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(54) **GAS CONTENT STATUS INDICATING DEVICE AND A SYSTEM FOR PROVIDING GAS FROM A GAS CONTAINER**

(57) The present invention relates to a gas content status indicating device (1, 2) for indicating the gas content status of a gas container, said gas content status indicating device (1, 2) comprising a light source (200)

which is operable in dependence on the gas content status, and a system (1000) for providing gas from a gas container, comprising a gas container and the gas content status indicating device (1, 2).

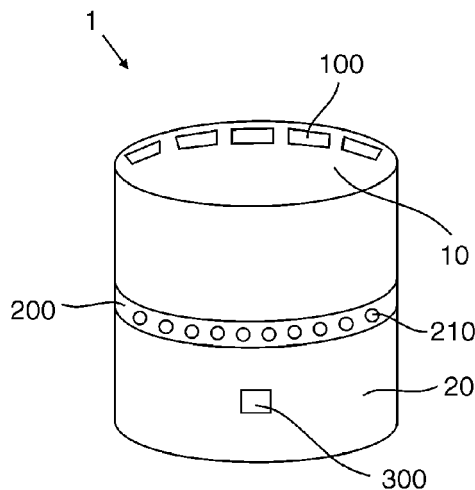


FIG. 1

Description

[0001] The present invention relates to a gas content status indicating device for indicating the gas content status of a gas container, and a system for providing gas from a gas container.

Prior Art

[0002] Advances in therapeutic uses of oxygen have resulted in its increased application for a number of clinical conditions, e.g. hypoxia and hypoxemia, respiratory depression, chronic obstructive pulmonary disease, pneumoconiosis, pneumonia, heart attack and pulmonary embolism, respiratory distress syndrome in newborns, cluster headaches, respiratory burns and carbon monoxide poisoning.

[0003] While oxygen for use in hospitals is often delivered in large quantities in liquid state by tank trucks and distributed to the points of use, e.g. wards or operation theatres, from a central distribution point via pipe systems and wall outlets, gas cylinders are used if smaller quantities are required, e.g. in hospital transport, for example, when an oxygen-dependent patient is driven to an examination such as X-ray or ultrasound.

[0004] Gas cylinders are equipped with analogue or digital integrated valves, which enable hospital staff, for example, to determine the gas content. However, the hospital staff needs a clear view of the pressure gauge or digital display. Since gas cylinders are usually stored in large numbers, for example in racks, a clear view of the pressure gauge or digital display of each individual gas cylinder is not possible. Thus the hospital staff is not able to see at a glance how much gas is left in a gas cylinder.

[0005] There is a need for an indication which allows a quick and clear statement about the gas content status of each individual gas cylinder.

Disclosure of the invention

[0006] This object is solved by a gas content status indicating device for indicating the gas content status of a gas container and a system for providing gas from a gas container according to the independent claims. Preferred embodiments of the invention and further features are subject of the following description.

[0007] According to the present invention, a gas content status indicating device is provided, said gas content status indicating device comprises a light source which is operable in dependence on the gas content status. Gas content status refers, for example, to a status of the gas content, a status of the gas filling or a status of the filling quantity which is determined, for example by the gas pressure inside the gas container. Although reference is primarily made to oxygen, a gas in the gas container may be any other gas, like nitrogen, helium or the like and mixtures thereof.

[0008] Preferably the light source of the gas content status indicating device comprises one or more LEDs. It is noted that another type of light source may be used, such as a light bulb, and the present invention is not limited to LEDs. LEDs are preferred because they consume less energy and are durable.

[0009] Preferably a colour of the light source is changed and/or a flashing of the light source is activated, each colour and/or flashing corresponds to a predetermined gas content status or gas content status range. For example, a blue colour and/or a flashing with a first time interval between two flashes of the light source indicates that the gas container has been filled. A green colour and/or a flashing with a second time interval between two flashes of the light source indicates, for example, that the gas container has been used. A red colour and/or a flashing with a third time interval between two flashes of the light source indicates for example, that the gas container is empty soon. The first, second and third time interval may have the same length or a different length. Flashing is performed in one colour or in different colours, such as blue, green and red. It is understood that the colours and time intervals described herein are examples only and other colours or time intervals may be used instead to indicate the gas content status. It is noted that the LEDs must be able to indicate the desired colour and/or flashing of the light source.

