite material device. The heat transfer device may also be made of intercalated highly oriented pyrolytic graphite and machined, rather than made of fibers.

NASA



N93-24597* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
CONTINUOUS FIBER THERMOPLASTIC PREPREG Patent
MAYWOOD L. WILSON, inventor (to NASA) and GARY S. JOHNSON, inventor (to NASA) 27 Apr. 1993 10 p Filed 15 Nov. 1990 supersedes N91-15334 (29 - 7, p 972)
(NASA-CASE-LAR-14459-1; US-PATENT-5,205,898; US-PATENT-APPL-SN-613046; US-PATENT-CLASS-156-441; US-PATENT-CLASS-118-124; US-PATENT-CLASS-118-125; US-PATENT-CLASS-156-181; INT-PATENT-CLASS-B05C-3/152; INT-PATENT-CLASS-B29B-15/12; INT-PATENT-CLASS-B29C-67/14) Avail: US Patent and Trademark Office

A pultrusion machine employing a corrugated impregnator vessel to immerse multiple, continuous strand, fiber tow in an impregnating material, and an adjustable metered exit orifice for the impregnator vessel to control the quantity of impregnating material retained by the impregnated fibers, is provided. An adjustable height insert retains transverse rod elements within each depression of the corrugated vessel to maintain the individual fiber tows spread and in contact with the vessel bottom. A series of elongated heating dies, transversely disposed on the pultrusion machine and having flat heating surfaces with radiused edges, ensure adequate temperature exposed dwell time and exert adequate pressure on the impregnated fiber tows, to provide the desired thickness and fiber/resin ratio in the prepreg formed. The prepreg passing through the pulling mechanism is wound on a suitable take-up spool for subsequent use. A formula is derived for determining the cross sectional area opening of the metering device. A modification in the heating die system employs a heated nip roller in lieu of one of the pressure applying flat dies.

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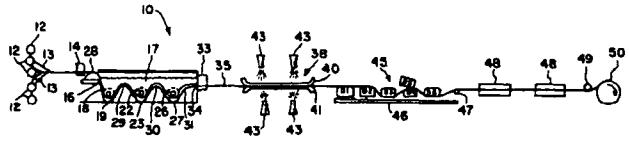

N93-26100* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
CERAMIC FIBER REINFORCED GLASS-CERAMIC MATRIX COMPOSITE Patent
NAROTTAM P. BANSAL, inventor (to NASA) 25 May 1993 4 Filed 4 Jun. 1992
(NASA-CASE-LEW-15262-1; US-PATENT-5,214,004; US-PATENT-APPL-SN-892055; US-PATENT-CLASS-501-8; US-PATENT-CLASS-501-32; US-PATENT-CLASS-501-89; US-PATENT-CLASS-501-95; US-PATENT-CLASS-428-428; US-PATENT-CLASS-428-698; US-PATENT-CLASS-264-58) Avail: US Patent and Trademark Office

A slurry of BSAS glass powders is cast into tapes which are cut to predetermined sizes. Mats of continuous chemical vapor deposition (CVD)-SiC fibers are alternately stacked with these matrix tapes. This tape-mat stack is warm-pressed to produce a 'green' composite which is heated to burn out organic constituents. The remaining interim material is then hot-pressed to form a BSAS glass-ceramic fiber-reinforced composite.

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

N93-29023* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
METHOD FOR PREPARATION OF A MICROPOROUS STRUCTURE WITH LAYERED INTERSTITIAL SURFACE TREATMENT Patent
STEVEN L. KOONTZ, inventor (to NASA) 1 Jun. 1993 10 p Filed 2 Jun. 1992 Continuation-in-part of US-Patent-Appl-SN-429739, filed 31 Oct. 1989
(NASA-CASE-MSC-21487-2; US-PATENT-5,215,790; US-PATENT-APPL-SN-894505; US-PATENT-APPL-SN-429739; US-PATENT-CLASS-427-535; US-PATENT-CLASS-427-244; US-PATENT-CLASS-427-269; US-PATENT-CLASS-427-270; US-PATENT-CLASS-427-287; US-PATENT-CLASS-427-377) Avail: US Patent and Trademark Office

A microporous structure with layered interstitial surface treatments, and method and apparatus for preparation thereof are described. The structure is prepared by sequentially subjecting a uniformly surface-treated structure to atomic oxygen treatment to remove an outer layer of surface treatment to a generally uniform depth, and then surface treating the so exposed layer with another surface treating agent. The atomic oxygen/surface treatment steps may optionally be repeated, each successive time to a lesser depth, to produce a microporous structure having multilayered surface treatments. The apparatus employs at least one side arm from a main atomic oxygen-containing chamber. The side arm has characteristic relaxation times such that a uniform atomic oxygen dose rate is delivered to a specimen positioned transversely in the side arm spaced from the main gas chamber.

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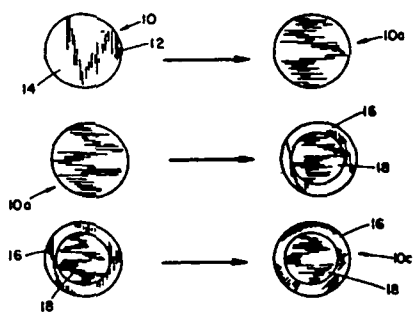

N93-29609* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
APPARATUS FOR INTERCALATING LARGE QUANTITIES OF FIBROUS STRUCTURES Patent
JAMES R. GAIER, inventor (to NASA) 6 Jul. 1993 7 p Filed 24 Jul. 1991 Supersedes N91-28289 (29 - 20, p 3304) Division of US-Patent-Appl-SN-608493, filed 2 Nov. 1990
(NASA-CASE-LEW-15077-2; US-PATENT-5,225,171; US-PATENT-APPL-SN-735548; US-PATENT-APPL-SN-608493; US-PATENT-CLASS-422-209; US-PATENT-CLASS-422-136; INT-PATENT-CLASS-B01J-19/28) Avail: US Patent and Trademark Office

Apparatus for intercalating large quantities of fibrous structures uses a rotatable reaction chamber containing a liquid phase intercalate. The intercalate liquid phase is controlled by appropriately heating, cooling or pressurizing the reaction. Rotation of the chamber containing the fiber sample ensures total submergence if the fiber during intercalation. Intercalated graphite fibers having metal-like resistivities are produced and are conceivably useful as electrical conductors.

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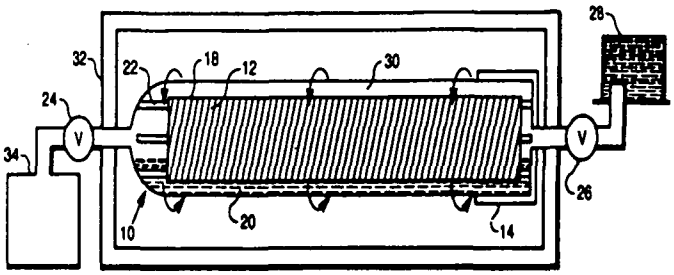

N93-29614* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
SEMICONDUCTOR COOLING APPARATUS Patent
BRUCE A. BANKS, inventor (to NASA) and JAMES R. GAIER, inventor (to NASA) 29 Jun. 1993 7 p Filed 11 May 1992 Supersedes N92-34208 (30 - 24, p 4148) Continuation-in-part of abandoned US-Patent-Appl-SN-657238, filed 19 Feb. 1991, which is a continuation-in-part of abandoned US-Patent-Appl-SN-501893, filed 30 Mar. 1990
(NASA-CASE-LEW-14162-3; US-PATENT-5,224,030; US-PATENT-APPL-SN-880851; US-PATENT-APPL-SN-657238; US-PATENT-APPL-SN-501893; US-PATENT-CLASS-361-386; US-PATENT-CLASS-165-185; US-PATENT-CLASS-174-16.3; US-PATENT-CLASS-428-614; INT-PATENT-CLASS-H05K-7/20) Avail: US Patent and Trademark Office

Gas derived graphite fibers generated by the decomposition of an organic gas are joined with a suitable binder. This produces a high thermal conductivity composite material which passively conducts heat from a source, such as a semiconductor, to a heat sink. The fibers may be intercalated. The intercalate can be halogen or halide salt, alkaline metal, or any other species which contributes to the electrical conductivity improvement of the graphite fiber. The fibers are bundled and joined with a suitable binder to form a high thermal conductivity composite material device. The heat transfer device may also be made of intercalated highly oriented pyrolytic

graphite and machined, rather than made of fibers.
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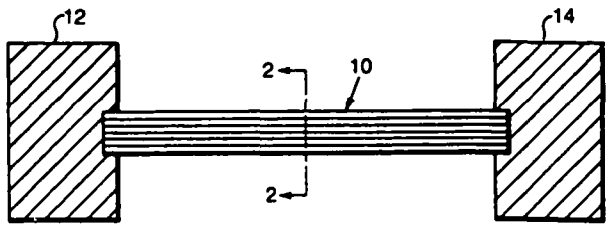

N93-31293*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
SIC FIBER-REINFORCED CELSIAN GLASS-CERAMIC MATRIX COMPOSITE Patent Application
NAROTTAM P. BANSAL, inventor (to NASA) 16 Apr. 1992 7 p (NASA-CASE-LEW-15264-1; NAS 1.71:LEW-15264-1; US-PATENT-APPL-SN-872262) Avail: CASI HC A02/MF A01

A fiber-reinforced composite composed of a BaO-Al2O3-2SiO2 (BAS) glass ceramic matrix is reinforced with CVD silicon carbide continuous fibers. A slurry of BAS glass powders is cast into tapes which are cut to the proper size. Continuous CVD-SiC fibers are formed into mats of the desired size. The matrix tapes and the fiber mats are alternately stacked in the proper orientation. This tape-mat stack is warm pressed to produce a 'green' composite. The 'green' composite is then heated to an elevated temperature to burn out organic constituents. The remaining interim material is then hot pressed to form a silicon carbide fiber-reinforced celsian (BAS) glass-ceramic matrix composite which may be machined to size.

NASA

Fig. 1

N93-31296*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
METHOD FOR PRODUCING HYBRID GRAPHITE COMPOSITE Patent Application
JAMES R. GAIER, inventor (to NASA) 22 Jul. 1993 13 p (NASA-CASE-LEW-15241-2; NAS 1.71:LEW-15241-2; US PATENT-APPL-SN-094732) Avail: CASI HC A03/MF A01

Highly conducting lightweight hybrid materials are obtained by weaving strands of carbon or graphite fibers into a 2-dimensional fabric-like structure, depositing a layer of carbon onto the fibers of the fabric-like structure, heating the fabric-like structure to graphitize the carbon layer and intercalating the graphitized carbon layer. Composite materials for use in lightning strike protection are composed of at least one layer of the highly conducting lightweight hybrid material and at least one layer of traditional composite materials.

NASA

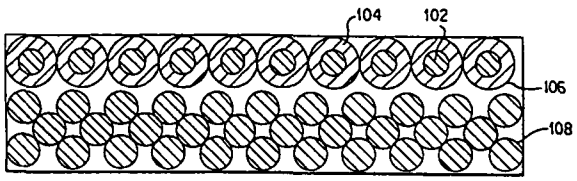

FIG.2

N93-31299*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
METHOD OF PRODUCING A CERAMIC FIBER-REINFORCED GLASS-CERAMIC MATRIX COMPOSITE Patent Application
N. P. BANSAL, inventor (to NASA) 30 Jun. 1993 8 p (NASA-CASE-LEW-15264-2; NAS 1.71:LEW-15264-2; US-PATENT-APPL-SN-084058) Avail: CASI HC A02/MF A01

A fiber-reinforced composite composed of a BaO-Al2O3-2SiO2 (BAS) glass ceramic matrix is reinforced with CVD silicon carbide continuous fibers. A slurry of BAS glass powders is prepared and celsian seeds are added during ball melting. The slurry is cast into tapes which are cut to the proper size. Continuous CVD-SiC fibers are formed into mats of the desired size. The matrix tapes and the fiber mats are alternately stacked in the proper orientation. This tape-mat stack is warm pressed to produce a 'green' composite. The 'green' composite is then heated to an elevated temperature to burn out organic constituents. The remaining interim material is then hot pressed to form a silicon carbide fiber-reinforced celsian (BAS) glass-ceramic matrix composite which may be machined to size.

NASA

Fig. 1

25
INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

N93-20570* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
ACOUSTOPHORESIS SEPARATION METHOD Patent

JOSEPH S. HEYMAN, inventor (to NASA) 9 Mar. 1993 8 p Filed 17 Jun. 1992 Division of US-Patent-Appl-SN-628062, filed 17 Dec. 1990
(NASA-CASE-LAR-13388-2; US-PATENT-5,192,450; US-PATENT-APPL-SN-901627; US-PATENT-APPL-SN-628062; US-PATENT-CLASS-210-748; US-PATENT-CLASS-55-277; US-PATENT-CLASS-210-767; US-PATENT-CLASS-210-806; US-PATENT-CLASS-406-197; INT-PATENT-CLASS-B01D-17/06) Avail: US Patent and Trademark Office

A method and apparatus are provided for acoustophoresis, i.e., the separation of species via acoustic waves. An ultrasonic transducer applies an acoustic wave to one end of a sample container containing at least two species having different acoustic absorptions. The wave has a frequency tuned to or harmonized with the point of resonance of the species to be separated. This wave causes the species to be driven to an opposite end of the sample container for removal. A second ultrasonic transducer may be provided to apply a second, oppositely directed acoustic wave to prevent undesired streaming. In addition, a radio frequency tuned to the mechanical resonance and coupled with a magnetic field can serve to identify a species in a medium comprising species with similar absorption coefficients, whereby an acoustic wave having a frequency corresponding to this gyrational rate can then be applied to sweep the identified species to one end of the container for removal.

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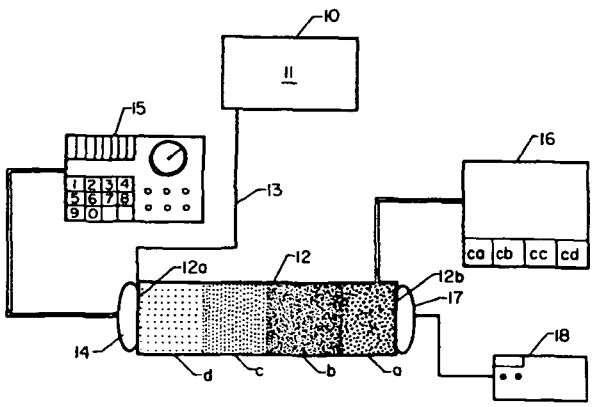
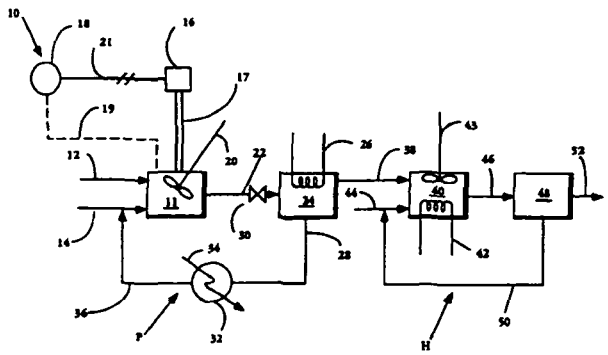


N93-22036* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
APPARATUS AND METHOD FOR CELLULOSE PROCESSING USING MICROWAVE PRETREATMENT Patent
HATICE S. CULLINGFORD, inventor (to NASA), CLIFFORD E. GEORGE, inventor (to NASA), and GEORGE R. LIGHTSEY, inventor (to NASA) 23 Mar. 1993 7 p Filed 5 Jul. 1991 Supersedes N92-19486 (30 - 10, p 1585)
(NASA-CASE-MSC-21936-1-SB; US-PATENT-5,196,069; US-PATENT-APPL-SN-728901; US-PATENT-CLASS-127-37; US-PATENT-CLASS-127-1; US-PATENT-CLASS-127-2; US-PATENT-CLASS-162-72; US-PATENT-CLASS-162-76; US-PATENT-CLASS-162-50; INT-PATENT-CLASS-C13K-1/02) Avail: US Patent and Trademark Office

A method for pretreating a cellulosic waste product with microwaves is disclosed as well as a method and apparatus for converting cellulosic waste into soluble saccharides. The invention greatly enhances a reaction rate for enzymatic hydrolysis. A feed mixture of cellulose, water, and acetic acid are irradiated with microwaves at a superatmospheric pressure in an autoclave reaction vessel and the treated cellulose is enzymatically hydrolyzed in a bioreactor. The acid and enzymes are optionally separated for reuse. As a feed stock for the culture of microbes, the sugars can be further processed into ethanol, or food protein. High yield, low hazard potential, low energy usage, and ready preparation in space of acetic acid and the enzyme makes the present invention well suited for use on long duration space missions.

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



N93-29506* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PROCESS TO PREPARE 1,3-DIAMINO-5-PENTAFLUOROSULFANYLBENZENE Patent
TERRY L. ST.CLAIR, inventor (to NASA), ANNE K. ST.CLAIR, inventor (to NASA), and JOSEPH S. THRASHER, inventor (to NASA) 15 Jun. 1993 6 p Filed 5 Sep. 1991
(NASA-CASE-LAR-14773-2-CU; US-PATENT-5,220,070; US-PATENT-APPL-SN-755207; US-PATENT-CLASS-564-440; US-PATENT-CLASS-564-417; US-PATENT-CLASS-562-827; INT-PATENT-CLASS-C07C-323/09) Avail: US Patent and Trademark Office

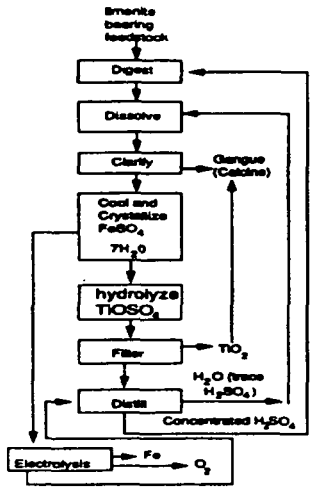
A process was developed to prepare 1,3-diamino- 5-pentafluoro sulfanylbenzene. This process involved two steps: preparing the dinitro compound, 1,3-dinitro- 5-pentafluoro sulfanylbenzene, and reducing this compound to form the corresponding diamine. This diamine was reacted with various dianhydrides, diacidchlorides, and epoxy resins to form polyimides, polyamides, and cross linked epoxies. These polymers were used to prepare semi-permeable membranes, wire coatings, and films.

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

N93-29617* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
METHOD FOR PRODUCING OXYGEN FROM LUNAR MATERIALS Patent
THOMAS A. SULLIVAN, inventor (to NASA) 13 Jul. 1993 12 p Filed 24 Sep. 1991 Supersedes N92-12079 (30 - 3, p 367)
(NASA-CASE-MSC-21759-1; US-PATENT-5,227,032; US-PATENT-APPL-SN-764581; US-PATENT-CLASS-204-129; US-PATENT-CLASS-204-105R; US-PATENT-CLASS-204-112; US-PATENT-CLASS-204-104; INT-PATENT-CLASS-C25B-1/02; INT-PATENT-CLASS-C25B-1/22; INT-PATENT-CLASS-C25C-1/06) Avail: US Patent and Trademark Office

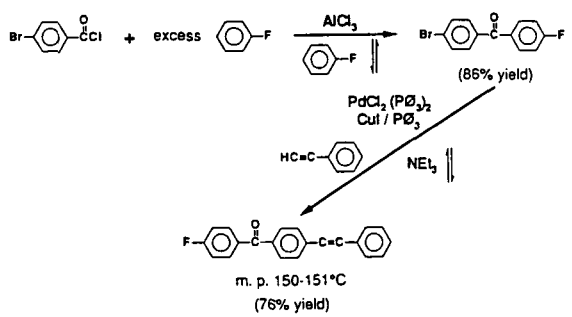
This invention is related to producing oxygen from lunar or Martian materials, particularly from lunar ilmenite in situ. The process includes producing a slurry of the minerals and hot sulfuric acid, the acid and minerals reacting to form sulfates of the metal. Water is added to the slurry to dissolve the minerals into an aqueous solution, the first aqueous solution is separated from unreacted minerals from the slurry, and the aqueous solution is electrolyzed to

produce the metal and oxygen.
Official Gazette of the U.S. Patent and Trademark Office



N93-31459*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PHENYLETHYNYL ENDCAPPING REAGENTS AND REACTIVE DILUENTS Patent Application
BRIAN J. JENSEN, inventor (to NASA), ROBERT G. BRYANT, inventor (to NASA), and PAUL M. HERGENROTHER, inventor (to NASA) 2 Apr. 1993 21 p
(NASA-CASE-LAR-14796-1; NAS 1.71:LAR-14796-1; US-PATENT-APPL-SN-045343) Avail: CASI HC A03/MF A01

A phenylethynyl composition which can be used to endcap nucleophilic species is employed in the production of phenylethynyl terminated reactive oligomers exclusively. These phenylethynyl terminated reactive oligomers display unique thermal characteristics, as exemplified by the model compound, 4-phenoxy 4'-phenylethynylbenzophenone, which is relatively stable at 200 C, but reacts at 350 C. In addition, a reactive diluent was prepared which decreases the melt viscosity of the phenylethynyl terminated oligomers and subsequently reacts therewith to increase density of the resulting thermoset. The novelty of this invention resides in the phenylethynyl composition used to terminate a nucleophilic reagent, resulting in the exclusive production of phenylethynyl terminated reactive oligomers which display unique thermal characteristics. A reactive diluent was also employed to decrease the melt viscosity of a phenylethynyl terminated reactive oligomer and to subsequently react therewith to increase the crosslink density of the resulting thermoset. These materials have features which make them attrac tive candidates for use as composite matrices and adhesives.
NASA

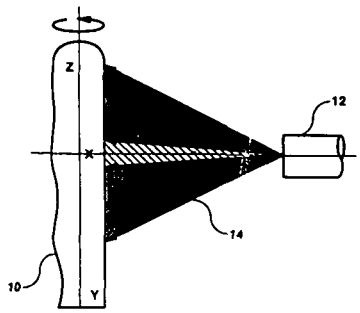


26
METALLIC MATERIALS

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

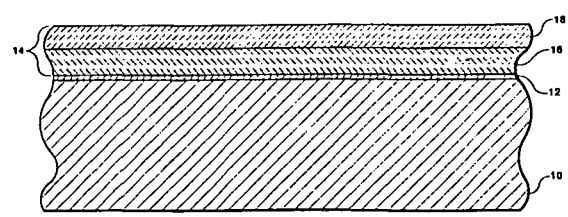
N93-29172*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
HIGH TEMPERATURE CREEP AND OXIDATION RESISTANT CHROMIUM SILICIDE MATRIX ALLOY CONTAINING MOLYBDENUM Patent Application
SAI V. RAJ, inventor (to NASA) 26 May 1993 14 p
(NASA-CASE-LEW-15697-1; NAS 1.71:LEW-15697-1; US-PATENT-APPL-SN-067184) Avail: CASI HC A03/MF A01

Cr3Si is alloyed with molybdenum which produces a two-phase micro structure of (Cr,Mo)3Si and (Cr,Mo)5Si3. The alloy forms two protective oxides over a wide range of temperatures. Chromium and molybdenum oxide volatize under flowing air at high temperatures above 1200 C which facilitates the formation of SiO2 on the surface. Below 1200 C Cr203 is formed. The new alloy has excellent high temperature strength and creep properties.
NASA



N93-31294*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
PLASMA SPRAYED CERAMIC THERMAL BARRIER COATING FOR NIAL-BASED INTERMETALLIC ALLOYS Patent Application
R. A. MILLER, inventor (to NASA) and J. DOYCHAK, inventor (to NASA) 26 Oct. 1992 10 p
(NASA-CASE-LEW-15535-1; NAS 1.71:LEW-15535-1; US-PATENT-APPL-SN-970669) Avail: CASI HC A02/MF A01

A thermal barrier coating system consists of two layers of a zirconia-yttria ceramic. The first layer is applied by low pressure plasma spraying. The second layer is applied by conventional atmospheric pressure plasma spraying. This facilitates the attachment of a durable thermally insulating ceramic coating directly to the surface of a highly oxidation resistant NiAl-based intermetallic alloy after the alloy has been preoxidized to promote the formation of a desirable Al2O3 scale.
NASA



27
NONMETALLIC MATERIALS

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

N93-20041*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
IMPROVED CERAMIC SLIP CASTING TECHNIQUE Patent Application
GREGORY M. BUCK, inventor (to NASA) and PETER VASQUEZ, *inventor (to NASA)* *22 Sep. 1992* 9 p
(NASA-CASE-LAR-14471-1; NAS 1.71:LAR-14471-1; US-PATENT-APPL-SN-950580) Avail: CASI HC A02/MF A01

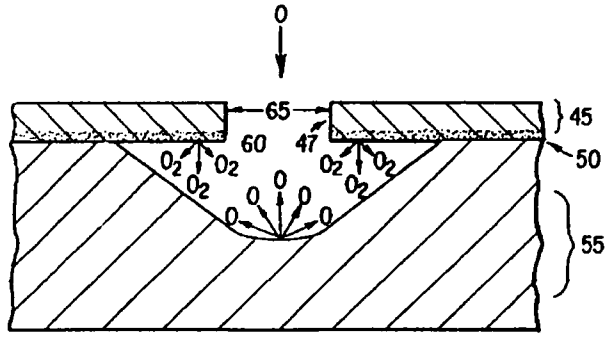
A primary concern in modern fluid dynamics research is the experimental verification of computational aerothermodynamic codes. This research requires high precision and detail in the test model employed. Ceramic materials are used for these models because of their low heat conductivity and their survivability at high temperatures. To fabricate such models, slip casting techniques were developed to provide net-form, precision casting capability for high-purity ceramic materials in aqueous solutions. In previous slip casting techniques, block, or flask molds made of plaster-of-paris were used to draw liquid from the slip material. Upon setting, parts were removed from the flask mold and cured in a kiln at high temperatures. Casting detail was usually limited with this technique — detailed parts were frequently damaged upon separation from the flask mold, as the molded parts are extremely delicate in the uncured state, and the flask mold is inflexible. Ceramic surfaces were also marred by 'parting lines' caused by mold separation. This adversely affected the aerodynamic surface quality of the model as well. (Parting lines are invariably necessary on or near the leading edges of wings, nosetips, and fins for mold separation. These areas are also critical for flow boundary layer control.) Parting agents used in the casting process also affected surface quality. These agents eventually soaked into the mold, the model, or flaked off when releasing the case model. Different materials were tried, such as oils, paraffin, and even an algae. The algae released best, but some of it remained on the model and imparted an uneven texture and discoloration on the model surface when cured. According to the present invention, a wax pattern for a shell mold is provided, and an aqueous mixture of a calcium sulfate-bonded investment material is applied as a coating to the wax pattern. The coated wax pattern is then dried, followed by curing to vaporize the wax pattern and leave a shell mold of the calcium sulfate-bonded investment material. The shell mold is cooled to room temperature, and a ceramic slip is poured therein. After a ceramic shell of desired thickness has set up in the shell mold, excess ceramic slip is poured out. While still wet, the shell mold is peeled from the ceramic shell to expose any delicate or detailed parts, after which the ceramic shell is cured to provide a complete, detailed, precision ceramic article without parting lines.

