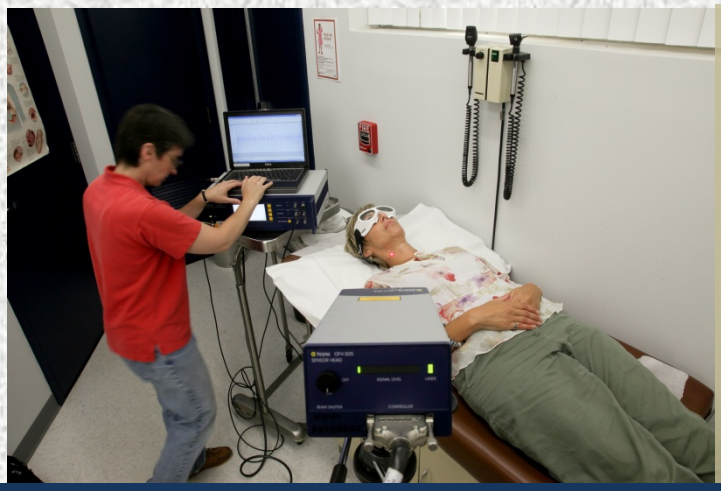

2012

NUWC Division Newport Commercialization Opportunities

NAVSEA
NEWPORT
Undersea Warfare Center Division

TPO
TECHNOLOGY PARTNERSHIPS OFFICE

Technology Partnerships Office
Naval Undersea Warfare Center Division Newport
Newport, RI 02841-1707

About NUWC Division Newport

Division Newport, one of the two divisions of the Naval Undersea Warfare Center, is the Navy's full-spectrum research, development, test and evaluation (RDT&E) engineering, and Fleet support center for submarine warfare systems and many other systems associated with the undersea battlespace. Newport Division provides the technical foundation that enables the conceptualization, research, development, fielding, modernization, and maintenance of systems that ensure our Navy's undersea superiority.

NUWC Division Newport is responsible, cradle to grave, for all aspects of the systems under its charter, and is engaged in efforts ranging from participation in fundamental research to the support of evolving operational capabilities in the Fleet. The major thrust of NUWC Division Newport's activities is in applied research and system development. With headquarters in Rhode Island, NUWC Division Newport operates detachments at West Palm Beach, Florida, and Andros Island in the Bahamas. Remote test facilities are located at Seneca Lake and Fisher's Island in New York, and Dodge pond, Connecticut.

NUWC Division Newport is a shore command of the U.S. Navy under the Naval Sea Systems Command (NAVSEA) WFC Enterprise, which engineers, builds, and supports America's Fleet of ships and combat systems. NAVSEA's world-class team of professionals provide virtual support anywhere and anytime to ensure that the Fleet remains ready and capable- operating around the globe and Keeping America's Navy #1 in the World.

Mission

Provide research, development, test and evaluation, engineering, analysis and assessment, and fleet support capabilities for submarines, autonomous underwater systems, and offensive and defensive undersea weapon systems, and stewards existing and emerging technologies in support of undersea warfare. Execute other responsibilities as assigned by the Commander, Naval Undersea Warfare Center.

Vision

Undersea Superiority: Today and tomorrow

Unique Facilities and Capabilities

- Acoustic Wind Tunnel
- Anechoic Chamber
- Combat Systems Evaluation & Analysis Laboratory
- Launcher Laboratory
- Narragansett Bay Shallow Water Test Facility
- Over-water Arch facility
- Propulsion Test Facility
- Quiet Water Tunnel
- Submarine Towed and Deployed Systems RDT&E Complex
- Survivability Test Facility
- Acoustic Pressure Tank
- Seneca Lake Acoustic Measurement Facility
- Undersea Warfare Analysis Laboratory

Scientific and Technical Disciplines

- Acoustic Devices
- Undersea Surveillance
- Autonomous Vehicles
- Undersea Range Management and Technology
- Underwater Acoustics
- Electronic Communications and Antenna Systems
- Periscopes and Imaging
- Environmental Assessment
- Distributed Networked Systems
- Underwater Sensing
- Modeling and Simulation

PARTNERING AND TECHNOLOGY TRANSFER

NUWC Division Newport has long been a proponent of technical partnering and technology transfer opportunities. A world leader in undersea technology, NUWC Division Newport's scientists and engineers are renowned for their expertise in acoustics, signal processing, undersea vehicles, information processing, transduction materials, electromagnetic, and hydrodynamics. The outstanding technical staff is backed by modern, state-of-the-art research and testing facilities and unique modeling and simulation capabilities- all of which are available to industry and academia for research and development.

OPPORTUNITES FOR PARTNERING

CRADA

A Cooperative Research and Development Agreement (CRADA) allows cooperative R&D and sharing of resources and intellectual property with a non-Federal entity. A CRADA enables both parties to conduct joint research and development in a specific technical area and share in the technical results.

Patent License

It is the policy of the Federal Government to promote the utilization and commercialization of inventions that are produced through agency-sponsored research. A Patent License allows licensees to make, use, and sell a device or process patented by NUWC.

EPA

An Educational Partnership Agreement (EPA) encourages study in science, engineering and mathematics through collaboration and sharing of resources with educational institutions.

BAA

The Broad Agency Announcement (BAA) in Science and Technology focuses on cooperative research for innovative R&D technological initiatives and solutions.

WFPP

Works for Private Parties (WFPP) agreements allow private sector access to unique capabilities and equipment that are not available commercially.

SBIR

A Small Business Innovation Research (SBIR) project works to develop innovative, dual-use technology to meet both federal and commercial needs, Open to small businesses.

CONTACT US

Technology Partnerships Office (Code 07TP)
Naval Undersea Warfare Center Division Newport
1176 Howell St.
Newport, RI 02841-1708

Phone: (401) 832-8728

Email: NUWC_NPT_TPEO@navy.mil

Patent Number: 7101808 Issue Date: 9/5/2006

Title: CHROMATE-FREE METHOD FOR SURFACE TECHING OF STAINLESS STEEL

Abstract: Non-chromate solutions for treating and/or etching metals, particularly, aluminum, aluminum alloys, steel and titanium, and method of applying same wherein the solutions include either a titanate or titanium dioxide as a "drop-in replacement" for a chromium-containing compound in a metal surface etching solution that otherwise would contain chromium.

Patent Number: 7106269 Issue Date: 9/12/2006

Title: OMNI-AZIMUTHAL PATTERN GENERATOR FOR VLF AND LF COMMUNICATION

Abstract: A relative phase shift is induced in the signals of a pair of identical orthogonal antennas such that when the signals are combined the signals are 90 degrees out of phase. This is done in order to eliminate the null along the axis between the two dipole moments of the antennas such that the system has equally good reception from all azimuth angles over a broad range of frequencies. The phase shift is accomplished with the use of single pole operational amplifier circuits whose pole frequencies are adjusted by means of a potentiometer prior to implementation of the antenna system.

Patent Number: 7106658 Issue Date: 9/12/2006

Title: NAVIGATION SYSTEM AND METHOD USING DIRECTIONAL SENSOR

Abstract: An apparatus for determining a position includes a source which transmits a signal having a source position and a transmission time coded therein. A sensor having a directional beam pattern is positioned at the location of interest. A signal processor steers the directional beam pattern of the sensor in order to determine the direction to the signal source. A sensor processor uses a clock to find a receipt time of the signal. The transmission time and source position is decoded from the signal. The position of interest is calculated from the receipt time, transmission time, direction, and source position. A method is also provided.

Patent Number: 7111577 Issue Date: 9/26/2006

Title: ELECTROMAGNETIC WAVE PROPAGATION SCHEME

Abstract: An apparatus for effecting propagation of electromagnetic waves, comprising a hull outer surface, a dielectric material disposed over the hull outer surface, and an electrically conductive member embedded within the dielectric material. When a liquid medium contacts the dielectric material, the liquid medium, the hull outer surface, the dielectric material and the electrically conductive member cooperate to provide a waveguide through which electromagnetic waves can propagate wherein the boundaries of the waveguide are defined by the liquid medium and the hull outer surface. A sensor network can be provided within the dielectric material for receiving power and transmitting information.

Patent Number: 7120088 Issue Date: 10/10/2006

Title: ARRAY SYSTEM FOR SUPERCAVITATING HYDROFOILS

Abstract: A sonar system includes a forward looking array which is embedded in a cavitator for generating a gaseous cavity which minimizes hydrodynamic noise resulting from turbulent pressure fluctuations. A marine vessel incorporating the sonar system includes a hull, a hydrofoil suspended beneath the hull by a strut, and a cavitator for generating a laminar flow over the hydrofoil and for creating a cavity for eliminating turbulent flow contact. The cavitator is located at a leading edge area of the hydrofoil. The sonar array is embedded into the cavitator.

Patent Number: 7123544 Issue Date: 10/17/2006

Title: ASSEMBLY AND METHOD FOR DETERMINING SPEED OF A SUPERCAVITATING UNDERWATER VEHICLE

Abstract: An assembly for determining speed of a supercavitating underwater vehicle during underwater travel includes a fin mounted on the vehicle aft of a cavitator portion of the vehicle and adapted to be extended outwardly beyond a hull of the vehicle and through a boundary of a gas-filled cavity around the vehicle to form a disturbance in the cavity boundary, which disturbance propagates along the boundary. An acoustic transmitter is mounted on the vehicle and directs acoustic energy toward the boundary and the disturbance. An acoustic receiver is mounted on the vehicle and receives acoustic energy reflected off the disturbance. An autopilot is mounted on the vehicle and clocks times of projection of the fin and acoustic transmission receptions of reflected acoustic energy to determine the speed of the vehicle through the water.

Patent Number: 7125298 Issue Date: 10/24/2006

Title: MAN OVERBOARD BEACON

Abstract: A user-worn man overboard beacon that provides multiple indication means to alert a ship to an overboard crew person and to assist in locating the crew person. The beacon device is contained in a housing attached to the clothing of the sailor and is activated upon contact with seawater. A battery powers the multiple indicators contained in the housing, which include a high intensity strobe light to provide a visual indication, an x-band radar patch antenna to transmit a radar signal indication that can be detected by the ship's radar system, and an acoustic transducer to project an acoustic signal indication that can be detected by the ship's sonar system.

Patent Number: 7126876 Issue Date: 10/24/2006

Title: HARMONIC AMBIGUITY RESOLVER AND INTER-ARRAY TRACKER

Abstract: The present application discloses a method for resolving harmonic ambiguity and inter-array harmonic tracking. The method allows derivation of a complete set of possible harmonic families given the selection (by an operator) or automatic detection (by an automated algorithm) of a single tone

(f.sub.selected) from a frequency spectrum using a novel "ambiguity matrix" approach in which a matrix of all N possible harmonic members and M hypothetical fundamentals is constructed. The ambiguity matrix provides an image of all possible harmonic families associated with a selected tone. The selection of the correct fundamental is then made based on simple comparisons between this image and the set of all possible fundamentals. The ambiguity matrix effectively provides a reduced finite solution space (discrete set of possibilities) in which to unambiguously estimate the correct fundamental.

Patent Number: 7128013 Issue Date: 10/31/2006

Title: LAUNCH TUBE SYSTEM HAVING INFLATABLE BLADDER SHOCK ISOLATION

Abstract: A launch tube system has two concentric sleeves. An inner sleeve having holes formed therethrough defines a launch tube, and an outer sleeve surrounds the inner sleeve and is spaced apart therefrom. One or more flexible bladders are disposed between the inner outer sleeves. When filled with fluid, the flexible bladder(s) expands and extends into and through the holes and into confines of the inner sleeve to thereby form shock isolation for a projectile housed in the inner sleeve.

Patent Number: 7128714 Issue Date: 10/31/2006

Title: NON-CONTACT WAVEFORM MONITOR

Abstract: A non-contact method and apparatus for continuously monitoring a physiological event in a human or animal, such as blood pressure, which involves utilizing a laser-based interferometer system to produce a waveform that is representative of continuous blood pressure in a subject. The invention may preferably utilize a laser Doppler vibrometer which is oriented to produce a laser beam directed toward the subject substantially perpendicular to a skin surface of the subject wherein the skin surface is moveable in response to blood pressure. The vibrometer is sensitive to motion of the skin surface in a direction parallel to the laser beam and produces a signal representative of this motion. By plotting the velocity of the skin surface movement in the direction parallel to the laser beam with respect to time, a waveform is produced that has been found to be representative of the blood pressure waveform and highly defined to thereby permit accurate timing analysis thereof relating to cardiac cycles.

Patent Number: 7130242 Issue Date: 10/31/2006

Title: SYSTEM AND METHOD FOR DETECTING AN ACOUSTIC SIGNAL IN THE PRESENCE OF FLOW NOISE

Abstract: A system and method are provided for detecting an acoustic signal in the presence of flow noise produced by the turbulent flow field that develops about a hosewall of a towed array. Pressure is sensed with pressure sensors at two diametrically-opposed locations at the surface of the hosewall over a period of time. The sensed pressure signals are used to generate an ensemble-averaged cross-spectra which effectively cancels out the flow noise while retaining the acoustic signal associated with a possible target of interest.

Patent Number: 7139221 Issue Date: 11/21/2006

Title: SUBMARINE CLOSE ENCOUNTERS AVOIDANCE SYSTEM AND METHOD

Abstract: A system for close range sonar is provided. The system provides sufficient warning to permit maneuvering to avoid a close encounter even in the forward starboard/port regions, which have been problematic in the past due to ownship noise. The system utilizes a hull mounted sonar array and a towed sonar array which may be controlled in position to provide sufficient separation of noise received by both sonar arrays such that the noise is largely uncorrelated. The system utilizes beamformers for each array to supply a cross-correlator section which is able to minimize the ownship noise and maximize the signal thereby providing more time for maneuvering. The system also provides a LOFAR display and other displays that are highly sensitive to detecting close encounters.

Patent Number: 7139741 Issue Date: 11/21/2006

Title: A MULTI-OBJECTIVE OPTIMIZATION METHOD

Abstract: A mathematical programming method in which a common decision space is defined by identifying decision variables, and a set of objective functions is developed as piecewise defined functions. Each objective function is dependent on at least one of the decision variables and corresponds to a goal. The objective function has a plurality of pieces, such that the objective function has only one piece for each combination of decision variables. A value function is developed in additive preference form based on weights and the objective functions. The value function is optimized by searching through the decision variable values to find the values of the decision variables that maximize the developed value function. An action dictated by the decision variable values can then be executed.

Patent Number: 7141150 Issue Date: 11/28/2006

Title: METHOD AND TEST CHAMBER FOR ACCELERATED AGING OF MATERIALS AND BONDS SUBJECT TO CORROSION RELATED DEGRADATION

Abstract: A method and test apparatus for carrying out testing on a variety of samples of polymer bonded to metal wherein the samples are subjected to an accelerated cathodic reaction causing cathodic delamination of the samples. In particular, the method and test apparatus include a closed vessel that is partially filled with synthetic ocean water. An impressed current system is employed to protect the metal component of the samples. The synthetic ocean water is heated with an external band heater raising the temperature of the synthetic ocean water to thermal levels exceeding normal ocean temperatures in order to accelerate the reaction. Pure oxygen is then introduced into the closed vessel at a desired pressure to dissolve the oxygen into the synthetic ocean water to further simulate natural ocean conditions.

Patent Number: 7150200 Issue Date: 12/19/2006

Title: MINIATURE AXISYMMETRIC STREAMLINE TENSILE (MAST) SPECIMEN

Abstract: A miniature axisymmetric streamline tensile (MAST) specimen having improved axisymmetric surface profile design and surface stress concentration factor (SSCF) improvements, i.e., close to unity is

described. The MAST specimen also has improved variable curvature transition fillets, miniaturized profile dimension and shoulder region features used in conjunction with the collet loading method. An axisymmetric, rather than flat, design is preferred since no stress gradients exist in the hoop direction, i.e., circumferential direction, of the specimen. The MAST specimen is designed to permit various loading options. The MAST specimen 10 may be used for testing any suitable material including, but not limited to, metals, plastics and ceramics.

Patent Number: 7150434 Issue Date: 12/19/2006

Title: MODIFICATION OF VEHICLE WAKE VORTICES

Abstract: Wake vortices are made less detectable or reduced in their effect on nearby vehicles by re-orientation of vorticity about an axis in the direction of vehicle motion to transverse vorticity interacting with the longitudinal vorticity. The re-orientation may be by a flapping foil, and arrangements of a plurality of foils moving toward or from each other may be used. Alternatively, fluid may be injected longitudinally between opposite surfaces each having a port so that selective suction through the ports alternately attaches the fluid to the surfaces to deflect the fluid from the longitudinal direction and generate transverse vortices. Oppositely rotating vortices may be formed by separators extendable from each surface to engage the deflected fluid, and extension of the separators may be varied to control vortex trajectory. The transverse vortices may be intermittent, selected for speed, or made asymmetric for maneuvering.

