NASA PATENT ABSTRACTS
BIBLIOGRAPHY

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This bibliography was prepared by the NASA Center for AeroSpace Information operated for the National Aeronautics and Space Administration.
NASA PATENT ABSTRACTS
BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY
SECTION 1 ABSTRACTS
This supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, price code A04.
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 154 citations published in this issue of the Abstract Section cover the period January 1991 through June 1991. The Index Section references over 5000 citations covering the period May 1969 through June 1991.

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 the desired technical subject term. (B) Note the indicated Accession Number and the Subject Category Number. (C) Using the indicated Accession Number, turn to the inside front cover of the Index Section to determine which issue of the Abstract Section includes the Accession Number desired. (D) To find the abstract of the particular invention in the issue of the Abstract Section selected, (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.
A method for collection of fecal matter designed to operate efficiently in a zero gravity environment was invented. The system consists of a waste collection area within a body having a seat opening. Low pressure within the waste collection area directs fecal matter away from the user's buttocks and prevents the escape of waste gases. The user actuates a piston covered with an absorbent pad that sweeps through the waste collection area to collect fecal matter, scrub the waste collector area, press the waste against an end of the waste collection area and retracts, leaving the used pad. Multiple pads are provided on the piston to accommodate multiple usages. Also a valve allows air to be drawn through the body, which keeps the valve from becoming plugged with the feces. A sheet feeder feeds fresh sheets of absorbent pads to a face of the piston with each actuation.

Official Gazette of the U.S. Patent and Trademark Office
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### AERONAUTICS
For related information see also Astronautics.

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<td>Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also 34 Fluid Mechanics and Heat Transfer.</td>
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<td>03</td>
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<td>Includes passenger and cargo air transport operations; and aircraft accidents. For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.</td>
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<td>04</td>
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<td>Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 17 Space Communications, Spacecraft Communications, Command and Tracking and 32 Communications and Radar.</td>
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<td>Includes aircraft simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Urban Technology and Transportation.</td>
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<td>06</td>
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<td>Includes cockpit and cabin display devices; and flight instruments. For related information see also 19 Spacecraft Instrumentation and 35 Instrumentation and Photography.</td>
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<td>07</td>
<td>AIRCRAFT PROPULSION AND POWER</td>
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<td>Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.</td>
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<td>Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information see also 14 Ground Support Systems and Facilities (Space).</td>
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### ASTRONAUTICS
For related information see also Aeronautics.

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<td>GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)</td>
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<td>Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators. For related information see also 09 Research and Support Facilities (Air).</td>
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<td>LAUNCH VEHICLES AND SPACE VEHICLES</td>
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<td>Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. For related information see also 20 Spacecraft Propulsion and Power.</td>
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<td>16</td>
<td>SPACE TRANSPORTATION</td>
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<td>Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information see also 03 Air Transportation and Safety and 18 Spacecraft Design, Testing and Performance. For space suits see 54 Man/System Technology and Life Support.</td>
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<td>Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout. For related information see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.</td>
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N.A.—no abstracts were assigned to this category for this issue.
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. For life support systems see 54 Man/System Technology and Life Support. For related information see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation.

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

20 SPACECRAFT PROPULSION AND POWER
Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also 07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion, and 15 Launch Vehicles and Space Vehicles.

CHEMISTRY AND MATERIALS
23 CHEMISTRY AND MATERIALS (GENERAL)
24 COMPOSITE MATERIALS
Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see 27 Nonmetallic Materials.

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

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

27 NONMETALLIC MATERIALS
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

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

29 MATERIALS PROCESSING
Includes space-based development of products and processes for commercial application. For biological materials see 55 Space Biology.

ENGINEERING For related information see also Physics.
31 ENGINEERING (GENERAL)
Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

32 COMMUNICATIONS AND RADAR
Includes radar; land and global communications; communications theory; and optical communications. For related information see also 04 Aircraft Communications and Navigation and 17 Space Communications, Spacecraft Communications, Command and Tracking. For search and rescue see 03 Air Transportation and Safety; and 16 Space Transportation.

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

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

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

36 LASERS AND MASERS
Includes parametric amplifiers. For related information see also 76 Solid-State Physics.
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<td>MECHANICAL ENGINEERING</td>
<td>Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.</td>
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<td>38</td>
<td>QUALITY ASSURANCE AND RELIABILITY</td>
<td>Includes product sampling procedures and techniques; and quality control.</td>
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<td>39</td>
<td>STRUCTURAL MECHANICS</td>
<td>Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.</td>
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<td>EARTH RESOURCES AND REMOTE SENSING</td>
<td>Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see 35 Instrumentation and Photography.</td>
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<td>44</td>
<td>ENERGY PRODUCTION AND CONVERSION</td>
<td>Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.</td>
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<td>45</td>
<td>ENVIRONMENT POLLUTION</td>
<td>Includes atmospheric, noise, thermal, and water pollution.</td>
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<td>46</td>
<td>GEOPHYSICS</td>
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<td>47</td>
<td>METEOROLOGY AND CLIMATOLOGY</td>
<td>Includes weather forecasting and modification.</td>
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<td>OCEANOGRAPHY</td>
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<td>LIFE SCIENCES</td>
<td>Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also 43 Earth Resources and Remote Sensing.</td>
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<td>AEROSPACE MEDICINE</td>
<td>Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.</td>
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<td>MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT</td>
<td>Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.</td>
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<td>55</td>
<td>SPACE BIOLOGY</td>
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<td>MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)</td>
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<td>60</td>
<td>COMPUTER OPERATIONS AND HARDWARE</td>
<td>Includes hardware for computer graphics, firmware, and data processing. For components see 33 Electronics and Electrical Engineering.</td>
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<tr>
<td>61</td>
<td>COMPUTER PROGRAMMING AND SOFTWARE</td>
<td>Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.</td>
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<tr>
<td>62</td>
<td>COMPUTER SYSTEMS</td>
<td>Includes computer networks and special application computer systems.</td>
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63 CYBERNETICS
Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also 54 Man/System Technology and Life Support.

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

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

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

67 THEORETICAL MATHEMATICS
Includes topology and number theory.

PHYSICS For related information see also Engineering.

70 PHYSICS (GENERAL)
For precision time and time interval (PTTI) see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

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

72 ATOMIC AND MOLECULAR PHYSICS
Includes atomic structure, electron properties, and molecular spectra.

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

74 OPTICS
Includes light phenomena and optical devices. For lasers see 36 Lasers and Masers.

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

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

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

SOCIAL SCIENCES

80 SOCIAL SCIENCES (GENERAL)
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE
Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

83 ECONOMICS AND COST ANALYSIS
Includes cost effectiveness studies.

84 LAW, POLITICAL SCIENCE AND SPACE POLICY
Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

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

88 SPACE SCIENCES (GENERAL) ................................................................. N.A.

89 ASTRONOMY .................................................................................. 45
Includes radio, gamma-ray, and infrared astronomy; and astrometry.

90 ASTROPHYSICS ............................................................................. N.A.
Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.
For related information see also 75 Plasma Physics.

91 LUNAR AND PLANETARY EXPLORATION ............................................. N.A.
Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see 18

92 SOLAR PHYSICS ............................................................................. N.A.
Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

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

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

99 GENERAL ...................................................................................... N.A.

Section 2 • Indexes

SUBJECT INDEX  CONTRACT NUMBER INDEX
INVENTOR INDEX  NUMBER INDEX
SOURCE INDEX  ACCESSION NUMBER INDEX
AERODYNAMICS

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

N91-15138# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
SELECTABLE TOWLINE SPIN CHUTE SYSTEM Patent Application
DANIEL M. VAIRO, inventor (to NASA) (Lockheed Engineering and Sciences Co., Hampton, VA.) and RAYMOND D. WHIPPLE, inventor (to NASA) 25 Oct. 1990 22 p
(NASA-CASE-LAR-14322-1; NAS 1.71:LAR-14322-1; US-PATENT-APPL-SN-603335) Avail: NTIS HC/MF A03 CSCL 01A

An emergency spin recovery parachute is housed within a centrally mounted housing on the aft end of an aircraft and is connected to a ring fitting within the housing. Two selectively latching shackles, connected to separate towlines are openly disposed adjacent the ring fitting. The towlines extend in opposite directions from the housing along the aircraft wing to attachment points adjacent the wing-tips, where the other end of each towline is secured. Upon pilot command, one of the open shackles latches to the ring fitting to attach the towline connected thereto, and a second command signal deploys the parachute. Suitable break-away straps secure the towlines to the aircraft surface until the parachute is deployed and the resulting force on the towline attached to the parachute overcomes the straps and permits the towline to extend to the point of attachment to exert sufficient drag on the spinning aircraft to permit the pilot to regain control of the aircraft. To employ the parachute as a drag chute to reduce landing speeds, both shackles and their respective towlines are latched to the ring fitting.

AIR TRANSPORTATION AND SAFETY

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

N91-15142# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EMERGENCY EGRESS FIXED ROCKET PACKAGE Patent

A method of effecting the in-flight departure of an astronaut from a shuttle craft, and apparatus is presented. A plurality of removable compartment covers are provided, behind which rocket assemblies are stowed. To actuate the system, the astronaut pulls off a tab from one of the compartments which exposes a cannister having a lanyard with a hook. The lanyard extends around a spring biased sleeve with a safety lever preventing rocket ignition until the hook is moved by the astronaut. Upward movement of the hook allows the trigger mechanism to actuate the system resulting in the rods projecting out of the hatch. When the lanyard becomes taut, a lanyard elongation detector transmits a signal to the firing mechanisms to fire the rocket.

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AIRCRAFT COMMUNICATIONS AND NAVIGATION

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

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

EFFICIENT DETECTION AND SIGNAL PARAMETER ESTIMATION WITH APPLICATION TO HIGH DYNAMIC GPS RECEIVER Patent


In a system for deriving position, velocity, and acceleration information from a received signal emitted from an object to be tracked wherein the signal comprises a carrier signal phase modulated by unknown binary data and experiencing very high Doppler and Doppler rate, this invention provides combined estimation/detection apparatus for simultaneously detecting data bits and obtaining estimates of signal parameters such as carrier phase and frequency related to receiver dynamics in a sequential manner. There is a first stage for obtaining estimates of the signal parameters related to phase and frequency in the vicinity of possible data transitions on the basis of measurements obtained within a current data bit. A second stage uses the estimates from the first stage to decide whether or not a data transition has actually occurred. There is a third stage for removing data modulation from the received signal when a data transition has occurred and a fourth stage for using the received signal with data modulation removed therefrom to update global parameters which are dependent only upon receiver dynamics and independent of data modulation. Finally, there is a fifth stage for using the global parameters to determine the position, velocity, and acceleration of the object.

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WINGTIP VORTEX TURBINE Patent


A means for extracting rotational energy from the vortex created at aircraft wing tips which consists of a turbine with blades located in the crossflow of the vortex and attached downstream of the wingtip. The turbine has blades attached to a core. When the aircraft is in motion, rotation of a core transmits energy to a centrally attached shaft. The rotational energy thus generated may be put to use within the airfoil or aircraft fuselage.

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RESEARCH AND SUPPORT FACILITIES (AIR)

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

RECORD I COMPLEX SIGNAL MIXER
The perimeter of the spin tunnel and the base of the spin tunnel includes a fuselage, wings, nose, and tail. Six targets are located under the fuselage. Two targets are located on the side of the fuselage at the nose tip and tail. Two targets are located at the base of the spin tunnel and its quadrant and at the nose tip and tail measure spin rate of the spin model, and the targets under the wing tips measure roll angle of the spin model. Optical receivers are mounted at 90 degree increments around the periphery of the spin tunnel to determine angle of attack and roll angle of the spin model. Optical receivers are also mounted at the base of the spin tunnel to define quadrant and position of the spin model and to determine the spin rate of the spin model.

An electro-optical spin measurement system for a spin model includes a radio controlled receiver/transmitter, targets located on the spin model, and a control system for accumulating data from the radio controlled receiver and receivers. Six targets are employed. The spin model includes a fuselage, wings, nose, and tail. Two targets are located under the fuselage of the spin model at the nose tip and tail. Two targets are located on the side of the fuselage at the nose tip and tail, and a target is located under each wing tip. The targets under the fuselage at the nose tip and tail measure spin rate of the spin model, targets on the side of the fuselage at the nose tip and tail measure angle of attack of the spin model, and the targets under the wing tips measure roll angle of the spin model. Optical receivers are mounted at 90 degree increments around the periphery of the spin tunnel to determine angle of attack and roll angle measurements of the spin model. Optical receivers are also mounted at the base of the spin tunnel to define quadrant and position of the spin model and to determine the spin rate of the spin model.

A flow-through balance is provided which includes a non-metric portion and the metric portion and at an intermediate portion thereof to the other of (1) and (2). A plurality of strain gages are mounted on the flexure beams to measure strain forces on the flexure beams. The flexure beams are disposed so as to enable symmetric forces on the flexure beams to cancel out so that only asymmetric forces are measured as deviations by the strain gages.

