

1) Family number: 30320135 (US2004074312 AA)

Title: APPARATUS AND METHOD FOR MEASURING MULTI-PHASE FLOWS IN PULP AND PAPER INDUSTRY APPLICATIONS

Abstract: The consistency of a pulp slurry in a pipe 12 is determined using a pair of effective sound speeds a_{1eff} and a_{2eff} of the fluid/pipe system. The pair of effective system sound speed measurements are taken at two sensing regions X 1, X 2 along the pipe wherein each of the sensing regions comprises a different system cross sectional area compliance. The pair of effective system sound speeds a_{1eff} and a_{2eff} are provided to signal processing logic 160, which determines at least the composition of the fluid 12 flowing in the pipe 112. The effective system sound speeds a_{1eff} and a_{2eff} may be provided by a pair of sound speed meters positioned at sensing regions X 1, X 2 wherein the sound speed meters utilize a spatial array of acoustic pressure sensors placed at predetermined axial locations along the pipe 112. One technique uses acoustic spatial array signal processing techniques with the direction of propagation of the acoustic signals along the longitudinal axis of the pipe 112.

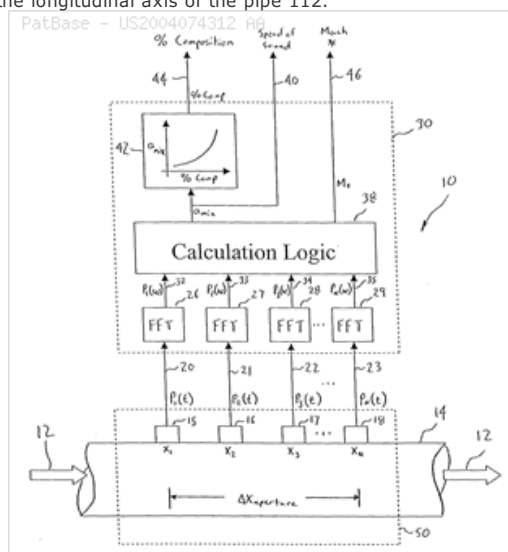
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International (IPC 8-9): G01F1/66 G01F1/74 G01N29/00 G01N33/34

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CPC: G01F1/668 G01F1/74 G01N2291/02836 G01N2291/02872

US: 73/53.03 73/61.49 73/861.04 73/861.040P



Family:

Publication number	Publication date	Application number	Application date
AU2003255235 AA	20040225	AU20030255235	20030807
AU2003255235 AH	20040225	AU20030255235	20030807
US2004074312 AA	20040422	US20030636095	20030807
US7181955 BB	20070227	US20030636095	20030807
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WO04015377 A3	20040624	WO2003US24943	20030807

Priority:

US20020402491P 20020808 WO2003US24943 20030807 US20030636095 20030807

Probable Assignee: WEATHERFORD TECHNOLOGY HOLDINGS LLC

Assignee(s): (std): CIDRA CORP ; WEATHERFORD LAMB

Assignee(s): CIDRA CORPORATE SERVICES INC ; DEUTSCHE BANK TRUST CO AMERICAS ADMINISTRATIVE AGENT AS ; GYSLING DANIEL L ; HIGH PRESSURE INTEGRITY INC ; PRECISION ENERGY SERVICES INC ; PRECISION ENERGY SERVICES LLC ; WEATHERFORD CANADA LTD ; WEATHERFORD LAMB INC ; WEATHERFORD NETHERLANDS BV ; WEATHERFORD NORGE AS ; WEATHERFORD SWITZERLAND TRADING AND DEVELOPMENT GMBH ; WEATHERFORD TECHNOLOGY HOLDINGS LLC ; WEATHERFORD UK LTD ; WEBSTER BANK NATIONAL ASSOCIATION ; WELLS FARGO BANK NATIONAL ASSOCIATION AGENT AS ; WILMINGTON TRUST NATIONAL ASSOCIATION

Inventor(s): (std): GYSLING DANIEL L

Inventor(s): DANIEL L GYSLING

Agent(s): PATTERSON AND SHERIDAN LLP

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM
DZ EC EE ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LK
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SG SI SK SL SN SY SZ TD TG TJ TM TN TR TT TZ UA UG UZ VN YU ZA ZM ZW

2) Family number: 30941144 (US2004231431 AA)

Title: APPARATUS HAVING A MULTI-BAND SENSOR ASSEMBLY FOR MEASURING A PARAMETER OF A FLUID FLOW FLOWING

Abstract: An apparatus is provided that measures the speed of sound and/or vortical disturbances propagating in a fluid flow to determine a parameter of the flow propagating through a pipe. The apparatus includes a sensing device that includes an array of pressure sensors used to measure the acoustic and convective pressure variations in the flow to determine a desired parameter. The sensing device includes a unitary strap having a plurality of bands disposed parallel to each other. The bands are interconnected by cross members to maintain the bands a predetermined distance apart. Each of the bands having a strip of piezoelectric film material mounted along a substantial length of the bands. The piezoelectric film material provides a signal indicative of the unsteady pressures within the pipe. The sensing device includes a conductive shield around the multi-band strap and the piezoelectric film material to provide a grounding shield. A cover is disposed around the entire assembly to protect it from environmental influences. The unitary multi-band strap permits the sensors to be accurate spaced apart during manufacturing and ensures fast and simple installation of the meter on the pipe.

