



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
07.02.2018 Bulletin 2018/06

(51) Int Cl.:
F17C 13/02 (2006.01)

(21) Application number: **17184464.0**

(22) Date of filing: **02.08.2017**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

(72) Inventors:
• **BAYERL, Wilhelm**
82054 Sauerlach (DE)
• **KANDZIORA, Christine**
82056 Baierbrunn (DE)
• **KARMIRES, Philipp**
81377 München (DE)

(74) Representative: **Christie, Gemma Louise**
The Linde Group
Intellectual Property
10 Priestley Road The Surrey Research Park
Guildford, Surrey GU2 7XY (GB)

(30) Priority: **03.08.2016 GB 201613402**

(71) Applicant: **Linde Aktiengesellschaft**
80331 München (DE)

(54) **A PRESSURISED GAS CYLINDER**

(57) A pressurised gas cylinder having a valve to control the flow of pressurised gas from the cylinder. A sensor module is located within the cylinder comprising a pressure sensor and a transmitter for transmitting a signal, including pressure information, out of the cylinder. The sensor module is small enough to be inserted through the opening in the neck of the cylinder.

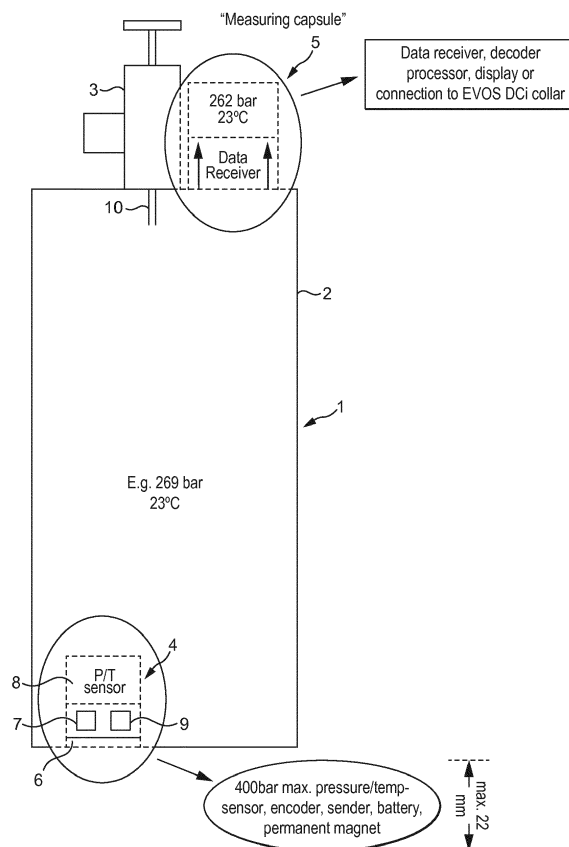


FIG. 1

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 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] This allows a pressure sensor to be employed in an existing cylinder without the need to change the cylinder or the existing valve assembly. It also provides a low cost solution to measuring internal cylinder parameters in new cylinders.

[0006] The module may be provided with a temperature sensor. It may also be provided with additional sensors such as moisture sensors, Oxygen impurity sensors, CO₂ sensors, acceleration sensors.

[0007] The module could be inductively charged from outside the cylinder in the case of a non-metallic cylinder. However, the module preferably includes a battery.

[0008] The module can be allowed to be loose within the cylinder or may be provided with a tacky surface to adhere to the wall. However, preferably the module is provided with a permanent magnet by which it attaches to the internal cylinder wall of iron cylinders.

[0009] If the cylinders are to be used in a well-defined location, such as part of a bundle, the receiver which communicates with the transmitter may be separate from the cylinder. However, preferably, a receiver is provided by an external portion of the cylinder.

[0010] There is preferably also a second transmitter on an external portion of the cylinder in order to transmit the information received from the transmitter within the cylinder to a remote location. This second transmitter can be combined with the receiver in one unit.

[0011] 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.

[0012] The cylinder 1 is a standalone gas cylinder typically 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.

[0013] The signal transmission from the sensor module 4 to the receiver 5 can be done using an electromagnetic transmission means if the cylinder is made of a non-metallic material such as a composite.

[0014] If the cylinder is metallic, an acoustic transmission is used. In this case, 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.

[0015] 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 neck with an opening to receive a valve to selectively control the flow of pressurised gas from the cylinder; and a sensor module within the cylinder, the module comprising a pressure sensor and a transmitter to transmit a signal including pressure information out of the cylinder; wherein the sensor module is small enough to be insertable through the opening in a neck of the cylinder.
2. A cylinder according to claim 1, wherein the module is also provided with a temperature sensor.
3. A cylinder according to claim 1 and claim 2, wherein the module is provided with additional sensors for detecting moisture, Oxygen, CO₂, acceleration.
4. A cylinder according to any one of the preceding claims, wherein the module comprises a battery.
5. A cylinder according to any one of the preceding claims, wherein the module is provided with a permanent magnet by which it attaches to the internal cylinder wall.
6. A cylinder according to any one of the preceding

claims, wherein a receiver is provided by an external portion of the cylinder.

