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(54) **A PRESSURISED GAS CYLINDER**

(57) A pressurised gas cylinder comprising a cylinder body and a valve assembly to control the gas flow into an out of the cylinder. The valve assembly comprises a low pressure line having a first shut off valve, an integrat-

ed regulator, a low pressure outlet and a residual pressure device. The valve assembly also has a high pressure line which has a second shut off valve, a high pressure outlet and a residual pressure device.

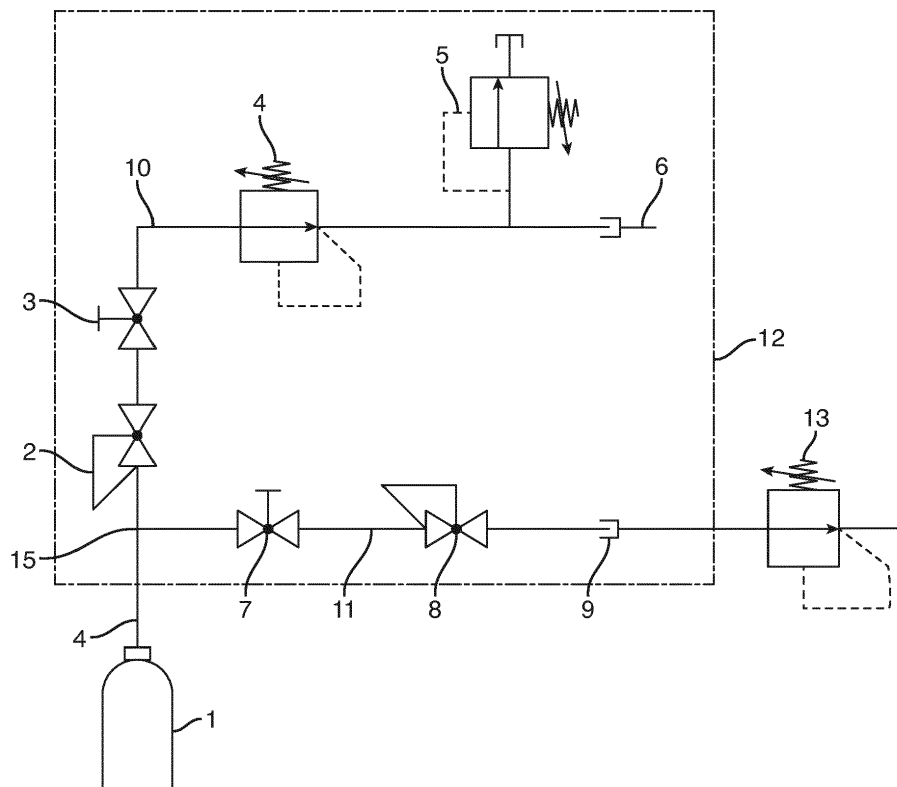


FIG. 1

Description

[0001] The present invention is a pressurised gas cylinder.

[0002] In particular, the present invention relates to a pressurised gas cylinder comprising a cylinder body and a valve assembly to control the flow of gas into and out of the cylinder body. The valve assembly comprises an integrated regulator. This is known in the art as a valve with an integrated pressure regulator (VIPR).

[0003] VIPR valves have been known for around 20 years and have proved popular because an end user does not need to attach a separate regulator. However, because VIPR valves have a relatively large number of components in the small space, they have limited outlet pressure and flow capabilities. A typical VIPR valve has a maximum outlet pressure of 10 bar and 500 litres per minute. These maximum pressure and flow limits are able to cover the majority of end user requirements, for example in industrial process and healthcare therapy applications. The compact arrangement can also lead to inaccuracies in the regulator.

[0004] However, there are end users that require a higher outlet flow or pressure that current VIPR valves are not able to achieve. An obvious solution to this problem is to scale up an existing VIPR valve. However, such an arrangement would become unnecessarily bulky and prohibitively expensive. In the meantime, however, for applications which require a higher flow capacity or greater regulator accuracy, a valve without an integrated pressure regulator is supplied such that the user can attach their own separate regulator to meet their flow requirements. This means, that a supply company must provide two different valves to the user.

[0005] According to the first aspect of the present invention, there is provided a pressurised gas cylinder according to claim 1.

[0006] The high pressure line is commonly used as a fill line in known VIPR devices. However, this has not been used as an outlet. But providing a residual pressure device on the high pressure line, the high pressure line can be reliably used as a high pressure outlet. This means that a relatively small change made to the device provides an end user with the possibility of using the low pressure line via the integrated regulator. If that does not meet their requirements, they will then have the option to use the high pressure line as the outlet.

[0007] According to a second aspect of the present invention there is provided an assembly according to claim 4.

[0008] The user has the possibility of using the low pressure line if the integrated regulator is able to meet their pressure and flow requirements. If it is not, they can attach a separate regulator to the high pressure port thereby allowing a higher flow rate to be achieved. In contrast to the prior art where a gas company has to provide two different valves to meet all of these requirements, all of this can be achieved from a single valve

assembly.

[0009] According to a third aspect of the present invention, there is provided a method of using a pressurised gas cylinder according to claim 5.

[0010] Again, this provides the benefits to the user of having the options of the high and low pressure outlets.