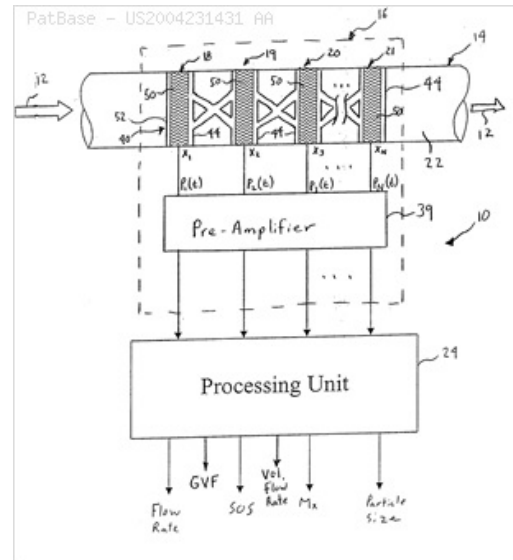
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International (IPC 1-7): B06B1/06 G01F1/66 H01L41/053

CPC: G01F1/662 G01F1/666 G01F1/7082 G01F1/74

US: 73/861.42 73/861.420P



Family:

Publication number	Publication date	Application number	Application date
CN100480639 C	20090422	CN200480010612	20040304
CN1777792 A	20060524	CN200480010612	20040304
EP1599705 A1	20051130	EP20040717493	20040304
EP1599705 B1	20190102	EP20040717493	20040304
US2004231431 AA	20041125	US20040795111	20040304
US7146864 BB	20061212	US20040795111	20040304
WO04079306 A1	20040916	WO2004US06800	20040304
WO04079306 C2	20041028	WO2004US06800	20040304

Priority:

US20030451685P 20030304 WO2004US06800 20040304 US20040795111 20040304

Probable Assignee: EXPRO METERS INC

Assignee(s): (std): CIDRA CORP

Assignee(s): BAILEY TIMOTHY J ; CIDRA CORPORATE SERVICES INC ; DAVIS MICHAEL A ; EXPRO METERS INC ; FERNALD MARK R ; HSBC CORPORATE TRUSTEE CO (UK) LTD ; HSBC CORPORATE TRUSTEE CO UK COLLATERAL AGENT AS LTD ; HSBC CORPORATE TRUSTEE CO UK LTD ; HSBC CORPORATE TRUSTEE COMAPNY (UK) LTD ; HSBC CORPORATE TRUSTEE COMAPNY UK LTD ; NIEZGORSKI RICHARD ; SULLIVAN JAMES ; WEBSTER BANK NATIONAL ASSOCIATION

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Agent(s): SCHMITT NILSON SCHRAUD WAIBEL WOHLFROM PATENTANWALTE PARTNERSCHAFT MBB

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LI LK LR LS LT LU LV MA MC MD MG MK ML MN MR MW MX MZ NA NE NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SN SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

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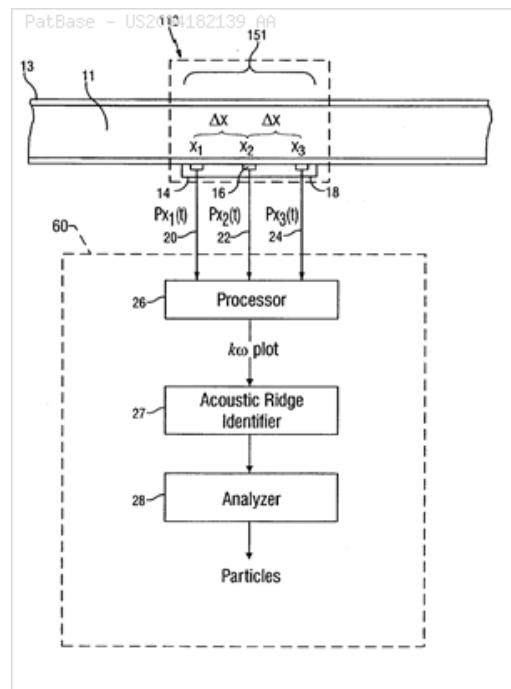
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Title: SAND MONITORING WITHIN WELLS USING ACOUSTIC ARRAYS

Abstract: A method for detecting the presence of particles, such as sand, flowing within a fluid in a conduit is disclosed. At least two optical sensors measure pressure variations propagating through the fluid. These pressure variations are caused by acoustic noise generated by typical background noises of the well production environment and from sand particles flowing within the fluid. If the acoustics are sufficiently energetic with respect to other disturbances, the signals provided by the sensors will form an acoustic ridge on a komega plot, where each data point represents the power of the acoustic wave corresponding to that particular wave number and temporal frequency. A sand metric then compares the average power of the data points forming the acoustic ridge to the average power of the data points falling outside of the acoustic ridge. The result of this comparison allows one to determine whether particles are present within the fluid. Furthermore, the present invention can also determine whether the generated acoustic noise is occurring upstream or downstream of the sensors, thus giving an indication of the location of the particles in the fluid relative to the sensors.

