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(54) **A PRESSURISED GAS CYLINDER**

(57) A pressurised gas cylinder comprising a cylinder body with a cylinder wall and a valve to control the flow of pressurised gas from the cylinder. A sensor module is located within the cylinder, the module arranged to sense a parameter within the cylinder. The module is brought into contact with an internal wall of the cylinder, or is just lying in the cylinder on the bottom. An acoustic transmitter transmits a signal including information from the sensor via the cylinder wall. An acoustic receiver on an external portion of the cylinder body then receives the acoustic signal from the wall.

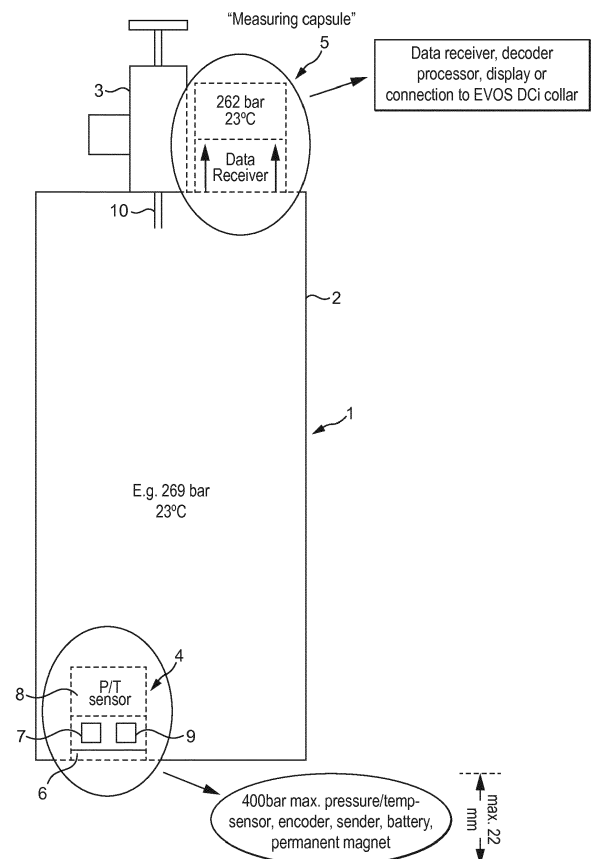


FIG. 1

Description

[0001] The present invention relates to a pressurised gas cylinder.

[0002] Such cylinders are known for a wide range of applications where a piped gas supply is not available.

[0003] In order to measure information on the content of the cylinder, for example, pressure, impurities, polymerisation, composition, temperature etc., this has to be done via sensors which are provided in a port through the cylinder wall or via the housing of the valve assembly which is present on the top of the cylinder. This means that dedicated hardware either in the form of a modified valve or a modified cylinder is needed. It is not therefore possible to monitor pressure of a gas cylinder which is already in service without changing the cylinder or the valve.

[0004] According to the present invention there is provided a pressurised gas cylinder according to claim 1.

[0005] The acoustic transmitter from the module which is in contact with an internal wall of the cylinder provides a way of getting information out of the cylinder without requiring a physical port. Further, the use of an acoustic signal to achieve this is a solution which will work with metal cylinders where it is not possible to use an electromagnetic system due to the shielding properties of the metal.

[0006] The sensor may include a pressure sensor and/or a temperature sensor. It may include additional sensors such as accelerometers, moisture-, CO₂-, or O₂-sensors.

[0007] The module may be formed integrally with the cylinder body or may be inserted through some other opening in the cylinder body. However, preferably, the cylinder has a neck with an opening to receive the valve and the module is small enough to be insertable through this opening. This provides a simple way of applying the module to existing cylinders without the need to change the cylinder or the existing valve assembly.