NASA

N93-20566*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ATOMIC OXYGEN PROTECTIVE COATING WITH RESISTANCE TO UNDERCUTTING AT DEFECT SITES Patent Application
BRUCE A. BANKS, inventor (to NASA) and SHARON K. RUTLEDGE, inventor (to NASA) 6 Jul. 1992 15 p
(NASA-CASE-LEW-15306-1; NAS 1.71:LEW-15306-1; US-PATENT-APPL-SN-909345) Avail: CASI HC A03/MF A01

Structures composed at least partially of an organic substrate may be protected from oxidation by applying a catalyst onto said substrate for promoting the combination of atomic oxygen to molecular oxygen. The structure may also be protected by applying both a catalyst and an atomic oxygen shielding layer onto the substrate. The structures to be protected include spacecraft surfaces.

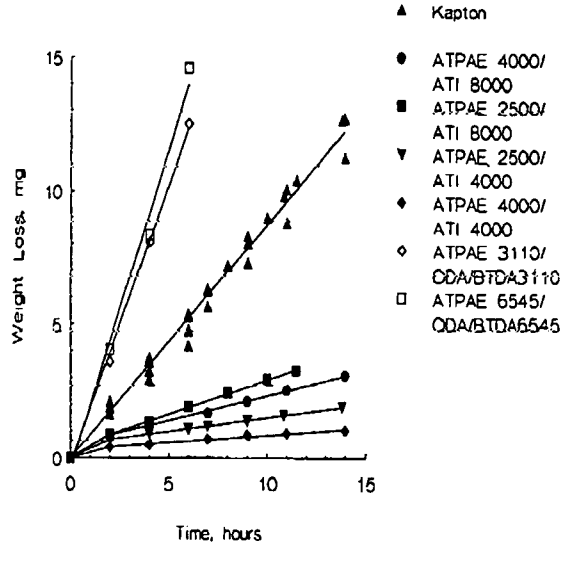
NASA



N93-20567*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
IMIDE/ARYLENE ETHER COPOLYMERS CONTAINING PHOSPHINE OXIDE GROUPS Patent Application
BRIAN J. JENSEN, inventor (to NASA) 20 Nov. 1992 19 p
(NASA-CASE-LAR-14925-1; NAS 1.71:LAR-14925-1; US-PATENT-APPL-SN-990570) Avail: CASI HC A03/MF A01

Anhydride terminated poly(amic acids) are reacted with amine terminated phosphine oxide containing poly(arylene ethers) in polar aprotic solvents to form poly(amic acids) which are cyclodehydrated yielding atomic oxygen resistant imide/arylene ether block copolymers. The resulting block copolymers exhibited excellent resistance to oxygen plasma etching and improved tensile strength and modulus,making them useful for films, coatings, adhesives and composite matrices for low earth orbit applications.

NASA



N93-22033* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
POLYIMIDE FROM BIS(N-ISOPRENYL)S OF ARYL DIAMIDES Patent
JOSEPH G. SMITH, JR., inventor (to NASA) and RAPHAEL M. OTTENBRITE, inventor (to NASA) 6 Apr. 1993 6 p Filed 16 Aug. 1990 Supersedes N91-13560 (29 - 5, p 642)
(NASA-CASE-LAR-14330-2-CU; US-PATENT-5,200,497; US-PATENT-APPL-SN-568128; US-PATENT-CLASS-526-262; US-PATENT-CLASS-528-170; US-PATENT-CLASS-528-321; US-PATENT-CLASS-528-322; INT-PATENT-CLASS-C08F-222/40) Avail: US Patent and Trademark Office

A process and polyimide product formed by the reaction of a bismaleimide with a bis(amidediene) is disclosed wherein the bis(amidediene) is formed by reacting an excess of an acid chloride with 1,4-N,N'-diisoprenyl 2,3,5,6-tetramethyl benzene.

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

N93-25995* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PROCESS FOR BONDING ELASTOMERS TO METALS Patent
GEORGE E. DICKERSON, inventor (to NASA) and HENRY L. KELLEY, inventor (to NASA) 25 May 1993 5 p Filed 26 Jun. 1991 Supersedes N91-28424 (29 - 20, p 3327)
(NASA-CASE-LAR-13645-1; US-PATENT-5,213,739; US-PATENT-APPL-SN-721038; US-PATENT-CLASS-264-135; US-PATENT-CLASS-156-245; US-PATENT-CLASS-264-259; US-PATENT-CLASS-264-265; US-PATENT-CLASS-264-DIG.65; INT-PATENT-CLASS-B29C-45/16) Avail: US Patent and Trademark Office

A process for bonding elastomeric material to a metal part includes coating a heat curable adhesive on the surfaces of the metal part to be bonded. The metal part is placed in a mold, a bottom plate and an upper transfer pot of a transfer molding machine is preheated to a predetermined cure temperature. A predetermined quantity of uncured elastomeric material is loaded into the transfer pot. The mold containing the adhesive coated metal part is clamped to the bottom plate, and almost contemporaneously, the uncured elastomeric material is pressed into the mold while maintaining heat and pressure in the mold for a time sufficient to vulcanize and thereby cure the elastomeric material simultaneously with the adhesive, whereby contacting surfaces of the metal part are strongly bonded to the vulcanized elastomeric material.

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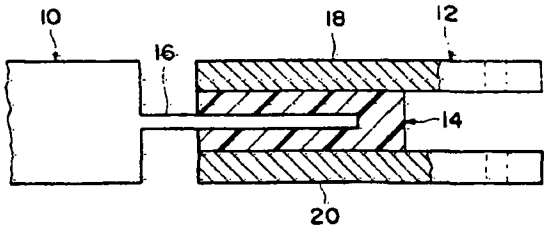

N93-25997*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
POLYIMIDES WITH IMPROVED COMPRESSION MOLDABILITY Patent
PAUL M. HERGENROTHER, inventor (to NASA), STEPHEN J. HAVENS, inventor (to NASA), and MARK W. BELTZ, inventor (to NASA) 18 May 1993 9 p Filed 8 May 1990 Supersedes N92-11198 (30 - 2, p 218)
(NASA-CASE-LAR-14457-1; US-PATENT-5,212,276; US-PATENT-APPL-SN-520472; US-PATENT-CLASS-528-125; US-PATENT-CLASS-528-128; US-PATENT-CLASS-528-170; US-PATENT-CLASS-528-172; US-PATENT-CLASS-528-173; US-PATENT-CLASS-528-176; US-PATENT-CLASS-528-183) Avail: US Patent and Trademark Office

The semicrystalline polyimide prepared by reaction of 3,3',4,4' benzophenonetetracarboxylic (BTDA) and 1,3-bis(4-aminophenoxy 4' benzoyl) benzene (1,3-BABB) is modified so that it can be more readily processed to form adhesive bonds, moldings, and composites. The stoichiometric ratio of the two monomers, BTDA and 1,3-BABB is controlled so that the intermediate polyamide acid is of a calculated molecular weight. A polyimide acid with excess anhydride groups is then reacted with the stoichiometrically required amount of monofunctional aromatic or aliphatic amine required for complete endcapping. The stoichiometrically offset, encapped polyimide is processed at lower temperatures and pressures than the unmodified high molecular weight polyimide with the same repeat unit, and exhibits an improved melt stability.

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N93-25999* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
POLYIMIDES CONTAINING THE CYCLOBUTENE-3,4-DIONE MOIETY Patent
TERRY L. ST.CLAIR, inventor (to NASA) 18 May 1993 5 p Filed 3 Mar. 1992 Supersedes N92-30313 (30 - 21, p 3601)
(NASA-CASE-LAR-14753-1; US-PATENT-5,212,283; US-PATENT-APPL-SN-845090; US-PATENT-CLASS-528-353; US-PATENT-CLASS-528-125; US-PATENT-CLASS-528-128; US-PATENT-CLASS-528-170; US-PATENT-CLASS-528-172; US-PATENT-CLASS-528-173; US-PATENT-CLASS-528-176) Avail: US Patent and Trademark Office

In the present invention, linear aromatic polyimides containing the cyclobutene-3,4-dione moiety were produced from the reaction of a substituted or unsubstituted 1,2-bis(4-aminoanilino) cyclobutene-3,4-dione (SQDA) with various aromatic dianhydrides. These polymers had high molecular weights and their glass transition temperatures (Tgs) were greater than 500 C. Despite the very high Tg, these polymers exhibited excellent adhesion to glass. In addition, the films of these polyimides increased in flexibility with increasing cure temperatures. The novelty of this invention lies in the linear aromatic polyimide containing the cyclobutene-3,4-dione moiety. The presence of this moiety causes such changes in properties as Tgs greater than 500 C, excellent adhesion to glass, and increased flexibility with increasing cure temperatures.

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

N93-28423*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
GUANIDINE BASED VEHICLE/BINDERS FOR USE WITH OXIDES, METALS, AND CERAMICS Patent Application
WARREN H. PHILIPP, inventor (to NASA), LISA C. VEITCH, inventor (to NASA), and MARTHA H. JASKOWIAK, inventor (to NASA) 25 Jun. 1993 14 p
(NASA-CASE-LEW-15314-2; NAS 1.71:LEW-15314-2; US-PATENT-APPL-SN-081180) Avail: CASI HC A03/MF A01

The use of guanidine salts of organic fatty acids (guanidine soaps) as vehicles and binders for coating substrate surfaces is disclosed. Being completely organic, the guanidine soaps can be burned off leaving no undesirable residue. Of special interest is the use of guanidine 2-ethyl hexanoate as the vehicle and binder for

coating problematic surfaces such as in coating alumina fibers with platinum or zirconia. For this application the guanidine soap is used as a melt. For other applications the guanidine soap may be used in a solution with a variety of solvents, the solution containing chlorometalates or powdered metals, refractories or ceramics.

NASA

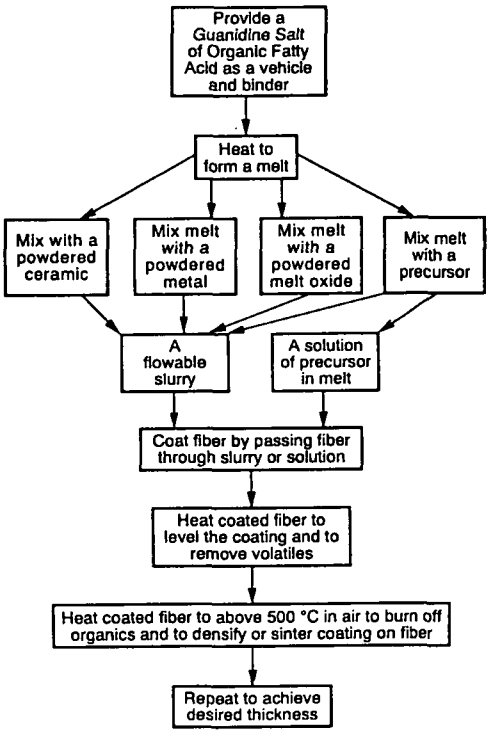


FIG. 1

N93-28425*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

METHOD FOR RETARDING OXIDATION OF AN ORGANIC SUBSTRATE Patent Application

BRUCE A. BANKS, inventor (to NASA) and SHARON K. RUTLEDGE, inventor (to NASA) 24 May 1993 15 p

(NASA-CASE-LEW-15306-2; NAS 1.71:LEW-15306-2; US-PATENT-APPL-SN-065794) Avail: CASI HC A03/MF A01

Structures composed at least partially of an organic substrate are protected from oxidation by applying a catalyst onto said substrate for promoting the combination of atomic oxygen to molecular oxygen. The structure may also be protected by applying both a catalyst and an atomic oxygen shielding layer onto the substrate. The invention is useful for enhancing the protection of polymeric blankets, solar arrays, and spacecraft surfaces in low earth orbit from cavities produced by atomic oxygen.

NASA

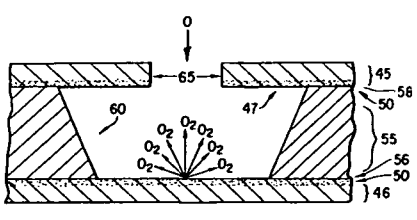


FIG. 4

N93-28426*# National Aeronautics and Space Administration. Pasadena Office, CA.

DIAMOND COMPOSITE FILMS FOR PROTECTIVE COATINGS ON METALS AND METHOD OF FORMATION Patent Application

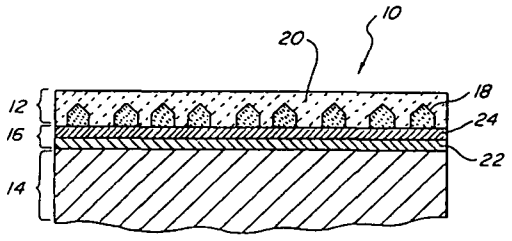
T. P. ONG, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and Y. H. SHING, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 22 Apr. 1993 20 p

(Contract NAS7-918)

(NASA-CASE-NPO-18501-1-CU; NAS 1.71:NPO-18501-1-CU; US-PATENT-APPL-SN-052419) Avail: CASI HC A03/MF A01

Composite films consisting of diamond crystallites and hard amorphous films such as diamond-like carbon, titanium nitride, and titanium oxide are provided as protective coatings for metal substrates against extremely harsh environments. A composite layer having diamond crystallites and a hard amorphous film is affixed to a metal substrate via an interlayer including a bottom metal silicide film and a top silicon carbide film. The interlayer is formed either by depositing metal silicide and silicon carbide directly onto the metal substrate, or by first depositing an amorphous silicon film, then allowing top and bottom portions of the amorphous silicon to react during deposition of the diamond crystallites, to yield the desired interlayer structure.

NASA



N93-29083* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

POLYIMIDES PREPARED FROM 3,5-DIAMINO BENZO TRIFLUORIDE Patent

MARGARET K. GERBER, inventor (to NASA) (Proctor and Gamble Co., Cincinnati, OH.), J. RICHARD PRATT, inventor (to NASA) (PRC Kentron, Inc., Hampton, VA.), TERRY L. ST.CLAIR, inventor (to NASA), and ANNE K. ST.CLAIR, inventor (to NASA) 8 Jun. 1993 6 p Filed 31 Aug. 1989 Supersedes N91-28425 (30 - 2, p 218)

(NASA-CASE-LAR-14206-1; US-PATENT-5,218,083; US-PATENT-APPL-SN-429574; US-PATENT-CLASS-528-353; US-PATENT-CLASS-528-26; US-PATENT-CLASS-528-28; US-PATENT-CLASS-528-125; US-PATENT-CLASS-528-128; US-PATENT-CLASS-528-170; US-PATENT-CLASS-528-172) Avail: US Patent and Trademark Office

High performance, thermooxidatively stable polyimides are prepared by reacting aromatic diamines with pendant trifluoromethyl groups and dianhydrides in an amide solvent to form a poly(amic-acid), followed by cyclizing the poly(amic acid) to form the corresponding polyimide.

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

N93-29085* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

DIPHENYLMETHANE-CONTAINING DIANHYDRIDE AND POLYIMIDES PREPARED THEREFROM Patent

ANNE K. ST.CLAIR, inventor (to NASA) (Lockheed Engineering and Sciences Co., Hampton, VA.), HAROLD G. BOSTON, inventor (to NASA), and J. RICHARD PRATT, inventor (to NASA) (Lockheed Engineering and Sciences Co., Hampton, VA.) 8 Jun. 1993 11 p

Filed 26 Aug. 1991 Supersedes N92-11200 (30 - 2, p 218) (NASA-CASE-LAR-14487-1; US-PATENT-5,218,077; US-PATENT-APPL-SN-750158; US-PATENT-CLASS-528-188; US-PATENT-CLASS-528-125; US-PATENT-CLASS-528-126; US-PATENT-CLASS-528-128; US-PATENT-CLASS-528-172; US-PATENT-CLASS-528-173; US-PATENT-CLASS-528-179) Avail: US Patent and Trademark Office

A high temperature stable, highly optically transparent-to-colorless, low dielectic linear aromatic polyimide is prepared by reacting an aromatic diamine with 3,3'bis (3,4-dicarboxyphenoxy) diphenylmethane dianhydride in an amide solvent to form a linear aromatic polyamic acid. This polyamic acid is then cyclized to form the corresponding polyimide.

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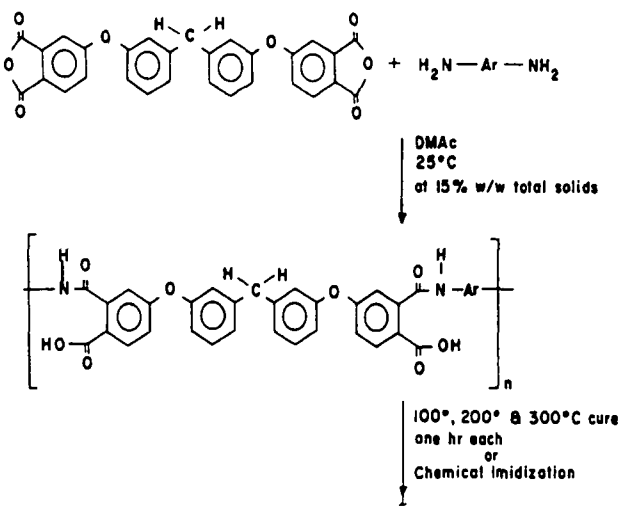


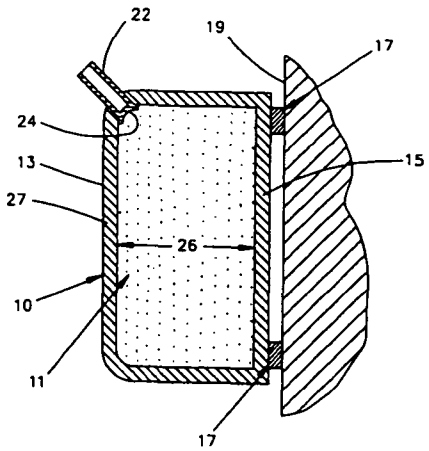
N93-29088* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

ABLATIVE SHIELDING FOR HYPERVELOCITY PROJECTILES Patent

MICHELLE A. RUCKER, inventor (to NASA) 8 Jun. 1993 7 p Filed 21 May 1992 Supersedes N92-30539 (30 - 21, p 3602) (NASA-CASE-MSC-21884-1; US-PATENT-5,217,185; US-PATENT-APPL-SN-887674; US-PATENT-CLASS-244-121; US-PATENT-CLASS-244-158R; US-PATENT-CLASS-89-36.02; INT-PATENT-CLASS-B64D-7/00) Avail: US Patent and Trademark Office

A hypervelocity projectile shield which includes a hollow semi-flexible housing fabricated from a plastic like, or otherwise transparent membrane which is filled with a fluid (gas or liquid) is presented. The housing has a inlet valve, similar to that on a tire or basketball, to introduce an ablating fluid into the housing. The housing is attached by a Velcro mount or double-sided adhesive tape to the outside surface of a structure to be protected. The housings are arrayed in a side-by-side relationship for complete coverage of the surface to be protected. In use, when a hypervelocity projectile penetrates the outer wall of a housing it is broken up and then the projectile is ablated as it travels through the fluid, much like a meteorite ≡burns up as it enters the earth s atmosphere, and the housing is deflated. The deflated housing can be easily spotted for replacement, even from a distance. Replacement is then accomplished by simply pulling a deflated housing off the structure and installing a new housing.

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



N93-30565*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

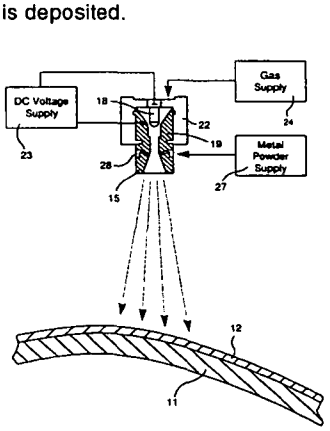
METHOD OF FABRICATING A ROCKET ENGINE COMBUSTION CHAMBER Patent Application

RICHARD R. HOLMES, inventor (to NASA) (Rockwell International Corp., Huntsville, AL.), TIMOTHY N. MCKECHNIE, inventor (to NASA) (Rockwell International Corp., Huntsville, AL.), CHRISTOPHER A. POWER, inventor (to NASA) (Rockwell International Corp., Huntsville, AL.), RONALD L. DANIEL, inventor (to NASA) (Rockwell International Corp., Huntsville, AL.), and ROBERT M. SAXELBY, inventor (to NASA) (Rockwell International Corp., Huntsville, AL.) 27 Jan. 1993 13 p

(NASA-CASE-MFS-28569-1; NAS 1.71:MFS-28569-1; US-PATENT-APPL-SN-009908) Avail: CASI HC A03/MF A01

A process for making a combustion chamber for a rocket engine wherein a copper alloy in particle form is injected into a stream of heated carrier gas in plasma form which is then projected onto the inner surface of a hollow metal jacket having the configuration of a rocket engine combustion chamber is described. The particles are in the plasma stream for a sufficient length of time to heat the particles to a temperature such that the particles will flatten and adhere to previously deposited particles but will not spatter or vaporize. After a layer is formed, cooling channels are cut in the layer, than the channels are filled with a temporary filler and another layer of particles is deposited.

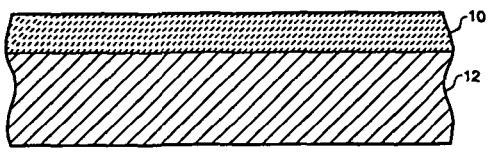
NASA



N93-31300*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
OXIDATION RESISTANT OVERLAY COATINGS FOR LOW EXPANSION SUBSTRATES Patent Application
W. J. BRINDLEY, inventor (to NASA), R. A. MILLER, inventor (to NASA), J. L. SMIALEK, inventor (to NASA), and C. J. ROUGE, inventor (to NASA) 29 Jun. 1993 18 p
(NASA-CASE-LEW-15154-2; NAS 1.71:LEW-15154-2; US-PATENT-APPL-SN-083246) Avail: CASI HC A03/MF A01

A low thermal expansion oxidation resistant coating utilizes an oxidation resistant alloy and an inert low thermal expansion phase which act to reduce overall thermal expansion. This coating is prepared by mixing powders of an MCrAlX material with a sufficient quantity of powders of an inert low thermal expansion phase ceramic material to reduce the aggregate coefficient of thermal expansion of the resulting mixture to about that of the substrate. The coating is applied by a powder based coating process.

NASA



N93-31316*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
ION EXCHANGE POLYMERS AND METHOD FOR MAKING Patent Application
WARREN H. PHILIPP, inventor (to NASA) and KENNETH W. STREET, JR., inventor (to NASA) 21 Jun. 1993 13 p
(NASA-CASE-LEW-15576-1; NAS 1.71:LEW-15576-1; US-PATENT-APPL-SN-081910) Avail: CASI HC A03/MF A01

An ion exchange polymer comprised of an alkali metal or alkaline earth metal salt of a poly(carboxylic acid) in a poly(vinyl acetal) matrix is described. The polymer is made by treating a mixture made of poly(vinyl alcohol) and poly(acrylic acid) with a suitable aldehyde and an acid catalyst to cause acetalization with some cross-linking. The material is then subjected to an alkaline aqueous solution of an alkali metal salt or an alkali earth metal salt. All of the film forming and cross-linking steps can be carried out simultaneously, if desired.

NASA

29
MATERIALS PROCESSING

Includes space-based development of products and processes for commercial applications.

N93-24600* National Aeronautics and Space Administration. Pasadena Office, CA.
SAMPLE POSITIONING IN MICROGRAVITY Patent
GOVIND SRIDHARAN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 27 Apr. 1993 7 p Filed 1 Nov. 1991 supersedes N92-30083 (30 - 20, p 3428)
(Contract NAS7-918)
(NASA-CASE-NPO-18448-1-CU; US-PATENT-5,206,504; US-PATENT-APPL-SN-786612; US-PATENT-CLASS-250-251; INT-PATENT-CLASS-H05H-3/04) Avail: US Patent and Trademark Office

Repulsion forces arising from laser beams are provided to produce mild positioning forces on a sample in microgravity vacuum environments. The system of the preferred embodiment positions samples using a plurality of pulsed lasers providing opposing repulsion forces. The lasers are positioned around the periphery of a confinement area and expanded to create a confinement zone. The grouped laser configuration, in coordination with position sensing devices, creates a feedback servo whereby stable position control of a sample within microgravity environment can be achieved.

