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(71) Applicant (for all designated States except US): **JOHNSON MATTHEY PLC** [GB/GB]; 5th Floor, 25 Farringdon Street, London EC4A 4AB (GB).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **CUNNINGHAM, Colin** [GB/GB]; 51 Ruskin Avenue, Acklam, Middlesbrough, Cleveland TS5 8PG (GB). **GOLIGHTLY, Adam** [GB/GB]; 6 Beverley Crescent, Low Fell, Gateshead, Tyne & Wear NE9 5UP (GB). **GREEN, Darrell** [GB/GB]; 5 Hallmoor Close, Krklevington, Yarm, Cleveland TS15 9NN (GB).

(74) Agent: **GIBSON, Sara, Hillary, Margaret**; Johnson Matthey Catalysts, Intellectual Property Department, PO

Box 1, Belasis Avenue, Billingham, Cleveland TS23 1LB (GB).

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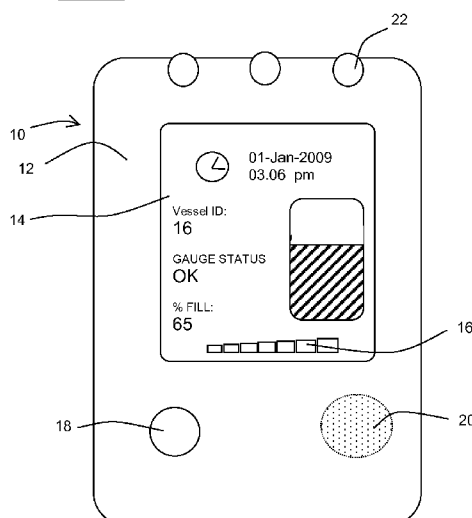
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(54) Title: INTRINSICALLY SAFE PORTABLE USER INTERFACE WITH ORGANIC LED DISPLAY

Figure 1



(57) Abstract: The invention comprises a portable user interface (10), capable of communicating with a measuring instrument, said user interface comprising a power source, a signal processor, communication means and a display, power source, signal processor, communication means and display being housed within a housing (12), wherein said display comprises a multicolour, pixel-addressable display (14).

INTRINSICALLY SAFE PORTABLE URES INTERFACE WITH PRGANIC LED DISPLAY

The present invention relates to instruments installed in potentially hazardous environments and in particular to a programmable interface for use with such instruments.

- 5 Instruments such as level gauges for example, may be installed on chemical plant, storage vessels and other process vessels which are used in potentially hazardous environments, especially where potentially explosive mixtures of gases may be present. In such environments, it is necessary to use intrinsically safe equipment in order to eliminate the risk of igniting combustible gases through sparking. When a measuring instrument is installed on
- 10 such plant the information collected is often sent to a control system for display at a remote location. The use of a portable interface which can communicate with such instruments may provide an alternative means of gaining access to the information read by the instrument and/or of sending instructions to the instrument. However, such a portable device must comply with the relevant standards for use within a potentially explosive environment.
- 15 According to the invention we provide a portable user interface, capable of communicating with a measuring instrument, said user interface comprising a power source, a signal processor, communication means and a display, power source, signal processor, communication means and display being housed within a housing, wherein said display comprises a multicolour, pixel-addressable display.
- 20 In a preferred embodiment, the housing comprises a sealed instrument housing formed from a material which is resistant to static discharge. It is further preferred that at least some of the electronic components of the portable user interface, including the display, are encapsulated in order to avoid contact of said electronic components with atmospheric gases. It is further preferred to limit possible ignition energies due to electrical faults to less than about 40 μ J.
- 25 The portable user interface is preferably suitable for use in hazardous areas, zones 0, 1 and 2. The portable user interface preferably incorporates intrinsically safe materials and design. The power, processor and display circuits are preferably not capable of igniting explosive atmospheres. The power supply is preferably potted. The housing is preferably sealed to prevent the ingress of liquid. The instrument is preferably resistant to normal impact shocks
- 30 such as may be experienced when the instrument is dropped so the housing is preferably rugged and formed from a tough, e.g. impact-modified plastics, material. Preferably the housing is formed completely or mostly from a non-metallic material which is resistant to static discharge or is coated with such a material. If metal parts are used they should be formed from a metal or alloy which is acceptable for use in hazardous zones.
- 35 The portable user interface according to the invention is preferably capable of meeting the relevant standards for electrical apparatus for use in explosive gas atmospheres, including