A reconfigurable telemetry multiplexer is described which includes a monitor-terminal and a plurality of remote terminals. The remote terminals each include signal conditioning for a plurality of sensors for measuring parameters which are converted by an analog to digital converter. CPU's in the remote terminals store instructions for prompting system configuration and reconfiguration commands. The measurements, instructions, and the terminal's like are input at the monitor-terminal and transmitted to the remote terminals. The CPU in each terminal receives the prompts generated and displayed at the monitor-terminal, data generation request commands, status and health commands, and the like are input at the monitor-terminal and transmitted to the remote terminals. The CPU in each remote terminal receives the various commands, stores them in electrically alterable memory, and reacts in accordance with the commands to reconfigure a plurality of aspects of the system. The CPU in each terminal also generates parameter measurements, status and health signals, and transmits these signals of the respective terminals to the monitor-terminal for low data rate operator viewing and to higher rate external transmission/monitor equipment. Reconfiguration may be in real time during the general period of parameter measurement acquisition, and may include alteration of the gain, automatic gain rescaling, bias, and or sampling rates associated with one or more.
of the parameter measurements made by the remote terminals.

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BUS CONTROLLER

REMOTE TERMINAL I

REMOTE TERMINAL N

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.

N91-13481* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
INTEGRATED LAUNCH AND EMERGENCY VEHICLE SYSTEM Patent Application
JAMES A. MARTIN, inventor (to NASA) 31 Aug. 1990 17 p

A heavy launch vehicle is disclosed for placing a payload into a spatial earth orbit including an expendable, multi-container, propellant tank having a plurality of winged booster propulsion modules releasably disposed about one end thereof, and a payload supported by adapter structure at the other end. The preferred payload is an entry module adapted to be docked to a space station and used as a return vehicle for the space station crew, as scheduled, or in emergency situations. Alternately, the payload may include communication satellites, supplies, equipment and/or structural elements for the space station. The winged propulsion modules are released from the expendable propellant tank in pairs and return to Earth in a controlled glide, for safe landing at or near the launch site and prepared for reuse. The rocket engines for each propulsion module are dual-fuel, dual-mode engines and use methane-oxygen and hydrogen-oxygen, respectively, from the multi-containers of the propellant tank. When the propulsion modules are released from the expendable propellant tank, the rocket engines are pivotally moved into the module cargo bay for the return glide flight.

N91-13482* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
STANDARD REMOTE MANIPULATOR SYSTEM DOCKING TARGET AUGMENTATION FOR AUTOMATED DOCKING Patent Application
RICHARD DABNEY, inventor (to NASA), RICHARD HOWARD, inventor (to NASA), and THOMAS BRYAN, inventor (to NASA) 20 Feb. 1990 12 p

A docking target is provided for use in automated docking of a first vehicle on which the target is located. The target comprising a pair of laterally extending arm portions lying in substantially the same plane and a central post extending outwardly from the plane of the arm portions. At least three reflectors are located on the target, two of the reflectors being located at the outboard ends of the arms portions and another reflector being located at the end of the central post. In an important embodiment, the reflectors comprise individual pieces of retroreflective tape. The reflectors, when viewed from the front of the target, are aligned along the longitudinal center line of the target, and can take a number of different shapes including circular or square.

N91-13483* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
ASSURED CREW RETURN VEHICLE Patent Application
CHRISTOPHER J. CERIMELE, inventor (to NASA), ROBERT C. RIED, inventor (to NASA), WAYNE L. PETERSON, inventor (to NASA), GEORGE A. ZUPP, JR., inventor (to NASA), MICHAEL J. STAIGNAU, inventor (to NASA), and GEORGE A. ZUPP, JR., inventor (to NASA) 28 Dec. 1989 87 p

A return vehicle is disclosed for use in returning a crew to Earth from low earth orbit in a safe and relatively cost effective manner. The return vehicle comprises a cylindrically-shaped crew compartment attached to the large diameter of a conical heat shield having a spherical nose rounded nose. On-board inertial navigation and cold gas control systems are used together with a de-orbit propulsion system to effect a landing near a preferred site on the surface of the Earth. State vectors and attitude data are loaded from the attached orbiting craft just prior to separation of the return vehicle.

NASA
SMART TUNNEL: DOCKING MECHANISM Patent
JOHN A. SCHLIESING, inventor (to NASA) and KEVIN L. EDENBOROUGH, inventor (to NASA) 29 Aug. 1989 9 p Filed 30 Dec. 1988
Avail: US Patent and Trademark Office CSCL 22B

A docking mechanism is presented for the docking of a space vehicle to a space station comprising a flexible tunnel frame structure which is deployable from the space station. The tunnel structure comprises a plurality of series connected frame sections, one end section of which is attached to the space station and the other end attached to a docking module of a configuration adapted for docking in the payload bay of the space vehicle. The docking module is provided with trunnions, adapted for latching engagement with latches installed in the vehicle payload bay and with hatch means connectable to a hatch of the crew cabin of the space vehicle. Each frame section comprises a pair of spaced ring members, interconnected by actuator-attenuator devices which are individually controllable by an automatic control means to impart relative movement of one ring member to the other in six degrees of freedom of motion. The control means includes computer logic responsive to sensor signals of range and attitude information, capture latch condition, structural loads, and actuator stroke for generating commands to the onboard flight control system and the individual actuator-attenuators to deploy the tunnel to effect a coupling with the space vehicle and space station after coupling.

A tubular fluid-impervious liner, preferably fabric, is disposed through the frame sections of a size sufficient to accommodate the passage of personnel and cargo.

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METHOD AND APPARATUS FOR DETERMINING TIME, DIRECTION, AND COMPOSITION OF IMPACTING SPACE PARTICLES Patent

The primary objective is to prepare high temperature polymeric materials, especially linear aromatic polyimides, which maintain their integrity and toughness during long exposure times at elevated temperatures. The attained benefits are obtained by first providing the bis (exocyclodiene) bis (4-(3,4-dimethylene-pyrrolidyl)-phenyl) methane, which is a novel material formed from the monomer N-phenyl-3,4-dimethylene-pyrrolidine. This compound undergoes Diels-Alder reaction with a bismaleimide, without the evolution of gaseous by-products, to form the aromatic polyimide bis (4-(3,4-dimethylenepyrrolidyl)-phenyl) methane.

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Acetylene terminated aspartimides are prepared using two methods. In the first, an amino-substituted aromatic acetylene is reacted with an aromatic bismaleimide in a solvent of glacial acetic acid and/or m-cresol. In the second method, an aromatic diamine is reacted with an ethynyl containing maleimide, such as N-(3-ethynylphenyl) maleimide, in a solvent of glacial acetic acid and/or m-cresol. In addition, acetylene terminated aspartimides are blended with various acetylene terminated oligomers and polymers to yield composite materials exhibiting improved mechanical properties.

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Synthetic procedures to tetraalkyls, tetraacids and dianhydrides substituted 1,1,1-triaryl-2,2,2-trifluoroethanes and processes for their synthesis Patent

SALVATORE J. GRISAFFE, inventor (to NASA) 31 Jul. 1990

A composite thermal barrier coating for a substrate has a first layer which includes a first ceramic material and a second layer which includes a second ceramic material impregnated with a glass, the glass being a ternary eutectic. The glass may consist of about 14.6 weight percent Al2O3, about 23.3 weight percent CaO, and about 62.1 weight percent SiO2. The first and second ceramic materials may include yttria-stabilized zirconia.

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A composition containing 30 to 70 percent chromium carbide, 5 to 20 percent soft noble metal, 5 to 20 percent metal fluorides, and 20 to 60 percent metal binder is used in a powdered metallurgy process for the production of self-lubricating components, such as bearings. The use of the material allows the self-lubricating bearing to maintain its low friction properties over an extended range of operating temperatures.

Improved graphite fluoride fibers are produced by contact reaction between highly graphitized fibers and fluorine gas. It is preferable to intercalate the fibers with bromine or fluorine and metal fluoride prior to fluorination. These graphite fluoride fibers are bound by an epoxy. The resulting composites have high thermal conductivity, high electric resistivity, and high emissivity.

A method of fabricating structures formed from composite materials by positioning the structure about a high coefficient of thermal expansion material, wrapping a graphite fiber overwrap about the structure, and thereafter heating the assembly to expand the high coefficient of thermal expansion material to forcibly compress the composite structure against the restraint provided by the graphite overwrap. The high coefficient of thermal expansion material is disposed about a mandrel with a release system therebetween, and with a release system between the material having the high coefficient of thermal expansion and the composite material, and between the graphite fibers and the composite structure. The heating may occur by inducing heat into the assembly by a magnetic field created by coils disposed about the assembly through which alternating current flows. The method permits structures to be formed without the use of an autoclave.

NASA
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.

25

INORGANIC AND PHYSICAL CHEMISTRY

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

N91-15368# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
METAL ETCHING COMPOSITION Patent Application
JOSEPH E. OTOSA, inventor (to NASA), CLARK S. THOMAS, inventor (to NASA), and ROBERT E. FOSTER, inventor (to NASA) (Rockwell International Corp., Canoga Park, CA.) 25 Sep. 1990 15 p
The present invention is directed to a chemical etching composition for etching composition for etching metals or metallic alloys. The composition includes a solution of hydrochloric acid, phosphoric acid, ethylene glycol, and an oxidizing agent. The etching composition is particularly useful for etching metal surfaces in preparation for subsequent fluorescent penetrant injection.

26

METALLIC MATERIALS

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

N91-153534# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
CONTINUOUS FIBER THERMOPLASTIC PREPREG Patent Application
MAYWOOD L. WILSON, inventor (to NASA) and GARY S. JOHNSON, inventor (to NASA) 15 Nov. 1990 28 p
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.
distinct and known magnetoacoustic (MAC) and a magnetoacoustic emission (MAE) measurement circuit means. A switch permits the selective operation of the respective circuit means.

**Perform MAC test**

- **Case 17**
  - YES
  - Object is under uniaxial compression

- **Case 37**
  - YES
  - Object is under uniaxial tension

- NO
  - Case 2 and Case 4: Stress level in the object is negligible

**Perform MAE test**

**27 NONMETALLIC MATERIALS**

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

**N91-13559#** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**NOVEL POLYIMIDE MOLDING POWDER, COATING, ADHESIVE, AND MATRIX RESIN Patent Application**

TERRY L. ST.CLAIR, inventor (to NASA) and DONALD J. PROGAR, inventor (to NASA) 31 Jul. 1990 16 p


The invention is a polyimide prepared from 3,4'-oxydianiline (3,4'-ODA) and 4,4'-oxydiphthalic anhydride (ODPA) in 2-methoxyethyl ether (diglyme). The polymer was prepared in ultra high molecular weight and in a controlled molecular weight form which has a 2.5 percent offset is stoichiometry (excess diamine) with a 5.0 percent level of phthalic anhydride as an endcap. This controlled molecular weight form allows for greatly improved processing of the polymer for moldings, adhesive bonding, and composite fabrication. The higher molecular weight version affords
27 NONMETALLIC MATERIALS

tougher films and coatings. The overall polymer structure groups in the dianhydride, the diamine, and a metal linkage in the diamine affords adequate flow properties for making this polymer useful as a molding powder, adhesive, and matrix resin.

NASA

N91-13560* # National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
PREPARATION OF POLYIMIDES FROM BIS(N-ISOPRENYL)S OF ARYL DIAMIDES Patent Application
JOSEPH G. SMITH, JR., inventor (to NASA) and RAFAEL M. OTTENBRIT, inventor (to NASA) (Virginia Commonwealth Univ., Richmond.) 16 Aug. 1990 15 p

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

NASA

N91-13561* # National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
METHYL SUBSTITUTED POLYIMIDES CONTAINING CARBONYL AND ETHER CONNECTING GROUPS Patent Application
PAUL M. HERGENROTHER, inventor (to NASA) and STEVEN J. HAVENS, inventor (to NASA) (Lockheed Engineering and Sciences Co., Hampton, VA.) 28 Sep. 1990 19 p

Polyimides were prepared from the reaction of aromatic dianhydrides with novel aromatic diamines having carbonyl and ether groups connecting aromatic rings containing pendant methyl groups. The methyl substituted polyimides exhibit good solubility and form tough, strong films. Upon exposure to ultraviolet irradiation and/or heat, the methyl substituted polyimides crosslink to become insoluble.

NASA

N91-13562* # National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.
TISSUE SIMULATING GEL FOR MEDICAL RESEARCH Patent Application

A tissue simulating gel and a method for preparing the tissue simulating gel are disclosed. The tissue simulating gel is prepared by a process using water, gelatin, ethylene glycol, and a cross-linking agent. In order to closely approximate the characteristics of the type of tissue being simulated, other material has been added to change the electrical, sound conducting, and wave scattering properties of the tissue simulating gel. The result of the entire process is a formulation that will not melt at the elevated temperatures involved in hyperthermia medical research. Furthermore, the tissue simulating gel will not support mold or bacterial growth, is of a sufficient mechanical strength to maintain a desired shape without a supporting shell, and is non-hardening and non-drying. Substances were injected into the tissue simulating gel prior to the setting-up thereof just as they could be injected into actual tissue, and the tissue simulating gel is translucent so as to permit visual inspection of its interior. A polyurethane spray often used for coating circuit boards can be applied to the surface of the tissue simulating gel to give a texture similar to human skin, making the tissue simulating gel easier to handle and contributing to its longevity.