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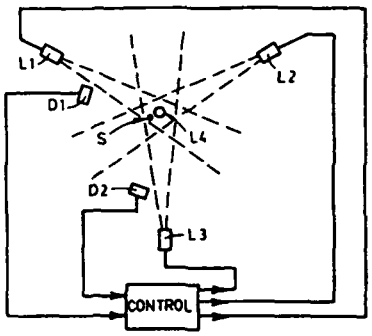


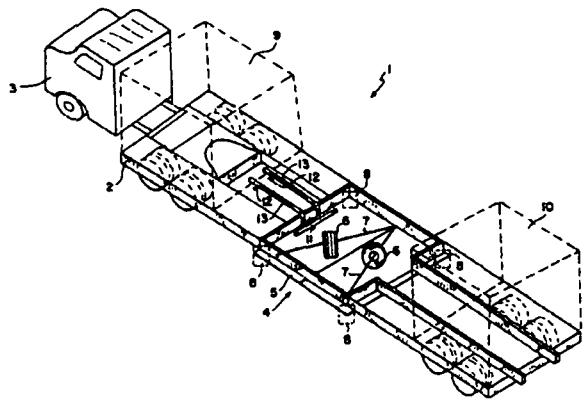
31
ENGINEERING (GENERAL)

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

N93-22035* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
METHOD AND APPARATUS FOR CLEANING RUBBER DEPOSITS FROM AIRPORT RUNWAYS AND ROADWAYS Patent
SANDY M. STUBBS, inventor (to NASA) 6 Apr. 1993 5 p Filed 3 Apr. 1991 Supersedes N91-28455 (29 - 20, p 3332)
(NASA-CASE-LAR-14483-1; US-PATENT-5,199,128; US-PATENT-APPL-SN-682153; US-PATENT-CLASS-15-52; US-PATENT-CLASS-15-80; US-PATENT-CLASS-15-87; INT-PATENT-CLASS-A47L-11/282) Avail: US Patent and Trademark Office

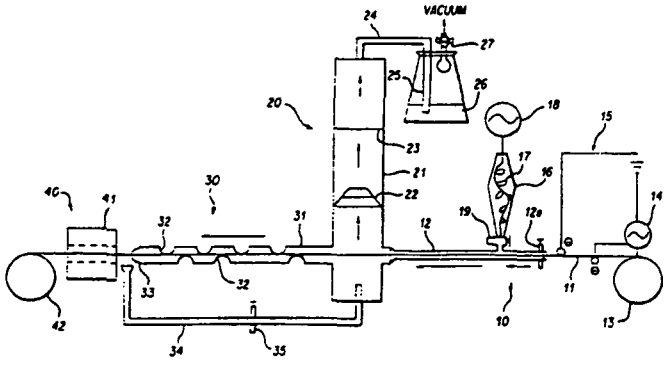
A method and apparatus for cleaning rubber deposits from surfaces such as airport runways and roadways is disclosed. The apparatus includes a large vehicle that has the capacity to be loaded so as to effectively add weight to the rubber cleaning tires of the vehicle. In addition, the vehicle has a water tank and sprinkler system so that the surface may be wetted down in front of the tires as the vehicle proceeds across the surface. The cleaning tires of the apparatus are aligned so that they are at a yaw angle to the direction of travel, and the cleaning tire assembly is attached to the underside of the trailer of the vehicle and positioned between a forward and rear water tank. In addition, this tire assembly is equipped with a means of loading the tires onto the contaminated surface. The method comprises driving such a vehicle at low speeds down the surface as the road is being wet in front of the cleaning tires. The effect of the angled tires is to create a scrubbing action that not only heats the rubber deposits by friction but also causes it to be removed from the surface. The rubber that does not stick to the

cleaning tires is then removed from the surface by sweeping.
Official Gazette of the U.S. Patent and Trademark Office



N93-26101* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
VACUUM POWDER INJECTOR AND METHOD OF IMPREGNATING FIBER WITH POWDER Patent
DENNIS C. WORKING, inventor (to NASA) 25 May 1993 6 p *Filed* 5 Aug. 1991
(NASA-CASE-LAR-14179-1; US-PATENT-5,213,843; US-PATENT-APPL-SN-740526; US-PATENT-CLASS-427-180; US-PATENT-CLASS-427-195; US-PATENT-CLASS-427-294; US-PATENT-CLASS-427-295; US-PATENT-CLASS-427-296; US-PATENT-CLASS-118-308; US-PATENT-CLASS-118-325) Avail: US Patent and Trademark Office

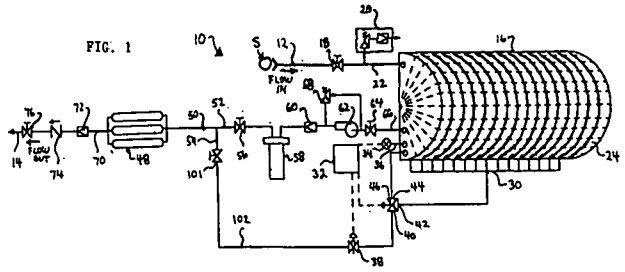
A method and apparatus uniformly impregnate stranded material with dry powder such as low solubility, high melt flow polymer powder to produce, for example, composite prepregs. The stranded material is expanded in an impregnation chamber by an influx of air so that the powder, which may enter through the same inlet as the air, penetrates to the center of the stranded material. The stranded material then is contracted for holding the powder therein. The stranded material and powder may be pulled through the impregnation chamber in the same direction by vacuum. Larger particles of powder which do not fully penetrate the stranded material may be combed into the stranded material and powder which does not impregnate the stranded material may be collected and reused.
Official Gazette of the U.S. Patent and Trademark Office



N93-28136*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
GAS STORAGE AND RECOVERY SYSTEM Patent Application
JOSEPH S. COOK, Inventor (to NASA) 23 Mar. 1993 17 p
(NASA-CASE-MSC-22091-1; NAS 1.71:MSC-22091-1; US-PATENT-APPL-SN-039602) Avail: CASI HC A03/MF A01

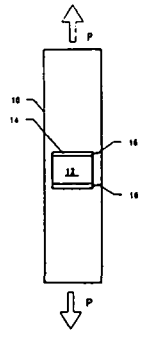
A system for recovering and recycling gases is disclosed. The system is comprised of inlet and outlet flow lines, controllers, an inflatable enclosure, and inflatable rib stiffeners which are inflatable by the gas to be stored. The system does not present gas at an undesirable back pressure to the gas source. A filtering relief valve is employed which prevents environmental airborne contamination from flowing back into the system when the relief valve is closing. The system is for storing and re-using helium.

NASA



N93-29611* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
METHOD AND APPARATUS FOR WEAVING A WOVEN ANGLE PLY FABRIC Patent
GARY L. FARLEY, inventor (to NASA) 6 Jul. 1993 14 p Filed 26 Sep. 1991 Supersedes N92-11220 (30 - 2, p 222)
(NASA-CASE-LAR-14048-1; US-PATENT-5,224,519; US-PATENT-APPL-SN-766609; US-PATENT-CLASS-139-11; US-PATENT-CLASS-139-DIG.1; US-PATENT-CLASS-428-225; INT-PATENT-CLASS-D03D-41/00; INT-PATENT-CLASS-D03D-13/00; INT-PATENT-CLASS-D03C-13/00) Avail: US Patent and Trademark Office

Planar or multilayer structural preforms are made having yarns extending in a bias direction of the preform. Angularly directed yarns can be inserted in planar and multilayer fabrics to increase shear strength of structural preforms made from the fabrics. In multilayer fabrics, the angle yarns can extend between layers to provide through-the-thickness reinforcement. Fabrics are formed by carrying yarns transversely across the fabric as the fabric advances. Fill yarns may be inserted by an insertion technique employing a pneumatic beating element. Angle yarn feeding arrangements are made readily removable to provide for the use of other weaving assemblies.
Official Gazette of the U.S. Patent and Trademark Office



32
COMMUNICATIONS AND RADAR

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

N93-28126*# National Aeronautics and Space Administration. Pasadena Office, CA.

MULTIPATH NOISE REDUCTION SPREAD SPECTRUM SIGNALS Patent Application

THOMAS K. MEEHAN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 17 Mar. 1993 41 p (Contract NAS7-918)

(NASA-CASE-NPO-18970-1-CU; NAS 1.71:NPO-18970-1-CU; US-PATENT-APPL-SN-039783) Avail: CASI HC A03/MF A01

The concepts of early-prompt delay tracking, multipath correction of early-prompt delay tracking from correlation shape, and carrier phase multipath correction are addressed. In early-prompt delay tracking, since multipath is always delayed with respect to the direct signals, the system derives phase and pseudorange observables from earlier correlation lags. In multipath correction of early-prompt delay tracking from correlation shape, the system looks for relative variations of amplitude across the code correlation function that do not match the predicted multipath-free code cross-correlation shape. The system then uses deviations from the multipath-free shape to infer the magnitude of multipath, and to generate corrections pseudorange observables. In carrier phase multipath correction, the system looks for variations of phase among plural early and prompt lags. The system uses the measured phase variations, along with the general principle that the multipath errors are larger for later lags, to infer the presence of multipath, and to generate corrections for carrier-phase observables.

NASA

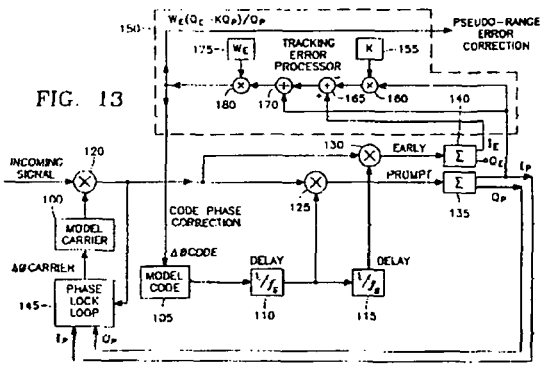


FIG. 13

N93-28422*# National Aeronautics and Space Administration. Pasadena Office, CA.

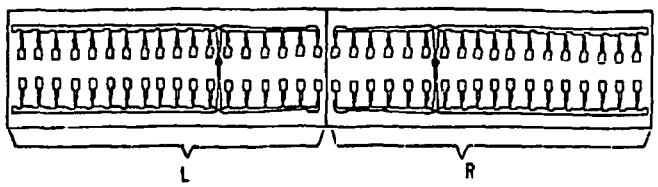
PARALLEL AND SERIES FED MICROSTRIP ARRAY WITH HIGH EFFICIENCY AND LOW CROSS POLARIZATION Patent Application

JOHN HUANG, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 28 Apr. 1993 17 p (Contract NAS7-918)

(NASA-CASE-NPO-18678-1-CU; NAS 1.71:NPO-18678-1-CU; US-PATENT-APPL-SN-056018) Avail: CASI HC A03/MF A01

A microstrip array antenna for vertically polarized fan beam (approximately 2 deg x 50 deg) for C-band SAR applications with a physical area of 1.7 m by 0.17 m comprises two rows of patch elements and employs a parallel feed to left- and right-half sections of the rows is described. Each section is divided into two segments that are fed in parallel with the elements in each segment fed in series through matched transmission lines for high efficiency. The inboard section has half the number of patch elements of the outboard section, and the outboard sections, which have tapered distribution with identical transmission line sections, terminated with half wavelength long open-circuit stubs so that the remaining energy is reflected and radiated in phase. The elements of the two inboard segments of the two left- and right-half sections are provided with tapered transmission lines from element to element for uniform power distribution over the central third of the entire array antenna. The two rows of array elements are excited at opposite patch feed locations with opposite (180 deg difference) phases for reduced polarization.

NASA



N93-28955*# National Aeronautics and Space Administration. Pasadena Office, CA.

A SATELLITE-TRACKING MILLIMETER-WAVE REFLECTOR ANTENNA SYSTEM FOR MOBILE SATELLITE-TRACKING Patent Application

ARTHUR C. DENSMORE, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), VAHRAZ JAMNEJAD, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), and KENNETH E. WOO, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 30 Nov. 1992 37 p (Contract NAS7-918)

(NASA-CASE-NPO-18772-1-CU; NAS 1.71:NPO-18772-1-CU; US-PATENT-APPL-SN-999794) Avail: CASI HC A03/MF A01

A miniature dual-band two-way mobile satellite tracking antenna system mounted on a movable ground vehicle includes a miniature parabolic reflector dish having an elliptical aperture with major and minor elliptical axes aligned horizontally and vertically, respectively, to maximize azimuthal directionality and minimize elevational directionality to an extent corresponding to expected pitch excursions of the movable ground vehicle. A feed-horn has a back end and an open front end facing the reflector dish and has vertical side walls opening out from the back end to the front end at a lesser horn angle and horizontal top and bottom walls opening out from the back end to the front end at a greater horn angle. An RF circuit couples two different signal bands between the feed-horn and the user. An antenna attitude controller maintains an antenna azimuth direction relative to the satellite by rotating it in azimuth in response to sensed yaw motions of the movable ground vehicle so as to compensate for the yaw motions to within a pointing error

angle. The controller sinusoidally dithers the antenna through a small azimuth dither angle greater than the pointing error angle while sensing a signal from the satellite received at the reflector dish, and deduces the pointing angle error from dither-induced fluctuations in the received signal.

NASA

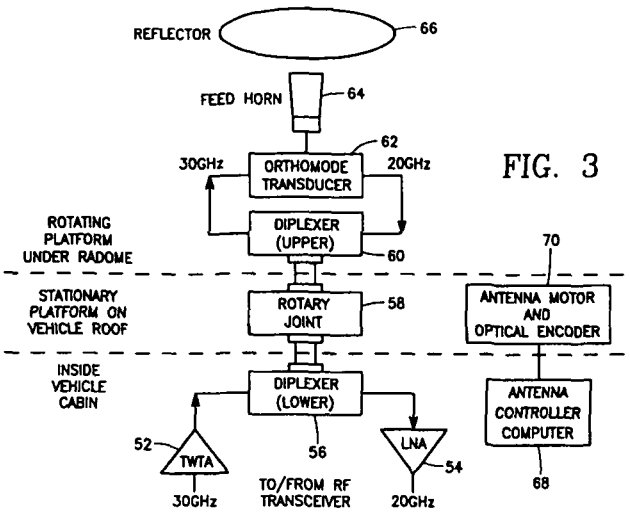


FIG. 3

N93-29087* National Aeronautics and Space Administration. Pasadena Office, CA.

MINIATURE MODULAR MICROWAVE END-TO-END RECEIVER Patent

LIN M. SUKAMTO, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), THOMAS W. COOLEY, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), MICHAEL A. JANSSEN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), and GARY S. PARKS, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 8 Jun. 1993 17 p Filed 3 Dec. 1991 Supersedes N92-30103 (30 - 20, p 3437)

(Contract NAS7-918)

(NASA-CASE-NPO-18713-1-CU; US-PATENT-5,218,357; US-PATENT-APPL-SN-802078; US-PATENT-CLASS-342-351; US-PATENT-CLASS-343-700; US-PATENT-CLASS-361-394; US-PATENT-CLASS-257-712; INT-PATENT-CLASS-G01S-3/02; INT-PATENT-CLASS-H05K-5/00; INT-PATENT-CLASS-H01L-23/02) Avail: US Patent and Trademark Office

An end-to-end microwave receiver system contained in a single miniature hybrid package mounted on a single heatsink is presented. It includes an input end connected to a microwave receiver antenna and an output end which produces a digital count proportional to the amplitude of a signal of a selected microwave frequency band received at the antenna and corresponding to one of the water vapor absorption lines near frequencies of 20 GHz or 30 GHz. The hybrid package is on the order of several centimeters in length and a few centimeters in height and width. The package includes an L-shaped carrier having a base surface, a vertical wall extending up from the base surface and forming a corner therewith, and connection pins extending through the vertical wall. Modular blocks rest on the base surface against the vertical wall and support microwave monolithic integrated circuits on top surfaces thereof connected to the external connection pins. The modular blocks lie end-to-end on the base surface so as to be modularly removable by sliding along the base surface beneath the external connection pins away from the vertical wall.

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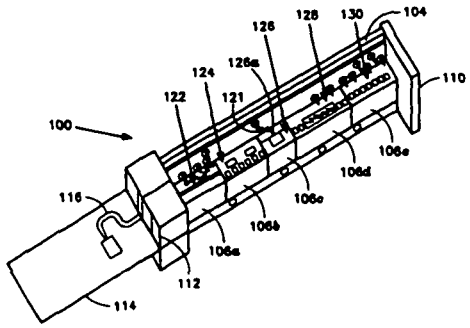

N93-29507* National Aeronautics and Space Administration. Pasadena Office, CA.

PLANAR MICROSTRIP YAGI ANTENNA ARRAY Patent

JOHN HUANG, inventor (to NASA) 15 Jun. 1993 10 p Filed 28 Feb. 1991 Continuation-in-part of abandoned US-Patent-Appl-SN-501892, filed 30 Mar. 1990

(NASA-CASE-NPO-17873-2-CU; US-PATENT-5,220,335; US-PATENT-APPL-SN-664445; US-PATENT-APPL-SN-501892; US-PATENT-CLASS-343-700MS; US-PATENT-CLASS-343-819; US-PATENT-CLASS-343-833; US-PATENT-CLASS-343-834;INT-PATENT-CLASS-H01Q-1/380; INT-PATENT-CLASS-H01Q-19/300) Avail: US Patent and Trademark Office

A directional microstrip antenna includes a driven patch surrounded by an isolated reflector and one or more coplanar directors, all separated from a ground plane on the order of 0.1 wavelength or less to provide end fire beam directivity without requiring power dividers or phase shifters. The antenna may be driven at a feed point a distance from the center of the driven patch in accordance with conventional microstrip antenna design practices for H-plane coupled or horizontally polarized signals. The feed point for E-plane coupled or vertically polarized signals is at a greater distance from the center than the first distance. This feed point is also used for one of the feed signals for circularly polarized signals. The phase shift between signals applied to feed points for circularly polarized signals must be greater than the conventionally required 90 degrees and depends upon the antenna configuration.

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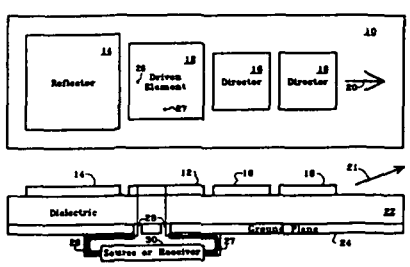

33
ELECTRONICS AND ELECTRICAL ENGINEERING

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

N93-20119* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
A METHOD OF MAKING A SINGLE LAYER MULTI-COLOR LUMINESCENT DISPLAY Patent
JAMES B. ROBERTSON, inventor (to NASA) 16 Mar. 1993 8 p Filed 24 Mar. 1992 Supersedes N92-30389 (30 - 21, p 3622) Continuation-in-part of US-Patent-Appl-SN-693049, filed 30 Apr. 1991 which is a continuation-in-part of US-Patent-Appl-SN-337768, filed 13 Apr. 1989 which is a division of abandoned US-Patent-Appl-SN-140185, filed 31 Dec. 1987
(NASA-CASE-LAR-14811-1; US-PATENT-5,194,290; US-PATENT-APPL-SN-858176; US-PATENT-APPL-SN-693049; US-PATENT-APPL-SN-337768; US-PATENT-APPL-SN-140185; US-PATENT-CLASS-427-526; US-PATENT-CLASS-427-66; US-PATENT-CLASS-427-68; US-PATENT-CLASS-427-108) Avail: US Patent and Trademark Office

The invention is a method of forming a multi-color luminescent display including the steps of depositing on an insulator substrate a smooth single layer of host material which itself may be a phosphor with the properties to host varying quantities of different impurities and introducing one or more of said different impurities into selected areas of the single layer of host material via an appropriately positioned mask as by thermal diffusion or ion-implantation to form a pattern of phosphors of different colors in the single layer of host material such that the top surface of the host layer remains smooth. Red phosphors are formed by adding impurities selected from the group consisting of Sm, SmF3, Eu, EuF3, and ZnS:MnTbF3 to a ZnS host; green phosphors by adding impurities selected from the group consisting of Tb and TbF3 to a ZnS host; and blue phosphors by adding impurities selected from the group consisting of Tm, Al, Ag, and Mg to a ZnS host.
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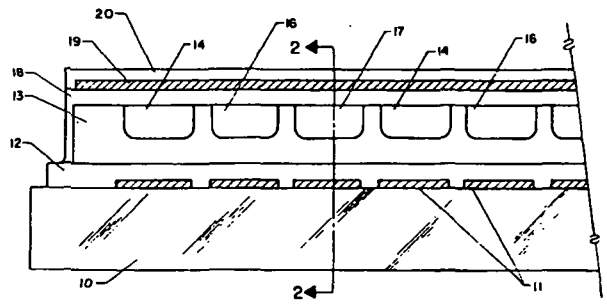
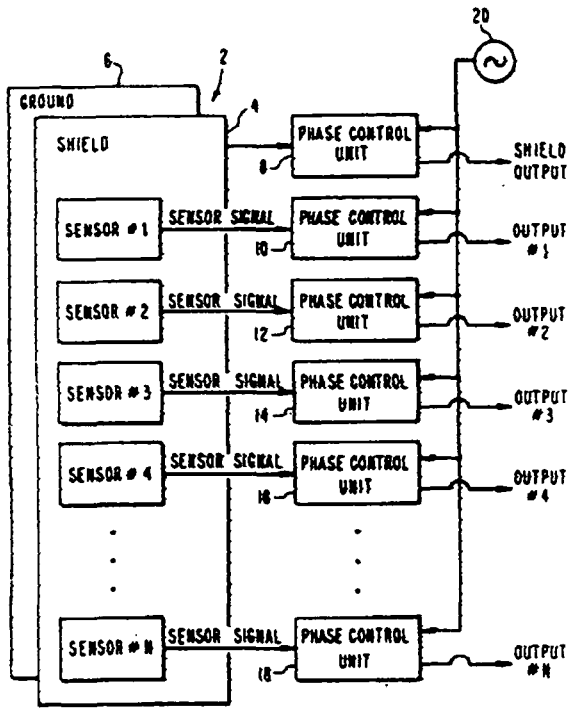


N93-26104* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.
PHASE DISCRIMINATING CAPACITIVE ARRAY SENSOR SYSTEM Patent
JOHN M. VRANISH, inventor (to NASA) and WADI RAHIM, inventor (to NASA) 25 May 1993 7 p Filed 28 May 1992
(NASA-CASE-GSC-13460-1; US-PATENT-5,214,388; US-PATENT-APPL-SN-889577; US-PATENT-CLASS-324-683; US-PATENT-CLASS-324-662; US-PATENT-CLASS-324-681; US-PATENT-CLASS-324-690; US-PATENT-CLASS-340-870.37; INT-PATENT-CLASS-G01R-27/26) Avail: US Patent and Trademark Office

A phase discriminating capacitive sensor array system which provides multiple sensor elements which are maintained at a phase and amplitude based on a frequency reference provided by a single frequency stabilized oscillator. Sensor signals provided by the multiple sensor elements are controlled by multiple phase control units, which correspond to the multiple sensor elements, to adjust the sensor signals from the multiple sensor elements based on the frequency reference. The adjustment made to the sensor signals is indicated by output signals which indicate the proximity of the object. The output signals may also indicate the closing speed of the object based on the rate of change of the adjustment made, and the edges of the object based on a sudden decrease in the adjustment made.
Official Gazette of the U.S. Patent and Trademark Office



N93-29173*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
HEATING HEAD FOR INDUCTION HEATING APPARATUS Patent Application
ROBERT H. COULTRIP, inventor (to NASA) (Inductron Corp., Yorktown, VA.), SAMUEL D. JOHNSON, inventor (to NASA) (Inductron Corp., Yorktown, VA.), CARL E. COPELAND, inventor (to NASA) (Inductron Corp., Yorktown, VA.), ROBERT J. SWAIM, inventor (to NASA), ROBERT L. FOX, inventor (to NASA), and WILLIAM M. PHILLIPS, JR., inventor (to NASA) (Inductron Corp., Yorktown, VA.) 15 Mar. 1993 11 p
(NASA-CASE-LAR-14429-1; NAS 1.71:LAR-14429-1; US-PATENT-APPL-SN-030894) Avail: CASI HC A03/MF A01

A heating head is presented for an induction heating apparatus that includes an elongated pole piece being substantially E-shaped in cross section and has a base, two outer legs, and a middle leg spaced from the two outer legs by two parallel gaps. A capacitor is connectable to a power source, and a coil wrapped around the middle leg of the pole piece. The coil has first and second ends connected to the capacitor. When a susceptor is placed in juxtapo-

sition to distal ends of the two outer legs and the middle leg, the susceptor is heated by eddy currents induced in the susceptor due to the magnetic flux passing between the two outer legs and the middle leg along two parallel heating zones substantially centered over the two parallel gaps.