Patent Number: 7159501 Issue Date: 1/9/2007

Title: STACKABLE IN-LINE SURFACE MISSILE LAUNCH SYSTEM FOR A MODULAR PAYLOAD BAY

Abstract: An underwater missile launch system includes one or more missile loading modules for supporting a plurality of missiles in a stackable, in-line configuration within a pressure vessel. The missiles are arranged inside the modules, which may be stacked in groups inside a single pressure vessel, or payload bay. Each module is preferably substantially identical including a common size, shape, and payload of missiles in common with the module above and below it. A one-way positioning latch is provided that prevents the upper missiles from dropping down on top of the lower missiles, while allowing the lower missiles to later pass up through the same launch tube as the upper missiles, after the upper missiles have been ejected.

Patent Number: 7170821 Issue Date: 1/30/2007

Title: DISPLACEMENT CURRENT METHOD AND APPARATUS FOR REMOTE POWERING OF A SENSOR GRID

Abstract: This invention serves as a method and apparatus for delivering power to a series of remote sensors in an on hull sensor grid for the purpose of biasing the active circuitry on the sensors. It requires no physical connection between the source of power and the sensor. It works by delivering electrical energy across the insulating gap that separates the sensor from the hull by means of a displacement current. In particular, the method and device include a conducting layer interposed between inner and

outer decouplers and a ground plane interposed between a bonding layer and the inner decoupler. An application of alternating current to the ground plane will activate the conducting layer and provide power to the sensors at a location of the outer decoupler. The inner decoupler acts as a capacitor and the ground plane further provides an electrical path back to the hull.

Patent Number: 7177232 Issue Date: 2/13/2007

Title: WIRELESS RADIO FREQUENCY HYDROPHONE SYSTEM

Abstract: A wireless hydrophone system includes a hydrophone joined to a preamplifier. A serial A/D converter receives the amplified hydrophone signal and provides a serial digital output representative of the signal. The A/D converter is joined to a processor which provides a start signal and a clock signal to the A/D converter. A digital transmitter is also controlled by the processor. The transmitter receives the serial digital output from the A/D converter for wireless transmission over an antenna. The system can also include logic for allowing the processor to provide an extended sync signal for transmission. The extended sync signal can alert a receiver to an initial transmission. The system can be incorporated in a hull treatment for positioning on a vessel's hull.

Patent Number: 7180416 Issue Date: 2/20/2007

Title: TIME KEYED INFORMATION TRANSMISSION

Abstract: A method and apparatus is described for enabling a single sensor to indicate a greater quantity of information about a sensed event, or the occurrence of many different types of events. A sensor system employs a number of individual sensors with single-use indication means (such as an explosive charge). Each individual sensor is equipped with a chronometer. The sensors are programmed to transmit information through their single-use indication means at specific times with each specific time being indicative of a particular type of event or of specific information about an event. A central monitor chronologically records all sensor indications and compares indication times to a schedule of time keyed information to determine the nature of each sensor indication.

Patent Number: 7195841 Issue Date: 3/27/2007

Title: A SYSTEM AND METHOD OF SOLID STORAGE AND DISSOLUTION OF A CATHOLYTE FOR FOR USE IN ELECTROCHEMICAL CELL

Abstract: A system and a method of storage and dissolution of solid catholyte are provided. The system and the method employ a solid medium having a controlled surface from which solid catholyte particles suspended within a matrix of encapsulating species are dissolved and hydrolyzed producing hydrogen peroxide to be used in semi fuel cells of undersea vehicles. Encapsulating species are also dissolved and hydrolyzed rendering products completely usable in the semi fuel cell. Sodium peroxide is preferably used as the solid catholyte and potassium superoxide and/or sodium hydroxide are preferably used as encapsulating species.

Patent Number: 7204160 Issue Date: 4/17/2007

Title: BIAXIAL AND SHEAR TESTING APPARATUS WITH FORCE CONTROLS

Abstract: A testing apparatus having four-bar linkages pivotable to sleeves on opposite vertices with the sleeves of each vertex rotationally attached to each other. Links of each linkage are pivotally attached to loading plate assemblies securing a test specimen. During loading, the assemblies move toward or away from each other; thereby, applying compression or tension to the specimen. A pressure system fluidly impacts opposite faces of a piston of the assembly such that one of the faces is pressurized and impacts arms of the assembly for a sliding motion to move toward or away from the longitudinal axis of the apparatus thereby, applying a compression or tensile load on the specimen or augmenting the loads applied by the movement of the loading plate assemblies. The pressure system includes a controller connected to a reservoir, a pressurized source, a plurality of shutoff valves and pressure-adjustable check valves.

Patent Number: 7205043 Issue Date: 4/17/2007

Title: PRESSURE RESISTANT ANECHOIC COATING FOR UNDERSEA PLATFORMS

Abstract: A composite material containing inclusions of spherical shells in which each spherical shell encapsulates a rubber core with ferrite loading. The inclusions are embedded in a matrix material of syntactic foam. The spherical shells are made from glass and therefore acoustically transparent and in combination with the cores are statically stiffer than the surrounding matrix material. The composite material with the matrix material and inclusions allows the composite material to be acoustically dissipating with a stiffness in which the energy of forces associated with undersea platforms is resisted.

Patent Number: 7206257 Issue Date: 4/17/2007

Title: ACOUSTIC REMOTE CAVITATION AS A DESTRUCTION DEVICE

Abstract: A method is disclosed of generating a predetermined field of cavitation around a remote target in an underwater environment. The method includes the steps of identifying a remote target location, generating at least two acoustic beams, each at a high power output, from an underwater acoustic source, and controlling the generated acoustic beams to intersect with each other at the remote target location and thereby create a destructive cavitation field at the intersection of the beams. The acoustic source and target can be located in unconfined underwater space and at a distance of at least 100 m apart.

Patent Number: 7207725 Issue Date: 4/24/2007

Title: OPTICAL FIBER COUPLER

Abstract: Optical fiber coupler for coupling fiber optic elements includes a first fiber optic element extending in a first direction to position a free end thereof in a selected zone, and a second fiber optic element extending into the selected zone from an opposite direction to position a free end of the

second fiber optic element in the zone confronting the first fiber optic element free end. A cured optical grade epoxy resin body defines the zone and envelopes the free ends of the fiber optic elements, to effect physical and optical connection between the first and second fiber optic elements. Once cured, the housing material is removed leaving the completed coupler device. The free ends of the fiber optic elements are in close proximity, or in the case of coupling from one strand to a plurality of strands, in enough of a spaced relation, to permit required light diffusion.

Patent Number: 7212652 Issue Date: 5/1/2007

Title: A METHOD FOR TRACKING TARGETS WITH HYPER-SPECTRAL DATA

Abstract: In the present invention, the histogram model used in H-PMHT is extended to treat the problem of tracking using hyper-spectral data. Completely general spectral density functions are handled via the use of non-parametric methods. The present invention is not restricted to derivations based on knowledge of the spectral character of the source being tracked. The source spectrum can be estimated in a non-parametric fashion based on an initial track, and this allows the invention to adapt to the source spectrum in situ. The resulting method has improved crossing track performance on sources that have some degree of spectral distinction and will perform no worse than regular H-PMHT on sources that have identical spectral densities.

Patent Number: 7226325 Issue Date: 6/5/2007

Title: A DEVICE FOR STABILIZING RE-ENTRANT CAVITY FLOW PAST HIGH-SPEED UNDERWATER VEHICLES

Abstract: A stabilizing device for a supercavitating vehicle that isolates re-entrant jet flows of liquid from its cavity. The device has a receiving means positioned on the supercavitating vehicle where the re-entrant jet flow impinges on the supercavitating vehicle. An exit means is joined to the receiving means for carrying the received re-entrant jet flow out of interference with the cavity. The exit means includes an exhaust nozzle joined to the aft of the supercavitating vehicle and a re-entrant jet nozzle positioned in communication between the receiving means and said exhaust nozzle transferring said received re-entrant jet flow into the exhaust nozzle. This stabilizes the cavity and improves controllability and maneuverability of the supercavitating vehicles while also reducing the gas ventilation required to maintain the cavity. Furthermore, this reduces self-generated noise allowing improved operation of acoustical sensors incorporated in the vehicle.

Patent Number: 7236252 Issue Date: 6/26/2007

Title: A SYSTEM AND APPARATUS FOR MEASURING DISPLACEMENTS IN ELECTRO- ACTIVE MATERIALS

Abstract: A device designed to apply uniaxial pressure to the surface of an electro-active material while simultaneously applying a current to the material under controlled temperature conditions and then measuring the displacement of the material by means of a laser interferometer. The device involves a housing with a chamber in which a sample of material is secured. The chamber has an aperture with a quartz window that allows the laser beam from the interferometer to pass. The sample is connected to

electrodes and the chamber is filled with dielectric oil that applies the uniaxial pressure to one side of the sample. The device is placed onto a thermal control system. When the appropriate thermal and pressure conditions are established, current is applied to the sample and the interferometer measures the displacement.

Patent Number: 7249711 Issue Date: 7/31/2007

Title: A LOW-POWER REMOTELY READABLE SENSOR

Abstract: A plurality of remotely readable sensor apparatus and reader systems for collecting data frames from all apparatus within the reader field of view. Each sensor apparatus converts one or more environmental observable into information signals, converts the information signals into digital data and appends other discriminating digital data as desired to form a digital data frame. The state of a diode, connected to an antenna with the digital data frame, is modulated and a timing apparatus controls the digital-data-frame start times. The modulated states of the diode connected to a sensor-apparatus antenna are chosen so the angle of the antenna reflection coefficient is modulated between two values separated by approximately 180 degrees, so a carrier signal received by the antenna effects a bi-phase modulated signal containing the digital data frame that is reflected by the sensor-apparatus antenna toward the reader receiver antenna.

Patent Number: 7250568 Issue Date: 7/31/2007

Title: UNDERWATER VEHICLE DECELLERATION AND POSITIVE BUOYANCY ASSEMBLY

Abstract: An assembly for vehicle deceleration and buoyancy comprises a pair of doors enclosing flotation bags inflatable for buoyant recovery of the torpedo. In operation, the doors are controllably forced open to an initial angle off a longitudinal axis of the assembly to a fully-deployed position by hydrodynamic forces of the movement of the vehicle. From the doors blocking the hydrodynamic forces, the vehicle decelerates. The hydrodynamic braking action of the doors reduces the time required to reach terminal velocity, thus reducing the depth the vehicle sinks and enabling recovery with less gas required for inflation.

Patent Number: 7251196 Issue Date: 7/31/2007

Title: PASSIVE OPTICAL DETECTION OF UNDERWATER SOUND

Abstract: A passive acoustic sensor that may be employed to detect sounds emanating from under the surface of a body of water. The sensor uses optics to determine vibration on the surface of a water body to detect sound pressure waves from underwater sound sources. The sensor is deployed above the surface and has no direct interaction with anything under the surface that may be emanating sounds. This allows the invention to operate without interfering with potential sound sources as well as allows for numerous deployment methods.

Patent Number: 7257048 Issue Date: 8/17/2007

Title: COUNTERMEASURE SYSTEM AND METHOD TO EMULATE TARGET WITH SPATIAL EXTENT

Abstract: An acoustic countermeasure system comprises a plurality of individual countermeasure devices which act in concert to emulate a target with spatial extent. The individual countermeasure devices may be programmed to navigate into predetermined positions within a preset pattern with spatial characteristics similar to that of a target of interest, e.g., a submarine. The individual countermeasure devices are programmed to produce acoustic signals, such as in response to a ping or pulse by an incoming torpedo that collectively appears to be an echo similar to that which would come from a target having spatial extent.

Patent Number: 7259637 Issue Date: 8/21/2007

Title: ACCUMULATED ERROR THRESHOLDING (AET): METHODOLOGY FOR THE CREATION OF A PRECISION TIME-BASE THROUGH THE USE OF PROGRAMMABLE CONT

Abstract: An apparatus provides a correction value for an oscillator. At least one parameter sensor measures a system parameter influencing the oscillator. A lookup table determines a cycle adjustment value based on the system parameter. A processor joined to the oscillator implements the cycle adjustment value to correct for oscillator variation. Cycle adjustment values can be computed in both whole cycles and partial cycles through accumulated error thresholding. The parameter sensor can be a temperature sensor, a voltage sensor or both kinds of sensors. The lookup table and processor can have additional terms to account for hysteresis in the oscillator.

Patent Number: 7259864 Issue Date: 8/21/2007

Title: OPTICAL UNDERWATER ACOUSTIC SENSOR

Abstract: An acoustic sensor used in underwater applications. The sensor includes a reflective material adhered to a structure, such as an outer submarine hull or any marine vessel hull. A laser interferometer is placed on the side of the structure with the reflective material. The laser interferometer sends a plurality of laser beams, in sequence or all at one time, to a plurality of points across the retro-reflective material. The laser beams reflect back to the interferometer, which captures the reflected beams using receiving optics. The phase modulation of the reflected laser beams is compared to a reference laser beam within the interferometer to obtain the vibration velocity characteristics of the hull surface structure. Since the reflective material is adhered to the structure, the structure vibration is the same as the vibration of the reflective material. From this vibration, the acoustic pressure associated with the structure may be calculated.

Patent Number: 7266046 Issue Date: 9/4/2007

Title: MINIATURE LOW-FREQUENCY ACOUSTIC TRANSMITTER

Abstract: A miniature lightweight transmitter that mechanically generates low-frequency acoustic energy is described, wherein one or more miniature balloons filled with air are positioned at the center of a pressure vessel filled with water and tethered in place. The system is then driven into resonance by

using transducers that directly drive the wall of the pressure vessel or by using a piston to drive fluid into and out of the pressure vessel.

Patent Number: 7269097 Issue Date: 9/11/2007

Title: METHOD FOR RECOVERING DATA FROM A LARGE ARRAY OF LOW-COST SENSORS

Abstract: The present invention provides a system and method of use for recovering data from an area. The data are gathered with at least one sensor converting the data to a digital packet. The packet is processed as encoded data and the encoded data is stored as a data frame. A reader transmits a signal to a plurality of the sensors and replicates the signal. Each sensor produces a reflected signal in response to the transmit signal and assigns a modulation frequency to the reflected signal. The reader receives the reflected signal. The reader separates frequency components of the reflected signal into upper and lower sidebands and separates the sidebands into data channels. The reader outputs the encoded data by processing the data channels. The reader decodes the encoded data to retrieve the data packet and the environmental data.

Patent Number: 7272072 Issue Date: 9/18/2007

Title: METHOD OF CONVERTING RECEIVED DATA TO A TWO-DIMENSIONAL COLOR MAP

Abstract: Beams of sampled data are converted into a two-dimensional color map thereof. Fourier transforms are performed on range cells of each beam with each transform being sampled M times where M is defined by M discrete sets of red, green and blue intensity values of a color spectrum. For each range cell in each beam, each sample of the corresponding M-sampled Fourier transform is multiplied by a corresponding one of the red, green and blue intensity values from a corresponding one of the M discrete sets thereof. Each of the resulting M red values, M green values and M blue values are averaged. As a result, a triplet is defined for each range cell by the averaged values. For each triplet, the minimum thereof is used to reduce the triplet's averaged values to thereby form a corresponding re-valued triplet. The resulting array of re-valued triplets are normalized across all of the range cells with the resulting array of re-valued triplets so-normalized being used to generate a two-dimensional color display.

Patent Number: 7274622 Issue Date: 9/25/2007

Title: NONLINEAR TECHNIQUES FOR PRESSURE VECTOR ACOUSTIC SENSOR ARRAY SYNTHESIS

Abstract: The present invention presents a method for use with an acoustic sensor array comprised of a number of pressure-vector sensors capable of sensing the acoustic scalar field and acoustic vector field of an acoustic wave. The method is a signal processing technique that utilizes nonlinear processing of pressure-vector sensor signals in the acoustic sensor array. The method involves the steps of receiving the sensor output values, processing the output values using a non-linear algorithm to create a mathematical series of values, transforming the series, applying weighting to the series and performing a summation of the values in the series to calculate the array directivity response. The array directivity response can then be further processed where the array is part of a sonar system.