Classifications:

International (IPC 8-9): E21B47/00 G01F1/66 G01F1/704 G01F1/708 G01F1/712 G01F1/74 G01N15/06 G01N29/00 G01N29/04 G01N29/14
International (IPC 1-7): E21B43/12 E21B47/00 E21B47/06 G01F1/66 G01F1/74 G01H9/00 G01N15/06 G01N29/00 G01N29/02
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US: 73/152.18 73/152.180 73/579 73/587 73/61.47 73/61.75 73/61.750 73/61.79 73/643

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CA2461973 AA	20040919	CA20042461973	20040319
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GB2399637 B2	20060503	GB20040006245	20040319
US2004182139 AA	20040923	US20030392493	20030319
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US2005109112 AA	20050526	US20050028974	20050104
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Priority:

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Assignee(s): (std): GYSLING DANIEL L ; LOOSE DOUGLAS H ; WEATHERFORD LAMB ; WEATHERFORD LAMB INC

Assignee(s): CIDRA CORPORATE SERVICES INC ; DEUTSCHE BANK TRUST CO AMERICAS ADMINISTRATIVE AGENT AS ; HIGH PRESSURE INTEGRITY INC ; PRECISION ENERGY SERVICES INC ; PRECISION ENERGY SERVICES ULC ; WEATHERFORD CANADA LTD ; WEATHERFORD LAMB INC 2000 ST. JAMES PLACE HOUSTON TX 77056 US ; WEATHERFORD NETHERLANDS BV ; WEATHERFORD NORGE AS ; WEATHERFORD SWITZERLAND TRADING AND DEVELOPMENT GMBH ; WEATHERFORD TECHNOLOGY HOLDINGS LLC ; WEATHERFORD TECHNOLOGY HOLDINGS LLC 2000 ST. JAMES PL. HOUSTON TX 77056 US ; WEATHERFORD UK LTD ; WEBSTER BANK NATIONAL ASSOCIATION ; WELLS FARGO BANK NATIONAL ASSOCIATION AGENT AS ; WILMINGTON TRUST NATIONAL ASSOCIATION

Inventor(s): (std): GYSLING DANIEL L ; LOOSE DOUGLAS H

Inventor(s): DANIEL L GYSLING ; DOUGLAS H LOOSE ; GYSLING DANIEL ; GYSLING DANIEL LUS ; LOOSE DOUGLAS ; LOOSE DOUGLAS HUS

Agent(s): DEETH WILLIAMS WALL LLP; MOSER PATTERSON AND SHERIDAN LLP; PATTERSON AND SHERIDAN LLP

4) Family number: 31451073 (US2005005711 AA)

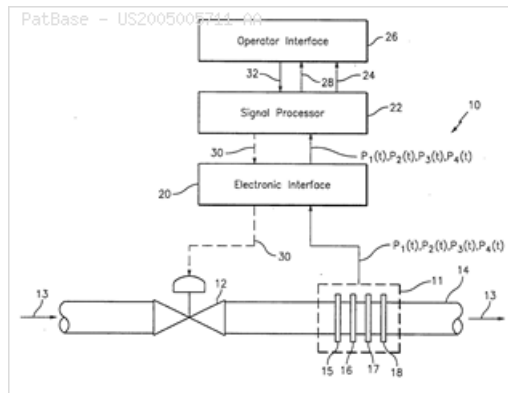
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Title: SYSTEM AND METHOD FOR OPERATING A FLOW PROCESS

Abstract: A system for monitoring, diagnosing, and/or controlling a flow process uses one or more flow meters based on an array of pressure sensors. A signal processor outputs at least one of a flow signal, a diagnostic signal, and a control signal in response to the pressure signals from the pressure sensors. The flow signal indicates the at least one parameter of the fluid, the diagnostic signal indicates a diagnostic condition of a device in the flow process, and the control signal is effective in adjusting an operating parameter of at least one device in the flow process. The system may be arranged as a distributed control system (DCS) architecture for monitoring a plurality of flow meters based on array-processing installed at various locations throughout a flow process.

