



Pergamon

Int. J. Multiphase Flow Vol. 23, Suppl., pp. 121-165, 1997

© 1998 Elsevier Science Ltd

Printed in Great Britain. All rights reserved

0301-9322/97 \$17.00 + 0.00

PII: S0301-9322(98)00003-2

PatentsALERT

This section contains abstracts of recently issued patents in the United States and published patent applications filed from over 90 countries under the Patent Cooperation Treaty and compiled in accordance with interest profiles developed by the Editors.

Further information about complete patents can be obtained from:

REEDFAX Document Delivery System
275 Gibraltar Road, Horsham, PA 19044, USA

Phone: +1 215 441-4768

Fax: +1 215 441-5463

who offer a 24-hour, 7-days a week service.

See overleaf for details of a special service for readers of
International Journal of Multiphase Flow

An offer from



Free to readers of: *International Journal of Multiphase Flow*

REEDFAX™ Document Delivery System FAX FORM

FAX TODAY (our local international access code) **+1-215-441-5463**

As a first-time user, you are eligible to receive 5 FREE U.S. patents (*you pay only for the cost of delivery*). Complete and return to confirm your personal 24-hour REEDFAX™ account number.

Yes! By return fax, please confirm my personal 24-hour REEDFAX account number and put me on-line — without cost or obligation — for **5 FREE United States patents** (*excluding delivery charges*).

AUTHORIZED SIGNATURE _____

NAME (please print) _____

TITLE _____

COMPANY _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

PHONE _____

FAX _____

Alternate FAX (if desired) _____

Name to appear on faxed patent documents. If same as above, check box:

NAME (please print) _____

Check here if you plan to use Client Numbers (Client charge-back numbers)

Tax exempt number (PA, FL and NY) _____

Name and address for billing. If same as above, check box:

Please list your other locations or other individuals who would be interested in REEDFAX Document Delivery System. Use additional sheets, if necessary.

5474653**METHOD FOR CONTROLLING
SOLID PARTICLE FLOW IN AN
EVAPORATOR**

Bostjancic Joseph J Renton, WA, UNITED STATES assigned to Ionics Incorporated

A method for use in an evaporator for selectively controlling the flow of solid particles within the evaporator. The method provides for the separation of solids from a liquid through the use of a separation chamber having a plurality of apertures, each of which has a critical size. In the separation chamber, solid particles which are larger than a critical size are separated from the remainder of the solution. The separated particles exit the separation chamber via a bypass conduit for circulation directly to the sump of the evaporator for recombining with the separated liquid portion which passed through the separation chamber and was subsequently concentrated in the heat exchange tubes. The method prevents solid particles from clogging the system and allows for continuous circulation of the solution and solid particles.

5476143**WELL SCREEN HAVING SLURRY
FLOW PATHS**

Sparlin Derry D; Nagaoka Tadayoshi; Ashton Jeff Spring, TX, UNITED STATES assigned to Nagaoka International Corporation

A well screen having slurry flow paths enclosed therein includes support rods extending in the axial direction of the screen disposed cylindrically at a predetermined interval in the circumferential direction of the screen, a wire wound on the outer periphery of said support rods so as to form slits of a predetermined width, one or more flow paths for gravel-containing slurry provided inside of the wire and extending in the axial direction of the screen, and openings for communicating the flow paths with the outside of the screen. Lowering and lifting of the screen through a wellbore can be made smoothly without interfering of the slurry flow paths with the wellbore and installation of the screen can thereby be facilitated.

5476370**OIL PUMP SUBJECT TO PUMPING
A TWO PHASE FLOW**

Wood Russell E Fayetteville, NY, UNITED STATES assigned to Carrier Corporation

In a lubrication system subject to two phase flow, the oil pump is provided with a capacity such that it can always pump sufficient oil plus the refrigerant and/or excess oil. The excess oil and/or outgassed refrigerant is vented to provide the desired lubricant flow.

5479020**METERING DEVICE FOR A FLUID**

Mohn Frank London, UNITED KINGDOM assigned to Framo Developments (UK) Limited

PCT No. PCT/GB92/02072 Sec. 371 Date Jul. 6, 1994 Sec. 102(e) Date Jul. 6, 1994 PCT Filed Nov. 10, 1992 PCT Pub. No. WO93/10439 PCT Pub. Date May 27, 1993. A metering device for multiphase fluid, for example, crude oil, comprises a gamma or X-ray densitometer incorporating windows for the metering radiation of boron carbide. The boron carbide windows can be provided by a sleeve guiding the fluid flow, the sleeve being reinforced by a thin external layer of carbon fiber embedded in epoxy resin. Alternatively, a steel tube receiving the fluid flow has aligned transverse apertures containing plugs of boron carbide.

5479957**SLUDGE PIPELINE
LUBRICATION SYSTEM**

Crow Harry; Anderson Thomas M; Kelly Scott; Atherton Terr; Schmidt Larry Richfield, CT, UNITED STATES assigned to Schwing America Inc

A system for lubricating a plug flow of high viscosity material in a pipeline is disclosed. The

system includes first and second pipes through which the plug flow of high viscosity material is pumped. The first pipe has a flange which is positioned adjacent a flange of the second pipe. A plurality of bolts, attached to the flange of the first pipe and to the flange of the second pipe, connect the first pipe to the second pipe. A lubrication spool is positionable in a first location between the flange of the first pipe and the flange of the second pipe for lubricating the plug flow of high viscosity material. The lubrication spool is removable from the first position without completely disconnecting the first and second pipes. The lubrication spool includes a first spool section which is located immediately adjacent the flange of the first pipe while in the first position and a second spool section immediately adjacent the first spool section. The second spool section is also located immediately adjacent the flange of the second pipe while in the first position. An aperture in the first and second spool sections provides a passage for the plug flow of high viscosity material being pumped between the first and second pipes. An annular reservoir, formed between the first and second spool sections, distributes lubricant. An inlet supplies lubricant to the reservoir. A circumferential lubrication passage, formed between the first and second spool sections, applies a uniform ring of the lubricant to the plug flow of high viscosity material being pumped through the lubrication spool aperture. The circumferential lubrication passage provides a fluid path between the annular reservoir and the aperture.

5485743

MICROWAVE DEVICE AND METHOD FOR MEASURING MULTIPHASE FLOWS

Taherian M Rez; Habashy Tarek Ridgefield, CT, UNITED STATES assigned to Schlumberger Technology Corporation

A method for measuring multiphase flows in a conduit using series of microwave antennae arranged around the circumference of the conduit so as to transmit microwave energy into, or detect propagated microwave energy in the conduit, the method including the steps of: transmitting microwave energy from each antenna in turn while detecting microwave energy at the

non-transmitting antenna and integrating the results from all antennae so as to characterize the flow in the conduit. Apparatus for performing the method includes means for exciting each antenna in turn to transmit microwave energy into the pipe and means for detecting microwave energy at the non-transmitting antennae, and means for integrating the results from all transmitters to characterize the flow in the conduit.

5486328

EXTRUSION SURGE SUPPRESSOR AND METHOD

Luker Keith Little Falls, NJ, UNITED STATES assigned to Randcastle Extrusion Systems Inc

An apparatus and method for extruding an elastomeric polymer which is subject to periodic pressure surges. The apparatus includes a barrel having an upstream portion and a downstream portion, a hopper positioned for delivering polymer to the upstream portion of the barrel, a shaft rotationally mounted within the barrel and a drive means for rotating the shaft. The shaft has a conveying screw flight for conveying polymer downstream from the hopper through the barrel. The barrel has a discharge port located downstream of the hopper. A surge suppressor is provided on the shaft for reducing the pressure and flow rate surges in the polymer. The surge suppressor includes a screw flight downstream of the discharge port for urging the polymer upstream toward the discharge while permitting a portion of the polymer to flow downstream into the surge suppressor. A polymer seal is provided downstream of the surge suppressor.

5488224

SYSTEM FOR CHARACTERIZING FLOW PATTERN, PRESSURE AND MOVEMENT OF A FLUID

Fagan John E; Sluss James; Hassell John W; Mears R Brian; Beason Ronnie; Wilkinson Sonja; Lear Tommy; Tan Kok S Norman, OK, UNITED STATES assigned to Gas Research Institute

A system for characterizing the pressure,

temperature, movement and flow patterns of a fluid under high pressure within a test cell. The test cell is lined internally with adjustable rock facings. Pressure is measured within the test cell using a device employing pressure-distortable optical fibers. Fluid velocity, flow direction, and filter-cake buildup are measured with laser Doppler velocimetry. The flow pattern of the fluid is viewed using corresponding arrays of transmitting and receiving optical fibers. Temperature of the fluid is estimated using a combination of thermal sensors. The pressure, velocity, viewing and temperature systems are integral to the rock facings of the test cell.

5490769

VARIABLE CAPACITY SCROLL TYPE FLUID DISPLACEMENT APPARATUS

Calhoun John L Dallas, TX, UNITED STATES
assigned to Sanden International (U S A) Inc

An infinitely variable scroll-type fluid displacement apparatus comprises an orbiting scroll having a spiral element interfitted with a spiral element of a base scroll. The orbiting scroll and the base scroll are both rotatably disposed in the compressor housing and operationally connected through a rotation prevention mechanism. The orbiting scroll is continuously driven by a drive shaft, even when fluid is not displaced through the scroll-type fluid displacement apparatus. The base scroll is mounted on a carrier which has magnetic rotor elements extending in close proximity to an electromagnet. When the electromagnet is energized, an attraction force is generated between the electromagnet and the magnetic rotor elements, thereby imparting a braking force to the base scroll. Depending on the amount of braking force imparted to the base scroll, the capacity of the scroll-type fluid displacement apparatus can be infinitely varied.

5491733

NUCLEAR FUEL ROD ASSEMBLY APPARATUS

Patterson John; Cooke George C; Yates Jack;
Bjornard Trond Richland, WA, UNITED
STATES assigned to Siemens Power Corporation

The present invention provides a fuel rod for a light water nuclear reactors that comprises a part-length fuel rod and an extension tube having at least one wall member defining an enclosed flow path therethrough, the extension tube being coupled to a portion of the part-length fuel rod so as to be disposed axially above the part-length fuel rod, and including at least one inlet opening, for allowing fluid that surrounds the rod and initially comprises a two phase mixture of steam and liquid, to enter the enclosed fluid path and at least one outlet opening located above the inlet opening, the extension tube includes means for separating at least some of the steam located in the fluid from the liquid located therein. The improved fuel rod allows steam to bypass the upper active portions of the fuel assembly. A coolant diverter is positioned in a spacer of a nuclear fuel rod assembly in the large subchannel above a part length fuel rod for increasing the hydraulic resistance of the large subchannel and for separating liquid from two phase flow.

5492176

METHOD FOR TREATING FORMATIONS TO PLUG FLOW

Yeh Charles S; Strom E Thomas; Cox Larry L
Plano, TX, UNITED STATES assigned to Mobil
Oil Corporation

A method for plugging a zone of a subterranean formation to block flow therethrough. A specific plugging solution comprised of an allyl monomer and an initiator is injected into the zone where it is allowed to set at an elevated temperature to harden and form a flow-blocking solid. The allyl monomer is an allyl ester selected from the group of diallyl orthophthalate, diallyl isophthalate, diallyl terephthalate, diallyl benzenephosphonate, diethylene glycol bis(allyl carbonate) and other known allyl monomers and the initiator is

preferably a peroxy compound (e.g. benzoyl peroxide, diisopropyl peroxydicarbonate, etc.) or an azo compound (e.g. 4,4'-azobis(4-cyanovaleric acid). A diluent such as an alcohol (e.g. isopropyl alcohol or isobutyl alcohol) or a mutual solvent (e.g. ethylene glycol monobutyl ether, diacetin, triacetin, acetone, etc.) and a coupling agent (e.g. an organofunctional silane) may be added if needed.

5492276

**METHOD AND MEANS FOR
MERGING LIQUID STREAMS**

Kaylor Joseph B Manassas, VA, UNITED STATES assigned to Valkyrie Scientific Proprietary L C

A plurality of relatively high pressure, but low velocity, liquid entry streams, that may be of different pressures and flow rates, are directly combined to form a single exit stream of higher velocity but lower pressure by merging the streams in a waterway having an elongated, generally ovoid shape. The entering streams are arranged in an equi-spaced relationship about the longitudinal axis of the waterway, and the cross-section of each entering stream is configured as an ellipse that is oriented with the major ellipse axis generally parallel to the waterway longitudinal axis, but offset therefrom by a small angle. The entering streams mesh and rotate within the waterway to form a unified exit stream.

5494067

**DEVICE FOR REGULATING AND
DAMPING A MULTIPHASE FLOW**

Levallois Emil Courbevoie, FRANCE assigned to Institut Francais du Petrole

The characteristics of a device for regulating and damping the composition fluctuations of a multiphase flow comprising a tank or surge drum and a sample tube located between a source of effluents and a multiphase pump are optimized by selecting the volume of the tank and the distribution of the apertures of the sample tube so as to define an average level around which the

level of the liquid-gas interface is stabilized and so that the volume of the liquid phase corresponding to this average level is at least equal to the volume of liquid necessary to discharge any foreseeable volume of gaseous phase coming from the source of effluents. In case of a large volume of gaseous phase, an unpierced tube is introduced inside the sample tube.

5502161

**METHOD FOR THE PRODUCTION
OF FREE-FLOWING
TETRAFLUOROETHYLENE
POLYMER MOLDING POWDERS**

Harvey Leonard W; Martin Eric N Downingtown, PA, UNITED STATES assigned to ICI Americas Inc

An improved process for preparing free flowing tetrafluoroethylene (TFE) polymer powders is disclosed in which a TFE polymer powder is (1) wetted with an aqueous solution containing a wetting agent selected from the group consisting of (a) ethylene glycol ethers, (b) propylene glycol ethers and (c) diols or triols, (2) agglomerated and (3) dried.

5505390

**TWO STAGE HAMMER MILL
WITH PARTICLE SEPARATOR**

Rodgers Charles C Baker City, OR, UNITED STATES

A two stage hammer mill which reduces recycled glass and its associated contaminants to small glass particles in the 100-800 grit size range and waste. The glass grinder is of light weight, modular construction, such that it may be taken apart, relocated, and restored to operation quickly and easily. A modular design also allows it to be easily cleaned and reconfigured to produce aggregate of selectable size. Located on separate rotors, installed in separate grinding chambers, the two hammer mills are spaced apart from one another and mounted within a common housing. The first stage provides a relatively coarse reduction of the

material flow, which then passes into the secondary grinding chamber where the material is further ground. The design of the hammers in this hammer mill are such that they entrain a large quantity of air, accelerate it to high velocity, and drive the mixture of air and material through the system, entraining small, medium and large sized particles. Vacuum pressure is utilized to enhance particle flow through the system and to provide for more precise separation of the finished product as well as separating contaminants from the ground glass. A shaker screen is also employed to facilitate the separation process. Paper shredders are utilized to enhance paper removal.

5505595

**SCROLL TYPE FLUID
DISPLACEMENT APPARATUS
HAVING AXIAL MOVEMENT
REGULATION OF THE DRIVING
MECHANISM**

Fukui Tsuyoshi Isesaki, JAPAN assigned to Sanden Corporation

A scroll-type fluid displacement apparatus includes a compressor housing, which contains a compression mechanism and a driving mechanism operatively connected to one another. The compression mechanism includes a fixed scroll and an orbiting scroll interfitting at angular and radial offsets, and a rotation preventing mechanism which prevents rotation of the orbiting scroll during its orbital motion. The driving mechanism includes a drive shaft axially disposed within the housing and rotatably supported by an inner block, which is fixedly disposed within the housing. An axial movement regulating mechanism for regulating an axial movement of the driving mechanism is disposed between the inner block and an internal component of the compressor axially spaced from the inner block. The regulating mechanism includes an annular flange extending from an exterior surface of the drive shaft and a shim which is detachably disposed either between the annular flange and the inner block or between the annular flange and the internal component.

5505854

**TWO CONTINUOUS FILTRATION
SYSTEM FOR SUPPLYING
FILTRATE TO AUTOMATIC
ANALYZERS**

Glover Robert L; Moser Robert E; Meserole Frank; Richardson Carl; Maybach Gerard; Maller Gordo; Hanley Timothy; King Thomas Southlake, TX, UNITED STATES assigned to Electric Power Research Institute

A continuous filtration system for supplying an uninterrupted supply of filtrate from a solids-containing industrial process suitable for use by on-line automatic analyzers is provided. The continuous filtration system, which is particularly useful for filtering flue gas desulfurization process slurry to produce a solids-free filtrate for autoanalysis, includes a pair of filters connected in series which concurrently receive a tangential flow of slurry into the filter head that is discharged perpendicularly through a filtrate head. An automatic flushing system is provided to keep the filter membranes free of solid particles. An optional autoanalyzer for unfiltered slurry may also be included in the system.