NASA

FIG. 1

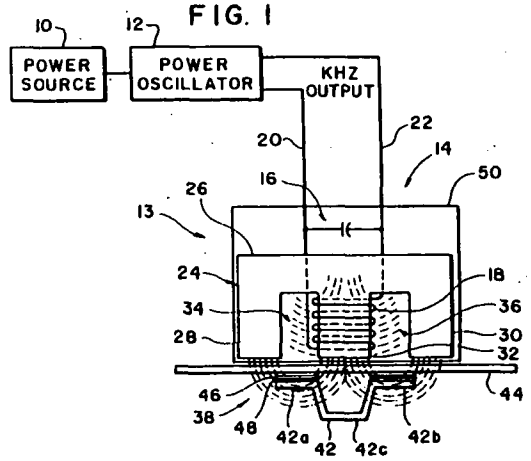
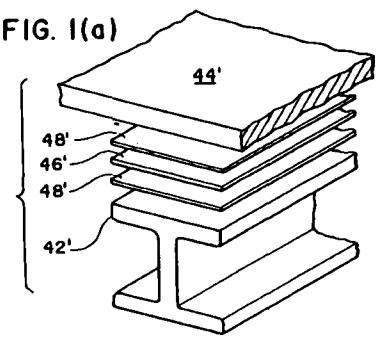


FIG. 1(a)



34

FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

N93-26000* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

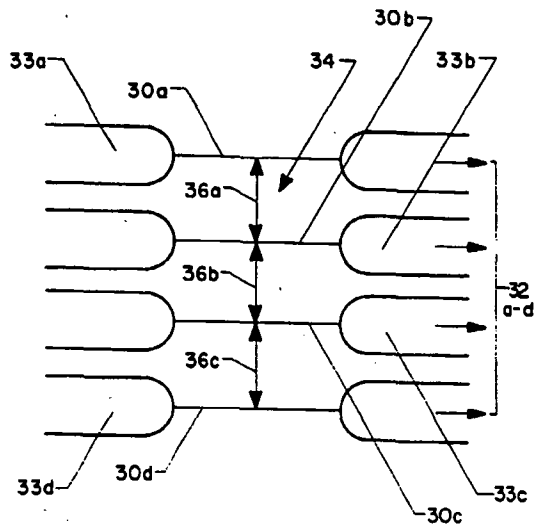
METHOD OF MEASURING CROSS-FLOW VORTICES BY USE OF AN ARRAY OF HOT-FILM SENSORS Patent

AVAL K. AGARWAL, inventor (to NASA), DAL V. MADDALON, inventor (to NASA), and SIVA M. MANGALAM, inventor (to NASA) 11 May 1993 9 p Filed 7 Jan. 1992 Supersedes N92-30390 (30 - 21, p 3628)

(NASA-CASE-LAR-14824-1-SB; US-PATENT-5,209,111; US-PATENT-APPL-SN-823805; US-PATENT-CLASS-73-147; US-PATENT-CLASS-73-178R; US-PATENT-CLASS-73-204.11; INT-PATENT-CLASS-G01M-9/00) Avail: US Patent and Trademark Office

The invention is a method for measuring the wavelength of cross-flow vortices of air flow having streamlines of flow traveling across a swept airfoil. The method comprises providing a plurality of hot-film sensors. Each hot-film sensor provides a signal which can be processed, and each hot-film sensor is spaced in a straight-line array such that the distance between successive hot-film sensors is less than the wavelength of the cross-flow vortices being measured. The method further comprises determining the direction of travel of the streamlines across the airfoil and positioning the straight-line array of hot film sensors perpendicular to the direction of travel of the streamlines, such that each sensor has a spanwise location. The method further comprises processing the signals provided by the sensors to provide root-mean-square values for each signal, plotting each root-mean-square value as a function of its spanwise location, and determining the wavelength of the cross-flow vortices by noting the distance between two maxima or two minima of root-mean-square values.

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



35

INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

N93-20569* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

SYSTEM FOR DETERMINING THE ANGLE OF IMPACT OF AN OBJECT ON A STRUCTURE Patent

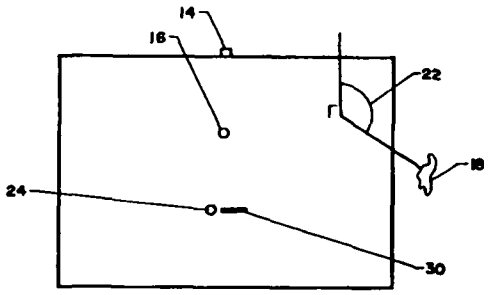
WILLIAM H. PROSSER, investor (to NASA) and MICHAEL R. GORMAN, inventor (to Navy) 2 Mar. 1993 8 p Filed 17 Jun. 1992 Supersedes N93-17041 (31 - 5, p 1169)

(NASA-CASE-LAR-14817-1; US-PATENT-5,191,558; US-PATENT-APPL-SN-903708; US-PATENT-CLASS-367-124; INT-PATENT-CLASS-G01S-3/80) Avail: US Patent and Trademark Office

A method for determining the angle of impact of an object on a thin-walled structure which determines the angle of impact through analysis of the acoustic waves which result when an object impacts a structure is presented. Transducers are placed on and in the surface of the structure which sense the wave caused in the structure by impact. The waves are recorded and saved for analysis. For source motion normal to the surface, the antisymmetric mode

has a large amplitude while that of the symmetric mode is very small. As the source angle increases with respect to the surface normal, the symmetric mode amplitude increases while the antisymmetric mode amplitude decreases. Thus, the angle of impact is determined by measuring the relative amplitudes of these two lowest order modes.

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



N93-26103* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

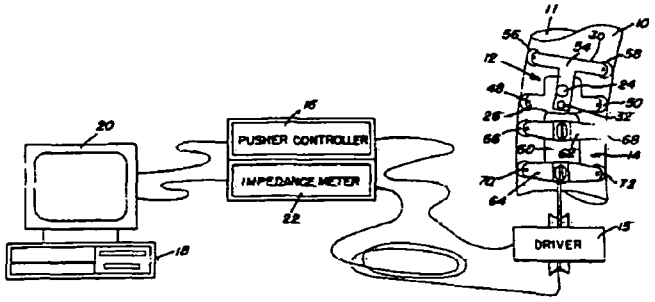
METHOD AND APPARATUS FOR DEFLECTION MEASUREMENTS USING EDDY CURRENT EFFECTS Patent

ENGMIN J. CHERN, inventor (to NASA) 25 May 1993 8 p Filed 25 Jun. 1992

(NASA-CASE-GSC-13506-1; US-PATENT-5,214,379; US-PATENT-APPL-SN-904308; US-PATENT-CLASS-324-220; US-PATENT-CLASS-33-542; US-PATENT-CLASS-324-207.16; US-PATENT-CLASS-324-262; INT-PATENT-CLASS-G01B-7/28; INT-PATENT-CLASS-G01B-5/20; INT-PATENT-CLASS-G01N-27/72) Avail: US Patent and Trademark Office

A method and apparatus for inserting and moving a sensing assembly with a mechanical positioning assembly to a desired remote location of a surface of a specimen under test and measuring angle and/or deflection by sensing the change in the impedance of at least one sensor coil located in a base plate which has a rotatable conductive plate pivotally mounted thereon so as to uncover the sensor coil(s) whose impedance changes as a function of deflection away from the center line of the base plate in response to the movement of the rotator plate when contacting the surface of the specimen under test is presented. The apparatus includes the combination of a system controller, a sensing assembly, an eddy current impedance measuring apparatus, and a mechanical positioning assembly driven by the impedance measuring apparatus to position the sensing assembly at a desired location of the specimen.

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



N93-28322*# National Aeronautics and Space Administration. Pasadena Office, CA.

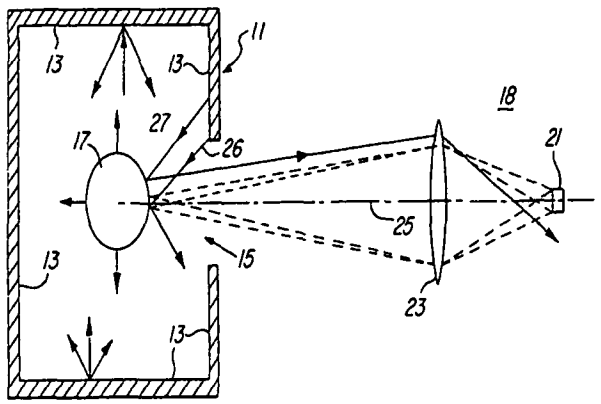
CORRECTION-FREE PYROMETRY IN RADIANT WALL FURNACES Patent Application

ANDREW S. W. THOMAS, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 30 Mar. 1993 22 p (Contract NAS7-918)

(NASA-CASE-NPO-18655-1-CU; NAS 1.71:NPO-18655-1-CU; US-PATENT-APPL-SN-044449) Avail: CASI HC A03/MF A01

A specular, spherical, or near-spherical target is located within a furnace having inner walls and a viewing window. A pyrometer located outside the furnace 'views' the target through pyrometer optics and the window, and is so positioned that its detector sees only the image of the viewing window on the target. Since this image is free of any image of the furnace walls, it is free from wall radiance, and correction-free target radiance is obtained. The pyrometer location is determined through a nonparaxial optical analysis employing differential optical ray tracing methods to derive a series of exact relations for the image location.

NASA



N93-29084* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

CONSTANT FREQUENCY PULSED PHASE-LOCKED LOOP MEASURING DEVICE Patent

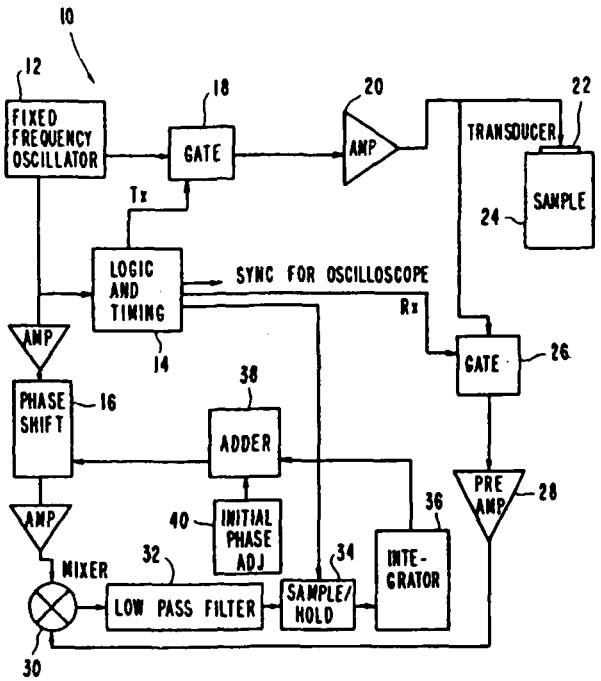
WILLIAM T. YOST, inventor (to NASA) (PRC Kentron, Inc., Hampton, VA.), PETER W. KUSHNICK, inventor (to NASA) (PRC Kentron, Inc., Hampton, VA.), and JOHN H. CANTRELL, inventor (to NASA) 1 Jun. 1993 12 p Filed 26 Aug. 1991 Supersedes N92-10182 (30 - 1, p 34)

(NASA-CASE-LAR-13823-1; US-PATENT-5,214,955; US-PATENT-APPL-SN-749737; US-PATENT-CLASS-73-24.05; US-PATENT-CLASS-374-119; US-PATENT-CLASS-73-5.97; US-PATENT-CLASS-73-32A; US-PATENT-CLASS-73-61.75; US-PATENT-CLASS-73-61.79; US-PATENT-CLASS-73-64.53) Avail: US Patent and Trademark Office

A measuring apparatus is presented that uses a fixed frequency oscillator to measure small changes in the phase velocity ultrasonic sound when a sample is exposed to environmental changes such as changes in pressure, temperature, etc. The invention

automatically balances electrical phase shifts against the acoustical phase shifts in order to obtain an accurate measurement of electrical phase shifts.

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



N93-29503* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

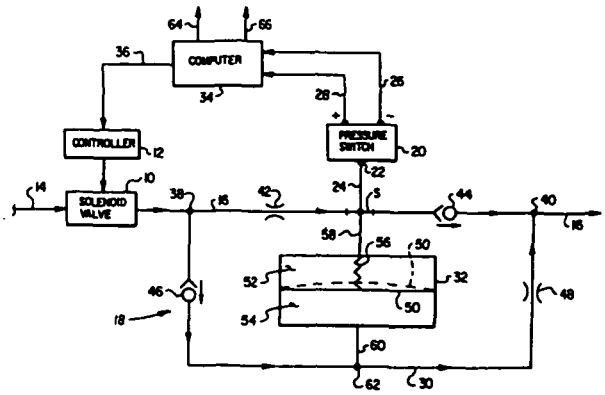
VALVE MALFUNCTION DETECTION APPARATUS Patent

RICHARD K. BURLEY, inventor (to NASA) 13 Jul. 1993 6 p Filed 7 Oct. 1992

(NASA-CASE-MFS-29904-1; US-PATENT-5,226,447; US-PATENT-APPL-SN-957127; US-PATENT-CLASS-137-554; US-PATENT-CLASS-137-557; US-PATENT-CLASS-116-70; US-PATENT-CLASS-340-611; INT-PATENT-CLASS-F16K-37/00) Avail: US Patent and Trademark Office

A detection system is provided for sensing a malfunction of a valve having an outlet connected to an end of a first pipe through which pressurized fluid may be flowed in a downstream direction away from the valve. The system includes a bypass pipe connected at its opposite ends to the first pipe and operative to bypass a portion of the fluid flow therethrough around a predetermined section thereof. A housing is interiorly divided by a flexible diaphragm into first and second opposite chambers which are respectively communicated with the first pipe section and the bypass pipe, the diaphragm being spring-biased toward the second chamber. The diaphragm housing cooperates with check valves and orifices connected in the two pipes to create and maintain a negative pressure in the first pipe section in response to closure of the valve during pressurized flow through the first pipe. A pressure switch senses the negative pressure and transmits a signal indicative thereof to a computer. Upon cessation of the signal while the valve is still closed, the computer responsively generates a signal indicating that the valve,or another portion of the detection system, is leaking.

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



N93-31297*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

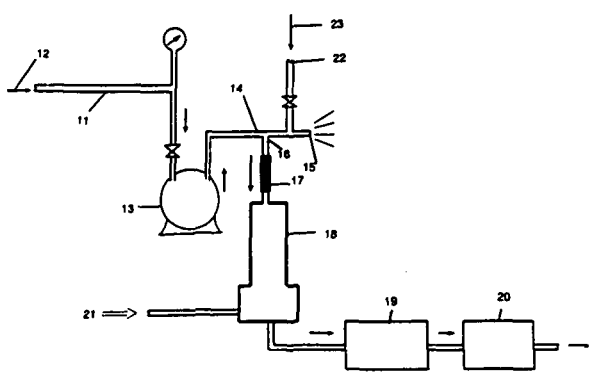
TWO-STAGE GAS MEASUREMENT SYSTEM Patent Application

DANNY R. SPRINKLE, inventor (to NASA), TONY T. D. CHEN, inventor (to NASA) (Old Dominion Univ., Norfolk, VA.), and SUSHIL K. CHATURVEDI, inventor (to NASA) (Old Dominion Univ., Virginia Beach, VA.) 7 May 1992 10 p

(NASA-CASE-LAR-14791-1; NAS 1.71:LAR-14791-1; US-PATENT-APPL-SN-879480) Avail: CASI HC A02/MF A01

A quick-response, real-time gaseous measurement system allows for the continuous sampling of a low pressure gaseous environment. A sample of test gas from the low pressure gaseous environment is continuously extracted and pumped to a structural tee joint which is open to the atmosphere at one end to maintain the test gas at a constant pressure. The structural tee joint communicates at the other end with a heater for maintaining the test gas at a constant temperature. From the heater, the test gas is sent to a sensor which develops a voltage that is proportional to the partial pressure of the gaseous component to be measured in the test gas, a constant flow rate of test gas being provided through the heater and sensor. Since test gas pressure, temperature, and flow rate are being held constant, changes in sensor voltage are attributable only to changes in the concentration of the measured gas component.

NASA

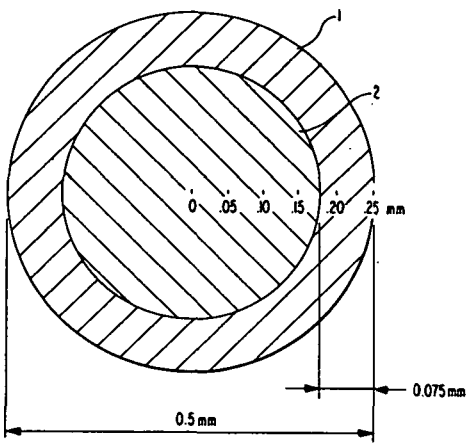


N93-31298*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
HIGH TEMPERATURE, OXIDATION RESISTANT NOBLE METAL-AL ALLOY THERMOCOUPLE Patent Application
JAMES L. SMIALEK, inventor (to NASA) and MICHAEL GEDWILL, inventor (to NASA) 6 Jul. 1993 22 p
(NASA-CASE-LEW-15515-1; NAS 1.71:LEW-15515-1; US-PATENT-APPL-SN-086584) Avail: CASI HC A03/MF A01

A thermocouple having an electropositive leg formed of a noble metal-Al alloy and an electronegative leg electrically joined at respective ends thereof to form a thermocouple junction. The thermocouple provides for accurate and reproducible measurement of high temperatures (600 - 1300 C) in inert, oxidizing, or reducing environments, gases, or vacuum. Furthermore, the thermocouple circumvents the need for expensive, strategic precious metals such as rhodium as a constituent component. Selective oxidation of rhodium is also thereby precluded.

NASA

FIG. 1



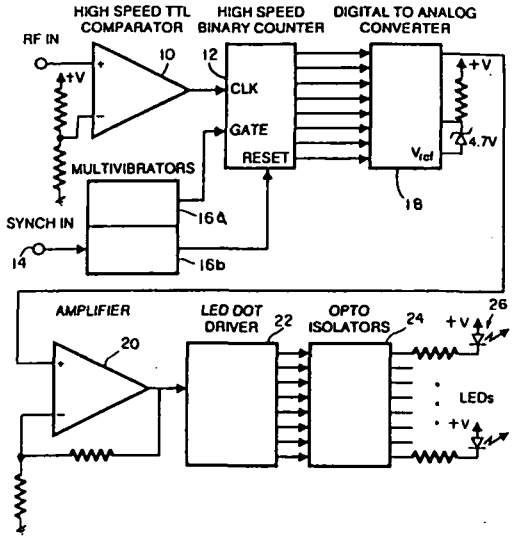
36
LASERS AND MASERS

Includes parametric amplifiers.

N93-28132*# National Aeronautics and Space Administration. Pasadena Office, CA.
BURST-BY-BURST LASER FREQUENCY MONITOR Patent Application
CARLOS ESPROLES, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 1 Feb. 1993 12 p
(Contract NAS7-918)
(NASA-CASE-NPO-18596-1-CU; NAS 1.71:NPO-18596-1-CU; US-PATENT-APPL-SN-023252) Avail: CASI HC A03/MF A01

The invention is a system for real-time frequency monitoring and display of an RF burst where the burst frequency is analyzed and displayed on a burst-by-burst basis in order to allow for frequency control. Although the invention was made for monitoring the laser frequency of a LIDAR system, it has other applications where realtime monitoring is required. The novelty of the invention resides in the use of a counter that is reset at the beginning of each unit time of monitoring and then gated for a unit of time. The invention also has an LED bar graph for displaying the measure of frequency at the end of each unit time in either a bar length mode or a moving dot mode. In the latter mode, the operator makes necessary adjustments to maintain the dot at the center of the bar graph.

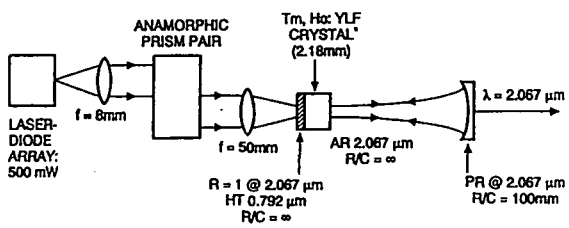
NASA



N93-30415*# National Aeronautics and Space Administration. Pasadena Office, CA.
TUNABLE CW DIODE-PUMPED TM,HO:YLIF4 LASER OPERATING AT OR NEAR ROOM TEMPERATURE Patent Application
BRENDAN T. MCGUCKIN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and ROBERT T. MENZIES, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 30 Mar. 1993 29 p
(Contract NAS7-918)
(NASA-CASE-NPO-18611-1-CU; NAS 1.71:NPO-18611-1-CU; US-PATENT-APPL-SN-044668) Avail: CASI HC A03/MF A01

A conversion efficiency of 42 percent and slope efficiency of 60 percent relative to absorbed pump power are obtained from a continuous wave diode-pumped Tm,Ho:YLiF4 laser at 2 microns with output power of 84mW at a crystal temperature of 275K. The emission spectrum is etalon tunable over a range of 7nm (16.3 cm(sup -1) centered on 2.067 microns with fine tuning capability of the transition frequency with crystal temperature at a measured rate of -0.03/(cm)K. The effective emission cross-section is measured to be 5 x 10(sup -21) cm squared. These and other aspects of the laser performance are disclosed in the context of calculated atmospheric absorption characteristics in this spectral region and potential use in remote sensing applications. Single frequency output and frequency stabilization are achieved using an intracavity etalon in conjunction with an external reference etalon.

NASA



37
MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

N93-20117* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ROBOT-FRIENDLY CONNECTOR Patent
GEORGE F. PARMA, inventor (to NASA), MARK H. VANDEBERGHE, inventor (to NASA), and STEVE C. RUIZ, inventor (to NASA) 2 Mar. 1993 13 p Filed 26 Nov. 1991 Supersedes N92-23544 (30 - 14, p 2382)
(NASA-CASE-MSC-21864-1; US-PATENT-5,190,392; US-PATENT-APPL-SN-799460; US-PATENT-CLASS-403-171; US-PATENT-CLASS-403-176; US-PATENT-CLASS-403-353; US-PATENT-CLASS-403-381; US-PATENT-CLASS-52-465; INT-PATENT-CLASS-F16B-1/04) Avail: US Patent and Trademark Office

Robot friendly connectors, which, in one aspect, are truss joints with two parts, a receptacle and a joint, are presented. The joints have a head which is loosely inserted into the receptacle and is then tightened and aligned. In one aspect, the head is a rounded hammerhead which initially is enclosed in the receptacle with sloppy fit provided by the shape, size, and configuration of surfaces on the head and on the receptacle.

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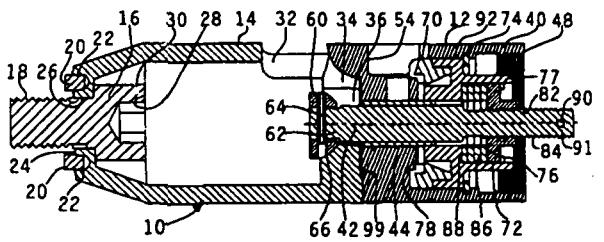

N93-20120* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
METHOD AND APPARATUS FOR PRELOADING A JOINT BY REMOTELY OPERABLE MEANS Patent
JON B. KAHN, inventor (to NASA) 16 Mar. 1993 8 p Filed 1 Jun. 1992 Supersedes N92-30540 (30 - 21, p 3659)
(NASA-CASE-MSC-21940-1; US-PATENT-5,193,929; US-PATENT-APPL-SN-892072; US-PATENT-CLASS-403-14; US-PATENT-CLASS-403-404; US-PATENT-CLASS-403-273; US-PATENT-CLASS-403-321; INT-PATENT-CLASS-B25G-3/00) Avail: US Patent and Trademark Office

The invention is a method and apparatus for joining structures, an active structure and a passive structure, and imposing a tensile pre-load on the joint by a remotely operable mechanism comprising a heat contractible joining element. The method and apparatus include mounting on the structure, a probe shaft of material which is transformable from an expanded length to a contracted length when heated to a specific temperature range. The shaft is provided with a probe head which is receivable in a receptacle opening formed in the passive structure, when the active structure is moved into engagement therewith by an appropriate manipulator mechanism. A latching system mounted on the structure adjacent to the receptacle opening captures the probe head, when the probe head is inserted a predetermined amount. A heating coil on the shaft is energizable by remote control for heating the shaft to a temperature range which transforms the shaft to its contracted length, whereby a latching shoulder thereof engages latching elements of the latching system and imposes a tensile preload on the structural joint. Provision is also made for manually adjusting the probe head on the shaft to allow for manual detachment of the structures or manual preloading of the structural joint.

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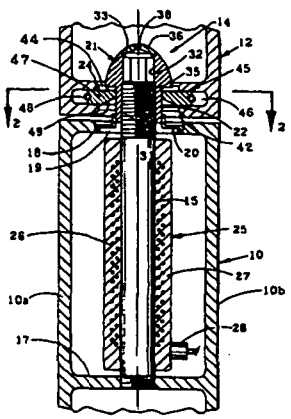
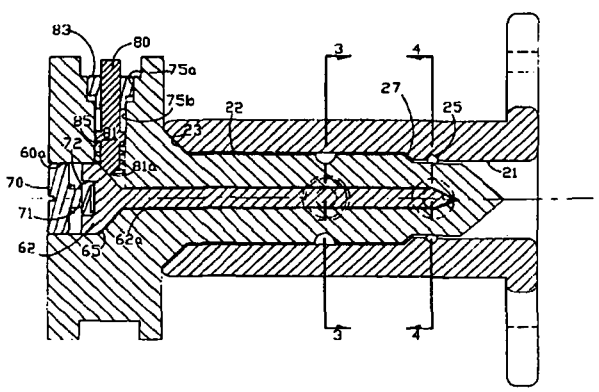


N93-22007*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ROBOT FRIENDLY PROBE AND SOCKET ASSEMBLY Patent Application
KAREN L. NYBERG, inventor (to NASA) 14 Dec. 1992 14 p
(NASA-CASE-MSC-22028-1; NAS 1.71:MSC-22028-1; US-PATENT-APPL-N-993477) Avail: CASI HC A03/MF A01

A probe and socket assembly for serving as a mechanical interface between structures is presented. The assembly comprises a socket having a housing adapted for connection to a first supporting structure and a probe which is readily connectable to a second structure and is designed to be easily grappled and manipulated by a robotic device for insertion and coupling with the socket. Cooperable automatic locking means are provided on the probe shaft and socket housing for automatically locking the probe in the socket when the probe is inserted a predetermined distance. A second cooperable locking means on the probe shaft and housing are adapted for actuation after the probe has been inserted the predetermined distance. Actuation means mounted on the probe and responsive to the grip of the probe handle by a gripping device, such as a robot for conditioning the probe for insertion and are also responsive to release of the grip of the probe handle to actuate the second locking means to provide a hard lock of the probe in the socket.