Classifications:

International (IPC 8-9): B29C47/06 F02M1/00 G01D4/00 G01F1/00 G01F1/56 G01F1/66 G01F1/708 G01F1/712 G01F1/74 G01F15/06 G01F7/00 G01N11/00 G05D7/00 H04Q9/00
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CPC: G01F1/363 G01F1/662 G01F1/7082 G01F1/74
US: 702/100 702/104 702/45 702/45P 702/47 702/48 702/50 73/195



Family:

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Priority:

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Probable Assignee: EXPRO METERS INC

Assignee(s): (std): CIDRA CORP ; CIDRA CORPORATE SERVICES INC ; DAVIS MICHAEL A ; EXPRO METERS INC ; GYSLING DANIEL L ; KERSEY ALAN D

Assignee(s): CIDRA CORPORATE SERVICES INC ; CIDRA CORPORATION ; CURRY PATRICK ; DIDDEN F KEVIN ; HSBC CORPORATE TRUSTEE CO (UK) LTD ; HSBC CORPORATE TRUSTEE CO UK COLLATERAL AGENT AS LTD ; HSBC CORPORATE TRUSTEE CO UK LTD ; HSBC CORPORATE TRUSTEE COMPANY (UK) LTD ; HSBC CORPORATE TRUSTEE COMPANY UK LTD ; WEBSTER BANK NATIONAL ASSOCIATION

Inventor(s): (std): CURRY PATRICK ; DAVIS MICHAEL A ; DIDDEN F KEVIN ; GYSLING DANIEL L ; KERSEY ALAN D

Inventor(s): DAVIS MICHAEL ; DIDDEN F ; GYSLING DANIEL ; KERSEY ALAN

Agent(s): CIDRA CORP; GOWLING LAFLEUR HENDERSON LLP; GRILLO MICHAEL; KLUNKER SCHMITT NILSON HIRSCH; MICHAEL; ROBERT D CRAWFORD CIDRA CORP

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LI LK LR LS LT LU LV MA MC MD MG MK ML MN MR MW MX MZ NA NE NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SN SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

5) Family number: 30741070 (US2004194539 AA)

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Title: APPARATUS FOR MEASURING PARAMETERS OF A FLOWING MULTIPHASE MIXTURE

Abstract: An apparatus 10 is provided that measures the speed of sound propagating in a multiphase mixture to determine

parameters, such as mixture quality, particle size, vapor/mass ratio, liquid/vapor ratio, mass flow rate, enthalpy and volumetric flow rate of the flow in a pipe or unconfined space, for example, using acoustic and/or dynamic pressures. The apparatus includes a pair of ultrasonic transducers disposed axially along the pipe for measuring the transit time of an ultrasonic signal to propagate from one ultrasonic transducer to the other ultrasonic transducer. A signal process, responsive to said transit time signal, provides a signal representative of the speed of sound of the mixture. An SOS processing unit then provides an output signal indicative of at least one parameter of the mixture flowing through the pipe. The frequency of the ultrasonic signal is sufficiently low to minimize scatter from particle/liquid within the mixture. The frequency based sound speed is determined utilizing a dispersion model to determine the at least one parameter of the fluid flow and/or mixture.

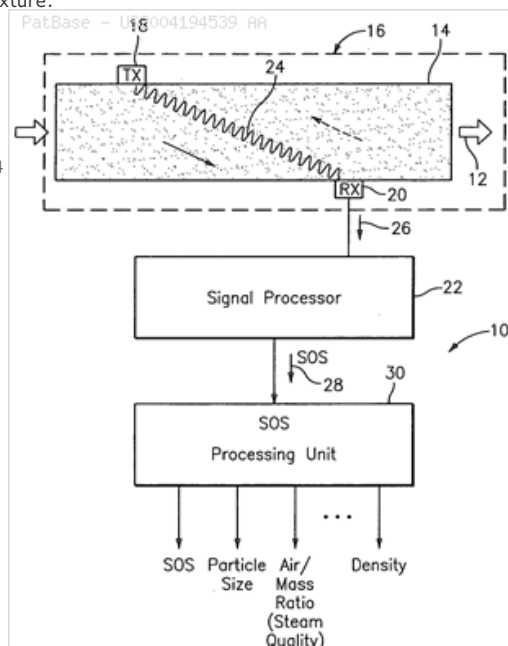
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International (IPC 1-7): G01F1/66 G01F1/704 G01F1/708 G01F1/712 G01F1/74 G01F23/00 G01H5/00 G01N15/02 G01N29/02 G01N29/18 G01P5/00

CPC: G01F1/662 G01F1/666 G01F1/667 G01F1/7082 G01F1/712 G01F1/74 G01N2291/011 G01N2291/02408 G01N2291/02416 G01N2291/02425 G01N2291/02836 G01N2291/102 G01N2291/106 G01N29/024 G01N29/032 G01N29/222 G01N29/348 G01P5/245 G01N2291/024 G01N2291/02845 G01N2291/051

