(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 180 708 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
17.05.2023 Bulletin 2023/20

(21) Application number: **21020567.0**

(22) Date of filing: **16.11.2021**

(51) International Patent Classification (IPC):
F17C 13/04 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
F17C 13/04; F17C 2201/0109; F17C 2201/032; F17C 2201/056; F17C 2201/058; F17C 2205/0308; F17C 2205/0329; F17C 2205/0338; F17C 2205/0382; F17C 2221/011; F17C 2221/014; F17C 2223/0123; F17C 2223/036; F17C 2270/025

(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:
KH MA MD TN

(71) Applicant: **Linde GmbH**
82049 Pullach (DE)

(72) Inventors:
- **Jacobsen, Brian**
  82049 Pullach (DE)
- **Reid, Dennis**
  82049 Pullach (DE)

(74) Representative: **Reuß, Stephanie**
Linde GmbH
Intellectual Property EMEA
Dr.-Carl-von-Linde-Straße 6-14
82049 Pullach (DE)

(54) **DEVICE FOR INDICATING A VALVE OPENING STATUS**

(57) The invention proposes a device (100) for indicating a valve opening status, comprising a manipulator (110), configured to change an opening status of a valve, further comprising an indicator (120), configured to display an information on the opening status of the valve, and a drive element, configured to effect a change of the information displayed by the indicator (120) in reaction to a change of the opening status of the valve.

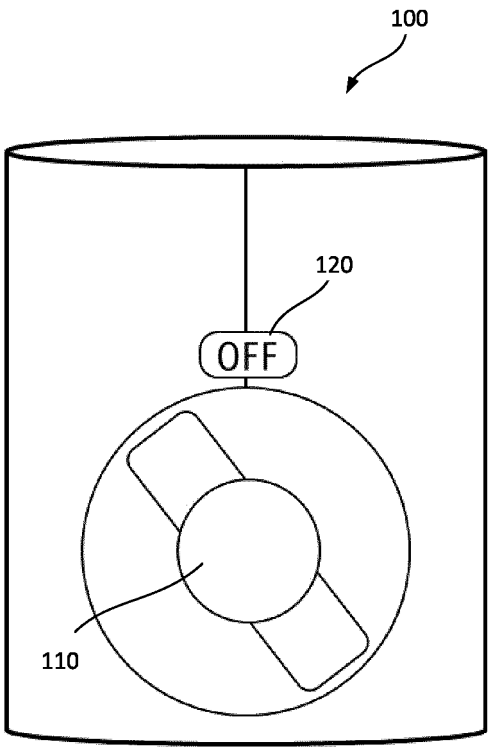

Fig. 2A

EP 4 180 708 A1

Description

[0001] The present invention relates to a device for indicating a valve opening status according to the preamble of the main claim.

Technological background of the invention

[0002] Mobile medical oxygen is commonly delivered via cylinders with an integrated valve with integrated pressure regulator (VIPR). The VIPR typically comprises a valve and a handling device / guard. Various designs of VIPR and guard/handling device exist today. In the UK alone, there are approximately half a million oxygen VIPR in the market with a so-called '2 knob design' i.e. a safety shutoff valve (controlled by a handwheel) and used to isolate the valve from the high pressure cylinder, and a flowknob used to set discrete flow rates (typically in the range from 0.25 to 25 L/min).

Disclosure of the invention

[0003] The present invention provides a device for indicating a valve opening status according to the main claim. Advantageous embodiments are subject-matter of the dependent claims as well as the following description.

[0004] According to the invention, a device for indicating a valve opening status comprises a manipulator, configured to change an opening status of a valve, and is characterized by an indicator, configured to display an information on the opening status of the valve, and a drive element, configured to effect a change of the information displayed by the indicator in reaction to a change of the opening status of the valve. This enhances the operating safety, since the valve opening status is immediately recognisable from the indicator without the danger of misinterpretation as is the case when observing a position of the manipulator.

[0005] Advantageously, the manipulator is at least partially and/or temporarily covered by a cover, wherein the cover is configured to not cover the indicator at least when covering the manipulator. This provides the advantage, that the information regarding the valve opening status cannot be hidden by the cover, which further enhances operating safety in that the manipulator is covered and therefore cannot be operated by accident while the in formation is still recognisable.