NASA



N93-22384* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
BLIND FASTENING APPARATUS Patent
NORMAN F. WILLEY, inventor (to NASA) and JAMES F. LINKER, inventor (to NASA) 30 Mar. 1993 9 p Filed 8 Aug. 1991
Supersedes N92-11354 (30 - 2, p 243)
(NASA-CASE-LAR-14542-1; US-PATENT-5,197,839; US-PATENT-APPL-SN-743485; US-PATENT-CLASS-411-340; US-PATENT-CLASS-411-103; US-PATENT-CLASS-411-402; INT-PATENT-CLASS-F16B-21/00) Avail: US Patent and Trademark Office

An anchor nut insert is provided having external threads for engaging an internally threaded receptacle of a fixture to be installed. The fixture also has two side wings flanking the receptacle and having fastener holes. An insert driver is provided having a projecting blade which engages a slot in the anchor nut insert for driving the insert. A guide member, such as a wire, passes through symmetry axes of the anchor nut insert and insert driver such that the anchor nut insert is located between the insert driver and a first terminal end of the guide wire. A swag is provided on this terminal end to prevent the anchor nut insert and insert driver from sliding off the end. The fixture with the installed anchor nut insert is fed through the central hole in a structure wall having a blind side. The fixture is rotated until the wing holes are aligned with side holes in the wall and then the fixture is pulled flush against the blind side via the guide wire. Fasteners are then inserted through the hole and the anchor nut insert removed via the driver, exposing the fixed threaded receptacle for engagement as desired.

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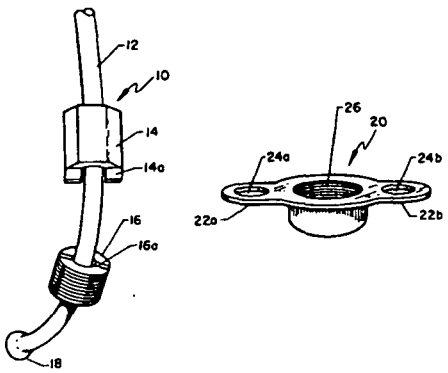
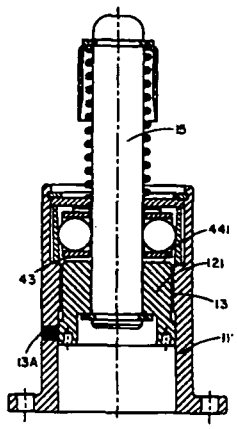


N93-23075* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ENERGY DISSIPATOR Patent
HORACIO M. DELAFUENTE, inventor (to NASA), KORNEL NAGY, inventor (to NASA), and CLARENCE J. WESSELSKI, inventor (to NASA) 30 Mar. 1993 7 p Filed 15 Feb. 1991 Supersedes N91-23492 (29 - 15, p 2435)
(NASA-CASE-MSC-21555-1; US-PATENT-5,197,573; US-PATENT-APPL-SN-656925; US-PATENT-CLASS-188-67; US-PATENT-CLASS-188-82.84; US-PATENT-CLASS-188-129; INT-PATENT-CLASS-F16D-63/00) Avail: US Patent and Trademark Office

An all metal energy dissipator construction is disclosed for dissipating kinetic energy force (F) by rolling balls which are forced by a tapered surface on an expandable sleeve to frictionally load a force rod. The balls are maintained in an initial position by a plate member which is biased by a spring member. A spring member returns the force rod to its initial position after a loading force is removed.

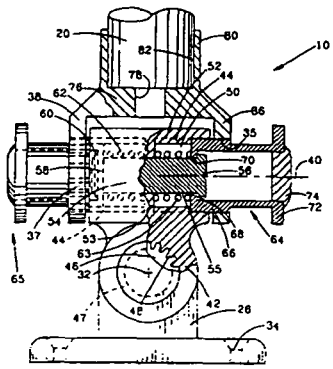
Official Gazette of the U.S. Patent and Trademark Office



N93-23076* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
QUICK ACTING GIMBAL JOINT Patent
WILLIAM B. WOOD, inventor (to NASA) and GARY D. KRCH, inventor (to NASA) 30 Mar. 1993 9 p Filed 16 Jun. 1992
Supersedes N92-30316 (30 - 21, p 3658)
(NASA-CASE-MSC-21918-1; US-PATENT-5,197,817; US-PATENT-APPL-SN-899536; US-PATENT-CLASS-403-93; US-PATENT-CLASS-403-97; US-PATENT-CLASS-403-84; US-PATENT-CLASS-403-324; INT-PATENT-CLASS-F16C-11/00) Avail: US Patent and Trademark Office

The present invention relates to an adjustable linkage assembly for selectively retaining the position of one member pivotable with respect to another member. More specifically, the invention relates to a linkage assembly commonly referred to as a gimbal joint, and particularly to a quick release or quick acting gimbal joint. The assembly is relatively simple in construction, compact in size, and has superior locking strength in any selected position. The device can be quickly and easily actuated, without separate tooling, by inexperienced personnel or by computer controlled equipment. It also is designed to prevent inadvertent actuation.

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



N93-23078*National Aeronautics and Space Administration. Pasadena Office, CA.

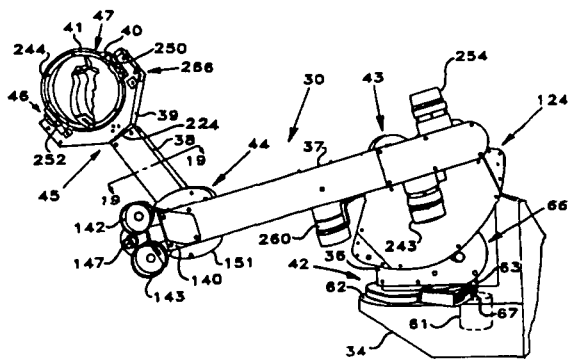
FORCE REFLECTING HAND CONTROLLER Patent

DOUGLAS A. MCAFFEE, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), EDWARD R. SNOW, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), and WILLIAM T. TOWNSEND, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 16 Mar. 1993 25 p Filed 31 Oct. 1990

(NASA-CASE-NPO-17851-1-CU; US-PATENT-5,193,963; US-PATENT-APPL-SN-608658; US-PATENT-CLASS-414-5; US-PATENT-CLASS-414-7; INT-PATENT-CLASS- B25J-3/00) Avail: US Patent and Trademark Office

A universal input device for interfacing a human operator with a slave machine such as a robot or the like includes a plurality of serially connected mechanical links extending from a base. A handgrip is connected to the mechanical links distal from the base such that a human operator may grasp the handgrip and control the position thereof relative to the base through the mechanical links. A plurality of rotary joints is arranged to connect the mechanical links together to provide at least three translational degrees of freedom and at least three rotational degrees of freedom of motion of the handgrip relative to the base. A cable and pulley assembly for each joint is connected to a corresponding motor for transmitting forces from the slave machine to the handgrip to provide kinesthetic feedback to the operator and for producing control signals that may be transmitted from the handgrip to the slave machine. The device gives excellent kinesthetic feedback, high-fidelity force/torque feedback, a kinematically simple structure, mechanically decoupled motion in all six degrees of freedom, and zero backlash. The device also has a much larger work envelope, greater stiffness and responsiveness, smaller stowage volume, and better overlap of the human operator's range of motion than previous designs.

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



N93-26001* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

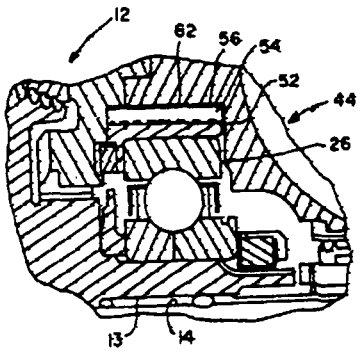
RADIAL SPLINE ASSEMBLY FOR ANTIFRICTION BEARINGS Patent

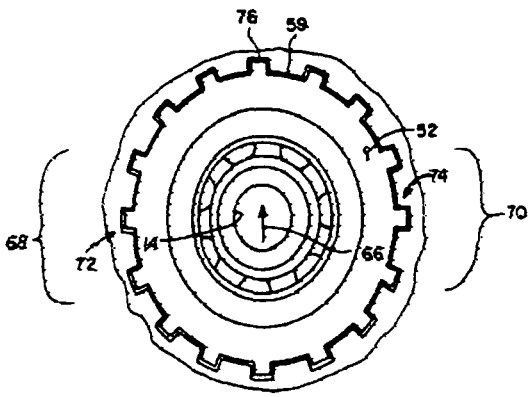
JERRY H. MOORE, inventor (to NASA) 18 May 1993 7 p Filed 7 Oct. 1992 Supersedes N93-17084 (31 - 5, p 1179)

(NASA-CASE-MFS-28629-1; US-PATENT-5,211,489; US-PATENT-APPL-SN-957128; US-PATENT-CLASS-384-585; US-PATENT-CLASS-384-493; US-PATENT-CLASS-384-537; INT-PATENT-CLASS-F16C-43/04; INT-PATENT-CLASS-F16C-19/52) Avail: US Patent and Trademark Office

An outer race carrier is constructed for receiving an outer race of an antifriction bearing assembly. The carrier in turn is slidably fitted in an opening of a support wall to accommodate slight axial movements of a shaft. A plurality of longitudinal splines on the carrier are disposed to be fitted into matching slots in the opening. A deadband gap is provided between sides of the splines and slots, with a radial gap at ends of the splines and slots and a gap between the splines and slots sized larger than the deadband gap. With this construction, operational distortions (slope) of the support wall are accommodated by the larger radial gaps while the deadband gaps maintain a relatively high springrate of the housing. Additionally, side loads applied to the shaft are distributed between sides of the splines and slots, distributing such loads over a larger surface area than a race carrier of the prior art.

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





N93-28127*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

AN APPARATUS FOR GRIPPING TEST SPECIMENS Patent Application

REBECCA MACKAY, inventor (to NASA) and MICHAEL V. NATHAL, inventor (to NASA) 2 Apr. 1993 14 p

(NASA-CASE-LEW-15345-2; NAS 1.71:LEW-15345-2; US-PATENT-APPL-SN-039735) Avail: CASI HC A03/MF A01

A pair of solid-teeth wedges are employed in an improved gripping system. These wedges fit inside a pair of plates having an

angled cavity to accommodate them. As stress is applied to the specimen, the wedges are urged toward the specimen by the angled cavity to increase the gripping force.

NASA

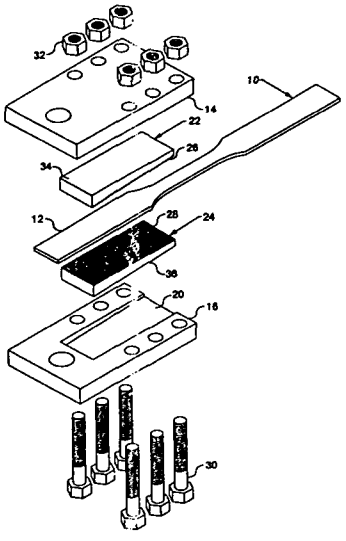


Fig. 1

N93-28129*# National Aeronautics and Space Administration. Pasadena Office, CA.

EXTENDED TASK SPACE CONTROL FOR ROBOTIC MANIPULATORS Patent Application

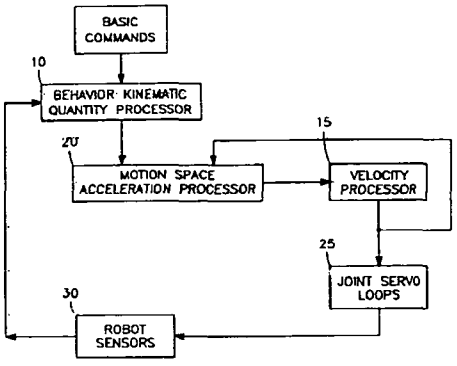
PAUL G. BACKES, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and MARK K. LONG, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 24 Mar. 1993 46 p

(Contract NAS7-918)

(NASA-CASE-NPO-18902-1-CU; NAS 1.71:NPO-18902-1-CU; US-PATENT-APPL-SN-034607) Avail: CASI HC A03/MF A01

The invention is a method of operating a robot in successive sampling intervals to perform a task. The robot is comprised of joints and joint actuators, which make use of actuator control loops. The actuators decompose the task into behavior forces that are comprised of accelerations, velocities, and positions of robotic behaviors. The actuator accelerations, velocities, and positions of the current sampling interval are stored for use during the next sampling interval.

NASA



N93-28131*# National Aeronautics and Space Administration. Pasadena Office, CA.

SEPARATION TOOL FOR MULTIPIN ELECTRICAL CONNECTORS Patent Application

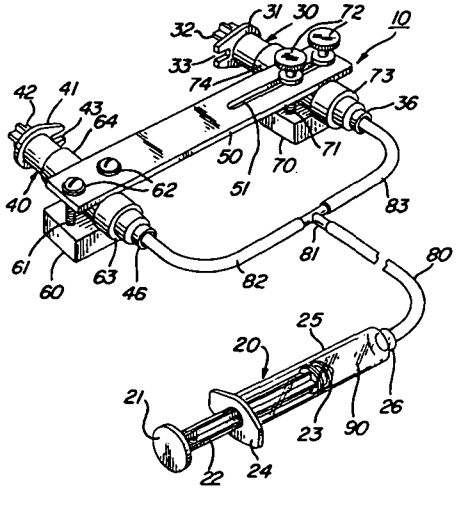
LARRY D. SMITH, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 30 Mar. 1993 16 p

(Contract NAS7-918)

(NASA-CASE-NPO-18786-1-CU; NAS 1.71:NPO-18786-1-CU; US-PATENT-APPL-SN-048871) Avail: CASI HC A03/MF A01

A hydraulic tool for safely separating one multipin electrical connector from another is presented. The separation tool consists of a master cylinder which operates a pair of slave cylinders. Each slave cylinder has a corresponding operative shaft and an extraction tab. The slave cylinders are spaced apart from one another so that they may be positioned on either side of mated connector pairs of different sizes and so that their extraction tabs may be slid between the connectors. When the master cylinder's plunger is operated, its operation is hydraulically transmitted to the operative shafts of the slave cylinders which extend outward and, once pressed against a substrate, causes the slave cylinders and corresponding extractor tabs to move away and separate one connector from the other. A second preferred separation tool includes an additional pair of extractor tabs, one at the end of each operative shaft, so that the tool can be used to separate a mated connector pair hanging in free space.

NASA



N93-28326*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

HYBRID BEARINGS FOR TURBOPUMPS AND THE LIKE Patent Application

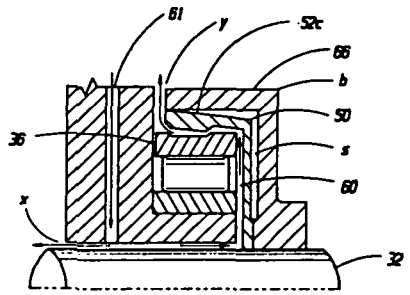
JOHN F. JUSTAK, inventor (to NASA) (Pratt and Whitney Aircraft, West Palm Beach, FL.) and GREGG R. OWENS, inventor (to NASA) (Pratt and Whitney Aircraft, West Palm Beach, FL.) 27 Jan. 1993 15p

(NASA-CASE-MFS-28491-1; NAS 1.71:MFS-28491-1; US-PATENT-APPL-SN-010030) Avail: CASI HC A03/MF A01

In rocket engines power is usually obtained by burning fuel and oxidizer which are mixed, pressurized, and directed to a combustion chamber by means of turbopumps. Roller bearings are generally used in these turbopumps, but because of bearing demands hydrostatic bearings were proposed. The use of such bearings is quite feasible because during flight hydrostatic lubrication can reduce roller bearing wear. A disadvantage of such proposals is that during

startup, acceleration, and shutdown high pressure fluids are not available for hydrostatic bearings. The fluid lubrication film is not always present in bearings of turbopumps. During these periods a second bearing is required to carry the load. This requirement suggests the use of hybrid bearings in rocket engine turbopumps. Such duplex bearings were provided, but when their inner races are keyed to the shaft or journal two of them are required. And such duplex bearings do not wear evenly. A hybrid hydrostatic-rolling element bearing was provided wherein the rolling element bearing is locked on the stationary housing rather than on the rotating journal.

NASA



N93-28501*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

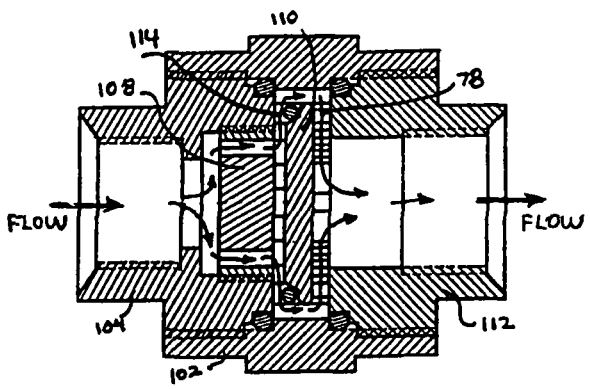
MAGNETICALLY OPERATED CHECK VALVE Patent Application

BRIAN G. MORRIS, inventor (to NASA) and RICHARD J. BOZEMAN, JR., inventor (to NASA) 19 Mar. 1993 26 p

(NASA-CASE-MSC-22046-1; NAS 1.71:MSC-22046-1; US-PATENT-APPL-SN-038748) Avail: CASI HC A03/MF A01

A magnetically operated check valve is disclosed having, in one aspect, a valve body and a movable poppet disposed therein. A magnet attracts the poppet to hold the valve shut until the force of fluid flow through the valve overcomes the magnetic attraction and moves the poppet to an unseated, open position. The poppet and magnet are configured and disposed to trap a magnetically attracted particulate and prevent it from flowing to a valve seating region.

NASA



N93-28951*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

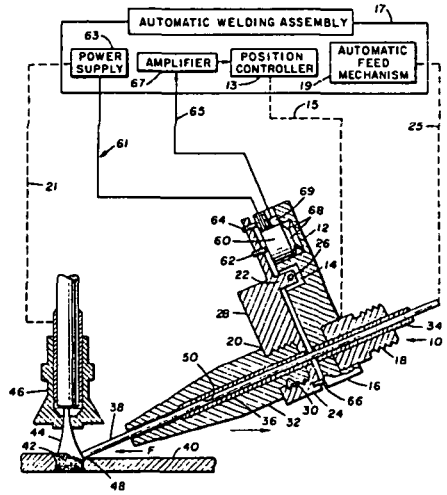
WELDING WIRE PRESSURE SENSOR ASSEMBLY Patent Application

TIMOTHY B. MORRIS, inventor (to NASA) (Nichols Research Corp., Huntsville, AL.), PETER F. MILLY, inventor (to NASA) (Nichols Research Corp., Huntsville, AL.), and J. KEVIN WHITE, inventor (to NASA) (Nichols Research Corp., Huntsville, AL.) 27 May 1993 9 p

(NASA-CASE-MFS-26216-1; NAS 1.71:MFS-26216- 1; US-PATENT-APPL-SN-070132) Avail: CASI HC A02/MF A01

The present invention relates to a device which is used to monitor the position of a filler wire relative to a base material being welded as the filler wire is added to a welding pool. The device is applicable to automated welding systems wherein nonconsumable electrode arc welding processes are utilized in conjunction with a filler wire which is added to a weld pool created by the electrode arc. The invention senses pressure deviations from a predetermined pressure between the filler wire and the base material, and provides electrical signals responsive to the deviations for actuating control mechanisms in an automatic welding apparatus so as to minimize the pressure deviation and to prevent disengagement of the contact between the filler wire and the base material.

NASA



N93-28954*# National Aeronautics and Space Administration Pasadena Office, CA.

DUAL ARM GENERALIZED COMPLIANT MOTION WITH SHARED CONTROL Patent Application

PAUL G. BACKES, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 24 Mar. 1993 60 p (Contract NAS7-918)

(NASA-CASE-NPO-18738-1-CU; NAS 1.71:NPO-18738-1-CU; US-PATENT-APPL-SN-034608) Avail: CASI HC A04/MF A01

A multiple arm generalized compliant motion robot control system governs dual multi-joint robot arms handling an object with both of the arms in accordance with input parameters governing plural respective behaviors to be exhibited by the robot in respective behavior spaces simultaneously. A move-squeeze decomposition processor computes actual move and squeeze decomposition forces based upon current robot force sensor outputs. A compliant motion processor transforms plural object position perturbations of the plural behaviors from the respective behavior spaces to a common space and computes a relative transformation to a behavior-commanded object position in accordance with the object position

perturbations of the plural behaviors. A kinematics processor updates a transformation to a current commanded object position based upon the relative transformation to the behavior-commanded object position. A multiple arm squeeze control processor computes from appropriate squeeze force input parameters and from actual squeeze forces for each of the arms, a squeeze control position perturbation for each of the arms, to provide squeeze control. An inverse kinematics processor computes from the commanded object position transformation and from the squeeze control position perturbation, new robot joint angles, and controls respective joints of the robot arms in accordance with the new robot joint angles.

NASA

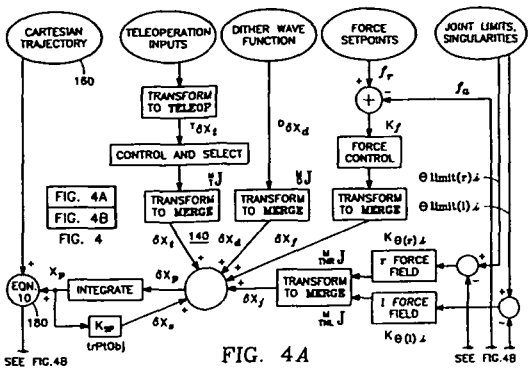


FIG. 4A

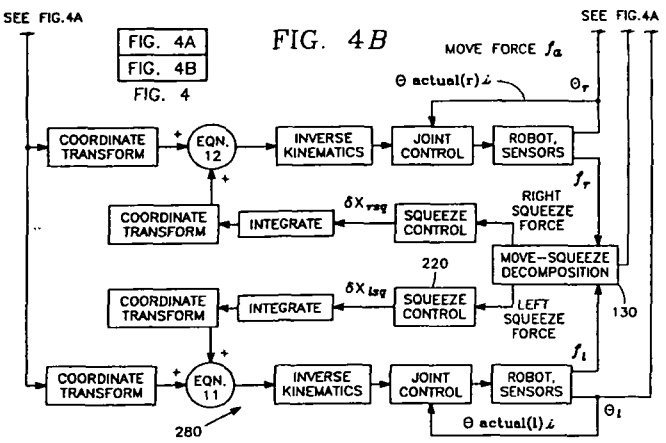


FIG. 4B

N93-29175*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

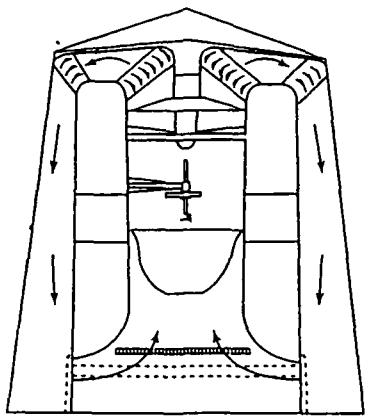
SINGLE ACTING TRANSLATION/ROTATIONAL BRAKE Patent Application

JOHNNY W. ALLRED, inventor (to NASA) and VINCENT J. FLECK, inventor (to NASA) 12 May 1993 15 p

(NASA-CASE-LAR-14738-1; NAS1.71:LAR-14738-1; US-PATENT-APPL-SN-064324) Avail: CASI HC A03/MF A01

A brake system is provided that applies braking forces on surfaces in both the translational and rotational directions using a single acting self-contained actuator that travels with the translational mechanism. The brake engages a mechanical lock and creates a frictional force on the translational structure preventing translation while simultaneously creating a frictional torque that prevents rotation of the vertical support. The system may include serrations on the braking surfaces to provide increased breaking forces.

NASA



N93-29505* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

SPLINE SCREW AUTOCHANGER Patent

JOHN M. VRANISH, inventor (to NASA) 15 Jun. 1993 7 p Filed 27 Jul. 1992

(NASA-CASE-GSC-13435-1; US-PATENT-5,219,318; US-PATENT-APPL-SN-918746; US-PATENT-CLASS-483-16; US-PATENT-CLASS-414-729; US-PATENT-CLASS-483-901; US-PATENT-CLASS-901-30; US-PATENT-CLASS-901-41; INT-PATENT-CLASS-B23Q-3/155; INT-PATENT-CLASS-B25J-15/04) Avail: US Patent and Trademark Office

A captured nut member is located within a tool interface assembly and being actuated by a spline screw member driven by a robot end effector. The nut member lowers and rises depending upon the directional rotation of the coupling assembly. The captured nut member further includes two winged segments which project outwardly in diametrically opposite directions so as to engage and disengage a clamping surface in the form of a chamfered notch respectively provided on the upper surface of a pair of parallel forwardly extending arm members of a bifurcated tool stowage holster which is adapted to hold and store a robotic tool including its end effector interface when not in use. A forward and backward motion of the robot end effector operates to insert and remove the tool from the holster.

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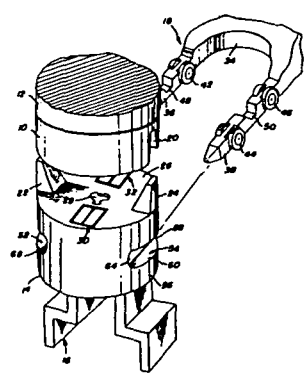

N93-29618* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

SYSTEM FOR TESTING BEARINGS Patent

JOHN C. GIBSON, inventor (to NASA) 13 Jul. 1993 5 p Filed 26 Dec. 1991 Supersedes N92-17584 (30 - 8, p 1306)

(NASA-CASE-MFS-28589-1; US-PATENT-5,226,308; US-PATENT-APPL-SN-813628; US-PATENT-CLASS-73-9; INT-PATENT-CLASS-G01N-19/02) Avail: US Patent and Trademark Office

Disclosed here is a system for testing bearings wherein a pair of spaced bearings provides support for a shaft on which is mounted a bearing to be tested, this bearing being mounted in a bearing holder spaced from and in alignment with the pair of bearings. The bearing holder is provided with an annular collar positioned in an opening in the bearing holder for holding the bearing to be tested. A screw threaded through the bearing holder into engagement with the annular collar can be turned to force the collar radially out of alignment with the pair of bearings to apply a radial load to the bearing.