[0010] Preferably the gas content status indicating device is in an annular form comprising an outer side and an inner side. Preferably the light source is disposed on the outer side of the gas content status indicating device. This means that the light source can be seen in a case where the gas content status indicating device is viewed from a side and/or from above.

[0011] Preferably the gas content status indicating device is in the form of an annular sleeve. Thus, the gas content status indicating device is configured to fit around a part, e.g. the neck or shoulder, of a gas container, for example, a gas cylinder or the like. The light source may extend annularly around the entire gas content status indicating device forming an entire ring around the gas content status indicating device or is disposed in light source sections on a circumference of a circular segment of the annular sleeve forming an interrupted ring. A light source section comprises at least one LED and is spaced from an adjacent light source section. It is noted that one or more light sources, each forming an interrupted or entire ring, may be disposed on the gas content status indicating device. If light source sections are used, either each single section or a combination of several adjacent sections is/are configured to indicate the desired colour and/or flashing of the light source.

[0012] When the gas content status indicating device which is in the form of an annular sleeve is mounted around the neck or shoulder of a gas container, the light source which is disposed on the outer side of the gas content status indicating device can be seen in a case in which the gas container stands upright and in a case in

which the gas container is stored horizontal, for example, in a rack.

[0013] Preferably a button switch is disposed on the outer side of the gas content status indicating device. The button switch may be located between, above or below the light source or the light source sections.

[0014] Preferably the button switch is configured to be operated manually. Thus, for example, after the gas container has been filled, the light source of the gas content status indicating device is configured to be adjusted by pressing the button switch in such a way that the light source indicates that the gas container has been filled. If the gas container has been used, for example, for the first time, the light source of the gas content status indicating device is configured to be adjusted by pressing the button switch in such that the light source indicates that the gas container has already been used.

[0015] Preferably a replaceable and/or rechargeable power source and electronics configured to operate the light source are provided within the gas content status indicating device. The power source provides the light source with power. The power source may be, for example, at least one battery or rechargeable battery. The electronics are connected to the power source, the light source and the button switch in such that the button switch is used to control the colour and/or the flashing of the light source.

[0016] Preferably the power source and electronics are disposed on the inner side of the gas content status indicating device. On the one hand, the power source and electronics are protected from external influences by the gas content status indicating device. On the other hand, disposing the power source and electronics on the outer side of the gas content status indicating device would reduce the space available for the light source, thereby reducing the visibility of the light source.

[0017] Preferably the electronics are configured to generate a first signal indicating the gas content status and/or the location of the gas content status indicating device. The first signal preferably is a wireless signal such as WiFi or Bluetooth or the like.

[0018] Preferably the electronics are configured to send the first signal wirelessly to an associated management system. The associated management system allows the gas content status of each individual gas container to be recorded. This allows to determine which gas container needs to be refilled or needs to be replaced with a filled gas container. In addition, by transmitting the location of the gas container to the associated management system, the gas container can be easily found.

[0019] According to the present invention a system for providing gas from a gas container is provided, said system comprising a gas container and the gas content status indicating device as described above.

[0020] Preferably the system comprises a gas container in the form of a gas cylinder and a gas content status indicating device in the form of an annular sleeve, wherein the annular sleeve is configured to fit around a part of

the gas container. This part is, for example, the neck and/or shoulder of the gas container.

[0021] Preferably the gas container is provided with an integrated valve device which is configured to generate a second signal indicating the gas content of the gas container, and wherein the gas content status indicating device and the integrated valve device are connected such that the second signal is received by the gas content status indicating device which - depending on the second signal - indicates the gas content status. The integrated valve device is, for example, a LIV IQ device sold by the applicant which is an integrated complete system comprising a gas cylinder, pressure reducer and digital display. The integrated valve device shows at a glance all relevant parameters such as remaining gas pressure. However, the digital display is only visible up to a distance of five meters. Since gas cylinders are usually stored in large numbers, for example in racks, a clear view of the digital display of each individual gas cylinder is not possible. By coupling the gas content status indicating device with the integrated valve device, this disadvantage can be eliminated, since the gas content status indicating device indicates the gas content status depending on the second signal. Due to the shape of the annular sleeve, the visibility of the light source of the gas content status indicating device is greater than the visibility of the digital display of the integrated valve device.

