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(54) **FRAME DEVICE FOR A PLURALITY OF GAS VESSELS**

(57) It is disclosed a device (1) device (1) for the supply of a gas comprising: a plurality of gas vessels (4), preferably in the form of gas cylinders; a frame (2) comprising a lower portion (21), an upper portion (22), and a plurality of side portions (23), defining a space (3) for arranging said plurality of gas vessels (4); a hooking element (8) coupled to said upper portion (21) of said frame (2), configured to cooperate with a hook or similar element of an external machine adapted to lift said device (1), said hooking element (8) being coupled to said frame in a movable manner (2), at least between an operative position and a rest position; an activation mechanism (9a, 9b, 9c) mechanically coupled to the hooking element (8), comprising a control portion, that is operable by a user to move said hooking element between said operative position and said rest position.

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Description

TECHNICAL FIELD

[0001] The present invention relates to devices for the supply of a gas having a plurality of gas vessels, typically in the form of gas cylinders. Device of this kind are e.g. the ones known in the art as "gas cylinder bundles".

BACKGROUND

[0002] These kinds of devices are generally provided with a frame defining a space within which a plurality of gas vessels are placed; the frame protects the gas vessels during transportation. A manifold is connected to all the gas vessels to allow a dispensing of gas from all the gas cylinders.

[0003] At least a hooking element such as a hook eye is typically provided on the upper side of the frame, to allow an external machine to lift the device. The external machine is typically provided with a hook or similar element, that can be inserted, or anyway coupled, to the hooking element to lift the bundle of cylinders.

[0004] The hooking element typically is welded to the top side of the frame and protrudes from the frame, thus being an inconvenient element, e.g. by preventing the stacking of the frames one onto the other.

[0005] The hooking element is also placed on top of the device, that is a position that is not (easily) reachable by a user when the device is in operative condition.

SUMMARY OF THE INVENTION

[0006] It is thus an object of the present invention to provide a device for the supply of gas having a hooking element that is free from the above discussed problems.

[0007] It is a particular object of the present invention to provide a device for the supply of gas having a hooking element that that is easy to handle for a user.

[0008] These and other objects are achieved by a device according to one or more of the enclosed claims.

[0009] In particular, the present invention relates to a device for the supply of a gas and a relevant assembling process according to the independent claims. Preferred aspects are recited in the dependent claims.

[0010] According to an aspect, a device for the supply of a gas comprises: a plurality of gas vessels, preferably in the form of gas cylinders; a frame comprising a lower portion, an upper portion, and a plurality of side portions, defining a space for arranging the plurality of gas vessels; a hooking element coupled to the upper portion of the frame, configured to cooperate with a hook or similar element of an external machine adapted to lift the device, the hooking element being coupled to the frame in a movable manner, at least between an operative position and a rest position; an activation mechanism mechanically coupled to the coupling element, comprising a control portion, that is operable by a user to move the hooking element between the operative position and the rest position.

[0011] Various shapes of the hooking element are possible. Typically, as known in the art, a hooking element defines an area into which the hook (or similar element) of the external machine can be inserted. The hooking element at least part of the perimeter of such an area, e. g. a hooking element having the shape of a "J" or a hook. preferably it defines the whole perimeter of such an area, e.g. a hooking element having the shape of a closed "U" or a ring.

[0012] The relative movement between the hooking element and the frame allows to arrange the hooking element in the most suitable position according to the situation. As an example, in the operative position the hooking element is arranged in the position allowing the easiest coupling with an external machine. In the rest position, it can be arranged in the most convenient position, e.g. allowing stacking of the frames.

[0013] The activation mechanism allows a user to move the hooking element without the need for him to manually reach the hooking element.

[0014] A preferred solution for providing such an effect is that, in the operative position, the hooking element protrudes from the upper portion more in the operative position than in the rest position, preferably the hooking element not protruding from the upper portion in the rest position.

[0015] According to an aspect, the hooking element in the operative position, is arranged substantially perpendicularly with respect to the upper portion, while in the rest position it is arranged substantially parallel to the upper portion.

[0016] According to an aspect, the control portion is arranged at one of the side portions of the frame.

[0017] According to an aspect, the activation mechanism comprised a first bar coupled to the hooking element and a second bar coupled to the first bar, the first bar arranged at the upper portion of the frame, the second bar arranged at one of the side portions of the frame, the second bar comprising, or being coupled to, the control portion.

[0018] Device according to any preceding claim wherein, considering the use condition wherein the device rests on a support surface, the distance between the control portion and the support surface is less than 80% of the height of the device, preferably less than 60% of the height of the device, more preferably less than 50% of the height of the device.

[0019] Device according to any preceding claim, wherein the hooking element is rotatably coupled to the upper portion of the frame.

[0020] Device according to any preceding claim, wherein the device comprises a plurality of fasteners, configured to reversibly constrain to each other at least part of at least two of the frame portions.

[0021] The present invention also relates to a method for lifting the above device according to the enclosed

method independent claim.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] With reference to the enclosed figures, exemplary and non limiting embodiments will be now discussed, wherein:

- figure 1 is a schematic view of a device according to an embodiment of the present invention;
- figure 2 is a partial perspective view of an embodiment of a device according to the present invention;
- figure 3 is a partial and perspective top view of a hooking element of the device of fig. 2, in the operative position;
- figure 4 is a partial and perspective top view of a hooking element of the device of fig. 2, in the rest position;
- figures 5(A) - 5(D) are schematic view of possible hooking elements;
- figure 6 is a perspective view of an activation mechanism of a device according to an embodiment of the invention;
- figure 7 is a schematic view of the activation mechanism of fig. 6;
- figure 8 is a schematic top view of a different embodiment according to the present invention;
- figures 9A and 9B are schematic lateral views showing the operation of the embodiment of fig. 8.

DETAILED DESCRIPTION

[0023] A device 1 for the supply of a gas comprises a frame 2 defining a space 3 within which a plurality of gas vessels 4 can be housed.

[0024] Gas vessels 4 can be of different kinds, known in the art; they are generally containers configured to house a gas, and typically they are gas cylinders 4. For easiness, reference will be made to gas cylinders 4 as a generic gas vessel.

[0025] According to the invention, the device 1 also comprises a manifold 6, that is arranged to collect gas from at least part, typically all, of the gas cylinders 4. In a known way, the gas cylinders 4 are typically connected to the manifold 6 via different ducts 6a. The ducts 6a are arranged so as to allow an even collection of gas from the gas cylinders 6, i.e. to empty at the same rate the different gas cylinders 4. Preferably, the ducts 6a are arranged so that they all have the same or similar length, measured from the manifold 6 to the gas cylinders 4. In general, the ducts 6a are configured so that they provide the same or similar pressure drop from the relevant gas cylinder 4 to the manifold 6, or up to the delivery of gas from the device 1. Such an object may be achieved by properly selecting the length of the ducts 6a, and the path followed by the ducts 6a. In fact, as known, the longer the duct, the higher the pressure drop in fluid flowing in the duct 6a. In addition, a curve in the path of a duct provide a pressure drop for the fluid flowing within the duct.