[0006] The drive element preferably comprises a mechanism mechanically coupled to both the manipulator and the indicator, such that a movement of the manipulator effects a movement of the drive element and a movement of the drive element effects a change of the information displayed by the indicator. This means that by changing the valve opening status, the indicator automatically and reliably displays the correct information.

[0007] Said mechanism advantageously comprises a Geneva gear. This is a simple and robust mechanism and thus ensures proper displaying of the information required.

[0008] The manipulator preferably comprises a handling element of a gas container shutoff valve. Therefore, the indicator displays information on whether gas can be withdrawn from the container or not. This reduces the risk, for example, of setting a flow rate for gas withdrawal from an oxygen cylinder while the shutoff valve is closed. If that were done, a patient requiring oxygen might be harmed due to a lack of respiratory oxygen. Thus, the invention may save lives of patients with respiratory conditions requiring oxygen treatment.

[0009] In advantageous embodiments, the device further comprises a regulator configured to regulate a gas flow and/or a gas pressure. Integrated valve and regulators are preferred for ease of use and intuitivity.

[0010] Preferably, the indicator is arranged adjacent to said regulator. In such a case, on setting a flow rate and/or pressure to be effective downstream from the device, it is immediately evident, if the valve is opened or closed, so that an operation error becomes very unlikely.

[0011] Further advantages and features of the invention will be described in the following with reference to the appended drawings.

Brief description of the drawings

[0012]

Figure 1 shows an arrangement of an advantageous embodiment of a device according to the invention with a gas cylinder.

Figures 2A and 2B show a partial side view of the device shown in Figure 1.

Figure 3 shows top and perspective sectional views of the device of Figure 1.

Detailed description

[0013] In Figure 1, an arrangement of an advantageous embodiment of a device according to the invention and a gas cylinder is shown. The device is collectively referred to with 100, the gas cylinder with 150.

[0014] In Figures 2A, 2B and 3, more detailed partial views of the device 100 are depicted. Functionally corresponding elements are referred to with the same reference numerals throughout the drawings.

[0015] The device 100 comprises a connector port 130, a regulator 140, an indicator 120, a manipulator 110 and a manipulator cover 115, beneath which, as shown in Figures 2A and 2B, a manipulator 110, here in the form of a handwheel, is arranged. By turning the handwheel 110, a shutoff valve of the gas cylinder 150 can be opened and closed. In Figure 2A, a situation with a closed valve is shown, whereas in Figure 2B, a situation with an open valve is illustrated.

[0016] The handwheel 110 is connected to the indicator 120 via a drive element such as a mechanism, an exemplary embodiment of which is depicted in Figure 3 and collectively referred to with 200. The mechanism 200, as shown in Figure 3 in top (left) and perspective (right) sectional views, may comprise an indicating cylinder 210 which is rotatable around its vertical axis. A rotation of the indicating cylinder 210 may be effected by a Geneva gear 230, which is in engagement with a knob 212 protruding in a direction perpendicular to the vertical axis from the indicating cylinder 210. Rotational movement of the indicating cylinder may be limited, e.g. by an end stop 214 also protruding in a radial direction from the indicating cylinder 210. The Geneva gear 230 may be directly coupled to the handwheel 110, for example via a common axis, or may engage with the handwheel via a transfer means such as a toothed gear, a belt or similar means. The rotational movement of the indicating cylinder 210 may be aided and/or hindered by a torsion spring 216 or the like, so as to minimize play and/or required force.

[0017] The indicating cylinder 210 can have an indicating label, e.g. with colour and/or text and/or symbolic representations printed on the surface. As the indicating cylinder 210 rotates, the label presented to the user, e.g. through a window in a housing of the device 100, can indicate, for example, 'ON', showing the shutoff valve is open, or 'OFF', showing the shutoff valve is closed. This information may additionally or alternatively colour coded and/or represented by symbols. Said window in combination with the indicating cylinder 210 may form the indicator 120 mentioned herein before.