[0022] Preferably the colour and/or the flashing of the light source of the gas content status indicating device changes automatically in response to the second signal. Thus, the colour and/or the flashing of the light source no longer has/have to be switched manually by pressing the button switch. If an indication of the gas content status is changed automatically depending on the second signal, it is preferred that the function of the button switch is deactivated or that the button switch is omitted. In addition, the indication of the gas content status is performed more precisely and can be divided into smaller ranges, each range corresponds to a predetermined gas content status, more accurately. Additional characteristic colours and/or flashings of the light source may also be used for additional ranges of predetermined gas content statuses, for example yellow.

[0023] Preferably the integrated valve device has its own power source. The power source of the integrated valve device can be supplied with power from the power source of the gas content status indicating device. This is advantageous because the power source of the integrated valve device, which is installed within the integrated valve device, is usually smaller than the power source of the gas content status indicating device. Rechargeable batteries of the gas content status indicating device are, for example, easier to replace than those of the integrated valve device because they can be disposed on the inner side of the annular sleeve forming the gas content status indicating device and are therefore easier to access.

[0024] Preferably the communication between the integrated valve device and the associated management

system is performed via the gas content status indicating device. For this purpose, the gas content status indicating device receives the second signal emitted by the integrated valve device, the second signal indicating how much gas is present in the gas container. Then the colour and/or the flashing of the light source is changed according to the gas content and the first signal indicating the gas content status and/or the location is sent to the associated management system.

[0025] The invention is further explained with reference to the appended drawings which show preferred embodiments of the invention.

Short description of the figures

[0026]

Figure 1 schematically illustrates a gas content status indicating device according to a first preferred embodiment of the invention.

Figure 2 schematically illustrates a gas content status indicating device according to a second preferred embodiment of the invention.

Figure 3 schematically illustrates a system for providing gas from a gas container according to a preferred embodiment of the invention.

[0027] In the figures, like elements are indicated with identical reference numerals. A repeated explanation is omitted for reasons of conciseness.

Embodiments of the invention

[0028] Figure 1 schematically illustrates a gas content status indicating device 1 according to a first preferred embodiment of the invention. The gas content status indicating device 1 is in a form of an annular sleeve comprising an outer side 20 and an inner side 10 configured to fit around a part of a gas container. This part may be a neck and/or a shoulder of the gas container. It is noted, that the position of the gas content status indicating device is not limited to the position around the neck or shoulder of the gas container. A light source 200 is disposed on the outer side 20 of the gas content status indicating device 1. The light source 200 extends annularly around the entire gas content status indicating device 1 forming an entire ring around the gas content status indicating device 1. It is noted that one or more light sources 200, each forming an entire ring, may be disposed on the gas content status indicating device 1. The light source 200 comprises a plurality of LEDs 210. The LEDs 210 are extending annularly around the entire gas content status indicating device 1 in a row. It is noted that the light source 200 may also consist of several rows of LEDs 210.

[0029] Each LED 210 emits a characteristic colour. A colour of the light source 200 is composed of the sum of

the individual colours of the LEDs 210. This colour may be a colour that is a characteristic colour of a LED type (e.g. blue, green, red), or a mixture of several characteristic colours of a plurality of LEDs. Each colour of the light source 200 corresponds to a predetermined gas content status. In this embodiment, a blue colour of the light source 200 indicates that the gas container has been freshly filled. A green colour of the light source 200 indicates that the gas container has already been used, for example, for the first time. A red colour of the light source indicates that the gas container is empty soon. The LEDs 210 may be disposed alternately in the order blue, green and red. It is noted that this order may be changed as desired by a person skilled in the art.

[0030] Also a flashing of the light source 200 can be used as described above to indicate the gas content status. For example, a flashing with a first time interval, a second time interval, and a third time interval between two flashes may be used for the different gas content statuses. The first, second and third time interval may have the same length or a different length. Flashing may be performed in one colour or in different colours, such as blue, green and red.

[0031] A button switch 300 is disposed on the outer side 20 of the gas content status indicating device 1. The button switch 300 is located below the light source 200. The button switch 300 is configured to be operated manually. By pressing the button switch 300, the colour of the light source 200 is changed to indicate a specific gas content status.