IEC 60079-0, IEC 60079-11, EN 60079-0, EN 50020: and EN 60079-26. Additionally the portable user interface must meet other relevant standards required for its sale and use in industrial installations, such as standards relating to radio-frequency emission and electromagnetic interference (e.g. EN6100). These features or a combination thereof may

5 enable the portable user interface to be certifiable for use in hazardous areas, for example zone 0, 1 or 2 hazardous areas, in accordance with national and international standards for intrinsically safe equipment for use in potentially explosive atmospheres, such as those described in the ATEX European Union Directives, as amended from time to time.

The housing is portable, in that it is of suitable size, weight and shape to be carried or worn by

10 the user. The housing preferably may comprise a clip, strap or other means of attachment to a user's clothing or PPE or a handle. Alternatively it may be provided with a case which includes such carrying or attachment means. It is preferred that any case, strap, clip etc is detachable from the instrument so that contamination hazards may be minimised. The housing may be brightly coloured to increase its visibility or to identify individual instruments

15 within a set of instruments.

The portable user interface may comprise means to determine its location. Suitable means include a GPS system or means to calculate location by reception of signals transmitted from locator beacons or transponder means.

The display is preferably a multicolour display. The display is an electronic display screen

20 suitable for use in small portable electronic devices. The display preferably utilises a matrix technology allowing addressing of individual pixels in the display in order to provide a more adaptable display of information from the instrument. This type of display allows more information to be presented to the user than many pre-existing displays used in personal dose meters. A preferred type of display comprises an organic LED which is preferably an active-

25 matrix organic LED (AMOLED). Alternatively, a passive-matrix OLED (PMOLED) may be used. A significant benefit of OLED displays over traditional liquid crystal displays (LCDs) is that OLEDs do not require a backlight to function. Thus they draw far less power and, when powered from a battery, can operate longer on the same charge. An OLED display can be made lighter and thinner than an LCD panel. Another benefit of an OLED display, particularly

30 an AMOLED display, is that the screen may be programmed to provide a wide variety of information. For example, the screen may provide a menu system, a means to select the operating mode or settings of the instrument and/or a page-based information function. These features of an OLED display enable the user to operate the instrument relatively easily.

The display is of a suitable size, for example being a rectangle having sides of approximately

35 30 – 50 mm. A suitable standard size which is available is a 47 mm display, i.e. a rectangle having a diagonal length of 47 mm. The display may be programmed according to the

particular instrument or set of instruments with which it is designed to communicate. The display may include alphanumeric indicators. It is preferred that the display can be programmed to show graphical information, for example to display a graphical indicator to show the level of fill within a vessel being monitored by a measuring instrument. Such

5 graphical indicators may be shown in addition to a numerical indication of the measured parameter. The display may also be programmed to show date, time, instrument identifiers etc. The display is also capable of showing the amount of power remaining in the power source. The display may be programmed to rotate the displayed information by a predetermined amount, preferably through 180 degrees, so that it may be viewed by the user

10 from above when required, for example when the instrument is attached to the user's clothing.

Two or more displays may be provided, each being positioned to be visible at a different face of the instrument housing. As a further alternative, a colour matrix display may be positioned at a first part of the housing and a second type of display may be positioned to be visible at a second part of the housing. The second type of display may take the form of one or more lights

15 (e.g. LEDs) or a conventional LCD type of display. Warning lights, alerting the user and other personnel to a particular occurrence are preferably visible from more than one surface of the housing. A display may be positioned to be visible at an upper surface of the housing, when the instrument is attached to apparel worn by a user.