Patent Number: 7276839 Issue Date: 10/2/2007

Title: BONDABLE FLUOROPOLYMER FILM AS A WATER BLOCK/ACOUSTIC WINDOW FOR ENVIRONMENTALLY ISOLATING ACOUSTIC DEVICES

Abstract: A combination transducer and water-blocking film for acoustic signaling through ambient water. The water-blocking film has an etched fluoropolymer film and adjacent bonding film interposed between the transducer and the water. Potting material extends adjacent to and is bonded to both sides of the water-blocking film. The film and potting material create an acoustic window. The etched fluoropolymer film is approximately one to two thousandths inch thick and the bonding film is approximately one thousandths inch thick, and the potting material is a polyurethane matrix.

Patent Number: 7278290 Issue Date: 10/9/2007

Title: PROJECTILE IMPACT ENERGY AND LOCATION MEASUREMENT SYSTEM

Abstract: A projectile impact energy and location measurement system is taught employing a target apparatus having an impact plate of a solid durable substance such as steel or titanium. Disposed over the plate is a layer of elastoluminescent material composed of zinc sulfide and manganese embedded in an elastomeric composite. This luminescent material is designed to emit light or exhibit luminescence when elastically strained, for example when a projectile strikes the material. Optical photosensitive sensors are deployed at strategic locations to observe and record color images of the target before during and after impact by a projectile. These images capture the target luminescence and impact location of the projectile. The images are transmitted to a traditional image processing system that can isolate the impact location and correlate the light wave length with a known kinetic energy value that was obtained through initial calibration of the system.

Patent Number: 7281482 Issue Date: 10/16/2007

Title: SIDE THRUSTER PERFORMANCE IMPROVEMENT WITH POWER OPTIMIZATION CONTROLLER

Abstract: A system and method of use for a marine vehicle to compensate for the effects of forward velocity of the vehicle and ambient currents of a water medium on lateral thrust from a lateral tunnel in the vehicle. A thruster in the tunnel has a variable pitch propeller rotated by a motor at a maintained constant speed to produce lateral thrust of flowing water through the tunnel. A power supply provides input power to the motor, and voltage and amp meters provide signals representative of the power. A computer generates pitch control signals from the representative signals, and a pitch actuator connected to the propeller and the computer is responsive to the pitch control signals to change the blade pitch of the propeller in order to maintain the lateral thrust at a predetermined level.

Patent Number: 7283424 Issue Date: 10/16/2007

Title: HIGH SPEED UNDERWATER PROJECTILE TRACKING SYSTEM AND METHOD

Abstract: A system and a method are provided to accurately track the trajectory of high-speed underwater objects. A number of hoops with means for controlling the buoyancy thereof are aligned on a range in the anticipated path of the high speed projectile. The hoops are sufficiently large relative to the size of the projectile and anticipated path. Each hoop contains a number of independent hydrophones. The signals from the hydrophones may be analyzed to accurately determine position and track of an underwater projectile along the plane of each hoop. The system may be used as a fixed range or as a mobile range in a remote location.

Patent Number: 7287252 Issue Date: 10/23/2007

Title: UNIVERAL CLIENT AND CONSUMER

Abstract: In a network computing environment with a distributed software system utilizing Common Object Request Broker Architecture (CORBA), a Universal Client and Consumer tool that creates Client and Consumer implementations for use in interacting with any existing Servers and/or Suppliers in the system, and displaying the data resulting from the interactions for the purpose of validating the operation, functionality and performance of the Servers and Suppliers. The tool creates a graphical user interface for the user to select Servers or Suppliers to evaluate. The tool identifies the Server or Supplier IDL interface, and then creates either a Client or Consumer Implementation that uses the same corresponding IDL interface. The tool then attempts to connect to the Server or Supplier and where appropriate allow the user to invoke methods. Data received from the Servers and/or Suppliers is displayed on a video device and logged for later analysis.

Patent Number: 7288944 Issue Date: 10/30/2007

Title: EVANESCENT WAVEGUIDE APPARATUS AND METHOD FOR MEASUREMENT OF DIELECTRIC CONSTANT

Abstract: A dielectric constant waveguide measuring apparatus preferably comprises a rectangular waveguide aperture on each end with a width a and height b. The waveguide frame is preferably split to permit the waveguide to be opened for insertion of the unknown material into a middle reduced cross-sectional area portion of the waveguide frame. In one embodiment, a metal septum is inserted between two samples of the unknown material to thereby reduce the cross-sectional area of the waveguide aperture by splitting width a of the rectangular waveguide in half. The waveguide frame is closed and a frequency response of the waveguide is then measured. The dynamic dielectric constant of the unknown material is determined from the frequency of the lowest order minimum value of the frequency response of the waveguide apparatus wherein the unknown material has been inserted.

Patent Number: 7295493 Issue Date: 11/13/2007

Title: PRESSURE TOLERANT FIBER OPTIC HYDROPHONE

Abstract: An interferometric hydrophone is disclosed that comprises a first mandrel defining an interior that is open to surrounding fluid. A sensing optical fiber is wound upon the first mandrel. A second mandrel is positioned in surrounding relationship with respect to the first mandrel. The first and second

mandrels define a first chamber therebetween. A case encloses the first and second mandrels and first chamber. The cylindrical case and the second cylindrical mandrel define a second chamber therebetween, which is sealed and filled with gas or vacuum.

Patent Number: 7300323 Issue Date: 11/27/2007

Title: LINEAR ACTUATOR FOR FLAPPING HYDROFOIL

Abstract: A linear actuator is provided that converts linear motion to oscillatory motion. The linear actuator includes flats, a hinge, and linear actuators. A hydrofoil is mountable on a spindle attached to the hinge. In operation, a linear push direction by the linear actuator drive causes the hydrofoil to rotate in an oscillating manner. A linear push by another linear actuator drive reverses the oscillation directions of the hydrofoil. The flats are preferably made of flexible strip metal to easily transmit motion to the spindle. The hydrofoil and spindle combine to a slot for smooth transmission of linear to oscillatory motion.

Patent Number: 7302744 Issue Date: 12/4/2007

Title: MOSAIC PROCESS FOR THE FABRICATION OF AN ACOUSTIC TRANSDUCER ARRAY

Abstract: A method that involves establishing the performance level of a proposed acoustic transducer array. Deriving a geometric shape for the array based on the established performance level. Selecting piezoceramic materials based on considerations related to the performance level and derived geometry. Forming small primary shapes of the selected piezoceramic materials for use as the basic elements of the larger derived geometric shape of the array. Arranging the basic elements into a mosaic of the larger derived geometric shape. Filling the interstices between the basic elements with urethane to bind the mosaic of basic elements thereby fabricating the completed piezoceramic transducer array.

Patent Number: 7307590 Issue Date: 12/11/2007

Title: WIDEBAND TRAVELING WAVE MICROSTRIP ANTENNA

Abstract: The present invention by propagates a traveling wave of electric current along a microstrip antenna structure rather than a standing wave. By loading an antenna with a series of capacitive gaps of the correct values, the shape of the electric current distribution can be tailored to suppress the resonant properties of the antenna, specifically the standing wave of electric current that normally forms along the antenna structure. A microstrip antenna having a "bulls-eye target" structure comprised of a center disk and concentrically larger capacitively coupled annular sections will tailor the shape of the electric current distribution to achieve a suppression of the resonant properties of the antenna, thereby increasing the antenna bandwidth.

Patent Number: 7307914 Issue Date: 12/11/2007

Title: HYPOTHESIZED RANGE AND DEPTH SONAR PROCESSING SYSTEM

Abstract: A method for determining the likely range and depth of an acoustically radiating source in which characteristics are used from hypothetical ranges and depths. A received sonar signal is compared with modeled ranges and depths. The correlation between the received signal characteristics and the modeled characteristics gives the likely range and depth. In a preferred embodiment this is presented as a contour plot.

Patent Number: 7310286 Issue Date: 12/18/2007

Title: SYSTEM FOR UNDERSEA DIGITAL ACOUSTIC COMMUNICATIONS

Abstract: An undersea communications system in which a message is converted to a redundant fixed-length data packet and transmitted acoustically as a quadrature phase-keyed signal in a frequency band with a continuous pilot signal at a frequency closely adjacent to the frequency band. A receiver uses the received continuous pilot signal to Doppler compensate the incoming quadrature phase keyed signal by estimating any Doppler distortion in the received pilot signal. The resultant redundant signals are then robustly processed coherently and jointly by the adaptive decision feedback equalizer and decoder to provide the original transmitted data.

Patent Number: 7311496 Issue Date: 12/25/2007

Title: APPARATUS AND METHOD FOR GENERATING ELECTRIC ENERGY IN A FLUID ENVIRONMENT

Abstract: Apparatus for generating electrical energy in a fluid environment, the apparatus including a wing member for disposition in the fluid and pivotally movable about an axis in response to flow of the fluid thereabout, connector rods each pivotally mounted at a first end thereof on the wing on opposite sides of the axis, a crank member attached to a second end of each of the connector rods and rotatable about a pivot axis by movement of the attached connector rod, a housing supporting the wing member, a gear system disposed in the housing, an axle interconnecting each of the crank members and the gear system, and an electrical generator disposed in the housing and driven by the gear system.

Patent Number: 7313881 Issue Date: 1/1/2008

Title: PNEUMATIC LAUNCHER SYSTEM AND METHOD FOR OPERATING SAME

Abstract: A pneumatic launcher has a plenum chamber section, an intermediate chamber section and a launch tube section connected together in a generally linear arrangement. The plenum chamber section defines a plenum chamber that has a closed end and an open end. The intermediate chamber section has aft and forward rupture disks consecutively arranged to define an intermediate chamber. The plenum chamber is pressurized with a pressurized gas to a design plenum pressure and the intermediate chamber is pressurized with a pressurized gas to pressure that is about one-half the design plenum pressure. The intermediate chamber is then depressurizing to produce a pressure imbalance between the plenum and intermediate chambers that causes said aft and forward rupture disks to rupture. As a result, pressure equilibrium occurs between the plenum chamber and launch tube thereby discharging the fluid and projectile from the interior of the launch tube.

Patent Number: 7319640 Issue Date: 1/15/2008

Title: NOISE SUPPRESSION SYSTEM

Abstract: A method and apparatus is provided for suppressing noise which includes receiving a plurality of signals from an array of sensors and transforming each of these signals to the frequency domain. The transformed signals are beamformed so that noise sources can be identified by bearing and frequency range. A planewave-fit noise-suppression routine is then used to remove identified noise sources from the transformed signals and to provide a noise-suppressed transformed signal having signals from said identified noise sources suppressed.

Patent Number: 7349292 Issue Date: 3/25/2008

Title: INCREASED EFFECTIVE APERTURE FOR RECEIVE ARRAYS

Abstract: A sonar dome having an acoustic array housed therein. A plurality of bubbles are generated within the fluid inside the sonar dome. The generated bubbles are of an amount and size to reduce the speed of sound within the sonar dome fluid. Reduction of the speed of sound within the sonar dome fluid effectively increases the aperture of the acoustic array. The bubbles can be generated from a gas source or electrolytically. Typically, each individual bubble is less than 0.01 mm in diameter to reduce bubble velocity in the fluid.

Patent Number: 7354626 Issue Date: 4/8/2008

Title: METHOD FOR INCREASING FIBER DENSITY IN ELECTROSTATIC FLOCKING

Abstract: A direct charging electrostatic flocking method is provided for the fabrication of a fibrous structure. Fibers are deposited directly on a first electrically conductive surface while a second electrically conductive surface with an adhesive thereon is disposed over the first surface. A vacuum is created in the space between the first electrically conductive surface and the second electrically conductive surface. The vacuum is then filled with sulfur hexafluoride gas. An electric field is generated between the first and second electrically conductive surfaces. The fibers leave the first electrically conductive surface, accelerate through the electric field and sulfur hexafluoride gas, and are coupled on one end thereof to the adhesive. As a result of using sulfur hexafluoride rather than air there is an increase in fiber density of the fibrous structure.

Patent Number: 7361427 Issue Date: 4/22/2008

Title: IMPROVED MANIFOLD FOR A PILE CONFIGURED BATTERY

Abstract: An improved method of fabricating and discharging a pile configured battery which utilizes an electrically conductive flowing aqueous electrolyte. This is accomplished by use of a single piece hydraulic manifold plate which decouples the hydraulic performance parameters of the manifold from

the electrical performance parameters. The manifold plate includes a configuration of hydraulic feed channels and distribution headers which separately account for electrical resistive effects and fluid viscous and dynamic pressure effects. Implementation of such manifold plates allow for improved energy conversion efficiency as well as utilization of multiple dissimilar fluids in a single battery cartridge cell discharge at greatly reduced complexity and cost.

Patent Number: 7362655 Issue Date: 4/22/2008

Title: TIME-SYNCHRONOUS ACOUSTIC SIGNAL RANGING SYSTEM AND METHOD

Abstract: This is an underwater acoustic ranging system for determining a range to a target object. An acoustic receiver is provided for detecting acoustic energy and determining an angle of arrival of said acoustic energy in at least one plane. An acoustic transmitter transmits an acoustic energy pulse. A receiver clock joined to the receiver, and a transmitter clock is joined to the transmitter. Acoustic energy is transmitted at a synchronized time. Range can be calculated based on the transmit time, the receive time and the reception angle. The system can also include a means for synchronizing the clocks.

Patent Number: 7365650 Issue Date: 4/29/2008

Title: UNDERWATER RF PROPAGATION PATH

Abstract: An underwater RF signal propagation path is created by utilizing a plurality of individual RF transceivers such as MEMS RF transceivers. Each MEMS RF transceiver has a predetermined buoyancy. A stream of the RF transceivers are released to form a line of RF transceivers underwater such that the individual RF transceivers have an RF transmission and reception distance greater than the distance between the RF transceivers whereby an RF signal can be repeatedly retransmitted down the line of RF transceivers.

Patent Number: 7379392 Issue Date: 5/27/2008

Title: A FLEXIBLE CYMBAL ARRAY

Abstract: A cymbal array for underwater vehicle applications includes piezoelectric discs disposed in a line, a first flex circuit comprising first annular members each affixed to a first side of one of the discs, a first series of cymbal caps each mounted on one of the first annular members, a second flex circuit comprising second annular members each fixed to a second side of one of the discs, and a second series of cymbal caps each mounted on one of the second annular members. The flex circuits each comprise an electrically conductive layer disposed between two electrically insulative layers.

Patent Number: 7380244 Issue Date: 5/27/2008

Title: STATUS DISPLAY TOOL

Abstract: In a distributed computing environment utilizing Common Object Request Broker Architecture (CORBA), a software status display tool that provides a graphical representation of the current operational status of all of the data sources in a computer network. The display tool accesses the CORBA Name Server and obtains all available references for object implementations and their CORBA Interface Definition Language (IDL) interface. The references and interfaces map directly to all of the data suppliers and servers and their respective interfaces. The display tool then interfaces with each and every supplier and server as if it were a corresponding client or consumer and based upon the data it is able to obtain it makes a determination of the state of that particular supplier or server. The display tool then logs the results of its determinations and presents a fundamental color-coded system-wide display of its determinations on a video device.

Patent Number: 7392733 Issue Date: 7/1/2008

Title: HIGH RESOLUTION PROJECTILE BASED TARGETING SYSTEM

Abstract: A projectile based targeting system for underwater objects includes a trainable gun terminal mounted in a waterproof housing. The gun terminal includes plural gun barrels terminating in waterproof breeches. Noise generating projectiles are launched from the gun barrels, and a fire control system selectively fires the projectiles from each of the plural gun barrels in a noise pattern. A host controller detects and processes noise generated by a launched pattern of the noise generating projectiles to give information about the objects. The projectiles each include a void region connected to an outer surface of the projectile by a hole formed in a neck of the projectile. Launching of the projectile creates a vaporous cavity around the projectile and thus the hole, thereby causing the void region to resonate at a noise generating frequency.

Patent Number: 7402805 Issue Date: 7/22/2008

Title: DEVICE FOR THE IN-SITU MEASUREMENT OF ACOUSTICALLY STIMULATED BIOLUMINESCENCE

Abstract: A device and method of use for measurement of in-situ bioluminescence generally comprising an acoustical pulse generator, a detector chamber, a lens assembly and a photomultiplier tube. The generator comprises transducers which can generate acoustical energy in the object field of the device. The acoustical energy provides a stimulus of aquatic organisms within the object field (typically an aqueous volume) to produce the bioluminescence. The generator is positioned outside of the detector chamber and the photomultiplier tube and lens assembly are mounted within the chamber. The lens assembly restricts light to the photomultiplier tube of that bioluminescence light originating only from the volume. The photomultiplier tube detects the bioluminescence generated by any aquatic organisms in a captured volume or if a changing measurement occurs by water flow in the volume. The output of the photomultiplier tube is provided to a controller to be analyzed.