7. 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 transmitter within the cylinder to a remote location.

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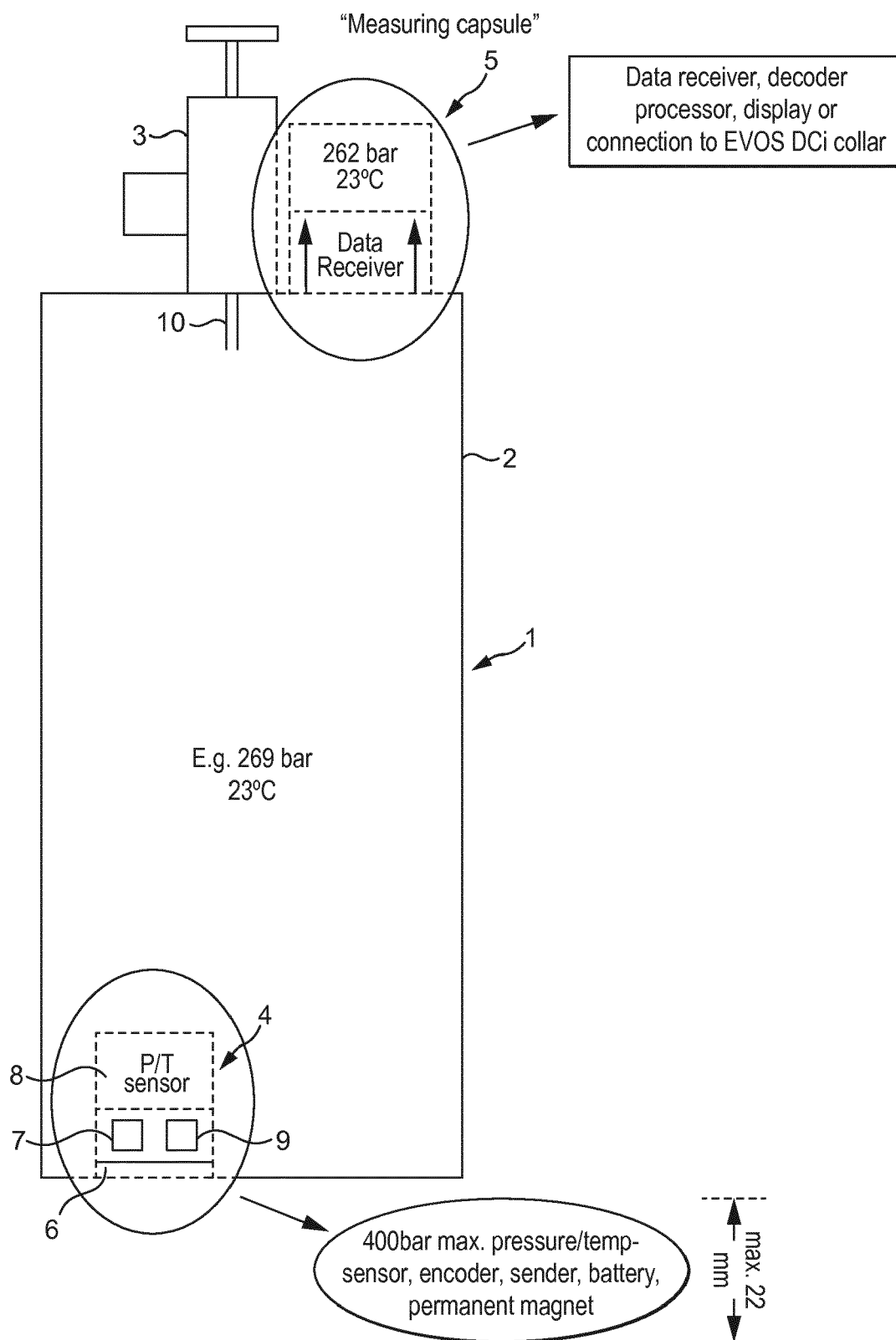


FIG. 1



EUROPEAN SEARCH REPORT

Application Number
EP 17 18 4464

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 10 2014 003342 A1 (ASTRIUM GMBH [DE]) 10 September 2015 (2015-09-10)	1-3,5-7	INV. F17C13/02
Y	* paragraphs [0001], [0002], [0006], [0007], [0011] - [0013] *	4	
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A	* paragraphs [0003], [0019] - [0032], [0078]; figure 2 *	1-3,5-7	
			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.**

EP 17 18 4464

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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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18-09-2017

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82