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NASA PATENT ABSTRACTS
BIBLIOGRAPHY

A CONTINUING BIBLIOGRAPHY
SECTION 1 ABSTRACTS
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 128 citations published in this issue of the Abstract Section cover the period January 1993 through June 1993. The Index Section references over 5400 citations covering the period May 1969 through June 1993.

ABSTRACT SECTION (SECTION 1)

This PAB issue includes 10 major subject divisions separated into 76 specific categories and one general category/division. (See Table of Contents for the scope note of each category, under which are grouped appropriate NASA inventions.) This scheme was devised in 1975 and revised in 1987 in lieu of the 34 category divisions which were utilized in PAB supplements (01) through (06) covering STAR abstracts from May 1969 through January 1974. Each entry in the Abstract Section consists of a STAR citation accompanied by an abstract and, when appropriate, a key illustration taken from the patent or application for patent. Entries are arranged by subject category in order of the ascending NASA Accession Number originally assigned for STAR to the invention. The range of NASA Accession Numbers within each issue is printed on the inside front cover.

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

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

These data elements are identified in the Typical Citation and Abstract and in the indexes.
INDEX SECTION (SECTION 2)

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

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

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

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

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

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

HOW TO USE THIS PUBLICATION TO IDENTIFY NASA INVENTIONS

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

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

2. *Using Subject Index:* To identify all NASA inventions listed under a desired technical subject index term, (A) turn to the cumulative Subject Index in the Index Section and find the invention(s) listed under 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.
Rapid Detection and Quantification of Features Such as Damage or Flaws in Composite and Metallic Structures

An apparatus, system, and method for non-destructible evaluation (NDE) of a material use thermography to rapidly detect and/or generally locate a feature such as, for example, damage or a defect in the material. The apparatus, system, and method also use ultrasound to specifically locate the feature in the material for quantification and/or evaluation either by an operator or by an external device suited for such purpose. Accordingly, the apparatus, system, and method are particularly useful for NDE in applications such as the analysis of the structure of an aircraft, for example, in which the scale of the material to be analyzed is large, thus requiring the rapid NDE afforded by thermography, and in which quantification and/or evaluation of a feature must be performed with precision, thus requiring the relatively high-resolution NDE afforded by ultrasound.
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## Section 1 • Abstracts

### AERONAUTICS

For related information see also Astronautics.

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<td>02 AERODYNAMICS</td>
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<tr>
<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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</tr>
<tr>
<td>03 AIR TRANSPORTATION AND SAFETY</td>
<td>N.A.</td>
</tr>
<tr>
<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>
<td></td>
</tr>
<tr>
<td>04 AIRCRAFT COMMUNICATIONS AND NAVIGATION</td>
<td>N.A.</td>
</tr>
<tr>
<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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<tr>
<td>05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE</td>
<td>N.A.</td>
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<tr>
<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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<tr>
<td>06 AIRCRAFT INSTRUMENTATION</td>
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<tr>
<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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<tr>
<td>07 AIRCRAFT PROPULSION AND POWER</td>
<td>N.A.</td>
</tr>
<tr>
<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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<tr>
<td>08 AIRCRAFT STABILITY AND CONTROL</td>
<td>N.A.</td>
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<tr>
<td>Includes aircraft handling qualities; piloting; flight controls; and autopilots. For related information see also 05 Aircraft Design, Testing and Performance.</td>
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<tr>
<td>09 RESEARCH AND SUPPORT FACILITIES (AIR)</td>
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<tr>
<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>For extraterrestrial exploration see 91 Lunar and Planetary Exploration.</td>
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<td>13 ASTRODYNAMICS</td>
<td>N.A.</td>
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<tr>
<td>Includes powered and free-flight trajectories; and orbital and launching dynamics.</td>
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<tr>
<td>14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)</td>
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<tr>
<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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<tr>
<td>15 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 SPACE TRANSPORTATION</td>
<td>N.A.</td>
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<tr>
<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>17 SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING</td>
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<tr>
<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 .......................................................... 2
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 .................................................................................. N.A.
For related information see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.

20 SPACECRAFT PROPULSION AND POWER ..................................................................... 3
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) ................................................................. N.A.

24 COMPOSITE MATERIALS .............................................................................................. 4
Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see 27 Nonmetallic Materials.

25 INORGANIC AND PHYSICAL CHEMISTRY ............................................................... 5
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.

26 METALLIC MATERIALS ............................................................................................... 5
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS .......................................................................................... 6
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 .......................................................................................... 7
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 ............................................................................................ N.A.
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) ........................................................................................... 8
Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

32 COMMUNICATIONS AND RADAR .............................................................................. 9
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 .................................................. 9
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 ............................................................. 12
Includes boundary layers; hydrodynamics; fluidics; mass transfer and ablation cooling. For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

35 INSTRUMENTATION AND PHOTOGRAPHY ............................................................ 13
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 ............................................................................................... 17
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>N.A. Includes product sampling procedures and techniques; and quality control.</td>
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<td>39</td>
<td>STRUCTURAL MECHANICS</td>
<td>N.A. 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>43</td>
<td>EARTH RESOURCES AND REMOTE SENSING</td>
<td>N.A. 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>N.A. 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 26 Propellants and Fuels.</td>
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<td>45</td>
<td>ENVIRONMENT POLLUTION</td>
<td>N.A. Includes atmospheric, noise, thermal, and water pollution.</td>
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<td>46</td>
<td>GEOPHYSICS</td>
<td>N.A. Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see 93 Space Radiation.</td>
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<tr>
<td>47</td>
<td>METEOROLOGY AND CLIMATOLOGY</td>
<td>N.A. Includes weather forecasting and modification.</td>
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<td>48</td>
<td>OCEANOGRAPHY</td>
<td>N.A. 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>LIFE SCIENCES</td>
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<td>51</td>
<td>LIFE SCIENCES (GENERAL)</td>
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<td>52</td>
<td>AEROSPACE MEDICINE</td>
<td>N.A. Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.</td>
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<td>53</td>
<td>BEHAVIORAL SCIENCES</td>
<td>N.A. Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.</td>
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<td>54</td>
<td>MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT</td>
<td>N.A. 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>
<td>N.A. Includes exobiology; planetary biology; and extraterrestrial life.</td>
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<td>MATHEMATICAL AND COMPUTER SCIENCES</td>
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<td>59</td>
<td>MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)</td>
<td>N.A.</td>
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<tr>
<td>60</td>
<td>COMPUTER OPERATIONS AND HARDWARE</td>
<td>N.A. Includes hardware for computer graphics, firmware, and data processing. For components see 33 Electronics and Electrical Engineering.</td>
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<td>61</td>
<td>COMPUTER PROGRAMMING AND SOFTWARE</td>
<td>N.A. 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>N.A. Includes computer networks and special application computer systems.</td>
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</table>
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 .................................................................................. N.A.
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 Spacecraft Design, Testing and Performance.

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, astronautical, 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

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SOURCE INDEX

CONTRACT NUMBER INDEX
NUMBER INDEX
ACCESSION NUMBER INDEX
AERODYNAMICS

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

BOUNDARY LAYER RELAMINARIZATION DEVICE Patent Application

Relamination of a boundary layer formed in supersonic flow over the leading edge of a swept airfoil is accomplished by means of at least one band, especially a quadrangular band, and most preferably a square band. Each band conforms to the leading edge and the upper and lower surfaces of the airfoil as an integral part thereof and extends perpendicularly from the leading edge. Each band has a height of about two times the thickness of the maximum expected boundary layer.

REFLECTION TYPE SKIN FRICTION METER Patent

A housing block is provided having an upper surface conforming to the test surface of a model or aircraft. An oil film is supplied upstream of a transparent wedge window located in this upper surface by an oil pump system located external to the housing block. A light source located within the housing block supplies a light beam which passes through this transparent window and is reflected back through the transparent window by the upper surface of the oil film to a photo-sensitive position sensor located within the housing. This position sensor allows the slope history of the oil film caused by and aerodynamic flow to be determined. The skin friction is determined from this slope history. Internally located mirrors augment and

UNDERWING COMPRESSION VORTEX ATTENUATION DEVICE Patent Application

A vortex attenuation device is presented which dissipates a lift-induced vortex generated by a lifting aircraft wing. The device consists of a positive pressure gradient producing means in the form of a compression panel attached to the lower surface of the wing and facing perpendicular to the airflow across the wing. The panel is located between the midpoint of the local wing cord and the trailing edge in the chord-wise direction and at a point which is approximately 55 percent of the wing span as measured from the fuselage center line in the spanwise direction. When deployed in flight, this panel produces a positive pressure gradient aligned with the final roll-up of the total vortex system which interrupts the axial flow in the vortex core and causes the vortex to collapse.
Aircraft Instrumentation

Includes cockpit and cabin display devices; and flight instruments.

N93-19023* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

Stall Departure Resistance Enhancer Patent Application


A stall departure resistance enhancer for an aircraft for controlling flow separation by inducing vortical flow over the upper surface of the wing is described. A flat triangular plate is secured to a leading edge of the wing to reduce drag, and the tip of the triangular plate is sharp and the edges are thin and sharp to induce good vortical flow. The thickness of the plate is minimal, but it is sufficient so that the plate remains rigid for all angles of attack. A tip of the triangular plate protrudes forward from the leading edge of the wing, and the centerline of the triangular plate extending through the tip is aligned in the freestream direction. In a second embodiment, the triangular plate is hingedly secured to the leading edge of the wing, and a stop is provided to limit the hinged movement of the plate at or near the stall angle of attack.

Research and Support Facilities (Air)

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

N93-11057* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

Method of Remotely Characterizing Thermal Properties of a Sample Patent


Spacecraft Design, Testing and Performance

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

N93-17061* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, AL.