[0008] The module may simply be dropped into the cylinder so that it is in contact with the bottom wall. However, preferably the module further comprises an attachment means to attach the module to the internal wall of the cylinder. The attachment means may be a mechanical mounting or a tacky surface to adhere to the cylinder wall. However, preferably, the module is provided with a permanent magnet by which it attaches to the internal cylinder wall.

[0009] The second transmitter may have a display to display the sensed data. However, it preferably additionally or alternatively has a second transmitter in order to transmit the information received from the acoustic transmitter to a remote location.

[0010] An example of a cylinder in accordance with the present invention will now be described with reference to the accompanying drawing which is a schematic cross-section of the cylinder.

[0011] The cylinder 1 is a standalone gas cylinder typ-

ically used in various fields including medical and industrial fields to supply bottled gas to a user when a piped gas supply is not available. The cylinder will typically have a maximum pressure of up to 400 bar. The cylinder comprises a cylinder body 2 and a valve assembly 3 both of which are conventional. The improvement provided by the present invention is the addition of a sensor module 4 and its associated receiver 5. The sensor module comprises a magnet 6 which will adhere to the bottom wall of the cylinder body 2 provided that this is a ferrous material. The sensor also comprises a battery 7, pressure and temperature sensors 8 and a transmitter 9. The module 4 preferably has the ability to fit through a circular opening with a diameter of 20mm and more preferably has the ability to fit through a circular gap with a diameter of 12mm. The sensor module can therefore be dropped in through the neck 10 of the cylinder body 2 before the valve assembly 3 is screwed into place in the neck 10.

[0012] More specifically, the sensor module 4 includes a sound encoder and transmitter to send an acoustic signal via the wall of the cylinder body 2. The information is modulated on a carrier signal using, for example, AM, FM, QAM or other technologies. The receiver 5 then extracts the information from a carrier signal using a decoder and converter.

[0013] The transmitter 9 of the module 4 transmits data concerning the pressure and temperature to the receiver 5. This is provided with a decoder, processor, display and/or second transmitter to transmit information to a remote location (e.g. via Bluetooth, NFC or GMS).

Claims

1. A pressurised gas cylinder comprising a cylinder body with a cylinder wall and a valve to selectively control the flow of pressurised gas from the cylinder; a sensor module within the cylinder, the module comprising a sensor to sense a parameter within the cylinder; means to bring the module into contact with an internal wall of the cylinder or is just lying in the cylinder on the bottom ; and an acoustic transmitter to transmit an acoustic signal including information from the sensor via the cylinder wall; and an acoustic receiver on an external portion of the cylinder body to receive the acoustic signal from the wall.
2. A cylinder according to claim 1, wherein the sensor includes a pressure sensor.
3. A cylinder according to claim 1 or claim 2, wherein the sensor includes a temperature sensor.
4. A cylinder according to any preceding claim, wherein the module includes additional sensors such as accelerometers, moisture-, CO₂-, or O₂-sensors.
5. A cylinder according to any one of the preceding

claims, wherein the cylinder body comprises a neck with an opening to receive the valve and wherein the sensor module is small enough to be insertable through the opening in the neck of the cylinder.

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6. A cylinder according to any one of the preceding claims, further comprising an attachment means to attach the module to the internal wall of the cylinder,

7. A cylinder according to claim 6, wherein the module is provided with a permanent magnet by which is attaches to an internal surface of the cylinder wall.

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8. A cylinder according to any one of the preceding claims, further comprising a second transmitter on an external portion of the cylinder in order to transmit the information received from the acoustic transmitter to a remote location.