NASA

N91-13566* # National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
VINYL CAPPED ADDITION POLYIMIDES Patent Application
RAYMOND D. VANNUCCI, inventor (to NASA), DIANE C. MALARIK, inventor (to NASA), and PETER DELVIGS, inventor (to NASA) 25 Oct. 1990 14 p

Polyimide resins having improved thermo-oxidative stability are provided having aromatic vinyl end-caps. The polyimides are prepared by the reaction of a mixture of monomers comprising (1) a diamine, (2) an ester of tetracarboxylic acid and (3) an aromatic vinyl compound in a molar ratio of 1:2:3 of n: (n + 1):2 when the aromatic vinyl compound contains nitrogen and in a ratio of (n + 1):n:2 when the aromatic vinyl compound does not contain nitrogen, wherein n ranges from about 5 to about 20.

NASA

N91-14489* National Aeronautics and Space Administration. Pasadena Office, CA.
HIGH TEMPERATURE REFRACTORY MEMBER WITH RADIATION EMISSIVE OVERCOAT Patent Application
WILLIAM D. DEININGER, inventor (to NASA) and DAVID Q. KING, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 22 May 1990 6 p Filed 20 Aug. 1987

A radiation type heat dissipator for use in a plasma engine is formed of a refractory metal layer upon which there is deposited a radiation emissive coating made of a high emissivity material such as zirconium diboride. The radiation emissive coating has a surface emissivity coefficient substantially greater than the emissivity coefficient of the refractory metal and thereby enhances the optical radiating efficiency of the heat dissipator.

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invention also would find application in moderately high temperature regions of gas turbine engines and any other application employing a thermal barrier coating at moderate temperatures. Ni-35Cr-6Al-1Y, Ni-35Cr-6Al-1Yb, or other metallic alloy denoted as MCrAlx is applied over a zirconia-based thermal barrier overlay layer. The close-out layer is glass-bead preened to densify its surface. This seals and protects the thermal barrier coating system.

28 PROPELLANTS AND FUELS

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

N91-14495* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, FL.
LIQUID HYDROGEN POLYGENERATION SYSTEM AND PROCESS Patent
PETER A. MINDERMAN, inventor (to NASA), GARY P. GUTKOWSKI, inventor (to NASA), LAWRENCE MANFREDI, inventor (to NASA), JULIAN V. KING, inventor (to NASA), and FRANK S. HOWARD, inventor (to NASA) 26 Jun. 1990 9 p Filed 15 Nov. 1985 Continuation of abandoned

N91-16152* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
METHOD OF MAKING CONTAMINATION-FREE CERAMIC BODIES Patent Application

Ceramic structures having high strength at temperatures above 1000 C after sintering are made by mixing ceramic powders with binder deflocculants such as guanidine salts of polymeric acids, guanidine salts of aliphatic organic carboxylic acids or guanidine alkylsulfates with the foregoing guanidine salts. The novelty of the invention appears to lie in the substitution of guanidine salts for undesirable metal contaminants are present in the final ceramic structure. Guanidine alkyl sulfates also replace the Na or K alkyl sulfates commonly used with binder-deflocculants in making high temperature ceramic structures.

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28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels.
An integrated polygeneration system and process is disclosed for generating liquid hydrogen as a main energy product for use as a propellant for space vehicles. Secondary energy products and commodities for supporting a space center complex and launching of the space vehicle includes the production of electrical and thermal energy and gaseous nitrogen. The integrated process includes a coal gasification and gas cleanup system, a combined cycle power generation system, a hydrogen production and liquefaction system and an air separation system. A medium BTU gas is produced by the coal gasification system. Steam also produced in the coal gasification process is delivered to a steam turbine in the combined cycle power generation system.

A crystal growth apparatus is presented. It utilizes a vapor diffusion method for growing protein crystals, and particularly such an apparatus wherein a ball mixer is used to mix the fluids that form a drop within which crystals are grown. Particular novelty of this invention lies in utilizing a ball mixer to completely mix the precipitate and protein solutions prior to forming the drop. Additional novelty lies in details of construction of the vials, the fluid deployment system, and the fluid storage system of the preferred embodiment.

A fluid storage and expulsion system comprising a tank with an internal flexible diaphragm assembly of dual diaphragms in back-to-back relationship, at least one of which is provided with a patterned surface having fine edges such that the diaphragms are in contact along said edges without mating contact of surface areas to thereby form fluid channels which extend outwardly to the peripheral edges of the diaphragms. The interior wall of the tank at the juncture of tank sections is formed with a circumferential annular recess comprising an outer annular recess portion which forms a fluid collection chamber and an inner annular recess portion which accommodates the peripheral edge portions of the diaphragms and a sealing ring in clamped sealing relation therebetween. The sealing ring is perforated with radially extending passages which allow any fluid leaking or diffusing past a diaphragm to flow through the fluid channels between the diaphragms to the sealing ring and in clamped sealing relation therebetween. The sealing ring is perforated with radially extending passages which allow any fluid leaking or diffusing past a diaphragm to flow through the fluid channels between the diaphragms to the fluid collection chamber. Ports connectable to pressure fittings are provided in the tank sections for admission of fluids to opposite sides of the diaphragm assembly. A drain passage through the tank wall to the fluid collection chamber permits detection, analysis and removal of fluids in the collection chamber.
is disclosed. The flexible heat transfer apparatus consists of a pair of flexible corrugated sheets made from high thermal conductivity materials such as copper, aluminum, gold, or silver. The ridges of the corrugated sheets are oriented perpendicular to one another and bonded sandwich-fashion between three plates to define an upper section and a lower section. The upper section provides X flexure, the lower section provides Y flexure, and both sections together provide Z flexure.

NASA
for the liquid sheet is virtually the same as the droplet sheet specific power.

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32 COMMUNICATIONS AND RADAR

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

N91-13594*# National Aeronautics and Space Administration. Pasadena Office, CA.
METHOD FOR PROVIDING A POLARIZATION FILTER FOR PROCESSING SYNTHETIC APERTURE RADAR IMAGE DATA Patent Application
PASCALE C. DUBOIS, inventor (to NASA) and JAKOB J. VANZYL, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 25 Jun. 1990 27 p
(Contract NAS7-918)

A polarization filter can maximize the signal-to-noise ratio of a polarimetric synthetic aperture radar (SAR) and help discriminate between targets or enhance image features, e.g., enhance contrast between different types of target. The method disclosed is based on the Stokes matrix/ Stokes vector representation, so the targets of interest can be extended targets, and the method can also be applied to the case of bistatic polarimetric radars.

N91-13595*# National Aeronautics and Space Administration. Pasadena Office, CA.
PIPELINE SYNTHETIC APERTURE RADAR DATA COMPRESSION UTILIZING SYSTOLIC BINARY TREE-SEARCHED ARCHITECTURE FOR VECTOR QUANTIZATION Patent Application
CHI-YUNG CHANG, inventor (to NASA), WAI-CHI FANG, inventor (to NASA), and JOHN C. CURLANDER, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 10 Jul. 1990 37 p
(Contract NAS7-918)

A system for data compression utilizing systolic array architecture for Vector Quantization (VQ) is disclosed for both full-searched and tree-searched. For a tree-searched VQ, the special case of a Binary Tree-Search VQ (BTQV) is disclosed with identical Processing Elements (PE) in the array for both a Raw-Codebook VQ (RCVQ) and a Difference-Codebook VQ (DCVQ) algorithm. A fault tolerant system is disclosed which allows a PE that has developed a fault to be bypassed in the array and replaced by a spare at the end of the array, with codebook memory assignment shifted one PE past the faulty PE of the array.

N91-13596*# National Aeronautics and Space Administration. Pasadena Office, CA.
MULTIPLE SYMBOL DIFFERENTIAL DETECTION Patent Application
D. DIVSALAR, inventor (to NASA) and M. SIMON, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 31 Jul. 1990 24 p
(Contract NAS7-918)

A differential detection technique for multiple phase shift keying (MPSK) signals is provided which uses a multiple symbol observation interval on the basis of which a joint decision is made regarding the phase of the received symbols. In accordance with the invention, a first difference phase is created between first and second received symbols. Next the first difference phase is correlated with the possible values thereof to provide a first plurality of intermediate output signals. A second difference phase is next created between second and third received symbols. The second difference phase is correlated with plural possible values thereof to provide a second plurality of intermediate output signals. A third difference phase is next created between second and third received symbols. The third difference phase is correlated with plural possible values thereof to provide a third plurality of intermediate output signals. Each of the first plurality of intermediate outputs are combined with each of the second plurality of intermediate outputs and each of the third plurality of intermediate outputs to provide a plurality of possible output values. Finally, a joint decision is made by choosing from the plurality of possible output values the value which represents the best combined correlation of the first, second and third difference values with the possible values thereof.
A non-adaptive predictor, a nonuniform quantizer, and a multi-level Huffman coder are incorporated into a differential pulse code modulation system for coding and decoding broadcast video signals in real time.
single-ion tracks in integrated circuits distinguishes between multiple bit errors caused by ion tracks which do not strike charge collection junctions having substantial capacitance and those that do on the basis of the sensitivity of the errors to changes in VDD. Data which do not occur during the time interval between successive read cycles, which do not occur at integral multiples of the read clock, whose recorded time tags are not greater than those of previous data or whose recorded address tags are not greater than those of previous data are discarded as bad data before further processing and display.

A protective device for one battery or serially arranged battery cells is disclosed and is adapted to fit between one battery and its terminal connector or between adjacent battery cells. The device incorporates a disk of positive temperature coefficient material having a pair of circular end faces for contact. The disk is supported by a ring adhesively joined thereto, the ring having a central axial opening to enable the button terminal of a battery cell to contact against the disk as the disk and battery cell are arranged in a single battery application or in serial contact with similar battery cells.

Higher energy and power densities are achieved in a secondary battery based on molten sodium and a solid, ceramic separator such as a beta alumina and a molten catholyte such as sodium tetrachloroaluminate and a copper chloride cathode. The higher cell voltage of copper chloride provides higher energy densities and power densities are achieved in a secondary battery based on molten sodium and a solid, ceramic separator such as a beta alumina and a molten catholyte such as sodium tetrachloroaluminate and a copper chloride cathode. The higher cell voltage of copper chloride provides higher energy densities.
and the higher power density results from increased conductivity resulting from formation of copper as discharge proceeds.

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33 ELECTRONICS AND ELECTRICAL ENGINEERING

N91-14552* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

UNIVERSAL NONDESTRUCTIVE MM-WAVE INTEGRATED CIRCUIT TEST FIXTURE Patent
ROBERT R. ROMANOFSKY, inventor (to NASA) and KURT A. SHALKHAUSER, inventor (to NASA) 25 Dec. 1990 9 p Filed 10 Aug. 1989

Monolithic microwave integrated circuit (MMIC) test includes a bias module having spring-loaded contacts which electrically engage pads on a chip carrier disposed in a recess of a base member. RF energy is applied to and passed from the chip carrier by chamfered edges of ridges in the waveguide passages of housings which are removably attached to the base member. thru, Delay, and Short calibration standards having dimensions identical to those of the chip carrier assure accuracy and reliability of the test. The MMIC chip fits in an opening in the chip carrier with the boundaries of the MMIC lying on movable reference planes thereby establishing accuracy and flexibility.

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N91-15489*# National Aeronautics and Space Administration. Pasadena Office, CA.

HIGH Q QUASI-OPTICAL TUNABLE RESONATOR Patent Application
MARGARET A. FRERKING, inventor (to NASA) and KAREN A. LEE, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 13 Dec. 1989 23 p (Contract NAS7-918)

A reflection cavity which could serve as the resonator for a submillimeter wavelength oscillator employing a resonant tunneling device is comprised of three elements in cascade: a high Q, high finesse folded Fabry-Perot resonator, a lower Q low finesse Fabry-Perot resonator and a Littrow mounted diffraction grating for reflecting radiation back upon itself and performing the final filtering after the first high Q Fabry-Perot resonator has provided sharp peaks in the signal spectrum and the second low Q Fabry-Perot resonator has filtered half the longitudinal modes passed by the first high Q Fabry-Perot resonator, i.e., has filtered alternate peaks in the signal spectrum. Tuning the quasi-optical reflection cavity is accomplished by adjusting the angle of incidence of the diffraction grating and adjusting the space between planar mirrors and elliptical refocusing mirrors of the high and low Q Fabry-Perot resonators.

N91-15489* National Aeronautics and Space Administration. Pasadena Office, CA.

MEASUREMENT OF WAVES IN FLOWS ACROSS A SURFACE Patent Application
JAMES M. KENDALL, JR., inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 16 Aug. 1990 16 p (Contract NAS7-918)
(NASA-CASE-MSC-21549-1; NAS 1.71:MSC-21549-1; US-PATENT-APPL-SN-507553) Avail: NTIS HC/MF A03 CSCL 20D

A method and apparatus is disclosed for sensing wave flow across a surface wherein at least two pressure levels are sensed and combined to provide a representation of waves within the flow. In the preferred embodiment holes bored through the aircraft surface at an interval of one-half the wavelength of the flow being measured introduce pressure perturbations into a cavity so they may acoustically interfere. The interfering waveform is sensed by at least one microphone disposed in the cavity.

N91-13657*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

VARIABLE ORIFICE FLOW REGULATOR Patent Application

A flow regulator for high-pressure fluids at elevated temperatures includes a body having a flow passage extending between inlet and outlet openings. First and second orifice members are arranged in the flow passage so at least one of the orifice members can be moved transversely in relation to the flow passage between one operating position where the two orifice openings are aligned and at least one other operating position in which the two openings are moderately misaligned with one another for establishing a predetermined reduced flow rate of fluids flowing through the flow passage.