[0026] The manifold 6 is typically a tube (preferably a substantially straight tube, or a tube that is substantially straight for at least part of its path) that is connected to the gas cylinders 4, typically via relevant ducts 6a.

[0027] Different kinds of frames 2 can be used, provided that they define a space 3 to house the gas cylinders 4.

[0028] According to a possible aspect, the frame 2 comprise a lower portion 21, an upper portion 22 and a plurality of side portions 23. The frame 2 has typically the shape of a prism, more preferably of a rectangular parallelepiped, i.e. provided with four side portions 23, that are arranged perpendicularly one to the other.

[0029] The above mentioned space 3 is thus the volume defined by portions 21 - 23 of the frame 2, i.e. the portion of space that is comprised within the geometrical figure defined by the portions 21 - 23.

[0030] Coupling between the different portions 21 - 23 of the frame 2 can be carried out in different manner, e. g. manner known in the art. Preferably, the different portions 21 - 23 are at least in part (and preferably exclusively) coupled via fasteners 5. Fasteners 5 of various kinds known in the art can be used. Preferred embodiments use bolts (i.e. screws coupled with relevant nuts) as fasteners 5.

[0031] The lower portion 21 is typically a substantially planar element or, in any case, an element having a dimension (in particular the vertical dimension, considering the use condition of the device 1) that is sensibly smaller with respect to the other two dimensions. Friction elements (typically protrusions) can be provided on the upper surface of the lower portion 21, i.e. the surface that, in use, supports the gas cylinders 4.

[0032] The side portions 23 are typically provided with a main body 230 that is substantially planar. In preferred embodiments, the side portions comprise a main body 230, arranged between vertical elements 231. The vertical elements 231 are defined as vertical because they are substantially vertical in the use condition.

[0033] As mentioned, the frame 2 typically has a substantially prismatic shape. Preferably, the main body 230 of the side portions 23 does not entirely cover the lateral surface of the prism defined by the frame 2. In particular, the main body 230 does not cover the whole surface comprised between the vertical elements 231. The main body 230 preferably comprises one or more transversal elements, typically plates, arranged between the vertical elements 231, and preferably arranged substantially coplanar between each other. As an example, in the shown embodiment, the main body 230 comprise two transversal elements.

[0034] The upper portion 22 is also an element having two dimensions prevailing over the others. However, it is usual that cylinder bundles are lifted via the upper portion. Thickness of the upper portion 22 is thus typically greater than the thickness of the lower portion 21. A hooking element 8 is provided on the upper portion 22 (typi-

cally on the top of the upper portion 22, considering the orientation of the device 1 in the use condition), to allow an external machine (e.g. via a hook 100) to lift the device 1. As mentioned, the hooking element 8 can have different shapes in different embodiment.

[0035] Typically, the hooking element 8 defines a space 24 into which a hook 100 (or similar element) of an external machine can be inserted.

[0036] Some examples of possible hooking elements 8 are schematically shown in figure 5. The hooking element 8 can define the whole perimeter of the space 24. Thus, according to a preferred embodiment, there is at least one sectional view, taken along a plane that, in use condition, contains the direction along which the device is lifted, that is typically a vertical plane, the hooking element defines a closed figure around the space 24. Possible examples of these embodiments are shown in fig. 5(A) - 5(C).

[0037] In possible embodiments, the hooking element 8 may not define the whole perimeter of the space 24, i. e. the hooking element defines an open figure around the space 24 on all the vertical planes intersecting the hooking element, when the device 1 is in use condition. A possible example of such an embodiment is e.g. schematically shown in fig. 5(D).

[0038] It is evident that the embodiments shown in the figure do not show all the possible shapes for the hooking element 8, and other shapes are possible.

[0039] In general, the hooking element 8 is preferably shaped so that, in use, a hook 100 or a similar element of an external machine configured to lift the frame 2 can be arranged so that at least a first part 8a contacts the hook 100, and is arranged above at least part of the hook 100, while a horizontal plane HP intersects the hook 100 and the hooking element on opposite sides of the hook 100.

[0040] The hooking element 8 is coupled in a movable manner to the frame 2, preferably in a rotatable manner to the frame 2.

[0041] Typically, the hooking element 8, as e.g. in the shown embodiment, is hinged to the frame 2.

[0042] As a result, the hooking element 8 is movable between an operative position (e.g. shown in fig. 3), allowing an external machine provided with a hook 100 (or similar element) to lift the device 1, and a rest position (e.g. shown in fig. 4).

[0043] Typically, in the operative position, considering the use condition, the hooking element is arranged substantially vertically, while, in the rest condition, the hooking element 8 is arranged substantially horizontally ("substantially" meaning 20 degrees tolerance). In general, in the operative position, at least part of the hooking element 8 protrudes from the frame 2 (i.e. there is at least one prism entirely containing the frame 2 that does not contain the whole hooking element 8), while in the rest position the hooking element protrudes by a smaller amount (i.e. considering the same prism, the portion of the hooking element 8 outside the prism in the operative position has a greater volume than the portion of the hooking element outside the prism when the hooking element is in the rest condition). Even more preferably, the hooking element 8 does not protrude from the frame 2 when the hooking element 8 is in the rest condition (i.e. all the prisms that entirely contain the frame 2 also entirely contain the hooking element 8).

[0044] The hooking element is coupled to an activation mechanism 9a, 9b, 9c, that is mechanically coupled to the hooking element 8. The activation mechanism 9a, 9b, 9c is provided with a control portion 90, that is operable by a user, to move the hooking element 8 between its rest and operative position.

[0045] The skilled person will understand that different components and joints can be used to achieve such an effect.

[0046] Exemplary embodiments are discussed herein below, even if different solutions, not discussed in detail in the following, can be used.

[0047] Preferred embodiments of an activation mechanism 9a, 9b, 9c, comprise a first bar 9a coupled to the hooking element, and a second bar 9b comprising the control portion 90.

[0048] The first bar 9 is typically jointed to the hooking element 8 so that movement of the first bar 9a causes movement of the hooking element 8. Preferably, the first bar 9a is hinged to the hooking element 8, so that translation of the first bar 9a causes a rotation of the hooking element 8 (e.g. as in a crank - connecting rod mechanism).