Pressure Wall Patch Patent Application


A rigid patch body for placing over a damaged portion (hole) of an external wall of a pressurized vessel, such as a space vehicle or a habitat, is discussed. The rigid patch body allows an astronaut to make temporary repairs to the pressurized vessel from the exterior of the vessel, which enables more permanent repairs to be made from the interior of the vessel. The pressure wall patch of the present invention includes a floor surrounded by four side members. Each side member includes a threaded screw for anchoring the patch body to the external wall of the pressurized vessel and a recess in its lower surface for supporting an inflatable bladder for surrounding the damaged portion (hole) of the external wall to seal the area.
20 RESEARCH AND SUPPORT FACILITIES (AIR)

The floor of the rigid patch body supports a source of gas that is connected to the gas supply valve and a gas supply gauge in communication with the gas supply valve and the inflatable bladder.

N93-17412* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

Synthetic procedures to tetraalkyls, tetraacids, and dianhydrides substituted 1,1,1-triaryl 2,2,2-trifluoroethanes which comprises: (1) 1,1-bis(dialkylaryl) 1-aryl-2,2,2-trifluoroethane, (2) 1,1-bis(dicarboxyaryl) 1-aryl-2,2,2-trifluoroethane, or (3) cyclic dianhydride or diamine of 1,1-bis(dialkylaryl) 1-aryl-2,2,2-trifluoroethanes. The synthesis of (1) is accomplished by the condensation reaction of an aryltrifluoromethyl ketone with a dialkylaryl compound. The synthesis of (2) is accomplished by oxidation of (1). The synthesis dianhydride of (3) is accomplished by the conversion of (2) to its corresponding cyclic dianhydride. The synthesis of the diamine is accomplished by the similar reaction of an aryltrifluoromethyl ketone with aniline or alkyl substituted or disubstituted anilines. Also, other derivatives of the above are formed by nucleophilic displacement reactions.

N93-18856* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

The elemental composition of a material exposed to hot gases and subjected to wear is determined. Atoms of an elemental species not appearing in this material are implanted in a surface at a depth based on the maximum allowable wear. The exhaust gases are spectroscopically monitored to determine the exposure of these atoms when the maximum allowable wear is reached.

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N93-18283* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

The primary object of this invention constitutes new compositions of matter and a new process to prepare poly(1,2,4-triazoles) (PT). It concerns new PT, novel monomers, and the process for preparing the same. Another object of the present invention is to provide new PT that are useful as composite matrix resins for aircraft
and dielectric interlayers in electronic devices. Another object of the present invention is the composition of several new di(hydroxyphenyl)-
1,2,4-triazole monomers. According to the foregoing and additional objects were obtained by synthesizing PT by the nucleophilic displacement reaction of di(hydroxyphenyl)-
1,2,4-triazole monomers with activated aromatic dihalides. The inherent viscosities of the PT ranged from 1.37 to 3.4 dL/g and the glass transition temperatures ranged from 126 to 216 C. One polymer exhibited a crystalline melting temperature of 377 C. Thermogravimetric analysis (TGA) showed no weight loss occurring below 300 C in air or nitrogen with a 5 percent weight loss occurring at approximately 550 C in air and nitrogen. The synthesis of the di(hydroxyphenyl)-1,2,4-triazole monomer is represented in an equation. The monomer can be prepared by either of the two routes shown. The chemistry can easily be extended to prepare similar di(hydroxyphenyl)-1,2,4-triazole monomers. The aromatic dihydrazides in some cases are commercially available or readily prepared from hydrazine and a di(acid chloride). The substitution of the hydroxyl groups in either type of monomer may be meta-meta, para-para, or para-meta. The general reaction sequence of PT from each type of di(hydroxyphenyl)-1,2,4-triazole monomer is shown.

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24 COMPOSITE MATERIALS

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

N93-11543# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH.

SILICON CARBIDE FIBER REINFORCED STRONTIUM ALUMINOSILICATE GLASS-CERAMIC MATRIX COMPOSITE Patent Application


A SrO-Al2O3-2SrO2 (SAS) glass ceramic matrix is reinforced with CVD SiC continuous fibers. This material is prepared by casting a slurry of SAS glass powder into tapes. Mats of continuous CVD-SiC fibers are alternately stacked with the matrix tapes. The tape-mat stack is warm-pressed to produce a 'green' composite. Organic constituents are burned out of the 'green' composite, and the remaining interim material is hot pressed.

NASA

N93-13416* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

A TOUGH HIGH PERFORMANCE COMPOSITE MATRIX Patent

METHOD OF APPLYING A THERMAL BARRIER COATING SYSTEM TO A SUBSTRATE Patent


A metallic close-out layer is applied to the surface of a thermal barrier coating system to seal the ceramic material in the coating. The close-out layer is glass-bead preened to densify the surface.

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SANDWICHEO STRUCTURAL PANEL HAVING A BI-DIRECTIONAL CORE STRUCTURE Patent Application


A structural panel assembly has a bi-directional core structure sandwiched between and secured to a pair of outer side wall members. The core structure is formed from first and second perpendicular series of elongated strip members having crenelated configurations. The strip members in the first series thereof are transversely interwoven with the strip members in the second series thereof in a manner such that crest portions of the strip members in the first series overlie and oppose trough portions of the strip members in the second series, and trough portions of the strip members in the first series underlie and oppose crest portions of the strip members in the second series. The crest portions of all of the strip members lie generally in a first plane and are secured to the inner side of one of the panel assembly outer side walls, and the trough portions of all of the strip members lie generally in a second plane and are secured to the inner side of the other panel assembly outer side wall.

HIGH TEMPERATURE SORBENTS FOR OXYGEN Patent Application


A sorbent capable of removing trace amounts of oxygen (ppt) from a gas stream at a high temperature above 200 C comprising a porous alumina silicate support such as zeolite containing from 1 to 10 percent by weight of ion exchanged transition metal such as copper or cobalt ions and 0.05 to 1.0 percent by weight of an activator selected from a platinum group metal such as platinum is described. The activation temperature, oxygen sorption, and reducibility are all improved by the presence of the platinum activator.

METHOD OF CHARACTERIZING RESIDUAL STRESS IN FERROMAGNETIC MATERIALS USING A PULSE HISTOGRAM OF ACOUSTIC EMISSION SIGNALS Patent


The invention is a method and apparatus for characterizing residual uniaxial stress in a ferromagnetic test member by distinguishing between residual stresses resulting from positive (tension) forces and negative (compression) forces by using the distinct and

INORGANIC AND PHYSICAL CHEMISTRY

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

METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.
known magnetoacoustic (MAC) and a magnetoacoustic emission (MAE) measurement circuit means. A switch permits the selective operation of the respective circuit means.

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27 NONMETALLIC MATERIALS

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

N93-11059* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

SEMI-INTERPENETRATING POLYMER NETWORK FOR TOUGHER AND MORE MICROCRACKING RESISTANT HIGH TEMPERATURE POLYMERS Patent


A process for making a semi-interpenetrating polymer network which includes a high performance thermosetting polyimide having a nadic end group acting as a crosslinking site and a high performance linear thermoplastic polyimide is disclosed. Provided is an improved high temperature matrix resin which is capable of performing at 316 °C in air for several hundreds of hours. This resin has significantly improved toughness and microcracking resistance, excellent processability and mechanical performance, and cost effectiveness.

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N93-11912# National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

MULTI-LAYER LIGHT-WEIGHT PROTECTIVE COATING AND METHOD FOR APPLICATION Patent Application


N93-14709* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

LOW TOXICITY HIGH TEMPERATURE PMR POLYIMIDE Patent


In-situ polymerization of monomer reactants (PMR) type polyimides constitute an important class of ultra high performance composite matrix resins. PMR-15 is the best known and most widely used PMR polyimide. An object of the present invention is to provide a substantially improved high temperature PMR-15 system that exhibits better processability, toughness, and thermo-oxidative stability than PMR-15, as well as having a low toxicity. Another object is to provide new PMR polyimides that are useful as adhesives, moldings, and composite matrices. By the present invention, a new PMR polyimide comprises a mixture of the following compounds: 3,4'-oxydianiline (3,4'-ODA), NE, and BTDE which are then treated with heat. This PMR was designated LaRC-RP46 and has a broader processing window, better reproducibility of high quality composite parts, better elevated temperature mechanical properties, and higher retention of mechanical properties at an elevated temperature, particularly, at 371 °C.

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Oxides having a composition of \((\text{Ba}(1-x)\text{Sr}(x))\text{O}-\text{Al}_2\text{O}_3-2\text{SiO}_2\) are used as sintering aids for producing an improved silicon nitride ceramic material. The \(x\) must be greater than 0 to insure the formation of the stable monoclinic celsian glass phase.

NASA

A low thermal expansion oxidation resistant coating utilizes an oxidation resistant alloy and an inert low thermal expansion phase which act to reduce overall thermal expansion. This coating is applied to a low thermal expansion substrate.

NASA

The compound \(N-(3\text{-ethynylphenyl})\text{maleimide (NEPMI)}\) was used to prepare thermally stable, glassy polyimides which did not exhibit glass transition temperatures below 500 C. NEPMI was blended with the maleimide of methylene dianiline (BMI) and heated to form the polyimide. NEPMI was also mixed with Thermid 600 R, a commercially available bisethynyl oligomeric material, and heated to form a thermally stable, glassy polyimide. Lastly, NEPMI was blended with both BMI and Thermid 600 R to form thermally stable, glassy polyimides.

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PROPELLANTS AND FUELS

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

NASA

Common blasting caps are made from an aluminum shell in the form of a tube which is closed at both ends. One end, which is called the output end, terminates in a principal side or face, and contains a detonating agent which communicates with a means for igniting the charge.
The improvement of the present invention is a flat, steel foil bonded to the face in a position which is aligned perpendicularly to the longitudinal axis of the tube.