N91-13658*# National Aeronautics and Space Administration. Pasadena Office, CA.

MEASUREMENT OF WAVES IN FLOWS ACROSS A SURFACE Patent Application
JAMES M. KENDALL, JR., inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 16 Aug. 1990 16 p (Contract NAS7-918)

A method and apparatus is disclosed for sensing wave flow across a surface wherein at least two pressure levels are sensed and combined to provide a representation of waves within the flow. In the preferred embodiment holes bored through the aircraft surface at an interval of one-half the wavelength of the flow being measured introduce pressure perturbations into a cavity so they may acoustically interfere. The interfering waveform is sensed by at least one microphone disposed in the cavity.

N91-13658* National Aeronautics and Space Administration. Pasadena Office, CA.

MEASUREMENT OF WAVES IN FLOWS ACROSS A SURFACE Patent Application
JAMES M. KENDALL, JR., inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 16 Aug. 1990 16 p (Contract NAS7-918)

A method and apparatus is disclosed for sensing wave flow across a surface wherein at least two pressure levels are sensed and combined to provide a representation of waves within the flow. In the preferred embodiment holes bored through the aircraft surface at an interval of one-half the wavelength of the flow being measured introduce pressure perturbations into a cavity so they may acoustically interfere. The interfering waveform is sensed by at least one microphone disposed in the cavity.

N91-13658* National Aeronautics and Space Administration. Pasadena Office, CA.

MEASUREMENT OF WAVES IN FLOWS ACROSS A SURFACE Patent Application
JAMES M. KENDALL, JR., inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 16 Aug. 1990 16 p (Contract NAS7-918)

A method and apparatus is disclosed for sensing wave flow across a surface wherein at least two pressure levels are sensed and combined to provide a representation of waves within the flow. In the preferred embodiment holes bored through the aircraft surface at an interval of one-half the wavelength of the flow being measured introduce pressure perturbations into a cavity so they may acoustically interfere. The interfering waveform is sensed by at least one microphone disposed in the cavity.
Gas derived graphite fibers are generated by the decomposition of an organic gas. These fibers, when joined with a suitable binder, are used to make a high thermal conductivity composite material. 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 heat transfer device may also be made of intercalated highly oriented pyrolytic graphite and machined, rather than made of fibers.

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A low noise, variable discharge area, valve is constructed having opposed recesses within which a pair of gates are slidably disposed. Each of the gates is provided with upstream edges having a radius thereon, the radius enabling smooth, accelerated, low noise flow therebetween. The gates are further provided with tracks along each side, which in turn slide along splines set in the side walls of the valve. A threaded rod which rotates in a threaded insert in a rear wall of each of the gates, serves to move the gates within their respective recesses.

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A gas sampling system is disclosed for determining particulate matter contamination in a high velocity gas flow where the sampling chamber is first cleaned, then evacuated and is coupled by a closed three way valve in a straight line relationship to the gas supply line. A predetermined gas flow rate is established through the three way valve which is quickly opened to couple the gas flow gas to the evacuated sample chamber in a straight line relationship to trap a gas sample under dynamic conditions. When the sampling chamber has a gas sample the three way valve is again closed so that particulate matter in the sample chamber can be flushed from the sample chamber with a compatible liquid to a filter for collection and analysis.

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Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
VOLUMETRIC MEASUREMENT OF TANK VOLUME Patent Application
RICHARD T. WALTER, inventor (to NASA), PAUL VANBUSKIRK, inventor (to NASA) (Lockheed Engineering and Sciences Co., Houston, TX.), WILLIAM WEBER, inventor (to NASA), and RICHARD FROEBEL, inventor (to NASA) 28 Dec. 1989 18 p

A method is disclosed for determining the volume of compressible gas in a system including incompressible substances in a zero-gravity environment consisting of measuring the change in pressure (delta P) for a known volume change rate (delta V/delta t) in the polytrophic region between isothermal and adiabatic conditions. The measurements are utilized in an idealized formula for determining the change in isothermal pressure (delta P sub iso) for the gas. From the isothermal pressure change (delta iso) the gas volume is obtained. The method is also applicable to determination of gas volume by utilizing work (W) in the compression process. In a passive system, the relationship of specific densities can be obtained.

WATER COOLED STATIC PRESSURE PROBE Patent Application
NICHOLAS T. LAGEN, inventor (to NASA) (George Washington Univ., Washington, DC.), JOHN W. EVES, inventor (to NASA), GARLAND D. REECE, inventor (to NASA), and STEVE K. GEISSINGER, inventor (to NASA) 31 Aug. 1990 18 p

An improved static pressure probe containing a water cooling mechanism is disclosed. This probe has a hollow interior containing a central coolant tube and multiple individual pressure measurement tubes connected to holes placed on the exterior. Coolant from the central tube symmetrically immerses the interior of the probe, allowing it to sustain high temperature, in the region of 2500 F, supersonic jet flow indefinitely, while still recording accurate pressure data. The coolant exits the probe body by way of a reservoir attached to the aft of the probe. The pressure measurement tubes are joined to a single, larger manifold in the reservoir. This manifold is attached to a pressure transducer that records the average static pressure.

PLUG-TYPE HEAT FLUX GAUGE AND METHOD OF PRODUCING SAME Patent Application
CURT H. LIEBERT, inventor (to NASA) and JOHN KOCH, JR., inventor (to NASA) 31 May 1990 17 p

The invention is an ambulatory, passive sensor for use in a fetal monitoring system. The invention incorporates piezoelectric polymer film combined with a metallic mounting plate fastened to a belt and electrically connected to a signal processing unit by means of a shielded cable. The purpose of the sensor is to receive pressure pulses emitted from a fetus inside an expectant mother and to provide means for filtering out pressure pulses arising from other sources, such as the maternal heart.

DUAL STRAIN GAGE BALANCE SYSTEM FOR MEASURING LIGHT LOADS Patent Application
PAUL W. ROBERTS, inventor (to NASA) 18 Sep. 1990 20 p

A dual strain gage balance system for measuring normal and axial forces and pitching moment of a metric airfoil model imparted by aerodynamic loads applied to the airfoil model during wind tunnel testing includes a pair of non-metric panels being rigidly
connected to and extending towards each other from opposite sides of the wind tunnel, and a pair of strain gage balances, each connected to one of the non-metric panels and to one of the opposite ends of the metric airfoil model for mounting the metric airfoil model between the pair of non-metric panels. Each strain gage balance has a first measuring section for mounting a first strain gage bridge for measuring normal force and pitching moment and a second measuring section for mounting a second strain gage bridge for measuring axial force.


A predictive algorithm is used to determine, in near real time, the steady state response of a slow responding sensor such as hydrogen gas sensor of the type which produces an output current proportional to the partial pressure of the hydrogen present. A microprocessor connected to the sensor samples the sensor output at small regular time intervals and predicts the steady state response of the sensor in response to a perturbation in the parameter being sensed, based on the beginning and end samples of the sensor output for the current sample time interval.


The invention is a holder for supporting and acoustically coupling a transducer to a surface of a test object. The holder is formed in one piece in a suitable mold of a castable gel-like material having a determined acoustical impedance loss characteristic, the transducer being embedded in the holder as it is formed. The transducer is prepositioned within the mold at a determined angle N relative to the surface of the test object. The gel-like material may be composed of a solution of water and ethylene glycol in a collagen matrix.


The grooved surface of an aberration-corrected holographic model grating is sensed by utilizing the sensing head of a scanning tunneling microscope. The sensing head is mechanically connected to a blazing type stylus for replicating the groove pattern of the holographic model on a ruled grating blank. A ruling engine causes the sensing head not only to scan the surface of the holographic grating model but also drive a blazing type ruling stylus or an equivalent type device in accordance with an error signal resulting from a departure of a sensing tip from the top of the holographic model groove as a function of tunneling current.

A real-time dynamic holographic image storage device uses four-wave mixing in a pair of photorefractive crystals. An oscillation is produced between the crystals which can be maintained indefinitely after the initial object beam is discontinued. The object beam produces an interference pattern in a first crystal to produce phase-conjugated object beam which is directed towards the second crystal. In the second crystal another interference pattern is created which produces a reconstructed object beam. The reconstructed object beam is directed back towards the first crystal. The interference patterns are produced by interaction of the object and phase-conjugated object beam with a read and write beam in each of the crystals. By manipulation of the ratio of the read and write beam intensities in at least one of the crystals, the phase-conjugate or reconstructed object beam output therefrom can be amplified to maintain stable oscillation between the two crystals.

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**N91-14587** National Aeronautics and Space Administration. Pasadena Office, CA.

**APPARATUS AND METHOD FOR CHARACTERIZING THE TRANSMISSION EFFICIENCY OF A MASS SPECTROMETER**

Patent

SANTASH SRIVASYTA, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 27 Nov. 1990 9 p Filed 26 May 1989


Avail: US Patent and Trademark Office CSCL 14B

An electron/ion coincidence technique is employed to characterize the absolute mass dependent transmission efficiency of mass spectrometers. The technique is not dependent upon the partial pressure of the sample beam or the ionization cross sections of calibrant gases.

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**N91-14588** National Aeronautics and Space Administration. Pasadena Office, CA.

**FIELD INDUCED GAP INFRARED DETECTOR**

Patent


A tunable infrared detector which employs a vanishing band gap semimetal material provided with an induced band gap by a magnetic field to allow intrinsic semiconductor type infrared detection capabilities is disclosed. The semimetal material may thus operate as a semiconductor type detector with a wavelength sensitivity corresponding to the induced band gap in a preferred embodiment of a diode structure. Preferred semimetal materials include Hg(1-x)Cd(x)Te, x is less than 0.15, HgCdSe, BiSb, alpha-Sn, HgMgTe, HgMnTe, HgZnTe, HgMnSe, HgMgSe, and HgZnSe. The magnetic field induces a band gap in the semimetal material proportional to the strength of the magnetic field allowing tunable detection cutoff wavelengths. For an applied magnetic field from 5 to 10 tesla, the wavelength detection cutoff will be in the range of 20 to 50 micrometers for Hg(1-x)Cd(x)Te alloys with x about 0.15. A similar approach may also be employed to generate infrared energy in a desired band gap and then operating the structure in a light emitting diode or semiconductor laser type of configuration.

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**N91-14590** National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

**THERMAL COMPENSATING MOUNT**

Patent

ANTONY JALINK, JR., inventor (to NASA) and SCOTT R. CAMPBELL, inventor (to NASA) 23 Jan. 1990 4 p Filed 14 Mar. 1988


Avail: US Patent and Trademark Office CSCL 14B

The main objective is to provide a device for maintaining the alignment integrity of an alignment sensitive component over a wide range of temperatures. A thermal compensating mount is presented. A cylindrical extension is integrally formed to the alignment sensitive component. Both the extension and component share the same coefficient of thermal expansion. The cylindrical extension is placed into a mounting structure which has a diameter greater than that of the extension. An adhesive secures the
cylindrical extension to the mount. The difference between the diameters of the cylindrical extension and the cylindrical receptacle is such that the differential thermal expansion across the extension and the receptacle edges is exactly compensated for by the thermal compensation of the adhesive between them. Accordingly, the alignment sensitive component does not change position when subjected to temperature variations. One application of this invention is laser optical-path folding prisms, which are fixed to the mounting surface by a small amount of epoxy adhesive.

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primary object of this invention to provide a system for remotely defining an object's configuration in a manner compatible with a computer's analytical capability.

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N91-15519* # National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

WATER WINDOW IMAGING X RAY MICROSCOPE Patent Application

A high resolution x ray microscope for imaging microscopic structures within biological specimens has an optical system including a highly polished primary and secondary mirror coated with identical multilayer coatings, the mirrors acting at normal incidence. The coatings have a high reflectivity in the narrow wave bandpass between 23.3 and 43.7 angstroms and have low reflectivity outside of this range. The primary mirror has a spherical concave surface and the secondary mirror has a spherical convex surface. The radii of the mirrors are concentric about a common center of curvature on the optical axis of the microscope extending from the object focal plane to the image focal plane. The primary mirror has an annular configuration with a central aperture and the secondary mirror is positioned between the primary mirror and the center of curvature for reflecting radiation through the aperture to a detector. An x ray filter is mounted at the stage end of the microscope, and film sensitive to x rays in the desired bandwidth is mounted in a camera at the image plane of the optical system. The microscope is mounted within a vacuum chamber for minimizing the absorption of x rays in air from a source through the microscope.

NASA

N91-15520* # National Aeronautics and Space Administration. Ames Research Center, Moffett Field, CA.

LASER VELOCIMETER FOR NEAR-SURFACE MEASUREMENTS Patent Application

A laser Doppler velocimeter is disclosed for near-wall measurements which includes at least one beam-turning device. The beam-turning device receives laser light, reflects, and redirects the light at various angles in order to obtain measurement for all three velocity components at grazing incident angles. The beam-turning device includes a mirror or prism at one end which reflects the received light in a particular direction. A collector lens receives the particle scattered light from which the relevant velocity components are determined. The beam-turning device can also be a miniature fiber optic head which outputs laser light and can be turned in any direction.

NASA

N91-17350* National Aeronautics and Space Administration. Pasadena Office, CA.