5507858

**LIQUID/GAS SEPARATOR AND
SLUG FLOW ELIMINATOR AND
PROCESS FOR USE**

Jepson William P Athens, OH, UNITED STATES assigned to Ohio University

An apparatus and method for separating the liquid phase and the gas phase of a liquid/gas mixture and for substantially eliminating slug flow is provided. The apparatus includes a housing containing a separation table positioned in an inclined position within the housing. The liquid/gas mixture flows into the housing through an inlet and spreads over the surface of the separation table. As the mixture spreads over the table, entrained gas is released and the liquid is decelerated. The separated liquid and gas then pass through orifices in the separation table and are separately discharged from the housing. In a

second version, a plurality of separation tables may be contained in the housing.

5508323

**METHOD FOR IMPARTING FIRE
RETARDANCY TO ORGANIC
RESINS**

Romenesko David J; Buch Robert Midland, MI, UNITED STATES assigned to Dow Corning Corporation

A free-flowing silicone polymer powder, having an average particle size of 1 to 1000 microns and prepared by mixing a polydiorganosiloxane with a silica filler, is uniformly dispersed in an organic resin using conventional equipment, such as a single screw or, preferably, a twin screw extruder. When employed at a concentration of about 0.5 to 25 parts by weight of powder per 100 parts by weight of resin, a significant improvement in the burn character of the modified resin is obtained such that the rate of heat release, generation of smoke and evolution of toxic carbon monoxide gas is significantly reduced relative to the unmodified resin.

5510247

**CENTRIFUGAL MULTIPHASE
SYSTEMS AND METHOD FOR
USING THE SAME**

Komives Clair; Russell Alan Pittsburgh, PA, UNITED STATES assigned to University of Pittsburgh

Centrifugal systems and methods of use thereof are provided. The systems and methods provide two-phase extraction/reaction and separation in a single operational unit. The systems are easily scalable and operable in a continuous manner. Also provided is a system and method for effecting catalytic reactions in an organic/reverse micelle system.

5511626

**HYDRAULICALLY OPERATED
SUBSOIL DISPLACEMENT
APPARATUS**

Steen Henri Hjallerup, DENMARK assigned to Breakers A/S

A hydraulically operated mole has a reciprocating hammer operated by means of an impact mechanism which may be readjusted from forward to backward wiring by displacement of a valve tube secured to a piston near the rear end of the apparatus. The piston is activated by the switching of oil supply and withdrawal respectively to the tank between two pipeline stubs at the rear end of the apparatus. The fluid connections between the stubs and the piston are completely separated as regards the flow. As a result, complicated and vulnerable valve elements used in known hydraulic moles are avoided.

5511952

**REFRIGERANT DISPLACEMENT
APPARATUS WITH AN
IMPROVED THERMAL SENSING
DEVICE**

Sato Tadashi Maebashi, JAPAN assigned to Sanden Corporation

A scroll type fluid displacement apparatus includes a housing in which interfitting fixed and orbiting scrolls are disposed. The outer surface of the end plate of the fixed scroll and the inner surface of the housing are in fluid tight contact so that the interior of the housing is partitioned into two chambers. After the refrigerant is compressed, it is discharged through a discharge bore into the second chamber. A dividing wall formed in the second chamber partially surrounds the discharge bore. The compressor housing has a recessed portion near the outlet port. A thermal sensor is positioned in the recessed portion. A passageway formed in the dividing wall directs the air flowing out of the discharge bore against the inside surface of the housing where the thermal sensor is positioned.

5513233**NUCLEAR REACTOR**

Hidaka Masatak; Kashiwai Shinich; Saito Yoshinori; Kawasaki Terufum Hitachi, JAPAN assigned to Hitachi Ltd

Improved operability and economy of a nuclear reactor can be obtained by attaining a mixing of the flows of coolant in the lower plenum of the fuel assemblies of the nuclear reactor, a high flow stability of the two-phase flow in the fuel assemblies and a small pressure loss in the core. To achieve this, there is provided a coolant guide tube that communicates with the inside of the fuel support piece inserted in the control rod guide tube and the passage, wherein there is formed a coolant guide passage along which coolant descends in the area outside of the coolant guide tube in the fuel assemblies from opening. The coolant guide passage along which the coolant descends from the opening is formed in an area outside of the coolant guide tube in the fuel support piece.

5513968

**INSPECTION SYSTEM FOR A
DEFECTIVE ROTATION
PREVENTING DEVICE IN AN
ORBITING MEMBER OF A FLUID
DISPLACEMENT APPARATUS**

Ochiai Yoshihiro Tomioka, JAPAN assigned to Sanden Corporation

An inspection system for a rotation preventing device comprises a balance weight member disposed within a hollow portion of the compressor housing and at least one recessed portion formed in an annular surface of the hollow portion. If, during the assembly of the compressor, a ball from the rotation preventing/thrust bearing device rolls into the hollow portion or is accidentally dropped into the hollow portion, the balance weight member pushes the ball along the annular surface until it falls into the recessed portion. Further rotation of the balance weight locks the ball within the recessed portion, thereby preventing further rotation of the drive shaft.

Therefore, defects in assembly due to the rotation prevention mechanism may be easily detected.

5515915

**WELL SCREEN HAVING
INTERNAL SHUNT TUBES**

Jones Lloyd; Yates Tommy Dallas, TX, UNITED STATES assigned to Mobil Oil Corporation

A well screen for use in gravel packing completions which produces a good distribution of gravel over the entire completion interval. The screen is comprised of a base pipe and an outer surface (e.g. wire wrap). A plurality of flow paths (e.g. shunt tubes) are positioned in the annulus which is formed between the base pipe and the outer surface of the screen, thereby providing the necessary alternate flowpaths for the slurry without substantially increasing the overall, effective outside diameter of the screen.

5522231

**APPARATUS AND METHOD FOR
MASS FLOW CONTROL OF A
WORKING FLUID**

Kenyon Richard L; Yabuki Roy; Campbell Chester; Harper Sandra L; Nolan Michael; Jain Virender; Matthies Alan Irvine, CA, UNITED STATES assigned to Parker-Hannifin Corporation

A mass flow control apparatus and method for use in combination with a heat transfer system having a compressor, condenser, expansion valve, evaporator and working fluid in a fluid circuit. The mass flow is controlled using a quality sensor for the working fluid exiting the evaporator, and a high side pressure sensor. A control circuit is provided that monitors the quality sensor and the high side pressure sensor, and controls operation of the compressor, condenser fan and valve in response thereto. A flow reduction mode is used to reduce high side pressure at the valve inlet without excessive compressor cycling by changing the quality sensor set point when the high side pressure exceeds the condenser fan turn-on pressure but is less than the compressor disengage pressure.

5522261

**FLUID FLOW DIRECTION AND
VELOCITY MONITOR AND
TEMPERATURE COMPENSATING
CIRCUIT THEREFOR**

Grover Stephen F; Ullrich Scott A; Montividas Edward; Chu Frederico Libertyville, IL, UNITED STATES assigned to Alnor Instrument Company

A fluid flow direction and velocity monitor, particularly useful in monitoring pressure differentials between a controlled environment and its surroundings, includes a heated thermal sensor situated between upstream and downstream cold thermal sensors within a channel. The heated thermal sensor provides a pressure differential or fluid flow velocity signal. The pair of cold thermal sensors are utilized to provide both temperature compensation and fluid flow direction. The pressure differential and direction signals are combined by the circuitry to yield a single digital direction and pressure signal.

5524475

**MEASURING VIBRATION OF A
FLUID STREAM TO DETERMINE
GAS FRACTION**

Kolpak Miroslav M; Rock Terry J Dallas, TX, UNITED STATES assigned to Atlantic Richfield Company

Multiphase fluid flowstreams may be analyzed to determine to gas fraction of the fluid by defining a zone in a conduit in which the fluid flowstream is caused to vibrate either laterally or longitudinally at a resonant frequency of vibration of the fluid flowstream using a transducer or by causing the fluid to flow through an orifice in the conduit. A vibrating zone within the conduit is delimited by spaced apart ports in the conduit and/or spaced apart grilles which reflect the longitudinal vibrations. Lateral vibrations may be enhanced by causing the flowstream to flow through a rectangular passage in the conduit. Spectral analysis of the vibrating flowstream identifies the resonant frequency of vibration which, together

with pressure and temperature measurements may be used in calculating the gas fraction.

5525133

GAS PIPELINE DRIP

Haukeness Miles E Chatham, CANADA assigned to St Clair Pipelines Ltd

Known drips for gas transmission pipelines do not work effectively for two phase liquid-gas flows. Disclosed is a drip having two parts; a flow separator and a receptacle. The flow separator comprises a pipe having circumferential apertures in the wall. Surrounding the pipe and the apertures is a shell that defines an annular passage between the pipe wall and the shell. Annular gas liquid flow entering the separator will be divided. Most of the gas will pass the apertures and continue through the pipe. Most if not all of the liquid and some gas will pass through the aperture. It is then passed to a receptacle where the fluid is removed. The secondary gas flow is then either recombined with the main flow or can be diverted to a secondary system. Periodically the liquid collected in the receptacle can be emptied.

5526684

**METHOD AND APPARATUS FOR
MEASURING MULTIPHASE
FLOWS**

Liu K T; Rieken Willia; Anduiza J P; Kouba G E Cerritos, CA, UNITED STATES assigned to Chevron Research and Technology Company a Division of Chevron U S A Inc

A self-regulating apparatus and method for measuring the components of a multiphase petroleum stream includes initially stratifying an incoming petroleum stream into substantially liquid and gas streams. The initial fluid stratification allows a flow-splitting separation to occur as the streams first enter a vertical separation tube. By positioning the inflow line eccentric to the vertical separation tube, a liquid vortex is created by the incoming liquid component to further enhance the liquid/gas separation. The liquid component is then drawn off by a liquid

flow line also eccentrically positioned on the vertical separator, thereby minimizing the energy dissipation of the liquid vortex. Both the gas and liquid components can then be individually measured before being recombined at a common outflow port for discharge.

5526685

FLUID FLOW RATE MEASURING AND CONTROLLING APPARATUS AND METHOD FOR USING SAME

Davis Homer Atlanta, GA, UNITED STATES assigned to Graseby Andersen Inc

A volumetric flow control apparatus and method for measuring and controlling the volumetric flow rate and flow volume of a fluid. The apparatus comprises a reciprocating diaphragm meter having a diaphragm mounted for reciprocating movement and a diaphragm position indicator assembly for monitoring the position of the diaphragm as it reciprocates. As a fluid under pressure passes through the reciprocating diaphragm meter the diaphragm reciprocates through at least one meter cycle during which the meter passes a fixed volume of fluid per meter cycle. A timer responsive to the diaphragm position indicator is provided to measure the elapsed time for the meter diaphragm to reciprocate through at least one meter cycle. A processor calculates the volume flow rate of the fluid passing through the reciprocating diaphragm meter by dividing the fixed volume of fluid passed by the meter in a meter cycle by the elapsed time measured during the meter cycle. The volume flow rate of fluid passing through the reciprocating diaphragm meter is controlled by a controller which compares the measured flow rate to a desired flow rate and then causes the pressure differential across the reciprocating diaphragm meter to be changed to increase or decrease the fluid flow rate.

5526696

FLOW METERS

Cappi James Amberley, UNITED KINGDOM assigned to Jordan Kent Metering Systems Limited

PCT No. PCT/GB92/02021 Sec. 371 Date Apr. 29, 1994 Sec. 102(e) Date Apr. 29, 1994 PCT Filed Nov. 2, 1992 PCT Pub. No. WO93/09404 PCT Pub. Date May 13, 1993. A temperature probe determines the instantaneous ambient temperature of a multiphase fluid flowing through a pipe, and at a position further downstream there is an inlet for water at a constant temperature significantly different from that of the fluid injected at timed intervals through a high pressure water jet nozzle. The effect of the jet is to mix the injected water intimately with the fluid flowing through the pipe and create a localised pulse of heated (or cooled) fluid which then flows through the pipe to be measured by a further temperature probe and possibly by yet another probe at positions downstream of the nozzle. The time taken for the localised heated pulse of fluid to travel along a fixed length of the pipe can be measured, and will be a function of the rate of flow of the fluid through the pipe.

5531112

FLUID HOLDUP TOOL FOR DEVIATED WELLS

Young Allen R; Davidson Jerry L; Baltazar Edwar Arlington, TX, UNITED STATES assigned to Computalog U S A Inc

A production logging tool is provided for use within a well to determine fluid holdup of a multiphase fluid flow within the well. The production logging tool includes a plurality of sensors secured within a plurality of arms which radially extend from a tool housing to points distal from the tool housing. A plurality of sensors are included within the plurality of arms for detecting variations in fluid properties attributable to different flow constituents of the multiphase fluid flow along a path which circumscribes an exterior of the tool housing. The plurality of arms are rotated about the tool housing for moving these sensors through the path in order to ensure that the volumetric proportions of the different flow constituents of the multiphase fluid flow are accurately detected in highly deviated and in horizontal wells.

5531266**METHOD OF INDIRECT HEAT EXCHANGE FOR TWO PHASE FLOW DISTRIBUTION**

Ragi Elias G; Godry Thomas J Williamsville, NY, UNITED STATES assigned to UOP

A method and apparatus for indirectly heating a mixed phase stream by contact with a boiling surface located on the inside of the plurality of heat exchange tubes. Improved vaporization of the stream is achieved by equalizing the liquid distribution and the ratio of liquid and vapor entering each tube to overcome poor boiling film heat transfer. The invention uses a means for subdividing the flow entering the heat exchanger into a plurality of streams with each of the divided streams discharging directly into a heat exchange tube. The means for dividing the stream can include baffle arrangements or plugs providing pressure drop at the inlets to the tubes. This method and apparatus is particularly useful in contactors for the sulfuric acid catalyzed alkylation of hydrocarbons.

5533412**PULSED THERMAL FLOW SENSOR SYSTEM**

Jerman John H; Toth Ronald E; Winchell David A; Pennington David Palo Alto, CA, UNITED STATES assigned to IC Sensors Inc; Baxter International

A precise fluid flow meter fabricated by micromachining techniques measures a wide range of fluid flow rates. Two serial portions of an enclosed channel have different cross-sectional areas, and therefore different flow velocities. The fluid carries the thermal pulse through the flow channel to two sensor elements spaced apart along the channel downstream from the heating element. The transit time of the thermal pulse between the two sensor elements measures the fluid flow velocity.

5535632**SYSTEMS AND METHODS FOR MEASURING FLOW RATES AND DENSITIES OF THE COMPONENTS OF OIL, WATER AND GAS MIXTURES**

Kolpak Miroslav M Dallas, TX, UNITED STATES assigned to Atlantic Richfield Company

Multiphase fluid flowstreams of gas, oil and water are measured by flowmeters which include an embodiment using a turbine flowmeter and a densitometer with total accuracy in the range of +/-15%, and an embodiment using a gas-liquid separator and a Coriolis flowmeter for flowstreams of a relatively high gas-to-liquid ratio with accuracies of +/-5% when the gas carry-over in the liquid flowstream is less than about 5%. A second alternate embodiment includes a water fraction meter, a turbine flowmeter and a densitometer for measuring flows with relatively low gas-to-liquid ratios but accurate measure of the water fraction. A meter capable of handling relatively high gas-to-liquid ratio but with residual gas in the liquid flowstream of less than 5% includes a separator, a Coriolis meter for measuring the liquid density and mass flow rate in the liquid flowstream and a densitometer and turbine flowmeter for measuring the fluid in the gas flowstream leaving the separator. A fourth alternate embodiment includes a turbine flowmeter and a densitometer in both flowstreams leaving the separator and a water fraction meter in the liquid flowstream wherein mixtures with high gas-to-liquid ratio and residual gas in the liquid flowstream of up to about 20% may be measured.

5537641**3D REALTIME FLUID ANIMATION BY NAVIER-STOKES EQUATIONS**

da Vitoria Lobo Niels; Jinxiong Chen Orlando, FL, UNITED STATES assigned to University of Central Florida

This is a method for physically-based modeling of three dimensional (3D) general fluid animation in

computer graphics. By solving the two dimensional (2D) Navier-Stokes equations using a Computational Fluid Dynamics method, we map it into 3D using the corresponding pressures in the fluid flow field. The method achieves realistic real-time fluid animation by solving the physical governing laws of fluids but avoiding the extensive 3D fluid dynamics computation. Unlike previous computer graphics fluid models, our approach can model many different fluid behaviors by changing the internal or external boundary conditions. It can also model different kinds of fluids by varying the Reynolds number. In addition, we have generated several ways to view the animation of fluid flow field, the streakline of the flow field and the blending of fluids of different colors. Our model can serve as a testbed to simulate many more fluid phenomena which have never been successfully modeled.