Patent Number: 7405559 Issue Date: 7/29/2008

Title: LOW-POWER GIANT MAGNETO-IMPEDANCE MAGNETIC DETECTOR THAT UTILIZES A CRYSTAL CONTROLLED OSCILLATOR

Abstract: The present invention is an electrical circuit for a sensor designed to detect external magnetic fields. The circuit is composed of a stable voltage reference source, connected to a low frequency amplifier where the operating point of the amplifier depends on the voltage reference source that is biased for maximum allowable voltage swings of the amplifier. A GMI fiber is connected to the low frequency amplifier and to a crystal oscillator that generates a square wave excitation signal with which to excite the GMI fiber. A decoupling network connected to the amplifier allows stable excitation of the GMI fiber by separating the direct current paths of the amplifier from the excitation signal. When the GMI fiber is excited by the square wave signal the GMI fiber impedance varies with impressed magnetic fields, which in turn varies the output voltage of the amplifier.

Patent Number: 7415063 Issue Date: 8/19/2008

Title: METHOD TO ESTIMATE NOISE IN DATA

Abstract: A method for estimating uncorrelated noise in a distributed record of data including data samples that represent both signal and noise, provided that the signal is substantially in phase between adjacent data samples. The method begins with dividing the record of data into an even number of equal intervals. The method proceeds compiling a reduced data record by subtracting from every other data sample in the record of data one data sample that is adjacent to it. Finally, the method entails a step of estimating the noise power in the signal relative to the signal power by calculating the standard deviation as a measure of the magnitude of the noise.

Patent Number: 7420522 Issue Date: 9/2/2008

Title: ELECTROMAGNETIC RADIATION INTERFACE SYSTEM AND METHOD

Abstract: An electromagnetic radiation interface is provided that is suitable for use with radio wave frequencies. A surface is provided with a plurality of metallic conical bristles. A corresponding plurality of termination sections are provided so that each bristle is terminated with a termination section. The termination section may comprise an electrical resistance for capturing substantially all the electromagnetic wave energy received by each respective bristle to thereby prevent reflections from the surface of the interface. Each termination section may also comprise an analog to digital converter for converting the energy from each bristle to a digital word. The bristles may be mounted on a ground plane having a plurality of holes therethrough. A plurality of coaxial transmission lines may extend through the ground plane for interconnecting the plurality of bristles to the plurality of termination sections.

Patent Number: 7426290 Issue Date: 9/16/2008

Title: NONPARAMETRIC METHOD FOR DETECTION AND IDENTIFICATION OF REGIONS OF CONCERN IN MULTIDIMENSIONAL INTENSITY IMAGES

Abstract: A method for detection and identification of regions of concern in multidimensional intensity images using a template and a nonparametric test is presented. Data corresponding to background intensity is extracted from the outer region of the template while data for mass detection is extracted

from the inner region. The statistical nature of the background intensity, specifically the tail structure of the unknown distribution, is estimated via tolerance intervals. Mass detection is based on the fraction of test data within the tail structure.

Patent Number: 7429957 Issue Date: 9/30/2008

Title: WIDEBAND FLOATING WIRE ANTENNA USING A DOUBLE NEGATIVE META-MATERIAL

Abstract: A buoyant cable antenna element is taught that employs a specific double-negative meta-material sheath with a negative permeability. The double-negative meta-material sheath is disposed over the insulated wire portion of the buoyant cable antenna element. The double-negative meta-material sheath enables a deliberate reduction in the antenna wire inductance to a zero value at a desired critical frequency. Reducing the antenna wire inductance to zero creates a traveling wave structure antenna having enhanced bandwidth.

Patent Number: 7437819 Issue Date: 10/21/2008

Title: METHOD FOR MAKING UNDERWATER CONNECTOR

Abstract: A method for sealing an electrical connector having a transition end and a cable. A protective coating is applied to the transition end of the connector. The connector, transition end and cable are positioned within halves of a mold. An annular resilient seal is positioned about the transition end within the mold. When the mold is filed with castable material the annular resilient seal compresses against the connector, preventing leakage of the castable material along the connector. The mold can then be separated leaving a waterproof boot formed on the transition end of the connector. The invention also provides a mold and sealing means for this process.

Patent Number: 7445132 Issue Date: 11/4/2008

Title: SYSTEM FOR DETERMINING GAS CARTRIDGE ACTUATION STATE

Abstract: A gas cartridge actuation state determination system includes a puncture pin adapted to abut an end of the gas cartridge. A load sensor coupled to and in line with the puncture pin. A spring bears against the load sensor. The spring's force is such that it is insufficient to cause the puncture pin to be driven through the end of the gas cartridge when the end has not been punctured, but is sufficient to cause the puncture pin to be driven through the end of the gas cartridge when the end has already been punctured. In addition, the spring's force is such that it will be approximately zero after the puncture pin has been driven through the end that has already been punctured. A device coupled to the load sensor determines when the spring force is approximately zero.

Patent Number: 7461610 Issue Date: 12/9/2008

Title: TOWLINE GUIDE CLIP

Abstract: The invention as disclosed is a towline guide clip, an apparatus that can hold a towline in place as it is dragged behind a large host marine vessel attempting to recover a small marine vessel. The towline guide clip is designed to gradually release the towline when a small marine vessel grabs hold of the line. The additional dragging force of the small marine vessel pulls the towline out of the towline guide clip so that the towline can then be reeled in by a winch.

Patent Number: 7463258 Issue Date: 12/9/2008

Title: EXTRACTION AND RENDERING TECHNIQUES FOR DIGITAL CHARTING DATABASE

Abstract: Disclosed is a method for extracting and rendering data from digital charting databases. The software method integrates and combines bathymetric/topographic data from several sources into a stream of three-dimensional data points, creating a triangle surface mesh, and dividing it into pieces along arbitrary lines to create regularly sized and shaped areas for efficient storing and rendering. The method works by forming an initial triangle mesh of the area and then refining the mesh by incrementally adding each point to the mesh, until a full mesh representation is achieved. The large single file is then broken down into discrete geographic regions, and the region data is converted into a standard file format for viewing and/or processing.

Patent Number: 7465201 Issue Date: 12/16/2008

Title: ARTICULATION MECHANISM AND ELASTOMERIC NOZZLE FOR THRUST-VECTORED CONTROL OF AN UNDERSEA VEHICLE

Abstract: The mechanism of the present invention maneuvers a vehicle by deflecting the flow from a propulsor of the vehicle. The mechanism has an elastomeric nozzle that encases the flow and is deflected via an articulation device mountable inside the vehicle. The nozzle is shaped and supported by spiral-wound composite to maintain a circular cross-section through a range of motion. An end of the nozzle is attached to the shroud of the propulsor and another end is supported by a ring with support struts radiating from a hub. The hub is supported by a shaft attached to a gimbal. The gimbal is constrained in movement by an outer race and an anti-rotation stud in a radial slot in a ball of the gimbal. A linkage as part of an articulation device controls rotation of the gimbal to direct movement of the shaft and enclosed nozzle thereby deflecting flow of the propulsor.

Patent Number: 7466278 Issue Date: 12/16/2008

Title: BUOYANT CABLE ANTENNA SYSTEM AND METHOD WITH ARTICULATING BLOCKS

Abstract: A buoyant cable system and method is provided with a towed platform that is flexible for deployment into the water from a submerged submarine. The towed platform has a memory that returns to a selected shape after deployment. In one embodiment the biasing member is a spring acting against and anchored to Kevlar.RTM. strands running through the blocks such that the blocks are compressed into a desired shape during operation but remain sufficiently flexible for deployment and retrieval. In another embodiment, a keel may be formed from a weighted curved portion that is suitable

for vertically supporting an antenna above the surface of the water to prevent signal interference due to water washing over the towed transmission line.

Patent Number: 7466631 Issue Date: 12/16/2008

Title: ENHANCED SENSITIVITY PRESSURE TOLERANT FIBER OPTIC HYDROPHONE

Abstract: An interferometric hydrophone operable for use in surrounding fluid, includes an outer mandrel having an interior open to the surrounding fluid. A sensing optical fiber is wound on the exterior of the outer mandrel. An inner mandrel is positioned in the interior of the outer mandrel. A chamber defined between the inner mandrel and outer mandrel is in communication with the surrounding fluid. The inner mandrel has a sealed gas filled interior. Compression and expansion of the inner mandrel results in compression and expansion of the outer mandrel.

Patent Number: 7468703 Issue Date: 12/23/2008

Title: BUOYANT CABLE ANTENNA SYSTEM

Abstract: A buoyant cable system and method is provided with a flexible towed platform that may be deployed into the water from a submerged submarine. The flexible towed platform has a memory that returns to a selected shape after deployment. A presently preferred selected shape may have one or more curves that provide a function during towing. For instance, in one embodiment two oppositely extending curves each float and each are pressed by the water in a balanced manner to provide a stable platform for one or more antennas which can be of different types suitable for a wide band of radio frequency reception/transmission. In another embodiment, a keel may be formed from a weighted curved portion that is suitable for vertically supporting an antenna. The flexible towed material may be constructed of coil springs, shaped memory alloys, and the like.

Patent Number: 7472866 Issue Date: 1/6/2009

Title: DEPLOYMENT SYSTEM AND METHOD FOR SUBSURFACE LAUNCHED UNMANNED AERIAL VEHICLE

Abstract: A launch system in which an unmanned aerial vehicle is secured to a platform in a watertight tube adapted to be launched from a submerged platform. Once launched, side panels on the tube are jettisoned and a flotation device is deployed to bring the tube to the surface. The flotation device maintains the tube in a vertical position when rising to and at the surface. After surfacing, a top-sealing cap of the tube is opened. A lifting mechanism within the tube raises the vertically oriented platform assembly up within the tube. Guide rails maintain the vertical orientation of the assembly during lifting. At the topmost point of travel, the assembly is raised clear of the tube and is disengaged from the guide rails, allowing the assembly to pivot about its attachment to the lifting mechanism and assume an orientation favorable for launching the UAV.

Patent Number: 7475651 Issue Date: 1/13/2009

Title: STRUCTURAL SECTION

Abstract: A structural element includes an internal rib and mounting structure having end ribs joined by rails to a plurality of intermediate ribs. A cylindrical skin positioned about the cylindrical rib and mounting structure allows the structure to slide in and out of the skin. A cylindrical male end joint can be a fastening to the end rib of the mounting structure to retain the structure within the skin. Likewise, a female end joint is secured on the other end rib of the structure to complete the structural element. The end joints are sealed against the skin to prevent leakage. The rails can be provided as rail sections joining adjacent ribs.

Patent Number: 7490573 Issue Date: 2/17/2009

Title: FAIRING FOR ARTICULATED TOW BODIES

Abstract: A fairing assembly is provided for a towed body having multiple sections that are flexibly joined together. For each pair of sections, a fairing is joined to the first section and positioned over the space between the pairs of sections. The fairing has discrete tabs that extend from the first section across the space between the sections. The tabs are separated to allow angular displacement of the first section with respect to the second section. Two layers of overlapping tabs are provided for reducing hydrodynamic forces in between the sections.

Patent Number: 7495454 Issue Date: 2/24/2009

Title: DEVICE FOR MEASUREMENT OF ELECTRICAL PROPERTIES IN MATERIALS

Abstract: A device for measuring electrical properties, including permittivity, of a material is disclosed. The device includes a first conduit and second conduit terminating at open ends and respectively connected to a first and second connector port. Annuli are formed by the open ends to encompass portions of a flange of the device. The flange as well the portions make firm contact with the material under test, permitting simultaneous measurements of the complex scattering parameters of the material when an electromagnetic field is transmitted through the first connector port. Electrical characteristics of the material can be computed using the measurements received at the first connector port and the second connector port. Shorting screws are used for calibration by selectively opening or shorting the conduits.

Patent Number: 7495611 Issue Date: 2/24/2009

Title: METHOD FOR DETERMINING SIGNAL DIRECTION USING ARTIFICIAL DOPPLER SHIFTS

Abstract: A method for determining the direction of an incoming signal is provided in which each of a plurality of receivers arranged in a linear array is sampled in sequence to simulate a single receiver moving along an aperture defined by the linear array at a simulated speed. This generates a simulated time series data from which a simulated Doppler shift in the incident angle is measured. The simulated Doppler shift is used to determine the incident angle between the incident signal and the linear array of receivers. By adjusting the simulated speed to eliminate artifacts in the power spectral density of the

data obtained from the receivers, the incident angle can be obtain from the expression of the simulated Doppler shift.

Patent Number: 7496246 Issue Date: 2/24/2009

Title: RUGGEDIZED FIBER OPTIC SOUND VELOCITY PROFILER

Abstract: The present invention relates to an optical fiber cable for use with a system for determining a velocity profile of sound in a medium. The optical fiber cable comprises an inner layer of strength members, an outer layer of strength members, and at least one tube containing at least one optical fiber incorporated into the outer layer. The at least one optical fiber has a plurality of Bragg grating sensors spaced along its length.

Patent Number: 7504905 Issue Date: 3/17/2009

Title: A METHOD FOR COUPLING A DIRECT CURRENT POWER SOURCE ACROSS A DIELECTRIC MEMBRANE OR OTHER NON-CONDUCTING MEMBRANE

Abstract: A method for coupling power across a non-conducting membrane. A generator converts a DC source on a first side of a non-conducting membrane to a square-wave at a determined frequency. The generator output connects to a transformer and onto a first set of capacitor plates on the first side of the membrane. A second set of plates on the second side of the membrane form a set of coupling capacitors wherein the non-conducting dielectric membrane becomes part of the coupling-capacitor dielectric material. The second set of plates connects to a transformer and onto a non-linear circuit that converts the square-wave to DC voltage and current that can power a load such that the power delivered is approximately equal to the power available from the DC source on the first side of the membrane. The coupling capacitors may be replaced by coupled coils with nearly the same power delivery effect.

Patent Number: 7506572 Issue Date: 3/24/2009

Title: COMBINATION SABOT AND LAUNCH SEAL

Abstract: A combination sabot and launch seal is taught that is made from a single piece of molded flexible material mounted to the interior of a launch capsule. The sabot portion of the invention is defined by multiple flexible appendages that are joined together at one end in a domed shape and positioned over the nose of a missile in a launch capsule. During a launch, the appendages separate and fold back over the lip of the forward aperture of the launch capsule

---

Patent Number: 7513968 Issue Date: 4/7/2009

Title: FABRICATION OF MAGNESIUM-TITANIUM TEMPLATE FOR A MAGNESIUM-HYDROGEN PEROXIDE FUEL CELL

Abstract: Using a 1/4 inch end mill a grid pattern of one inch squares or lands separated by concave troughs or grooves 0.025 inches deep is milled on to the surface of a one quarter inch thick magnesium plate. A conductive barrier such as a titanium foil is then laid over the magnesium plate, and is then pressed into the pattern with a one inch thick 80 durometer rubber sheet. Pressure of 250 pounds per square inch is then applied to the rubber to create indentations in the foil creating the same pattern as the one on the magnesium plate. The foil is then removed. An electrically conductive adhesive is then screen printed on the magnesium lands only, avoiding the grooves. The titanium foil is oriented to the pattern on the magnesium plate and mated to the magnesium plate by applying 200 pounds per square inch of pressure.

Patent Number: 7521149 Issue Date: 4/21/2009

Title: HIGH EFFICIENCY SEMI-FUEL CELL INCORPORATING AN ION EXCHANGE MEMBRANE

Abstract: A new semi-fuel cell design that incorporates ion exchange membranes to create separate compartments for the anolyte and catholyte to flow through the semi-fuel cell thereby isolating the metal anode of the bipolar electrode from the catholyte while still allowing the necessary ion transfer to affect the necessary electrochemical balance for the reaction to take place in the semi-fuel cell.

Patent Number: 7522105 Issue Date: 4/21/2009

Title: ANTENNA USING A PHOTONIC BANDGAP STRUCTURE

Abstract: A microstrip patch antenna utilizes a microstrip patch antenna substrate formed of photonic bandgap material. One or more periodic patterns may be used therewith to produce multiple bandgaps into the photonic bandgap material. The periodic patterns may be produced by introducing periodic defects into the dielectric material substrate with drilled holes, slots, shorted vias, blind vias, buried vias, and/or plated or unplated patterns, such as plated patterns on the groundplane or on internally positioned surfaces, or on the surface adjacent the radiating elements. One or more radiating elements are used on an upper surface of said microstrip patch antenna substrate, and a groundplane is formed on a lower surface of said microstrip patch antenna substrate.