TORQUE SENSOR HAVING A SPOKED SENSOR ELEMENT SUPPORT STRUCTURE Patent

Piezoelectric sensor devices are attached across pairs of circularly arranged spokes arrayed on the periphery of an annular ring. The sensor devices each include a preloaded steel ball mounting arrangement for mounting a piezoelectric sensor element. A first circular interface plate on one side of the sensor structure attaches to alternate one of the spokes, and a circular interface plate on the opposite side of the same diameter as the first interface plate attaches to the remaining spokes.

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Includes parametric amplifiers.

**N91-15528** National Aeronautics and Space Administration. Pasadena Office, CA.

**TM:HO:YLF LASER END-PUMPED BY A SEMICONDUCTOR DIODE LASER ARRAY Patent**


An Ho:YLF crystal including Tm as sensitizers for the activator Ho, is optically pumped with a semiconductor diode laser array to generate 2.1 micron radiation with a pump power to output power of efficiency as high as 68 percent. The prior-art dual sensitizer system of Er and Tm requires cooling, such as by LN2, but by using Tm alone and decreasing the concentrations of Tm and Ho, and decreasing the length of the laser rod to about 1 cm, it has been demonstrated that laser operation can be obtained from a temperature of 77 K with an efficiency as high as 68 percent up to ambient room temperature with an efficiency at that temperature as high as 9 percent. Official Gazette of the U.S. Patent and Trademark Office

**N91-13723** National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

**TWO FAULT TOLERANT TOGGLE-HOOK RELEASE Patent Application**

THOMAS JOSEPH GRAVES, inventor (to NASA) and CHRISTOPHER WILLIAM BROWN, inventor (to NASA) (Boeing Aerospace Co., Seattle, WA.) 25 Oct. 1990 19 p

NASA-CASE-MSC-21671-1; NAS 1.71 :MSC-21671-1; US-PATENT-APPL-SN-603337 Avail: NTIS HC/MF A03 CSCL 131

A coupling device is disclosed which is mechanically two fault tolerant for release. The device comprises a fastener plate and fastener body, each of which is attachable to a different one of a pair of structures to be joined. The fastener plate and body are coupled by an elongate toggle mounted at one end in a socket on the fastener plate for universal pivotal movement thereon. The other end of the toggle is received in an opening in the fastener body and adapted for limited pivotal movement therein. The toggle is adapted to be restrained by three latch hooks arranged in symmetrical equiangular spacing about the axis of the toggle, each hook being mounted on the fastener body for pivotal movement between an unlatching non-contact position with respect to the toggle and a latching position in engagement with a latching surface of the toggle. The device includes releasable lock means for locking each latch hook in its latching position whereby the toggle couples the fastener plate to the fastener body and means for releasing the lock means to unlock each said latch hook from the latching position whereby the unlocking of at least one of the latch hooks from its latching position results in the decoupling of the fastener plate from the fastener body. Official Gazette of the U.S. Patent and Trademark Office

**N91-13724** National Aeronautics and Space Administration. Pasadena Office, CA.

**BILEVEL SHARED CONTROL FOR TELEOPERATORS Patent Application**

SAMAD A. HAYATI, inventor (to NASA) and SUBRAMANIAN T. VENKATARAMAN, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 11 May 1990 44 p (Contract NAS7-918)

NASA-CASE-NPO-17800-1-CU; NAS 1.71 :NPO-17800-1-CU; US-PATENT-APPL-SN-522949 Avail: NTIS HC/MF A03 CSCL 131

A shared system is disclosed for robot control including
integration of the human and autonomous input modalities for an improved control. Autonomously planned motion trajectories are modified by a teleoperator to track unmodeled target motions, while nominal teleoperator motions are modified through compliance to accommodate geometric errors autonomously in the latter. A hierarchical shared system intelligently shares control over a remote robot between the autonomous and teleoperational portions of an overall control system. Architecture is hierarchical, and consists of two levels. The top level represents the task level, while the bottom, the execution level. In space applications, the performance of pure teleoperation systems depend significantly on the communication time delays between the local and the remote sites. Selection/mixing matrices are provided with entries which reflect how each input's signals modality is weighted. The shared control minimizes the detrimental effects caused by these time delays between earth and space.

N91-13729*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
SOLDER DROSS REMOVAL APPARATUS Patent Application

An automatic dross removal apparatus is disclosed for removing dross from the surface of a solder bath in an automated electric component handling system. A rotatable wiper blade is positioned adjacent the solder bath which skims the dross off of the surface prior to the dipping of a robot conveyed component into the bath. An electronic control circuit causes a motor to rotate the wiper arm one full rotational cycle each time a pulse is received from a robot controller as a component approaches the solder bath.

N91-13730*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
POST CLAMP Patent Application
John K. Ramsey, inventor (to NASA) and Erwin M. Meyn, inventor (to NASA) 29 Sep. 1989 15 p

A pair of spaced collars are mounted at right angles on a clamp body by retaining rings which enable the collars to rotate with respect to the clamp body. Mounting posts extend through aligned holes in the collars and clamp body. Each collar can be clamped onto the inserted post while the clamp body remains free to rotate about the post and collar. The clamp body is selectively clamped onto each post.

N91-13731*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.
CANTILEVER CLAMP FITTING Patent Application
Patrick B. Melton, inventor (to NASA) (United Technologies Corp., Huntsville, AL.) 28 Dec. 1989 12 p

A device is disclosed for sealing and clamping a cylindrical element which is to be attached to an object such as a wall, a pressurized vessel or another cylindrical element. The device includes a gland having an inner cylindrical wall, which is threaded at one end and is attached at a bendable end to a deformable portion, which in turn is attached to one end of a conical cantilever structure. The other end of the cantilever structure connects at a bendable area to one end of an outer cylindrical wall. The opposite end of cylindrical wall terminates in a thickened portion, the radially outer surface of which is adapted to accommodate a tool for rotating the gland. The terminal end of cylindrical wall also includes an abutment surface, which is adapted to engage a seal, which in turn engages a surface of a receiver. The receiver further includes a threaded portion for engagement with the threaded portion of gland whereby a tightening rotation of gland relative to receiver will cause relative movement between cylindrical walls and of gland. This movement causes a rotation of the conical structure and thus a bending action at bending area and at the bending end of the upper end of inner cylindrical wall. These rotational and bending actions result in a forcing of the deformable portion radially inwardly so as to contact and deform a pipe. This forcible contact creates a seal between gland and pipe, and simultaneously clamps the pipe in position.

N91-13732*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.
PROBE INSERTION APPARATUS WITH INFLATABLE SEAL Patent Application
Paul A. Trimarchi, inventor (to NASA) 23 Aug. 1990 17 p

A sealing apparatus is disclosed for inserting a probe into a pressure vessel having an elongated opening includes a pair of resiliently deformable seals opposingly disposed in sealing engagement with each other. A retainer is connected to the pressure vessel around the elongated opening and holds the pair of seals rigidly to the pressure vessel. A wedge is engageable with the pair of seals and carries the probe, for longitudinally translating the probe in pressure vessel.
A piston and cylinder assembly is disclosed which is constructed of polyvinyl chloride that uses local water pressure to perform small lifting tasks. The chamber is either pressurized to extend the piston or depressurized to retract the piston. The present invention is best utilized for raising and lowering toilet seats.

A device for applying constant pressure to a surface is disclosed. The device includes a cylinder having a longitudinal axis greater than the diameter of the cylinder. A first wheel and a second wheel are coupled to each end, respectively, of the cylinder. The wheels have a diameter substantially greater than the diameter of the cylinder. An elastomeric covering surrounds the cylinder. The elastomeric covering has an outer diameter substantially greater than the diameter of the wheels. A handle is coupled to the wheels for rolling and applying pressure to the elastomeric covering.

A cable-compliant robotic joint includes two U configuration cross-section brackets with their U cross-sections lying in different planes, one of the brackets being connected to a robot arm and the other to a tool. Additional brackets are displaced from the other brackets at corners of the robotic joint. All the brackets are connected by cable segments which lie in one or more planes which are perpendicular to the direction of tool travel as it approaches a work object. The compliance of the joint is determined by the cable segment characteristics, such as their length, material, angle, stranding, pre-twisting and pre-stressing.

The invention relates to monitoring circuitry for the real time detection of vibrations of a predetermined frequency and which are greater than a predetermined magnitude. The circuitry produces an instability signal in response to such detection. The circuitry is particularly adapted for detecting instabilities in rocket thrusters, but may find application with other machines such as expensive rotating machinery, or turbines. The monitoring circuitry identifies when vibration signals are present having a predetermined frequency of a multi-frequency vibration signal which has an RMS energy level greater than a predetermined magnitude. It generates an instability signal only if such a vibration signal is identified. The circuitry includes a delay circuit which responds with an alarm signal only if the instability signal continues for a predetermined time period. When used with a rocket thruster, the alarm signal may be used to cut off the thruster if such thruster is being used in flight. If the circuitry is monitoring tests of the thruster, it generates signals to change the thruster operation, for example, from pulse mode to continuous firing to determine if the instability of the thruster is sustained once it is detected.
Damping seals, damping bearings, and a support sleeve are presented for the ball bearings of a high speed rotor. The ball bearings consist of a duplex set having the outer races packaged tightly within the sleeve while the sleeve provides a gap with a support member so that the bearings may float with the sleeve. The sleeve has a web extending radially between the pair of outer races and acts in conjunction with one or more springs to apply an axial preload to the outer races. The sleeves have a series of slits which provide the sleeve with a spring-like quality so that the spring acts to center the rotor upon which the bearings are mounted during start up and shut down. A damping seal or a damping bearing may be used in conjunction with the ball bearings and supporting sleeve, the damping seal and damping bearing having rotor portions including rigid outer surfaces mounted within the bore of a stator portion having triangular shaped pockets on the surface facing the rotor. Axial gates are provided between adjacent pockets in sections of the stator permitting fluid to flow with less resistance axially relative to the flow of fluids circumferentially between the rotor and the stator.

A hybrid butterfly valve has a stationary seat and a valve closure disk which may rotate together with an actuating shaft from the fully open position to a position wherein the disk is aligned with the seat, and may be moved linearly into a sealing relationship with the seat. The disk is supported by brackets having an elongated slot through which the shaft extends, the brackets being adapted to move linearly relative to the shaft. Cams fastened to the shaft initiate a 90 degree rotation of the disk from the fully open position to the position where the valve disk is aligned with the seat. Upon alignment of the bores of the coupling members, a trigger member is activated to automatically release a spring biased tubular member in one of the coupling members. The tubular member has a conical end which is displaced into the other coupling member to lock the coupling members to one another. A tensioning nut is threadedly movable on a coupling member so as to be moved into tightening engagement with the other coupling member.
A system for mating fluid transfer couplings is constructed having a male connector which is provided with a pair of opposed rollers mounted to an exterior region thereof. A male half of a fluid transfer coupling is rotatably supported in an opening in an end of the connector and is equipped with an outwardly extending forward portion. The forward portion locks into an engagement and locking region of a female half of the fluid transfer coupling, with female half being rotatably supported in a receptacle. The receptacle has an opening aligned with locking region, with this opening having a pair of concentric, annularly disposed ramps extending around an interior portion of opening. These ramps are inclined toward the interior of the receptacle and are provided with slots through which rollers of the connector pass. After the connector is inserted into the receptacle (engaging forward portion into engagement region), relative rotation between the connector and receptacle causes the rollers to traverse ramps until the rollers abut and are gripped by retainers. This axially forces the forward portion into locked, sealed engagement with the engagement region.
A robotic hand is presented having a plurality of fingers, each having a plurality of joints pivotally connected one to the other. Actuators are connected at one end to an actuating and control mechanism mounted remotely from the hand and at the other end to the joints of the fingers for manipulating the fingers and passing externally of the robot manipulating arm in between the hand and the actuating and control mechanism. The fingers include pulleys to route the actuators within the fingers. Cable tension sensing structure mounted on a portion of the hand are disclosed, as is covering of the tip of each finger with a resilient and pliable friction enhancing surface.

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A pair of spaced collars are mounted at right angles on a clamp body by retaining rings which enable the collars to rotate with respect to the clamp body. Mounting posts extend through aligned holes in the collars and clamp body. Each collar can be clamped onto the insert post while the clamp body remains free to rotate about the post and collar. The clamp body is selectively clamped onto each post.

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

An assembly of three major components is disclosed which included a wrist interface plate which is secured to the wrist joint of a robotic arm, a tool interface plate which is secured to each tool intended for use by the robotic arm, and a tool holster for each tool attached to the interface plate. The wrist interface plate and a selected tool interface plate are mutually connectable together through an opening or recess in the upper face of the interface plate by means of a notched tongue protruding from the front face of the wrist interface plate which engages a pair of spring-biased rotatable notched wheels located within the body of the tool interface plate. The tool holster captures and locks onto the tool interface plate by means of a pair of actuation claws including a locking tab and an unlocking wedge which operate respective actuation bosses on each of the notched wheels in response to a forward and backward motion of the tool interface plate as a result of motion of the robotic arm to either park the tool or use the tool.
A compliant joint is provided for prosthetic and robotic devices which permits rotation in three different planes. The joint provides for the controlled use of cable under motion. Perpendicular outer mounting frames are joined by swaged cables that interlock at a center block. Ball bearings allow for the free rotation of the second mounting frame relative to the first mounting frame within a predetermined angular rotation that is controlled by two stop devices. The cables allow for compliance at the stops and the cables allow for compliance in six degrees of freedom enabling the duplication or simulation of the rotational movement and flexibility of a natural hip or knee joint, as well as the simulation of a joint designed for a specific robotic component for predetermined design parameters.