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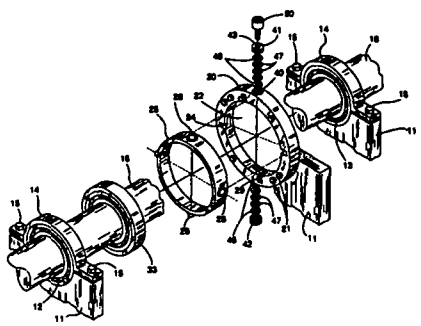


N93-29846*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

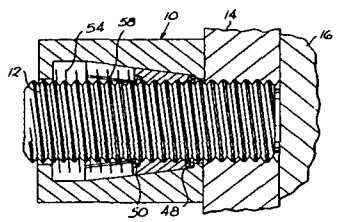
QUICK CONNECT FASTENER Patent Application

BRUCE WEDDENDORF, inventor (to NASA) 1 Jun. 1993 16 p

(NASA-CASE-MFS-28833-1; NAS 1.71:MFS-28833-1; US-PATENT-APPL-SN-069481) Avail: CASI HC A03/MF A01

This invention relates to a quick connect fastener for attachment to an axially elongated externally threaded member by axially thrusting the fastener onto the member, the fastener having an outer casing including a passageway having a frustoconical surface. A segmented core having four internally threaded shells is positioned within the casing, the shells having a frustoconical outer surface and a cylindrical annulus including a standard thread profile. The shells include a groove at each end for receiving a C-shaped clip which urge the shells radially outwardly and toward the larger end of the passageway. A coil spring positioned within the nut casing at the larger end acts to urge the shells toward a surface acting as a stop at the smaller end which limits movement of the shells and counteracts a substantial amount of the tension of the externally threaded member. Raised keys on the surfaces of the shells are received within grooves in the casing so that the shells rotate upon rotation of the shell.

NASA



N93-30567*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

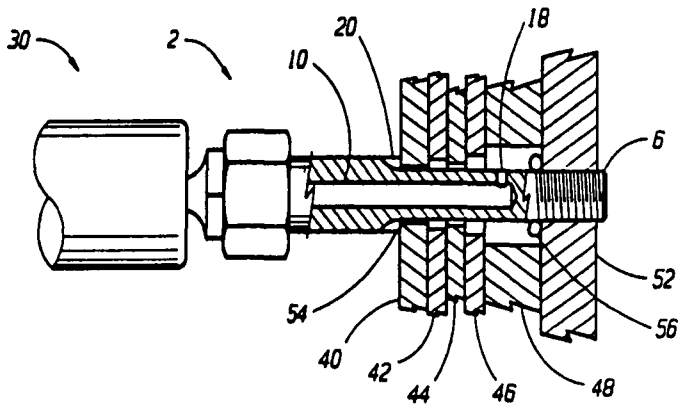
MOLD BOLT AND MEANS FOR ACHIEVING CLOSE TOLERANCES BETWEEN BOLTS AND BOLT HOLES Patent Application

DAVID JOHNSTON, inventor (to NASA) and PHILLIP G. BRYANT, inventor (to NASA) (Teledyne Brown Engineering, Huntsville, AL.) 27 Jan. 1993 12 p

(NASA-CASE-MFS-28720-1; NAS 1.71:MFS-28720-1; US-PATENT-APPL-SN-009909) Avail: CASI HC A03/MF A01

In the space shuttle, a cargo bay storage rack was required which was to be manufactured from a metal-plastic composite and bolted to a cargo structure. Following completion, utilization of the rack was disallowed due to tolerances, that is, the size differences between the outside bolt diameter and the inside hole diameter. In addition to the space shuttle problem there are other close tolerance requirements for bolts. Such environments often benefit from close tolerance bolting. Frequently such fabrication is not cost effective. Consequently there is a need for means of achieving close tolerances between bolts and bolt holes. Such means are provided. After compressing the elements together a strong rigid plastic, ceramic, or ceramic plastic fluid is forced into a channel extending through the bolt.

NASA



N93-31292*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

GAS ARC CONSTRICTION FOR PLASMA ARC WELDING Patent Application

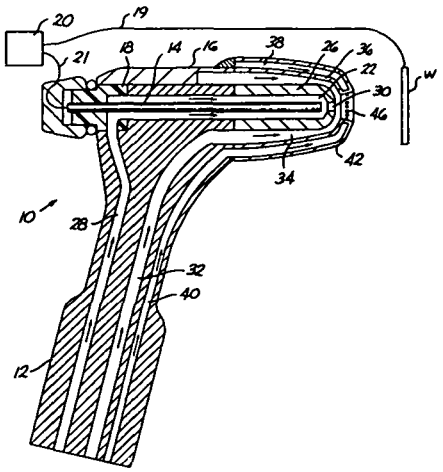
DANIEL J. RYBICKI, inventor (to NASA) (Martin Marietta Space Systems, Inc., Huntsville, AL.) and WILLIAM F. MCGEE, inventor (to NASA) (Martin Marietta Space Systems, Inc., Huntsville, AL.) 25 Jun. 1993 10 p

(NASA-CASE-MFS-28844-1; NAS 1.77:MFS-28844-1; US-PATENT-APPL-SN-081890) Avail: CASI HC A02/MF A01

A welding torch for plasma arc welding apparatus has an inert gas applied circumferentially about the arc column externally of the constricting nozzle so as to apply a constricting force on the arc after it has exited the nozzle orifice and downstream of the auxiliary shielding gas. The constricting inert gas is supplied to a plenum chamber about the body of the torch and exits through a series of circumferentially disposed orifices in an annular wall forming a closure at the forward end of the constricting gas plenum chamber. The constricting force of the circumferential gas flow about the arc concentrates and focuses the arc column into a more narrow and

dense column of energy after exiting the nozzle orifice so that the arc better retains its energy density prior to contacting the workpiece.

NASA



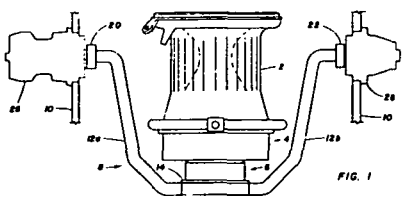
N93-31313*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

TURNTABLE MECHANISM Patent Application

WILLIAM NEILL MYERS, inventor (to NASA) 31 Jan. 1992 19 p (NASA-CASE-MFS-28522-1; NAS 1.71:MFS-28522-1; US-PATENT-APPL-SN-828612) Avail: CASI HC A03/MF A01

In vacuum plasma spraying a turntable must be provided which not only makes it possible to rotate and tilt a heavy workpiece, but to operate at vacuum plasma temperatures to do so. In the vacuum plasma coating of large parts such as combustion chambers of rocket engines, the workpiece must not only be rotated, but it must be tilted. Hence, the turntable must be capable not only of supporting heavy parts, but of angulating such heavy workpieces. And this must be done without drive means failure due to extremely high temperatures under which the turntable mechanism is operated. A turntable mechanism is provided which is capable of operating under such conditions. For cooling the turntable drive mechanism, internal cooling means are included.

NASA



N93-31314*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

SERVICE EQUIPMENT FOR USE IN HOSTILE ENVIRONMENTS Patent Application

JAMES L. DOLCE, inventor (to NASA) and ANDREW L. GORDON, inventor (to NASA) (Analytical Engineering Corp., North Olmsted, OH.) 26 Jul. 1993 20 p (NASA-CASE-LEW-14906-2; NAS 1.71:LEW-14906-2; US-PATENT-APPL-SN-104951) Avail: CASI HC A03/MF A01

Service equipment for use in hostile environments includes a detachable service unit secured to a stationary service unit. The detachable service unit includes a housing with an exterior plate, a power control interface for connection to an exterior power source, locating pins located in said exterior plate, an electrical connector in the exterior plate electrically coupled to said power control interface, and a pair of clamping receptacles formed in the exterior plate and located on adjacent opposite edges of the exterior plate. The stationary unit includes an electrical connector for connection to the electrical connector of the detachable service unit, a clamping apparatus for clamping and unclamping the detachable service unit from the stationary unit, a base clamp assembly for mounting the clamping apparatus onto the stationary unit, and locating pin holes for receiving the locating pins and aligning the detachable service unit onto the stationary unit. The detachable service unit and stationary unit have mating scalloped faces which aid in alignment and provide a mechanism for heat dissipation.

NASA

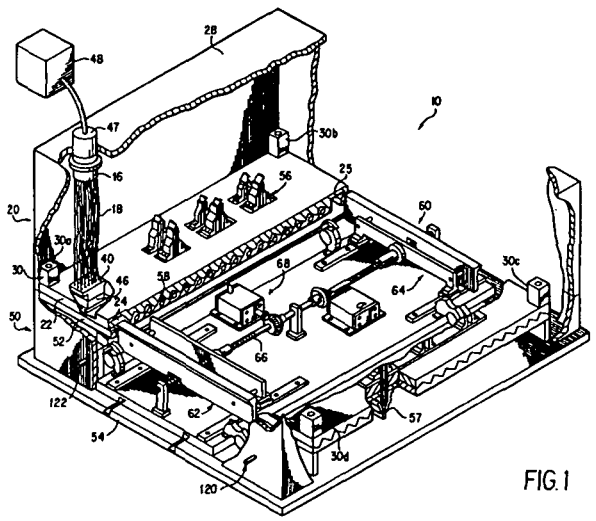


FIG. 1

N93-31317*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

SPLIT RAIL GRIPPER ASSEMBLY AND TOOL DRIVER THEREFOR Patent Application

GEORGE M. VOELLMER, inventor (to NASA) 15 Feb. 1991 18 p (NASA-CASE-GSC-13370-1; NAS 1.71:GSC-13370-1; US-PATENT-APPL-SN-656924) Avail: CASI HC A03/MF A01

A split rail gripper for robotic apparatus, including a pair of rails which are driven in mutually opposite directions by a rack and pinion gear mechanism is presented. Each rail includes a set of rack gear teeth which engage respective pinion gears and where the top rail engaging one of the pinion gears is driven by a harmonic gear reduction drive and motor unit coupled to an acme screw. The other pinion gear is driven by the top pinion gear engaging a set of rack gear teeth included in the bottom rail. As the top rail is driven in or out, the upper pinion gear is rotated, causing the other pinion gear, in turn, to rotate in the opposite direction. This causes the bottom rail to move in an opposite linear direction relative to the top rail. An outwardly extending gripper finger assembly is attached to respective ends of the rails, with each gripper finger including an arrangement of vertically and horizontally mounted roller members which

operate to automatically center and engage an H-plate type interface secured to the object being grasped. The gripper assembly also includes a base plate attached to an interface plate of a robotic tool changer mechanism. A retractable rotary tool driver and tool is also centrally mounted on the base plate.

NASA

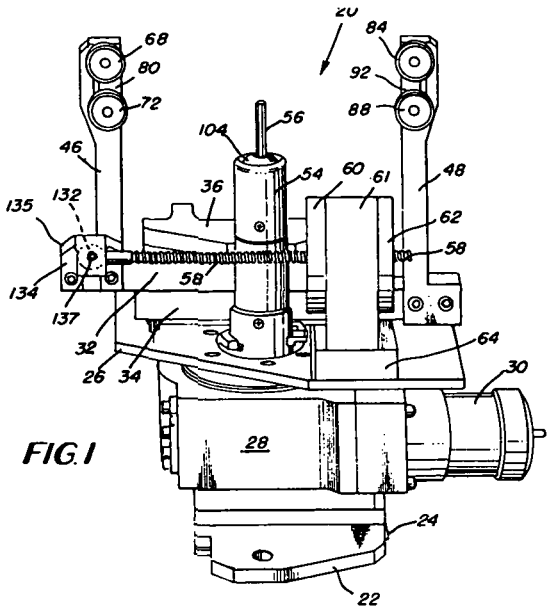


FIG. 1

Markov model is used to take advantage of temporal context and estimate class probabilities conditioned on recent past history. In this hierarchical pattern of information flow, the time series data is transformed and mapped into a categorical representation (the fault classes) and integrated over time to enable robust decision-making.

NASA

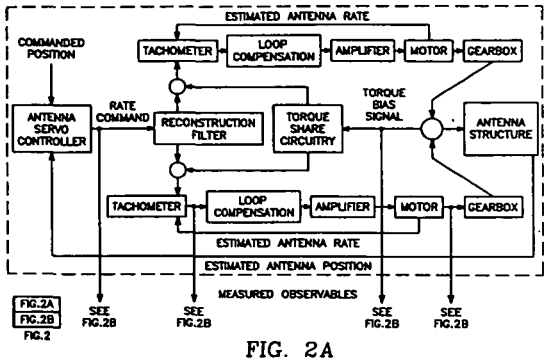


FIG. 2A

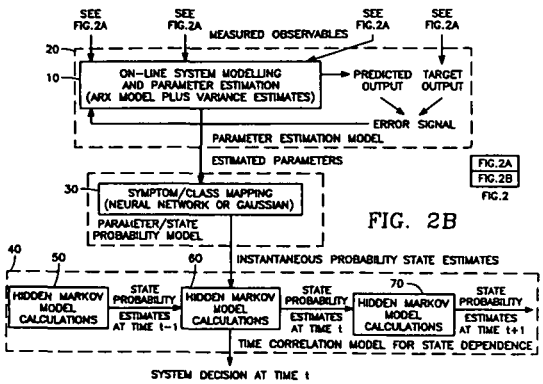


FIG. 2B

38
QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N93-30413*# National Aeronautics and Space Administration. Pasadena Office, CA.

HIDDEN MARKOV MODELS FOR FAULT DETECTION IN DYNAMIC SYSTEMS Patent Application

PADHRAIC J. SMYTH, Inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 7 Apr. 1993 60 p (Contract NAS7-918)

(NASA-CASE-NPO-18982-1-CU; NAS 1.71:NPO-18982-1-CU; US-PATENT-APPL-SN-047135) Avail: CASI HC A04/MF A01

The invention is a system failure monitoring method and apparatus which learns the symptom-fault mapping directly from training data. The invention first estimates the state of the system at discrete intervals in time. A feature vector x of dimension k is estimated from sets of successive windows of sensor data. A pattern recognition component then models the instantaneous estimate of the posterior class probability given the features, p(w(sub i) perpendicular to x), 1 less than or equal to i Is less than or equal to m. Finally, a hidden

N93-30414*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

A QUALITY MONITOR AND MONITORING TECHNIQUE EMPLOYING OPTICALLY STIMULATED ELECTRON EMISSION Patent Application

WILLIAM T. YOST, inventor (to NASA), CHRISTOPHER S. WELCH, inventor (to NASA) (College of William and Mary, Gloucester Point, VA.), EDMOND J. JOE, inventor (to NASA) (AS&M, Inc., Hampton, VA.), and BILL BRYAN HEFNER, JR., inventor (to NASA) (AS&M, Inc., Hampton, VA.) 11 May 1993 43 p

(NASA-CASE-LAR-15063-1; NAS 1.71:LAR-15063-1; US-PATENT-APPL-SN-060617) Avail: CASI HC A03/MF A01

A light source directs ultraviolet light onto a test surface and a detector detects a current of photoelectrons generated by the light. The detector includes a collector which is positively biased with respect to the test surface. Quality is indicated based on the photoelectron current. The collector is then negatively biased to replace charges removed by the measurement of a nonconducting substrate to permit subsequent measurements. Also, the intensity of the ultraviolet light at a particular wavelength is monitored and the voltage of the light source varied to maintain the light a constant desired intensity. The light source is also cooled via a gas circulation

system. If the test surface is an insulator, the surface is bombarded with ultraviolet light in the presence of an electron field to remove the majority of negative charges from the surface. The test surface is then exposed to an ion field until it possesses no net charge. The technique described above is then performed to assess quality.

NASA

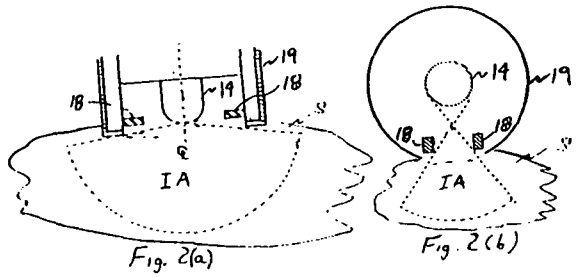


Fig. 2(a) Fig. 2(b)

39
STRUCTURAL MECHANICS

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

N93-20118* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, MD.

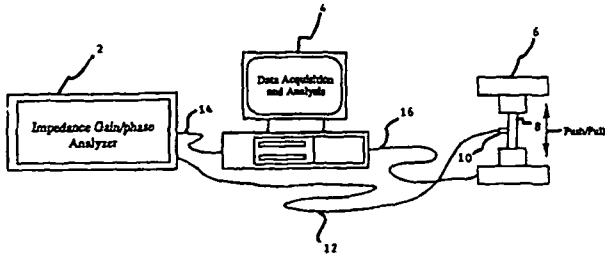
METHOD AND APPARATUS FOR DETERMINATION OF MATERIAL RESIDUAL STRESS Patent

ENGMIN J. CHERN, inventor (to NASA) and YURY FLOM, inventor (to NASA) 16 Mar. 1993 6 p Filed 2 Dec. 1991 Supersedes N92-23549 (30 - 14, p 2388)

(NASA-CASE-GSC-13451-1; US-PATENT-5,193,395; US-PATENT-APPL-SN-801141; US-PATENT-CLASS-73-779; US-PATENT-CLASS-73-797; US-PATENT-CLASS-324-222; INT-PATENT-CLASS-G01N-3/32) Avail: US Patent and Trademark Office

A device for the determination of residual stress in a material sample consisting of a sensor coil, adjacent to the material sample, whose resistance varies according to the amount of stress within the material sample, a mechanical push-pull machine for imparting a gradually increasing compressional and tensional force on the material sample, and an impedance gain/phase analyzer and personal computer (PC) for sending an input signal to and receiving an input signal from the sensor coil is presented. The PC will measure and record the change in resistance of the sensor coil and the corresponding amount of strain of the sample. The PC will then determine, from the measurements of change of resistance and corresponding strain of the sample, the point at which the resistance of the sensor coil is at a minimum and the corresponding value and type of strain of the sample at that minimum resistance point, thereby, enabling a calculation of the residual stress in the sample.

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



N93-24596* National Aeronautics and Space Administration. Pasadena Office, CA.

COMPOSITE PASSIVE DAMPING STRUTS FOR LARGE PRECISION STRUCTURES Patent

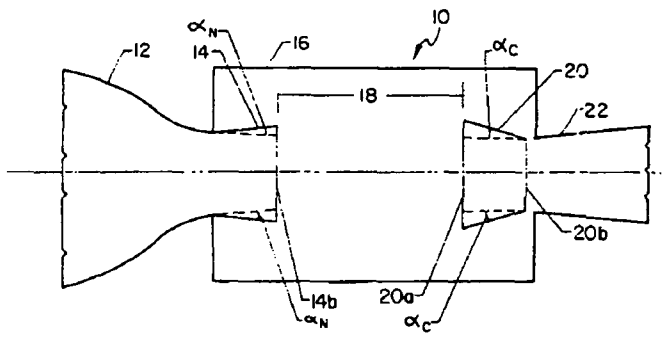
BENJAMIN P. DOLGIN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 20 Apr. 1993 9 p Filed 31 Aug. 1990 supersedes N91-13767 (29 - 5, p 678)

(Contract NAS7-918)

(NASA-CASE-NPO-17914-1-CU; US-PATENT-5,203,435; US-PATENT-APPL-SN-575697; US-PATENT-CLASS-188-322.5; US-PATENT-CLASS-267-154; US-PATENT-CLASS-267-141.2; INT-PATENT-CLASS-F16F-1/14) Avail: US Patent and Trademark Office

In the field of viscoelastic dampers, a new strut design comprises a viscoelastic material sandwiched between multiple layers, some of which layers bear and dampen load force. In one embodiment, the layers are composite plies of opposing orientation. In another embodiment, the strut utilizes a viscoelastic layer sandwiched between V-shaped composite plies. In a third embodiment, a viscoelastic layer is sandwiched between sine-shaped plies. Strut strength is equal to or greater than conventional aluminum struts due to the unique high interlaminar shear ply design.

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



N93-26102* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

METHODS OF DETERMINING LOADS AND FIBER ORIENTATIONS IN ANISOTROPIC NON-CRYSTALLINE MATERIALS USING ENERGY FLUX DEVIATION Patent

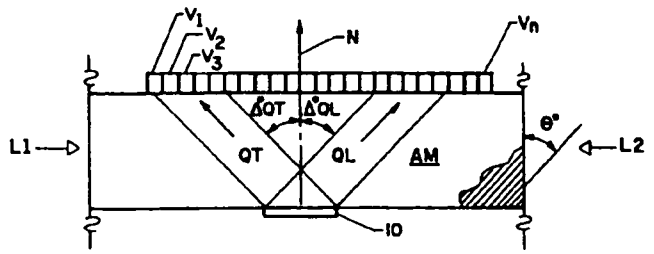
WILLIAM H. PROSSER, inventor (to NASA), RONALD D. KRIZ, inventor (to NASA), and DALE W. FITTING, inventor (to NASA) 11 May 1993 8 p Filed 22 Nov. 1991

(NASA-CASE-LAR-14399-1; US-PATENT-5,209,123; US-PATENT-APPL-SN-797507; US-PATENT-CLASS-73-788; US-PATENT-CLASS-73-641; INT-PATENT-CLASS-G01N-3/00) Avail: US Patent and Trademark Office

An ultrasonic wave is applied to an anisotropic sample material in an initial direction and an angle of flux deviation of the ultrasonic wave front is measured from this initial direction. This flux deviation angle is induced by the unknown applied load. The flux shift is determined between this flux deviation angle and a previously determined angle of flux deviation of an ultrasonic wave applied to a similar anisotropic reference material under an initial known load condition. This determined flux shift is then compared to a plurality of flux shifts of a similarly tested, similar anisotropic reference

material under a plurality of respective, known load conditions, whereby the load applied to the particular anisotropic sample material is determined. A related method is disclosed for determining the fiber orientation from known loads and a determined flux shift.

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



N93-29612* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

METHOD OF CONTINUOUSLY DETERMINING CRACK LENGTH Patent

RAMAMURTHY PRABHAKARAN, inventor (to NASA) and OSVALDO F. LOPEZ, inventor (to NASA) 13 Jul. 1993 14 p Filed 24 May 1991 Supersedes N92-11374 (30 - 2, p 247)

(NASA-CASE-LAR-14480-1-CU; US-PATENT-5,227,731; US-PATENT-APPL-SN-705474; US-PATENT-CLASS-324-718; US-PATENT-CLASS-324-699; US-PATENT-CLASS-73-799; INT-PATENT-CLASS-G01R-27/02; INT-PATENT-CLASS-G01N-19/08) Avail: US Patent and Trademark Office

The determination of crack lengths in an accurate and straight forward manner is very useful in studying and preventing load created flaws and cracks. A crack length sensor according to the present invention is fabricated in a rectangular or other geometrical form from a conductive powder impregnated polymer material. The long edges of the sensor are silver painted on both sides and the sensor is then bonded to a test specimen via an adhesive having sufficient thickness to also serve as an insulator. A lead wire is connected to each of the two outwardly facing silver painted edges. The resistance across the sensor changes as a function of the crack length in the specimen and sensor. The novel aspect of the present invention includes the use of relatively uncomplicated sensors and instrumentation to effectively measure the length of generated cracks.

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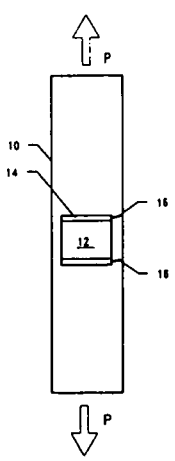

N93-29613* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

SHEAR SENSITIVE MONOMER-POLYMER LAMINATE STRUCTURE AND METHOD OF USING SAME Patent

JAG J. SINGH, inventor (to NASA), ABE EFTEKHARI, inventor (to NASA), and DEVENDRA S. PARMAR, inventor (to NASA) 29 Jun. 1993 13 p Filed 2 Mar. 1992 Supersedes N92-30317 (30 - 21, p 3662)

(NASA-CASE-LAR-14654-1-CU; US-PATENT-5,223,310; US-PATENT-APPL-SN-849612; US-PATENT-CLASS-428-1; US-PATENT-CLASS-428-409; US-PATENT-CLASS-428-480; US-PATENT-CLASS-428-913; US-PATENT-CLASS-359-67; US-PATENT-CLASS-359-74; US-PATENT-CLASS-359-82) Avail: US Patent and Trademark Office

Monomer cholesteric liquid crystals have helical structures which result in a phenomenon known as selective reflection, wherein incident white light is reflected in such a way that its wavelength is governed by the instantaneous pitch of the helix structure. The pitch is dependent on temperature and external stress fields. It is possible to use such monomers in flow visualization and temperature measurement. However, the required thin layers of these monomers are quickly washed away by a flow, making their application time dependent for a given flow rate. The laminate structure according to the present invention comprises a liquid crystal polymer substrate attached to a test surface of an article. A light absorbing coating is applied to the substrate and is thin enough to permit bonding steric interaction between the liquid crystal polymer substrate and an overlying liquid crystal monomer thin film. Light is directed through and reflected by the liquid crystal monomer thin film and unreflected light is absorbed by the underlying coating. The wavelength of the reflected light is indicative of the shear stress experienced by the test surface. Novel aspects of the invention include its firm bonding of a liquid crystal monomer to a model and its use of a coating to reduce interference from light unreflected by the monomer helical structure.

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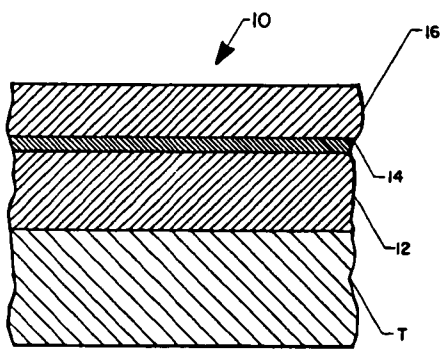

44
ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower.