5537813

**GAS TURBINE INLET AIR
COMBINED PRESSURE BOOST
AND COOLING METHOD AND
APPARATUS**

Davis Thomas L; Shell John; Beadle Todd W; McAllister Keith S; Hobbs Alexander O Raleigh, NC, UNITED STATES assigned to Carolina Power & Light Company

The operational capacity and efficiency of a combustion turbine is increased by treating the turbine inlet air to increase its density. The inlet air treatment is achieved in a columnar tower with the inlet air being drawn in at the top of the tower. Treatment water is injected into the tower at a downward velocity greater than that of the inlet air to establish a vertically descending, two-phase co-current flow of inlet air and treatment water. The system utilizes the natural phenomenon of drag-induced pressure boost to the air achieved by the difference in the relative velocities of the inlet air and the treatment water in the co-current flow. By utilizing a cold treatment water, for example at 32° - 40° F., the tower creates a direct contact heat transfer situation that cools the inlet air, thereby further increasing its density. The invention serves to increase the operational capacity and efficiency of existing or new peaking combustion turbines at a cost per kW that is substantially less than that of

installing new peaking combustion turbine capacity, while also permitting enhanced load following capabilities for the electric utility's control center.

5538162

**APPARATUS AND METHOD FOR
DOSING**

Reh Lothar; Tesch Marc; Huml ani Beat; Ruf Arthur; Meili Thomas; Goedicke Fran Zumikon, SWITZERLAND assigned to Buml uhler AG

A dosing apparatus provides for dosing a particulate phase within a free flowing two phase flow of a gas phase and the particulate phase, wherein the two phase flow leaves a fluidized bed. The apparatus includes, at its bottom, a gas inlet mechanism to supply the gas via an orifice, and an outlet orifice with a discharge pipe. Control of the gas flow to maintain a predetermined level of the bed is attained by weighing the contents of the bed or by use of sensors within a treatment space of the apparatus. Widening mechanism may be located subsequent to the outlet orifice for widening the stream of particulate phase for exposing an enlarged surface area of particles for treatment.

5539044

SLURRY DRAG REDUCER

Dindi Aysen; Johnston Ray L; Lee Yung; Massouda Debora F Ponca City, OK, UNITED STATES assigned to Conoco In

Flow of a stream comprised of hydrocarbons is improved by introducing into the stream a stable, non-agglomerating suspension comprising: (a) water, (b) highly dispersed in the water, and substantially insoluble therein, and extremely finely-divided, non-crystalline, ultra-high molecular weight, hydrocarbon-soluble, undegraded polyalkene having 2 to about 30 carbon atoms per alkene precursor and an inherent viscosity of at least 20 dL/g, and (c) a small but effective amount of a surfactant having a HLB of at least about 9. The finely divided polyalkene is prepared by polymerization and then cryogrinding below the glass transition temperature of the polyalkene.

5539998**HIGH PURITY BULK CHEMICAL DELIVERY SYSTEM**

Mostowy Lewis J; Chowdhury Naser Fogelsville, PA, UNITED STATES assigned to Air Products and Chemicals Inc

An apparatus and method are described for delivering hygroscopic, corrosive chemicals such as hydrogen chloride from a source such as a tube trailer to a use point such as a semiconductor fabrication tool minimizing infiltration of moisture, and entrainment of particulates, while still reducing moisture contents below 100 parts per billion and achieving appropriate pressure drops without two phase flow.

5540107**LIQUID FLOW METER**

Silverman Ira; Patel Tulsidas R Newhall, CA, UNITED STATES assigned to Futureflo Systems Inc

An improved liquid flow meter for measuring moderate to low liquid flow rates with improved accuracy and minimal back pressure. The flow meter has a housing with two halves, a cover and a body, that fit together around a impeller so that liquid may flow and turn the impeller. Impeller performance is improved by use of a tapered inlet nozzle that increases liquid velocity while minimizing back pressure. Liquid is introduced tangent to the impeller by the tapered inlet nozzle to enhance initial impeller turning. The impeller registers the liquid flow by turning. The turning of the impeller is sensed electronically. Plenums are used for inlet and outlet flow to create regions of relatively consistent pressure regardless of duct location and orientation. The impeller fins are almost as wide as the impeller chamber to prevent liquid flow around the impeller. A magnet is encapsulated within the impeller that gives rise to a detectable electromagnetic flux when the impeller turns. A wire coil is used to detect the changing magnetic flux generated by the turning magnet. The wire coil uses an iron core to enhance flux detection. A pre-programmed microprocessor detects the coil's response and calculates pertinent

information such as cumulative liquid flow. The microprocessor also keep track of the time since last reset. Flow meter status and warnings are transmitted to the user via indicators.

5542863**WATER VEHICLE JET PUMP FLOW CONTROL APPARATUS**

Brian Frank J; Burrow Gary M Baldwin Park, CA, UNITED STATES

In jet pump liquid flow control apparatus the combination comprising an annular body and a liquid flow passage through the body, the passage defining a longitudinal axis; an annular series of flow controlling elements spaced about the axis with successive of the elements having primary portions extending in edge overlapping relation whereby the elements define a flow controlling section of the passage; and control means extending about the axis for controllably urging the primary portions of elements toward the axis thereby to control the cross sectional area of the passage sections.

5544672**SLUG FLOW MITIGATION CONTROL SYSTEM AND METHOD**

Payne Richard L; Huff Richard E; Ogren Wayne E McKinney, TX, UNITED STATES assigned to Atlantic Richfield Company

Liquid slug flow in oil production well flowlines and the like is controlled by a throttling valve in the flowline upstream of a gas-liquid separator and a differential pressure gauge, densitometer or other device for measuring the presence and the volume of the slug in the flowline. The throttling valve may be actuated to throttle fluid flow into the separator in relation to the presence of the slug and the duration of the slug as determined by the slug detection device. Slug mitigation may also be controlled by throttling flow into the separator in relation to the level of liquid in the separator between a threshold level and a maximum liquid level. A third method for mitigating slug flow

measures the available volume in the separator vessel and the volume of the liquid slug moving toward the separator vessel to effect proportional throttling of fluid flow. A liquid slug may be detected by a differential pressure gauge or a densitometer interposed in the flowline upstream of the throttling valve.

5544961

TWO-PHASE SUPERSONIC FLOW SYSTEM

Fuks Efi; Fuks Vadim; Lunev Vladimir; Lunev Sergey Herzlia, ISRAEL assigned to April Dynamics Industries Ltd

PCT No. PCT/UA93/00001 Sec. 371 Date Sep. 15, 1994 Sec. 102(e) Date Sep. 15, 1994 PCT Filed Feb. 8, 1993 PCT Pub. No. WO93/16791 PCT Pub. Date Sep. 2, 1993. A passive injector including, a flow generator having a first inlet for gas or vapor at a first pressure and an outlet for gas or vapor, a mixing region having an inlet for the gas or vapor leaving the flow generator at supersonic velocity and a second inlet for a liquid at a second pressure, wherein liquid is incorporated into the flow of gas or vapor while maintaining supersonic velocity and a primary flow tube section aligned with an outlet of the mixing region and having an inlet and an injector outlet, the inlet of the flow tube being preceded by a gap surrounded by a cavity, wherein the flow velocity of the mixture is supersonic at the inlet of the primary flow tube section and the supersonic flow changes to subsonic flow within the primary flow tube section.

5545382

PROCESS AND APPARATUS FOR DISCHARGING PARTICLES AND FLUIDS FROM FLOW CHANNELS

Sechrist Paul A Des Plaines, IL, UNITED STATES assigned to UOP

A reactor arrangement and process for contacting a fluid reactant with a particulate catalyst in a plurality of flow channels and discharging converted reactant fluid and particles from the

flow channels. The particles are discharged axially from the bottom of the flow channels into an unconfined bed of particles. Reactants are discharged in a transverse direction through the sides of the flow channels and across screen openings located a short distance above the channel outlets. A plurality of chambers regulate fluid flow through sections of the screens and prevent excessive fluid velocity in any section from holding up particle flow through the flow channels. The reactor arrangement and process of this invention is particularly useful for arrangements that may be used to operate a reactor under isothermal or other controlled temperature controlled conditions where a heat transfer fluid surrounds a plurality of tubular conduits or multiple flow channels that confine the particles and reactants.

5548395

PARTICLE ANALYZER

Kosaka Tokihiro Kakogawa, JAPAN assigned to Toa Medical Electronics Co Ltd

A particle analyzer comprising a one-dimensional image sensor for producing imaging signals by scanning a particle in a flow of specimen containing particle components such as blood and urine in a flat sheath flow thin in thickness in the light emitting direction and broad in the direction orthogonal to the light emitting direction, and a signal processing device for processing the signals and operating on the basis of the imaging signals from the one-dimensional image sensor. A particle analyzer excellent in analyzing capability for obtaining morphological information of particles in the liquid specimen flowing in a flow cell in real time is presented. Besides, by emitting light to a flowing particle, the transmitted light image is focused on the one-dimensional image sensor (line sensor), and the detected image signal from the line sensor is further processed in detail in the signal processing device. The signal processing device comprises a background correction processing circuit, a binarizing processing circuit, a binary signal processing circuit, a particle region division processing circuit and an arithmetic circuit. A particle analyzer high in analyzing capability for obtaining the absorption quantity and morphological information of individual particles in the liquid specimen flowing in a flow cell in real time is presented.

5550761

METHOD FOR MODELLING MULTIPHASE FLOWS IN PIPELINES

Pauchon Christian; Ferschneider Gille; Ferre Daniel St Germain En Laye, FRANCE assigned to Institut Francais du Petrole; Total Elf Aquitai

A unified hydraulic model has been developed by the method according to the invention which is applicable to any slope and diameter of pipeline and can handle most of the steady state as well as transient multiphase flow regimes encountered in practice. The new modelling method differentiates two types of flow patterns: separated flow patterns (stratified or annular) and dispersed flow patterns. Intermittent flow patterns (slug, churn flow) are a combination of these two patterns. The same concept has been successfully applied for transition criteria between different flow regimes, insuring continuity of the solutions across the transitions. This requirement is very important for simulating transient phenomena. The transient resolution is achieved by an explicit time advancing scheme. The advantages of the method are; its ability to follow wave front propagation, an easy implementation for the resolution of complex pipeline networks. The performance of the resulting unified hydraulic model is demonstrated using a large number of experimental data.

5551305

APPARATUS AND METHOD FOR MEASURING TWO- OR THREE- PHASE FLUID FLOW UTILIZING ONE OR MORE MOMENTUM FLOW METERS AND A VOLUMETRIC FLOW METER

Farchi David; Agar Joram Houston, TX, UNITED STATES assigned to Agar Corporation Inc

An apparatus and method for measuring the flow rates of each component of two-phase flow consisting of a gas and a liquid or three-phase flow consisting of water, oil and gas, including a first volumetric flow-meter stage, and second and third

momentum flow meter stages coupled in a series flow path with the volumetric flow meter stage and in which a velocity ratio between the gas and the liquid in the series flow path is maintained to be one. A processor calculates flow rates of the components of flow by solving volumetric flow and momentum or energy equations defining flow through the first through third stages utilizing a volumetric flow output from the first stage and momentum flux outputs from said second and third stages, and an indicator displays flow of liquid and gas or oil, water and gas components of the flow. To measure three-phase flow, a water-cut meter is provided to determine the amount of water flow, which is then used by the processor to determine the flow of the rest of the liquid. The second and third momentum flow meter stages can be implemented by two separate momentum flow meters or by a single momentum flow meter, such as a venturi flow meter having a venturi nozzle including pressure taps for obtaining at least two differential pressure measurements. In the event that the density of the liquid component is known, a single momentum flow meter stage is sufficient.

5552814

IMAGE RECORDING APPARATUS WHEREIN TONER CARRIER MEMBER AND PARTICLE-FLOW MODULATING ELECTRODE MEMBER ARE HELD IN CONTACT WITH EACH OTHER

Maeda Masataka; Hattori Tomoaki Konan, JAPAN assigned to Brother Kogyo Kabushiki Kaisha

An apparatus for forming an image on a recording medium by deposition of a toner, including a particle-flow modulating electrode member having apertures formed therethrough and control electrodes corresponding to the apertures, a toner supply device including a toner carrier disposed on one of opposite sides of the electrode member, for carrying a layer of the toner to the apertures, and a voltage applying device for applying a controlled voltage to each control electrode, to thereby modulate flows of the toner particles through the apertures toward the recording medium located on the other side of the electrode member. The apparatus includes a device by which

corresponding portions of the toner carrier and the particle-flow modulating electrode member which are adjacent to the apertures are biased against each other for contact therebetween.

5558494

FLOW CONTROL APPARATUS AND METHOD

Chambers John E; Brenner David C Greenville, SC, UNITED STATES

A flow control apparatus receives air flow through a closure for discharge through an orifice plate carried at an air exit end opposite an opening in a wall, wherein a bellmouth air entrance member receives air flow from the closure and directs same to an evase for reception thereby through an exit opening in the orifice plate for discharge through the exit opening in the wall.

5561245

METHOD FOR DETERMINING FLOW REGIME IN MULTIPHASE FLUID FLOW IN A WELLBORE

Georgi Daniel T; Song Shanhong; Zhang Jian C Houston, TX, UNITED STATES assigned to Western Atlas International Inc

The invention is a method of determining the flow regime of fluid having more than one phase flowing in a conduit. The method includes the step of positioning a sensor in the conduit, the sensor generating measurements capable of discriminating more than one phase in the fluids, generating measurements from the sensor for a period of time, characterizing the measurements with respect to changes in magnitude of the measurements occurring during the period of time, and comparing the characterized measurements to similarly characterized measurements of a similar sensor positioned within flow streams having known flow regimes. In a preferred embodiment of the invention, the characterization of the measurements includes performing a variability analysis of the measurements.

5561276

TWO-PHASE-FLOW MUFFLER IN A ROTATING SHAFT

Quartarone James Newport, RI, UNITED STATES assigned to The United States of America as represented by the Secretary of the Navy

A muffler is described for use in connection with an exhaust passage in a elongated shaft rotating about a longitudinal axis. The shaft exhausts exhaust material generated by an internal or external combustion engine, having both a gaseous and a liquid material. The muffler includes a series of partitions situated transverse to the longitudinal axis of the shaft, each partition defining a central aperture to facilitate passage of gaseous material from an input end of the exhaust shaft to an output end of the exhaust shaft, and at least one exterior aperture proximate the sidewall of the exhaust passage to facilitate passage of liquid material from the input end to the output end. The central and exterior passages tend to separate the gaseous and liquid material in the exhaust. The series of partitions define chambers which attenuates the sound energy in the exhaust. A check valve may be provided at the exhaust's output end to reduce back flow of fluid from the exterior of the exhaust back into the exhaust shaft.

5562405

MULTISTAGE AXIAL FLOW PUMPS AND COMPRESSORS

Ryall Michael L Killearn, UNITED KINGDOM assigned to Weir Pumps Limited

A multistage axial flow pump or compressor comprises at least one stage including a rotor and a stator. The rotor is arranged to impart whirl in one direction, while the stator is arranged to impart whirl in the opposite direction. This arrangement is useful in providing comparatively high stage pressures for a given rotor tip velocity with relatively low rotor vane hydraulic loadings. The arrangement is also useful in pumping multiphase fluids.

5562530**PULSED-FORCE CHEMICAL
MECHANICAL POLISHING**

Runnels Scott; Eyman L Michael Austin, TX,
UNITED STATES assigned to Sematech Inc

A pulsed-force CMP scheme allows for the down force holding a wafer onto a pad to cycle periodically between minimum and maximum values. When the force is near its minimum value, slurry flows into the space between the wafer and the pad. When the force is near its maximum value, slurry is squeezed out allowing for the abrasive action of the pad surface to erode wafer surface features.

5562764**PROCESS FOR PREPARING
IMPROVED TiO₂ BY SILICON
HALIDE ADDITION**

Gonzalez Raul A Newark, DE, UNITED
STATES assigned to E I du Pont de Nemours and
Company

A process for producing substantially anatase-free TiO₂ by addition of a silicon halide in a reaction of TiCl₄ and an oxygen-containing gas in a plug flow reactor is disclosed. Pigmentary properties such as gloss and CBU are enhanced without loss of durability.

5565775**PRODUCIBLE FLUID VOLUMES
IN POROUS MEDIA DETERMINED
BY PULSED FIELD GRADIENT
NUCLEAR MAGNETIC
RESONANCE**

Stallmach Frank; Thomann Hans Leipzig,
GERMANY assigned to Exxon Research and
Engineering Company

The present invention is a method to determine the bound and free fluid index of fluids in porous

media by pulsed field gradient (PFG) NMR diffusion measurements. The PFG NMR signal is evaluated using a two-fluid model that describes the self diffusion coefficients for the fluid fractions with low and high translational mobilities.