A cable compliant robotic joint includes two U configuration cross section brackets with their U cross sections lying in different planes, one of their brackets being connected to a robot arm and the other to a tool. Additional angle brackets are displaced from the other brackets at corners of the robotic joint. All the brackets are connected by cable segments which lie in one or more planes which are perpendicular to the direction of tool travel as it approaches a work object. The compliance of the joint is determined by the cable segment characteristics, such as their length, material, angle, stranding, pretwisting, and prestressing.
EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial-photography.

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EARTH RESOURCES AND REMOTE SENSING

A technique based on synthetic aperture radar (SAR) interferometry is used to measure very small (1 cm or less) surface deformations with good resolution (10 m) over large areas (50 km). It can be used for accurate measurements of many geophysical phenomena, including swelling and buckling in fault zones, residual, vertical and lateral displacements from seismic events, and prevolcanic swelling. Two SAR images are made of a scene by two spaced antennas and a difference interferogram of the surface is made. After unwrapping phases of pixels of the difference interferogram, surface motion or deformation changes of the surface are observed. A second interferogram of the same scene is made from a different pair of images, at least one of which is made after some elapsed time. The second interferogram is then compared with the first interferogram to detect changes in line of sight position of pixels. By resolving line of sight observations into their vector components in other sets of interferograms along at least one other direction, lateral motions may be recovered in their entirety. Since in general, the SAR images are made from flight tracks that are separated, it is not possible to distinguish surface changes from the parallax caused by topography. However, a third image may be used to remove the topography and leave only the surface changes.

N91-13796*# National Aeronautics and Space Administration. Pasadena Office, CA.
THERMAL POWER TRANSFER SYSTEM USING APPLIED POTENTIAL DIFFERENCE TO SUSTAIN OPERATING PRESSURE DIFFERENCE Patent Application
PRADEEP BHANDARI, inventor (to NASA) and TOSHIO FUJITA, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 16 Aug. 1990 14 p (Contract NAS7-918)

A thermal power transfer system using a phase change liquid gas fluid in a closed loop configuration has a heat exchanger member connected to a gas conduit for inputting thermal energy into the fluid. The pressure in the gas conduit is higher than a liquid conduit that is connected to a heat exchanger member for outputting thermal energy. A solid electrolyte member acts as a barrier between the gas conduit and the liquid conduit adjacent a solid electrolyte member. The ions can be recombined with electrons with the assistance of a porous electrode. An electrical field is applied across the solid electrolyte member to force the ions of the fluid from a lower pressure liquid conduit to the higher pressure gas conduit.

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ENERGY PRODUCTION AND CONVERSION

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

N91-13797*# National Aeronautics and Space Administration. Pasadena Office, CA.
SYSTEM AND METHOD FOR MEASURING OCEAN SURFACE CURRENTS AT LOCATIONS REMOTE FROM LAND MASSES USING SYNTHETIC APERTURE RADAR Patent Application
LAWRENCE E. YOUNG, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena,) 14 Mar. 1990 22 p (Contract NAS7-918)

A system for measuring ocean surface currents from an airborne platform is disclosed. A radar system having two spaced antennas wherein one antenna is driven and return signals from the ocean surface are detected by both antennas is employed to get raw ocean current data which are saved for later processing. There are a pair of global positioning system (GPS) systems including a first antenna carried by the platform at a first location and a second antenna carried by the platform at a second location displaced from the first antenna for determining the position of the antennas from signals from orbiting GPS navigational satellites. Data are also saved for later processing. The saved data are subsequently processed by a ground-based computer system to determine the position, orientation, and velocity of the platform as well as to derive measurements of currents on the ocean surface.

N91-14642* National Aeronautics and Space Administration. Pasadena Office, CA.
METHOD FOR DETECTING SURFACE MOTIONS AND MAPPING SMALL TERRESTRIAL OR PLANETARY SURFACE DEFORMATIONS WITH SYNTHETIC APERTURE RADAR Patent
ANDREW K. GABRIEL, inventor (to NASA), RICHARD M. GOLDSTEIN, inventor (to NASA), and HOWARD A. ZEBKER, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena,) 4 Dec. 1990 9 p Filed 26 Jan. 1990

A technique based on synthetic aperture radar (SAR) interferometry is used to measure very small (1 cm or less) surface deformations with good resolution (10 m) over large areas (50 km). It can be used for accurate measurements of many geophysical phenomena, including swelling and buckling in fault zones, residual, vertical and lateral displacements from seismic events, and prevolcanic swelling. Two SAR images are made of a scene by two spaced antennas and a difference interferogram of the scene is made. After unwrapping phases of pixels of the difference interferogram, surface motion or deformation changes...
This invention relates to a small particle selective emitter for converting thermal energy into narrow band radiation with high efficiency. The small particle selective emitter is used in combination with a photovoltaic array to provide a thermal to electrical energy conversion device. An energy conversion apparatus of this type is called a thermo-photovoltaic device. In the first embodiment, small diameter particles of a rare earth oxide are suspended in an inert gas enclosed between concentric cylinders. The rare earth oxides are used because they have the desired property of large emittance in a narrow wavelength band and small emittance outside the band. However, it should be emphasized that it is the smallness of the particles that enhances the radiation property. The small particle selective emitter is surrounded by a photovoltaic array. In an alternate embodiment, the small particle gas mixture is circulated through a thermal energy source. This thermal energy source can be a nuclear reactor, solar receiver, or combustor of a fossil fuel.

A thin, lightweight solar cell utilizes front contact metallization. Both the front light receiving surface of the solar cell and the facing surface of the cover glass are recessed to accommodate this metallization. This enables the two surfaces to meet flush for an optimum seal.
of distant lightning for distances beyond 600 km by detecting the electric field associated with a return stroke of distant lightning, and processing the electric field signal to determine the polarity of the slow tail of the VLF waveform signal associated with the detected electric field. The polarity of the return stroke of distant lightning is determined based upon the polarity of the slow tail portion of the waveform.

N91-13865*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
THREE-DIMENSIONAL CELL TO TISSUE ASSEMBLY PROCESS Patent Application

The present invention relates a 3-dimensional cell to tissue and maintenance process, more particularly to methods of culturing cells in a culture environment, either in space or in a gravity field, with minimum fluid shear stress, freedom for 3-dimensional spatial orientation of the suspended particles and localization of particles with differing or similar sedimentation properties in a similar spatial region.

N91-14703* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
BIO-REACTOR CHAMBER Patent

A bioreactor for cell culture is disclosed which provides for the introduction of fresh medium without excessive turbulent action. The fresh medium enters the bioreactor through a filter with a backwash action which prevents the cells from settling on the filter. The bioreactor is sealed and depleted medium is forced out of the container as fresh medium is added.

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N91-17531*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
A CULTURE VESSEL WITH LARGE PERFUSION AREA TO VOLUME RATIO Patent Application
DAVID A. WOLF, inventor (to NASA); CLARENCE F. SAMS, inventor (to NASA); and RAY P. SCHWARZ, inventor (to NASA) 11 Dec. 1990 25 p (NASA-CASE-MSC-21662-1; NAS 1.71:MSC-21662-1; US-PATENT-APPL-SN-525345) Avail: NTIS HC/MF A03
An improved bio-reactor vessel and system useful for carrying out mammalian cell growth in suspension in a culture media are presented. The main goal of the invention is to grow and maintain cells under a homogeneous distribution under acceptable biochemical environment of gas partial pressures and nutrient levels without introducing direct agitation mechanisms or associated disruptive mechanical forces. The culture chamber rotates to maintain an even distribution of cells in suspension and minimizes the length of a gas diffusion path. The culture chamber design is presented and discussed.

**DUAL PHYSIOLOGICAL RATE MEASUREMENT INSTRUMENT Patent**

**PATENT**

**INVENTOR**

**TOMMY G. COOPER, inventor (to NASA)**

26 Jun. 1990 6 p

Filed 15 Apr. 1988

Continuation of abandoned


Avail: US Patent and Trademark Office

The object of the invention is to provide an instrument for converting a physiological pulse rate into a corresponding linear output voltage. The instrument which accurately measures the rate of an unknown rectangular pulse wave over an extended range of values comprises a phase-locked loop including a phase comparator, a filtering network, and a voltage-controlled oscillator, arranged in cascade. The phase comparator has a first input responsive to the pulse wave and a second input responsive to the output signal of the voltage-controlled oscillator. The comparator provides a signal dependent on the difference in phase and frequency between the signals appearing on the first and second inputs. A high-input impedance amplifier accepts an output from the filtering network and provides an amplified output DC signal to a utilization device for providing a measurement of the rate of the pulse wave.

**PORTABLE DYNAMIC FUNDUS INSTRUMENT Patent Application**

**INVENTOR**

**GERALD TAYLOR, inventor (to NASA), RICHARD MEEHAN, inventor (to NASA), NORWOOD HUNTER, inventor (to NASA), MICHAEL CAPUTO, inventor (to NASA) (Krug International, Houston, TX.), and C. ROBERT GIBSON, inventor (to NASA)**

29 Jun. 1990 21 p

(NASA-CASE-MSC-21675-1; NAS 1.71 :MSC-21675-1; US-PATENT-APPL-SN-562095)

Avail: NTIS HC/MF A03

A portable diagnostic image analysis instrument is disclosed for retinal funduscopy in which an eye fundus image is optically processed by a lens system to a CCD device which produces recordable and viewable output data and is simultaneously viewable on an electronic view finder. The fundus image is processed to develop a representation of the vessel or vessels from the output data.

**EMU HELMET MOUNTED DISPLAY Patent Application**

**INVENTOR**

**JOSE MARMOLEJO, inventor (to NASA), STEPHEN SMITH, inventor (to NASA), ALAN PLOUGH, inventor (to NASA), ROBERT CLARKE, inventor (to NASA), WILLIAM MCLEAN, inventor (to NASA), and JOSE FOURNER, inventor (to NASA) (Hamilton Standard, Windsor Locks, CT.)**

25 Sep. 1990 14 p

(NASA-CASE-MSC-21460-1; NAS 1.71 :MSC-21460-1; US-PATENT-APPL-SN-587919)

Avail: NTIS HC/MF A03

A helmet mounted display device is disclosed for projecting a
display on a flat combiner surface located above the line of sight where the display is produced by two independent optical channels with independent LCD image generators. The display has a fully overlapped field of view on the combiner surface and the focus can be adjusted from a near field of four feet to infinity.

Valve for Waste Collection and Storage Patent


A method and valve apparatus for collection of fecal matter designed to operate efficiently in a zero gravity environment was invented. The system consists of a waste collection area within a body having a seat opening. Low pressure within the waste collection area directs fecal matter away from the user's buttocks and prevents the escape of undesirable gases. The user actuates a piston covered with an absorbent pad that sweeps through the waste collection area to collect fecal matter, scrub the waste collection area, press the waste against an end of the waste collection area and retracts, leaving the used pad. Multiple pads are provided on the piston to accommodate multiple usages. Also a valve allows air to be drawn through the body, which keeps the valve from becoming plugged with the feces. A sheet feeder feeds fresh sheets of absorbent pads to a face of the piston with each actuation.

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Whole Body Cleansing Agent Patent Application

STEVEN E. LENTSCH, inventor (to NASA) (ECO-Labs., Cleveland, OH.) 29 May 1990 15 p


The subject invention relates to a human cleansing agent particularly suitable for use in long duration spaceflight and a method of bathing with the agent. The agent of the subject invention is in the form of a paste having a pH of 5.0 to 7.9 which comprises an acyltaurate, a skin conditioner, a hair conditioner, and a preservative. More specifically, it includes sodium N-coconut acid-N-methyl taurate, in combination with soybean lecithin, polyquaternium 16, and formalin. This particular combination satisfies the following objectives: (1) that it be usable with a minimum amount of water per shower (approximately 1 gallon); (2) that it be easily separated from the water for purposes of water reclamation; (3) that it be pH compatible with skin and hair; (4) that it rinse well in deionized water; (5) that it be mild to skin and eyes; (6) that it effectively clean both skin and hair; (7) that it be suitable for use in zero gravity; and (8) that it provide ease of combing of wet and dry hair. The method of the invention includes
the steps of wetting the skin and hair with a small quantity of water, lathering the skin with the paste, rinsing the lather from the skin and hair with a small quantity of water to produce a rinse water containing the cleansing agent, defoaming the rinse water, and supplying the defoamed rinse water to a water reclamation unit for recycling the water. The novelty of the invention appears to lie in the particular formulation of the cleansing agent and its method of use which provide optimal results under the given constraints and objectives.

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COMPUTER OPERATIONS AND HARDWARE

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

N91-13888*# National Aeronautics and Space Administration. Pasadena Office, CA.