N93-28974* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

ALKALI METAL CARBON DIOXIDE ELECTROCHEMICAL SYSTEM FOR ENERGY STORAGE AND/OR CONVERSION OF CARBON DIOXIDE TO OXYGEN Patent

NORMAN H. HAGEDORN, inventor (to NASA) 25 May 1993 7 p Filed 26 Sep. 1991 Supersedes N92-10222 (30 - 1, p 42) (NASA-CASE-LEW-14973-1; US-PATENT-5,213,908; US-PATENT-APPL-SN-766593; US-PATENT-CLASS-429-16; US-PATENT-CLASS-429-27; US-PATENT-CLASS-429-29; US-PATENT-CLASS-429-30; US-PATENT-CLASS-429-46; US-PATENT-CLASS-429-103; INT-PATENT-CLASS-H01M-8/14) Avail: US Patent and Trademark Office

An alkali metal, such as lithium, is the anodic reactant; carbon dioxide or a mixture of carbon dioxide and carbon monoxide is the cathodic reactant; and carbonate of the alkali metal is the electrolyte in an electrochemical cell for the storage and delivery of electrical energy. Additionally, alkali metal-carbon dioxide battery systems include a plurality of such electrochemical cells. Gold is a preferred catalyst for reducing the carbon dioxide at the cathode. The fuel cell of the invention produces electrochemical energy through the use of an anodic reactant which is extremely energetic and light, and a cathodic reactant which can be extracted from its environment and therefore exacts no transportation penalty. The invention is, therefore, especially useful in extraterrestrial environments.

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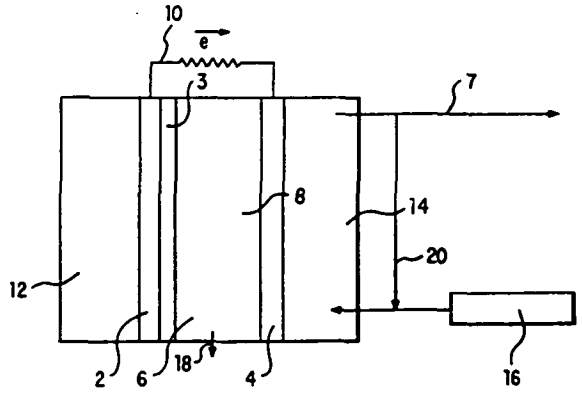

51
LIFE SCIENCES (GENERAL)

N93-25994* National Aeronautics and Space Administration. Pasadena Office, CA.

PSEUDOMONAS SCREENING ASSAY Patent

RUTH MARGALIT, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 11 May 1993 4 p Filed 30 Mar. 1990 Supersedes N90-27239 (29 - 21, p 3032) (NASA-CASE-NPO-17653-1-CU; US-PATENT-5,210,019; US-PATENT-APPL-SN-501908; US-PATENT-CLASS-435-7.32; US-PATENT-CLASS-435-7.92; US-PATENT-CLASS-435-874; US-PATENT-CLASS-436-518; INT-PATENT-CLASS-G01N-33/569) Avail: US Patent and Trademark Office

A method for the detection of Pseudomonas bacteria is described where an Azurin-specific antibody is employed for detecting the presence of Azurin in a test sample. The detection of the presence of Azurin in the sample is a conclusive indicator of the presence of the Pseudomonas bacteria since the Azurin protein is a specific marker for this bacterial strain.

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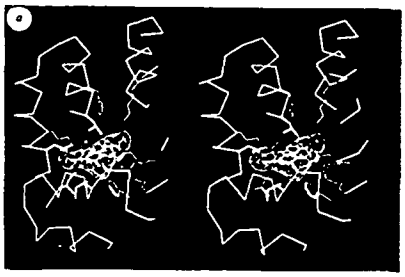
N93-28952*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

AMINO ACID SEQUENCES FOR THE BINDING REGIONS IN SERUM ALBUMIN PROTEINS Patent Application

DANIEL C. CARTER, inventor (to NASA) 1 Mar. 1993 17 p (NASA-CASE-MFS-28402-1; NAS 1.71:MFS-28402-1; US-PATENT-APPL-SN-024547) Avail: CASI HC A03/MF A01

In accordance with the present invention, biologically active protein fragments can be constructed which contain only those specific portions of the serum albumin family of proteins such as regions known as subdomains IIA and IIIA which are primarily responsible for the binding properties of the serum albumins. The artificial serums that can be prepared from these biologically active protein fragments are advantageous in that they can be produced much more easily than serums containing the whole albumin, yet still retain all or most of the original binding potential of the full albumin proteins. In addition, since the protein fragment serums of the present invention can be made from non-natural sources using conventional recombinant DNA techniques, they are far safer than serums containing natural albumin because they do not carry the potentially harmful viruses and other contaminants that will be found in the natural substances.

NASA



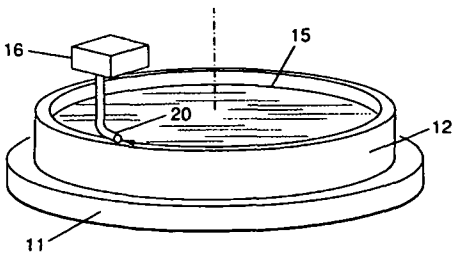
N93-29174*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

PROCESS FOR SELECTIVELY RECOVERING ALGAE AND PROTOZOA Patent Application

DAVID A. NOEVER, inventor (to NASA) (Universities Space Research Association, Huntsville, AL.) 12 Apr. 1993 8 p (NASA-CASE-MFS-26124-1-NPO; NAS 1.71:MFS-26124-1-NPO; US-PATENT-APPL-SN-045142) Avail: CASI HC A02/MF A01

A process is presented for selectively recovering swimming microorganisms from a liquid wherein the liquid is placed in a container and the container is rotated such that the coriolis force and the swimming activity of the microorganisms cause the microorganisms to concentrate in rings at different radii from the axis of rotation of the liquid. Liquid is withdrawn from the container at different distances from the axis of rotation of the container to selectively recover the microorganisms.

NASA



53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior;crewtraining and evaluation; and psychiatric research.

N93-28128*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
METHOD OF ENCOURAGING ATTENTION BY CORRELATING VIDEO GAME DIFFICULTY WITH ATTENTION LEVEL Patent Application
ALAN T. POPE, inventor (to NASA) and EDWARD H. BOGART, inventor (to NASA) (Lockheed Engineering and Sciences Co., Hampton, VA.) 8 Mar. 1993 37 p
(NASA-CASE-LAR-15022-1; NAS 1.71:LAR-15022-1; US-PATENT-APPL-SN-029808) Avail: CASI HC A03/MF A01

A method of encouraging attention in persons such as those suffering from Attention Deficit Disorder is provided by correlating the level of difficulty of a video game with the level of attention in a subject. A conventional video game comprises a video display which depicts objects for interaction with a player and a difficulty adjuster which increases the difficulty level, e.g., action speed and/or evasiveness of the depicted object, in a predetermined manner. The electrical activity of the brain is measured at selected sites to determine levels of awareness, e.g., activity in the beta, theta, and alpha states. A value is generated based on this measured electrical signal which is indicative of the level of awareness. The difficulty level of the game is increased as the awareness level value decreases and is decreased as this awareness level value increases.

NASA

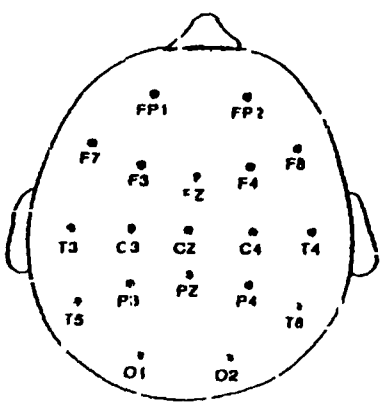


Fig. 1

N93-29610* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
AN ACCELERATED TRAINING METHOD FOR BACK PROPAGATION NETWORKS Patent
ROBERT O. SHELTON, inventor (to NASA) 13 Jul. 1993 21 p Filed 17 Jun. 1991 Supersedes N91-28730 (29 - 20, p 3381)
(NASA-CASE-MSC-21625-1; US-PATENT-5,228,113; US-PATENT-APPL-SN-716182; US-PATENT-CLASS-395-23; INT-PATENT-CLASS-G06F-15/18) Avail: US Patent and Trademark Office

The principal objective is to provide a training procedure for a feed forward, back propagation neural network which greatly accelerates the training process. A set of orthogonal singular vectors are determined from the input matrix such that the standard deviations of the projections of the input vectors along these singular vectors, as a set, are substantially maximized, thus providing an optimal means of presenting the input data. Novelty exists in the method of extracting from the set of input data, a set of features which can serve to represent the input data in a simplified manner, thus greatly reducing the time/expense to training the system.

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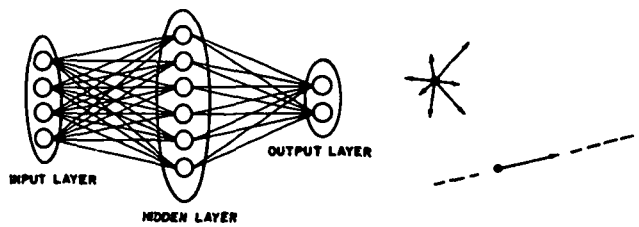


54

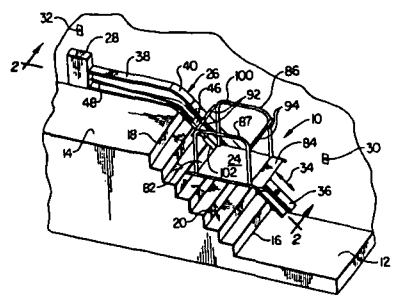
MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

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

N93-29845*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
PLATFORM STAIR LIFT Patent Application
BRUCE WEDDENDORF, inventor (to NASA) and KOSTA VARNAVAS, inventor (to NASA) 22 Mar. 1993 21 p
(NASA-CASE-MFS-28772-1; NAS 1.71:MFS-28772-1; US-PATENT-APPL-SN-035345) Avail: CASI HC A03/MF A01

A motorized lift system for carrying a wheelchair user up or down a flight of stairs includes a platform sized to underlie and support a wheelchair and a person sitting thereon. The platform is driven upwardly or downwardly along one side of the stairway between the floors at the opposite ends thereof, in response to manual operation of a start/stop switch mounted on an upwardly projecting side rail portion of the platform, in a manner maintaining the platform in a horizontal orientation at all times. With the platform resting on the floor at the appropriate end of the stairs, a user simply rolls his wheelchair onto the platform and pushes the start button. This initiates the movement of the platform toward the opposite end of the stairs and also automatically closes guard rail structures at the opposite ends of the platform to retain the wheelchair thereon during platform movement. When the platform reaches the opposite end of the stairs, and is brought to rest on the floor adjacent thereto, the platform movement is automatically terminated and the guard rail structure opened. This permits the user to simply roll his wheelchair off the platform onto the floor and be on his way after comfortably and conveniently traversing the stairs on the platform.

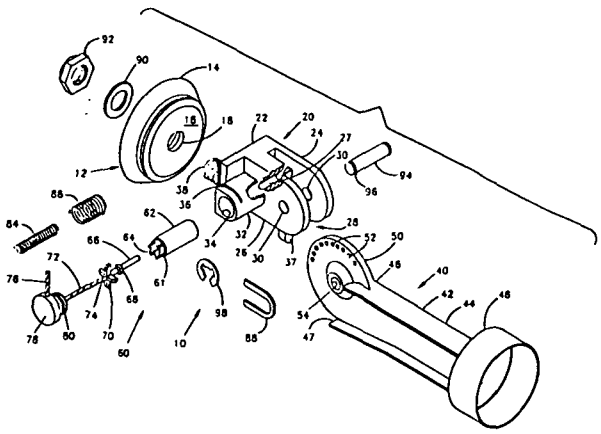
NASA



N93-30566*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
PROSTHETIC ELBOW JOINT Patent Application
BRUCE WEDDENDORF, inventor (to NASA) 8 Jul. 1992 19 p (NASA-CASE-MFS-28707-1; NAS 1.71:MFS-28707-1; US-PATENT-APPL-SN-912953) Avail: CASI HC A03/MF A01

An artificial manually positionable elbow joint for use in an upper extremity, above-elbow, prosthetic which provides a locking feature that is easily controlled by the wearer is described. The instant elbow joint is very strong and durable to withstand the repeated heavy loadings encountered by a wearer who works in an industrial, construction, farming or similar environment. The elbow joint of the present invention comprises a turntable, a frame, a forearm, and a locking assembly. The frame generally includes a housing for the locking assembly and two protruding ears. The forearm includes an elongated beam having a cup-shaped cylindrical member at one end and a locking wheel having a plurality of holes along a circular arc on its other end with a central bore for pivotal attachment to the protruding ears of the frame. The locking assembly includes a collar having a central opening with a plurality of internal grooves, a plurality of internal cam members each having a chamfered surface at one end and a V-shaped slot at its other end; an elongated locking pin having a crown wheel with cam surfaces and locking lugs secured thereto; two coiled compression springs; and a flexible filament attached to one end of the elongated locking pin and extending from the locking assembly for extending and retracting the locking pin into the holes in the locking wheel to permit selective adjustment of the forearm relative to the frame. In use, the turntable is affixed to the upper arm part of the prosthetic in the conventional manner and the cup-shaped cylindrical member on one end of the forearm is affixed to the forearm piece of the prosthetic in the conventional manner. The elbow joint is easily adjusted and locked between maximum flex and extended positions.

NASA



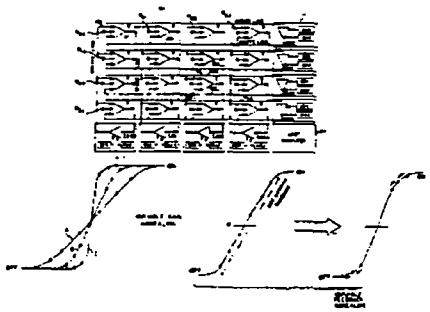
60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing.

N93-20116* National Aeronautics and Space Administration. Pasadena Office, CA.
NEURAL-NETWORK DEDICATED PROCESSOR FOR SOLVING COMPETITIVE ASSIGNMENT PROBLEMS Patent
SILVIO P. EBERHARDT, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 16 Mar. 1993 16 p Filed 12 Aug. 1991 Supersedes N92-17884 (30 - 8, p 1337)
(NASA-CASE-NPO-17781-1-CU; US-PATENT-5,195,170; US-PATENT-APPL-SN-744042; US-PATENT-CLASS-395-24; US-PATENT-CLASS-395-11; US-PATENT-CLASS-395-23; INT-PATENT-CLASS-G06F-15/18) Avail: US Patent and Trademark Office

A neural-network processor for solving first-order competitive assignment problems consists of a matrix of N x M processing units, each of which corresponds to the pairing of a first number of elements of (R sub i) with a second number of elements (C sub j), wherein limits of the first number are programmed in row control superneurons, and limits of the second number are programmed in column superneurons as MIN and MAX values. The cost (weight) W sub ij of the pairings is programmed separately into each PU. For each row and column of PU's, a dedicated constraint superneuron insures that the number of active neurons within the associated row or column fall within a specified range. Annealing is provided by gradually increasing the PU gain for each row and column or increasing positive feedback to each PU, the latter being effective to increase hysteresis of each PU or by combining both of these techniques.

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

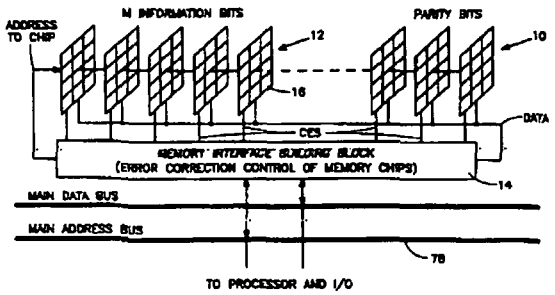


N93-22032* National Aeronautics and Space Administration. Pasadena Office, CA.
SELF-CHECKING ON-LINE TESTABLE STATIC RAM Patent
SAVIO N. CHAU, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and DAVID A. RENNELS, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 6 Apr. 1993 13 p Filed 26 Jun. 1990 Supersedes N90-26518 (28 - 20, p 2904)
(NASA-CASE-NPO-17939-1-CU; US-PATENT-5,200,963; US-PATENT-APPL-SN-543915; US-PATENT-CLASS-371-68.1; US-PATENT-CLASS-371-67.1; US-PATENT-CLASS-365-131; INT-PATENT-CLASS-G06F-15/40) Avail: US Patent and Trademark Office

This is a fault-tolerant random access memory for use in fault-tolerant computers. It comprises a plurality of memory chips each comprising a plurality of on-line testable and correctable memory cells disposed in rows and columns for holding individually addressable binary bits and provision for error detection incorporated into each memory cell for outputting an error signal whenever a transient error occurs therein. In one embodiment, each of the memory cells comprises a pair of static memory sub-cells for simultaneously receiving and holding a common binary data bit written to the memory cell and the error detection provision comprises comparator logic for continuously sensing and comparing the contents of the memory sub-cells to one another and for outputting the error signal whenever the contents do not match. In another embodiment, each of the memory cells comprises a static memory sub-cell and a dynamic memory sub-cell for simultaneously receiving and holding a common binary data bit written to the memory cell and the error

detection provision comprises comparator logic for continuously sensing and comparing the contents of the static memory sub-cell to the dynamic memory sub-cell and for outputting the error signal whenever the contents do not match. Capability for correction of errors is also included.

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



N93-29504* National Aeronautics and Space Administration. Pasadena Office, CA.

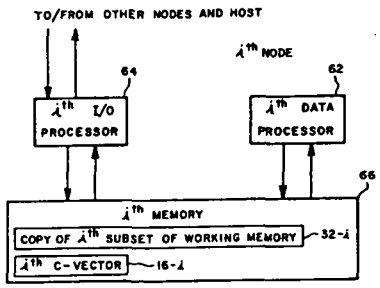
PARALLEL INFERENCING METHOD AND APPARATUS FOR RULE-BASED EXPERT SYSTEMS Patent

URSULA M. SCHWUTTKE, inventor (to NASA), DAN MOLDOVAN, inventor (to NASA), and STEVE KUO, inventor (to NASA) 6 Jul. 1993 9 p Filed 29 Mar. 1991

(NASA-CASE-NPO-18004-1-CU; US-PATENT-5,226,110; US-PATENT-APPL-SN-677059; US-PATENT-CLASS-395-11; US-PATENT-CLASS-395-51; INT-PATENT-CLASS-G06F-15/18) Avail: US Patent and Trademark Office

The invention analyzes areas of conditions with an expert knowledge base of rules using plural separate nodes which fire respective rules of said knowledge base, each of said rules upon being fired altering certain of said conditions predicated upon the existence of other said conditions. The invention operates by constructing a P representation of all pairs of said rules which are input dependent or output dependent; constructing a C representation of all pairs of said rules which are communication dependent or input dependent; determining which of the rules are ready to fire by matching the predicate conditions of each rule with the conditions of said set; enabling said node means to simultaneously fire those of the rules ready to fire which are defined by said P representation as being free of input and output dependencies; and communicating from each node enabled by said enabling step the alteration of conditions by the corresponding rule to other nodes whose rules are defined by said C matrix means as being input or communication dependent upon the rule of said enabled node.

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



N93-29608* National Aeronautics and Space Administration. Pasadena Office, CA.

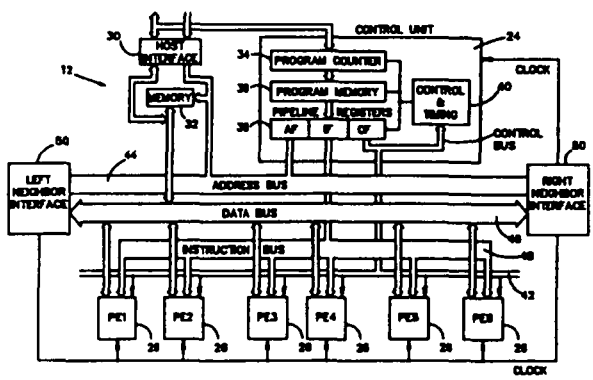
SPECIAL PURPOSE PARALLEL COMPUTER ARCHITECTURE FOR REAL-TIME CONTROL AND SIMULATION IN ROBOTIC APPLICATIONS Patent

AMIR FIJANY, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and ANTAL K. BEJCZY, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 8 Jun. 1993 10 p Filed 28 Dec. 1989 Supersedes N90-27268 (30 - 21, p 3038)

(NASA-CASE-NPO-17629-1-CU; US-PATENT-5,218,709; US-PATENT-APPL-SN-458280; US-PATENT-CLASS-395-800; US-PATENT-CLASS-364-231.9; US-PATENT-CLASS-364-DIG.1; INT-PATENT-CLASS-G06F-9/00; INT-PATENT-CLASS-G06F-15/16) Avail: US Patent and Trademark Office

This is a real-time robotic controller and simulator which is a MIMD-SIMD parallel architecture for interfacing with an external host computer and providing a high degree of parallelism in computations for robotic control and simulation. It includes a host processor for receiving instructions from the external host computer and for transmitting answers to the external host computer. There are a plurality of SIMD microprocessors, each SIMD processor being a SIMD parallel processor capable of exploiting fine grain parallelism and further being able to operate asynchronously to form a MIMD architecture. Each SIMD processor comprises a SIMD architecture capable of performing two matrix-vector operations in parallel while fully exploiting parallelism in each operation. There is a system bus connecting the host processor to the plurality of SIMD microprocessors and a common clock providing a continuous sequence of clock pulses. There is also a ring structure interconnecting the plurality of SIMD microprocessors and connected to the clock for providing the clock pulses to the SIMD microprocessors and for providing a path for the flow of data and instructions between the SIMD microprocessors. The host processor includes logic for controlling the RRCS by interpreting instructions sent by the external host computer, decomposing the instructions into a series of computations to be performed by the SIMD microprocessors, using the system bus to distribute associated data among the SIMD microprocessors, and initiating activity of the SIMD microprocessors to perform the computations on the data by procedure call.

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



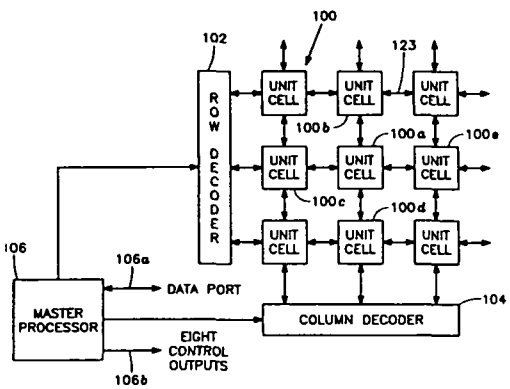
62
COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

N93-28427*# National Aeronautics and Space Administration. Pasadena Office, CA.
DIGITAL PARALLEL PROCESSOR ARRAY FOR OPTIMUM PATH PLANNING Patent Application
SABRINA E. KEMENY, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), ERIC R. FOSSUM, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), and ROBERT H. NIXON, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 30 Mar. 1993 32 p (Contract NAS7-918)
(NASA-CASE-NPO-18727-1-CU; NAS 1.71:NPO-18727-1-CU; US-PATENT-APPL-SN-042486) Avail: CASI HC A03/MF A01

The invention computes the optimum path across a terrain or topology represented by an array of parallel processor cells interconnected between neighboring cells by links extending along different directions to the neighboring cells. Such an array is preferably implemented as a high-speed integrated circuit. The computation of the optimum path is accomplished by, in each cell, receiving stimulus signals from neighboring cells along corresponding directions, determining and storing the identity of a direction along which the first stimulus signal is received, broadcasting a subsequent stimulus signal to the neighboring cells after a predetermined delay time, whereby stimulus signals propagate throughout the array from starting one of the cells. After propagation of the stimulus signals throughout the array, a master processor traces back from a selected destination cell to the starting cell along an optimum path of the cells in accordance with the identity of the directions stored in each of the cells.

NASA



63
CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems.

N93-24599* National Aeronautics and Space Administration. Pasadena Office, CA.
GAAS-BASED OPTOELECTRONIC NEURONS Patent
STEVEN H. LIN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), JAE H. KIM, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), and DEMETRI PSALTIS, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 20 Apr. 1993 7 p Filed 3 Mar. 1992 (Contract NAS7-918)
(NASA-CASE-NPO-18497-1-CU; US-PATENT-5,204,521; US-PATENT-APPL-SN-845283; US-PATENT-CLASS-250-214LS; US-PATENT-CLASS-307-201; US-PATENT-CLASS-250-551; INT-PATENT-CLASS-H01J-31/50) Avail: US Patent and Trademark Office

An integrated, optoelectronic, variable thresholding neuron implemented monolithically in GaAs integrated circuit and exhibiting high differential optical gain and low power consumption is presented. Two alternative embodiments each comprise an LED monolithically integrated with a detector and two transistors. One of the transistors is responsive to a bias voltage applied to its gate for varying the threshold of the neuron. One embodiment is implemented as an LED monolithically integrated with a double heterojunction bipolar phototransistor (detector) and two metal semiconductor field effect transistors (MESFET's) on a single GaAs substrate and another embodiment is implemented as an LED monolithically integrated with three MESFET's (one of which is an optical FET detector) on a single GaAs substrate. The first noted embodiment exhibits a differential optical gain of 6 and an optical switching energy of 10 pJ. The second embodiment has a differential optical gain of 80 and an optical switching energy of 38 pJ. Power consumption is 2.4 and 1.8 mW, respectively. Input 'light' power needed to turn on the LED is 2 micro-W and 54 nW, respectively. In both embodiments the detector is in series with a biasing MESFET and saturates the other MESFET upon detecting light above a threshold level. The saturated MESFET turns on the LED. Voltage applied to the biasing MESFET gate controls the threshold.