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An assembly planning system that operates based on a recursive decomposition of assembly into subassemblies is presented. The planning system analyzes assembly cost in terms of stability, directionality, and manipulability to guide the generation of preferred assembly plans. The planning in this system incorporates the special processes, such as cleaning, testing, labeling, etc., that must occur during the assembly. Additionally, the planning handles nonreversible, as well as reversible, assembly tasks through backward assembly planning. In order to decrease the planning efficiency, the system avoids the analysis of decompositions that do not correspond to feasible assembly tasks. This is achieved by grouping and merging those parts that can not be decomposable at the current stage of backward assembly planning due to the requirement of special processes and the constraint of interconnection feasibility. The invention includes methods of evaluating assembly cost in terms of the number of fixtures (or holding devices) and reorientations required for assembly, through the analysis of stability, directionality, and manipulability. All these factors are used in defining cost and heuristic functions for an A* search for an optimal plan.

NASA

A three-stage sorption type cryogenic refrigeration system, each stage containing a fluid having a respectively different boiling point, is presented. Each stage includes a compressor in which a respective fluid is heated to be placed in a high pressure gaseous state. The compressor for that fluid which is heated to the highest temperature is enclosed by the other two compressors to permit heat to be transferred from the inner compressor to the surrounding compressors. The system may include two sets of compressors, each having the structure described above, with the interior compressors of the two sets coupled together to permit selective heat transfer therebetween, resulting in more efficient utilization of input power.

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INTEGRAL FILL YARN INSERTION AND BEATUP METHOD USING INFLATABLE MEMBRANE Patent

An apparatus and method for integral fill yarn insertion and beatup are disclosed. A modified rapier contains a channel for holding fill yarn. The channel is covered with a flexible and inflatable boot, and an inflating apparatus for this boot is also attached. Fill yarn is inserted into the channel, and the rapier is extended into a shed formed by warp yarn. Next, the rapier is pushed into the fell of the fabric, and the flexible and inflatable cover inflated, which both pushes the yarn into the fell of the fabric and performs beatup. The rapier is withdrawn and the shed closed to complete one step of the weaving process.

METHOD AND APPARATUS FOR THREE DIMENSIONAL BRAIDING Patent Application

A machine for three-dimensional braiding of fibers is provided in which carrier members travel on a curved, segmented and movable braiding surface. The carrier members are capable of independent, self-propelled motion along the braiding surface. Carrier member position on the braiding surface is controlled and monitored by computer. Also disclosed is a yarn take-up device capable of maintaining tension in the braiding fiber.

COMPOSITE VIDEO AND GRAPHICS DISPLAY FOR CAMERA VIEWING SYSTEMS IN ROBOTICS AND TELEOPERATION Patent

NASA system for real-time video image display for robotics or remote-vehicle teleoperation is described that has at least one robot arm or remotely operated vehicle controlled by an operator through handheld controllers, and one or more television cameras and optional lighting element. The system has at least one television monitor for display of a television image from a selected camera and the ability to select one of the cameras for image display. Graphics are generated with icons of cameras and lighting elements for display surrounding the television image to provide the operator information on: the location and orientation of each camera and lighting element; the region of illumination of each lighting element; the viewed region and range of focus of each camera; which camera is currently selected for image display for each monitor; and when the controller coordinates for said robot arms or remotely operated vehicles have been transformed to correspond to coordinates of a selected or nonselected camera.

COMMUNICATIONS AND RADAR

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

COMPOSITE VIDEO AND GRAPHICS DISPLAY FOR CAMERA VIEWING SYSTEMS IN ROBOTICS AND TELEOPERATION Patent

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OVERCHARGE AND OVERDISCHARGE PROTECTION OF AMBIENT TEMPERATURE SECONDARY LITHIUM CELLS

Patent Application


A cathode additive is provided for protecting an ambient temperature secondary lithium cell from overcharging or overdischarging. The cathode additive is chosen to create an upper voltage plateau which is slightly higher than a characteristic charge cutoff voltage of the cathode of the cell. The cathode additive additionally creates a lower voltage plateau which is slightly lower than the characteristic discharge cutoff voltage of the cell. Preferably, the cathode additive is a transition metal oxide or a sulfide and may, for example, include a mixture of Li₂Mn₂O₄ and Li(0.1)MoO₂.

HIGH ENERGY AND HIGH POWER DENSITY ULTRACAPACITORS AND SUPERCAPACITORS Patent Application

CAROL R. LEWIS, inventor (to NASA) and SHIAO-PING S. YEN, inventor (to NASA) 29 Sep. 1992 24 p

Ultracapacitor and supercapacitor designs wherein two discrete metal film current collectors of the prior art, one for each of the cathode and anode, are replaced by a single thin polymer film. The polymer film is typically several microns thick and metallized on both sides. The thickness of the metallization is varied from several hundred to several thousand Angstroms depending upon the particular application. This metallization serves as the positive and negative electrodes (current collectors) which are spatially separated by the polymer dielectric film. The resulting reduction of volume increases the volumetric energy density and the reduction of mass increases the gravimetric energy density. The electrolyte solvent/salt system can be selected to provide useful individual cell voltages as high as 5 volts. The voltage is limited only by the electrolytic stability of the solvent and salt. Ultracapacitors fabricated in accordance with the present invention may have energy densities exceeding 10 watt-hours per kilogram and volumetric energy densities exceeding 15 watt-hours per liter. Values which are yet higher are feasible with supercapacitors fabricated in accordance with the present invention.

ENHANCED FATIGUE AND RETENTION IN FERROELECTRIC THIN FILM MEMORY CAPACITORS BY POST-TOP ELECTRODE ANNEAL TREATMENT Patent Application

SARITA THAKOOR, inventor (to NASA) 20 Oct. 1992 23 p

Thin film ferroelectric capacitors comprising a ferroelectric film sandwiched between electrodes for nonvolatile memory operations are rendered more stable by subjecting the capacitors to an anneal following deposition of the top electrode. The anneal is done so as to form the interface between the ferroelectric film and the top electrode. Heating in an air oven, laser annealing, or electron bombardment may be used to form the interface. Heating in an air oven is done at a temperature at least equal to the crystallization temperature of the ferroelectric film. Where the ferroelectric film comprises lead zirconate titanate, annealing is done at about 550 to 600 C for about 10 to 15 minutes. The formation treatment reduces the magnitude of charge associated with the nonswitching pulse in the thin film ferroelectric capacitors. Reduction of this charge leads to significantly more stable nonvolatile memory operations in both digital and analog memory devices. The formation treatment also reduces the ratio of change of the charge associated with the nonswitching pulse as a function of retention time. These improved memory devices exhibit greater performance in retention and reduced fatigue in memory arrays.

HIGH ENERGY AND HIGH POWER DENSITY ULTRACAPACITORS AND SUPERCAPACITORS Patent Application

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An ambient room temperature, high density, rechargeable lithium battery includes a Li(x)Mg2Si negative anode which intercalates lithium to form a single crystalline phase when x is up to 1.0 and an amorphous phase when x is from 1 to 2.0. The electrode has good reversibility and mechanical strength after cycling.
interference. Since the coated substrate need only be heated for evaporation and curing at relatively low temperatures compared to firing, the superconducting coating can be applied to a wide variety of different materials.

An alkali metal thermoelectric converter (AMTEC) having a plurality of cells structurally connected in series to form a septum dividing a plenum into two chambers, and electrically connected in series, is provided with porous metal anodes and porous metal cathodes in the cells. The cells may be planar or annular, and in either case a metal alkali vapor at a high temperature is provided to the plenum through one chamber on one side of the wall and returned to a vapor boiler after condensation at a chamber on the other side of the wall in the plenum. If the cells are annular, a heating core may be placed along the axis of the stacked cells. This arrangement of series-connected cells allows efficient generation of power at high voltage and low current.

A wave rotor system that is comprised of a wave rotor coupled to first and second plates is described. Special ports are provided, one in each of the first and second end plates, to cancel expansion waves generated by the release of working fluid from the wave rotor. One of the expansion waves is reflected in the wave rotor from a reflecting portion and provided to the special port in the second end plate. Fluid present at the special port in the second end plate has a stagnation pressure and mass flow which is the same as that of the cells of the wave rotor communicating with such special port. This allows for cancellation of the expansion wave generated by the release of working fluid from the wave rotor. The special port in the second end plate has a first end corresponding to the head of the expansion wave and a second end corresponding to the tail of the expansion wave. Also, the special port is configured to continually change along the circumference of the second end plate to affect expansion wave cancellation. An expansion wave generated by a second release of working fluid from the wave rotor is cancelled in a similar manner to that described above using a special port in the first end plate. The cycle of operation of the wave rotor system is designed so that the stagnation pressure and mass flow of the fluid present at the special ports is the same so that the special ports may be connected by a common duct.

A fluid separator for separating particulate matter such as contaminates is provided which includes a series of spiral tubes of progressively decreasing cross sectional area connected in series. Each tube has an outlet on the outer curvature of the spiral. As fluid spirals down a tube, centrifugal force acts to force the heavier
particulate matter to the outer wall of the tube, where it exits through the outlet. The remaining, and now cleaner, fluid reaches the next tube, which is smaller in cross sectional area, where the process is repeated. The fluid which comes out the final tube is diminished of particulate matter.

INSTRUMENTATION AND PHOTOGRAPHY

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

N93-12205* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA. COMPENSATED HIGH TEMPERATURE STRAIN GAGE Patent Application

A device for measuring strain in substrates at high temperatures, in which the thermally induced apparent strain is nulled, is presented. Two gages are used: one active gage and one compensating gage. Both gages are placed on the substrate to be gaged; the active gage is attached such that it responds to mechanical and thermally induced apparent strain while the compensating gage is attached such that it does not respond to mechanical strain and measures only thermally induced apparent strain. A thermal blanket is placed over the two gages to maintain the gages at the same temperature. The two gages are wired as adjacent arms of a Wheatstone bridge which nulls the thermally induced apparent strain giving a true reading of the mechanical strain in the substrate.

N93-14714* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA. METHOD OF FORMING A MULTIPLE LAYER DIELECTRIC AND A HOT FILM SENSOR THEREWITH Patent

The invention is a method of forming a multiple layer dielectric for use in a hot-film laminar separation sensor. The multiple layer dielectric substrate is formed by depositing a first layer of a thermoplastic polymer such as on an electrically conductive substrate such as the metal surface of a model to be tested under cryogenic conditions and high Reynolds numbers. Next, a second dielectric layer of fused silica is formed on the first dielectric layer of thermoplastic polymer. A resistive metal film is deposited on selected areas of the multiple layer dielectric substrate to form one or more hot-film sensor elements to which aluminum electrical circuits deposited upon the multiple layered dielectric substrate are connected.