5569423**PROCESS FOR THE
MANUFACTURE OF A SILICA
FIBER BASED HEAT INSULATING
MATERIAL**

Belunova Ludmila V; Gribkov Vladimir N;
Chernyak Andracu e I; Mizyurina Galina T;
Mordovin Oleg A; Mukhanova Elena E Moscow,
assigned to Aerospatiale Societe Nationale
Industrielle; VIAM - All Russian Institut of
Aviation Material

A process for making light, fibrous heat insulating materials wherein the silica fibers used in the process are quartz fibers formed by spraying quartz. The fibers are predispersed in water until there is formed a homogeneous flowing slurry from which is molded a green fibrous block, with simultaneous partial removal of water. This green fibrous block is dispersed in water and mixed with an aqueous emulsion containing an organosilicon binder, a boron-containing sintering adjuvant and a surface-active agent. A green billet is molded from the suspension thus obtained, a portion of the water being simultaneously removed by suction. The green billet is compressed until the desired height is obtained and then it is dried, in the compressed state, at a temperature of up to 300°C. The billet is released from pressure and fired at high temperature.

5570869**SELF-CALIBRATING WATER
FLUID CONTROL APPARATUS**

Diaz Alexander; Roush Ronald L Greer, SC,
UNITED STATES assigned to T & S Brass and
Bronze Inc

A self-calibrating fluid flow control apparatus for use with a fluid flow source is provided. A

detection area is defined wherein the interposition of an object therein causes a control device to activate the fluid flow source. A calibrating device is configured to continuously define, at a predetermined rate, a steady state boundary of the detection area, wherein the steady state boundary conforms to objects interposed within said detection area so that a new detection area is defined which is free of interposed objects capable of activating the fluid flow source. An object left indefinitely within the detection area will not, therefore, cause the control device to indefinitely activate the fluid flow source nor, after deactivation by a timing mechanism, prevent the fluid flow source's subsequent reactivation.

5571974

**METHOD AND APPARATUS FOR
THE MEASUREMENT OF
PARTICLE FLOW IN A PIPE**

Nauful Eli S Columbia, SC, UNITED STATES

A system to measure the flow of coal using externally mounted vibration sensors. One or more vibration sensors are located on a pipe section which is not impacted by coal particles in the flow stream. This sensor measures the ambient pipe vibration. An equal number of vibration sensors is located on a pipe section impacted by the coal particles in the flow stream which will measure the ambient pipe vibrations plus the coal particle impact vibrations. The two vibration outputs from the sensors are combined to develop a coal or particle flow signal.

5575615

**MULTIPHASE FLUID
TREATMENT**

Mohn Frank London, UNITED KINGDOM
assigned to Framo Developments (UK) Limited

Apparatus for the treatment of a multiphase fluid, comprises a pretreatment stage upstream of a treatment stage, the pretreatment stage being arranged to cause an incoming flow of multiphase fluid to concentrate fluids of greater and lesser specific gravity into respective flow paths for

subsequent treatment in the treatment stage and the pretreatment stage comprising a cyclonic separator device concentrating fluid or fluids of greater specific gravity into an outer annular flow path around an inner flow path for fluid or fluids of lesser specific gravity. The treatment stage comprises a centrifuge having a separator drum rotatable about the axis thereof with an inlet end portion next to the cyclonic separator device comprising concentric inner and outer walls and helical vanes between the walls. The cyclonic separator device comprises radially spaced concentric sleeves with at least one helical fin disposed between the sleeves, the sleeves confining the inner and outer flow paths between them.

5576495

TWO PHASE FLOW METER

Vetterick Richard C Akron, OH, UNITED STATES assigned to The Babcock & Wilcox Company

An apparatus for determining the relative flows of a two phase flow using differential pressure to obtain mass flow having a bend portion for concentrating the dense phase toward an outside of the bend; a perforated plate downstream of the bend for passing the portion of the light phase; a nozzle for channelling the portion of the flow having high density phase toward the center of a venturi throat which is positioned downstream of the perforated plate; and four pressure sensors strategically located for measuring pressure differences at various points in the flow meter.

5579588

**METHOD FOR DOSING A
PARTICULATE PHASE IN A
GAS/PARTICLE FLOW IN A
FLUIDIZED BED**

Reh Lothar; Tesch Marc; Huml ani Bea; Ruf Arthur Zumikon, SWITZERLAND assigned to Buml uhler AG

A method for metering solid present in the gas/solid stream of a fluidized-bed apparatus, in

which gas and solid are present as a prehomogenized, free-flowing mixture in a fluidized bed and in which at least one outlet orifice for removal of the gas/solid stream is provided in an outflow pipe. The method provides for feeding a particulate phase and a gas phase, homogenizing the two phases in a fluidized bed, discharging the two-phase flow via a discharge pipe and injecting gas into the discharge pipe.

5579646

CRYOGEN DELIVERY APPARATUS

Lee Ron C Bloomsbury, NJ, UNITED STATES assigned to The BOC Group Inc

A cryogen delivery apparatus for delivering cryogen in a saturated state includes a vessel to contain the cryogen in liquid and vapor phases. The vessel has a headspace region and a heat exchanger located within the headspace region for indirectly exchanging heat between the vapor located within the headspace region and a liquid stream composed of the liquid phase of the cryogen. In case the cryogen is introduced into the vessel as a subcooled liquid, the vapor will condense into the liquid phase and the subcooled liquid will be converted into a saturated liquid. The saturated liquid will then be discharged from a liquid outlet connected to the heat exchanger. In the event the liquid enters the vessel as two-phase flow, the vessel will act as a phase separator. A branched supply line is provided having a liquid inlet branch connected to a bottom liquid inlet of the vessel so that a supply stream composed of the cryogen flows into the vessel. A vapor inlet branch of the branched supply line is connected to an inlet to the headspace. A heating element is provided to heat the vapor inlet branch so that liquid cryogen is vaporized to replenish vapor within the headspace that is depleted through condensation or discharge from a vapor discharge outlet of the vessel.

5580214

MULTIPHASE FLUID TREATMENT

Mohn Frank London, UNITED KINGDOM assigned to Framo Developments (UK) Limited

PCT No. PCT/GB92/02403 Sec. 371 Date Aug. 29, 1994 Sec. 102(e) Date Aug. 29, 1994 PCT Filed Dec. 29, 1992 PCT Pub. No. WO93/13318 PCT Pub. Date Jul. 8, 1993. An apparatus for the treatment of a multiphase fluid, comprising a rotatable shaft having a fluid flow path coaxial with the shaft. A fixed guide member surrounds the shaft and comprises annular plural helical channels for imparting centrifugal forces to the fluid to concentrate heavier fluid into an outer annular flow path around an inner flow path for lighter fluid. An impeller is supported on and driven by the shaft. The flow in the outer flow path is diverted, so as to divert the flow of the fluid of greater specific gravity into an annular channel member having an impeller. A stationary scoop extracts fluid from the channel member. The impeller comprises generally radially outwardly extending disks receiving fluid flowing on the inner flow path between them. Guide vanes are carried by the disks for guiding the fluid radially outwardly. A discharge chamber in the form of a volute is provided for the lighter fluid on the inner flow path issuing from between the disks.

5580503

CONTINUOUS PROCESS FOR EXPANDING THERMOPLASTIC MINIPELLETS

Hall Thomas; Trivedi Yogesh C Mount Olive, NJ, UNITED STATES assigned to BASF Corporation

The subject invention pertains to a continuous process for expanding thermoplastic minipellets, particularly polypropylene. The minipellets are continuously expanded by continuously charging and mixing water and minipellets in a slurry tank to form a slurry which is subsequently pressurized. A blowing agent such as butane is entrained into the pressurized slurry flow, which said slurry is then heated by a heating means, such as a shell and

tube heat exchanger, to the softening point of the minipellets. The heated minipellets are given the time necessary for impregnation by permitting them to flow through one or more impregnation vessels. The impregnated minipellets are released through an orifice into an expansion vessel where the blowing agent flashes off, thereby expanding the minipellets.

5584437

AIR FLOW CONTROL APPARATUS IN AN AIR CONDITIONER

Deuk Ik Ji; Jong Youb Ki Suwon, KOREA
assigned to Samsung Electronics Co Ltd

An air conditioner comprises a heat exchanger for conducting refrigerant in heat exchanging relationship with an air flow, and a blower for drawing air through the heat exchanger. An adjustable flow distributing plate is disposed between the heat exchanger and blower and is movable by a motor to various positions for controlling the relative air flows through respective portions of the heat exchanger. Temperature sensors are connected to the heat exchanger for detecting the refrigerant temperature at various regions of the heat exchanger. The adjustable plate is positioned in a desired position in response to the detected refrigerant temperatures for equalizing the refrigerant temperatures in the regions of the heat exchanger.

5584901

DISPERSED PHASE SEPARATOR

Bakharev Alexander; Bakharev Valery Gorod Yubileynii, assigned to Environmental Protection Group Ltd

A device for separating particulate matter from a fluid in which such particles are dispersed by causing the fluid to flow longitudinally through a conduit of uniform cross-section and in which a plurality of elements are disposed, with the first of the elements being disposed at an input end of the conduit and sealed against the inner wall thereof. The fluid is caused to flow through the conduit at

a velocity such that the particles are fluid-borne. The remainder of the elements are offset laterally inward of the conduit wall by a distance which increases as a function of each element's numerical position after the first element and they are equally spaced apart in a longitudinal direction to provide a gap between successive pairs thereof. Each element, except for an outtake orifice, includes an inner surface disposed at an oblique angle with respect to the longitudinal axis of the conduit. The lateral offset of the elements is such that an outer portion of each downstream element is partially shaded from direct exposure to the longitudinal fluid flow within the conduit. The orientation of successive elements being such that the unshaded or exposed inner edge portions of the obliquely oriented surfaces serve as deflecting regions for the particle laden fluid flow. The deflecting region of each element is generally a non-convex surface and the shaded portion of each element, following the first one, serves as a separating region and with the gap between successive elements provides for the outflow of gas from the inwardly deflected flow. The outtake orifice includes an upper surface that defines the peripheral edge of the orifice which is disposed generally in axial alignment with an innermost edge of the deflecting region of the last of the elements for removing the deflected flow from the conduit.

5591895

DETECTING PARTICLES IN A GAS FLOW

Rigby Michael Cambridgeshire, UNITED KINGDOM assigned to Pollution Control & Measurement (Europe) Ltd

PCT No. PCT/GB92/00816 Sec. 371 Date Oct. 31, 1994 Sec. 102(e) Date Oct. 31, 1994 PCT Filed May 5, 1992 PCT Pub. No. WO93/22653 PCT Pub. Date Nov. 11, 1993. In a method for detecting particles in a gas flow, a probe is charged triboelectrically by particles in the flow and the quantities of electrical charges transferred to the probe are evaluated to provide an indication of the particle flow in the gas flow. In order to reduce the effect of variations in gas flow related variables other than those relating to particle flow, an alternating component in the signal caused by the triboelectrical charging of the probe is monitored.

5591922**METHOD AND APPARATUS FOR
MEASURING MULTIPHASE
FLOWS**

Segeral Gerard; Long Peter; Atkinson Ian Gif sur Yvette, FRANCE assigned to Schlumberger Technology Corporation

A device for measuring flow rate of multiphase fluids such as oilwell effluents, containing liquid hydrocarbons, gas, and water includes first and second sections situated at a distance one from the other in the flow direction, each including a passage provided with structure such as venturis for inducing a change of speed therein, and respective means for measuring the resulting pressure differences, the pressure difference signals obtained in the respective sections being suitable for cross-correlation to produce a signal representative of the total volume flow rate.

5593131**VARIABLE ORIFICE PLATE FOR
COAL PIPES**

Briggs Oliver G; Sund John Jefferson, MA, UNITED STATES assigned to DB Riley Inc

A flow control apparatus for a coal pipe containing a stream of primary combustion air carrying pulverized solid fuel particles, includes a frame sealingly secured to an outside surface of the coal pipe around a window opening formed on one side of the pipe. An orifice plate having an orifice opening at the center is supported for pivotal movement in the coal pipe on a spindle extending radially outwardly from an edge portion on one side of the orifice plate and out through the window opening in the pipe. A bearing sleeve is provided for supporting the spindle for rotating movement about a spindle axis extending transversely of the coal pipe across the center thereof. A mounting plate structure for the sleeve is provided and is attached to the frame. A removable handle is attached on an outer end of the spindle for rotating the orifice plate in the coal pipe to vary the effective flow cross-section of the orifice opening for controlling the flow of coal and primary air to a burner.

5596401**PARTICLE ANALYZING
APPARATUS USING A
COHERENCE LOWERING
DEVICE**

Kusuzawa Hide Kobe, JAPAN assigned to TOA Medical Electronics Co Ltd

A particle analyzing apparatus includes a flow device having a light-transmissive flow cell for allowing subject particles in a sample liquid to flow in a separated state, a laser beam illuminator for illuminating a subject particle flowing in the flow cell with a laser beam and a coherence lowering device for lowering coherence of the laser beam. The particle analyzing apparatus further includes an image capturing device receiving light from the subject particle, for capturing an image of the subject particle and an image processor for processing and analyzing the captured image of the subject particle. By use of the coherence lowering device, both temporal and spatial coherence of the laser beam is lowered. Thus, image quality is improved and a high quality particle image can be obtained which is bright and high in S/N ratio.

5597961**TWO AND THREE PHASE FLOW
METERING WITH A WATER CUT
MONITOR AND AN ORIFICE
PLATE**

Marrelli John D Houston, TX, UNITED STATES assigned to Texaco Inc

A three phase meter to measure the oil/water/gas fractions of a multi-phase fluid flow uses a fraction meter and a flow meter to calibrate flow with the fraction meter sending mixture density information to the flow meter to make the calculation.

5597963

**SUBMERSIBLE STREAMLINED
METER WITH A PITOT TUBE
FOR MEASURING WATER FLOW
IN AN OPEN CHANNEL**

Smart Graeme; Hayes Michael; George Stephen G
Christchurch, NEW ZEALAND assigned to
National Institute of Water and Atmospheric
Research

PCT No. PCT/NZ92/00009 Sec. 371 Date Oct. 6,
1994 Sec. 102(e) Date Oct. 6, 1994 PCT Filed
Dec. 23, 1992 PCT Pub. No. WO93/13425 PCT
Pub. Date Jul. 8, 1993. A gauging meter including
a streamline housing at a forward end of which a
pitot type tube, the tail end of the housing having
a tail fin of fins, the housing being connected to a
cable or rod which, in use, suspends or supports
the housing in liquid flow, the housing
incorporating electronic measuring device for
optionally measuring liquid depth, liquid velocity
head and temperature, the sensed measurements
being either stored within the housing or
multiplexed and sent to a remote controller for
storage and recording or viewing.

5598700

**UNDERWATER TWO PHASE
RAMJET ENGINE**

Varshay Hez; Gany Alon Netanya, ISRAEL
assigned to Dimotech Ltd

An underwater two-phase ramjet engine propulsion
unit, includes an inlet for receiving a flow of water,
compressed gas injector for injecting compressed
gas into the flow of water, a mixing chamber for
mixing the compressed gas with the flow of water
to provide a two-phase flow of working fluid and
a nozzle for accelerating the two-phase flow of
working fluid so as to generate a two-phase jet.
The propulsion unit can be implemented with a
fixed geometry or with a variable geometry. The
propulsion unit includes a supersonic gas injector
as well as a subsonic gas injector. The propulsion
unit includes a control system the controlling the
compressor, supersonic gas injector, the subsonic
gas injector, the geometry of the propulsion unit,
and the direction of the thrust vector.

5599440

**CATALYST METHOD AND
APPARATUS FOR AN
ON-STREAM PARTICLE
REPLACEMENT SYSTEM FOR
COUNTERCURRENT CONTACT
OF A GAS AND LIQUID FEED
STREAM WITH A PACKED BED**

Stangeland Bruce; Kramer David; Smith David;
McCall James; Scheuerman Georgieanna L;
Bachtel Robert W; Johnson David R Berkeley,
CA, UNITED STATES assigned to Chevron U S
A Inc

This invention makes possible substantially
continuous flow of uniformly distributed hydrogen
and hydrocarbon liquid across a densely packed
catalyst bed to fill substantially the entire volume
of a reactor vessel by introducing the fluids as
alternate annular rings of gas and liquid (i.e. a
mixture of liquid hydrocarbon and a
hydrogen-containing gas) at a rate insufficient to
levitate or ebullate the catalyst bed. Catalyst are
selected by density, shape and size at a design feed
rate of liquids and gas to prevent ebullation of the
packed bed at the design feed rates. Catalysts are
selected by measuring bed expansion, such as in a
large pilot plant run, with hydrocarbon, hydrogen,
and catalyst at the design pressures and flow
velocities. The liquid and gas components of the
feed flow into the bed in alternate annular rings
across the full area of the bed. At the desired flow
rate, such catalyst continually flows in a plug-like
manner downwardly through the reactor vessel by
introducing fresh catalyst at the top of the catalyst
bed by laminarily flowing such catalyst in a liquid
stream on a periodic or semicontinuous basis.
Catalyst is similarly removed by laminarily flowing
catalyst particles in a liquid stream out of the
bottom of the catalyst bed. Intake for such flow is
out of direct contact with the stream of gas flowing
through the bed and the flow path is substantially
constant in cross-sectional area and greater in
diameter by several times than the diameter of the
catalyst particles. The catalyst of this invention
produces a plug-flowing substantially packed bed
of hydroprocessing catalyst which occupies at least
about 75% by volume of the reactor volume.