Patent Number: 7523714 Issue Date: 4/28/2009

Title: HYDRAULIC CIRCUIT FOR PREVENTION OF INADVERTENT WEAPON LAUNCHES

Abstract: A hydraulic circuit for prevention of inadvertent weapons launches in which a hydraulic firing valve provides hydraulic pressure to a backup select valve rather than the backup select valve receiving hydraulic pressure directly from a ship supply header. This hydraulic pressure shifts the backup select valve to allow hydraulic pressure to pass to a mode select control valve that actuates a controllable air-firing valve, until a hydraulic firing valve for the weapon is opened. The backup select valve actuation can only occur with the initiation of the hydraulic firing valve. Only after the hydraulic firing valve is open, does the backup select valve initiate hydraulic pressure to the mode select control valve thereby preventing hydraulic actuation of the backup select valve.

Patent Number: 7528195 Issue Date: 5/5/2009

Title: MIXING AND CURING CARBOXY-TERMINATED BUTADIENE-NITRILE RUBBER, EPOXY RESIN AND CURING

Abstract: A dampening material is presented with a carboxy-terminated butadiene nitrile (CTBN) as a dampening element. The glass transition temperature of the CTBN is generally at room temperature. The material is a two-component system with micro-scale phase segregation. The CTBN is reacted into an epoxy resin at a high temperature and cooled to allow the epoxy to react with a curing agent. A phase segregation occurs between the epoxy and the CTBN as the epoxy gels/cures. The extent of phase separation in the reaction is controlled by cross-linking and gelling. The rubbery component of CTBN phase segregates and forms discrete, spherical domains. Because the glass transition temperature of the rubbery domains is in the operational temperature range of interest, the composite is capable of absorbing acoustic energy. A high modulus allows a larger amount of acoustic energy to enter the composite where it is absorbed by the rubbery CTBN component.

Patent Number: 7529304 Issue Date: 5/5/2009

Title: WIRELESS SERIAL DATA TRANSMISSION METHOD AND APPARATUS

Abstract: A data transmission system includes a serial A/D converter and a transmission processor. Transmission processor provides control signals to the A/D converter and first and second transmitters. The first transmitter is joined to the A/D converter to transmit a sync signal at a first frequency. The second transmitter is joined to transmit serial digitized data at a second frequency. First and second receivers are used to receive these frequencies. A reception processor is joined to the first receiver to activate a D/A converter on receipt of the sync signal. The D/A converter then converts digitized data received by the second receiver back to analog format. A method is also provided for transmitting and decoding the digital data.

Patent Number: 7534394 Issue Date: 5/19/2009

Title: POTENTIONMETRIC TITRATION METHOD FOR QUANTITATIVE DETERMINATION OF HYDROGEN PEROXIDE

Abstract: An electrochemical potentiometric titration method that entails titration of a known volume of a catholyte containing an unknown amount of hydrogen peroxide in a titration cell having two electrodes, a platinum working electrode and a silver/silver chloride reference electrode. A known concentration of a titrant is added to the catholyte in the titration cell. Simultaneously, as the titrant is added the potential between the working electrode and the reference electrode is monitored. The point at which all of the hydrogen peroxide has been consumed is signaled when the cell potential changes abruptly. Since the concentration of the titrant is already known, the amount of titrant added (concentration multiplied by volume) is directly related to the amount of hydrogen peroxide consumed. The concentration of hydrogen peroxide is calculated from the volume of catholyte and the moles of hydrogen peroxide.

Patent Number: 7536899 Issue Date: 5/26/2009

Title: FLANGE PENETRATOR PRESSURE TEST FIXTURE (FPPTF)

Abstract: An apparatus as a fixture for fluidly pressure testing a flange penetrator seal with the apparatus having a flange cover including a recess and a flange extension including a recess with the extension matable to the cover such that the recesses create a volume around the seal. The extension is secured to the flange of a device for which the flange penetrator seal supports. The cover has a pressure fitting for application of fluid pressure to the recess of the cover for pressure testing the seal within the volume and the extension having a fitting for draining the volume after testing is complete. The test fixture includes a clamping fixture attachable to the cover, the clamping fixture encompassing the flange cover and the extension such that the apparatus can be further secured to the flange of the device which the flange penetrator seal supports.

Patent Number: 7559288 Issue Date: 7/14/2009

Title: RECOVERABLE OPTICAL FIBER TETHERED BUOY ASSEMBLY

Abstract: The invention as disclosed is a recoverable tethered optical fiber buoy and winch assembly that is mounted to the back of the sail or the back of an aft non-moving surface of an underwater vehicle and housed in a configuration to provide very little additional drag to the underwater vehicle when the assembly is not deployed. The invention provides a capability to connect ocean surface visual or radio frequency sensors to an underwater mobile platform with a very high data rate link that is retrievable.

Patent Number: 7572324 Issue Date: 8/11/2009

Title: A NON-CHROMATE PRIMER FOR PAINTING

Abstract: The present invention uses titanate compounds to replace chromates in metal primer paints used for corrosion protection on metal substrates.

Patent Number: 7574922 Issue Date: 8/18/2009

Title: TEST APPARATUS TO DETERMINE THE SHEAR STRENGTH OF A COMPOSITE SANDWICH BEAM UNDER A HIGH HYDROSTATIC LOAD

Abstract: An apparatus for determining the strength of composite sandwich beam in which an enclosure and insertable bladder is provided. The apparatus comprises positioning a bladder within the enclosure. The beam to be tested is slid through a cutout or aperture of the enclosure with support feet holding the beam in place within the enclosure. The enclosure supports the bladder sides with one face of the bladder pressuring the composite sandwich beam. For testing, water is pumped under pressure through a fitting into the bladder. The tolerances between the beam, enclosure and an extrusion seal do not allow the bladder to squeeze outward with the result being measurable testing pressure on the face of the composite beam.

Patent Number: 7582334 Issue Date: 9/1/2009

Title: METHOD TO ACCELERATE WETTING OF AN ION EXCHANGE MEMBRANE IN A SEMI-FUEL CELL

Abstract: A new treatment method for ion exchange membranes used in semi-fuel cells that accelerates the wetting of the membranes by aqueous electrolyte solutions, thus reducing the start up time for metal/hydrogen peroxide-based semi-fuel cells. Specifically, a NAFION.RTM. membrane that is intended for dry storage in a semi-fuel cell is treated with glycerin (glycerol) to enhance its rate of absorption of electrolyte solution when the semi-fuel cell is activated.

Patent Number: 7584060 Issue Date: 9/1/2009

Title: AN INVERSE METHOD TO CALCULATE MATERIAL PROPERTIES USING AN INSERTION LOSS TEST

Abstract: A method for calculating material properties of a material includes conducting two insertion loss tests of the material having a single thickness and a double thickness. These tests are conducted at a zero wavenumber. Utilizing these insertion loss tests, a dilatational wavespeed is computed. The method continues by calculating a shear wavespeed by performing three insertion loss tests of the material at single, double and triple thicknesses. These tests are conducted at a non-zero wavenumber. A shear wavespeed can be calculated from the dilatational wavespeed and these insertion loss tests. Lame constants, Young's modulus, Poisson's ratio, and the shear modulus for the material of interest can then be calculated using the dilatational and shear wavespeeds.

Patent Number: 7585580 Issue Date: 9/8/2009

Title: DIRECT REACTING ANOLYTE-CATHOLYTE FUEL CELL FOR HYBRID ENERGY SOURCES

Abstract: A fuel cell and a method for using the fuel cell to make electricity, in which the fuel cell has an anode half-cell having an electrocatalytic anode and a liquid anolyte that is substantially isopropanol dissolved in seawater. The fuel cell has a cathode half-cell having an electrocatalytic cathode and a liquid catholyte that is substantially hydrogen peroxide dissolved in slightly acidic seawater. The half-cells share a common proton exchange membrane. When the anode and cathode are in electrical connection the isopropanol is oxidized to carbon dioxide, which is fugitive, and the hydrogen peroxide is reduced to water. In the method, the anolyte and the catholyte, which are in effect the fuel of the fuel cell, are metered and re-circulated as needed to produce the necessary electrical power. The electrocatalytic electrodes are typically comprised of palladium and iridium alloys.

Patent Number: 7587374 Issue Date: 9/8/2009

Title: DATA CLUSTERING METHOD FOR BAYESIAN DATA REDUCTION

Abstract: This invention is a method of training a mean-field Bayesian data reduction algorithm (BDRA) based classifier which includes using an initial training for determining the best number of levels. The Mean-Field BDRA is then retrained for each point in a target data set and training errors are calculated for each training operation. Cluster candidates are identified as those with multiple points having a common training error. Utilizing these cluster candidates and previously identified clusters as the identified target data, the clusters can be confirmed by comparing a newly calculated training error with the previously calculated common training error for the cluster. The method can be repeated until all cluster candidates are identified and tested.

Patent Number: 7590495 Issue Date: 9/15/2009

Title: AN INVERSE METHOD TO CALCULATE MATERIAL PROPERTIES USING A NON-RESONANT TECHNIQUE

Abstract: A method for calculating material properties of a material includes determining a dilatational wavespeed and a shear wave speed. The dilatational wavespeed is determined by conducting vertical vibration tests of two specimens of the material, one specimen being twice as thick as the other. Transfer functions are obtained from these tests and used to calculate the dilatational wavespeed. The shear wavespeed is determined by conducting horizontal vibration tests of two specimens with one specimen being twice as thick as the other. The shear wavespeed can be calculated from transfer functions obtained from these tests and the dilatational wavespeed. Other material properties can be calculated from the dilatational and shear wavespeeds. Frequency dependence of the properties can be determined by conducting the tests at different frequencies.

Patent Number: 7602351 Issue Date: 10/13/2009

Title: THREE-DIMENSIONAL DISPLAY ASSEMBLY

Abstract: An assembly for displaying three-dimensional images includes a base portion forming a housing adapted to house electronics and mechanics, and having a planar surface, a projection member disposed in a position removed from the base portion planar surface, drive rods extending from the base portion and connected to the projection member covered by a layer to mask/reveal selectable pixels, the drive rods being movable by electronics and mechanics disposed in the base portion to move the projection member through planes parallel to the base portion planar surface, and a transparent envelope enclosing the base portion planar surface, the drive rods, and the projection member, the envelope being adapted to contain a near vacuum therein.

Patent Number: 7613074 Issue Date: 11/3/2009

Title: LASER-BASED BI-DIRECTIONAL TRANSLAYER OPTO-ACOUSTIC AND ACOUSTO-OPTIC COMMUNICATIONS TECHNIQUE

Abstract: The present invention includes a system and method of use for communications from an in-air platform to a submerged platform. The system includes a laser positionable on the in-air platform above a water medium that sends a pulsed information-bearing laser beam containing a modulated

communications signal to create and react in a non-linear regime manner with the water medium at an air/water interface. The beam vaporizes and optically breaks down a portion of the water medium, creates a shock wave and generates bubble oscillations at the vaporized portion. An acoustic sensor on the submerged platform detects these shock wave oscillations within the water medium and a demodulator-decoder that identifies these broadband acoustic transients that contain deterministically placed energy and demodulates-decodes the acoustic transients into the transmitted communications signals from the in-air platform.

Patent Number: 7613075 Issue Date: 11/3/2009

Title: ADAPTIVE HIGH-FREQUENCY LASER SONAR SYSTEM

Abstract: An acoustic sensing device includes a housing having an internal cavity filled with a vibration decoupling medium. An acoustic window formed of an acoustically transparent material is mounted in the housing. This mounting can be by antivibration mounts to prevent housing noise from affecting the acoustic window. A scanning laser vibrometer is positioned within the housing and directed to detect vibrations of the acoustic window. Antivibration mounts are joined between said scanning laser vibrometer and said housing. In further embodiments, the scanning laser vibrometer detects vibrations at a plurality of locations on the acoustic window forming a virtual array.

Patent Number: 7613553 Issue Date: 11/3/2009

Title: UNMANNED VEHICLE CONTROL SYSTEM

Abstract: A method for autonomously controlling a vehicle includes establishing decision variables for maneuvering the vehicle. Behavior functions are established for behaviors of the vehicle as a function of at least one of the established decision variables. These behavior function give a score which may be weighted, indicating the desirability of engaging in the associated behavior. A summation of the weighted behavior functions can be solved while the vehicle is operating to determine the values of the decision variables giving the highest summation of scores. In a preferred method, an optimal structure for the behavior functions and summation solution is taught. The method then guides the vehicle in accordance with the determined decision variable values.

Patent Number: 7620503 Issue Date: 11/17/2009

Title: SIGNAL PROCESSING FAULT DETECTION SYSTEM

Abstract: A fault detection system designed to evaluate the structural integrity of a material employs an array of sensors disposed over the material being evaluated. The sensors detect vibrations in the material and the sensor signals are fed to a data processor. The processor employs a method to analyze the linear and nonlinear characteristics of the sensor signals and then determines whether to proceed with a linear signal processing analysis or a nonlinear signal processing analysis of the sensor signals. Once the analysis is completed, the results are compared to baseline results to determine what if any divergence exists between the results and the baseline results. A significant divergence indicates a

potential material failure. The fault detection system will indicate such a potential failure through a visual alarm on a graphical user interface.

Patent Number: 7623002 Issue Date: 11/24/2009

Title: A METHOD FOR COUPLING A DIRECT CURRENT POWER SOURCE ACROSS A NEARLY FRICTIONLESS HIGH-SPEED ROTATION BOUNDARY

Abstract: A system and method is provided for coupling a power source across a rotation boundary. A generator converts a DC source on the stationary side of a rotation boundary to a square-wave at a determined frequency. The generator output connects through a transmission line and a first transformer to a set of stator rings. A set of rotor rings form a set of coupling capacitors with the stator rings. The rotor rings connect through a second transformer and a transmission line to a non-linear circuit capable of converting the square-wave to a DC voltage and current that can power a load on the rotating side of the rotating boundary in which the power is nearly equal to the power available from the source on the stationary side of the rotation boundary.

Patent Number: 7629938 Issue Date: 12/8/2009

Title: OPEN YAGGI ANTENNA ARRAY

Abstract: An open Yaggi antenna array is disclosed wherein the reflector element and parasitic director elements of the antenna array are opened in line with the feed point of the driven element so that the reflector and director elements do not cause a shunting effect on the driven element of the antenna.

Patent Number: 7635531 Issue Date: 12/22/2009

Title: SELF CONTAINED FUEL SYSTEM FOR SOLID OXIDE FUEL CELL

Abstract: A power source for an unmanned undersea vehicle with increased energy density is described that employs a self-contained fuel system to address carbon dioxide evolution. A solid oxide fuel cell serves as the power source in the self-contained fuel system. In combination with the solid oxide fuel cell, the system comprises a chemical composite that is combined with water to create both a hydrocarbon fuel for the solid oxide fuel cell and a water-soluble byproduct. The byproduct is then combined with the carbon dioxide gas generated by the fuel cell to create a storable solid precipitate.

Patent Number: 7639565 Issue Date: 12/29/2009

Title: POINT SOURCE LOCALIZATION SONAR SYSTEM AND METHOD

Abstract: A matched-field based sonar system and method of use that supports real-time, three-dimensional acoustic source localization using a mobile, horizontal array. The system receives and processes acoustic array, non-acoustic array, and own-ship navigational data in the matched-field process (MFP). Driven by own-ship and array status, a global bathymetry database and an acoustic

environmental model are used to generate replicas for the MFP. If a three-dimensional tracker is assigned, then the tracker will steer the search region to maintain contact on the target of interest. Displays are provided to the user including tracker displays (which provide tracker information), MFP ambiguity surface displays (which support contact localization), and non-acoustic and navigational displays. A control interface allows a user to control the search region in bearing, range, depth, and frequency; assign the three-dimensional tracker function; and control display processing.

Patent Number: 7649283 Issue Date: 1/19/2010

Title: INDUCTIVE COUPLING METHOD FOR REMOTE POWERING OF SENSORS

Abstract: Means and methods of remotely powering a plurality of sensor coils are described. The plurality of sensor coils can be inductively coupled to a single, primary coil so as to bias the active circuitry of the sensors. The primary and sensor coils can have a separation on the order of inches, such that the sensors can be mounted exterior to a vessel and the primary coil can be mounted interior to the vessel. In some embodiments, the primary coil can be a wire coil. In other embodiments, the primary coil can be a planar coil pattern etched onto a printed circuit board.

Patent Number: 7654213 Issue Date: 2/2/2010

Title: A TRACTION BELT CAPSTAN ASSEMBLY

Abstract: A normal belt capstan assembly for arrays towed by vessels includes a drive wheel mounted on the vessel and adapted to deploy and discharge an array. The drive wheel has a continuous groove throughout an outer edge thereof with opposed rims on either side of the groove. The assembly further includes a normal belt mounted on a plurality of rollers and disposed along a portion of the periphery of the drive wheel, the belt having a continuous central groove formed in a surface facing the drive wheel. The combined drive wheel groove and central groove are adapted to receive the array and termination module, and a retaining groove on either side of the central groove are adapted for receiving the drive wheel rims. The normal belt provides a normal force to the array and termination module.