The display is preferably protected by and visible through a transparent or translucent portion

20 of the instrument housing. The transparent / translucent material forming the housing is resistant to electrostatic discharge. The screen material may be coated with a static dissipative material and/or formed from a material which is inherently static dissipative.

The portable user interface may incorporate an audible signal to indicate various occurrences to the user. Such occurrences include the attainment of a pre-determined alarm situation

25 such as a maximum or minimum fill level. The audible signal may comprise a siren, alarm, and/or a recorded speech. For example the instrument may be programmed to give non-final warnings in speech mode whilst urgent warnings may be signalled by means of an alarm.

The instrument housing comprises a user interface enabling the user to switch the power on or off, and select the display mode, function, identity of the instrument to communicate with etc.

30 The interface preferably provides one or more pressure activated buttons or switches located on one or more interface panels, the switches preferably being sealed within the housing. When more than one calibration is available, the interface comprises means to select the desired calibration. It is preferred that the display functions are selected by the user from a programmed menu system displayed on the display. The interface may also provide means

35 for the user to operate an audible indication means and/or a light.

The power supply preferably comprises a battery, housed within a sealed compartment within the instrument housing. The battery is preferably a rechargeable battery. The portable user interface preferably includes means to signal when the battery power falls below a threshold in order to warn the user and may comprise means to indicate the estimated power remaining in the battery. The portable user interface is preferably provided with means to recharge a rechargeable battery. Connectors may be provided on the housing to engage with reciprocal connectors on a recharger. The connectors may be provided within an array of connectors so that a number of instruments may be recharged simultaneously.

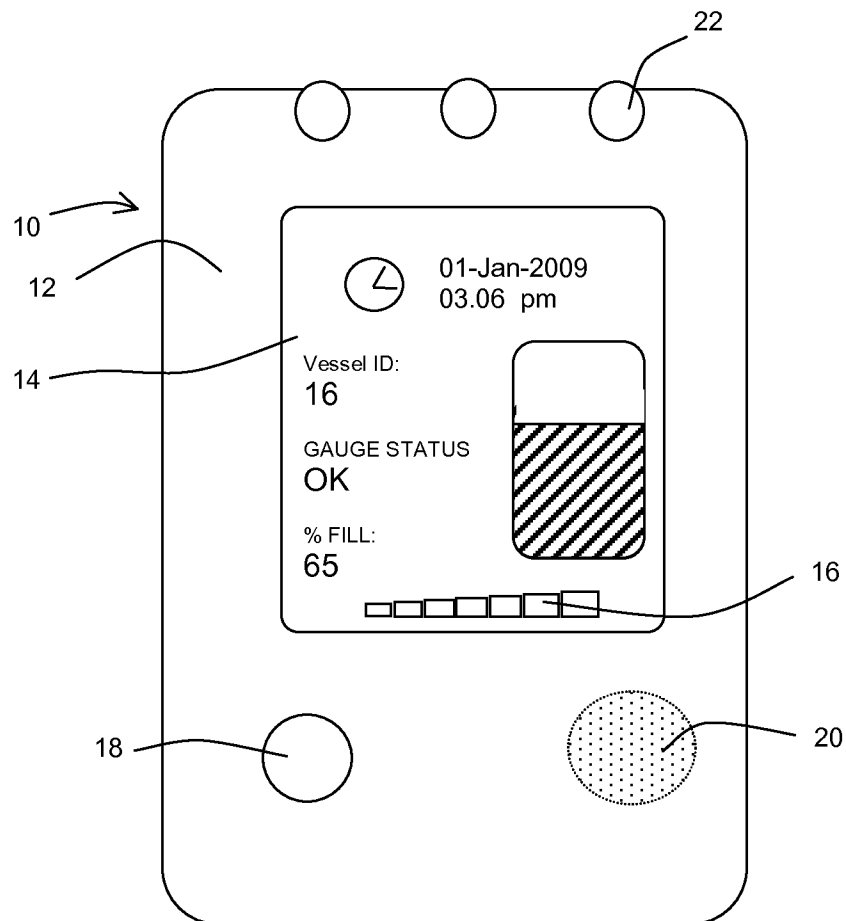
The portable user interface is provided with means to communicate with an instrument or with a data or control processor. The communication means preferably include wireless transmission means but may also include wired connection means. The communication means must, of course, be capable of communicating with communication means associated with the installed instrument(s) and therefore must be configured accordingly. In a particular embodiment, the instrument may be adapted to communicate using radio signals using a pre-existing radio transmitter-receiver communications system. Physical connection means may be provided in a power recharging module so that the instrument is in communication with a control system during recharging. The communication with an installed instrument is preferably two-way. In this way information concerning the measurable parameters, such as the level of material fill within a vessel measured by the instrument, its power status and/or location can be communicated to the portable user interface. Instructions such as operating parameters, calibration information etc may be sent by the portable user interface to the instrument. The portable user interface may be capable of intermittent or continuous communication with a control system during use. A back up alarm may be operable by the control system in the event it detects any predetermined alarm events.