US: 702/45 702/50 702/50P 73/19.03 73/24.03 73/24.04 73/597 73/597S 73/61.45 73/61.450P 73/61.49 73/61.75 73/64.53



Family:

Publication number	Publication date	Application number	Application date
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CA2513248 AA	20050713	CA20042513248	20040113
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Priority:

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Probable Assignee: EXPRO METERS INC

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Assignee(s): CIDRA CORPORATE SERVICES INC ; GYSLING DANIEL L ; HSBC CORPORATE TRUSTEE CO (UK) LTD ; HSBC CORPORATE TRUSTEE CO UK COLLATERAL AGENT AS LTD ; HSBC CORPORATE TRUSTEE CO UK LTD ; HSBC CORPORATE TRUSTEE COMAPNY (UK) LTD ; HSBC CORPORATE TRUSTEE COMAPNY UK LTD ; KERSEY ALAN D ; WEBSTER BANK NATIONAL ASSOCIATION

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Agent(s): GOWLING LAFLEUR HENDERSON LLP; KLUNKER SCHMITT NILSON HIRSCH

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LI LK LR LS LT LU LV MA MC MD MG MK ML MN MR MW MX MZ NA NE NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SN SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

Abstract: A apparatus 10,110 is provided that measures the speed of sound and/or vortical disturbances propagating in a fluid or mixture having entrained gas/air to determine the gas volume fraction of the flow 12 propagating through a pipes and compensating or correcting the volumetric flow measurement for entrained air. The GVF meter includes and array of sensor disposed axially along the length of the pipe. The GVF measures the speed of sound propagating through the pipe and fluid to determine the gas volume fraction of the mixture using array processing. The GVF meter can be used with an electromagnetic meter and a consistency meter to compensate for volumetric flow rate and consistency measurement respective, to correct for errors due to entrained gas/air.

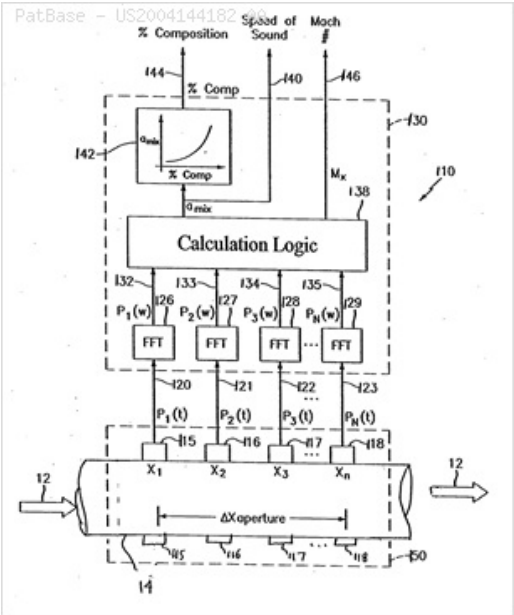
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International (IPC 1-7): G01F1/34 G01F1/66 G01F1/708 G01F1/712 G01F1/74 G01F15/02 G01F23/00 G01L1/00 G01L11/04 G01L23/00 G01L23/04 G01L7/00 G01L9/00 G01N29/02 G01N29/024

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US: 137/599.13 137/599.130S 702/189 702/24 702/24S 702/45 702/48 702/50 702/50P 702/54 702/54S 73/19.01 73/19.03 73/19.030P 73/19.1 73/19.11 73/61.41 73/61.49 73/61.79 73/753 73/756 73/861 73/861.04 73/861.040P 73/861.18 73/861.180P 73/861.22 73/861.42 73/861.420P 73/862 73/862P



Family:

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Probable Assignee: CIDRA CORP

Assignee(s): (std): C1DRA CORP ; CIDRA CORP ; CIDRA CORPORATE SERVICES INC ; EXPRO METERS INC ; GYSLING DANIEL L ; LOOSE DOUGLAS H

Assignee(s): CIDRA CORPORATION ; CIDRA CORP WALLINGFORD ; CIDRA CORPORATE SERVICES INC WALLINGFORD ; CIDRA CORPORATION ; CROTEAU PAUL ; CROTEAU PAUL F ; ENGEL THOMAS ; ENGEL THOMAS W ; HSBC CORPORATE TRUSTEE CO (UK) LTD ; HSBC CORPORATE TRUSTEE CO UK COLLATERAL AGENT AS LTD ; HSBC CORPORATE TRUSTEE CO UK LTD ; HSBC CORPORATE TRUSTEE COMAPNY (UK) LTD ; HSBC CORPORATE TRUSTEE COMAPNY UK LTD ; MARON ROBERT ; MARON ROBERT J ; WEBSTER BANK NATIONAL ASSOCIATION

Inventor(s): (std): CROTEAU PAUL ; CROTEAU PAUL F ; ENGEL THOMAS ; ENGEL THOMAS W ; GYSLING DANIEL ; GYSLING DANIEL L ; LOOSE DOUGLAS ; LOOSE DOUGLAS H ; MARON ROBERT ; MARON ROBERT J