5600060

**APPARATUS AND METHOD FOR
COMPUTING UNSTEADY FLOWS
BY DIRECT SOLUTION OF THE
VORTICITY EQUATION**

Grant John R Jamestown, RI, UNITED STATES
assigned to The United States of America as
represented by the Secretary of the Navy

Fluid flow characteristics are calculated directly from a two dimensional surface model of the object. A plurality of surface nodes with defined boundary conditions are established on the surface model. Consecutive layers of nodes are created a preset distance outward from said surface model. Curved panels are defined passing through three nodes at a layer, and a surface shape function is established for each panel from previous panels or from the boundary conditions. The fluid flow velocity for the next layer is developed from the velocities calculated at the previous layer and the shape function. Triangular elements are created by connecting a node on the next layer with two nodes from the previous layer to form an element. First and second vorticity gradients can be calculated for the current node at a time segment from the parameters associated with the previous layer of interest nodes at that time increment. This can be combined with the calculated diffusion velocity for the node to produce a rate of change of vorticity with respect to time which can be used to calculate the velocity of the fluid at the node.

5600073

**METHOD AND SYSTEM FOR
ANALYZING A TWO PHASE
FLOW**

Hill Wayne Westborough, MA, UNITED STATES assigned to Foster-Miller Inc

A method of and system for analyzing a two-phase flow in a conduit in which acoustic energy is transmitted through a conduit and into the flow therein; return echoes are detected, one or more flow indicator quantities are computed from the return echoes; and the mass flow rate and/or the

flow quality is determined from the computed flow indicator quantities.

5602348

**METHOD AND EQUIPMENT FOR
TAKING A SAMPLE**

Takakarhu Jouni; Nyfors Klaus Helsinki, FINLAND assigned to Borealis Polymers Oy

PCT No. PCT/FI94/00182 Sec. 371 Date Feb. 12, 1996 Sec. 102(e) Date Feb. 12, 1996 PCT Filed May 10, 1994 PCT Pub. No. WO94/27134 PCT Pub. Date Nov. 24, 1994. The invention concerns a method and an equipment for taking a sample in slurry polymerization. The sample is taken directly from the liquid phase of the reactor through an in-line filter. The slurry flow is maintained in the in-line filter at a sufficiently high level to prevent immobilization of polymer or catalyst particles on the filter face of the in-line filter.

5604316

**MULTIPLE PHASE CORIOLIS
MASS METER**

Alonso Joey Anchorage, AK, UNITED STATES

A Coriolis mass flow meter that measures total mass flow of multi phase fluid mixtures of gases and liquids in any proportion even with slippage occurring among the various phases. The device includes a rotating member made up of a plurality of flow conduits arranged symmetrically around a shaft and driven by an electric motor or internal combustion engine. The conduits are attached on both ends to the shaft with one end closer to the shaft centerline than the other end. The passage of the multiphase fluid from the end of the conduit closer to the shaft and exiting at the end further from the shaft while being rotated causes centrifugal force to be imparted to the fluid separating the gas and liquid inside the conduits into distinct layers. At the same time, Coriolis force is generated as the fluid mixture flows through the conduit with an increasing rotational radius. The Coriolis force is imparted to the conduits where bending beam load cells are attached to measure the force.

5605174

**DEVICE FOR CONVEYING THICK
SUBSTANCES CONTAINING A
GREAT DEAL OF SOLID
MATERIAL**

Schlecht Kar; Rockstroh Axel; Schuster Ulrich
Filderstadt, GERMANY assigned to
Putzmeister-Werk Maschinenfabrik GmbH

PCT No. PCT/EP93/00251 Sec. 371 Date Dec. 27, 1994 Sec. 102(e) Date Dec. 27, 1994 PCT Filed Feb. 4, 1993 PCT Pub. No. WO93/20002 PCT Pub. Date Oct. 14, 1993. The invention relates to a conveyor for thick substances containing a great deal of solids and having a conveyor pipe which can be filled with the thick substances under pressure and at least one injection point opening into the conveyor pipe to supply a lubricant to the region between the pipe wall and the surface of a plug flow of thick substance being formed in the conveyor pipe. In order to center the plug flow inside the conveyor pipe and provide a stable layer of lubricant, the invention proposes that the conveyor pipe have at least one annular waist at a distance from and downstream of the injection point formed by a collar or shoulder-like projection inside the conveyor pipe. A bore passing radially through the pipe wall for the connection of a lubricant injection line may be provided in the flow shadow of the waist), and at least one further waist is provided downstream at a distance from the injection drilling.

5607893

**METHOD FOR UNIFORM
LOADING OF CATALYST TUBES**

Diekmann Ebbe J Ballerup, DENMARK
assigned to Haldor Tops

A method for the uniform loading of catalyst tubes with catalyst particles, which tubes are mounted at tube inlet side in a tube sheet, the method comprises introducing a feedstream of catalyst particles on the tubesheet in a number of substreams with a substantial equal particle flow and velocity by dividing the feedstream and each

resulting substream into at least two streams in two or more dividing steps.

5608170

FLOW MEASUREMENT SYSTEM

Atkinson David I H; Walton Ian; Glotin Bernard J P; Segeral Gacu erard Clamart, FRANCE
assigned to Schlumberger Technology Corporation

PCT No. PCT/GB93/00369 Sec. 371 Date Nov. 16, 1994 Sec. 102(e) Date Nov. 16, 1994 PCT Filed Feb. 22, 1993 PCT Pub. No. WO93/17305 PCT Pub. Date Sep. 2, 1993. Apparatus for measuring multiphase fluid flows comprising first and second sections each comprising a flow passage having means for making a dynamic pressure measurement on the multiphase fluid flow therethrough, the geometry of the first and second sections differing so as to affect a relationship between void fraction and velocity for the phases in a known manner. The difference in geometry between the two sections can be in the area of the flow passages or in the direction of flow relation to gravity. A method of measuring multiphase flows comprising the steps of: a) directing the flow through a first flow passage including means for making a dynamic pressure measurement; b) measuring a pressure drop across said means; c) directing the flow through a second flow passage including means for making a dynamic pressure measurement; d) measuring a pressure drop across said means; and e) calculating the composition and flow rates of the phases from the measured pressure drops. The method optionally includes the further steps of directing the flow through a pair of passages and f) intermittently isolating one or other of said pair of passages to prevent flow therethrough; g) measuring at least one property of the fluid as the phases separate in the isolated passage.

5609405

**OVERHEAD PROJECTOR FLUID
DYNAMICS SIMULATOR**

Dougherty Dennis Sault Ste Marie, MI, UNITED STATES

A portable water containing tray that uses various mediums to demonstrate and/or experiment with liquid and gas flow dynamics. It is designed to be compatible with overhead projection and contains a transparent activity area, fluid transport system, and activity components that when placed on an overhead projector allows light transmission through various liquid and/or solid object components. Fluids are recycled on the activity area by a pumping device. Various liquid dye and solid object components are placed on the activity area to simulate real-world events or environments. Solid activity components have a variety of internal and/or external flow configurations for creating a multitude of flow characteristics.

5613835

**FLOW CONTROL APPARATUS
FOR A WATER POWERED SUMP
PUMP**

Tyner Leslie M Saginaw, MI, UNITED STATES

A water powered sump pump has a flow control apparatus connected to a source of water under pressure and to a suction generator. Water from the flow control apparatus flows through a nozzle in the suction generator, creates a pressure drop, suck water in from a sump, and discharge water through a discharge line. The control apparatus has a variable pressure chamber and a constant pressure chamber. The constant pressure chamber is connected to a source of water under pressure and to the suction generator. A diaphragm separates the two chambers and opens and closes a passage between the water source and the suction generator. An orifice connects the two chambers. A bleed valve opens and closes the variable pressure chamber. A spring biased arm of an actuator assembly is biased in one direction to open the bleed valve, drop pressure in the variable pressure chamber, move the diaphragm and open the passage which permits flow to the suction generator. Spring biased arm is biased in another direction to close the bleed valve and move the diaphragm to stop flow to the suction generator. A control arm controls the direction the spring biased arm is biased. An adjustable float moves the control arm in response to changes in sump water level.

5613895

**PARTICULATE FLOW CONTROL
SYSTEM**

Baker Raymond E Porters Corners, NY,
UNITED STATES assigned to The Guyson
Corporation of USA

A simple and effective means is provided to control sand blast or like particulate media flow in the cleaning and scouring of workpieces to insure substantially uniform cleaning. To this end, microwave energy is directed at the particle flow, and energy reflection therefrom effects desired opening, closing, and intermediate control of sand blast flow means, as a valve interposed in the blast conduit.

5614773

**GENERATOR SECTION OF A
TWO-PHASE FLOW LIQUID
METAL
MAGNETOHYDRODYNAMIC
(LMMHD) GENERATOR**

Fabris Gracio Glendale, CA, UNITED STATES
assigned to California Institute of Technology

Two-phase LMMHD energy conversion systems have potentially significant advantages over conventional systems such as higher thermal efficiency and substantial simplicity with lower capital and maintenance costs. Maintenance of low velocity slip is of importance for achieving high generator efficiency. A bubbly flow pattern ensures very low velocity slip. The full governing equations have been written out, and a computer prediction code has been developed to analyze performance of a two-phase flow LMMHD generator and nozzle under conditions of no slip. Three different shapes of an LMMHD generator have been investigated. Electrical power outputs are in the 20 kW range. Generator efficiency exceeds 71% at an average void fraction of about 70%. This is an appreciable performance for a short generator without insulating vanes for minimizing electrical losses in the end regions.

5615713**METHOD FOR WEAVING A
FILTER FABRIC BELT FOR
PRESSURE FILTER APPARATUS**

Benesi Steve Novato, CA, UNITED STATES

The method of weaving a dimensionally stable fabric filter medium having particular use in a pressure filter apparatus. The fabric is woven with tension on the warp and weft yarns and the woven fabric is heat set outside the weaving loom to create a desired crimp in the warp and weft yarns and thus to produce a dimensionally stable filter medium. The fabric is woven in a pattern and of materials that provide the desired permeability while being capable of capture of the solids in a slurry and permitting the fluids of the slurry to flow through the medium.

5616015**HIGH DISPLACEMENT RATE,
SCROLL-TYPE, FLUID
HANDLING APPARATUS**

Liepert Anthony Lincoln, MA, UNITED STATES assigned to Varian Associates Inc

A positive displacement fluid handling apparatus has a first, high volumetric displacement rate scroll pump of nested interacting pairs of fixed and movable spiral-shaped blades supported in a housing between an inlet and an outlet. Each adjacent blade pair is of sufficient angular extent, preferably only about 360°, to close an inter-blade pocket. In a preferred form for a vacuum pump, a second scroll pump mounted in the housing has its fluid inlet in direct fluid communication with the first scroll outlet. The second scroll has a single pair of co-acting fixed and movable blades with multiple revolutions with a relatively short axial height. The low back leakage of this second pump allows the first pump to omit tip seals on the free spiral edges of the blades. The volumetric displacement rate of the first pump exceeds that of the second pump. An orbiting plate carries the movable blades of both scroll pumps. The drive has a small crank radius which reduces seal velocity and wear, and reduces radial crank force.

Ball thrust bearings held between recesses in the periphery and in the plate offset axially directed compressive forces while synchronizing the orbiting movement. A fan mounted on the drive air cools the apparatus. There is no oil or other liquid lubricant or coolant exposed to the working fluid.

5616493**METHOD FOR FOAM
BIOPROCESS**

Cahoon Richard S Freeville, NY, UNITED STATES

A biological process includes the step of producing a substantially continuous foam of gas bubbles in a liquid capable of undergoing a biological process utilizing prokaryotic or eukaryotic cells. The cells are introduced into the foam after the foam is produced and maintained in the foam under conditions effective to carry out the process. A reaction product of a biological process utilizing a foam culture medium is recovered by subjecting the foam to a pressure change after maintaining the cells in the foam culture medium under conditions effective to sustain the process. An apparatus for carrying out a biological process includes a foam production chamber having one or more inlets for introducing a gas and components of a culture medium. The chamber is adapted for producing a foam of bubbles of the gas in the culture medium. A plug-flow reactor is positioned to receive foam from the foam production chamber as a continuously flowing plug. The apparatus further includes means for introducing cells into the plug-flow reactor.

5616831**PROCESS AND APPARATUS FOR
CONTROLLING GRAVITY
SETTLING SYSTEM**

Ferland Pierre; Tremblay Leopold; Doucet Jean Jonquiere, CANADA assigned to Alcan International Limited

A testing device is described for use in determining optimum operating conditions for a full size industrial continuous gravity settling unit

and for the design of such settling unit. The testing device comprises an elongated, cylindrical settling column having concentric, inner and outer transparent cylindrical walls forming an annular space therebetween filled with transparent heat exchange liquid, with the inner wall defining a cylindrical settling cell. A cylindrical feedwell extends downwardly into the top end of the settling cell, an overflow outlet opening is provided in the inner wall at a location above the bottom end of said feedwell, a solids discharge opening is provided at the bottom of the settling cell and a rotating rake is provided at the bottom of the settling cell for compacting collected solids. The device also includes pump means for providing smooth, continuous flows of slurry and flocculant, mixing means for mixing together the slurry and flocculant, and means for measuring and controlling flow rates and temperatures. The testing device is utilized by observing the position and shape of a stream of agglomerated solids leaving the bottom of the feedwell of the settling column and adjusting the flow rate of at least one of the flow rate of the stream of suspended solids and the flow rate of the stream of flocculating agent to the settling column such that the stream of agglomerated solids leaving the feedwell displays hindered settling, and utilizing the adjusted flow rates of the suspended solids stream and the flocculant stream to determine the optimum operating conditions for an industrial settling unit.

5620144

**STACKED INTERSPACIAL SPRAY
HEADER FOR FGD WET
SCRUBBER**

Strock Thomas; White Frederick L Jackson Township, Stark County, OH, UNITED STATES assigned to The Babcock & Wilcox Company

An arrangement for uniformly distributing a liquid slurry across a flow path at a selected level of a housing. This invention incorporates a plurality of supply headers located adjacent the housing at that level of the housing for supplying the liquid slurry to the housing. A plurality of feeder lines extend from each of these supply headers across the flow path at this level of the housing. The feeder lines from one such supply header are arranged so as to be vertically displaced directly atop the feeder lines from an adjacent supply header. Thus, the

feeder lines from the separate supply headers extend in a parallel, in-line relationship one atop the other thereby reducing the blockage of the flow path. Nozzles extend in a staggered fashion from these feeder lines and are off-set with respect to each other. The staggering of the nozzles is provided so that the spray from the nozzles coupled to the upper feeder lines do not impinge directly on the structure of the lower feeder lines.

5620591

**HYDROCONVERSION PROCESS
WITH PLUG-FLOW
MOLYBDENUM CATALYST
CONCENTRATE PREPARATION**

Poole Martin; Halbert Thomas R; Bearden Roby; Reynolds Stephen D Baton Rouge, LA, UNITED STATES assigned to Exxon Research & Engineering Company

A hydroconversion process for converting a heavy hydrocarbonaceous feedstock to lower boiling products, which process involves the use of a sulfided catalyst concentrate which is prepared in a continuous plug-flow mode. The heavy hydrocarbonaceous feedstock is reacted with said catalyst concentrate in the presence of hydrogen at hydroconversion conditions.

5622224

**METHOD AND APPARATUS FOR
CEMENTING WELL CASING
USING ALTERNATE FLOW
PATHS**

Yates Tommy J Coppell, TX, UNITED STATES assigned to Mobil Oil Corporation

A method and apparatus for casing and cementing an interval of a well bore which provide for a good distribution of cement over the entire interval even when a restriction forms within the annulus before all of the cement has been placed. The casing is provided with an alternate flow path for delivering cement slurry which flows from the lower end of the casing to different levels within the well annulus so that if a restriction occurs in the

annulus, cement slurry can still be delivered to the annulus above the restriction.