Patent Number: 7660693 Issue Date: 2/9/2010

Title: ACTIVATION ENERGY MEASUREMENT METHOD

Abstract: A method for computing activation energy of diffusion for a material in a liquid is provided. At least two identical samples of the material are submerged in the liquid at different temperatures. The time required for each sample to reach a goal weight percentage is measured. A reaction acceleration factor is computed for the two samples from the resulting times and temperatures. Activation energy of diffusion is computed from the reaction acceleration factor and the temperatures. Additional samples can be used to give an error estimate.

Patent Number: 7661313 Issue Date: 2/16/2010

Title: ACCELERATION STRAIN TRANSDUCER

Abstract: An accelerometer is provided including a strain sensor with a substantially linear configuration. The strain sensor is mounted on a transducer such that the strain sensor extends laterally across the transducer. The transducer has a base and a plurality of flaps joined at a first end to the base and supporting the strain sensor at a second end. The flaps translate acceleration in a predefined direction to strain in the strain sensor. Further embodiments have flaps defining an interrupted surface with greater height at the center and flaps that have features for enhancing the strain caused by acceleration.

Patent Number: 7679410 Issue Date: 3/16/2010

Title: A METHOD FOR IMPROVING THE EFFICIENCY AND RELIABILITY OF A BROADBAND TRANSISTOR SWITCH FOR PERIODIC SWITCHING APPLICATIONS

Abstract: A driver circuit is provided for enabling a transistor collector-emitter path to be used as a broadband periodic switch. The broadband driver circuit controls the magnitude of the transistor base-emitter current in order to enable a CLOSED switch state and to simultaneously control the magnitude of the transistor base-emitter reverse-bias voltage in order to enable the OPEN-switch state. The precise control of these parameters minimizes base-charge storage and prevents reverse-breakdown failure.

Patent Number: 7679999 Issue Date: 3/16/2010

Title: MARINE ACOUSTIC SENSOR ASSEMBLY

Abstract: A marine acoustic sensor assembly includes an acoustic panel having a forward surface and an after surface, a laser scanner oriented so as to project a laser beam onto the acoustic panel after surface, and a sensor oriented so as to receive reflections of the laser beam off the acoustic panel and to transmit data from which a position of a sound generating source can be determined, wherein the acoustic panel is provided with an absorber layer extending over the after surface thereof, and the absorber layer is provided with holes extending therethrough, the holes being of a size sufficient to permit passage of the laser beams to the acoustic panel after surface and the reflections to pass to the sensor, whereby to minimize reflections and noise originating from aft of the after surface, while permitting sound incoming from forward of the acoustic panel to be measured.

Patent Number: 7685862 Issue Date: 3/30/2010

Title: TARGET SYSTEM GIVING ACCURACY AND ENERGY

Abstract: A target for a test range includes an impact plate having at least three strain sensors positioned on the plate. The sensors are connected to a data acquisition board for receiving a signal from each sensor upon impact of a projectile on the plate. The data acquisition board is joined to a processor for calculating impact location and energy. Optionally multiple sensors can be provided having different orientations for accounting for different strain components in the plate.

Patent Number: 7690309 Issue Date: 4/6/2010

Title: SUPERCAVITATING VEHICLE CONTROL

Abstract: A control system for a supercavitating vehicle includes a set of winglets for rapid maneuverability and a segmented ring wing for fine stabilization control. The winglets and ring wing extend from an aft portion of the vehicle. The winglets are supported by a strut attached to the vehicle. The angle of attack of each winglet into the water adjacent the cavity is controlled by a winglet actuator. The winglet assembly may be extended into the water or retracted to be completely within the cavity by means of a spring-loaded actuated mount. The segmented ring wing is controlled by a ring actuator. The ring actuator may be used to control the angle of attack of the ring wing. Alternately, or in combination, the flow over the ring wing may be neutralized by using the cavitator of the vehicle to globally enlarge the cavity and thus limit the flow.

Patent Number: 7721843 Issue Date: 5/25/2010

Title: VISUAL ACOUSTIC DEVICE

Abstract: A visual-acoustic device is provided that contains an acoustic detector to produce sound waves in communication with a moire pattern generator that produces moire patterns corresponding to the sound waves. The device includes a rigid plate having a first repetitive pattern and a flexible plate spaced from the rigid, plate and having a second repetitive pattern corresponding to the first repetitive pattern. The sound waves induce movement of the flexible plate such that the second repetitive pattern moves with respect to the first repetitive pattern to produce the moire pattern. The visual-acoustic device can be arranged as a visual-acoustic stethoscope.

Patent Number: 7734755 Issue Date: 6/8/2010

Title: INTERACTIVE DATA FAULT LOCALIZATION SYSTEM AND METHOD

Abstract: An interactive system is provided to help an operator locate the source of a data fault in an Asynchronous Transfer Mode (ATM) network. A database stores information related to data types and subsystems used by the ATM network. A processor coupled to the database uses the information stored therein to formulate a series of queries related to a selected one of the subsystems using the data type experiencing a data fault. The series of queries have a hierarchal order that sequentially inquire about operational status of the various subsystems having a relationship with the data type experiencing the data fault. A graphical user interface (GUI) coupled to the processor displays each query in accordance with the hierarchal order thereof. The GUI simultaneously displays identification of the various subsystems having a relationship with the data type experiencing the data fault.

Patent Number: 7755326 Issue Date: 7/13/2010

Title: BATTERY MONITORING AND CHARGING SYSTEM

Abstract: A battery monitoring device for a battery having cells grouped in modules. The device includes a monitoring circuit for each module which monitors the voltage in each cell and the overall module voltage. The monitoring circuits can also detect module temperatures. The monitoring circuits are networked to a control computer. The device can be used with a power supply and relays for each module to interrupt charging when a fault condition is detected by the monitoring circuits. Other features of the device allow equalization of cells having excessive voltages.

Patent Number: 7782712 Issue Date: 8/24/2010

Title: A METHOD TO ESTIMATE LOCAL TOWED ARRAY ANGES USING FLUSH MOUNTED HOT FILM WALL SHEAR SENSORS

Abstract: A towed array is provided with hot-film sensors and anemometer circuitry to calculate the angle of inclination of the towed array in real time during deployment of the towed array in a sea water environment. The hot-film sensors are arranged in pairs along the length of the towed array to increase the sensitivity of the inclination angle determinations and are located flush with an exterior surface of the towed array to minimize interference with the operation of the towed array. The pairs of hot-film sensors determine the local sheer stresses on the towed array, and these measurements are converted to inclination angles using an empirically derived look-up table.

Patent Number: 7800978 Issue Date: 9/21/2010

Title: METHOD FOR REAL TIME MATCHED FIELD PROCESSING

Abstract: A method for utilizing a matched field-processing algorithm employing a number of sensors wherein the sensor output is the measured acoustic data as the first input and is translated to a frequency by applying a Fourier transform to a set of time samples as a data vector output. A replica vector is the second data input as a predicted quantity which is computed by an acoustic model with an assumed acoustic location. The output is an ambiguity surface ranging between zero and one with the highest values indicating the likely position of an acoustic location. The matched field response is generalized by averaging the response over multiple frequencies. A response for an array may be computed by forming beams and then combining them by multiplying each by an eigenray factor before summing. The computation of the response may be further defined by voxel interpolation.

Patent Number: 7802474 Issue Date: 9/28/2010

Title: FIBER OPTIC LASER ACCELEROMETER

Abstract: An accelerometer is provided for a fiber optic laser. Strain applied to the fiber optic laser results in an emission wavelength shift. The fiber optic laser is joined to a transducer and extends laterally across said transducer. Acceleration of the transducer in a predefined direction causes strain in said fiber optic laser. The transducer can have many possible designs. There is further provided a system for sensing acceleration which includes a pumping laser and a distributor joined to the fiber optic laser. Return signals from the fiber optic laser are provided to an interferometer and analysis circuitry. In the absence of a transducer, the system can operate as a strain sensor.

Patent Number: 7804454 Issue Date: 9/24/2010

Title: ACTIVE HIGH FREQUENCY TRANSMITTER ANTENNA ASSEMBLY

Abstract: A combined antenna transmitter joined for transmitting a message signal includes a switching signal source modulated by the message signal. The switching signal is provided to a transistor at an operating frequency. The transistor switches a high voltage input through the transistor, a choke inductor and a boost inductor. A bypass capacitor is provided between the inductors for shielding the high voltage input. An antenna is connected between the boost inductor and the transistor for transmitting a radio frequency signal at the operating frequency. There is thus provided a compact, efficient transmitter and antenna assembly for transmitting modulated message signals.

Patent Number: 7832998 Issue Date: 11/16/2010

Title: CONTROLLED SKIN FORMATION FOR FOAMED EXTRUDATE

Abstract: An extrusion apparatus is taught that employs a die adapter that is partially submerged in a heat transfer bath on a horizontal plane such that there is no air gap between the die extrusion aperture and the heat transfer bath. A porous dam is positioned between the die and the heat transfer bath. A heat insulating plate is positioned between the porous dam and the die to prevent the heat transfer medium from flowing onto the die. The heat insulating plate also prevents excessive cooling of the die tip thereby allowing the necessary precise thermal control over the extrudate skin formation to prevent melt fracture and form a low density extrudate with a smooth solid skin and inner foamed core.

Patent Number: 7861977 Issue Date: 1/4/2011

Title: ADAPTIVE MATERIAL ACTUATORS FOR COANDA EFFECT CIRCULATION CONTROL SLOTS

Abstract: A system and method of use are provided for introducing tangential control fluid flows along the surface of an aerodynamic member. The fluid flows are directed toward a coanda surface disposed at the trailing edge of the aerodynamic member. At least two injection slots are provided on opposite sides of the aerodynamic member to produce opposing forces. Control of the flow of fluid from each slot determines the net effect of these opposing forces. Smart material actuators are used to control the flow of fluid from each slot by varying the size of each slot.

Patent Number: 7865836 Issue Date: 1/4/2011

Title: GEOSPATIAL PRIORITIZED DATA ACQUISITION ANALYSIS AND PRESENTATION

Abstract: The invention as disclosed is a method to identify and monitor/track ships as they traverse waterways. The earth's surface is partitioned into geospatial regions with attributes of each region being stored. A priority is assigned to each partitioned region. A variety of data sources are used to collect data about ships in the geospatial regions. The data is merged and presented in geospatial or tabular

formats on a graphical user interface, where the data itself, the data accuracy, and the age of the data can be visually determined graphically and chromatically from the display.

Patent Number: 7868833 Issue Date: 1/11/2011

Title: AN ULTRA WIDEBAND BUOYANT CABLE ANTENNA ELEMENT

Abstract: The invention as disclosed is of a buoyant cable antenna for use with underwater vehicles having improved bandwidth through the use of discrete distributed loading along the antenna. The buoyant cable antenna is designed with an antenna wire that is divided into N equal length segments of length d/2. A capacitor is coupled between every other segment such that capacitors are separated by a distance d. A shunt inductor is coupled to the antenna wire between the adjoining segments not separated by a capacitor such that the shunt inductors are separated by a distance d. This antenna design provides a substantially improved impedance bandwidth over existing prior art antennas at high frequency without increasing the physical profile of the antenna and without the use of active circuit elements.

Patent Number: 7869910 Issue Date: 1/11/2011

Title: AUTOCATALYTIC OSCILLATORS FOR ANIMAL-LIKE LOCOMOTION IN SMALL UNDERWATER VEHICLES

Abstract: A system is provided to control maneuvering flapping foils of an underwater vehicle. An oscillator generates periodic signals in which effects of external disturbances are minimized or amplified as required; the periodic signal can be either sinusoidal or can depart significantly from a sinusoid; the amplitude and frequency are varied by changing the oscillator parameters and the phase between the signals are varied by changing the parameters. The oscillator restores the parameters after a disturbance. Since the oscillator functions without external sensors, the oscillator serves as an inner-loop controller with a centralized control. An open loop control architecture for the controller, results in a motion where the vehicle maneuvers execute as force and moment commands. The non-linear, auto-catalytic oscillator can be realized using a variety of second-order differential equations. An oscillator model is added to a conventional motor control, where the outputs of the oscillator control the foils in real-time.

Patent Number: 7878873 Issue Date: 2/1/2011

Title: THRUST ADJUSTMENT APPARATUS FOR AN UNDERWATER VEHICLE

Abstract: An apparatus for providing thrust adjustment on an underwater vehicle with a propeller shroud is disclosed. A portion of the vehicles body is provided with a compliant surface such that expansion and contraction of the compliant surface affects the flow of water through a channel formed by the vehicle body and the propeller shroud, resulting in variable thrust on the vehicle.

Patent Number: 7881156 Issue Date: 2/1/2011

Title: METHOD TO ESTIMATE TOWED ARRAY ANGLES

Abstract: A towed array is provided with hot-film sensors and anemometer circuitry to calculate the angle of inclination of the towed array in real time during deployment of the towed array in a sea water environment. The hot-film sensors are arranged in pairs along the length of the towed array to increase the sensitivity of the inclination angle determinations and are located flush with an exterior surface of the towed array to minimize interference with the operation of the towed array. The pairs of hot-film sensors determine the local shear stresses on the towed array, and these measurements are converted to inclination angles using an empirically derived look-up table.

Patent Number: 7884592 Issue Date: 2/8/2011

Title: AN ENERGY EFFICIENT METHOD FOR CHANGING THE VOLTAGE OF A DC SOURCE TO ANOTHER VOLTAGE IN ORDER TO SUPPLY A LOAD THAT REQUIRES A DIFFERENT VOLTAGE

Abstract: A system and method of use for a DC-DC conversion wherein a DC supply at one voltage is converted to a DC supply at another voltage. The DC-DC converter uses a switching circuit with a broadband transmission line transformer to change the impedance level between a square-wave generator and a [square-wave]-to-DC converter. The transformer transforms generator characteristic impedance into load characteristic impedance. The method also transforms a DC source voltage into another DC load voltage.

Patent Number: 7886728 Issue Date: 2/15/2011

Title: SYSTEM AND METHOD FOR CONTROLLING THE POWER OUTPUT OF AN INTERNAL COMBUSTION ENGINE

Abstract: A system and method are provided to control the power output, fuel efficiency and gas emissions of an internal combustion engine using an exhaust gas recirculation system. A recirculation loop containing a heat exchanger and an accumulator is installed between the exhaust ports and intake ports of the cylinders of the internal combustion engine. Diverter valves are used to control the amount of exhaust gas directed into the recirculation loop and the proportion of exhaust gas entering the intake ports. Controlling the amount of re-circulated exhaust gas and proportion of exhaust gas in the intake ports thereby controls the power output of the internal combustion engine.

Patent Number: 7906340 Issue Date: 3/15/2011

Title: METHOD FOR QUANTITATIVE DETERMINATION OF HYDROGEN PEROXIDE USING POTENTIOMETRIC TITRATION

Abstract: An electrochemical potentiometric titration method that entails titration of a known volume of a catholyte containing an unknown amount of hydrogen peroxide in a titration cell having two electrodes, a platinum working electrode and a silver/silver chloride reference electrode. A known concentration of a titrant is added to the catholyte in the titration cell. Simultaneously, as the titrant is added the potential between the working electrode and the reference electrode is monitored. The point

at which all of the hydrogen peroxide has been consumed is signaled when the cell potential changes abruptly. Since the concentration of the titrant is already known, the amount of titrant added (concentration multiplied by volume) is directly related to the amount of hydrogen peroxide consumed. The concentration of hydrogen peroxide is calculated from the volume of catholyte and the moles of hydrogen peroxide.

Patent Number: 7924654 Issue Date: 4/12/2011

Title: SYSTEM FOR BEAMFORMING ACOUSTIC BUOY FIELDS

Abstract: A system using beamforming techniques in conjunction with an active or passive acoustic buoy field, where the buoy field has a plurality of buoys, each buoy employing at least one sensor attached to and extending substantially downward from that buoy so as to form a planar or conformal array. Each array buoy uses highly accurate GPS tracking devices to locate that buoy's array sensor position relative to all other buoy arrays in the known buoy field. This accurate positional data is used in conjunction with the sensor data from each depth to beamform a planar or a volumetric array.