Inventor(s): DANIEL L GYSLING ; DOUGLAS H LOOSE ; GYSLING DANIEL L GLASTONBURY ; LOOSE DOUGLAS H SOUTHTON ; PAUL CROTEAU ; ROBERT MARON ; THOMAS ENGEL

Agent(s): CIDRA CORP; GOWLING LAFLEUR HENDERSON LLP; GRILLO MICHAEL; KLUNKER SCHMITT NILSON HIRSCH; MICHAEL; ROBERT D; ROBERT D CRAWFORD CIDRA CORP; WARE FRESSOLA VAN D SLUYS AND ADOLPHSON LLP

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LI LK LR LS LT LU LV MA MC MD MG MK ML MN MR MW MX MZ NA NE NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SN SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

7) Family number: 30649646 (US2004167735 AA)

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Title: METHOD FOR CALIBRATING A VOLUMETRIC FLOW METER HAVING AN ARRAY OF SENSORS

Abstract: A method and apparatus are provided for calibrating a flow meter having an array of sensors arranged in relation to a pipe that measures a flow rate of a fluid flowing in the pipe. The method features the step of calibrating the flow rate using a calibration correction function based on one or more parameters that characterize either the array of sensors, the pipe, the fluid flowing in the pipe, or some combination thereof. The calibration correction function depends on either a ratio t/D of the pipe wall thickness (t) and the pipe inner diameter (D); a ratio t/λ of the pipe wall thickness (t) and the eddy wavelength (λ) of the fluid; a Reynolds number ($\rho U D / \mu$) that characterizes the fluid flow in the pipe; a ratio $\Delta x / D$ of the sensor spacing (Δx) and the pipe inner diameter (D); a ratio $f \Delta x / U$ of the usable frequencies (f) in relation to the sensor spacing (Δx) and the raw flow rate (U); or some combination thereof. The apparatus takes the form of a flow meter having a calibration correction function module performing the aforementioned functionality.

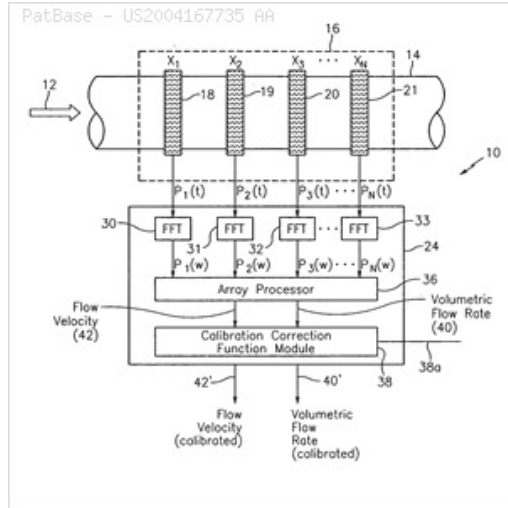
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International (IPC 1-7): G01F1/12 G01F1/66 G01F1/708 G01F25/00

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US: 702/100 702/100P 702/50 702/55 702/55P



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Publication number	Publication date	Application number	Application date
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Priority:

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Probable Assignee: EXPRO METERS INC

Assignee(s): (std): CIDRA CORP ; GYSLING DANIEL L ; KRAVETS ALEX ; LOOSE DOUGLAS H ; ROTHMAN PAUL

Assignee(s): BANK OF AMERICA NA ADMINISTRATIVE AGENT AS ; CGM GMBH ; CIDRA CORPORATE SERVICES INC ; EXPRO METERS INC ; FINISAR CORP ; FINISAR EUROPE GMBH ; HSBC CORPORATE TRUSTEE CO (UK) LTD ; HSBC CORPORATE TRUSTEE CO UK COLLATERAL AGENT AS LTD ; HSBC CORPORATE TRUSTEE CO UK LTD ; HSBC CORPORATE TRUSTEE COMAPNY (UK) LTD ; HSBC CORPORATE TRUSTEE COMAPNY UK LTD ; WEBSTER BANK NATIONAL ASSOCIATION

Inventor(s): (std): GYSLING DANIEL L ; KRAVETS ALEX ; LOOSE DOUGLAS H ; ROTHMAN PAUL

Inventor(s): ALEX KRAVETS ; DANIEL L GYSLING ; DOUGLAS H LOOSE ; GYSLING DANIEL ; LOOSE DOUGLAS ; PAUL ROTHMAN

Agent(s): CIDRA CORP; GRILLO MICHAEL; MICHAEL

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MC MD MG MK ML MN MR MW MX MZ NE NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SN SY SZ TD TG TJ TM TN TR TT TZ UA UG UZ VC VN YU ZA ZM ZW

8) Family number: 31450963 (US2005005713 AA)