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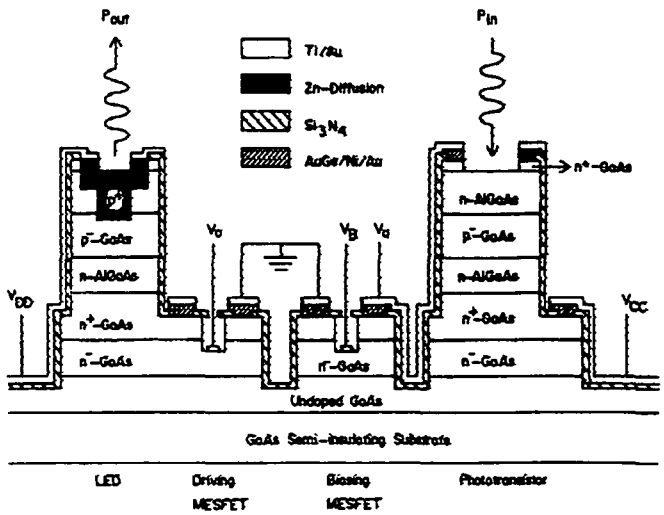


N93-29176*# National Aeronautics and Space Administration. Pasadena Office, CA.

THREE-PARAMETER TUNABLE TILT-INTEGRAL-DERIVATIVE (TID) CONTROLLER Patent Application

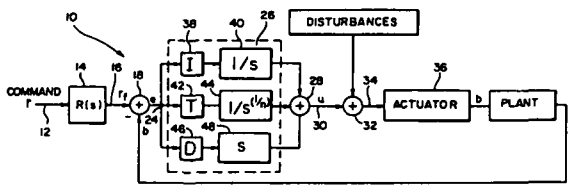
BORIS J. LURIE, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 1 Feb. 1993 24 p

(Contract NAS7-918)

(NASA-CASE-NPO-18492-1-CU; NAS 1.71:NPO-18492-1-CU; US-PATENT-APPL-SN-023253) Avail: CASI HC A03/MF A01

A feedback control system compensator of the PID type is provided, wherein the proportional component of the compensator is replaced with a tilted component having a transfer function s to the power of -1/n. The resulting transfer function of the entire compensator more closely approximates an optimal transfer function, thereby achieving improved feedback controller. Further, as compared to conventional PID compensators, the TID compensator allows for simpler tuning, better disturbance rejection ratio, and smaller effects of plant parameter variations on closed loop response.

NASA



71
ACOUSTICS

Includes sound generation, transmission, and attenuation.

N93-24602* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

FIBER OPTIC MICROPHONE HAVING A PRESSURE SENSING REFLECTIVE MEMBRANE AND A VOLTAGE SOURCE FOR CALIBRATION PURPOSE Patent

ALLAN J. ZUCKERWAR, inventor (to NASA), FRANK W. CUOMO, inventor (to NASA), and WILLIAM E. ROBBINS, inventor (to NASA) 6 Apr. 1993 16 p Filed 3 Jun. 1992 Division of US-Patent-Appl-SN-586369, filed 21 Sep. 1990

(NASA-CASE-LAR-14402-2-CU; US-PATENT-5,200,610; US-PATENT-APPL-SN-894504; US-PATENT-CLASS-250-227.21; US-PATENT-CLASS-250-231.19; US-PATENT-CLASS-364-571.01; INT-PATENT-CLASS-H01J-40/14) Avail: US Patent and Trademark Office

A fiber optic microphone is provided for measuring fluctuating pressures. An optical fiber probe having at least one transmitting fiber for transmitting light to a pressure-sensing membrane and at least one receiving fiber for receiving light reflected from a stretched membrane is provided. The pressure-sensing membrane may be stretched for high frequency response. Further, a reflecting surface of the pressure-sensing membrane may have dimensions which substantially correspond to dimensions of a cross section of the optical fiber probe. Further, the fiber optic microphone can be made of materials for use in high temperature environments, for example greater than 1000 F. A fiber optic probe is also provided with a back plate for damping membrane motion. The back plate further provides a means for on-line calibration of the microphone.

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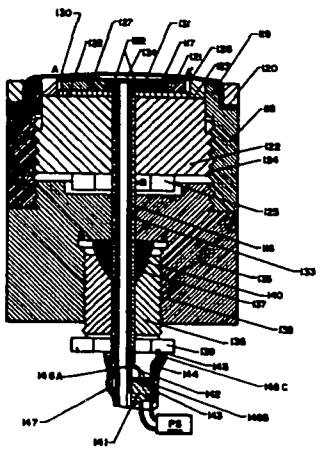


N93-28953*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

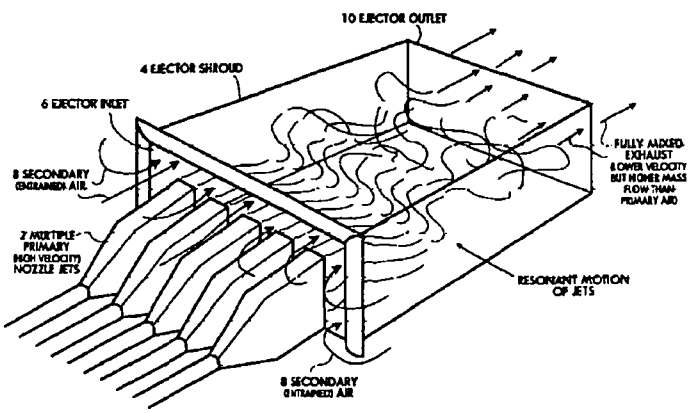
JET MIXER NOISE SUPPRESSOR USING ACOUSTIC FEEDBACK Patent Application

EDWARD J. RICE, inventor (to NASA) 14 Apr. 1993 20 p

(NASA-CASE-LEW-15170-1; NAS 1.71:LEW-15170-1; US-PATENT-APPL-SN-046256) Avail: CASI HC A03/MF A01

The present invention generally relates to providing an improved jet mixer noise suppressor for high speed jets that rapidly mixes high speed air flow with a lower speed air flow, and more particularly, relates to an improved jet mixer noise suppressor that uses feedback of acoustic waves produced by the interaction of sheer flow instability waves with an obstacle downstream of the jet nozzle.

NASA



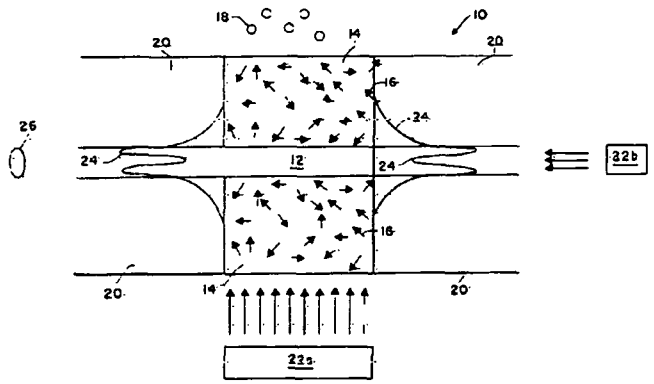
74
OPTICS

Includes light phenomena; and optical devices.

N93-22008*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
OPTICAL FIBER FLUOROSENSOR Patent Application
CLAUDIO O. EGALON, inventor (to NASA) (College of William and Mary, Hampton, VA.) and ROBERT S. ROWGOWSKI, inventor (to NASA) 16 Sep. 1991 15 p
(NASA-CASE-LAR-14525-1-CU; NAS 1.71:LAR-14525-1-CU; US-PATENT-APPL-SN-761298) Avail: CASI HC A03/MF A01

Optical fibers may have applications including fluorosensors which sense the concentration of an analyte. Like communication fibers, these fluorosensors are modeled using a weakly guiding approximation which is only effective when the difference between the respective refractive indices of the fiber core and surrounding cladding are minimal. An optical fiber fluorosensor is provided having a portion of a fiber core which is surrounded by an active cladding which is permeable by the analyte to be sensed and containing substances which emit light waves upon excitation. A remaining portion of the fiber core is surrounded by a guide cladding which guides these light waves to a sensor which detects the intensity of waves, which is a function of the analyte concentration. Contrary to conventional weakly guiding principles, the difference between the respective indices of refraction of the fiber core is surrounded by an active cladding which is thin enough such that its index of refraction is effectively that of the surrounding atmosphere, thereby the atmosphere guides the injective indices of the fiber core and the cladding results in an unexpected increase in the power efficiency of the fiber core.

NASA



N93-22037* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
OFF-SURFACE INFRARED FLOW VISUALIZATION Patent
GREGORY S. MANUEL, inventor (to NASA), CLIFFORD J. OBARA, inventor (to NASA), KAMRAN DARYABEIGI, inventor (to NASA), and DAVID W. ALDERFER, inventor (to NASA) 6 Apr. 1993 4 p Filed 16 Dec. 1991 Supersedes N92-30312 (30 - 21, p 3720)
(NASA-CASE-LAR-14568-1; US-PATENT-5,200,621; US-PATENT-APPL-SN-808302; US-PATENT-CLASS-250-330; US-PATENT-CLASS-250-338.5; US-PATENT-CLASS-250-340; US-PATENT-CLASS-244-204; US-PATENT-CLASS-73-147; INT-PATENT-CLASS-G01M-19/00; INT-PATENT-CLASS-G01M-9/06) Avail: US Patent and Trademark Office

A method for visualizing off-surface flows is provided. The method consists of releasing a gas with infrared absorbing and emitting characteristics into a fluid flow and imaging the flow with an infrared imaging system. This method allows for visualization of off-surface fluid flow in-flight. The novelty of this method is found in providing an apparatus for flow visualization which is contained within the aircraft so as not to disrupt the airflow around the aircraft, is effective at various speeds and altitudes, and is longer-lasting than previous methods of flow visualization.

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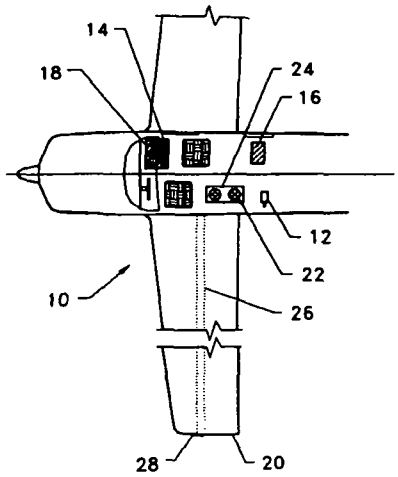
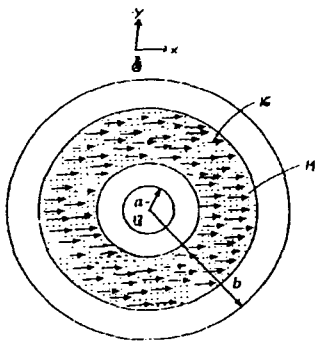


N93-22039*# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
TRANSVERSELY POLARIZED SOURCE CLADDING FOR AN OPTICAL FIBER Patent Application
CLAUDIO O. EGALON, inventor (to NASA) (AS&M, Inc., Hampton, VA.) and ROBERT S. ROGOWSKI, inventor (to NASA) 25 Feb. 1993 16 p
(NASA-CASE-LAR-14652-1-SB; NAS 1.71:LAR-14652-1-SB; US-PATENT-APPL-SN-022582) Avail: CASI HC A03/MF A01

An optical fiber comprising a fiber core having a longitudinal symmetry axis is provided. An active cladding surrounds a portion of the fiber core and comprises light-producing sources which emit light in response to chemical or light excitation. The cladding sources are oriented transversely with respect to the longitudinal axis of the fiber core. This polarization results in a superior power efficiency compared to active cladding sources that are randomly polarized or longitudinally polarized parallel with the longitudinal symmetry axis.

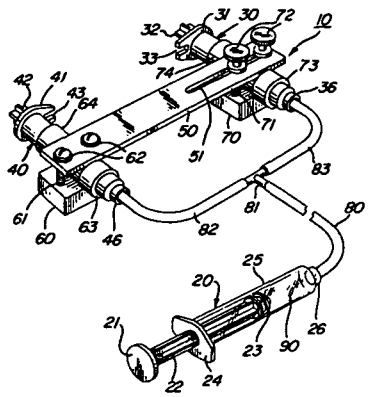
NASA



N93-28133*# National Aeronautics and Space Administration. Pasadena Office, CA.
MOTION-SENSITIVE OPTICAL CORRELATOR Patent Application
TSUEN-HSI LIU, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 7 Apr. 1993 14 p
(Contract NAS7-918)
(NASA-CASE-NPO-18769-1-CU; NAS 1.71:NPO-18769-1-CU; US-PATENT-APPL-SN-046331) Avail: CASI HC A03/MF A01

A new type of optical correlator is presented. The correlator performs motion detection or background clutter suppression and correlation simultaneously in a single photorefractive crystal. Additionally, the device is useful for moving target identification and tracking and for stationary clutter rejection. The correlation is of the VanderLugt type, and the motion detection or background clutter suppression is based on the erasing property of photorefractive crystals.

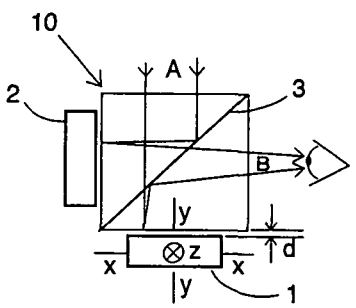
NASA



N93-28135*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
FULL COMPLEX MODULATION USING TWO ONE-PARAMETER SPATIAL LIGHT MODULATORS Patent Application
RICHARD D. JUDAY, inventor (to NASA) 10 Nov. 1992 37 p
(NASA-CAE-MSC-22255-1; NAS 1.71:MSC-22255-1; US-PATENT--SN-977302) Avail: CASI HC A03/MF A01

Full complex spatial light modulation is enabled by an optically additive combination of the actions of separate and independent spatial light modulators, even though the independent modulators can each express only a one-parameter subset of complex values called its operating curve. Similarly the operating curve of a single modulator can be shifted (biased) by optically adding a constant complex value.

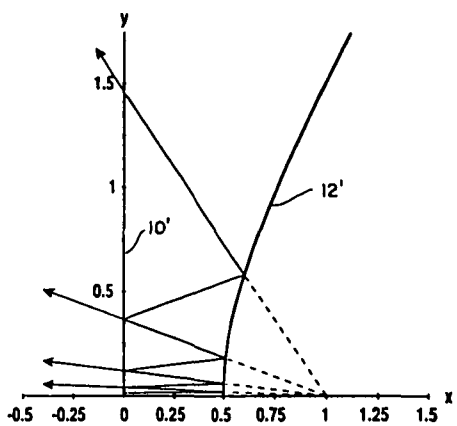
NASA



N93-28428*# National Aeronautics and Space Administration. Pasadena Office, CA.
ABERRATION CORRECTION OF UNSTABLE RESONATORS Patent Application
ROBERT J. LANG, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 22 Feb. 1993 29 p
(Contract NAS7-918)
(NASA-CASE-NPO-18662-1-CU; NAS 1.71:NPO-18662-1-CU; US-PATENT-APPL-SN-020813) Avail: CASI HC A03/MF A01

Construction of aspheric reflectors for unstable resonator lasers to provide an arbitrary laser mode inside the resonator to correct aberrations of an output beam by the construction of the shape of an end reflector opposite the output reflector of the resonator cavity, such as aberrations resulting from refraction of a beam exiting the solid of the resonator having an index of refraction greater than 1 or to produce an aberration in the output beam that will precisely compensate for the aberration of an optical train into which the resonator beam is coupled, is described.

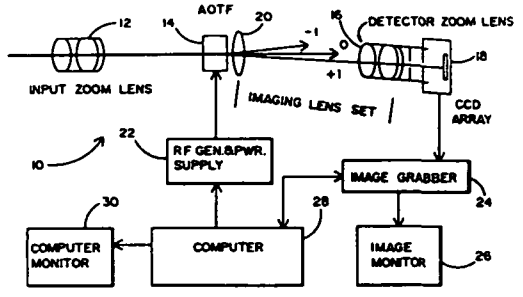
NASA



N93-29086* National Aeronautics and Space Administration. Pasadena Office, CA.
IMPROVED REAL-TIME IMAGING SPECTROMETER Patent
JAMES L. LAMBERT, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), TIEN-HSIN CHAO, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), JEFFREY W. YU, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.), and LI-JEN CHENG, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 1 Jun. 1993 14 p Filed 9 Dec. 1991 Supersedes N92-29832 (30 - 20, p 3552)
(Contract NAS7-918)
(NASA-CASE-NPO-18410-1-CU; US-PATENT-5,216,484; US-PATENT-APPL-SN-805341; US-PATENT-CLASS-356-326; US-PATENT-CLASS-356-51; US-PATENT-CLASS-250-339; US-PATENT-CLASS-359-308; INT-PATENT-CLASS-G01J-3/12) Avail: US Patent and Trademark Office

An improved AOTF-based imaging spectrometer that offers several advantages over prior art AOTF imaging spectrometers is presented. The ability to electronically set the bandpass wavelength provides observational flexibility. Various improvements in optical architecture provide simplified magnification variability, improved image resolution and light throughput efficiency and reduced sensitivity to ambient light. Two embodiments of the invention are: (1) operation in the visible/near-infrared domain of wavelength range 0.48 to 0.76 microns; and (2) infrared configuration which operates

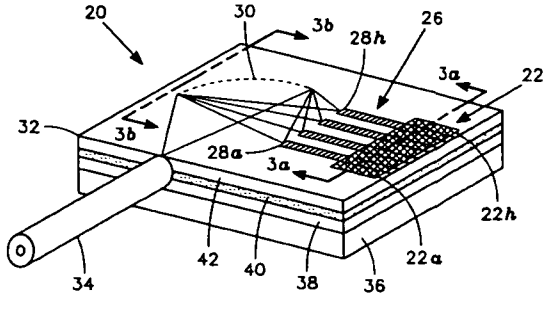
in the wavelength range of 1.2 to 2.5 microns.
Official Gazette of the U.S. Patent and Trademark Office



N93-29848*# National Aeronautics and Space Administration. Pasadena Office, CA.
WAVELENGTH-DIVISION MULTIPLEXED OPTICAL INTEGRATED CIRCUIT WITH VERTICAL DIFFRACTION GRATING Patent Application
ROBERT J. LANG, inventor (NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) and SIAMAK FOROUHAR, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 17 Mar. 1993 35 p
(Contract NAS7-918)
(NASA-CASE-NPO-18357-1-CU; NAS 1.71:NPO-18357-1-CU; US-PATENT-APPL-SN-033512) Avail: CASI HC A03/MF A01

A semiconductor optical integrated circuit for wave division multiplexing has a semiconductor waveguide layer, a succession of diffraction grating points in the waveguide layer along a predetermined diffraction grating contour, a semiconductor diode array in the waveguide layer having plural optical ports facing the succession of diffraction grating points along a first direction, respective semiconductor diodes in the array corresponding to respective ones of a predetermined succession of wavelengths, an optical fiber having one end thereof terminated at the waveguide layer, the one end of the optical fiber facing the succession of diffraction grating points along a second direction, wherein the diffraction grating points are spatially distributed along the predetermined contour in such a manner that the succession of diffraction grating points diffracts light of respective ones of the succession of wavelengths between the one end of the optical fiber and corresponding ones of the optical ports.

NASA



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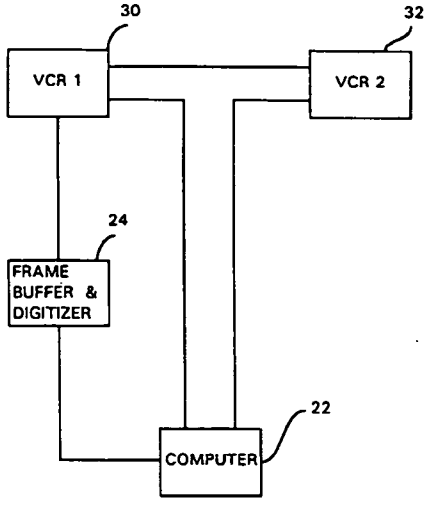
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography.

N93-22017*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
METHOD AND APPARATUS FOR FILTERING VISUAL DOCUMENTS Patent Application
MARK E. RORVIG, inventor (to NASA) and ROBERT O. SHELTON, inventor (to NASA) 5 Feb. 1993 19 p
(NASA-CASE-MSC-22093-1; NAS 1.71:MSC-22093-1; US-PATENT-APPL-SN-014985) Avail: CASI HC A03/MF A01

A method and apparatus for producing an abstract or condensed version of a visual document is presented. The frames comprising the visual document are first sampled to reduce the number of frames required for processing. The frames are then subjected to a structural decomposition process that reduces all information in each frame to a set of values. These values are in turn normalized and further combined to produce only one information content value per frame. The information content values of these frames are then compared to a selected distribution cutoff point. This effectively selects those values at the tails of a normal distribution, thus filtering key frames from their surrounding frames. The value for each frame is then compared with the value from the previous frame, and the respective frame is finally stored only if the values are significantly different. The method filters or compresses a visual document with a reduction in digital storage on the ratio of up to 700 to 1 or more, depending on the content of the visual document being filtered.

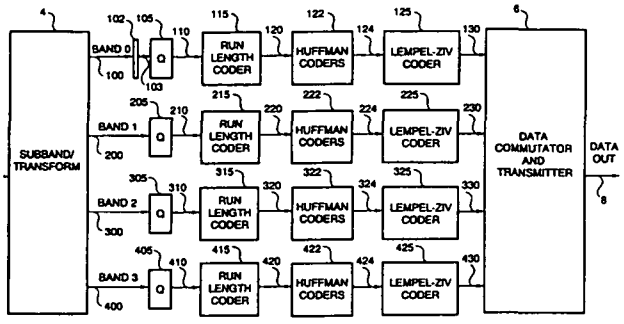
NASA



N93-28130*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
PICTURE DATA COMPRESSION CODER USING SUBBAND/ TRANSFORM CODING WITH A LEMPEL-ZIV-BASED CODER Patent Application
DANIEL R. GLOVER, inventor (to NASA) 11 Mar. 1993 18 p
(NASA-CASE-LEW-15700-1; NAS 1.71:LEW-15700-1; US-PATENT-APPL-SN-029520) Avail: CASI HC A03/MF A01

The present invention is a subband/transform coding system. The invention produces a digitally encoded signal which is a transformed version of an analog signal such as a video signal. The digitally encoded signal maintains the integrity of the original signal but allows transmission at low data rates. The transformed data is organized into frequency subbands with the lowest frequency subband being a low resolution version of the original signal. Once the data is transformed into subbands, it is coded with statistical coders. The statistical coder used in this invention is a Lempel-Ziv-based coder.

NASA



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 at $1.50 per 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 and microfiche by the NASA Center for AeroSpace Information (CASI). The N accession number should be used in ordering either paper copy or microfiche from CASI.

LICENSES FOR COMMERCIAL USE: INQUIRIES AND APPLICATIONS FOR LICENSE

NASA inventions, abstracted in *NASA PAB,* are available for nonexclusive or exclusive licensing in accordance 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 Associate General Counsel for Intellectual Property, code GP, National Aeronautics and Space Administration, Washington, D.C. 20546. Inquiries should refer to the NASA Case Number, the Title of the Invention, and the U.S. Patent Number or the U.S. Application Serial Number assigned to the invention as shown in *NASA PAB.*

The NASA Patent Counsel having cognizance of the invention is determined by the first three letters or prefix of the NASA Case Number assigned to the invention. The addresses of NASA Patent Counsels are listed alongside the NASA Case Number prefix letters in the following table.

STANDING ORDER SUBSCRIPTIONS

NASA SP-7039, Section 1 and its supplements are available from the NASA Center for AeroSpace Information on standing order subscription. Standing order subscriptions do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.

NASA Case Number Prefix Letters	Address of Cognizant NASA Patent Counsel
ARC-xxxxx XAR-xxxxx	Ames Research Center Mail Code: 200-11A Moffett Field, California 94035 Telephone: (415) 694-5104
ERC-xxxxx XER-xxxxx HQN-xxxxx XHQ-xxxxx	NASA Headquarters Mail Code: GP Washington, DC 20546 Telephone: (202) 358-2066
GSC-xxxxx XGS-xxxxx	Goddard Space Flight Center Mail Code: 204 Greenbelt, Maryland 20771 Telephone: (301) 286-7351
KSC-xxxxx XKS-xxxxx	John F. Kennedy Space Center Mail Code: PT-PAT Kennedy Space Center, Florida 32899 Telephone: (305) 867-2544
LAR-xxxxx XLA-xxxxx	Langley Research Center Mail Code: 279 Hampton, Virginia 23365 Telephone: (804) 865-3725
LEW-xxxxx XLE-xxxxx	Lewis Research Center Mail Code: 500-318 21000 Brookpark Road Cleveland, Ohio 44135 Telephone: (216) 433-5753
MSC-xxxxx XMS-xxxxx	Lyndon B. Johnson Space Center Mail Code: AL3 Houston, Texas 77058 Telephone: (713) 483-4871
MFS-xxxxx XMF-xxxxx	George C. Marshall Space Flight Center Mail Code: CC01 Huntsville, Alabama 35812 Telephone: (205) 544-0024
NPO-xxxxx XNP-xxxxx FRC-xxxxx XFR-xxxxx WOO-xxxxx	NASA Resident Legal Office Mail Code: 180-801 4800 Oak Grove Drive Pasadena, California 91103 Telephone: (818) 354-2700

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.

ADDRESS: Mr. John G. Mannix, Director of Patent Licensing, GP-4, NASA, Washington, D.C. 20546

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.

Authority: 35 U.S.C. Section 207 and 208.94 Stat 3023 and 3024.

★ ★ ★ ★ ★

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 (a) 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 in the United States, or a patent, patent application, plant variety protection, or other form of protection, in a foreign country, title to which has been assigned to or otherwise vested in 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. For the purpose of these regulations, the size standard for small business concerns involved in Government procurement, contained in 13 CFR 121.3-8, and in subcontracting, contained in 13 CFR 121.3-12, will be used.

(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 condition, 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 announced 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 if:

(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 nay 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 applicants 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 exclusivity 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, on reasonable terms, when necessary 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:

(i) 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 interests 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, title, 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;

a) 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 Incenses.

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. R1-31509 Filed 10-30-31, 3:45 am]

BILLING CODE 7510 01-M

REPORT DOCUMENTATION PAGE

1. Report No. NASA SP-7039 (44)	2. Government Accession No.	3. Recipient's Catalog No.
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