[0049] The first bar 9a is typically arranged so that, in operative condition, the bar can be moved at least along a horizontal direction (i.e. the movement is not only vertical). Typically, during its movement, the first bar 9a, remains substantially parallel with respect to the upper portion 22 of the frame 2.

[0050] The second bar 9b is linked to the first bar 9a, typically indirectly, via one or more further elements, so that movement of the second bar 9b causes movement of the first bar 9a.

[0051] According to a preferred solution, the second bar 9b is arranged at least in part at a side portion 23 of the frame 2. Preferably, the second bar 9b is configured to move at least vertically, considering the use condition of the device 1. Preferably, during its movement, the second bar 9b remains substantially parallel to the side portion 23 of the frame 2 at which it is arranged.

[0052] With "substantially parallel" it is meant an angle of 30 of less degrees between the upper portion 22 and the second bar 9b.

[0053] In a possible embodiment, as shown in the figures, the first bar 9a and the second bar 9b are hinged at opposite sides of a first class lever 9c, typically hinged to a fulcrum integral with the frame 2. The arms of the first class lever 9c are preferably angled, or arcuate, or in any case not parallel one to the other.

[0054] A control portion 90 is coupled to, or is part of, the second bar 9b. The control portion is configured to

be operated by a user in order to move the hooking element 8 via the activation mechanism 9a, 9b, 9c.

[0055] Such a control portion may be shaped in different ways. As an example, as in the shown embodiment, the control portion 90 may be in the form of a ring of a handle, or similar element, coupled at the free end of the second bar 9b. A user can insert a hand/finger within such a control portion 90, e.g. to pull down the second bar 9b in operative condition.

[0056] The control portion 90 may be a part of the second bar 9b. As an example, a part of the second bar 9b (typically at the free end of the second bar) can be covered in a material allowing an easy gripping of the second bar 9b to a user, that can thus directly grip the second bar 9b to move it.

[0057] The mechanism 9a, 9b, 9c can be arranged so that to place the hooking element 8 in the rest condition, the second bar 9b should be pushed upwards (as per the embodiment of figures 9A and 9B, or pulled downwards (as per the embodiment of figs 6 and 7). In general, the control portion 90 is configured to be easily handled by a user, allowing movement of the second bar 9b and, as a consequence, of the hooking element 8.

[0058] To allow an easy operation of the activation mechanism 9a, 9b, 9c the control portion is preferably arranged at a side portion 23 of the frame 2.

[0059] Typically, the control portion 90 is arranged below 80% of the height of said device, more preferably below 60%, even more preferably below 50 of the height of the device 1.

[0060] In other words, in use condition, when the device rests on a supporting surface (on the ground) G, the device 1 has a defined height H. The value of distance D to the ground/supporting surface G of the control portion 90 (measured perpendicularly with respect to the ground, from the ground to the point of the control portion nearest to the ground) is less than 80% (preferably 60%, more preferably 50%) the value of the height H of the device 1 (measured along a direction perpendicular to the ground, from the ground to the point of the device 1 farthest from the ground).

[0061] The device 1 may further comprise securing elements 7, to further prevent movement of the gas cylinders 4 with respect to the frame 2 in the use condition. Different securing elements are known in the art and may be used. As an example, securing elements may be wedges placed at the upper part of the gas cylinders, at the dome defined by the top portion of the gas cylinders. Wedges are usually fixed to the frame 2. In addition or as an alternative, securing elements 7 may e.g. comprise bands (not shown) that embrace the lateral surface of the gas cylinders.

[0062] During use, in order to lift the device 1, the hooking element 8 is brought to the operative position. Preferably, this is done by a user that acts on the control portion 90, thus movement the components of the activation mechanism 9a, 9b, 9c and, as a consequence, the hooking element 8.

[0063] A hook 100 or similar device of an external machine is thus coupled to the hooking element 8, typically it is inserted within the space 24 defined by the hooking element 8.

[0064] The external machine then raises the hook 100, causing lifting of the device 1.

[0065] The device 1 is then moved to the desired position, and rested on a supporting surface G. The hook 100 is then decoupled from the device 1.

[0066] Preferably, the user acts on the activation mechanism 9a, 9b, 9c to bring the hooking element 8 in the rest condition.

Claims

1. Device (1) for the supply of a gas comprising:

   • a plurality of gas vessels (4), preferably in the form of gas cylinders;
   • a frame (2) comprising a lower portion (21), an upper portion (22), and a plurality of side portions (23), defining a space (3) for arranging said plurality of gas vessels (4);
   • a hooking element (8) coupled to said upper portion (21) of said frame (2), configured to cooperate with a hook or similar element of an external machine adapted to lift said device (1), said hooking element (8) being coupled to said frame in a movable manner (2), at least between an operative position and a rest position;
   • an activation mechanism (9a, 9b, 9c) mechanically coupled to the hooking element (8), comprising a control portion, that is operable by a user to move said hooking element between said operative position and said rest position.

2. Device (1) according to claim 1, wherein in said operative position, the hooking element (8) protrudes from said upper portion (21) more in the operative position than in the rest position, preferably the hooking element (8) not protruding from the upper portion (21) in the rest position.

3. Device (1) according to claim 1 or 2, wherein the hooking element (8) in the operative position, is arranged substantially perpendicularly with respect to the upper portion, while in the rest position it is arranged substantially parallel to said upper portion (21).

4. Device (1) according to any preceding claim, wherein said control portion is arranged at one of said side portions of said frame (2).

5. Device (1) according to any preceding claim, wherein said activation mechanism comprises a first bar coupled to said hooking element and a second bar cou-

pled to said first bar, said first bar arranged at said upper portion of said frame, said second bar arranged at one of said side portions of said frame, said second bar comprising, or being coupled to, said control portion.

6. Device (1) according to any preceding claim wherein, considering the use condition wherein the device rests on a support surface, the distance between said control portion and said support surface is less than 80% of the height of said device, preferably less than 60% of the height of said device, more preferably less than 50% of the height of said device.

7. Device according to any preceding claim, wherein said hooking element is rotatably coupled to said upper portion of said frame.

8. Device (1) according to any preceding claim, wherein the device comprises a plurality of fasteners (5), configured to reversibly constrain to each other at least part of at least two of said frame portions (21, 22, 23).