[0018] The indicator 120 could also be used to display a status where the valve is not fully opened or closed by showing a graduated colour, for example red-green.

[0019] The device 100 can also incorporate an electronic sensor (for example a hall sensor and/or a magnet) that monitors the drive element, e.g. the position of the Geneva gear 230. The electronic sensor can also be used to trigger a misuse alarm condition (e.g. handwheel closed, flow rate set) which could activate an audible and/or visual alarm.

[0020] As shown in Figure 1, the indicator 120 may be arranged in different locations of the device, particularly in the vicinity of the regulator 140 and/or the manipulator 110. Particularly advantageous locations are outside an area covered by the cover 115, which may, for example, be attached for transport of fresh gas cylinders 150 and may be configured to be detached from the device, once it is in use, to indicate that a gas cylinder has already been opened. In other embodiments, the cover 115 may be reusable so as to provide an additional element of security for the manipulator. For example, it may be helpful to cover the handwheel 110 after it has been opened to provide a psychological barrier for closing it during a stressful situation.

[0021] In general, the device 100 provides enhanced operating safety by clearly indicating the valve opening status at a location easily visible for a user at all times. This is of particular advantage in connection with medical gases such as oxygen, nitrous oxide or other therapeutic gases.

[0022] The device 100 or its mechanism 200 may be used in connection with new gas containers 150 or retrofitted to existing systems, thereby reducing investment costs and environmental impact. The mechanism may at least partly consist of low cost materials such as thermoplastics, light metals or the like as well as combinations thereof.

[0023] It is to be understood that the mechanism 200 alone or the device 100 may also be used in connection with other valves and is not limited to gas cylinders 150.

Claims

1. Device (100) for indicating a valve opening status, comprising
   a manipulator (110), configured to change an opening status of a valve, **characterized by**

   an indicator (120), configured to display an information on the opening status of the valve, and a drive element, configured to effect a change of the information displayed by the indicator (120) in reaction to a change of the opening status of the valve.

2. Device (100) according to claim 1, wherein the manipulator (110) is at least partially and/or temporarily covered by a cover (115), wherein the cover (115) is configured to not cover the indicator (120) at least when covering the manipulator (110).

3. Device (100) according to claim 1 or 2, wherein the drive element comprises a mechanism (200) mechanically coupled to both the manipulator (110) and the indicator (120), such that a movement of the manipulator (110) effects a movement of the drive element and a movement of the drive element effects a change of the information displayed by the indicator (120).

4. Device (100) according to claim 3, wherein the mechanism (200) comprises a Geneva gear (230).

5. Device (100) according to any of the preceding claims, wherein the manipulator (110) comprises a handling element of a gas container shutoff valve.

6. Device (100) according to any of the preceding claims, further comprising a regulator (140) configured to regulate a gas flow and/or a gas pressure.