5623103

**METHOD AND APPARATUS FOR
MEASURING FLUID FLOW
CHARACTERISTICS**

Francisco Edward E Valley, AZ, UNITED STATES assigned to Calibron Systems Inc

The parameters of flowing fluids are measured via the insertion of a two rotor assembly into the flowing fluid, the rotors adapted to rotate at different free running speeds, and being coupled such that the rotors share a common axis, and such that an angular displacement of one rotor relative to the other rotor applies a restoring torque to the other rotor, the restoring torque being dependent on the amount of angular displacement. The fluid flow induced angular displacement is related to the fluid mass flow rate, and the time interval between the passage of the rotors through a fixed reference plane extending radially from the common axis of the rotors is related to the density of the fluid. The apparatus incorporates rotors that are coupled by connecting them with a plurality of spring elements at two or more positions radially outward from the common axis of the rotors. The rotors may be oriented such that the rotor which is upstream in the flow is adapted to have a slower free running speed. The downstream rotor may be provided with means to move axially in response to the angular displacement induced shortening of the axial extension of the spring elements.

5624077

**CONCRETE CYCLONE
RECLAIMER**

Branscome Henry Williamsburg, VA, UNITED STATES assigned to Henry Mfg Company

The present invention is a novel concrete reclaimer cylinder with a closed chamber and a screen chamber. The reclaimer is disposed in a non-horizontal position such that screen chamber is positioned lower than the closed chamber and driven to rotate. Concrete product is received into

the closed chamber at its receiving end and is washed with water to produce cement slurry. The cement slurry flows out of the closed chamber at the receiving end leaving a mixture of sand and gravel in the closed chamber. The sand and gravel mixture is advanced through the closed chamber by eight triangular blades. Each blade is planar in shape, with a screen portion disposed within each blade face, with a perpendicular portion extending from the front edge to direct the sand and gravel mixture through an aperture and into the screen chamber. The sand and gravel mixture is received in a rotating screen and washed by high pressure spray to separate the two constituents. The sand permeates the rotating screen while the gravel remains inside the rotating screen. The cement slurry, sand and gravel are collected in separate containers for future use.

5624563

**PROCESS AND APPARATUS FOR
AN ACTIVATED SLUDGE
TREATMENT OF WASTEWATER**

Hawkins John C Murrells Inlet, SC, UNITED STATES

A process and apparatus for biological purification of wastewater resulting in reduction of biological oxygen demand, reduction of suspended solids, and for nitrification, wherein the process involves aerating wastewater in a treatment zone for reduction of biological oxygen demand, transferring the mixed liquor from this treatment zone on an alternate basis to a second or third treatment zone which undergoes an aeration/settle, fill and decant cycle. As the second or third zone is receiving influent, it is being decanted in a modified plug-flow fashion. The alternate treatment zones allow for a continuous discharge of treated effluent during the process. During aeration of the second or third treatment zone, mixed liquor is recycled to the first treatment zone. Sludge is retained long enough to achieve nitrification. This invention is particularly suited for modification of aerated lagoon systems to achieve nitrification with a high degree of efficiency.

5625112**METHOD OF INDIRECT HEAT EXCHANGE FOR TWO PHASE FLOW DISTRIBUTION**

Ragi Elias; Godry Thomas J Williamsville, NY, UNITED STATES assigned to UOP

A method and apparatus for indirectly heating a mixed phase stream by contact with a boiling surface located on the inside of the plurality of heat exchange tubes. Improved vaporization of the stream is achieved by equalizing the liquid distribution and the ratio of liquid and vapor entering each tube to overcome poor boiling film heat transfer. The invention uses a means for subdividing the flow entering the heat exchanger into a plurality of streams with each of the divided streams discharging directly into a heat exchange tube. The means for dividing the stream can include baffle arrangements or plugs providing pressure drop at the inlets to the tubes. This method and apparatus is particularly useful in contactors for the sulfuric acid catalyzed alkylation of hydrocarbons.

5625293**DETERMINATION OF THE WATERCUT OF A MULTIPHASE FLOW DIRECTLY FROM MEASURED MICROWAVE FREQUENCY DIELECTRIC PROPERTIES**

Marrelli John D; Stafford Joseph D; Helms David; Durrett Michael G; Hatton Gregory J Houston, TX, UNITED STATES

The watercut of fluid in a multiphase flow is measured. Microwave energy in the 10 Ghz range is transmitted through a test cell having flow passing therein through a known geometry. Attenuation and phase shift of the microwave energy is measured and used to derive the wave number of the microwaves in the unknown fluid. The water fraction of the unknown fluid is then determined from the wave number and the known geometry of the test all using Hannai's equation.

5628563**METHOD AND SYSTEM FOR SLURRY PREPARATION AND DISTRIBUTION**

Fisher Donald Visalia, CA, UNITED STATES assigned to Montague/Fisher Inc

A method and apparatus for supplying gypsum slurry of predetermined concentration to a follow-on utilization device, such as an irrigation network. Slurry of a first higher concentration is prepared in a vessel using a vertically arranged mixer with power and drive components mounted outside the tank and a mixer shaft bearing an impeller and a propeller positioned inside the tank for immersion in the slurry ingredients. Rotation of the impeller and propeller causes the slurry ingredients to flow downwardly in the central region of the vessel, outwardly near the bottom towards the inner wall surfaces, upwardly of the inner wall surfaces towards the top and inwardly to the central region in a cyclic fashion to produce a uniform slurry. The slurry is withdrawn through an outlet in one of the tank walls and mixed with externally supplied water in a mixing chamber to dilute the slurry to a desired useable concentration. The added water is supplied via an adjustable flow meter to obtain the desired diluted concentration. Once the diluted concentration has been selected, a uniform concentration is maintained throughout the delivery cycle, regardless of the level of the slurry in the vessel.

5628912**ROTARY SEPARATOR METHOD FOR MANURE SLURRIES**

Nesseth Clinton A Cameron, WI, UNITED STATES assigned to NTH Inc

A method and apparatus for efficiently separating solids from liquid/solid slurries are disclosed. The slurry to be separated is retainably placed within a container having one or more lift paddles secured within its inner cavity. The container is supported for rotation about an axis and has drive means for slowly rotating the container. As the container rotates, the lift paddles lift a portion of the retained slurry, allowing the liquid portion to fall back into

the primary slurry pool to be separated, and lifting the solids toward the top of the rotation path of the paddles. The separated solids slide by gravity off of the lift paddles as they approach the top of their rotation paths and into a collection hopper and transport means that carry them away from the container. The liquids returned to the primary retained slurry within the container assist in washing the slurry for facilitating solids separation without required increase in the retained slurry volume. Continuous flow-through and multiple chamber separation containers are disclosed.

5631413

FLUID HOLDUP TOOL AND FLOW METER FOR DEVIATED WELLS

Young Allen R; Tello Lucio N; Blankinship Thomas Arlington, TX, UNITED STATES assigned to Computalog USA Inc

A production logging tool is provided for use within a well to directly measure a velocity profile of a multiphase fluid flow within a cross-section of a well. The production logging tool includes a tool housing from which a plurality of arms are radially extensible. The plurality of arms are rotatably mounted to the tool housing for rotating around a tool axis extending longitudinally through the tool housing. At least one Doppler flow sensor is fixedly mounted to one of the plurality of arms for moving with the arm to dispose the Doppler flow sensor within different localized regions within a cross-section of the well. The localized regions of the cross-section are located at different radial distances from and at different angular displacements around the tool axis of the tool housing, at points distal from the tool axis. The Doppler flow sensor has a depth of investigation for detecting flow velocities of a multiphase fluid flow proximate to the Doppler flow sensor, within the localized regions of the cross-section of the well. The plurality of arms are rotated about the tool housing to dispose the Doppler flow sensor within different ones of the localized regions disposed throughout the cross-section for measuring a velocity profile of the multiphase fluid flow through the cross-section of the well. Flow velocities are also preferably detected within localized regions disposed within the boundary layer of the multiphase fluid flow.

5656514

METHOD FOR MAKING HETEROJUNCTION BIPOLAR TRANSISTOR WITH SELF-ALIGNED RETROGRADE EMITTER PROFILE

Ahlgren David; Chu Jack; Revitz Martin; Ronsheim Paul; Saccamango Mary; Sunderland David Wappingers Falls, NY, UNITED STATES assigned to International Business Machines Corporation

A high gain, high frequency transistor is formed having a combination of a moderately doped retrograde emitter and a collector which is formed by self-aligned implantation through an emitter opening window. This combination allows continued base width scaling and ensures high current capability yet limits the electric field at the emitter-base junction, particularly near the base contacts, in order to reduce leakage and capacitance and to enhance breakdown voltage. Cut-off frequencies on the order of 100 GHz can thus be obtained in the performance of a transistor with a 30 nm base width in a SiGe device.

5656515

METHOD OF MAKING HIGH-SPEED DOUBLE-HETEROSTRUCTURE BIPOLAR TRANSISTOR DEVICES

Chandrasekhar S; Dentai Andrew Gomperz; Miyamoto Yasuyuki Matawan, NJ, UNITED STATES assigned to Lucent Technologies Inc

The lateral base resistance of a DHBT device is reduced and its high-speed operating characteristics thereby improved by forming a structure that initially includes a relatively thick extrinsic base layer overlying a relatively thin intrinsic base layer. The extrinsic base layer is then etched to form a window in which an emitter layer is deposited. In that way, the growth time for formation of the base-emitter junction is minimized. High-performance devices are thereby realized in a relatively simple process that has advantageous self-alignment features.

5656821**QUANTUM SEMICONDUCTOR
DEVICE WITH TRIANGULAR
ETCH PIT**

Sakuma Yoshiki Kawasaki, JAPAN assigned to
Fujitsu Limited

A semiconductor device is provided, including a semiconductor substrate of zinc blend structure, defined by a principal surface substantially coinciding to a (111)A-oriented crystal surface; an etch pit of the shape of a triangular pyramid, formed on the principal surface of the substrate, the etch pit being defined by side walls merging at an apex of said triangular pyramid, each two of the side walls merging at a valley of the triangular pyramid; and an active part formed on the etch pit; wherein the active part includes a quantum well layer having a first bandgap and provided along the side walls of the etch pit, and a pair of barrier layers having a second, larger bandgap and provided so as to sandwich the quantum well layer. According to the present invention, the quantum semiconductor device includes a quantum box at the apex of the triangular pyramid and quantum wires at the three valleys of the triangular pyramid, in addition to the one-dimensionally confined quantum wells formed by the quantum well layer in correspondence to each of the side walls of the triangular pyramid. By using the quantum box, quantum wires or quantum wells, the device of the present invention can perform various functions.

5656832**SEMICONDUCTOR
HETEROJUNCTION DEVICE
WITH ALN BUFFER LAYER OF
3NM-10NM AVERAGE FILM
THICKNESS**

Ohba Yasuo; Hatano Ako Yokohama, JAPAN
assigned to Kabushiki Kaisha Toshiba

A semiconductor device comprises a single crystal substrate, a nucleus formation buffer layer formed on the single crystal substrate, and a lamination layer including a plurality of $\text{Al}_{1-x-y}\text{Ga}_x\text{In}_y\text{N}$ ($0 < \text{or} = x < \text{or} = 1$, $0 < \text{or} = y < \text{or} = 1$, $x+y < \text{or} = 1$) layers

laminated above the nucleus formation buffer layer. The nucleus formation buffer layer is formed of $\text{Al}_{1-s-t}\text{Ga}_s\text{In}_t\text{N}$ ($0 < \text{or} = s < \text{or} = 1$, $0 < \text{or} = t < \text{or} = 1$, $s+t < \text{or} = 1$) and is formed on a surface of the substrate such that the nucleus formation buffer layer has a number of pinholes for control of polarity and formation of nuclei. A method of fabricating a semiconductor device comprises the steps of: forming, above an $\text{Al}_{1-x-y}\text{Ga}_x\text{In}_y\text{N}$ ($0 < \text{or} = x < \text{or} = 1$, $0 < \text{or} = y < \text{or} = 1$, $x+y < \text{or} = 1$) semiconductor layer doped with a p-type dopant, a cap layer for preventing evaporation of a constituent element of the semiconductor layer, the cap layer being formed of one of AlN in which a p-type dopant is added and Al_2O_3 , subjecting the semiconductor layer to heat treatment, and removing at least a part of the cap layer.

5659185**INSULATED GATE THYRISTOR**

Iwamuro Noriyuki Kawasaki, JAPAN assigned to
Fuji Electric Co Ltd

Improved breakdown withstand capability is realized in a double gate insulated gate thyristor with low on-voltage in the thyristor operation mode and high-speed turn-off in the IGBT operation mode. Turn-off current through the lateral MOSFET using a second gate electrode is reduced, and breakdown withstand capability of the insulated gate thyristor is improved by inclusion of a gap in the type source region, by contacting a part of the cathode directly to the type base layer, and by connecting the bipolar transistor and the thyristor in parallel, for a part of the turn-off current to flow through the bipolar transistor to the cathode. A trench-type first gate electrode is preferred.

5659190**SEMICONDUCTOR DEVICE IN A
THIN ACTIVE LAYER WITH
HIGH BREAKDOWN VOLTAGE**

Litwin Andre Danderyd, SWEDEN assigned to
Telefonaktiebolaget LM Ericsson

A silicon substrate carries an isolating silicon

dioxide layer and a relatively weakly and negatively doped monocrystalline silicon wafer. A component region is delimited in the wafer by an isolating layer. A bipolar transistor in the component region has a positively doped base region which includes a heavily and positively doped base connection and a heavily and negatively doped emitter. The transistor has a PN-junction at the underside of the base region and is series connected with a field effect transistor having a heavily and negatively doped drain connection. The component region is weakly doped and the distance from the PN-junction to the silicon dioxide layer is small so that a region will be readily depleted of charge carriers when applying voltages to the transistors. The voltages produce an electric field of low electrical field strength in the depleted region. This counteracts the breakthrough of a current between the base and the drain connection. The transistors withstand high voltages and require only half the space on the substrate required by corresponding earlier known transistors.

5659193

SEMICONDUCTOR DEVICE AND METHOD FOR MANUFACTURING THE SAME

Ishigaki Yoshiyuki Hyogo, JAPAN assigned to Mitsubishi Denki Kabushiki Kaisha

The present invention is provided in order to suppress a leak current at an emitter-base junction and to implement a high-speed operation of a bipolar transistor. An n+ buried layer is formed at a surface of a p- silicon substrate. An n- epitaxial growth layer and an n+ diffused layer are formed on n+ buried layer. A p+ external base region and a p- base region are formed at a surface of n- epitaxial growth layer so as to be adjacent to each other. A first interlayer insulating layer having an opening is formed on p- base region. A groove which is located under opening and extends under first interlayer insulating layer is formed at a surface of p- base region. An n+ emitter region is formed at a bottom surface of groove within p- base region. A sidewall insulating layer is formed so as to expose n+ emitter region and to cover a sidewall of opening and to come into contact with a bottom surface of first interlayer insulating layer.

5659197

HOT-CARRIER SHIELD FORMATION FOR BIPOLAR TRANSISTOR

Wei Yi-Hen Saratoga, CA, UNITED STATES assigned to VLSI Technology Inc

The present invention provides a bipolar transistor in which a lightly doped n-type hot-carrier shield extends in an epitaxial layer adjacent from a poly-emitter to an extrinsic base. This hot-carrier shield minimizes performance impairment that would otherwise occur due to a hot-carrier effect. Key steps in the method of making the bipolar transistor include a differential thermal oxidation while the poly-emitter is covered with a nitride cap. After the nitride cap is removed, an n-type dopant is implanted. The unprotected poly emitter is heavily doped. The implant partially penetrates a relatively thin oxide growth, thereby forming the hot-carrier shield. Other areas, such as the extrinsic base, and a polycrystalline base extension are covered by a relatively thick oxide growth and are unaffected by the n-type implant.

5659262

OFFSET TRIMMING FOR A MICROMACHINED SENSING DEVICE

Memishian John Newton, MA, UNITED STATES assigned to Analog Devices Inc

A micromachined device has first, second, and third electrodes forming a differential capacitor, and first and second drivers for providing clocked signals to the first and second electrodes. The drivers each have supply leads coupled to first and second reference voltage supplies via fixed first and second resistors, and also coupled together with variable resistors for trimming an offset so that electrostatic forces are balanced.

5661046**METHOD OF FABRICATING
BICMOS DEVICE**

Ilderem Vida; Iranmanesh Ali A; Solheim Alan; Blair Christopher S; Jerome Rick C; Lahri Rajeeva; Biswal Madan Puyallup, WA, UNITED STATES assigned to National Semiconductor Corporation

A BiCMOS method and device. The BiCMOS device achieves improved performance through the use of wrap-around silicide contacts, improved MOS gate formation, the use of n- and p-type LDD's, the formation of very shallow base regions in bipolar transistors, and through separate implants for base regions of the bipolar transistors and source/drains of the MOSFETS.