AUTO AND HETERO-ASSOCIATIVE MEMORY USING A 2-D OPTICAL LOGIC GATE Patent Application
TIEN-HSIN CHAO, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 16 Feb. 1990 17 p (Contract NAS7-918)

An optical system for auto-associative and hetero-associative recall utilizing Hamming distance as the similarity measure between a binary input image vector \(V^{(k)}\) and a binary image vector \(V^{(m)}\) in a first memory array using an optical Exclusive-OR gate for multiplication of each of a plurality of different binary image vectors in memory by the input image vector. After integrating the light of each product \(V^{(k)} \times V^{(m)}\), a shortest Hamming distance detection electronics module determines which product has the lowest light intensity and emits a signal that activates a light emitting diode to illuminate a corresponding image vector in a second memory array for display. That corresponding image vector is identical to the memory image vector \(V^{(m)}\) in the first memory array for auto-associative recall or related to it, such as by name, for hetero-associative recall.

N91-13890*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

PROGRAMMABLE REMAPPER WITH SINGLE FLOW ARCHITECTURE Patent Application

The invention relates to image processing systems and methods and in particular to a machine which accepts a real time video image in the form of a matrix of picture elements (pixels) and remaps such image according to a selectable one of a plurality of mapping functions to create an output matrix of pixels. Such mapping functions, or transformations, may be any one of a number of different transformations depending on the objective of the user of the system. The system remaps input images from one coordinate system to another using a set of look-up tables for the data necessary for the transform. The transforms, which are operator selectable, are precomputed and loaded into massive look-up tables. Input pixels, via the look-up tables of any particular transform selected, are mapped into output pixels with the radiance information of the input pixels being appropriately weighted. An earlier embodiment of the system included two parallel processors: a collect processor which mapped multiple input pixels into a single output pixel and an interpolative processor. The interpolative processor performed an interpolation among pixels in the input image where a given input pixel may affect the value of many output pixels. Several advantages are provided over previous embodiments in that the two distinct processors are replaced by a single processor capable of performing both types of operations (collective and interpolative) with no more complexity. Previously, there has existed no image processor or 'remapper' that can operate with sufficient speed and flexibility to permit investigating different transformation patterns in real time.

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COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms, and specific applications, e.g., CAD/CAM.

N91-13911# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

GENERAL METHOD OF PATTERN CLASSIFICATION USING THE TWO-DOMAIN THEORY Patent Application

Human beings judge patterns (such as images) by complex mental processes, some of which may not be known, while computing machines extract features. By representing the human judgements with simple measurements and reducing them and the machine extracted features to a common metric space and fitting them by regression, the judgements of human experts rendered on a sample of patterns may be imposed on a pattern population to provide automatic classification.
COMPUTER PROGRAMMING AND SOFTWARE

51 COMPUTER SYSTEMS

Incorporates computers and special application computer systems.

51 METHOD OF UP-FRONT LOAD BALANCING FOR LOCAL MEMORY PARALLEL PROCESSORS Patent

N91-14769* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX. METHOD OF UP-FRONT LOAD BALANCING FOR LOCAL MEMORY PARALLEL PROCESSORS Patent


51 DISTRIBUTED COMPUTING SYSTEM WITH DUAL INDEPENDENT COMMUNICATIONS PATHS BETWEEN COMPUTERS AND EMPLOYING SPLIT TOKENS Patent

N91-14772* National Aeronautics and Space Administration. Pasadena Office, CA. DISTRIBUTED COMPUTING SYSTEM WITH DUAL INDEPENDENT COMMUNICATIONS PATHS BETWEEN COMPUTERS AND EMPLOYING SPLIT TOKENS Patent


This is a distributed computing system providing flexible fault tolerance; ease of software design and concurrency specification; and dynamic balance of the loads. The system comprises a plurality of computers each having a first input/output interface and a second input/output interface for interfacing to communications networks each second input/output interface including a bypass for bypassing the associated computer. A global communications network interconnects the first input/output interfaces for providing each computer the ability to broadcast messages simultaneously to the remainder of the computers. A meshwork communications network interconnects the second input/output interfaces providing each computer with the ability to establish communications links with another of the computers bypassing the remainder of computers. Each computer is controlled by a resident copy of a

61 MEMORY PARALLEL PROCESSORS Patent

N91-14741* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX. DISCRETE EVENT SIMULATION TOOL FOR ANALYSIS OF QUALITATIVE MODELS OF CONTINUOUS PROCESSING SYSTEMS Patent


An artificial intelligence design and qualitative modeling tool is disclosed for creating computer models and simulating continuous activities, functions, and/or behavior using developed discrete event techniques. Conveniently, the tool is organized in four modules: library design module, model construction module, simulation module, and experimentation and analysis. The library design module supports the building of library knowledge including component classes and elements pertinent to a particular domain of continuous activities, functions, and behavior being modeled. The continuous behavior is defined discretely with respect to invocation statements, effect statements, and time delays. The functionality of the components is defined in terms of variable cluster instances, independent processes, and modes, further defined in terms of mode transition processes and mode dependent processes. Model construction utilizes the hierarchy of libraries and connects them with appropriate relations. The simulation executes a specialized initialization routine and executes events in a manner that includes selective inherency of characteristics through a time and event schema until the event queue in the simulator is emptied. The experimentation and analysis module supports analysis through the generation of appropriate log files and includes the ability of log file comparisons.

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N91-14775* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX. DISTRIBUTED COMPUTING SYSTEM WITH DUAL INDEPENDENT COMMUNICATIONS PATHS BETWEEN COMPUTERS AND EMPLOYING SPLIT TOKENS Patent


This is a distributed computing system providing flexible fault tolerance; ease of software design and concurrency specification; and dynamic balance of the loads. The system comprises a plurality of computers each having a first input/output interface and a second input/output interface for interfacing to communications networks each second input/output interface including a bypass for bypassing the associated computer. A global communications network interconnects the first input/output interfaces for providing each computer the ability to broadcast messages simultaneously to the remainder of the computers. A meshwork communications network interconnects the second input/output interfaces providing each computer with the ability to establish communications links with another of the computers bypassing the remainder of computers. Each computer is controlled by a resident copy of a
common operating system. Communications between respective ones of computers is by means of split tokens each having a moving first portion which is sent from computer to computer and a resident second portion which is disposed in the memory of at least one of computer and wherein the location of the second portion is part of the first portion. The split tokens represent both functions to be executed by the computers and data to be employed in the execution of the functions. The first input/output interfaces each include logic for detecting a collision between messages and for terminating the broadcasting of a message whereby collisions between messages are detected and avoided.

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CYBERNETICS

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


An intelligent computer-aided training system having a general modular architecture is provided for use in a wide variety of training tasks and environments. It is comprised of a user interface which permits the trainee to access the same information available in the task environment and serves as a means for the trainee to assert actions to the system; a domain expert which is sufficiently intelligent to use the same information available to the trainee and carry out the task assigned to the trainee; a training session manager for examining the assertions made by the domain expert and by the trainee for evaluating such trainee assertions and providing guidance to the trainee which are appropriate to his acquired skill level; a trainee model which contains a history of the trainee interactions with the system together with summary evaluative data; an intelligent training scenario generator for designing increasingly complex training exercises based on the current skill level contained in the trainee model and on any weaknesses or deficiencies that the trainee has exhibited in previous interactions; and a blackboard that provides a common fact base for communication between the other components of the system. Preferably, the domain expert contains a list of rules which typifies errors that are usually made by novice trainees. Also preferably, the training session manager comprises an intelligent error detection means and an intelligent error handling means. The present invention utilizes a rule-based language having a control structure whereby a specific message passing protocol is utilized with respect to tasks which are procedural or step-by-step in structure. The rules can be activated by the trainee in any order to reach the solution by any valid or correct path. NASA

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ACOUSTICS

Includes sound generation, transmission, and attenuation.


A method is described for use with an acoustic positioner, which enables a determination of the equilibrium position and orientation which an object assumes in a zero gravity environment, as well as restoring forces and torques of an object in an acoustic standing wave field. An acoustic standing wave field is established in the chamber, and the object is held at several different positions near the expected equilibrium position. While the object is held at each position, the center resonant frequency of the chamber is determined, by noting which frequency results in the greatest pressure of the acoustic field. The object position which results in the lowest center resonant frequency is the equilibrium position. The orientation of a nonspherical object is similarly determined, by holding the object in a plurality of different orientations at its equilibrium position, and noting the center resonant frequency for each orientation. The orientation which results in the lowest center resonant frequency is the equilibrium orientation. Where the acoustic frequency is constant, but the chamber length is variable, the equilibrium position or orientation is that which results in the greatest pressure of the acoustic field. The object position which results in the lowest center resonant frequency is the equilibrium position. The orientation of a nonspherical object is similarly determined, by holding the object in a plurality of different orientations at its equilibrium position, and noting the center resonant frequency for each orientation. The orientation which results in the lowest center resonant frequency is the equilibrium orientation. Where the acoustic frequency is constant, but the chamber length is variable, the equilibrium position or orientation is that which results in the greatest chamber length at the center resonant frequency.

Official Gazette of the U.S. Patent and Trademark Office
N91-14908* National Aeronautics and Space Administration. Pasadena Office, CA.

ACOUSTIC TRANSDUCER APPARATUS WITH REDUCED THERMAL CONDUCTION Patent

A horn is described for transmitting sound from a transducer to a heated chamber containing an object which is levitated by acoustic energy while it is heated to a molten state, which minimizes heat transfer to thereby minimize heating of the transducer, minimize temperature variation in the chamber, and minimize loss of heat from the chamber. The forward portion of the horn, which is the portion closest to the chamber, has holes that reduce its cross-sectional area to minimize the conduction of heat along the length of the horn, with the entire front portion of the horn being rigid and having an even front face to efficiently transfer high frequency acoustic energy to fluid in the chamber. In one arrangement, the horn has numerous rows of holes extending perpendicular to the length of horn, with alternate rows extending perpendicular to one another to form a sinuous path for the conduction of heat along the length of the horn.

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

N91-16707*# National Aeronautics and Space Administration.
Langley Research Center, Hampton, VA.

LAMINA TRANSDUCER COUPLER AND METHOD OF MAKING Patent Application

The invention is a novel lamina transducer coupler and method of making same from a solidified layer of gel-like material. The properties and thickness of the layer determine the acoustical impedance which may also be detachably formed on a suitable substrate. This invention provides a disposable transducer coupler that detachably conforms to, and provides a surface for an object to be scanned such as a burn victim. It is essentially self-lubricating though a coating of lubricant may be applied to further reduce the friction between a scanning transducer and the coupler. Since the coupler can be preformed, sterilized and packaged for subsequent use, it is believed to have important ultrasonic medical diagnostic applications.

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

N91-13995*# National Aeronautics and Space Administration.
Pasadena Office, CA.

HIGH-GAIN ALGaAs/GaAs DOUBLE HETEROJUNCTION DARLINGTON PHOTOTRANSISTORS FOR OPTICAL NEURAL NETWORKS Patent Application

High-gain MOCVD-grown (metal-organic chemical vapor deposition) AlGaAs/GaAs/AlGaAs n-p-n double heterojunction
bipolar transistors (DHBTs) and Darlington phototransistor pairs are provided for use in optical neural networks and other optoelectronic integrated circuit applications. The reduced base doping level used herein results in effective blockage of Zn out-diffusion, enabling a current gain of 500, higher than most previously reported values for Zn-diffused-base DHBTs. Darlington phototransistor pairs of this material can achieve a current gain of over 6,000; which satisfies the gain requirement for optical neural network designs, which advantageously may employ neurons comprising the Darlington phototransistor pair in series with a light source.

NASA

**MONOLITHIC MM-WAVE PHASE SHIFTER USING OPTICALLY ACTIVATED SUPERCONDUCTING SWITCHES**

Patent Application


A phase shifter is disclosed having a reference path and a delay path, light sources, and superconductive switches. Each of the superconductive switches is terminated in a virtual short circuit, which may be a radial stub. Switching between the reference path and delayed path is accomplished by illuminating the superconductive switches connected to the desired path, while not illuminating the superconductive switches connected to the other path.

NASA

**MOTION DETECTION, NOVELTY FILTERING, AND TARGET TRACKING USING AN INTERFEROMETRIC TECHNIQUE WITH A GAAS PHASE CONJUGATE MIRROR**

Patent Application

LI-JEN CHENG, inventor (to NASA) and TSUEN-HSI LIU, inventor (to NASA) (Jet Propulsion Lab., California Inst. of Tech., Pasadena.) 16 Aug. 1990 17 p. (Contract NAS7-918)

A method and apparatus is disclosed for detecting and tracking moving objects in a noise environment cluttered with fast-and slow-moving objects and other time-varying background. A pair of phase conjugate light beams carrying the same spatial information commonly cancel each other out through an image subtraction process in a phase conjugate interferometer, wherein gratings are formed in a fast photo-refractive phase conjugate mirror material. In the steady state, there is no output. When the optical path of one of the two phase conjugate beams is suddenly changed, the return beam loses its phase conjugate nature and the interferometer is out of balance, resulting in an observable output. The observable output lasts until the phase conjugate nature of the beam has recovered. The observable time of the output signal is roughly equal to the formation time of the grating. If the optical path changing time is slower than the formation time, the change of optical path becomes unobservable, because the index grating can follow the change. Thus, objects traveling at speeds which result in a path changing time which is slower than the formation time are not observable and do not clutter the output image view.