9. A method for lifting a device (1) for the supply of a gas according to one or more of the preceding claims via an external machine, provided with a hook or similar element, comprising the steps of:

(a) Operating the activation mechanism (9a, 9b, 9c) to arrange the hooking element (8) in the operating position;
(b) Couple the hook (100) of the external machine to said hooking element (8);
(c) Operate said external machine to raise said hook (100), in order to lift said device (1)

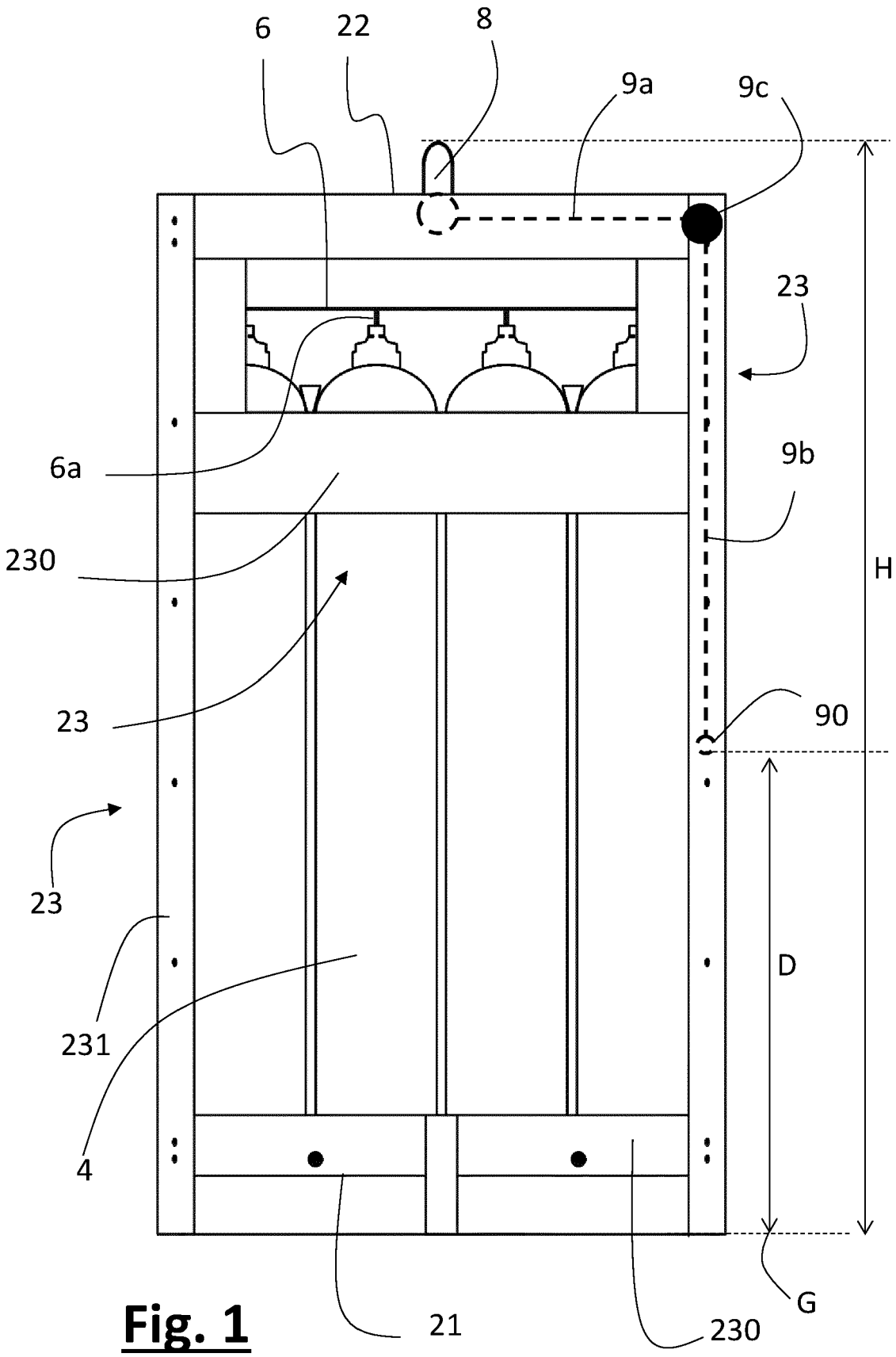

Fig. 1

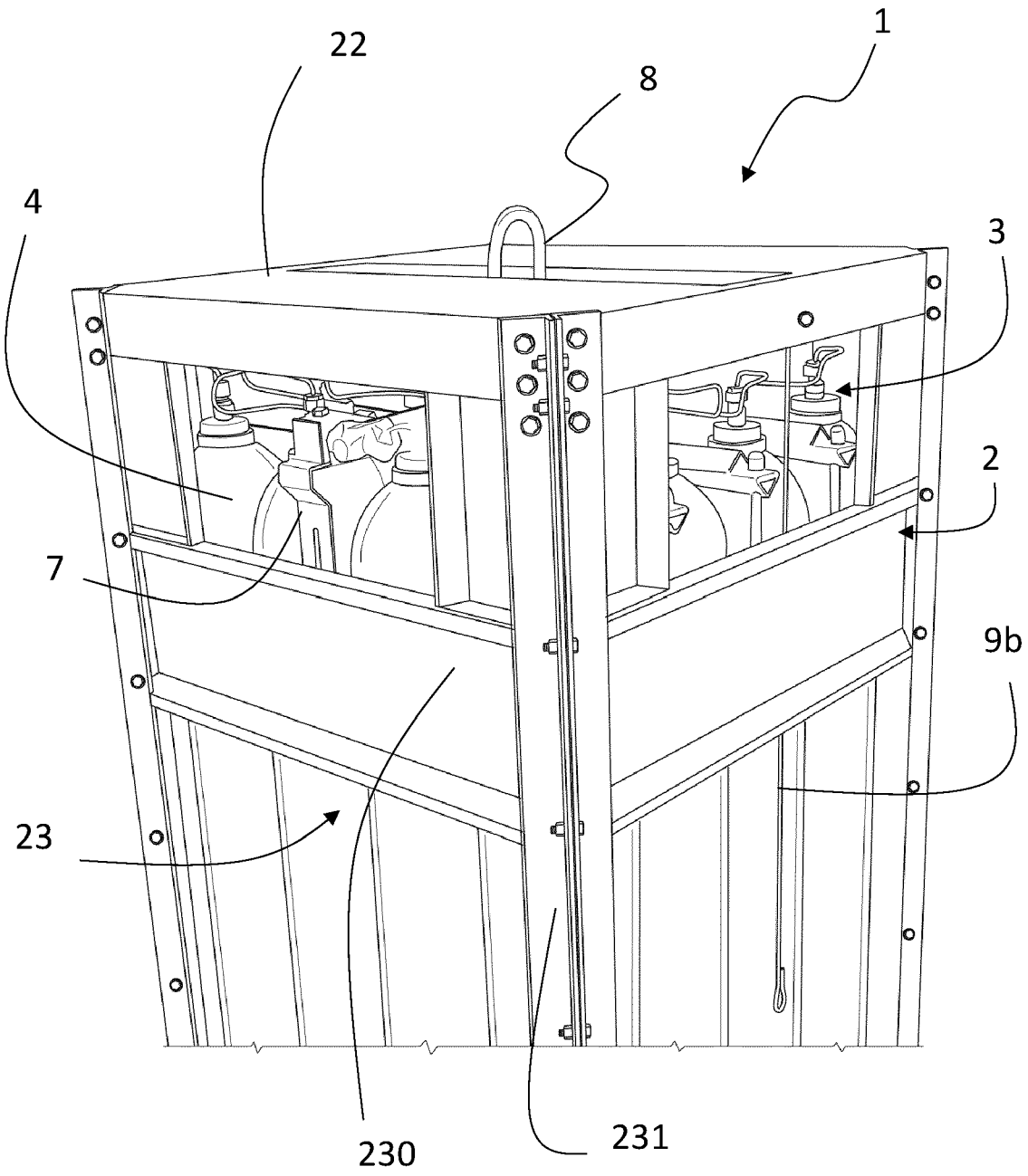

Fig. 2

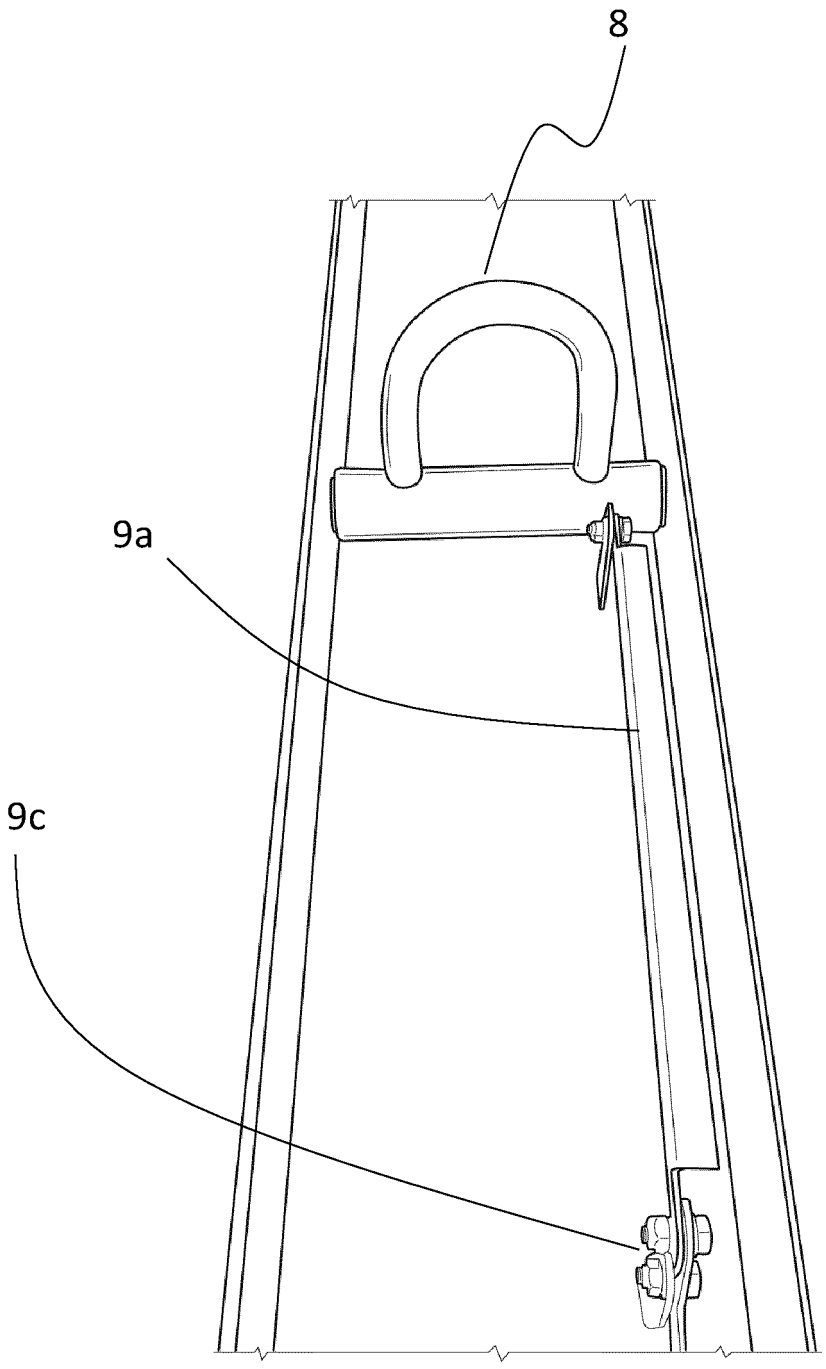

Fig. 3

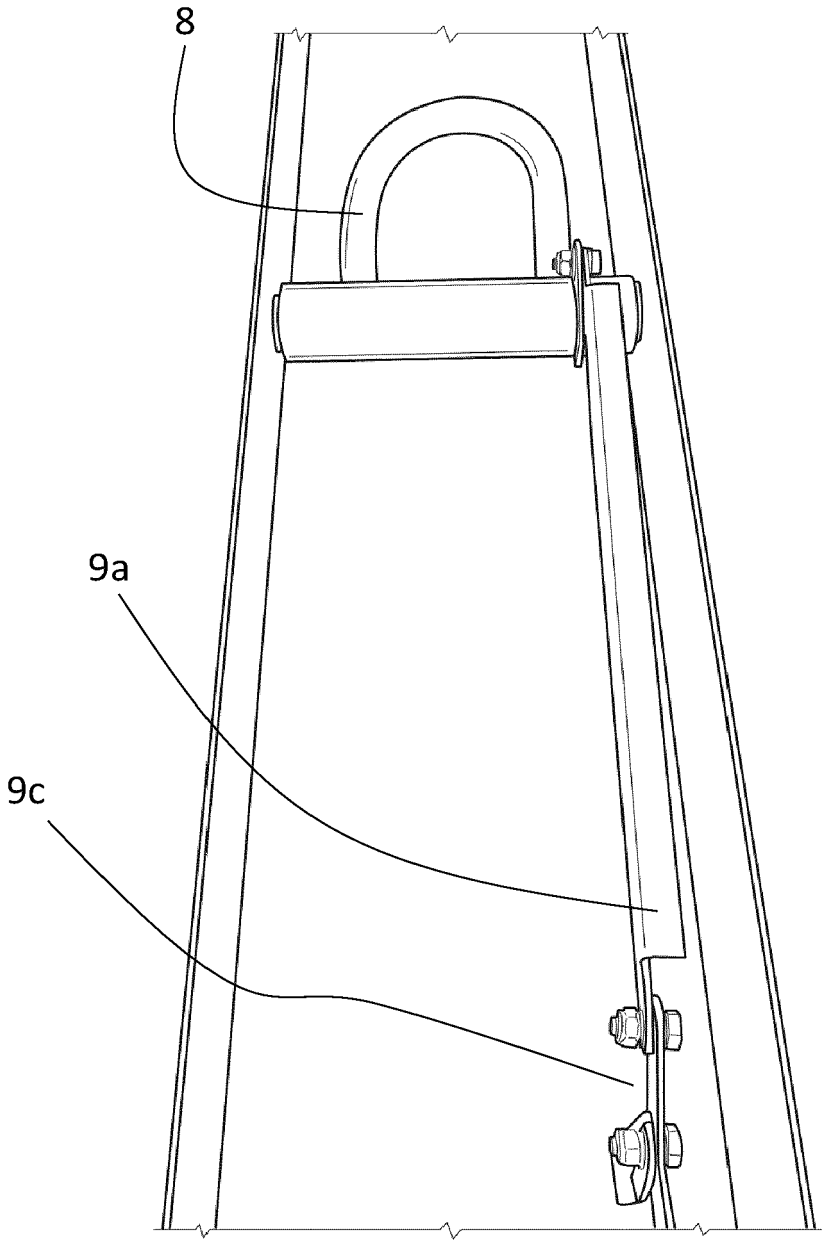

Fig. 4

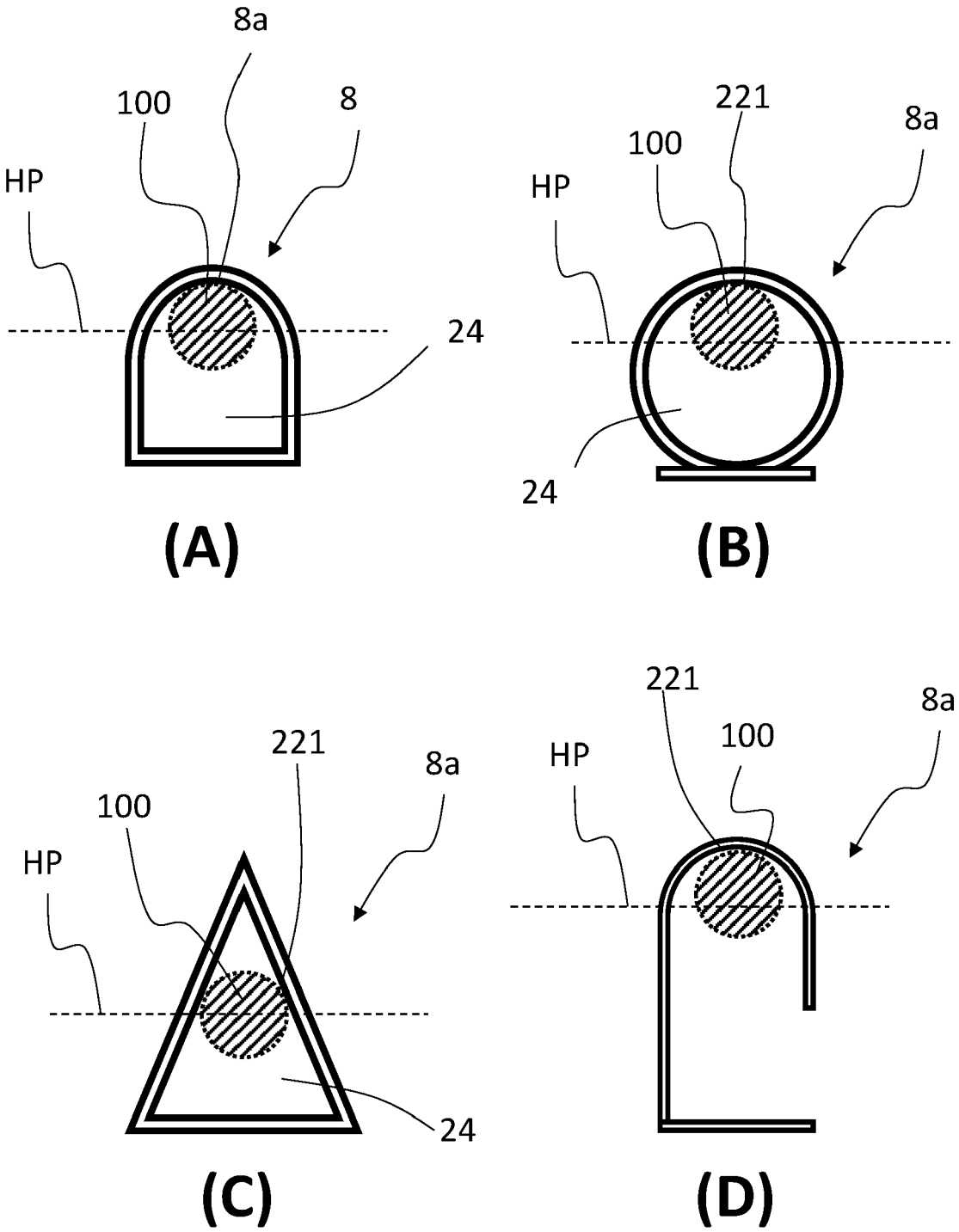

Fig. 5

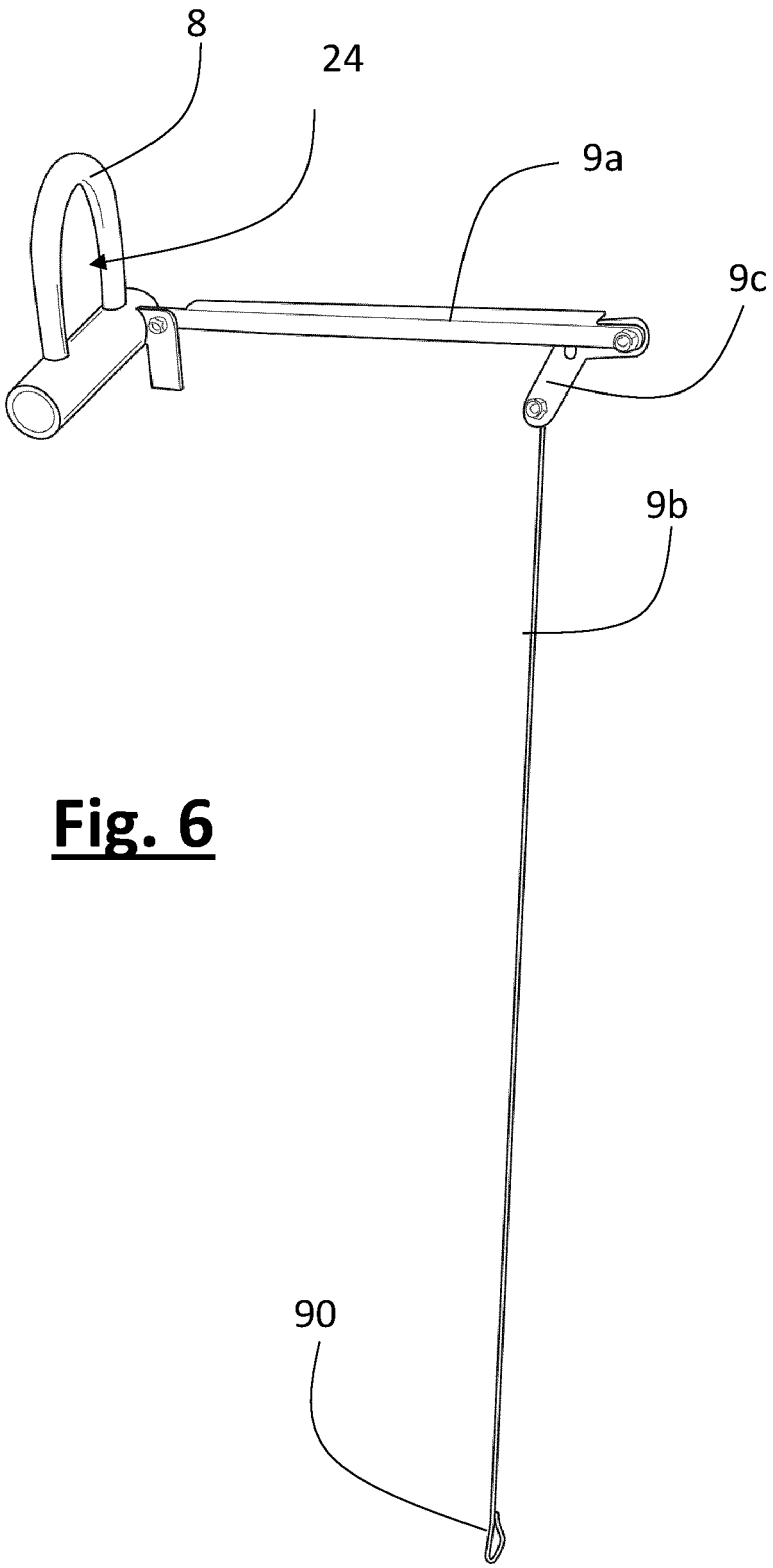

Fig. 6

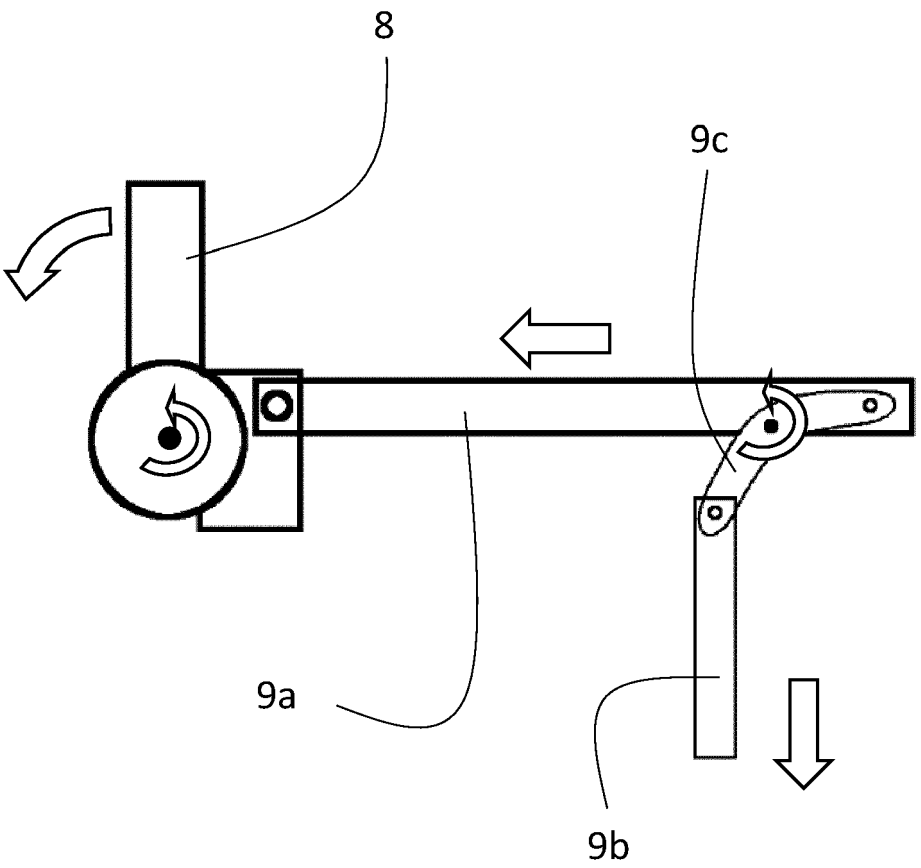

Fig. 7

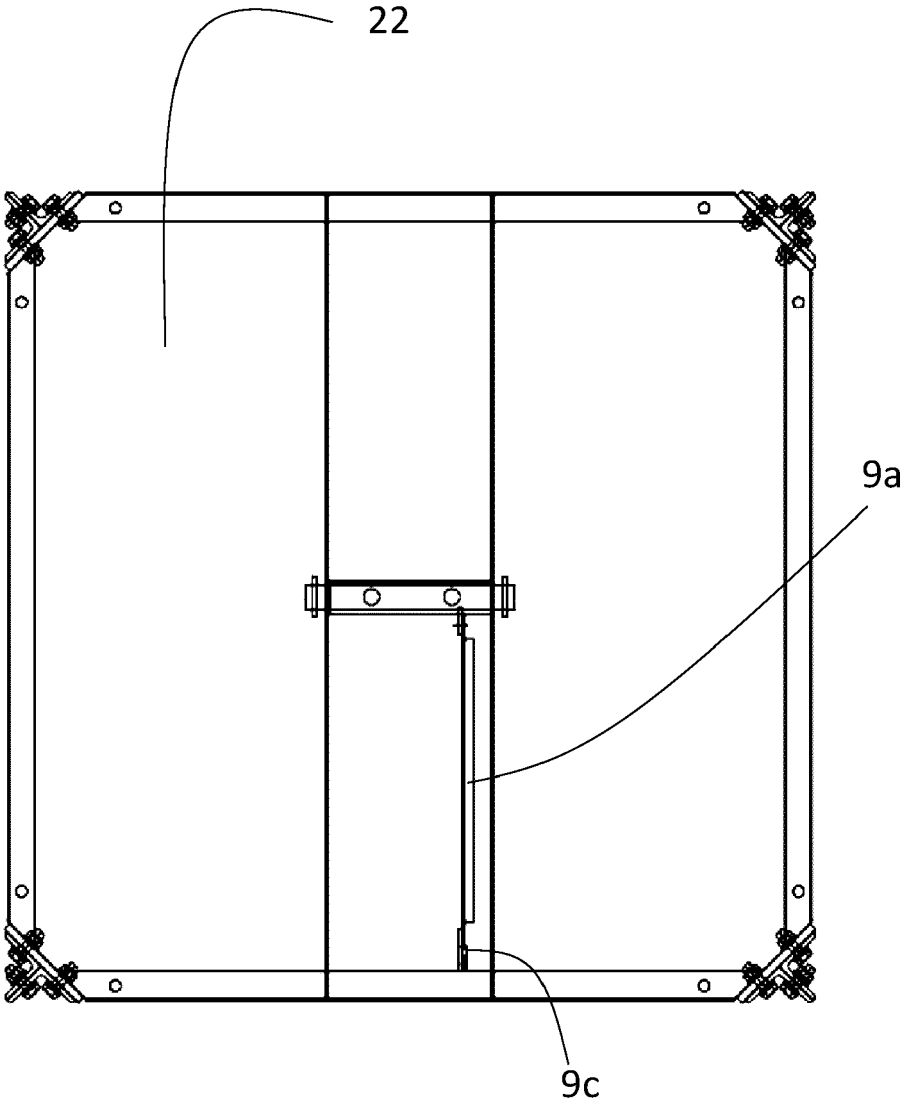

Fig. 8

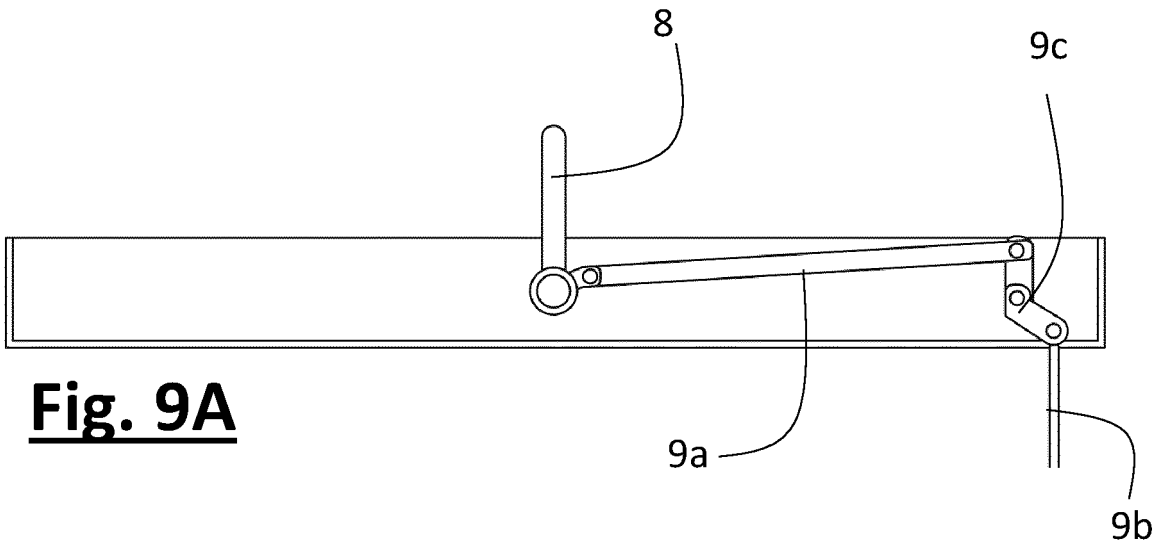

Fig. 9A