5661288**OPTOELECTRONIC DEVICE
INCLUDING DIGITAL FILTERS
COMPENSATING FOR
COMPONENT STIPULATED
SIGNAL DISTORTION IN A
RECEIVED SIGNAL FOR
RECOGNIZING BARCODE
SYMBOLS**

Keinath Armin; Wumler Juml org Dettingen, GERMANY assigned to Leuze electronic GmbH & Co

PCT No. PCT/EP94/02826 Sec. 371 Date Jul. 5, 1995 Sec. 102(e) Date Jul. 5, 1995 PCT Filed Aug. 25, 1994 PCT Pub. No. WO95/12861 PCT Pub. Date May 11, 1995. An optoelectronic apparatus is provided for identifying marks comprised of defined contrast patterns, particularly barcode symbols. The device includes a transmitting element which emits transmitted light and a receiving element. The transmitted light is guided across the marks, and the received light reflected by the marks has an amplitude modulation imposed by the contrast of the marks, with the received light being converted into a voltage signal that forms the received signal in the receiving element. The voltage signal is converted into a binary signal and filtered by an arrangement

of digital filters for compensation component stipulated distortions prior to being fed to a threshold-value unit for evaluation of the contrast pattern.

5661314**POWER TRANSISTOR DEVICE
HAVING ULTRA DEEP
INCREASED CONCENTRATION**

Merrill Perry; Gould Herbert J El Segundo, CA, UNITED STATES assigned to International Rectifier Corporation

A cellular insulated gate bipolar transistor (IGBT) device employs increased concentration in the active region between spaced bases to a depth greater than the depth of the base regions. The implant dose which is the source of the increased concentration is about 3.5×10^{12} atoms per centimeter squared and is driven for about 10 hours at 1175°C . Lifetime is reduced by an increased radiation dose to reduce switching loss without reducing breakdown voltage or increasing forward voltage drop above previous levels. The increased concentration region permits a reduction in the spacing between bases and provides a region of low localized bipolar gain, increasing the device latch current. The avalanche energy which the device can successfully absorb while turning off an inductive load is significantly increased. The very deep increased conduction region is formed before the body and source regions in a novel process for making the new junction pattern.

5661590**QUANTUM WELL INFRARED
PHOTO DETECTOR AND
MONOLITHIC CHOPPER**

Almogly Gila; Yariv Amnon; Xu Yuanjian Pasadena, CA, UNITED STATES assigned to California Institute of Technology

A quantum well infrared photodetector and modulator are monolithically integrated to one another. The infrared scene impinges on an infrared receiving element such as a phase grating,

which couples it to a modulator. The modulator includes asymmetric quantum wells which are shifted by an applied bias. By appropriately adjusting the bias, the modulator can pass a maximum amount of the input information or can pass less. The photodetector and modulator both use the same kinds of materials, preferably GaAs and AlxGal-xAs, so they essentially become a single unit, obtaining better noise and operating characteristics from the combination.

5661740

TEM MODE QUANTUM WIRE OR WELL STRUCTURE

Dutta Mitra; Stroschio Michael A; Sirenko Yuri; Kim Ki Woo Tinton Falls, NJ, UNITED STATES assigned to The United States of America as represented by the Secretary of the Army

A semiconductor lasing device is formed by disposing a quantum well or quantum wire array between positive and negative ohmic contacts such that different potentials are applied along the array to establish a transverse electromagnetic (TEM) mode of the optic signal (i.e. where the field components lie in a plane perpendicular to the direction of propagation). Thus, the light confinement l will be on the order of the electron confinement a . By applying different potentials via the positive and negative ohmic contacts to multiply connected waveguides, the established TEM mode does not have a cut-off frequency, and therefore, the gain of device can be greatly enhanced while still providing increased anisotropy and a low threshold current.

5662771

SURFACE MICROMACHINING PROCESS

Stoupe Rosario C Lawrence, MA, UNITED STATES assigned to Analog Devices Inc

A method for making micromachined structures that includes pinpoint polysilicon bumps for eliminating the stiction problem associated with elements of the micromachined structure, such as

movable or fixed beams. The pinpoint polysilicon bumps provide a reduced contact area for the beam which reduces the chances that there will be a stiction problem due to static or surface charge. The method takes advantage of an edge alignment technique to achieve a geometry for pinpoint bump structures of as low as 0.20 μm . The bump structures are located in a region of the movable and fixed beams at the edge adjacent the gaps between the interleaved fingers. The method forms bump structures that have a circular design. The formation of the bump structures is carefully controlled with respect to the overlap of these bump structures into interdigitated structures.

5663583

LOW-NOISE AND POWER ALGAPSB/GAINAS HEMTS AND PSEUDOMORPHIC HEMTS ON GAAS SUBSTRATE

Matloubian Mehran; Liu Takyiu; Nguyen Chanh Encino, CA, UNITED STATES assigned to Hughes Aircraft Company

An epitaxial structure and method of manufacture for a field-effect transistor capable of low-noise and power applications. Preferably, the epitaxial structure includes an N-type barrier layer comprising a wide-gap semiconductor material having the formula $\text{Al}_{1-y}\text{Ga}_y\text{P}_{0.71+z}\text{Sb}_{0.29-z}$.

5663659

SEMICONDUCTOR INTEGRATED CIRCUIT DEVICE COMPRISING CMOS TRANSISTORS AND DIFFERENTIATOR

Kaminaga Yasu; Nishio Yoji; Tamba Akihiro; Kobayashi Yutaka; Minami Masataka Hitachi, JAPAN assigned to Hitachi Ltd

The semiconductor IC device has a circuit arrangement constituted by a first CMOS logic gate having input and output terminals, and a second CMOS logic gate which performs the same logic operation as that of the first CMOS logic gate and which has an input terminal connected to the

input terminal of the first CMOS logic gate. The arrangement also requires a differentiator circuit which has an input terminal thereof connected to an output terminal of the second CMOS logic gate and has an output terminal connected to the output terminal of the first CMOS logic gate. With such an arrangement, the dependency of the effective gate propagation delay time on an output load is lowered. As a result, therefore, the arrangement can be effected using a low power supply voltage while securing a high operation speed as well as a low power consumption. The CMOS logic gates can also be facilitated in combination with NPN bipolar transistors which are connected therewith in an emitter follower circuit form. This type of arrangement is used to effect a BiNMOS type of logic (inverter) circuit. In accordance with another structural scheme, in place of the first CMOS logic gate, a BiCMOS type of arrangement is effected in combination with the second CMOS logic gate and differentiator.

5663678

ESD PROTECTION DEVICE

Chang Ming-Chien Hsinchu, CHINA (TAIWAN) assigned to Vanguard International Semiconductor Corporation

An FET with a lightly doped drain is connected between an input/output pad and ground and is protected from ESD at a pad by a structure that includes a resistor formed by the process step for the lightly doped drain. The resistor adjoins and interconnects a diffusion underlying the pad and the diffusion for the drain of the FET. A parasitic bipolar transistor is formed by the pad diffusion, the source diffusion for the FET, and the intervening substrate. When an ESD voltage appears at the pad, the FET conducts in circuit with the resistor and the voltage drop across the resistor helps to protect the FET and to turn on this parasitic bipolar transistor (in preference to a parasitic bipolar transistor otherwise formed by the FET) and thereby hold down the ESD voltage at the pad and at the drain of the FET. The FET and resistor can be formed as a number of parallel connected FETs and resistors located symmetrically on opposite sides of the pad diffusion. Protection for an input inverter circuit is also provided.

5665614

METHOD FOR MAKING FULLY SELF-ALIGNED SUBMICRON HETEROJUNCTION BIPOLAR TRANSISTOR

Hafizi Madjid; Stanchina William E Santa Monica, CA, UNITED STATES assigned to Hughes Electronics

A submicron emitter heterojunction bipolar transistor and a method for fabricating the same is disclosed. The fabrication process includes lattice matched growth of subcollector, collector, base, emitter, and emitter cap layers in sequential order on a semi-insulating semiconductor substrate. An emitter cap mesa, an emitter/base/collector mesa and a subcollector mesa are formed. Dielectric platforms are formed extending the base/collector layers laterally. Sidewalls are formed on the sides of emitter cap mesa and the sides of the extended base/collector layers and undercuts are etched into the emitter layer and the upper portion of the subcollector layer. This forms an overhang on the emitter cap mesa with respect to the emitter layer and an overhang on the base/collector layers with respect to the upper portion of the subcollector layer. Emitter, base and collector contacts are simultaneously formed, the base contact aligned to the edge of the emitter cap overhang and the collector contact aligned to the edge of the base/collector layer overhang.

5665615

METHOD OF MAKING BICMOS SEMICONDUCTOR DEVICE

Anno Hiroaki Kanagawa, JAPAN assigned to Sony Corporation

A BiCMOS semiconductor device comprising a substrate, a vertical bipolar transistor provided on the substrate and having a first conductive base terminal electrode formed in a portion of a first semiconductor film provided on the substrate, a second conductive semiconductor terminal electrode formed in a second semiconductor film provided through an insulating layer on the first semiconductor film, the first and second

conductive electrodes being disposed such that portions thereof overlap each other, and an LDD (lightly doped drain)-type MOS transistor provided on the substrate and having a gate electrode formed in a portion of said first semiconductor film and a gate side wall formed on a side wall of said gate electrode, wherein the insulating layer is caused to exist selectively in a region in which the first and second conductive electrodes are overlapped, and constitutes at least a portion of the gate side wall.

5665616

PROCESS OF MANUFACTURING A SEMICONDUCTOR DEVICE

Kimura Koji; Naruse Hiroshi Chigasaki, JAPAN
assigned to Kabushiki Kaisha Toshiba

In the Bi-CMOS process of manufacturing a semiconductor device by an effective combination of a bipolar transistor manufacturing process and a CMOS transistor manufacturing process in the case of the formation of a silicide film on a Bi-CMOS device, in which the bipolar transistor having an inner base region made of a silicon film grown by epitaxy and the MOS transistor having silicide formed on the gate electrode, source region and drain region in a self-aligned manner therewith are formed on the same semiconductor substrate, while the silicon film of the inner base region is epitaxially grown in a step, a silicon film is also epitaxially grown on the source/drain regions at the same time in the same step.

5665990

METAL OXIDE SEMICONDUCTOR DEVICE WITH SELF-ALIGNED GROOVE CHANNEL AND METHOD FOR MANUFACTURING THE SAME

Kang Won-Gu; Kang Sung-Weon; Kim Yeo-Whan; Lyu Jong-Sun Daejeon, KOREA
assigned to Electronics & Telecommunications Research Institute

A metal oxide semiconductor device with a

self-aligned groove channel structure is disclosed comprising a substrate in which a first channel region of a first conductivity type and source and drain regions of a second conductivity type are formed, a first gate insulating layer formed on the first channel region, and a first gate electrode formed on the gate insulating layer, a second gate electrode having a self-aligned groove structure formed at both sides of the first gate electrode; a second gate insulating layer formed between the substrate and the second gate insulating layer; and a non-planar second channel region of the first conductivity type formed under the second gate insulating layer and doped with a different concentration of an impurity from the first channel region. The groove structure prevents an electric field produced in the vicinity of a drain from penetrating into the channel region to lessen a short channel effect. The length of an effective channel is increased by the groove structure, and also a junction depth of source/drain regions can be further increased by a depth of the groove in comparison with the conventional MOS device. The source/drain resistance is lowered, and reliability is increased due to lessening the effect of a junction spike of a metallization and/or an electro-migration.

5666019

HIGH-FREQUENCY FIELD-EMISSION DEVICE

Potter Michael D Grand Isle, VT, UNITED STATES
assigned to Advanced Vision Technologies Inc

An improved high-frequency field-emission microelectronic device has a substrate and an ultra-thin emitter electrode extending parallel to the substrate and having an electron-emitting lateral edge facing an anode across an emitter-to-anode gap. A control electrode, having a lateral dimension only a minor fraction of the emitter-to-anode gap width, is disposed parallel to the emitter and spaced apart from the emitter by an insulator of predetermined thickness. A vertical dimension of the control electrode is only a minor fraction of the height of the anode. The control electrode may substantially surround a portion of the anode, spaced from the anode in concentric relationship. Inter-electrode capacitance between the emitter and the control electrode has only an

extremely small value, consisting of only a very small area term and a very small fringing-field term, thus allowing operation of the microelectronic device at higher frequencies or switching speeds than heretofore. Inter-electrode capacitance between the control electrode and the anode also has only an extremely small value, thus improving higher frequency performance further. Devices having a plurality of control electrodes may also be made with improved inter-electrode capacitance.

5668022

**SILICON-SILICON-GERMANIUM
HETEROJUNCTION BIPOLAR
TRANSISTOR FABRICATION
METHOD**

Cho Deok-H; Lee Soo-Mi; Han Tae-Hyeo; Ryum Byung-Ryul; Pyun Kwang-Eui Daejeon, KOREA assigned to Electronics and Telecommunications Research Institute; Korea Telecommunication Authority

A silicon/silicon-germanium bipolar transistor fabrication method employs a metallic silicide film as an extrinsic base electrode to reduce resistance of the extrinsic base electrode, and to increase a maximum oscillation frequency and cut-off frequency due to its self-aligned structure. The fabrication method enables agglomeration to occur on the side wall of the polycrystalline silicon film connected to the metallic silicide film instead of on the interface between the metallic silicide film and the lower silicon/silicon-germanium film, and leads the extrinsic base electrode to be sandwiched by the insulator films, thereby realizing a constant resistance and also resulting in the application of integrated circuits to a mass production mechanism.

5668387

**RELAXED CHANNEL HIGH
ELECTRON MOBILITY
TRANSISTOR**

Streit Dwight C; Block Thomas R Seal Beach, CA, UNITED STATES assigned to TRW Inc

A pseudomorphic HEMT having a partially relaxed InGaAs channel layer. In order to increase device performance and lower the electron transport energy levels within the potential well defined by the conduction band of the channel layer, the channel layer thickness is increased beyond a critical thickness that defines where a strained InGaAs channel becomes relaxed and forms crystal lattice dislocations. The channel layer is partially relaxed in that the channel layer thickness exceeds the critical thickness, but the thickness of the channel layer is limited so that dislocations only form in a single direction.

5668388

**BIPOLAR TRANSISTOR WITH
OPTIMIZED STRUCTURE**

Delage Sylvain; Poisson Marie-Antoinette; Brylinski Christian; Blanck Hervacu e Bures Sur Yvette, FRANCE assigned to Thomson-CSF

A bipolar transistor in which the emitter possesses a double mesa structure so as to achieve the maximum avoidance of the phenomena of electron/hole recombinations that have a deleterious effect on the current gain. The double mesa emitter can be made out of an alternation of materials MI/MII having different types of behavior with respect to a pair of etching methods. These materials may be GaInP and GaAs.

5668396

**BIPOLAR TRANSISTOR HAVING
THIN INTRINSIC BASE WITH
LOW BASE RESISTANCE AND
METHOD FOR FABRICATING
THE SAME**

Sato Fumihiko Tokyo, JAPAN assigned to NEC Corporation

A bipolar transistor has a first semiconductor region of an n-type epitaxial layer surrounded by a first insulating film, a second insulating film of silicon oxide having an opening, a second semiconductor region as a base link region of a p-type formed in the opening and having a high

impurity concentration and a thickness substantially the same as that of the second insulating film, a third semiconductor region as an intrinsic base of a p-type having a thickness thinner than that of the second insulating film, a sidewall insulating film covering the third semiconductor region, and a fourth semiconductor of a p-type formed on the third semiconductor region and surrounded by the side-wall insulating film. The reduction in the thickness of the intrinsic base is achieved without reducing the thickness of the base link region and thus it is possible to realize a bipolar transistor in which a cut-off frequency is high and yet the base resistance is low.

5670393

**METHOD OF MAKING
COMBINED METAL OXIDE
SEMICONDUCTOR AND
JUNCTION FIELD EFFECT
TRANSISTOR DEVICE**

Kapoor Ashok K Palo Alto, CA, UNITED STATES assigned to LSI Logic Corporation

An electrical circuit and method combine junction field effect transistors (JFET) and metal oxide semiconductor (MOS) circuits in series between VDD and ground, with a feedback of output voltage to control current from VDD to ground. The electrical circuit comprises a complementary metal oxide semiconductor (CMOS) inverter circuit with an input and an output, and a JFET having a gate coupled to the CMOS inverter for feedback to control the JFET. The JFET and CMOS circuitry is formed on a common substrate with the JFET gate junction being formed by implanting impurity dopants through a layer of gate oxide.