N93-14840* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, OH. APPARATUS FOR CHECKING THREADED HOLE PERPENDICULARITY Patent Application

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A simple assembly for checking the perpendicularity of a hole relative to a datum surface is described. A "go" plug is inserted into the hole and serves as a mounting stand for a cylindrical disk which houses an indicator. The indicator is then rotated 360 deg while checking for any deflection of the indicator that would signal the hole is not perpendicular.

The invention discloses a system capable of memorizing maximum sensed values. The system includes conditioning circuitry which receives the analog output signal from a sensor transducer. The conditioning circuitry rectifies and filters the analog signal and provides an input signal to a digital driver, which may be either linear or logarithmic. The driver converts the analog signal to discrete digital values, which in turn triggers an output signal on one of a plurality of driver output lines n. The particular output lines selected is dependent on the converted digital value. A microfuse memory device connects across the driver output lines, with n segments. Each segment is associated with one driver output line, and includes a microfuse that is blown when a signal appears on the associated driver output line.

A method and apparatus for detecting the temperature of gray and non-gray bodies in the presence of interfering radiation are presented. A gray body has a constant emissivity less than 1 and a non-gray body has an emissivity which varies with wavelength. The emissivity and reflectivity of the surface is determined over a range of wavelengths. Spectra are also measured of the extraneous interference radiation source and the surface of the object to be measured in the presence of the extraneous interference radiation source. An auxiliary radiation source is used to determine the reflectivity of the surface and also the emissivity. The measured spectrum of the surfaces in the presence of the extraneous interference radiation source is set equal to the emissivity of the surface multiplied by a
Planck function containing a temperature term $T$ plus the surface reflectivity multiplied by the spectrum of the extraneous interference radiation source. The equation is then solved for $T$ to determine the temperature of the surface.

**Fiber Optics**

The image signal from the memory buffer and correlates the image signal with other sensed parameters, such as longitudinal or other information. When the storage capacity of the hard disk has been filled, the disk can be replaced with a new disk.

A handheld, programmable, digital camera is disclosed that supports a variety of sensors and has program control over the system components to provide versatility. The camera uses a high performance design which produces near film quality images from an electronic system. The optical system of the camera incorporates a conventional camera body that was slightly modified, thus permitting the use of conventional camera accessories, such as telephoto lenses, wide-angle lenses, auto-focusing circuitry, auto-exposure circuitry, flash units, and the like. An image sensor, such as a charge coupled device ('CCD') collects the photons that pass through the camera aperture when the shutter is opened, and produces an analog electrical signal indicative of the image. The analog image signal is read out of the CCD and is processed by preamplifier circuitry, a correlated double sampler, and a sample and hold circuit before it is converted to a digital signal. The analog-to-digital converter has an accuracy of eight bits to insure accuracy during the conversion. Two types of data ports are included for two different data transfer needs. One data port comprises a general purpose industrial standard port and the other a high speed/high performance application specific port. The system uses removable hard disks as its permanent storage media. The hard disk receives the digital

**Acceleration Recorder and Playback Module**

The present invention is directed to methods and apparatus relating to an accelerometer electrical signal recorder and playback module. The recorder module may be manufactured in lightweight configuration and includes analog memory components to store data. Signal conditioning circuitry is incorporated into the module so that signals may be connected directly from the accelerometer to the recorder module. A battery pack may be included for powering both the module and the accelerometer. Timing circuitry is included to control the time duration within which data is recorded or played back so as to avoid overloading the analog memory components. Multiple accelerometer signal recordings may be taken simultaneously without analog to digital circuits, multiplexing circuitry or software to compensate for the effects of multiplexing the signals.

A flow reactor for simulating the interaction in the troposphere is set forth. A first reactant mixed with a carrier gas is delivered from a pump and flows through a duct having louvers therein. The louvers straighten out the flow, reduce turbulence, and provide laminar flow discharge from the duct. A second reactant delivered from a source through a pump is input into the flowing stream, the second reactant being diffused through a plurality of small diffusion tubes to avoid disturbing the laminar flow. The commingled first and second reactants in the carrier gas are then directed along an elongate duct where the walls are spaced away from the flow of reactants to avoid wall interference, disturbance, or turbulence arising from the walls. A probe connected with a measuring device can be inserted through various sampling ports in the second duct to complete measurements of the first and second reactants and the product of their reaction at selected XYZ locations relative to the flowing system.

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An apparatus for remotely measuring and logging the flow rate of groundwater seepage into surface water bodies is described. As groundwater seeps into a cavity created by a bottomless housing, it displaces water through an inlet and into a waterproof sealed upper compartment, at which point, the water is collected by a collection bag, which is contained in a bag chamber. A magnet on the collection bag approaches a proximity switch as the collection bag fills, and eventually enables the proximity switch to activate a control circuit. The control circuit then rotates a three-way valve from the collection path to a discharge path, enables a data logger to record the time, and enables a pump, which discharges the water from the collection bag, through the three-way valve and pump, and into the sea. As the collection bag empties, the magnet leaves the proximity of the proximity switch, and the control circuit turns off the pump, resets the valve to provide a collection path, and restarts the collection cycle.

Official Gazette of the U.S. Patent and Trademark Office
36 LASERS AND MASERS

Includes parametric amplifiers.

36 LASERS AND MASERS

Includes parametric amplifiers.

N93-13418* National Aeronautics and Space Administration. Pasadena Office, CA.

MULTIPERIOD-GRATING SURFACE-EMITTING LASERS Patent

Surface-emitting distributed feedback (DFB) lasers are disclosed with hybrid gratings. A first-order grating is provided at one or both ends of the active region of the laser for retroreflection of light back into the active region, and a second-order or nonresonant grating is provided at the opposite end for coupling light out perpen-
36 LASERS AND MASERS

dicular to the surfaces of the laser or in some other selected direction. The gratings may be curved to focus light retroreflected into the active region and to focus light coupled out to a point. When so focused to a point, the DFB laser may be part of a monolithic read head for a laser recorded disk, or an optical coupler into an optical fiber.

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Self-collimation of the output is achieved in an unstable resonator semiconductor laser by providing a large concave mirror $M_1$ and a small convex mirror $M_2$ on opposite surfaces of a semiconductor body of a material having an effective index of refraction denoted by $n$, where the respective mirror radii $R_1$, $R_2$ and beam radii $r_1$, $r_2$ are chosen to satisfy a condition

$$\frac{(R_2)}{(l + r_1)} = \frac{(n - 1)}{n},$$

with a value of geometric magnification $l$ less than or equal to $M$ less than or equal to $\frac{(n + 1)}{(n - 1)}$ where $r_1$ and $r_2$ are the radii of counterpropagating beams at respective mirrors of radii $R_1$ and $R_2$.

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The present invention detects prelasing in a Q-switch laser and terminates laser operation upon such detection. A detector senses the presence of light beyond a Q-switch and generates an appropriate electrical signal. A comparison stage circuit compares this detector signal with an established threshold value indicative of prelasing and generates a trigger signal if this detector signal exceeds this threshold value. A control stage circuit receives both this trigger signal and a sampled Q-switch signal indicative of an opening of the Q-switch. The control stage circuit terminates operation of the
laser if the trigger signal from the comparison stage is received while
the sampled Q-switch signal is being received to avoid the effects of
prelasing. Appropriate delays and timing sequencies are es-
stablished.

MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and pro-
cesses; and mechanical equipment.

TERMINAL SLIDER CONTROL OF NONLINEAR ROBOTIC
SYSTEMS Patent Application

SUBARAMANIAN T. VENKATARAMAN, inventor (to NASA) (Jet
Propulsion Lab., California Inst. of Tech., Pasadena,) and SANDEEP
GULATI, inventor (to NASA) (Jet Propulsion Lab., California Inst.
(Contract NAS7-918)
(NASA-CASE-NPO-15854-1-CU; NAS 1.71:NPO-15854-1-CU; US-
PATENT-APPL-SN-921192) Avail: CASI HC A03/MF A01

This invention provides robust nonlinear controllers for robotic
operations in unstructured environments based upon a new class of
sliding modes denoted terminal sliders that enforce closed loop
system convergence to equilibrium in finite time. Improved perfor-
mance results from the elimination of high frequency control switch-
ing previously employed for robustness to parametric uncertainties.
Improved performance also results from the dependence of terminal
slider stability upon the rate of change of uncertainties over the
sliding surface rather than the magnitude of the uncertainty itself for
robust control. Terminal sliding mode control also yields improved
convergence where convergence time is finite and is to be controlled.
This invention also applies terminal sliders to robot manipulator
control and benchmark performance with the traditional computed
torque control method and provides for design of control parameters.

METHOD AND APPARATUS FOR GRIPPING TEST
SPECIMENS Patent Application

REBECCA A. MACKAY, inventor (to NASA) and MICHAEL V.
NATHAL, inventor (to NASA) 18 May 1992 12 p
(NASA-CASE-LEW-15345-1; NAS 1.71:LEW-15345-1; US-PATENT-
APPL-SN-884980) Avail: CASI HC A03/MF A01

A pair of solid-teeth wedges are employed in an improved
gripping system. The wedges fit inside a pair of plates having an
angled cavity to accommodate them. As stress is applied to the
specimen, the wedges are urged toward the specimen by the angled
cavity to increase the gripping force. An alignment fixturing device is used to properly position the grips on the test specimen. This device not only axially aligns the grips but also locates them at the proper spacing.

force in the spring assembly can be adjusted; the body member can be permanently attached by a telescoping assembly to one of the devices; and the structure can be used as a pulling device for removing annular bearings or the like from blind bores.