[0032] A power source 100 and electronics (not shown) are disposed on the inner side 10 of the gas content status indicating device 1. On the one hand, the power source 100 and electronics are protected from external influences by the gas content status indicating device 1. On the other hand, disposing the power source 100 and electronics on the outer side of the gas content status indicating device 1 would reduce the space available for the light source 200, thereby reducing the visibility of the light source 200. The power source 100 provides the light source 200 with power. The power source 100 may be, for example, at least one battery or rechargeable battery. The electronics are connected to the power source 100, the light source 200 and the button switch 300 such that the button switch 300 is used to control the colour of the light source.

[0033] The electronics are configured to generate a first signal indicating the gas content status and/or the location of the gas content status indicating device. The first signal is a wireless signal such as WiFi or Bluetooth or the like.

[0034] Figure 2 schematically illustrates a gas content status indicating device 2 according to a second preferred embodiment of the invention. The light source 400 of the gas content status indicating device 2 is disposed in light source sections 410 on a circumference of at least a circular segment of the annular sleeve forming an interrupted ring. A light source section 410 comprises at

least one LED 210 and is spaced from an adjacent light source section 410. It is noted, that several interrupted rings may extend annularly around the gas content status indicating device 2. In this embodiment, each light source section 410 comprises three LEDs 210 which are arranged in a row. The LEDs 210 are arranged circumferentially in a row, but may also be arranged one above another. In addition, a light source section 410 may comprise more than one row of LEDs 210. The LEDs 210 are configured to indicate the colour (e.g. blue, green, red) of the light source 400 corresponding to a predetermined gas content status. It is noted, that each light source section 410 may comprise more or fewer LEDs 210. It is also noted, that either each single light source section 410 or a combination of several adjacent light source sections 410 is/are configured to indicate the colour of the light source 400.

[0035] The button switch 300 is located below the light source sections 410. It is noted, that the button switch 300 may also be located above or between the light source sections 410.

[0036] Figure 3 schematically illustrates a system 1000 for providing gas from a gas container according to a preferred embodiment of the invention. The system 1000 comprises a gas container in the form of a gas cylinder 3 and the gas content status indicating device 1. Although Figure 3 only illustrates the gas content status indicating device 1 of Figure 1 mounted on the gas cylinder 3, the gas content status indicating device 2 of Figure 2 or according to another embodiment may alternatively be mounted on the gas cylinder 3. The gas content status indicating device 1 is in the form of an annular sleeve configured to fit around a part of the gas cylinder 3. In this embodiment, the gas content status indicating device 1 is mounted around the shoulder or neck of the gas cylinder 3. Additionally, an integrated valve device 4 is mounted on a valve system of the gas cylinder 3. The integrated valve device 4 comprises a digital display 500, showing relevant parameters such as remaining gas pressure.

[0037] The integrated valve device 4 further comprises an own power source (not shown). The power source of the integrated valve device 4 can be supplied with power from the power source 100 of the gas content status indicating device 1. This is advantageous because the power source of the integrated valve device usually is smaller than the power source 100 of the gas content status indicating device 1. The power source 100 of the gas content status indicating device 1 is also easier to be replaced than the power source of the integrated valve device 4 because it is disposed on the inner side of the gas content status indicating device 1 and is therefore easier to access by lifting or removing the gas content status indicating device 1.

[0038] The integrated valve device 4 is configured to generate a second signal indicating the gas content of the gas cylinder 3. The gas content status indicating device 1 and the integrated valve device 4 are connected

such that the second signal is received by the gas content status indicating device 1 which - depending on the second signal - indicates the gas content status. For this purpose, the gas content status indicating device 1 receives the second signal emitted by the integrated valve device 4, the second signal indicating how much gas is present in the gas cylinder, e.g. by transmitting a gas pressure value. Then the colour of the light source 200 is changed according to the gas content status. By coupling the gas content status indicating device 1 with the integrated valve device 4 the indication of the gas content status is changed automatically. In this case it is preferred that the function of the button switch 300 is deactivated or the button switch 300 is completely omitted.

[0039] The digital display 500 of the integrated valve device 4 is usually only visible up to a maximum distance of five meters. Since gas cylinders 3 are usually stored in large numbers, for example in racks, a clear view of the digital display 500 of each integrated valve device 4 mounted on each gas cylinder 3 is not possible. By coupling the gas content status indicating device 1 with the integrated valve device 4, this disadvantage can be eliminated, since the gas content status indicating device 1 indicates the gas content status depending on the second signal. Due to the shape of the annular sleeve, the visibility of the light source 200 of the gas content status indicating device 1 is far greater than the visibility of the digital display 500 of the integrated valve device 4.