Patent Number: 7926275 Issue Date: 4/19/2011

Title: AFTERBURNER FOR CLOSED CYCLE BRAYTON PROPULSION SYSTEM

Abstract: A closed cycle Brayton direct contact reactor/storage tank uses a chemical scrubber to assist in removing metal vapors from the working fluid. The direct contact reactor/storage tank operates by bubbling an inert gas through liquid metal fuel. The inert gas picks up metal vapors from the fuel. The chemical scrubber is comprised of a reducible material contained within a filter at the top of the reactor/storage tank. The reducible material on reacting with the metal vapor forms components that are solids at the operating temperature and pressure, thereby preventing metal vapor from circulating throughout the system as part of the working fluid and causing damage to system components.

Patent Number: 7926276 Issue Date: 4/19/2011

Title: CLOSED CYCLE BRAYTON PROPULSION SYSTEM WITH DIRECT HEAT TRANSFER

Abstract: A liquid metal fueled Brayton cycle power system with a direct contact heat exchanger. In this invention, a compressor compresses the working gas. A regenerator preheats the compressed working gas and passes the working gas to a reactor/storage tank with liquid metal fuel stored therein. An oxidant is injected into the reactor/storage tank to react with the liquid metal fuel. The compressed working gas bubbles through the liquid metal fuel in the reactor/storage tank and is heated by direct contact with the fuel-oxidant mixture. A turbine expands the heated working gas and thereby withdraws power from the system. The spent working gas exits to the regenerator where it warms the compressed gas. A cooler reduces the working gas temperature and recirculates the gas to the compressor.

Patent Number: 7926587 Issue Date: 4/19/2011

Title: EXPLOSIVE WATER JET WITH PRECURSOR BUBBLE

Abstract: A water jet assembly and method of use is provided comprising a tank with cutting fluid, fuel and oxidizer lines, and a tank discharge lines. In operation, the tank is filled with oxidizer; the oxidizer line is closed and cutting fluid is supplied compressing the oxidizer. When the fluid reaches a level, the fluid line is closed and fuel is injected. A spark generator ignites the fuel/oxidizer mixture thereby raising the tank pressure. As the pressure rises, a low pressure valve simultaneously closes at a prescribed level. The vent line and a discharge to a nozzle are opened thereby, forming a gas bubble. When the bubble reaches a desired size and pressure drops below a level, the vent closes, allowing combustion expansion to force fluid through the nozzle to form a cutting jet.

Patent Number: 7929375 Issue Date: 4/19/2011

Title: METHOD AND APPARATUS FOR IMPROVED ACTIVE SONAR USING SINGULAR VALUE DECOMPOSITION FILTERING

Abstract: The invention is a method for improved active sonar using a singular value decomposition filtering and a Volterra-Hermite Basis Expansion to model real active sonar measurements. The fitting model minimizes the sum of the squared errors between a measured channel response, z(t), and model response, y(t), which is a fitted Volterra Series solution. The model requires as input an excitation waveform, x(t), to which is fitted the model response, y(t). A contracted broadband cross-ambiguity function is used to correct the excitation waveform for Doppler and range effects. Once completed, the modeled response can be used to determine the linearity or non-linearity of the channel effects. Appropriate measures can be utilized to reduce these effects on the measured channel response.

Patent Number: 7937930 Issue Date: 5/10/2011

Title: SEMI-CLOSED CYCLE BRAYTON POWER SYSTEM WITH DIRECT HEAT TRANSFER

Abstract: A semiclosed power system utilizing a Brayton cycle with combustion occurring between diesel fuel and O.sub.2 in direct contact with an inert gas. The inert gas and products of combustion form a heated working fluid which is expanded in a turbine to provide power. The expanded working fluid is then used in a regenerator to heat the cooler, compressed inert gas before the inert gas is transferred to the combustor. The expanded working fluid is cooled by direct contact with seawater causing the steam within the expanded working fluid to condense to water and CO.sub.2 in the working fluid to be dissolved in the water and seawater. The inert gas is separated from the fluids and recycled within the system. The fluids are pumped overboard.

Patent Number: 7938077 Issue Date: 5/10/2011

Title: HYDROGEN GENERATOR APPARATUS FOR AN UNDERWATER VEHICLE

Abstract: A hydrogen generation apparatus for an underwater vehicle is presented, the apparatus including a hydrolysis reaction compartment, a mass of solid lithium hydride disposed in the compartment, inlet and outlet structure for passing sea water through the compartment to generate

steam, lithium hydroxide and hydrogen gas, a condenser for condensing out the steam and retaining the condensate and lithium hydroxide, and a tank for collecting the hydrogen gas, the tank having outlet structure for discharging the hydrogen gas to a vehicle propulsion system.

Patent Number: 7940602 Issue Date: 5/10/2011

Title: AUTOMATIC DEPTH SOUNDER (FATHOMETER) ELECTRONIC CHART COMPARATOR

Abstract: An underwater depth discrepancy system and method are provided. A comparator compares an actual underwater depth with a predetermined/prerecorded chart depth corresponding to a current location corresponding to the location of the actual underwater depth. A first signal is generated when the actual underwater depth is greater than the chart depth while a second signal is generated when the actual underwater depth is less than the chart depth. The current location and actual underwater depth are recorded whenever the first or second signal is generated. In addition, one or more alarms are generated when the second signal is generated.

Patent Number: 7951339 Issue Date: 5/31/2011

Title: SCRUBBER FOR CLOSED CYCLE BRAYTON PROPULSION SYSTEM

Abstract: A closed cycle Brayton direct contact reactor/storage tank uses an afterburner to assist in removing metal vapors from the working fluid. The direct contact reactor/storage tank operates by bubbling an inert gas through liquid metal fuel. The inert gas picks up metal vapors from the fuel. The afterburner comprises a predetermined amount of oxygen, O.sub.2, being fed to a filter cavity within the reactor/storage tank and having the metal vapors react directly with the O.sub.2 forming a solid oxide that remains and does not circulate as part of the working fluid throughout the external parts of the Brayton cycle outside of the reactor/storage tank causing damage to system components.

Patent Number: 7952530 Issue Date: 5/31/2011

Title: SERPENTINE BUOYANT CABLE ANTENNA

Abstract: The present invention relates to an improved buoyant cable antenna system. The system includes a buoyant cable transmission line segment and an antenna segment formed from a flexible memory structure comprised of at least one segment of coiled compression, pinched to form a desired shape and encapsulated in a buoyant encapsulant material. The antenna segment may include a U-shaped keel portion, a horizontal serpentine shaped section, and a vertical element with the horizontal serpentine shaped section floating on the surface of the water and the vertical element extending above the surface of the water. A process for manufacturing the buoyant cable antenna system is also described.

Patent Number: 7954442 Issue Date: 6/7/2011

Title: TOWED ARRAY DEPLOYMENT SYSTEM FOR UNMANNED SURFACE VEHICLE

Abstract: A towed array deployment system is provided that uses the flow of fluid through the interior of a tube to deploy a towed line array. The system includes a small surface water craft such as an unmanned surface vehicle having a length between seven and eleven meters and a U-shaped tube mounted to the outside of the hull of the watercraft below the waterline. A towed array is fed from a winch aboard the surface craft, through one end of the tube, and the fluid is introduced through into the interior of the tube to force the towed array for deployment through the tube and out a second end of the tube near the stern of the watercraft.

Patent Number: 7966936 Issue Date: 6/28/2011

Title: TELESCOPING CAVITATOR

Abstract: A high speed underwater projectile configuration that includes a cylindrical telescoping cavitator design capable of providing projectile nose shape change where such change to the projectile nose tip geometry results in supercavitation and a concomitant vaporous cavity in the water that reduces projectile drag resistance while maximizing projectile range and where the projectile nose tip further includes a retractable cavitator piston feature. The projectile nose is designed to house a cylindrical cavitator piston that protrudes forward from the projectile and is held in place until launch. Velocity induced hydrodynamic forces on the forward face of this cavitator piston cause the piston to start moving aft and to gradually cause the piston to retract into the projectile nose, until a larger, secondary cavitator is exposed to the vaporous cavity.

Patent Number: 7975614 Issue Date: 7/12/2011

Title: ACOUSTIC SHOTGUN SYSTEM

Abstract: A high velocity acoustic signal producing underwater shotgun system for dispersing a plurality of relatively small supercavitating projectiles over a wide spatial field at long range using the dynamics of cavity collapse for better target localization in underwater mine clearance. A typical supercavitating projectile design is enhanced to produce a two-staged projectile in order to accomplish this innovation. The first stage of the two stage design allows for the long range firing underwater typical of a supercavitating projectile while the second stage permits the coverage of a wide area with a plurality of small supercavitating projectiles just as the first stage projectile reaches its fixed range. A distinctive feature of the radiated noise from a supercavitating projectile contacting a solid object is used in conjunction with the two stage projectile design to provide a system for underwater mine clearance verification. The distinctive noise signal may also be used in conjunction with an underwater targeting system to help identify, localize and track targets as well.

Patent Number: 7985924 Issue Date: 7/26/2011

Title: COAXIAL TRANSDUCER

Abstract: A coaxial transducer that uses lead zirconate titanate ceramic or other suitable material as an isolator between the conductors in a coaxial cable to transmit acoustic power at useful levels. The lead

zirconate titanate ceramic is diced into thin disks and placed in between spacers made of much stronger insulating material. The coaxial cable is then integrated into a conventional double-armored steel tow cable with a typical diameter of 1''. This provides substantial longitudinal strength and provides crushing resistance to the lead zirconate titanate ceramic when the cable is being deployed or retrieved over a sheave under tension.

Patent Number: 8006619 Issue Date: 8/30/2011

Title: UNDERWATER ACOUSTIC TRACER SYSTEM

Abstract: An underwater supercavitating projectile includes means to form ripples on its surrounding cavity so as to provide well-defined disturbances of the cavity boundary. As the ripples move aft of the supercavitating projectile and into the wake behind the advancing projectile, the ripples detach to form a pattern of vapor bubbles in the wake that are distinct in both size and regularity from the typical vapor bubbles formed as the cavity collapses behind the advecting projectile. Sensors record the track of the projectile along its path based on the distinct acoustic signature of the vapor bubbles. Combined with the acoustic echo from a target, the relative distance of the projectile to the target can be determined using methods known in the art. Multiple projectile trajectories are used to increase the ability to resolve the target by adjusting the aiming of the projectiles to reduce the relative distance.

Patent Number: 8028830 Issue Date: 10/4/2011

Title: ANTI-BALLISTIC COMPOSITE STRUCTURE FOR ORDINANCE

Abstract: A structure is disclosed to protect explosive ordnance. The structure comprises an inner ceramic layer. A polyurethane layer encompassing the inner ceramic layer. A third layer is a stainless steel layer encompassing the polyurethane layer with a second polyurethane layer wrapping around the stainless steel layer. A fifth layer is an outer ceramic layer. A sixth layer through tenth layer comprises interconnected aramid fiber fabric (i.e., KEVLAR) impregnated with polyurethane. The structure may be part of an explosive handling system to include a shipping container that decelerates projectiles approaching the explosive device. The container comprises fifteen additional layers to encompass the structure. The first layer is steel encompassing the structure with a second layer through fifteenth layer of the container each being KEVLAR impregnated with polyurethane. Both the composite structure and the shipping container can be made from commercially available products.

Patent Number: 8030825 Issue Date: 10/4/2011

Title: PIEZOELECTRIC GENERATOR AND METHOD

Abstract: An apparatus and method is provided to produce energy from movement of a user. At least one pair of plates is utilized to secure an array of cymbal transducers therebetween. The array of cymbal transducers is electrically interconnected with signal conditioning circuitry and power storage member. Electrical interconnections may comprise parallel and/or series connections between ones or groups of the cymbal transducers.

Patent Number: 8042255 Issue Date: 10/25/2011

Title: A RAPID PROTOTYPING FABRICATION TECHNIQUE FOR ARBITRARY SHAPE PIEZOELECTRIC COPOLYMER TRANSDUCER SENSORS

Abstract: The present invention provides methods for making an acoustic transducer. In one possible embodiment, a rigid inner shell is provided with a conductive exterior surface. Masking material is applied onto a first location on the conductive exterior surface of the rigid inner shell. Piezoelectric material is deposited over the conductive exterior surface of the rigid inner shell and the masking material. Conductive material is deposited onto the piezoelectric material. The masking material is removed. A first signal lead is attached to the first location on the conductive exterior surface of the rigid inner shell. A second signal lead is attached to the conductive material.

Patent Number: 8042483 Issue Date: 10/25/2011

Title: BIOLOGICALLY-INSPIRED CONTROL OF STATOR WAKES FOR BLADE RATE SIGNATURE REDUCTION

Abstract: The invention as disclosed is an apparatus that controls the wake of stator blades on an underwater vehicle. The apparatus comprises one or more stator blades each with a movable trailing edge that when actuated in a controlled manner produces a periodic flapping motion upstream of a propulsion rotor. The controlled periodic flapping of the trailing edge the fills the stator blade wake enough to overcome the stator blade's own drag and fill its wake deficit. This has the effect of reducing the blade rate tonal noise of the propulsion rotor.

Patent Number: 8044637 Issue Date: 10/25/2011

Title: BATTERY CHARGING METHOD

Abstract: A charging and equalizing method for a battery having a control computer in a charging system in communication with a plurality of module processors. Charging and equalization pauses periodically for voltage measurement by the module processors. The control computer determines when to equalize battery cells in the modules based on their open circuit voltages transmitted by the module processors. A selected group of cells in each module can be equalized. Equalization is carried out in the modules until all of the module processors indicate that equalization has been completed. Charging can then resume until charging is complete or cells reach a maximum voltage given by the control computer. In an alternative embodiment, a selected group of cells may be partially bypassed while charging to reduce the charge rate of the cell.

Patent Number: 8045419 Issue Date: 10/25/2011

Title: A METHOD FOR MITIGATING SPATIAL ALIASING

Abstract: The invention as disclosed is a method for mitigating spatial aliasing that takes advantage of the forward motion of towed array elements to overcome the frequency constraints imposed on beam

forming by the spatial separation of the array elements. The method employs the motion of a towed array of hydrophones to generate at least one synthetic array element to compensate for spatial under sampling.

Patent Number: 8045859 Issue Date: 10/25/2011

Title: HIGH SPEED UNDERWATER DATA TRANSMISSION SYSTEM AND METHOD

Abstract: An underwater data transmission system including arrays of nano-meter scaled photon emitters and sensors on an outer surface of an underwater platform. For the emitters, a laser is pulsed to correlate with data packets, providing a beam of photons at a prescribed frequency. Nano-scaled collecting lenses channel the incoming photons to photo-receptors located at a focal plane for the frequency at the base of each lens. A coating on the lenses absorbs photons at the frequency that are not aligned with the longitudinal axes of the lenses or tubes. Nano-wires connect the photo-receptors to a light intensity integrator. The integrator integrates the intensity over a surface area. The output of the integrator is fed to a signal processor to track and process the arriving digital packets.

Patent Number: 8047149 Issue Date: 11/1/2011

Title: LASER-BASED METHOD FOR DOCKING AN UNMANNED UNDERWATER VEHICLE TO A SUBMARINE

Abstract: An Unmanned Undersea Vehicle (UUV) docking system is provided in which the UUV is responsive to a first rotating light beam (which emits from a submarine) to begin a docking procedure. The UUV utilizes a photodetector to detect the first light beam and to guide the UUV toward the submarine by utilizing the first light beam. In one embodiment, the UUV reflects light from the first light beam back to the submarine. A photodetector on the submarine detects the reflected light to ascertain that the UUV is locked onto the first light beam. The submarine then stops rotating the light beam so that a trajectory of the UUV heads in the direction of a docking station which is positioned on the submarine.

Patent Number: 8047709 Issue Date: 11/1/2011

Title: METHOD AND SYSTEM FOR INTERFACE DETECTION

Abstract: A method and system for detecting the location of an air/sea interface on an Instrumented Tow Cable (ITC) when distributed temperature measurements are provided. The air/sea interface is determined by estimating the variance of observed temperature in the proximity of each measurement cell. The method and system described herein uses a sliding variance across the entire cable length. The variance of the cell or cells in the area of the interface has been found to be large compared to other cells. Accordingly, the location of the air/sea interface is determined based on the location of the peak variance. The location of the air/sea interface is used in determining the catenary of the ITC.

Patent Number: 8053057 Issue Date: 11/8/2011

Title: MATERIAL WITH IMPROVED ADHESION SURFACE

Abstract: An apparatus for improving and increasing sustainable shear force capabilities at an interfacing surface between a rigid material and a flexible material is disclosed. The interface includes at least two superimposed components having different surface roughnesses. A coarse surface roughness component has a surface roughness about 3 orders of magnitude greater than that of a fine surface roughness component. The interface is useful for all types of devices with a rigid-to-flexible interface that needs to resist shear, tension, torsion, compression, or any disturbing steady-state or variable force or forces.