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Title: PORTABLE FLOW MEASUREMENT APPARATUS HAVING AN ARRAY OF SENSORS

Abstract: A portable flow measuring apparatus is provided that measures the speed of sound and/or vortical disturbances propagating in a fluid flow to determine a parameter of the flow propagating through a pipe. The apparatus includes a sensing device that includes an array of pressure sensors, which may be removable, used to measure the acoustic and convective pressure variations in the flow to determine a desired parameter. A portable processing instrument processes the signals provided by the sensing array to provide an output signal indicative of a parameter of the fluid flow. The portable processing instrument includes a processor having appropriate processing algorithms to determine the desired or selected parameter(s) of the process flow 12. The portable processing instrument has a user interface to permit the user to select the parameters to be measured in the process flow, and/or more importantly, to enable the user to modify particular parameters or functions in the processor 30 and/or processing algorithms. The user interface 32 also enables a user to modify the code of the algorithm via a graphic user interface (GUI), keyboard and/or user input signal 34.

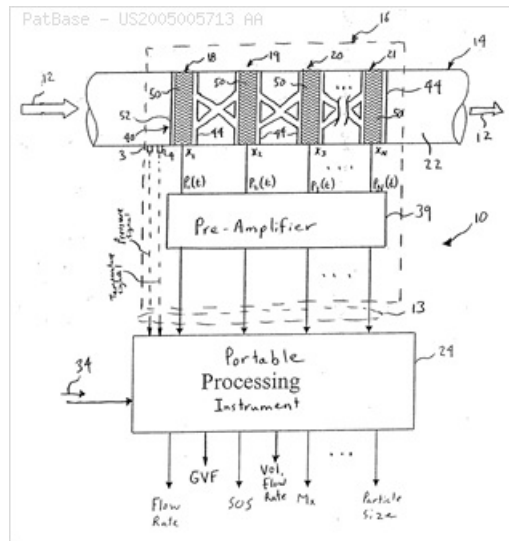
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CPC: G01F1/7082 G01F1/712 G01F1/74

US: 73/861.42 73/861.420P



Family:

Publication number	Publication date	Application number	Application date
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US7302861 BB	20071204	US20060582203	20061016
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Priority:

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Probable Assignee: EXPRO METERS INC

Assignee(s): (std): CIDRA CORP ; CURRY PATRICK ; GYSLING DANIEL L ; SAPACK MICHAEL A ; WINSTON CHARLES R

Assignee(s): CIDRA CORPORATE SERVICES INC ; CIDRA CORPORATION ; EXPRO METERS INC ; HSBC CORPORATE TRUSTEE CO (UK) LTD ; HSBC CORPORATE TRUSTEE CO UK COLLATERAL AGENT AS LTD ; HSBC CORPORATE TRUSTEE CO UK LTD ; HSBC CORPORATE TRUSTEE COMAPNY (UK) LTD ; HSBC CORPORATE TRUSTEE COMAPNY UK LTD ; WEBSTER BANK NATIONAL ASSOCIATION

Inventor(s): (std): CURRY PATRICK ; GYSLING DANIEL L ; SAPACK MICHAEL A ; WINSTON CHARLES R

Inventor(s): GYSLING DANIEL ; SAPACK MICHAEL ; WINSTON CHARLES

Agent(s): CIDRA CORP; MICHAEL; ROBERT D CRAWFORD CIDRA CORP

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MC MD MG MK ML MN MR MW MX MZ NA NE NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SN SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

9) Family number: 31392939 (US2005005712 AA)

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Title: APPARATUS FOR MEASURING VELOCITY AND FLOW RATE OF A FLUID HAVING A NON-NEGLIGIBLE AXIAL MACH NUMBER USING AN ARRAY OF SENSORS

Abstract: An apparatus 10 and method is provided that includes a spatial array of unsteady pressure sensors 15-18 placed at predetermined axial locations x_1 - x_N disposed axially along a pipe 14 for measuring the velocity and volumetric flow rate of a single phase or multi-phase fluid 12 having a non-negligible axial Mach number flowing in the pipe 14. The pressure sensors 15-18 provide acoustic pressure signals $P_1(t)$ - $P_N(t)$ to a signal processing unit 30 which determines the speed of sound propagating with and against the flow of the fluid 12 in the pipe 14 using acoustic spatial array signal processing techniques. The apparatus, responsive to the measured speed of sound propagating with and against the flow of the fluid, determines the velocity and the flow rate of the fluid propagating through the pipe.