NASA
A thruster nozzle sealing system and apparatus is provided for protection of spacecraft thruster motors. The system includes a sealing plug, a sealing plug insertion tool, an outer cover, an outer cover attachment, and a ferry flight attachment. The sealing plug prevents moisture from entering the thruster engine so as to prevent valve failure. The attachments are interchangeably connectable with the sealing plug. The ferry flight attachment is used during air transportation of the spacecraft, and the outer cover attachment is used during storage and service of the spacecraft. The outer cover provides protection to the thruster nozzle from mechanical damage.

A retractable tool bit assembly utilized in connection with a robotic gripper type end-effector is presented. The apparatus includes one or more spring loaded nestable or telescoping tubular sections together with a catch mechanism for capturing and holding the tool, such as an allen key, in its retracted position. The innermost tubular section includes a threshold cap and engages and holds the tool. The catch mechanism consists of a slider type mechanism located adjacent a relatively larger outer base section and includes means for engaging a conically or mushroom shaped rear end portion of the tool when the telescoping sections are moved to a retracted or parked position. The catch mechanism is released upon actuation of a rotary tool drive motor coupled to a circular mount and which holds the base section. When released all the telescoping sections including the tool extends fully outward to a use position.

A mechanical coupling system is described wherein a spline screw system is used to connect two bodies, a work attachment mechanism and a work attachment fixture. A kinematic clamp first guides and mates the attachment mechanism to the attachment fixture. The kinematic clamp includes three round roller members equidistantly located around the periphery of the bodies and three correspondingly located V-shaped grooves located on the periphery of the other body. A motor driven spline screw in the attachment mechanism then engages a spline bolt head in the attachment fixture and includes a threaded shank upon which is mounted a translatable nut which is adapted to translate up and down the shank but not rotate. The nut carries one or more electrical connectors which travel upwardly during a connecting sequence and cams open a set of dust covers which operate to engage an opposing set of dust covers adjacent complementary type electrical connectors on the attachment mechanism. A mechanical and electrical interconnection process between the bodies occurs sequentially.
37 MECHANICAL ENGINEERING

N93-14842# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
EXTRA-VEHICULAR ACTIVITY TRANSLATION TOOL Patent Application
LESLEI S. HARTZ, inventor (to NASA) 21 Aug. 1992 20 p

A portable hand-grip device for use during extravehicular activity is described. The device has a base member overlaid by a flexible pad having its opposite end releasably secured to the base. The pad includes an adhesive-covered surface which may be attached to a flat surface. A plurality of closely-spaced elongated rigid members are arranged side-by-side across the back of the flexible sheet to reinforce the flexible pad. The ends of these reinforcing members project beyond the opposite sides of the base and flexible pad. A selectively-operable mechanism on the base member releasably captures the outer end of the reinforcing members and secures them when the pad member is attached to a flat surface and provides a load path between a handle on the base and the flexible pad. The selectively-operable mechanism is further arranged to selectively release the reinforcing members so that the device may be progressively peeled away from a wall surface.

N93-14871* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.
BEARING SERVICING TOOL Patent

A tool for removing and/or replacing bearings in situ is presented. The tool is comprised of a brace having a first end adapted to engage a first end of the bearing housing, and a second end adapted to engage a second end of the bearing housing. If the two ends of the bearing housing are different in configuration, then the respective ends of the brace are configured accordingly. An elongate guide member integral with the brace has two parts, each projecting endwise from a respective end of the brace. A removable pressure plate can be mounted on either part of the guide member for longitudinal movement therealong and has first and second ends of different configurations adapted to engage the first and second ends of the bearing. A threaded-type drive is cooperative between the guide and the pressure plate to move the pressure plate longitudinally along the guide and apply a force to the bearing, either to remove the bearing from its housing, or toemplace a new bearing in the housing.
A saddle clamp assembly is presented. The assembly is comprised of a hollow cylindrical body centered about a longitudinal axis and being diametrically split into semicircular top and bottom sections. Each section has a pair of connection flanges, at opposite ends, that project radially outward. A pair of bolts are retained on the top section flanges and are threadable into nuts retained on the bottom section flanges. A base member is anchored to a central underside portion of the bottom clamp body section and has a pair of connection tabs positioned beneath the bottom clamp body section connection flanges on opposite sides of the clamp axis. A pair of bolts are retained on the base member connection tabs and are threadable into a pair of nuts retainable on a support structure. The connection tab and connection flanges on each side of the clamp body are axially offset in a manner permitting downward installation/removable tool access to the lower bolts past the connection flanges. An elongated retention tether is used to connect the top clamp body section to the balance of the clamp assembly. This prevents loss of the top clamp body section when it is removed from the bottom clamp body section.
A synthetic apatite containing agronutrients and a method for making the apatite are disclosed. The apatite comprises crystalline calcium phosphate having agronutrients dispersed in the crystalline structure. The agronutrients can comprise potassium, magnesium, sulfur, iron, manganese, molybdenum, chlorine, boron, copper and zinc in amounts suited for plant growth. The apatite can optionally comprise a carbonate and/or silicon solubility control agent. The agronutrients are released slowly as the apatite dissolves.

A method for surmounting an obstacle by a robot vehicle is accomplished by rotating the wheel forks of the vehicle about their transverse axes with respect to the vehicle body so as to shift most of the vehicle weight onto the rear wheels, and then driving the vehicle forward so as to drive the now lightly-loaded front wheels (only) over the obstacle. Then, after the front wheels have either surmounted or completely passed the obstacle (depending upon the length of the obstacle), the forks are again rotated about their transverse axes so as to shift most of the vehicle weight onto the front wheels. Then the vehicle is again driven forward so as to drive the now lightly-loaded rear wheels over the obstacle. Once the obstacle has been completely cleared and the vehicle is again on relatively level terrain, the forks are again rotated so as to uniformly distribute the vehicle weight between the front and rear wheels.
outward to a use position. Ovular neck portion rotates about the catch members upon actuation of a rotary tool drive motor. When released, all the telescoping sections and the tool extends fully outward to a use position.

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N93-18388* National Aeronautics and Space Administration.
Goddard Space Flight Center, Greenbelt, MD.
SPLIT RAIL GRIPPER ASSEMBLY AND TOOL DRIVER THEREFORE Patent
GEORGE M. VOELLMER, inventor (to NASA) 9 Feb. 1993 10 p
Filed 2 Sep. 1992 Continuation-in-part of US-Patent-Appl-SN-
656924, filed 15 Feb. 1991
(NASA-CASE-GSC-13370-2; US-PATENT-5,184,861; US-PATENT-
APPL-SN-938577; US-PATENT-APPL-SN-656924; US-PATENT-
and Trademark Office

This patent relates to a split rail gripper for a robotic apparatus including a pair of rails which are driven in mutually opposite directions by a rack and pinion gear mechanism. Each rail includes a set of rack gear teeth which engage respective pinion gears and where the top rail engaging one of the pinion gears is driven by a harmonic gear reduction drive and motor unit coupled to a drive screw. The other pinion gear is driven by the top pinion gear engaging a set of rack gear teeth included in the bottom rail. As the top rail is driven in or out, the upper pinion gear is rotated, causing the other pinion gear, in turn, to rotate in the opposite direction. This causes the bottom rail to move in an opposite linear direction relative to the top rail. An outwardly extending gripper finger assembly is attached to respective ends of the rails, with each gripper finger including an arrangement of vertically and horizontally mounted roller members which operate to automatically center and engage an H-plate type interface secured to the object being grasped. The gripper assembly also includes a base plate attached to an interface plate of a robotic tool changer mechanism. A retractable rotary tool driver and tool is also centrally mounted on the base plate.

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N93-19049* National Aeronautics and Space Administration.
Marshall Space Flight Center, Huntsville, AL.
VALVE LOCK Patent Application
RICHARD K. BURLEY, inventor (to NASA) (Rockwell International Corp., Huntsville, AL.) and KAMAL S. GUIRGUIS, inventor (to NASA) (Rockwell International Corp., Huntsville, AL.) 17 Nov. 1992 11 p
(NASA-CASE-MFS-29764-1; NAS 1.71:MFS-29764-1; US-PATENT-
APPL-SN-977469) Avail: CASI HC A03/MF A01

A valve security lock is provided which secures a double union ball valve. The lock is formed from a band inserted through slits in a tube, with that combination being positioned over the valve stem to be secured, and the ends of the band wrapped around the circumference of the double union ball valve. The apparatus is secured around the double union ball valve by insertion of the shank of a lock of known kind through holes in the ends of the band. In a fluid control system, the valve security lock provides a highly visible means to prevent accidental turn-ons or turn-offs during system maintenance, but which can be easily disengaged by persons having the key or combination to the shank type lock.

NASA
A hydraulically powered gas compressor receives low pressure gas and outputs a high pressure gas. The housing of the compressor defines a cylinder with a center chamber having a cross-sectional area less than the cross-sectional area of a left end chamber and a right end chamber, and a spool-type piston assembly is movable within the cylinder and includes a left end closure, a right end closure, and a center body that are in sealing engagement with the respective cylinder walls as the piston reciprocates. First and second annual compression chambers are provided between the piston enclosures and center housing portion of the compressor, thereby minimizing the spacing between the core gas and a cooled surface of the compressor. Restricted flow passageways are provided in the piston closure members and a path is provided in the central body of the piston assembly, such that hydraulic fluid flows through the piston assembly to cool the piston assembly during its operation. The compressor of the present invention may be easily adapted for a particular application, and is capable of generating high gas pressures while maintaining both the compressed gas and the compressor components within acceptable temperature limits.

**Quality Assurance and Reliability**

Includes product sampling procedures and techniques; and quality control.