[0040] Further, the communication between the integrated valve device 4 and an associated management system 5 is performed via the gas content status indicating device 1. The gas content status indicating device 1 receives the second signal indicating the gas content of the gas cylinder 3 emitted by the integrated valve device 4 and sends a first signal indicating the gas content status and/or a location of the gas content status indicating device 1 which corresponds to the status and/or the location of the gas cylinder 3 to the associated management system 5. This allows to determine which gas cylinder 3 needs to be refilled or needs to be replaced with a filled gas cylinder. In addition, by transmitting the location of the gas cylinder 3 to the associated management system 5, the gas cylinder 3 can be easily found. Preferably the first and the second signals are wireless signals such as WiFi or Bluetooth or the like.

Claims

1. Gas content status indicating device (1, 2) for indicating the gas content status of a gas container, said gas content status indicating device (1, 2) comprising a light source (200) which is operable in dependence on the gas content status.
2. Gas content status indicating device (1, 2) according to claim 1, wherein the light source (200) comprises one or more LEDs (210).

3. Gas content status indicating device (1, 2) according to claim 1 or 2, wherein a colour of the light source (200) is changed and/or a flashing of the light source (200) is activated, each colour and/or flashing corresponding to a predetermined gas content status or gas content status range. 5
4. Gas content status indicating device (1, 2) according to one of the preceding claims, wherein the gas content status indicating device (1, 2) is in an annular form comprising an outer side (20) and an inner side (10). 10
5. Gas content status indicating device (1, 2) according to claim 4, wherein the light source (200) is disposed on the outer side (20) of the gas content status indicating device (1, 2). 15
6. Gas content status indicating device (1, 2) according to claim 4 or 5, wherein the gas content status indicating device (1, 2) is in the form of an annular sleeve. 20
7. Gas content status indicating device (1, 2) according to any one of claims 4 to 6, wherein a button switch (300) is disposed on the outer side (20) of the gas content status indicating device (1, 2). 25
8. Gas content status indicating device (1, 2) according to claim 7, wherein the button switch (300) is configured to be operated manually. 30
9. Gas content status indicating device (1, 2) according to any one of the preceding claims, wherein a replaceable and/or rechargeable power source (100) and electronics configured to operate the light source (200) are provided within the gas content status indicating device (1, 2). 35
10. Gas content status indicating device (1, 2) according to claim 9 as far as referring back to claim 4, wherein the power source (100) and electronics are disposed on the inner side (10) of the gas content status indicating device (1, 2). 40
11. Gas content status indicating device (1, 2) according to claim 9 or 10, wherein the electronics are configured to generate a first signal indicating the gas content status and/or the location of the gas content status indicating device (1, 2). 45
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12. Gas content status indicating device (1, 2) according to claim 11, wherein the electronics are configured to send the first signal wirelessly to an associated management system (5). 55
13. System (1000) for providing gas from a gas container, said system (1000) comprising the gas container and the gas content status indicating device (1, 2) of any one of the preceding claims.
14. System (1000) according to claim 13, comprising a gas container in the form of a gas cylinder (3) and a gas content status indicating device (1, 2) of claim 6, wherein the annular sleeve is configured to fit around a part of the gas container.
15. System (1000) according to claim 13 or 14, wherein the gas container is provided with an integrated valve device (4) which is configured to generate a second signal indicating the gas content of the gas container, and wherein the gas content status indicating device (1, 2) of any one of claims 1 to 12 and the integrated valve device (4) are connected such that the second signal is received by the gas content status indicating device (1, 2) which - depending on the second signal - indicates the gas content status.
16. System (1000) according to claim 15 employing a gas content status indicating device (1, 2) of claim 3, wherein the colour and/or the flashing of the light source (200) of the gas content status indicating device (1, 2) changes automatically in response to the second signal.
17. System (1000) according to claim 15 or 16, wherein the integrated valve device (4) has its own power source, and wherein the power source of the integrated valve device can be supplied with power from the power source (100) of the gas content status indicating device (1, 2) of claim 9.
18. System (1000) according to claim 15 to 17 employing a gas content status indicating device (1, 2) of claim 12, wherein the communication between the integrated valve device (4) and the associated management system (5) is performed via the gas content status indicating device (1, 2).