Fig 1 is a schematic view from the front of a portable user interface according to the invention.

One embodiment of the interface according to the invention is described in the accompanying drawing, which is a schematic view from the front of a portable user interface 10. The interface comprises a moulded plastic housing having a carrying strap (not shown). An active matrix organic LED display 14 is mounted on the front face of the housing. The display shows information about the measuring instrument from which the interface is receiving information. The display also includes information 16 about the strength of the signal received. Operable button 18 is used to select the function and display operations of the instrument using a menu system displayed on the display. A speaker 20 is present to generate audible signals and alarms and LED lights 22, visible from several directions are also provided to signal warning states.

Claims

1. A portable user interface (10), capable of communicating with a measuring instrument, said user interface comprising a power source, a signal processor, communication means and a display, said power source, signal processor, communication means and display being housed within a housing (12), wherein said display comprises a pixel-addressable display (14).
2. A portable user interface according to claim 1, wherein said display comprises a multicolour display.
3. A portable user interface according to claim 1 or claim 2, wherein said display comprises an organic LED.
4. A portable user interface according to claim 3, wherein said display comprises an active-matrix organic LED (AMOLED).
5. A portable user interface according to claim 3, wherein said display comprises an active-matrix organic LED (PMOLED).
6. A portable user interface according to any one of the preceding claims comprising an audible indication means.
7. A portable user interface according to any one of the preceding claims wherein the power, processor and display circuits are not capable of igniting potentially explosive atmospheres, the power supply is potted and the housing is sealed to prevent the ingress of liquid.
8. A portable user interface according to any one of the preceding claims which is suitable for use in hazardous areas, zones 0, 1 and 2.
9. A portable user interface according to any one of the preceding claims, wherein said measuring instrument is a level gauge.

Figure 1

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2010/051474

A. CLASSIFICATION OF SUBJECT MATTER

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ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2004/230401 A1 (DUREN JOACHIM [DE] ET AL DUEREN JOACHIM [DE] ET AL) 18 November 2004 (2004-11-18) paragraph [0014] - paragraph [0051]; figures 1-6	1-9
X	Agilent Technologies: "Agilent U1253A True RMS OLED Multimeter Quick Start Guide", 1 October 2008 (2008-10-01), XP002609851, Retrieved from the Internet: URL: http://www.home.agilent.com/agilent/redirector.jsp?action=ref&cname=AGILENT_EDITORIAL&ckey=1414249&lc=eng&cc=US&nfr=-34618.803464 [retrieved on 2010-11-16] the whole document	1-9
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☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

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Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Barriuso Poy, Alex

INTERNATIONAL SEARCH REPORT

International application No

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Agilent Technologies: "Agilent Technologies Introduces World's First Handheld Digital Multimeter Equipped with OLED Display", 8 October 2008 (2008-10-08), XP002609852, Santa Clara, California Retrieved from the Internet: URL:http://www.agilent.com/about/newsroom/presrel/2008/08oct-em08149.html [retrieved on 2010-11-16] the whole document -----	1-9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/GB2010/051474

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2004230401 A1	18-11-2004	CN 1619442 A	25-05-2005
		EP 1515208 A2	16-03-2005