A multilayer object where the layers are arranged in a stacking direction is evaluated for imperfections such as voids, delaminations, and microcracks. First, an acoustic wave is transmitted into the object in the stacking direction via an appropriate transducer/waveguide combination. The wave propagates through the multilayer object and is received by another transducer/waveguide combination preferably located on the same surface as the transmitting combination. The received acoustic wave is correlated with the presence or absence of imperfections by generating pulse echo signals indicative of the received acoustic wave, wherein the successive signals form distinct groups over time. The respective peak amplitudes of each group are sampled and fitted to an exponential curve, wherein a substantial fit of approximately 80-90 percent indicates the absence of imperfections. Alternatively, the time intervals between distinct groups can be measured, wherein equal intervals indicate the absence of imperfections and unequal intervals indicate the presence of imperfections.

An apparatus, system, and method for non-destructible evaluation (NDE) of a material use thermography to rapidly detect and/or generally locate a feature such as, for example, damage or a defect in the material. The apparatus, system, and method also use ultrasound to specifically locate the feature in the material for quantification and/or evaluation either by an operator or by an external device suited for such purpose. Accordingly, the apparatus, system and method are particularly useful for NDE in applications such as the analysis of the structure of an aircraft, for example, in which the scale of the material to be analyzed is large, thus requiring the rapid NDE afforded by thermography, and in which quantification and/or evaluation of a feature must be performed with precision, thus requiring the relatively high-resolution NDE afforded by ultrasound.
ARRAYS OF ACTUATORS ARE AFFIXED TO STRUCTURAL ELEMENTS TO IMPEDE THE TRANSMISSION OF VIBRATIONAL ENERGY. A SINGLE PAIR IS USED TO PROVIDE CONTROL OF BENDING AND EXTENSIONAL WAVES AND TWO PAIRS ARE USED TO CONTROL TORSIONAL MOTION. THE ARRAYS ARE APPLIED TO A WIDE VARIETY OF STRUCTURAL ELEMENTS SUCH AS A BEAM STRUCTURE THAT IS PART OF A LARGER FRAMEWORK THAT MAY OR MAY NOT SUPPORT A RIGID OR NON-RIGID SKIN. ELECTRICAL EXCITATION IS APPLIED TO THE ACTUATORS THAT GENERATE FORCES ON THE STRUCTURE. THESE ELECTRICAL INPUTS MAY BE ADJUSTED IN THEIR AMPLITUDE AND PHASE BY A CONTROLLER IN COMMUNICATION WITH APPROPRIATE VIBRATIONAL WAVE SENSORS TO IMPede THE FLOW OF VIBRATIONAL POWER IN ALL OF THE ABOVE MENTIONED WAVE FORMS BEYOND THE ACTUATOR LOCATION. ADDITIONAL SENSOR ELEMENTS CAN BE USED TO MONITOR THE PERFORMANCE AND ADJUST THE ELECTRICAL INPUTS TO MAXIMIZE THE ATTENUATION OF VIBRATIONAL ENERGY.
A method for conducting an in vitro cell assay using a tetrazolium indicator is disclosed. The indicator includes a nonionic detergent which solubilizes a tetrazolium reduction product in vitro and has low toxicity for the cells. The incubation of test cells in the presence of zolium bromide and octoxynol (TRITON X-100) permits kinetics of the cell metabolism to be determined.
is connected in parallel with the iodinated resin bed and is activated periodically (e.g., by timer, by measured flow of water, or by iodine residual level) to recharge the bed. Novelty resides in the capability of inexpensively and repeatedly regenerating the ion-exchange bed in sites.

An annular culture vessel for growing mammalian cells is constructed in a one piece integral and annular configuration with an open end which is closed by an endcap. The culture vessel is rotatable about a horizontal axis by use of conventional roller systems commonly used in culture laboratories. The end wall of the endcap has tapered access ports to frictionally and sealingly receive the ends of hypodermic syringes. The syringes permit the introduction of fresh nutrient and withdrawal of spent nutrients. The walls are made of conventional polymeric cell culture material and are subjected to neutron bombardment to form minute gas permeable perforations in the walls.

A compliant walker is provided for humans having limited use of their legs and lower back. It includes an upright wheel frame which at least partially surrounds an upright user wearing a partial body harness. It is attached to the frame by means of cable compliant apparatus consisting of sets of cable segments and angle bracket members connected between opposite side members of the frame and adjacent side portions of the frame. Novelty is believed to exist in the combination of a wheeled frame including a side support
structure, a body harness, and compliance means connecting the body harness to the side support structure for flexibility holding and supporting a person in a substantially upright position when the user sags in the frame when taking weight off the lower extremities.

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A bright light therapy delivery system is disclosed. The system enhances the efficient delivery of bright light therapy by directing the light to the user's eyes while permitting the user to engage in other sedentary activities, such as reading. A shroud is disclosed which has reflective non-specular interior surfaces and which enclosed a bright light source of known kind. The shroud can be configured for delivery of bright light therapy in a direct, indirect, or direct/indirect mode. In the direct mode, the bright light source is located at the back of the shroud and faces the user; in the indirect mode, the bright light source is located within the shroud and faces away from the user; in the direct/indirect mode, the bright light source is located within the shroud, and has two luminous appertures, one facing the user and the other facing opposite the user.

NASA

A prosthetic device for below-the-elbow amputees is disclosed. The device has a removable effector, which is attached to the end of an arm cuff. The effector is comprised of a pair of C-shaped members that are oriented as to face each other. Working in concert, the C-shaped members are able to hold a bar such as a chainsaw handle. A flat spring is fitted around the C-shaped members to hold them together.

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A wheel is provided herein for vehicles using spoked wheels. Small obstacles, steps, and curbs present serious impediments to wheelchair and bicycle travelers. Yet until recently wheels for these vehicles have remained unchanged. These rigid type vehicles have the disadvantage of transmitting to their users shocks and vibrations generated by traversing over obstacles or rough terrain, creating an uncomfortable ride. The wheel herein responds to loads or shocks while overcoming the difficulties of prior art wheels. The wheel is of the type having a circular rim with the hub at its center, and spokes connected between the hub and the rim. A wheel is provided in which not only the spokes are unique, but the rim as well.

A portable seat lift that can help individuals either (1) lower themselves to a sitting position or (2) raise themselves to a standing position is presented. The portable seat lift consists of a seat mounted on a base with two levers, which are powered by a drive unit.

A control system and method for prosthetic devices is provided. The control system comprises a transducer for receiving movement from a body part for generating a sensing signal associated with that movement. The sensing signal is processed by a linearizer for linearizing the sensing signal to be a linear function of the magnitude of the distance moved by the body part. The linearized sensing signal is normalized to be a function of the entire range of body part movement from the no-shrug position of the movable body part through the full-shrug position of the movable body part. The normalized signal is divided into a plurality of discrete command signals. The discrete command signals are used by typical converter devices which are in operational association with the prosthetic device. The converter device uses the discrete command signals for driving the movable portions of the prosthetic device and its sub-prosthesis. The method for controlling a prosthetic device associated with the present invention comprises the steps of receiving the movement from the body part, generating a sensing signal in association with the movement of the body part, linearizing the sensing signal in association with the movement of the body part, linearizing the sensing signal to be a linear function of the magnitude of the distance moved by the body part, normalizing the linear signal to be a function of the entire range of the body part movement, dividing the normalized signal into a plurality of discrete command signals, and implementing the plurality of discrete command signals for driving the respective movable prosthesis device and its sub-prosthesis.
The invention is a protective helmet assembly with improved safety and impact resistance, high resistance to ignition and combustion, and reduced offgassing. The assembly comprises a hard rigid ballistic outer shell with one or more impact absorbing pads fitted to the interior surface. The pads are made of open cell flexible polyimide foam material, each of which is attached to the inner surface of the ballistic outer shell by cooperative VELCRO fastener strips of hook-and-loop material affixed respectively to the rigid outer shell and the impact absorbing pads. The helmet assembly with shell and pads is sized to fit relatively close over a wearer's head.

A high speed read MRAM memory element is configured from a sandwich of magnetizable, ferromagnetic film surrounding a magneto-resistive film which may be ferromagnetic or not. One outer ferromagnetic film has a higher coercive force than the other and therefore remains magnetized in one sense while the other may be switched in sense by a switching magnetic field. The magneto-resistive film is therefore sensitive to the amplitude of the resultant field between the outer ferromagnetic films and may be constructed of a high resistivity, high magneto-resistive material capable of higher sensing currents. This permits higher read voltages and therefore faster read operations. Alternate embodiments with perpendicular anisotropy, and in-plane anisotropy are shown, including an embodiment which uses high permeability guides to direct the closing flux path through the magneto-resistive material. High density, high speed, radiation hard, memory matrices may be constructed from these memory elements.

A process for realizing mappings between code-words of two distinct (N,K) Reed-Solomon (RS) codes over GF(2^j) having selected two independent parameters: J, specifying the number of bits per symbol; and E(sub 1), the symbol error correction capability of the code, wherein said independent parameters J and E yield the following: N = 2^j total number of symbols per codeword; 2E, the number of symbols assigned a role of check symbols; and K-N-2E, the number of code symbols representing information, all within a codeword of an (N,K) RS code over GF(2^j), and having selected said parameters for encoding, the implementation of a decoder are governed by: 2^j field elements defined by a degree J primitive polynomial over GF(2) denoted by F(x); a code generator polynomial of degree 2E containing 2E consecutive roots of a primitive element defined by F(x); and, in a Berlekamp RS code, the basis in which the RS information and check symbols are represented. The process includes separate transformation steps for symbol-by-symbol conversion for a first RS code to ultimately a second conventional RS code capable of being corrected by a conventional RS decoder, followed by a reverse sequence of the inverse of the first set of steps to arrive at codewords having connected information symbols, at which time check symbols of the RS code may be discarded.
61 COMPUTER PROGRAMMING AND SOFTWARE

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 judgments with simple measurements and reducing them and the machine extracted features to a common metric space and fitting them by regression, the judgments of human experts rendered on a sample of patterns may be imposed on a pattern population to provide automatic classification.

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memory device (C1, C2...) in the master computer, and the memory
devices (C1, C2...) of the master computer and slave card are
electrically parallel such that information seen by the master's
memory is also seen by the slave's memory. The slave card is also
connectable to a switch for electronically removing the slave micro-
processor from the system. With the master computer and the slave
card in programming mode relationship, and the slave microproces-
sor electronically removed from the system, loading a program in the
memory devices (C1, C2...) of the master accomplishes a parallel
loading into the memory devices (S1, S2...) of the slave.