Patent Number: 8054712 Issue Date: 11/8/2011

Title: AN AUTONOMOUS HYDROPHONE POSITION LOCATING AND TARGET TRACKING SYSTEM

Abstract: An autonomous hydrophone position locating and target tracking system employing a string or array of acoustic hydrophone equipped apparatuses that are easily and rapidly deployed over the ocean bottom within a preselected volume of water. For each bottom residing hydrophone, a dedicated cable provides surface location based on satellite generated GPS positioning data. Special real time cable deflection algorithms resident in the base unit electronic processor are continuously updated using the velocity gradient inputs from several in-line velocimeters positioned at different depths along the cable. The shape of the tether cable and the resulting position of the bottom unit mounted hydrophone is then back calculated in real time in three dimensions from the known global position of the surface buoy.

Patent Number: 8063838 Issue Date: 11/22/2011

Title: SUBMARINE MAST ANTENNA CONTROLLER

Abstract: The present invention is a submarine mast antenna controller for controlling a plurality of functions performed by an antenna mast of a submarine. The submarine mast antenna controller is a solid state electronic control unit on a single card that monitors various submarine mast antenna system sensors and motors, and controls electromechanical devices associated with the sensors and improves functionality over the former ACU system by consolidating control interfaces and indicators in one computer terminal via a VXI interface.

Patent Number: 8064060 Issue Date: 11/22/2011

Title: OUTBOARD OPTICAL CABLE SENSOR SYSTEM AND METHOD

Abstract: A plurality of optical sensors are mounted to a housing made of optically conductive material. The housing seals the optical sensors from a water-filled tube which extends through said housing. The optically conductive material provides optical coupling with the water-filled cable tube whereby a plurality of light beams are directed through the housing and the water-filled tube in a predetermined pattern, which provides certainty of the absence or presence of a cable within the water-filled cable tube for a minimum cable diameter regardless of the orientation of the cable within the water-filled tube.

Patent Number: 8065046 Issue Date: 11/8/2011

Title: OLIVO-CEREBELLAR CONTROLLER

Abstract: Non-linear control laws are disclosed and implemented with a controller and control system for maneuvering an underwater vehicle. The control laws change the phase of one Inferior-Olive (IO) neuron with respect to another IO. One control law is global, that is, the control law works (stable and convergent) for any initial condition. The remaining three control laws are local. The control laws are obtained by applying feedback linearization, while retaining non-linear characteristics. Each control law generates a profile (time history) of the control signal to produce a desired phase difference recognizable by a controller to respond to disturbances and to maneuver an underwater vehicle.

Patent Number: 8073797 Issue Date: 12/6/2011

Title: A METHOD FOR SOLVING COMBINATORAL OPTIMIZATION PROBLEMS

Abstract: A method for solving a combinatorial optimization problem and applying the solutions to routing as employed in naval convoying and other transit point scheduling. The method involves isolating a plurality of vertices into open-ended zones with lengthwise boundaries. In each zone, a minimum length Hamiltonian path is found for each combination of boundary vertices, leading to an approximation for the minimum-length Hamiltonian Cycle. The method discloses that when the boundaries create zones with boundary vertices confined to the adjacent zones, the sets of candidate HPs are found by advancing one zone at a time, considering only the vertices in the zone in question (with embedded HPs from previous zones) and an adjacent zone in the direction of progression. Determination of the optimal Hamiltonin paths for subsequent zones has the effect of filtering out non-optimal Hamiltonian paths from earlier zones.

Patent Number: 8075223 Issue Date: 12/13/2011

Title: DEPLOYMENT SYSTEM FOR FIBER OPTIC LINE SENSORS

Abstract: A system for deploying a fiber optic line sensor is provided that includes a launch vehicle to which three sections are attached. The first section is a buoy antenna section. The second section is an electronics canister section having control electronics. These sections are releasably attached to the launch vehicle. The electronics canister section is in contact with the antenna section and secured to the antenna section by a spring band. A communications cable is attached between the antenna and the control electronics. The third section is a spool section containing a spool of a fiber optic line sensor. This third section is attached to the launch vehicle by a rigid mount and is in contact with the electronics canister section. The fiber optic line sensor extends from the spool section into the electronics canister section to the control electronics.

Patent Number: 8082802 Issue Date: 12/27/2011

Title: COMPACT AND STAND-ALONE COMBINED MULTI-AXIAL AND SHEAR TEST APPARATUS

Abstract: A testing apparatus is disclosed that includes a turntable, an upper scissor jack assembly and a lower scissor jack assembly positioned in parallel planes, about a longitudinal axis and affixed to a base. The apparatus is powered by at least three motors with supporting controllers. The lower assembly is affixed to the base mechanically via the turntable which allows the lower assembly to rotate with respect to the upper assembly. There are two loading plates attached to the hinges of each scissor jack. The test specimen is secured by the loading plate. Each scissor jack operates by a screw-gear powered by one of the motors. Upon energizing a stepper motor; the screw-gear positions a scissor jack to apply a tension or compression on the specimen. While subjected to tension or compression, the lower jack assembly can be rotated with respect to the upper assembly for in-plane shear loading.

Patent Number: 8087371 Issue Date: 1/3/2012

Title: DEPLOYABLE AND INFLATABLE HYBRID FENDERING APPARATUS

Abstract: A deployable and inflatable/deflatable fendering apparatus capable of providing protection for watercrafts and docks. The apparatus has an inflatable cylindrical body, an outer collar body, and a water reservoir with an inflating and deflating means. The collar body circumferentially surrounds the cylindrical body, and is made of abrasion resistant materials and protects the cylindrical body from punctures, tearing and abuse. The collar body may be inflatable or filled with foam-like material. The reservoir comprises a one-way valve, a series of ballasts and is attached to the cylindrical body and is expandable to provide stabilization of the fendering apparatus. The fendering apparatus can be deflated for storage.

Patent Number: 8087372 Issue Date: 1/3/2012

Title: AN IMPROVED FAIRLEAD FOR A TOWED CABLE HANDLING SYSTEM

Abstract: A handling system with an improved fairlead is provided for protecting a tow cable wherein the cable breaking strength exceeds the system-rated tension load; the fairlead being positioned collinearly between the system bellmouth and winch. A guide slot passes through the fairlead positioning the cable higher than the winch release point and bellmouth entry point, maintaining the cable down-slope as the cable exits the fairlead. The slot has a hemispherical portion tapering inward to a groove extending downward. Near the groove bottom, at the fairlead end nearest the bellmouth, is a cutting device. Under tension, the cable rides in the hemispherical portion of the groove. If tension suddenly increases from a snag, the resulting force drives the cable down into the groove where the cable is cut by the device, separating before the force damages the system. The constrained cable end is securely held in place by the taper.

Patent Number: 8088162 Issue Date: 1/3/2012

Title: MEMBRANE PUMP FOR SYNTHETIC MUSCLE ACTUATION

Abstract: A synthetic muscle comprises an outer layer having an interior filled with a proton containing electrolyte. A first electrode extends into the interior, and a second electrode extends through the

interior. The second electrode is attached to the outer layer at two locations. An ion selective microporous membrane extends through the interior along the length of the second electrode and is also attached to the out layer at the two locations. The ion selective membrane is also attached to the second electrode at a plurality of points along its length, defining a plurality of pockets of the ion selective membrane. The ion elective membrane is generally disposed between the two electrodes. The two electrodes are in communication through a power source. Using the power source, an electroosmotic flow is established across the ion exchange membrane from the first electrode to the second electrode, inflating the pockets and constricting the outer layer.

Patent Number: 8096253 Issue Date: 1/17/2012

Title: CABLE FAIRING ATTACHMENT

Abstract: Systems and methods for automatically applying fairings to a cable as the cable is deployed from a winch are provided. Each fairing has two halves, with each half having a recess, or groove, to accommodate the cable. Like halves are connected together and the two halves are stored on separate spools. Counter-rotating wheels adjacent to and on opposite sides of the cable serve to feed the fairing halves from the spools to the cable as the cable is deployed. As the fairing halves approach the cable, magnets in the fairing halves are attract each other and bring the two halves together around the cable and firmly hold the two halves together. When the cable is retrieved, guides align the fairings such that a wedge can pry the two halves apart. The halves can be picked up by the wheels and fed back onto the spools.

Patent Number: 8120992 Issue Date: 2/21/2012

Title: METHOD FOR FINDING RANGE AND BEARING TO UNDERWATER OBJECT

Abstract: A method for localizing the range and bearing of a distant underwater object includes firing a preselected number of supercavitating projectiles sequentially from a firing location such that each projectile tracks along substantially the same trajectory. Supercavitating pellets are dispersed from a projectile at a pre-selected range. Acoustic signals are sensed to detect acoustic signals caused by supercavitating pellet impact with an object. These signals can be processed to determine the range and bearing to the object. In further steps the range and bearing can be used to aim the projectiles.

Patent Number: 8125198 Issue Date: 2/28/2012

Title: A LOW-COST ENERGY-EFFICIENT AMPLITUDE PHASE-FREQUENCY MODULATOR FOR LOW POWER WIRED AND WIRELESS COMMAND, CONTROL AND COMMUNCATI

Abstract: An amplitude, phase and frequency modulator circuit is provided with the circuit containing a periodically driven switch. The circuit connects a DC power source and a resistive load. Periodic operation of the switch generates a square-wave of voltage across the load. A transistor used as a switch is embedded in a switch driver that controls base current and base-emitter reverse bias voltage. The modulator DC input resistance is approximately equal to the load resistance when the switch ON-state period and OFF-state period are approximately equal. The modulator efficiency is nearly one hundred

percent. The frequency response of the square-wave modulator system is high-pass with a lower cutoff frequency determined by element values.

Patent Number: 8127138 Issue Date: 2/28/2012

Title: METHOD AND APPARATUS FOR EMBEDDING INFORMATION IN SONAR

Abstract: The invention as disclosed is of a method to authenticate identify and trace sonar transmissions and echoes by embedding transparent, secure and robust digital watermarks in signal space, where the additional information incurs no cost in bandwidth. The complex short time Fourier transform is selected as the domain for embedding the digital watermark, secured by a secret key, in the time frequency representation of the signal. The watermark is designed through an iterative optimization step. This step insures that the watermarked sonar is also realizable. Selection of the time frequency region for watermarking is driven by avoidance of interference with the sonar itself, or in case of network operation, other watermarks. In addition, the selected time-frequency region remains robust to sound channel and other transmission effects. Sonar echoes are authenticated in the time-frequency plane by a correlation receiver tuned to the watermarked region using the secret key.

Patent Number: 8127705 Issue Date: 3/6/2012

Title: WATER ENTRY SYSTEM

Abstract: A water entry system increases the drag of an underwater vehicle by disrupting the cavity that forms during high-speed transit of the vehicle through the water. A series of inlet ports are positioned in regions of the vehicle where pressure stagnation occurs during transit. Flow passages connect these inlets to outlet ports at regions of lower pressure. Pressure differences cause jets to flow in the respective passages. The jets produce a high flow rate normal to the original cavity boundary. The jets serve to increase drag in at least two manners. In one case, a flow jet normal to the cavity interface broadens the cavity to increase drag and slow the vehicle. In a second case, a jet can cause waves on the cavity interface to break down the stable cavity. As a result, the vehicle surface is wetted, producing skin friction drag and slowing vehicle.

Patent Number: 8134887 Issue Date: 3/13/2012

Title: DIRECTIONAL ACOUSTIC DENSITY SENSOR

Abstract: The invention as disclosed is a fiber optic interferometric directional acoustic density sensor that increases the directionality of a vector sensor that is much smaller in size than the wave length of an acoustic wave. This is accomplished through the use of second order directionality by measuring the acoustic fluctuations of fluid density at a point, wherein the acoustic density fluctuations are determined according to the principles of fluid compressibility and conservation of mass using a density fluctuation measuring apparatus that restricts two of the three vector components of the particle velocity of the acoustic wave and that employs a laser interferometer to measure the fluid density fluctuation along the remaining vector component.

Patent Number: 8156726 Issue Date: 4/17/2012

Title: SEMI-CLOSED CYCLE BRAYTON POWER SYSTEM WITH DIRECT CONTACT HEAT TRANSFER

Abstract: A semiclosed diesel fueled Brayton cycle power system is provided using CO.sub.2 and steam as the working fluid. Combustion occurs in a combustor between diesel fuel and O.sub.2 with CO.sub.2 present as a diluent. During combustion, a heated, high pressure working fluid of CO.sub.2 and steam is formed. The heated working fluid is expanded in a turbine and power is withdrawn from the fluid. The fluid is then used in a regenerator to heat cooler, compressed CO.sub.2 before the compressed CO.sub.2 is transferred to the combustor. The expanded working fluid is cooled conventionally by seawater in a cooler, condensing steam in the working fluid to water. The water is separated from the gaseous CO.sub.2. The gaseous CO.sub.2 is recycled, and the water is used to backfill the system's diesel fuel tank.

Patent Number: 8174166 Issue Date: 5/8/2012

Title: UNIFORMLY DISTRIBUTED LEAD ZIRCONATE TITANATE STRAIN SENSOR

Abstract: The invention as disclosed is a strain sensor that locates and quantifies the strain energy from a structure. The strain sensor has a lead zirconate titanate wafer with a circular shape such that the shape does not directionally restrict the signal of the sensor.

Patent Number: 8175547 Issue Date: 5/8/2012

Title: DISPOSABLE CHEMICAL SENSOR FOR BUILDING COLLAPSE INVESTIGATION

Abstract: A disposable sensor device for remote sensing of conditions such as temperature and dangerous gasses includes a body defining an enclosed chamber, a power source mounted in the chamber, an on-off switch mounted on and accessible from outside the body, a processor mounted in the chamber and powered by the power source, sensors mounted on the exterior of the body in communication with the processor and capable of detecting gasses and temperature. A transceiver, a speaker, and a microphone are mounted in the chamber and in communication with the processor. The transceiver is adapted to receive sound signals from a remote unit and input the signals to the speaker for broadcast, and the microphone is adapted to receive sound signals from outside the body and input the received sound signals to the processor for transmittal to the remote unit.

Patent Number: 8177721 Issue Date: 5/15/2012

Title: REMOTE, ANIMAL BLOOD PRESSURE WAVEFORM SENSING METHOD AND APPARATUS

Abstract: The invention as disclosed is a non-contact method and apparatus for continuously monitoring a physiological event in a human or animal, such as blood pressure, which involves utilizing a laser-based interferometer system in combination with a laser tracking system and a signal processor to produce a waveform that is representative of a continuous physiological event such as blood pressure or respiration in a subject.

Patent Number: 8179327 Issue Date: 5/15/2012

Title: SUBSURFACE DEPLOYABLE ANTENNA ARRAY

Abstract: A subsurface deployable antenna array is provided which expands upon deployment and contracts for storage to provide an antenna array that can be stored in a comparatively compact space. Electronically interconnected antenna modules are connected by expandable/contractable connectors. A helically-organized bundle of optical cables and electrical wiring are utilized in the expandable/contractable connectors. Mechanical, electrical, or hydraulic means may be utilized to control the spacing between the antenna modules.

Patent Number: 8185490 Issue Date: 5/22/2012

Title: CLASS-SPECIFIC ITERATED SUBSPACE CLASSIFIER

Abstract: A method is provided for calculating a class-specific iterated subspace for a classification system utilized in a computing system. Training data in the specific class for the class-specific iterated subspace is collected. A linear orthogonal transform is applied transforming the data into at least one bin. Magnitude squared bins are calculated and used as columns of a matrix. Orthonormal vectors of this matrix are selected and a J function is calculated. The J function and orthonormal starting vectors are used to obtain the class-specific iterated subspace for each class. The method further applies these class-specific iterated subspaces in a classification system for determining the most likely class of a data signal of interest.

Patent Number: 8188638 Issue Date: 5/29/2012

Title: COOLING ACOUSTIC TRANSDUCERS WITH HEAT PIPES

Abstract: A transducer with a closed heat pipe is provided with a hot surface and a cold surface. The hot surface is in contact with the transducer interior and the cold surface is in contact with a cooler contact area. A fluid is used in the pipe which boils at the temperature of the hot surface and condenses at the temperature of the cold surface. A wick inside the heat pipe facilities the return by capillary action of the condensed fluid to the hot end. The heat pipe can be evacuated to adjust the boiling temperature of the fluid. A variant involves drilling additional holes into ceramic rings and inserting heat pipes. Increasing the heat pipe length into the tail mass and the piston increases the cool region for the fluid to condense; thereby improving the performance of the transducer.