5670394

**METHOD OF MAKING BIPOLAR
TRANSISTOR HAVING
AMORPHOUS SILICON CONTACT
AS EMITTER DIFFUSION SOURCE**

Jerome Rick C; Post Ian R C Monument, CO, UNITED STATES assigned to United Technologies Corporation

The present invention teaches a method for fabricating a bipolar junction transistor (BJT) from a semiconductor substrate having a base region, wherein the BJT comprises an increased Early voltage. The method initially comprises the step of forming a patterned interlevel dielectric layer superjacent the substrate such that a segment of the substrate is exposed. Subsequently, a contact comprising a material having a grain size smaller than polycrystalline silicon is formed superjacent the patterned interlevel dielectric layer and the segment of the substrate exposed. The contact is then implanted with a dopant. Once implanted, the substrate is annealed to enable the dopant to diffuse from the contact into the base region impeded by the grain size to form an emitter region and thereby increase the Early voltage of the bipolar junction transistor.

5670798

**INTEGRATED
HETEROSTRUCTURES OF
GROUP III-V NITRIDE
SEMICONDUCTOR MATERIALS
INCLUDING EPITAXIAL OHMIC
CONTACT NON-NITRIDE BUFFER
LAYER AND METHODS OF
FABRICATING SAME**

Schetzina Jan Frederick Cary, NC, UNITED STATES assigned to North Carolina State University

An integrated heterostructure of Group III-V nitride compound semiconductors is formed on a multicomponent platform which includes a substrate of monocrystalline silicon carbide and a

non-nitride buffer layer of monocrystalline zinc oxide. The zinc oxide may be formed by molecular beam epitaxy (MBE) using an MBE effusion cell containing zinc, and a source of atomic oxygen, such as an MBE-compatible oxygen plasma source which converts molecular oxygen into atomic oxygen. An ohmic contact for a semiconductor device formed of Group III-V nitride compound semiconductor materials including a layer of aluminum nitride or aluminum gallium nitride, includes a continuously graded layer of aluminum gallium nitride and a layer of gallium nitride or an alloy thereof on the continuously graded layer. The continuously graded layer eliminates conduction or valence band offsets. A multiple quantum well may also be used instead of the continuously graded layer where the thickness of the layers of gallium nitride increase across the multiple quantum well. The ohmic contacts may be used for Group III-V nitride laser diodes, light emitting diodes, electron emitters, bipolar transistors and field effect transistors.

5670801

HETEROJUNCTION BIPOLAR TRANSISTOR

Nakano Hirofumi Tokyo, JAPAN assigned to Mitsubishi Denki Kabushiki Kaisha

A method of fabricating a semiconductor device includes producing a collector layer, a base layer, and an emitter layer on a semiconductor substrate; producing a dummy emitter electrode on a region of the emitter layer; forming a first resist except where the dummy emitter electrode is present; completely removing the dummy emitter electrode to expose the surface of the emitter layer; depositing an emitter electrode material on the first resist and the emitter layer that is exposed by the removal of the dummy emitter electrode; forming a mask on a region of the emitter electrode material film where an emitter electrode is later produced; and etching the emitter electrode material film using the mask; and removing the first resist, thereby producing an emitter electrode layer, a peripheral side part extending upward from the bottom part, and an upper fringe part protruding outward from the peripheral side part perpendicular to the peripheral side part. A minute emitter electrode is produced without employing vacuum evaporation and lift-off techniques that

can cause burrs on the emitter electrode. Since a refractory metal can be employed as the emitter electrode material, a highly-reliable emitter electrode is produced with high stability.

5670811

VERTICAL INSULATED GATE SEMICONDUCTOR DEVICE HAVING HIGH CURRENT DENSITY AND HIGH RELIABILITY

Mori Mutsuhiro; Tanaka Tomoyuki; Yasuda Yasumichi; Nakano Yasunori Hitachi, JAPAN assigned to Hitachi Ltd

The present invention is directed to a semiconductor device which can achieve high current density and which has a high reliability. In the insulated gate semiconductor device according to the present invention, a plurality of insulating gates are provided, with each two adjacent insulating gates being spaced from each other, the insulating gates being provided on a second semiconductor region of a first conductivity type. A first semiconductor region, of the same or different conductivity type from that of the second semiconductor region, extends from a surface of the second semiconductor region opposed to the surface thereof having the insulating gates thereon. A plurality of third semiconductor regions are provided in the second semiconductor region, between the insulating gates and aligned therewith, and two fourth semiconductor regions are provided extending into each of the third semiconductor regions, aligned with the sides of adjacent insulating gates. Electrodes are respectively provided in contact with the first semiconductor region and in contact with the third and fourth semiconductor regions, the electrode in contact with the third and fourth semiconductor regions contacting such regions in the space between adjacent insulating gates. By utilizing such aligned third and fourth semiconductor regions, an insulated gate semiconductor device which operates at high current densities can be fabricated at high accuracy, and such device will be less influenced by parasitic bipolar transistor effects.

5670885**SEMICONDUCTOR DEVICE**

Iwai Takashi; Nakano Motoo Hachioji, JAPAN
assigned to Fujitsu Limited

A semiconductor device has a first-conduction-type semiconductor substrate, an internal circuit including a vertical bipolar transistor formed in a second-conduction-type semiconductor layer, and a protective element. The protective element comprises a first-conduction-type diffusion layer formed at an upper part of a second-conduction-type semiconductor layer disposed on the semiconductor substrate, and a second-conduction-type diffusion layer formed in the first-conduction-type diffusion layer. The diffusion layer is at least partly deeper than an emitter diffusion layer of the vertical bipolar transistor.

5671437

**QUANTUM DOT-TUNNEL DEVICE
AND INFORMATION
PROCESSING APPARATUS AND
METHOD USING SAME**

Taira Kenichi Tokyo, JAPAN assigned to Sony
Corporation

A novel quantum dot-tunnel device having a revolutionarily faster processing speed and higher processing precision than conventional computer computation, which device has an array consisting of a large number of quantum dots which confine electrons three-dimensionally, with the coupling among quantum dots, that is, the tunnel transition probability, being defined by controlling the positional relationship and the shape of the quantum dots in accordance with an algorithm of predetermined information processing, so that the algorithm is expressed in solid state rather than by a conventional computer program. The electron transition among quantum dots occurs instantaneously and wave mechanically with a strict precision, and the results of the information processing are expressed as a spatial distribution of electrons over the plurality of quantum dots. Data is written into the quantum dots by irradiating

light (high energy) of a wavelength corresponding to the band gap energy, for example, to a specific region on the array, while data is read out by irradiating light (low energy) of a wavelength corresponding to the energy gap between a ground level of the valence band and a first excited level. Also, an information processing apparatus and method using the device.

5672522

**METHOD FOR MAKING
SELECTIVE SUBCOLLECTOR
HETEROJUNCTION BIPOLAR
TRANSISTORS**

Streit Dwight Christophe; Lammert Michael; Oki Aaron Kenji Seal Beach, CA, UNITED STATES
assigned to TRW Inc

A method for fabricating an HBT in which the subcollector-base junction, which contributes to the base-collector capacitance of the device, is reduced by using a selective subcollector. In particular, subcollector areas of the device that do not contribute to collector resistance reduction are eliminated, thereby reducing the subcollector area, which, in turn, reduces the base-collector capacitance. As such, the maximum power-gain frequency f_{max} is increased.

5672889

**VERTICAL CHANNEL SILICON
CARBIDE
METAL-OXIDE-SEMICONDUCTOR
FIELD EFFECT TRANSISTOR
WITH SELF-ALIGNED GATE FOR
MICROWAVE AND POWER
APPLICATIONS, AND METHOD
OF MAKING**

Brown Dale Marius Schenectady, NY, UNITED STATES
assigned to General Electric Company

A MOSFET includes a first SiC semiconductor contact layer, a SiC semiconductor channel layer supported by the first SiC contact layer, and a second SiC semiconductor contact layer supported

by the channel layer. The second contact and channel layers are patterned to form a plurality of gate region grooves therethrough. Each of the gate region grooves includes a base surface and side surfaces which are covered with groove oxide material. A plurality of metal gate layers are provided, each being supported in a respective one of the plurality of grooves. A plurality of deposited oxide layers are provided, each in a respective one of the grooves so as to be supported by a respective one of the plurality of metal gate layers. A first metal contact layer is applied to the surface of the first SiC contact layer, and a second metal contact layer is applied to a portion of the surface of the second SiC contact layer.

5672897

**BIMOS SEMICONDUCTOR
INTEGRATED CIRCUIT DEVICE
INCLUDING HIGH SPEED
VERTICAL BIPOLAR
TRANSISTORS**

Watanabe Atsuo; Ikeda Takahide; Tsukuda Kiyoshi; Hirao Mitsuru; Mukai Touji; Kamei Tatsuya Hitachiota, JAPAN assigned to Hitachi Ltd

An improved arrangement is provided for forming a bipolar transistor on a substrate with CMOS elements. All of the transistors (i.e., the bipolar, P-MOS and N-MOS) are formed in regions having gradually decreasing impurity concentrations from the surface toward the substrate. In addition, a buried layer is provided under each of the regions of decreasing impurity concentration in which the transistors are formed. These buried layers have a significantly higher impurity concentration than the portion of the region of decreasing impurity concentration which they are respectively adjacent to. Using this arrangement, punch-through is prevented and excellent electrical operating characteristics are provided for both the bipolar transistors and the CMOS elements.

5672898

**PLATINUM SILICIDE SCHOTTKY
DIODES IN A
TITANIUM-SILICIDED
CMOS-BASED HIGH
PERFORMANCE BICMOS
PROCESS**

Keller Stephen A; Shah Rajiv Sugarland, TX, UNITED STATES assigned to Texas Instruments Incorporated

A method for constructing a Schottky diode in an integrated circuit on a semiconductor substrate includes forming a mask layer over a region of the semiconductor substrate at which the Schottky diode is to be formed. First portions of said mask layer are removed to expose first regions of said substrate. At least one semiconductor processing step is performed prior to the formation of the Schottky diode, which has processing temperature above about 450°C in said first regions of said substrate, such as forming TiSi₂ in portions of an FET device in the integrated circuit. A second portion of said mask layer is removed to expose a second region of said semiconductor substrate at which said Schottky diode is to be formed, and a region is formed in said semiconductor substrate comprising a metal and a material of said semiconductor substrate in said second region, such as platinum silicide. Additionally disclosed are techniques for forming contacts to the Schottky diode and other integrated circuit structures at temperatures below those that would damage the Schottky diode.

5674406

**STOPPER MANUFACTURING
METHOD OF A SILICON
MICROMACHINING STRUCTURE**

Lee Jong-Hyun Taegu, KOREA assigned to Kyungpook National University Sensor Technology Research Center; Mando Machinery Corporation

A stopper manufacturing method of a silicon micromachining structure comprising steps of growing an oxidized film on a n-type substrate;

opening a n+-diffusion window by the photo-lithography through first selective diffusion and forming a n+-diffusion region using n-type impurity sources; forming a n+diffusion region by the depth 0.5 to 5 μm on the portion subject to form a stopper through the secondary diffusion; removing the oxidized film and growing a n-type silicon epitaxial layer on the front surface of the substrate; etching the n-type silicon epitaxial layer, selectively, exposing the n+-layer and depositing a porous silicon layer in HF solution by the anodic reaction; and etching the porous silicon layer away in etching solution to form a microstructure, thereby preventing the side etching and the breaking down of the microstructure by the exterior shock.

5674778

**METHOD OF MANUFACTURING
AN OPTOELECTRONIC CIRCUIT
INCLUDING HETEROJUNCTION
BIPOLAR TRANSISTOR, LASER
AND PHOTODETECTOR**

Lee KwyRo; Shur Michael; Jones Stephen
Taejon, KOREA assigned to Samsung Electronics
Co Ltd

An optoelectronic integrated circuit furnishes a monolithic integration of high-speed transistors, lasers and photodetectors for optoelectronic communication applications. The monolithic device integrates an indium phosphorus (InP)/indium gallium arsenide (InGaAs) emitter-down heterojunction bipolar transistor with an InP/InGaAs quantum well laser and modulator, and a metal-semiconductor-metal photodetector.

5675136

**OPTOELECTRIC DEVICE FOR
THE RECOGNITION OF
CONTRAST MARKS**

Keinath Armi; Wumlorner Jumlor Dettingen,
GERMANY assigned to Leuze electronic GmbH
+ Co

PCT No. PCT/EP95/00893 Sec. 371 Date Nov. 29, 1995 Sec. 102(e) Date Nov. 29, 1995 PCT Filed Mar. 30, 1994 PCT Pub. No. WO95/27257 PCT Pub. Date Oct. 12, 1995. An optoelectronic device for recognizing marks provided with defined contrast patterns includes a transmitting element that transmits a light beam and a receiving element. The beam of transmitted light is guided across the marks, and the received beam of light reflected from a mark exhibits an amplitude modulation which is impressed by the contrast of the mark and is dependent on the spatial course of intensity of the transmitted light beam. The received light in the receiving element is converted into an analog received signal. The analog received signal is converted, in an n-bit analog/digital converter, into a digital received signal which is supplied to a digital filter whose transmission characteristic is essentially equivalent to the inverse of the frequency spectrum of the spatial distribution of intensity of the transmitted light beam at the location of the mark.

5675175

BIPOLAR TRANSISTORS

Iranmanesh Ali Akbar Sunnyvale, CA, UNITED
STATES

A bipolar transistor is provided whose emitter surrounds the base. The transistor has in some embodiments a high ratio of the emitter area to the base area and low collector and emitter resistances. Further, a transistor is provided in which a collector contact region is surrounded by the base. Consequently, a low collector resistance is obtained in some embodiments.

5675328

**OPTOELECTRONIC DEVICE FOR
ASSISTANCE IN THE PILOTING
OF AN AIRCRAFT UNDER
CONDITIONS OF POOR
VISIBILITY**

Coirier Philippe; Goujon Alain; Leger Alain
Merignac, FRANCE assigned to Sextant
Avionique

An optoelectronic device designed to facilitate the piloting of an aircraft under conditions of poor visibility, at take-off and in the event of an interruption of approach procedures through a wave-off maneuver. It consists of a collimator displaying, in addition to the artificial skyline, the aircraft model and the ground speed vector, two take-off and wave-off slope scales inclined symmetrically along the arms of an X laid on the artificial skyline and intersecting at a value of pitch attitude called a safety pitch attitude to be maintained in the event of engine failure, a local horizon locked into the aircraft model and two pointers that identify the safety pitch attitude and frame the artificial skyline when the pitch attitude of the aircraft corresponds to the safety pitch attitude. Through these new graphic symbols, the pilot can examine the pitch attitude of the aircraft

and its roll attitude without taking his eyes off the aircraft model. This makes it easier for him to pilot the aircraft at take-off and during wave-off maneuvers with or without engine failure.

5675327

**OPTOELECTRONIC DEVICE FOR
ASSISTANCE IN THE PILOTING
OF AN AIRCRAFT**

Coirier Philippe; Goujon Alain Merignac,
FRANCE assigned to Sextant Avionique

The disclosed optoelectronic device is designed to facilitate the piloting of an aircraft under conditions of poor visibility, notably during landing at the stage when the aircraft approaches a runway. It consists of a collimator which displays, in addition to the artificial skyline, miniature aircraft index and attitude bars, a slope scale positioned across and on either side of the artificial skyline, at the position of the selected course chosen by the pilot. This slope scale, depicted in the form of a line of dots spaced out at one slope degree, enables the pilot to be presented simultaneously with information on selected course and slope and enables the determining of pitch attitude with high precision



Phone: 1 800-422-1337
Fax: 1 800-421 5585

REEDFAX Document Delivery System
*A service of Reed Technology and
Information Services Inc.*
275 Gibraltar Road, Horsham
PA 19044, USA

International Numbers:
Phone: 1 215-441-4768
Fax: 1 215-441-5463

REEDFAX™ Document Delivery System

We can begin fax transmission of patents within 15 minutes — 24 hours a day — 7 days a week.

We have over 1.9 million patents (1971 forward) and EP and PCT applications on our automated REEDFAX™ Document Delivery System which allows you to use a touchtone phone to order these patents without being limited to business hours

You can now get the patents you need before hours...after hours...over the weekend...on holidays...even when the US PTO is closed because of inclement weather!.

In addition to the patents on our automated system, we are able to deliver **all U.S. patents** beginning with #1 to the current week of issue. Patents not on our automated system are delivered from our second location with fax transmission beginning about 1½ hours, Monday-Friday, 8:30am–7:00pm ET. (13.00pm–24.00GMT).

We have no hidden charges at REEDFAX: no sign-on fees, no monthly fees and no minimum charges. You pay only for each patent delivered. Whatever your patent needs are - U.S. or foreign patents, file histories/wrappers, printed or faxed — we can fulfill them easily and promptly.

P.S. To experience your incredibly fast service, complete and return the FAXForm and we will provide your **FIRST FIVE U.S. PATENTS ABSOLUTELY FREE** (*you pay only for the cost of delivery!*)

 A member of the Reed Elsevier plc group