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This invention relates generally to pattern matching systems,
and more particularly to a method for dynamically adapting the
system to enhance the effectiveness of a pattern match. Apparatus
and methods for calculating the similarity between patterns are
known. There is considerable interest, however, in the storage and
retrieval of data, particularly, when the search is called or initiated by
incomplete information. For many search algorithms, a query initiat-
ing a data search requires exact information, and the data file is
searched for an exact match. Inability to find an exact match thus
results in a failure of the system or method.

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This invention relates generally to pattern matching systems,
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retrieval of data, particularly, when the search is called or initiated by
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searched for an exact match. Inability to find an exact match thus
results in a failure of the system or method.

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A capacitive proximity sensing element, backed by a reflector driven at the same voltage as and in phase with the sensor, is used to reflect the field lines away from a grounded robot arm towards an intruding object, thus dramatically increasing the sensor's range and sensitivity.

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N93-17056*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, TX.

MEASURAND TRANSIENT SIGNAL SUPPRESSOR Patent Application
RICHARD J. BOZEMAN, JR., inventor (to NASA) 2 Oct. 1992 17 p

A transient signal suppressor for use in a controls system which is adapted to respond to a change in a physical parameter whenever it crosses a predetermined threshold value in a selected direction of increasing or decreasing values with respect to the threshold value and is sustained for a selected discrete time interval is presented. The suppressor includes a sensor transducer for sensing the physical parameter and generating an electrical input signal whenever the sensed physical parameter crosses the threshold level in the selected direction. A manually operated switch is provided for adapting the suppressor to produce an output drive signal whenever the physical parameter crosses the threshold value in the selected direction of increasing or decreasing values. A time delay circuit is selectively adjustable for suppressing the transducer input signal for a preselected one of a plurality of available discrete suppression time and producing an output signal only if the input signal is sustained for a time greater than the selected suppression time. An electronic gate is coupled to receive the transducer input signal and the timer output signal and produce an output drive signal for energizing a control relay whenever the transducer input is a non-transient signal which is sustained beyond the selected time interval.

NASA


NEW KINEMATIC FUNCTIONS FOR REDUNDANCY RESOLUTION USING CONFIGURATION CONTROL Patent Application
HOMAYOUN SERAJI, inventor (to NASA) 2 Oct. 1992 54 p

The invention fulfills new goals for redundancy resolution based on manipulator dynamics and end-effector characteristics. These goals are accomplished by employing the recently developed configuration control approach. Redundancy resolution is achieved by controlling the joint inertia matrix of the end-effector mass matrix that affect the inertial torques, or by reducing the joint torques due to gravity loading and payload. The manipulator mechanical-advantage and velocity-ratio are also used as performance measures to be improved by proper utilization of redundancy. Furthermore, end-effector compliance, sensitivity, and impulsive force at impact are introduced as redundancy resolution criteria. The new goals for redundancy resolution allow a more efficient utilization of the redundant joints based on the desired task requirements.

NASA


NEURAL NETWORK TRAINING BY INTEGRATION OF ADJOINT SYSTEMS OF EQUATIONS FORWARD IN TIME Patent Application
NIKZAD TOOMARIAN, inventor (to NASA) and JACOB BARHEN, inventor (to NASA) 27 Oct. 1992 31 p

A method and apparatus for supervised neural learning of time dependent trajectories exploits the concepts of adjoint operators to enable computation of the gradient of an objective functional with respect to the various parameters of the network architecture in a highly efficient manner. Specifically, it combines the advantage of dramatic reductions in computational complexity inherent in adjoint methods with the ability to solve two adjoint systems of equations together forward in time. Not only is a large amount of computation and storage saved, but the handling of real-time applications becomes also possible. The invention has been applied to two examples of representative complexity which have recently been analyzed in the open literature and demonstrated that a circular trajectory can be learned in approximately 200 iterations compared to the 12000 reported in the literature. A figure eight trajectory was
achieved in under 500 iterations compared to 20000 previously required. The trajectories computed using our new method are much closer to the target trajectories than was reported in previous studies.
spaced plates can be utilized as high temperature structural materials for jet engines by constructing the plates from composite materials. Geometries of the plates, such as plate depth, shape, thickness, inter-plate spacing, arrangement, etc., can be selected to achieve bulk material-like behavior.

ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure, electron properties, and molecular spectra.


Atomic oxygen atoms are routed to a material through a sufficiently tortuous path so that vacuum ultraviolet radiation is obstructed from arriving at the surface of the material. However, the material surface continues to be exposed to the atomic oxygen.

OPTICS

Includes light phenomena; and optical devices.


A projected fringe interferometer for measuring the topography of an object is presented. The interferometer periodically steps the phase angle between a pair of light beams emanating from a common source. The steps are pi/2 radians (90 deg) apart, and at each step a video image of the fringes is recorded and stored. Photodetectors measure either the phase and theta of the beams or 2(theta). Either of the measures can be used to control one of the light beams so that the 90 deg theta is accurately maintained. A camera, a computer, a phase controller, and a phase modulator established closed-loop control of theta. Measuring the phase map of a flat surface establishes a calibration reference.

A spectral imaging system having an integrated filter and photodetector array is disclosed. The filter has narrow transmission bands which vary in frequency along the photodetector array. The frequency variation of the transmission bands is matched to, and aligned with, the frequency variation of a received spectral image. The filter is deposited directly on the photodetector array by a low temperature deposition process. By depositing the filter directly on the photodetector array, permanent alignment is achieved for all temperatures, spectral crosstalk is substantially eliminated, and a high signal to noise ratio is achieved.

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

A relatively small and low-cost system is provided for projecting a large and bright television image onto a screen. A miniature liquid crystal array is driven by video circuitry to produce a pattern of transparencies in the array corresponding to a television image. Light is directed against the rear surface of the array to illuminate it, while a projection lens lies in front of the array to project the image of the array onto a large screen. Grid lines in the liquid crystal array are eliminated by a spatial filter which comprises a negative of the Fourier transform of the grid.

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

An x-ray monochromator is described, wherein a housing supports a plurality of mirrors forming a plurality of opposed mirror faces in parallel with each other and having thereon multilayer coatings, with each of said pairs of mirror faces being provided with identical coatings which are different from the coatings on the other pairs of mirror faces such that each pair of mirror faces has a peak x-ray reflection at a different wavelength regime. The housing is moveable to bring into a polychromatic x-ray beam that pair of mirror faces.
having the best x-ray reflection for the desired wavelength, with the mirrors being pivotable to move the mirror faces to that angle of incidence at which the peak reflectivity of the desired wavelength x-rays occurs.

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

N93-17052* National Aeronautics and Space Administration. Langley Research Center, Hampton, VA.

AN INTERFEROMETER HAVING FUSED OPTICAL FIBERS, AND APPARATUS AND METHOD USING THE INTERFEROMETER Patent Application

An interferometer includes a first optical fiber coupled to a second optical fiber by fusing. At a fused portion, the first and second optical fibers are cut to expose respective cores. The cut or fused end of the first and second optical fibers is arranged to oppose a diaphragm or surface against which a physical phenomenon such as pressure or stress, is applied. In a first embodiment, a source light which is generally single-mode monochromatic, coherent light, is input to the first optical fiber and by evanescence, effectively crosses to the second optical fiber at the fused portion. Source light from the second optical fiber is reflected by the diaphragm or surface, and received at the second optical fiber to generate an output light which has an intensity which depends upon interference of reference light based on the source light, and the reflected light reflected from the diaphragm or surface. The intensity of the output light represents a positional relationship or displacement between the interferometer and the diaphragm or surface.

NASA

OPERATOR-TAILORED ADJUSTABLE CONTROL STATION WITH MOVABLE MONITORS AND CAMERAS FOR VIEWING SYSTEMS IN ROBOTICS AND TELEOPERATIONS Patent Application

Real-time video presentations are provided in the field of operator-supervised automation and teleoperation, particularly in control stations having movable cameras for optimal viewing of a region of interest in robotics and teleoperations for performing different types of tasks. Movable monitors to match the corresponding camera orientations (pan, tilt, and roll) are provided in order to match the coordinate systems of all the monitors to the operator internal coordinate system. Automated control of the arrangement of cameras and monitors, and of the configuration of system parameters, is provided for optimal viewing and performance of each type of task for each operator since operators have different individual characteristics. The optimal viewing arrangement and system parameter configuration is determined and stored for each operator in performing each of many types of tasks in order to aid the automation of setting up optimal arrangements and configurations for successive tasks in real time. Factors in determining what is optimal include the operator’s ability to use hand-controllers for each type of task. Robot joint locations, forces and torques are used, as well as the operator’s identity, to identify the current type of task being performed in order to call up a stored optimal viewing arrangement and system parameter configuration.

NASA
The apparatus for a near real-time stereo vision system for use with a robotic vehicle is described. The system is comprised of two cameras mounted on three-axis rotation platforms, image-processing boards, a CPU, and specialized stereo vision algorithms. Bandpass-filtered image pyramids are computed, stereo matching is performed by least-squares correlation, and confidence ranges are estimated by means of Bayes' theorem. In particular, Laplacian image pyramids are built and disparity maps are produced from the 60 x 64 level of the pyramids at rates of up to 2 seconds per image pair. The first autonomous cross-country robotic traverses (of up to 100 meters) have been achieved using the stereo vision system of the present invention with all computing done onboard the vehicle. The overall approach disclosed herein provides a unifying paradigm for practical domain-independent stereo ranging.

A strain sensor is constructed from a two mode optical fiber. When the optical fiber is surface mounted in a straight line and the object to which the optical fiber is mounted is subjected to strain within a predetermined range, the light intensity of any point at the output of the optical fiber will have a linear relationship to strain, provided the intermodal phase difference is less than 0.17 radians.