7. Device (100) according to claim 6, wherein the indicator (120) is arranged adjacent to the regulator (140).

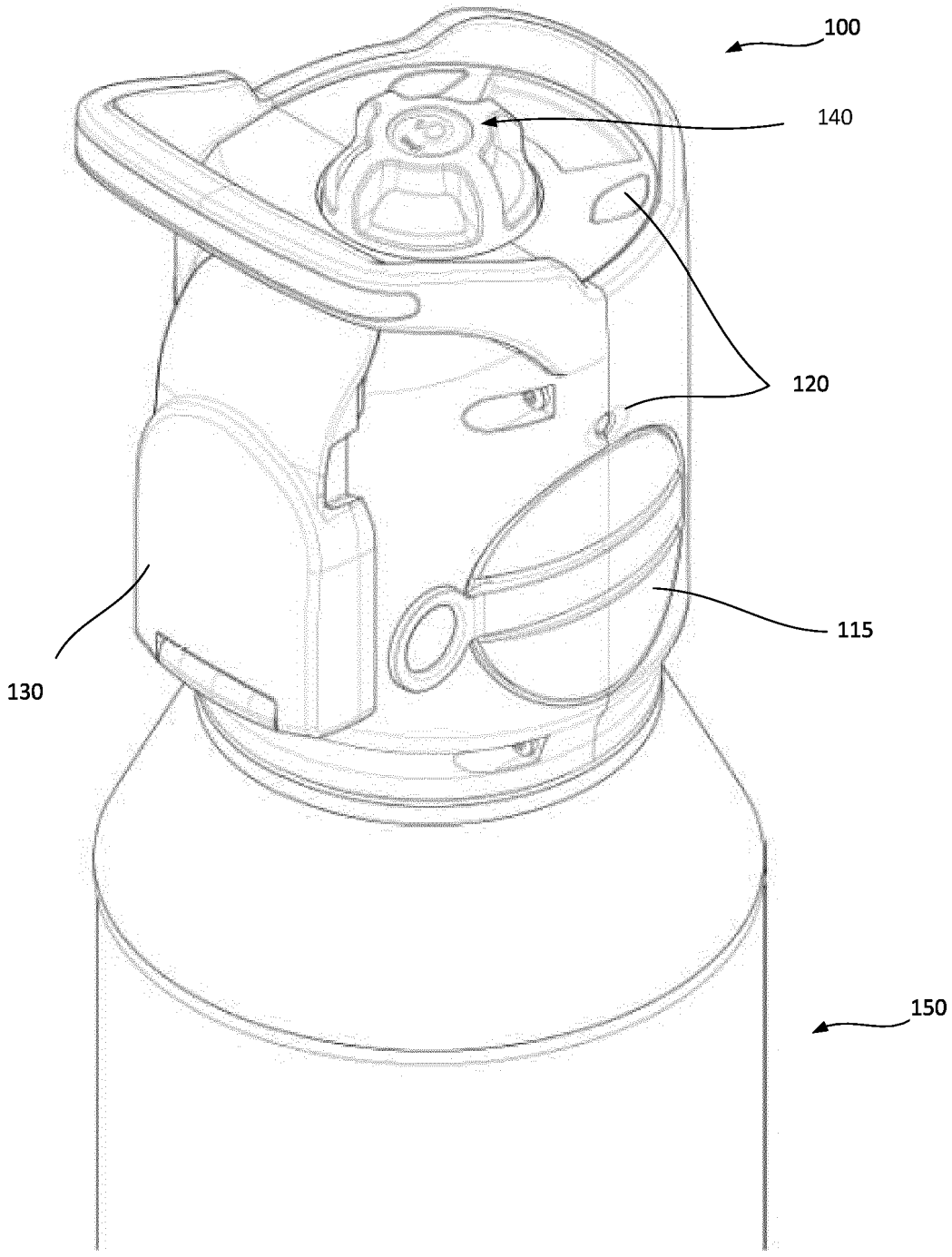

Fig. 1

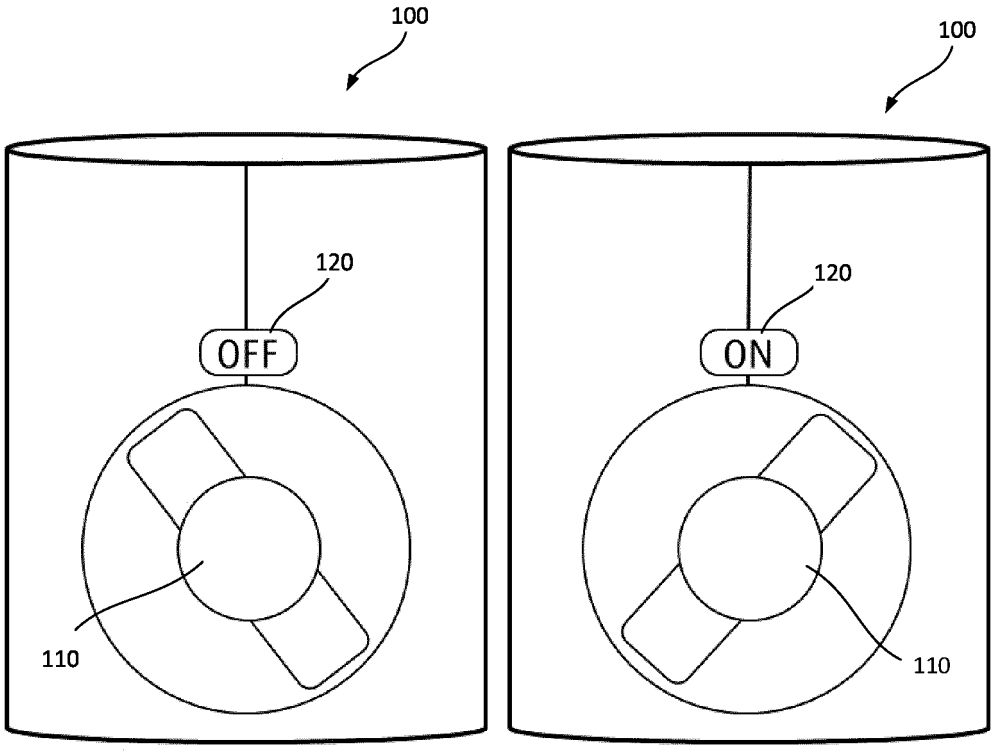

Fig. 2A

Fig. 2B

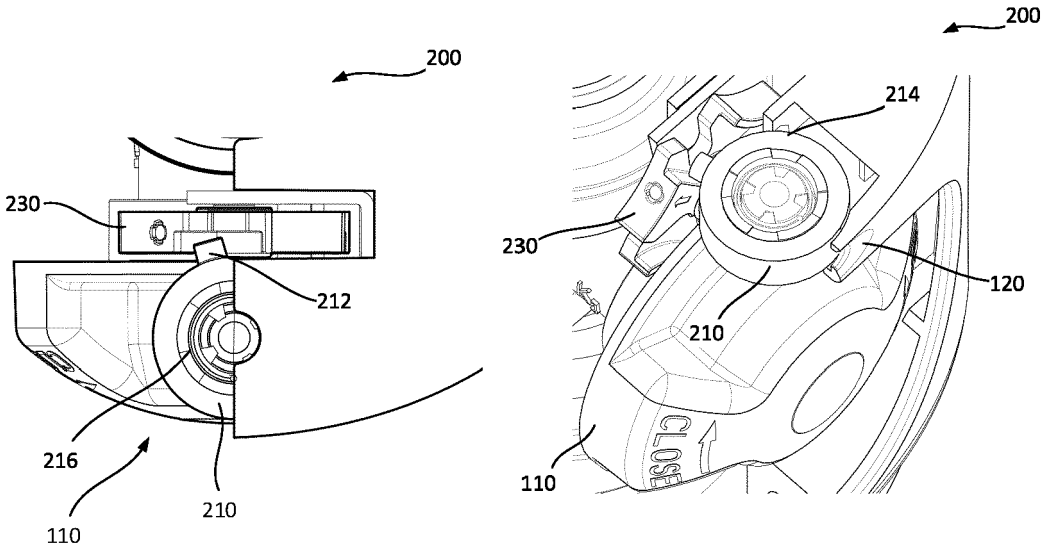

Fig. 3

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 21 02 0567

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	FR 2 774 452 A1 (AIR LIQUIDE [FR]) 6 August 1999 (1999-08-06)	1-3,5-7	INV. F17C13/04
A	* the whole document *	4	
X	US 2020/088318 A1 (SCANNELL CHRISTOPHER [US] ET AL) 19 March 2020 (2020-03-19)	1,3-7	
A	* the whole document *	2	

TECHNICAL FIELDS SEARCHED (IPC)

F17C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 April 2022	Ott, Thomas

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 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 21 02 0567

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

29-04-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2774452 A1	06-08-1999	NONE	
US 2020088318 A1	19-03-2020	CN 112997032 A	18-06-2021
		EP 3850253 A1	21-07-2021
		JP 2022500600 A	04-01-2022
		KR 20210047357 A	29-04-2021
		SG 11202101398R A	30-03-2021
		TW 202018220 A	16-05-2020
		US 2020088318 A1	19-03-2020
		WO 2020056255 A1	19-03-2020

EPO FORM P0459

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