NASA

**OPTICAL JOINT CORRELATION FOR REAL-TIME TRACKING**

Patent Application


A method for tracking an object in a sequence of images is described. Such sequence of images may, for example, be a sequence of television frames. The object in the current frame is correlated with the object in the previous frame to obtain the relative location of the object in the two frames. An optical joint transform correlator apparatus is provided to carry out the process. Such joint transform correlator apparatus forms the basis for laser eye surgical apparatus where an image of the fundus of an eyeball is stabilized and forms the basis for the correlator apparatus to track the position of the eyeball caused by involuntary movement. With knowledge of the eyeball position, a surgical laser can be precisely pointed toward a position on the retina.

NASA
The invention is directed to an optical collector requiring a wide acceptance angle, and a high concentration ratio. The invention is particularly adapted for use in solar collectors of cassegrain design. The optical collector system includes a parabolic circular concave primary mirror and a hyperbolic circular convex secondary mirror. The primary mirror includes a circular hole located at its center wherein a solar collector is located. The mirrored surface of the secondary mirror has three distinct zones: a center circle, an on-axis annulus, and an off-axis section. The parabolic shape of the primary mirror is chosen so that the primary mirror reflects light entering the system off-axis onto the on-axis annulus. A substantial amount of light entering the system off-axis is reflected by the primary mirror onto either the off-axis section or onto the center circle. Subsequently, the off-axis sections reflect the off-axis light toward the solar collector. Thus, off-axis light is captured which would otherwise be lost to the system. The novelty of the system appears to lie in the configuration of the primary mirror which focuses off-axis light onto an annular portion of the secondary mirror to enable capture thereof. This feature results in wide acceptance angle and a high concentration ratio, and also compensates for the effects of non-specular reflection, and enables a cassegrain configuration to be used where such characteristics are required.

An apparatus is disclosed for determining three-dimensional positioning relative to a predetermined point utilizing moire interference patterns such that the patterns are complementary when viewed on axis from the predetermined distance. Further, the invention includes means for determining rotational positioning in addition to three-dimensional translational positioning.

An angular position encoder is provided that minimizes the effects of eccentricity and other misalignments between the disk and the read stations by employing heads which incorporate beam steering optics with the ability to actively track the disk in directions along the disk radius and normal to its surface. The device adapts features prevalent in optical disk technology toward the application of angular position sensing. A reflective disk and the principles of interferometry are employed. The servo-controlled steering optics move so as to acquire a track on the disk lying at a predetermined radius and distance below the head, and then adjust position and orientation in order to maintain the view of the disk track as required. Thus, the device is actively self-aligning.

The invention relates to optical focusing apparatus and, more particularly, to optical apparatus for focussing a highly collimated Gaussian beam which provides independent and fine control over the focus waist diameter, the focus position both along the beam axis and transverse to the beam, and the focus angle. A beam focusing and positioning apparatus provides focusing and positioning for the waist of a waisted beam on a target such as an optical fiber. The apparatus includes a first lens, having a focal plane $f_1$, disposed in the path of an incoming beam and a second lens, having a focal plane $f_2$ and being space downstream from the first lens by a distance at least equal to $f_1 + 10 f_2$, which cooperates with the first lens to focus the waist of the beam on the target. A rotatable optical device, disposed upstream of the first lens, adjusts the angular orientation of the beam waist. The transverse position of the first lens relative to the axis of the beam waist is varied to control the transverse position of the beam waist relative to the target (a fiber optic as shown) while the relative axial positions of the lenses are varied to control the diameter of the beam waist and to control the axial position of the beam waist. Mechanical controllers $C_{(1)}$, $C_{(2)}$, $C_{(3)}$, $C_{(4)}$, and $C_{(5)}$
control the elements of the optical system. How seven adjustments can be made to correctly couple a laser beam into an optical fiber is illustrated. Prior art systems employing optical techniques to couple a laser beam into an optical fiber or other target simply do not provide the seven necessary adjustments. The closest known prior art, a Newport coupler, provides only two of the seven required adjustments.

N91-14835* National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, AL.

X RAY SENSITIVE AREA DETECTION DEVICE Patent
 DANIEL C. CARTER, inventor (to NASA), WILLIAM K. WITHEROW, inventor (to NASA), MARC L. PUSEY, inventor (to NASA), and VAUGHN H. YOST, inventor (to NASA) 12 Jun. 1990 14 p
Filed 31 Jan. 1989
(NASA-CASE-MFS-28222-1; US-PATENT-4,933,558;
US-PATENT-APPL-SN-304155; US-PATENT-CLASS-250-327.2;
US-PATENT-CLASS-250-484.1;
INT-PATENT-CLASS-G01N-23/20;
INT-PATENT-CLASS-H05B-33/00) Avail: US Patent and Trademark Office CSCL 20F

A radiation sensitive area detection device is disclosed which comprises a phosphor-containing film capable of receiving and storing an image formed by a pattern of incoming x rays, UV, or other radiation falling on the film. The device is capable of fluorescing in response to stimulation by a light source in a manner directly proportional to the stored radiation pattern. The device includes: (1) a light source capable of projecting light or other appropriate electromagnetic wave on the film so as to cause it to fluoresce; (2) a means to focus the fluoresced light coming from the phosphor-containing film after light stimulation; and (3) at least one charged coupled detector or other detecting element capable of receiving and digitizing the pattern of fluoresced light coming from the phosphor-containing film. The device will be able to generate superior x ray images of high resolution from a crystal or other sample and will be particularly advantageous in that instantaneous near-real-time images of rapidly deteriorating samples can be obtained. Furthermore, the device can be made compact and sturdy, thus capable of carrying out x ray or other radiation imaging under a variety of conditions, including those experienced in space.

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

N91-15874* National Aeronautics and Space Administration.

FIBER OPTIC MICROPHONE Patent Application
ALLAN J. ZUCKERWAR, inventor (to NASA), FRANK W. CUOMO, inventor (to NASA) (Rhode Island Univ., Kingston.), WILLIAM E. ROBBINS, inventor (to NASA), and PURNELL HOPSON, JR., inventor (to NASA) 21 Sep. 1990 35 p
(NASA-CASE-LAR-14402-1-CU; NAS 1.71:LAR-14402-1-CU;
US-PATENT-APPL-SN-586369) Avail: NTIS HC/MF A03 CSCL 20F

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 backplate for damping membrane motion. The backplate further provides a means for on-line calibration of the microphone.

N91-14066* National Aeronautics and Space Administration.

METHOD OF FABRICATING GERMANIUM AND GALLIUM ARSENIDE DEVICES Patent Application
MURZBAN JHABVALA, inventor (to NASA) 31 Aug. 1990 10 p
(NASA-CASE-GSC-13265-1; NAS 1.71:GSC-13265-1;
US-PATENT-APPL-SN-575864) Avail: NTIS HC/MF A02

A method of semiconductor diode fabrication is disclosed which relies on the epitaxial growth of a precisely doped thickness layer of gallium arsenide or germanium on a semi-insulating or intrinsic substrate, respectively, of gallium arsenide or germanium by either molecular beam epitaxy (MBE) or by metal-organic chemical vapor deposition (MOCVD). The method involves: depositing a layer of doped or undoped silicon dioxide on a germanium or gallium arsenide wafer or substrate, selectively removing the silicon dioxide layer to define one or more surface regions for a device to be fabricated thereon, growing a matched epitaxial layer of doped germanium or gallium arsenide of an appropriate thickness using MBE or MOCVD techniques on both the silicon dioxide layer and the defined one or more regions; and etching the silicon dioxide and the epitaxial material on top of the silicon dioxide to leave a matched epitaxial layer of germanium or gallium arsenide on the
germanium or gallium arsenide substrate, respectively, and upon which a field effect device can thereafter be formed.

NASA

A piezoelectrostatic generator includes a plurality of elongated piezoelectric elements having first and second ends, with the first ends fixedly mounted in a cylindrical housing and the second extending radially inwardly toward an axis. A shaft movable along the axis is connected to the inner ends of the elements to produce bending forces in piezoelectric strips within the elements. Each element includes a pair of strips mounted in surface contact and in electrical series to produce a potential upon bending. Electrodes spaced from the strips by a solid dielectric material act as capacitor plates to collect the potential charge.

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

This invention relates generally to control systems for controlling crystal growth, and more particularly to such a system which uses a beam of light refracted by the fluid in which crystals are growing to detect concentration of solutes in the liquid. In a hanging drop apparatus, a laser beam is directed onto drop which refracts the laser light into primary and secondary bows, respectively, which in turn fall upon linear diode detector arrays. As concentration of solutes in drop increases due to solvent removal, these bows move farther apart on the arrays, with the relative separation being detected by arrays and used by a computer to adjust solvent vapor transport from the drop. A forward scattering detector is used to detect crystal nucleation in drop, and a humidity detector is used, in one embodiment, to detect relative humidity in the enclosure wherein drop is suspended. The novelty of this invention lies in utilizing angular variance of light refracted from drop to infer, by a computer algorithm, concentration of solutes therein. Additional novelty is believed to lie in using a forward scattering detector to detect nucleating crystallites in drop.
A multispectral glancing incidence x ray telescope is disclosed, which capable of broadband, high resolution imaging of solar and stellar x ray and extreme ultraviolet radiation sources includes a primary optical system which focuses the incoming radiation to a primary focus. Two or more ellipsoidal mirrors are positioned behind the primary focus at an inclination to the optical axis, each mirror having a concave surface coated with a multilayer synthetic microstructure coating to reflect a desired wavelength. The ellipsoidal mirrors are segments of respective ellipsoids having a common first focus coincident with the primary focus. A detector such as an x ray sensitive photographic film is positioned at the second focus of each of the ellipsoids so that each of the ellipsoidal mirrors may reflect the image at the first focus to the detector. In one embodiment the mirrors are inclined at different angles and has its respective second focus at a different location, separate detectors being located at the respective second focus. The mirrors are arranged so that the magnification and field of view differ, and a solenoid activated arm may withdraw at least one mirror from the beam to select the mirror upon which the beam is to impinge so that selected magnifications and fields of view may be detected.
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AND PATENT APPLICATIONS

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NASA patent application specifications are sold in paper copy and microfiche by the National Technical Information Service. The US-Patent-Appl-SN-number should be used in ordering either paper copy or microfiche from NTIS.

LICENSES FOR COMMERCIAL USE:
INQUIRIES AND APPLICATIONS FOR LICENSE

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

Inquiries concerning the NASA Patent Licensing Program or the availability of licenses for the commercial use of NASA-owned inventions covered by U.S. patents or pending applications for patent should be forwarded to the NASA Patent Counsel of the NASA installation having cognizance of the specific invention, or the 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 National Technical Information Service (NTIS) on standing order subscription as PB 91-911100 at the price of $15.00 domestic and $30.00 foreign. 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.
<table>
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<tr>
<th>NASA Case Number</th>
<th>Address of Cognizant NASA Patent Counsel</th>
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</thead>
<tbody>
<tr>
<td>Prefix Letters</td>
<td></td>
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</table>
| ARC-xxxxx | Ames Research Center  
Mail Code: 200-11A  
Moffett Field, California 94035  
Telephone: (415) 694-5104 |
| XAR-xxxxx |
| ERC-xxxxx | NASA Headquarters  
Mail Code: GP  
Washington, D.C. 20546  
Telephone: (202) 453-2417 |
| XER-xxxxx |
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Mail Code: 204  
Greenbelt, Maryland 20771  
Telephone: (301) 286-7351 |
| XHQ-xxxxx |
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Kennedy Space Center, Florida 32899  
Telephone: (305) 867-2544 |
| XKS-xxxxx |
| LAR-xxxxx | Langley Research Center  
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Telephone: (804) 865-3725 |
| XLA-xxxxx |
| LEW-xxxxx | Lewis Research Center  
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21000 Brookpark Road  
Cleveland, Ohio 44135  
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| XNP-xxxxx |
| FRC-xxxxx |
| XFR-xxxxx |
| WOO-xxxxx |
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

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

Restrictions and Conditions

§ 1245.204 All licenses granted under this subpart.

Types of Licenses

§ 1245.205 Nonexclusive licenses.
§ 1245.206 Exclusive and partially exclusive licenses.

Procedures

§ 1245.207 Application for a license.
§ 1245.208 Processing applications.
§ 1245.209 Notice to Attorney General.
§ 1245.210 Modification and termination of licenses.
§ 1245.211 Appeals.
§ 1245.212 Protection and administration of inventions.
§ 1245.213 Transfer of ownership.
§ 1245.214 Confidentiality of information.

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.


(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.

§ 1245.205 Nonexclusive licenses.

A license may be granted under this subpart on inventions in its custody.
(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 following terms and conditions apply to domestic nonexclusive 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 as equally likely, if executed, to bring the invention to practical application or otherwise promote the invention's utilization by the public;

(ii) 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

(iii) 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 or otherwise promote the invention's utilization by the public;

(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.

§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 any written objections received during the period, NASA has determined that:

(i) The interests of the Federal Government and the public will best be served by the proposed license, in view of the applicant's intentions, plans, and ability to bring the invention to practical application or otherwise promote the invention's utilization by the public;

(ii) 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; and

(iii) 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

(iv) 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 or otherwise promote the invention's utilization by the public;

(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 as equally likely, if executed, to bring the invention to practical application or otherwise promote the invention's utilization by the public;

(ii) 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

(iii) 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 or otherwise promote the invention's utilization by the public;

(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.

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;
PATENT LICENSING REGULATIONS

(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.
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