A fault-tolerant, fiber optic interconnect, or backplane, which serves as a via for data transfer between modules is presented. Fault tolerance algorithms are embedded in the backplane by dividing the backplane into a read bus and a write bus and placing a redundancy management unit (RMU) between the read bus and the write bus so that all data transmitted by the write bus is subjected to the fault tolerance algorithms before the data is passed for distribution to the read bus. The RMU provides both backplane control and fault tolerance.

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An approach to long-wave-infrared (LWIR) technology is discussed. The approach is based on molecular beam epitaxy (MBE) growth of hole immobilized doping superlattices in narrow band gap 3-5 semiconductors, specifically, InAs and InSb. Such superlattices are incorporated into detector structures suitable for focal plane arrays. An LWIR detector that has high detectivity performance to wavelengths of about 16 microns at operating temperatures of 65K, where long-duration space refrigeration is plausible, is presented.

Accordingly, there is a need for a new improved nucleation process in space. Crystals are nucleated by creating a small localized region of high relative supersaturation in a host solution at a lower degree of supersaturation.

Official Gazette of the U.S. Patent and Trademark Office
A method for controlling the crystallization of protein by solvent evaporation including placing a drop of protein solution between and in contact with a pair of parallel plates and driving one of the plates toward and away from the other plate in a controlled manner to adjust the spacing between the plates is presented. The drop of solution forms a liquid cylinder having a height dependent upon the plate spacing thereby effecting the surface area available for solvent evaporation. When the spacing is close, evaporation is slow. Evaporation is increased by increasing the spacing between the plates until the breaking point of the liquid cylinder. One plate is mounted upon a fixed post while the other plate is carried by a receptacle movable relative to the post and driven by a belt driven screw drive. The temperature and humidity of the drop of protein solution are controlled by sealing the drop within the receptacle and mounting a heater and dessicant within the receptacle.

A method for the controlled growth of single-crystal semiconductor-device-quality films of SiC polytypes on vicinal (0001) SiC wafers with low tilt angles is presented. Both homoepitaxial and heteroepitaxial SiC films can be produced on the same wafer. In particular, 3C-SiC and 6H-SiC films can be produced within selected areas of the same 6H-SiC wafer.
PUBLIC AVAILABILITY OF COPIES OF PATENTS AND PATENT APPLICATIONS

Copies of U.S. patents may be purchased directly from the U.S. Patent and Trademark Office, Washington, D.C. 20231 at $1.50 per copy. When ordering patents, the U.S. Patent Number should be used, and payment must be remitted in advance, preferably by money order or check payable to the Commissioner of Patents and Trademarks. Prepaid purchase coupons for ordering are also available from the Patent and Trademark Office.

NASA patent application specifications are sold in paper copy and microfiche by the NASA Center for AeroSpace Information (CASI). The N accession number should be used in ordering either paper copy or microfiche from CASI.

LICENSES FOR COMMERCIAL USE: INQUIRIES AND APPLICATIONS FOR LICENSE

NASA inventions, abstracted in NASA PAB, are available for nonexclusive or exclusive licensing in accordance 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 NASA Center for AeroSpace Information on standing order subscription. Standing order subscriptions do not terminate at the end of a year, as do regular subscriptions, but continue indefinitely unless specifically terminated by the subscriber.
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SUMMARY: The National Aeronautics and Space Administration (NASA) is revising its patent licensing regulations to conform with Pub. L. 96-517. This interim regulation provides policies and procedures applicable to the licensing of federally owned inventions in the custody of the National Aeronautics and Space Administration, and implements Pub. L. 96-517. The object of this subpart is to use the patent system to promote the utilization of inventions arising from NASA supported research and development.

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

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

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

SUPPLEMENTARY INFORMATION:

PART 1245—PATENTS AND OTHER INTELLECTUAL PROPERTY RIGHTS

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

Subpart 2—Licensing of NASA Inventions

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

Restrictions and Conditions
1245.204 All licenses granted under this subpart.

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

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

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

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

(d) "Small business firm" means a small business concern as defined at section 2 of Pub. L. 85-536 (15 U.S.C. 632) and implementing regulations of the Administrator of the Small Business Administration. For the purpose of these regulations, the size standard for small business concerns involved in Government procurement, contained in 13 CFR 121.3-8, and in subcontracting, contained in 13 CFR 121.3-12, will be used.

(e) "Practical application" means to manufacture in the case of a composition or product, or 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.
PATENT LICENSING REGULATIONS

(6) The license shall require the licensee to report periodically on the utilization or efforts at obtaining utilization that are being made by the licensee, with particular reference to the plan submitted.

(7) All licenses shall normally require royalties or other consideration.

(8) Where an agreement is obtained pursuant to § 1245.204(a)(2) that any products embodying the invention or produced through use of the invention will be manufactured substantially in the United States, the license shall recite such agreement.

(9) The license shall provide for the right of NASA to terminate the license, in whole or in part, if:

(i) NASA determines that the licensee is not executing the plan submitted with its request for a license and the licensee cannot otherwise demonstrate to the satisfaction of NASA that it has taken or can be expected to take within a reasonable time effective steps to achieve practical application of the invention;

(ii) NASA determines that such action is necessary to meet requirements for public use specified by Federal regulations issued after the date of the license and such requirements are not reasonably satisfied by the licensee;

(iii) The licensee has willfully made a false statement of or willfully omitted a material fact in the license application or in any report required by the license agreement; or

(iv) The licensee commits a substantial breach of a covenant or agreement contained in the license.

(10) The license may be modified or terminated, consistent with this subpart, upon mutual agreement of NASA and the licensee.

(11) Nothing relating to the grant of a license, nor the grant itself, shall be construed to confer upon any person any immunity from or defenses under the antitrust laws or from a charge of patent misuse, and the acquisition and use of rights pursuant to this subpart shall not be immunized from the operation of state or Federal law by reason of the source of the grant.

Types of Licenses

§ 1245.205 Nonexclusive licenses.

(a) Availability of licenses. Nonexclusive licenses may be granted under NASA inventions without publication of availability or notice of a prospective license.

(b) Conditions. In addition to the provisions of § 1245.204, the nonexclusive license may also provide that, after termination of a period specified in the license agreement, NASA may restrict the license to the fields of use or geographic areas, or both, in which the licensee has brought the invention to practical application and continues to make the benefits of the invention reasonably accessible to the public. However, such restriction shall be made only in order to grant an exclusive or partially exclusive license in accordance with this subpart.

§ 1245.206 Exclusive and partially exclusive licenses.

(a) Domestic licenses.

(1) Availability of licenses. Exclusive or partially exclusive licenses may be granted on NASA inventions covered by a foreign patent, patent application, or other statutes, as determined appropriate in the public interest.

(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 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.

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

(iii) The license may grant the licensee the right of enforcement of the licensed patent pursuant to the provisions of Chapter 29 of Title 35, United States Code, or other statutes, as determined appropriate in the public interest.

(b) Foreign licenses.

(1) Availability of licenses. Exclusive or partially exclusive licenses may be granted on a NASA invention covered by a foreign patent, patent application, or other form of protection, provided that:

(i) Notice of a prospective license, identifying the invention and prospective licensee, has been published in the Federal Register, providing opportunity for filing written objections within a 60-day period and following consideration of such objections;

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

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

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

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

(ii) The license may 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.

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;
of intention to modify or terminate the license, and the licensee and any sublicen-

§ 1245.211 Appeals.

(a) The following parties may appeal to the NASA Administrator or designee

(b) Written notice of appeal must be filed within 30 days (or such other time

§ 1245.212 Protection and administration of inventions.

NASA may take any suitable and necessary steps to protect and administer

§ 1245.213 Transfer of custody.

NASA having custody of certain Federally owned inventions may transfer cus-

§ 1245.214 Confidentiality of information.

Title 35, United States Code, section 209, provides that any plan submitted

James M. Beggs,

Administrator.

October 15, 1981.

BILLING CODE 7510-01-M

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

(3) A person who timely filed a written objection in response to the notice

(b) When notice of a prospective exclusive or partially exclusive license is

(c) If the requested license, including any negotiated modifications, is denied

(d) In addition to, or in lieu of requesting reconsideration, the applicant may

§ 1245.211 Appeals.

(a) The following parties may appeal to the NASA Administrator or designee

any decision or determination concerning the grant, denial, interpretation, mod-

ture any products embodying the invention and geographic areas where appli-

cant intends to use or sell the invention, or both;

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

(3) A person who timely filed a written objection in response to the notice

(1) A statement of the time, nature and amount of anticipated investment of

(2) A statement as to applicant's capability and intention to fulfill the plan,

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

(4) A statement of the geographic areas in which applicant intends to manufac-

(e) Nature and type of applicant's business, identifying products or services

which the applicant has successfully commercialized, and approximate number

of applicant's employees;

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

(g) A statement indicating whether applicant is a small business firm as defined

in § 1245.202(c);

(h) A detailed description of applicant's plan for development or marketing of

the invention, or both, which should include:

(1) A statement of the time, nature and amount of anticipated investment of

capital and other resources which applicant believes will be required to bring

the invention to practical application;

(2) A statement as to applicant's capability and intention to fulfill the plan,

including information regarding manufacturing, marketing, financial, and techni-

cal resources;

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

invention, or both;

(4) A detailed description of applicant's plan for development or marketing of

the invention to practical application;

(5) Identification of applicants' best knowledge of the extent to which

the invention is being practiced by private industry or Government, or both, or

is otherwise available commercially;

(6) Any other information which applicant believes will support a determination

to grant the license to applicant.

§ 1245.208 Processing applications.

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

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

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

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

§ 1245.209 Notice to Attorney General.

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

§ 1245.210 Modification and termination of licenses.

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

§ 1245.211 Appeals.

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

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

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

(3) A person who timely filed a written objection in response to the notice
required by §§ 1245.206(a)(1)(iii)(A) or 1245.206(b)(1)(i) and who can demon-
strate 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 any additional 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 shall 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 Adminis-
trator 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 cus-
tody 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
maintained 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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