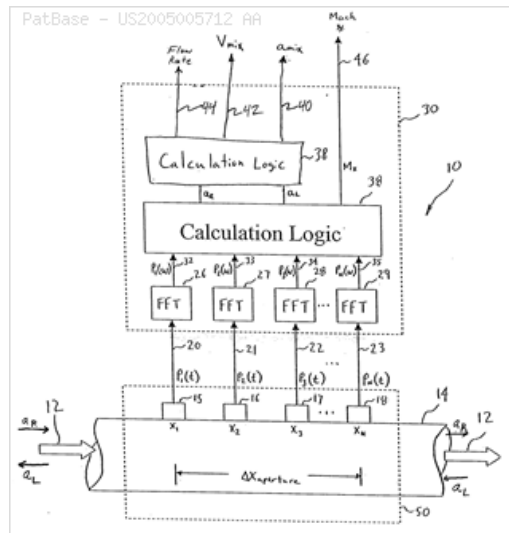
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International (IPC 8-9): G01F1/32 G01F1/66 G01F1/708 G01F1/712 G01F1/74 G01N29/02

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CPC: G01F1/7082 G01F1/712 G01F1/74 G01N2291/02836 G01N2291/02872

US: 73/24.01 73/861.23 73/861.230P



Family:

Publication number	Publication date	Application number	Application date
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Priority:

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Probable Assignee: EXPRO METERS INC

Assignee(s): (std): CIDRA CORP

Assignee(s): CIDRA CORPORATE SERVICES INC ; CIDRA CORPORATION ; EXPRO METERS INC ; GYSLING DANIEL L ; HSBC CORPORATE TRUSTEE CO (UK) LTD ; HSBC CORPORATE TRUSTEE CO UK COLLATERAL AGENT AS LTD ; HSBC CORPORATE TRUSTEE CO UK LTD ; HSBC CORPORATE TRUSTEE COMAPNY (UK) LTD ; HSBC CORPORATE TRUSTEE COMAPNY UK LTD ; LOOSE DOUGLAS H ; WEBSTER BANK NATIONAL ASSOCIATION

Inventor(s): (std): GYSLING DANIEL L ; LOOSE DOUGLAS H

Inventor(s): GYSLING DANIEL ; LOOSE DOUGLAS

Agent(s): ROBERT D ; ROBERT D CRAWFORD CIDRA CORP

Designated states: AE AG AL AM AT AU AZ BA BB BE BF BG BJ BR BW BY BZ CA CF CG CH CI CM CN CO CR CU CY CZ DE DK DM DZ EC EE EG ES FI FR GA GB GD GE GH GM GN GQ GR GW HR HU ID IE IL IN IS IT JP KE KG KP KR KZ LC LI LK LR LS LT LU LV MA MC MD MG MK ML MN MR MW MX MZ NA NE NI NL NO NZ OM PG PH PL PT RO RU SC SD SE SG SI SK SL SN SY SZ TD TG TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW

10) Family number: 28881797 (US2003154036 AA)

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Title: APPARATUS AND METHOD FOR MEASURING PARAMETERS OF A MIXTURE HAVING SOLID PARTICLES SUSPENDED IN A FLUID FLOWING IN A PIPE

Abstract: An apparatus 10,70 and method is provided that includes a spatial array of unsteady pressure sensors 15 - 18 placed at predetermined axial locations X 1 -X N disposed axially along a pipe 14. for measuring at least one parameter of a solid particle/fluid mixture 12 flowing in the pipe 14. The pressure sensors 15 - 18 provide acoustic pressure signals P 1 (t)-P N (t) to a signal processing unit 30 which determines the speed of sound a mix of the particle/fluid mixture 12 in the pipe 14 using acoustic spatial array signal processing techniques. The primary parameters to be measured include fluid/particle concentration, fluid/particle mixture volumetric flow, and particle size. Frequency based sound speed is determined utilizing a dispersion model to determine the parameters of interest.

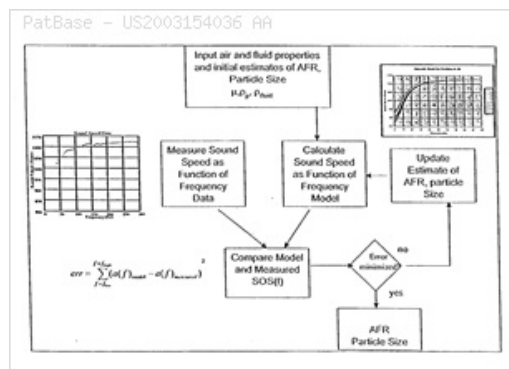
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International (IPC 1-7): G01F1/66 G01F1/708 G01F1/712 G01F1/74 G01F1/86 G01F25/00 G01H5/00 G01L13/02 G01N31/00 G06F19/00

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US: 702/25 702/25P 702/45 702/48 702/54 702/54P 73/1.16 73/1.160P 73/152.18 73/152.42 73/152.51 73/19.01 73/24.01 73/24.010P 73/597 73/61.41 73/61.43 73/61.44 73/61.47 73/61.49 73/61.79 73/617.9 73/643 73/736 73/736P 73/861.01 73/861.010P 73/861.49



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Probable Assignee: CIDRA CORP

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