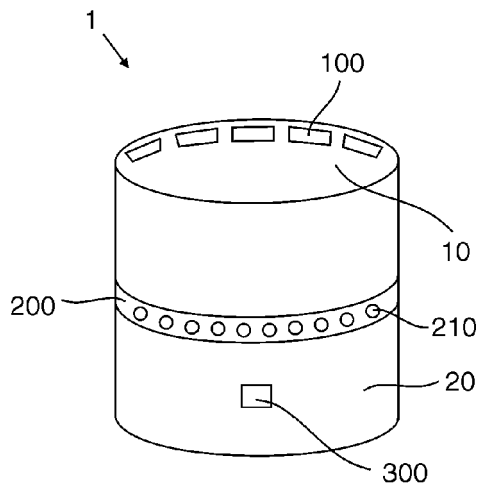


FIG. 1

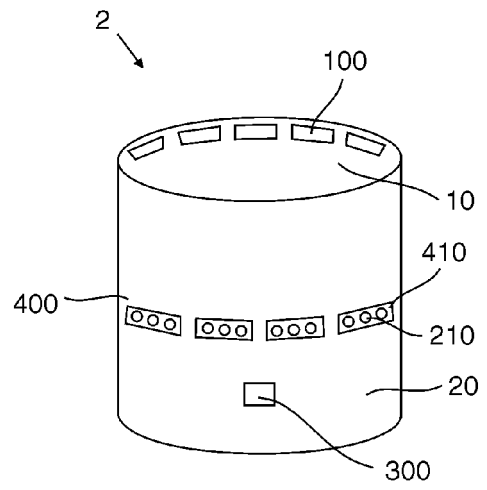


FIG. 2

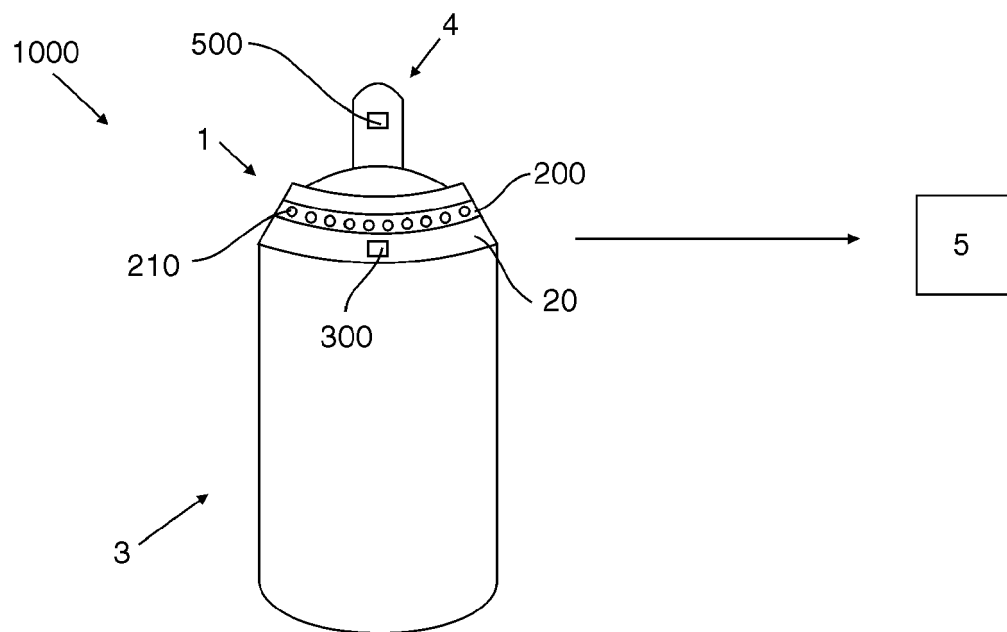


FIG. 3



EUROPEAN SEARCH REPORT

Application Number
EP 18 21 3631

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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	US 2013/334236 A1 (GERSTEL JOACHIM [DE]) 19 December 2013 (2013-12-19) * pages 1,2; figure 5 *	1-6, 9-16,18	INV. F17C13/02
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			TECHNICAL FIELDS SEARCHED (IPC)
			F17C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 22 May 2019	Examiner Papagiannis, Michail
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			

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

EP 18 21 3631

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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22-05-2019

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