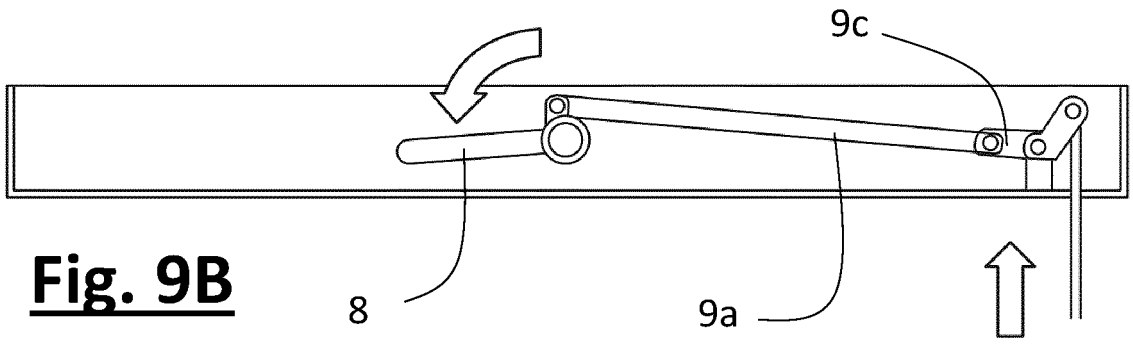

Fig. 9B

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EUROPEAN SEARCH REPORT

Application Number
EP 20 20 5007

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 A	US 10 677 391 B2 (AIR LIQUIDE [FR]) 9 June 2020 (2020-06-09) * column 5, line 1 - line 30; figures 1,6,7 *	1-4,6,8,9 5,7	INV. F17C13/00
A	US 9 752 726 B2 (L'AIR LIQUIDE SOCIÉTÉ ANONYME POUR L'ETUDE ET L'EXPLOITATION DES PROCÉ) 5 September 2017 (2017-09-05) * the whole document *	1-9	
A	EP 2 682 667 A2 (AIR LIQUIDE [FR]) 8 January 2014 (2014-01-08) * the whole document *	1-9	
A	GB 2 552 781 A (LINDE AKTIENGESELLSHCAFT [DE]) 14 February 2018 (2018-02-14) * the whole document *	1-9	
			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	14 April 2021	Forsberg, Peter

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 20 5007

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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14-04-2021

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 10677391 B2	09-06-2020	EP 3270035 A1	17-01-2018
		FR 3054019 A1	19-01-2018
		US 2018017215 A1	18-01-2018
US 9752726 B2	05-09-2017	CN 105020570 A	04-11-2015
		EP 2940372 A1	04-11-2015
		ES 2702276 T3	28-02-2019
		FR 3020442 A1	30-10-2015
		TR 201819038 T4	21-01-2019
		US 2015308620 A1	29-10-2015
EP 2682667 A2	08-01-2014	NONE	
GB 2552781 A	14-02-2018	NONE	

EPO FORM P0459

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