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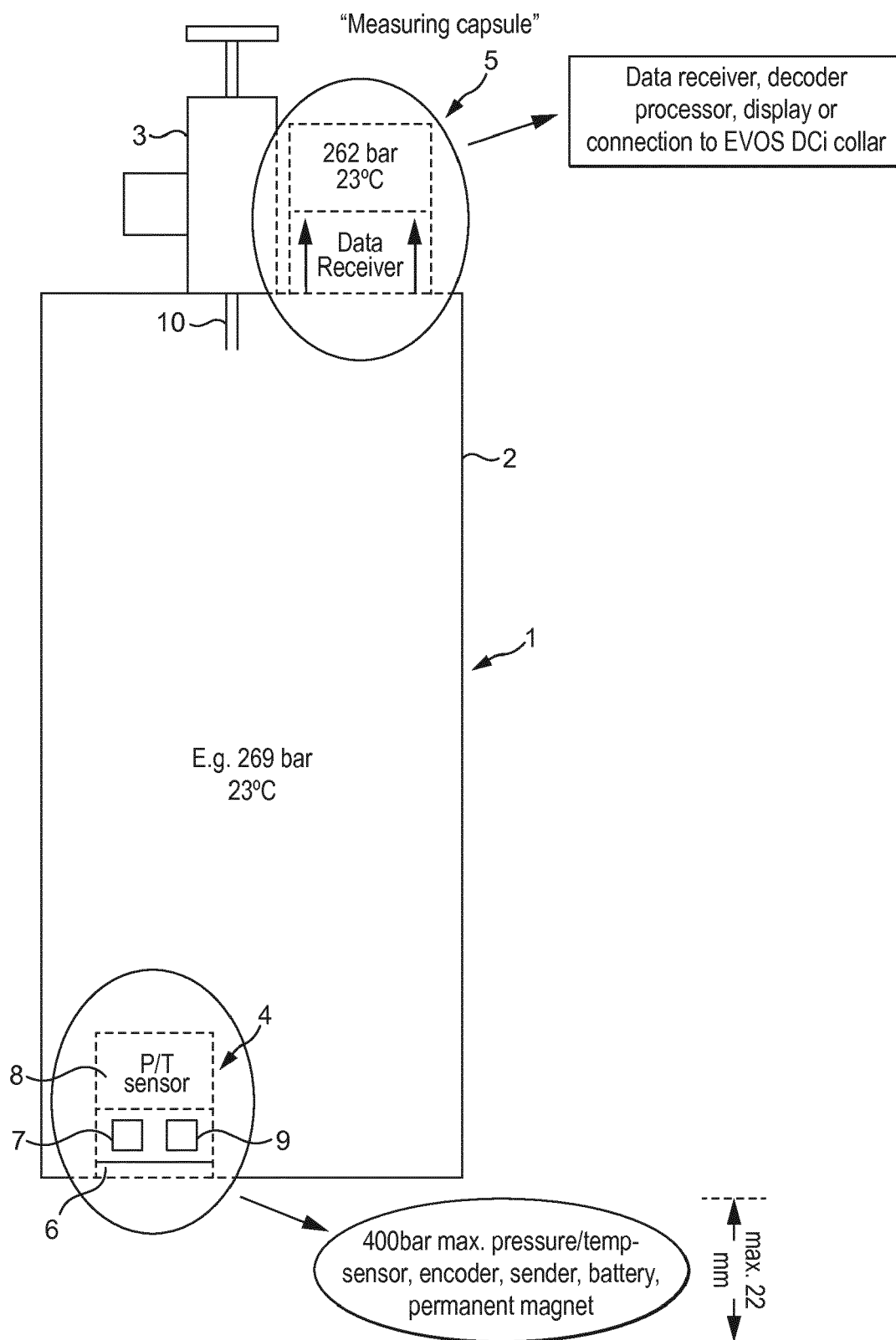


FIG. 1



EUROPEAN SEARCH REPORT

Application Number
EP 17 18 4367

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Y	* figures 1,7,8,9 * * paragraphs [0001] - [0007], [0046], [0139] - [0141], [0144], [0149] - [0151], [0156], [0163] - [0166] *	6,7	
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			TECHNICAL FIELDS SEARCHED (IPC)
			F17C B06B
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 18 September 2017	Examiner Sisinni, Giovanni
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.02 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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