[0011] An example of a method, cylinder and assembly in accordance with the present invention will now be described with reference to the accompanying drawings in which:

Fig. 1 is a schematic view of the valve;

Fig. 2A is a cross-section of a residual pressure device in a closed configuration;

Fig. 2B is a cross-section of a residual pressure device in an open configuration.

[0012] The VIPR valve 12 is connected to a pressurised gas cylinder 1. Most of the features of the VIPR are conventional and will not be described in detail here. In particular, the VIPR 12 has a regulated (low) pressure line 10 and a high pressure line 11. The regulated pressure line 10 comprises a residual pressure device 2, a shut off valve 3, an integrated pressure regulator 4 and a pressure relief device (PRD) 5 leading to the regulated pressure outlet 6. Thus, in use, a user opens the shut off valve 3 whereupon the regulator 4 reduces the gas pressure from the cylinder outlet pressure to a regulated outlet pressure at outlet 6. The residual pressure device 2 ensures that a residual pressure is retained within the pressurised cylinder 1 to prevent the ingress of contaminants for example, moisture, debris and the like into the cylinder 1. It does this by closing off the internal gas passages in the discharging direction. Typically it comprises a spring loaded non-return valve element which will close when the pressure on the valve element drops below the biasing force of the spring. The pressure relief device 5 is a safety device to prevent over pressurisation of user equipment.

[0013] The high pressure line 11 includes a shut off valve 7, a second residual pressure device 8 and a high pressure port 9. In a conventional VIPR, there is no residual pressure device and the shut off valve is usually simply a non-return valve.

[0014] In order to fill the cylinder 1, the gas supplier connects the gas supply to the high pressure port 9. With the shut off valve 7 open and the shut off valve 3 closed, the cylinder is filled.

[0015] The improvement provided by the present invention resides in the dual use of the port 9. With the present invention, the port 9 can also be used as an outlet port. If the regulated pressure or flow rate available at the port 6 is insufficient for a user's requirements, they can connect an external regulator 13 to the high pressure port 9 as shown in Figure 1 and thereby obtain a higher pressure or flow rate.

[0016] The presence of the residual pressure device 8 ensures that a residual pressure is maintained within the

cylinder 1 to prevent the ingress of contamination as previously described.

[0017] The pair of residual pressure devices 2, 8 may be replaced by a single residual pressure device which is in a common line 14 upstream of a junction 15 between the regulated 10 and high 11 pressure lines.

[0018] The residual pressure device 2 is shown in greater detail with reference to Figs. 2A and 2B. The residual pressure device comprises a valve body 20 containing a shuttle 21 which is biased by a spring 22 bearing against a plug 23 onto a seat 24. A high pressure line 25 from the cylinder 1 leads to an inclined face 26 of the shuttle 21 in a space between two O-ring seals 27, 28. The spring force can hold the shuttle closed against the cylinder pressure and maintains a seal with the outlet. The O-ring 28 prevents gas leaking into the spring chamber. As the pressure in the high pressure line from the cylinder 1 increases, the inclined face 26 is exposed to higher pressure thereby increasing the force against the spring 22 and opening the shuttle 21 thereby opening up the flow path 30 shown in Fig. 2B in which gas from the cylinder can now flow through the residual pressure device.

[0019] Thus, the residual pressure device ensures that the pressure will be maintained in the high pressure line 25 and hence back to the cylinder even in the event of a loss of pressure downstream of the residual pressure device which would, in the absence of the residual pressure device, cause the pressure to be lost back to the cylinder.

Claims

1. A pressurised gas cylinder, the cylinder comprising a cylinder body and a valve assembly to control the gas flow into and out of the cylinder body; the valve assembly comprising a low pressure line comprising a first shut off valve, an integrated regulator, a low pressure outlet and a residual pressure device; and a high pressure line comprising a second shut off valve, a high pressure outlet and a residual pressure device.
2. A cylinder according to claim 1 wherein the residual pressure device for the low and high pressure lines is in a common line upstream (in the direction of outlet flow from the cylinder) of a junction where the common line splits into the low and high pressure lines.
3. A cylinder according to claim 1, wherein there is a first residual pressure device in the low pressure line and a second residual pressure device in the high pressure line.
4. A combination of a pressurised gas cylinder and a regulator; the pressurised gas cylinder comprising a

cylinder body and a valve assembly to control the gas flow into and out of the cylinder body; the valve assembly comprising a low pressure line comprising a first shut off valve, an integrated regulator and a low pressure outlet; and a high pressure line comprising a second shut off valve and a high pressure outlet; wherein the regulator has a high pressure inlet connectable to the high pressure outlet of the cylinder and to a regulated pressure outlet.

5. A method of using a pressurised gas cylinder, the cylinder comprising a cylinder body and a valve assembly to control the gas flow into and out of the cylinder body; the valve assembly comprising a low pressure line comprising a first shut off valve, an integrated regulator and a low pressure outlet; and a high pressure line comprising a second shut off valve, and a high pressure port; the method comprising using the high pressure port as an outlet for high pressured gas.
6. A method according to claim 5 wherein the step of using the high pressure port as the outlet comprises attaching a detachable regulator to the outlet port to obtain a regulated outlet flow.

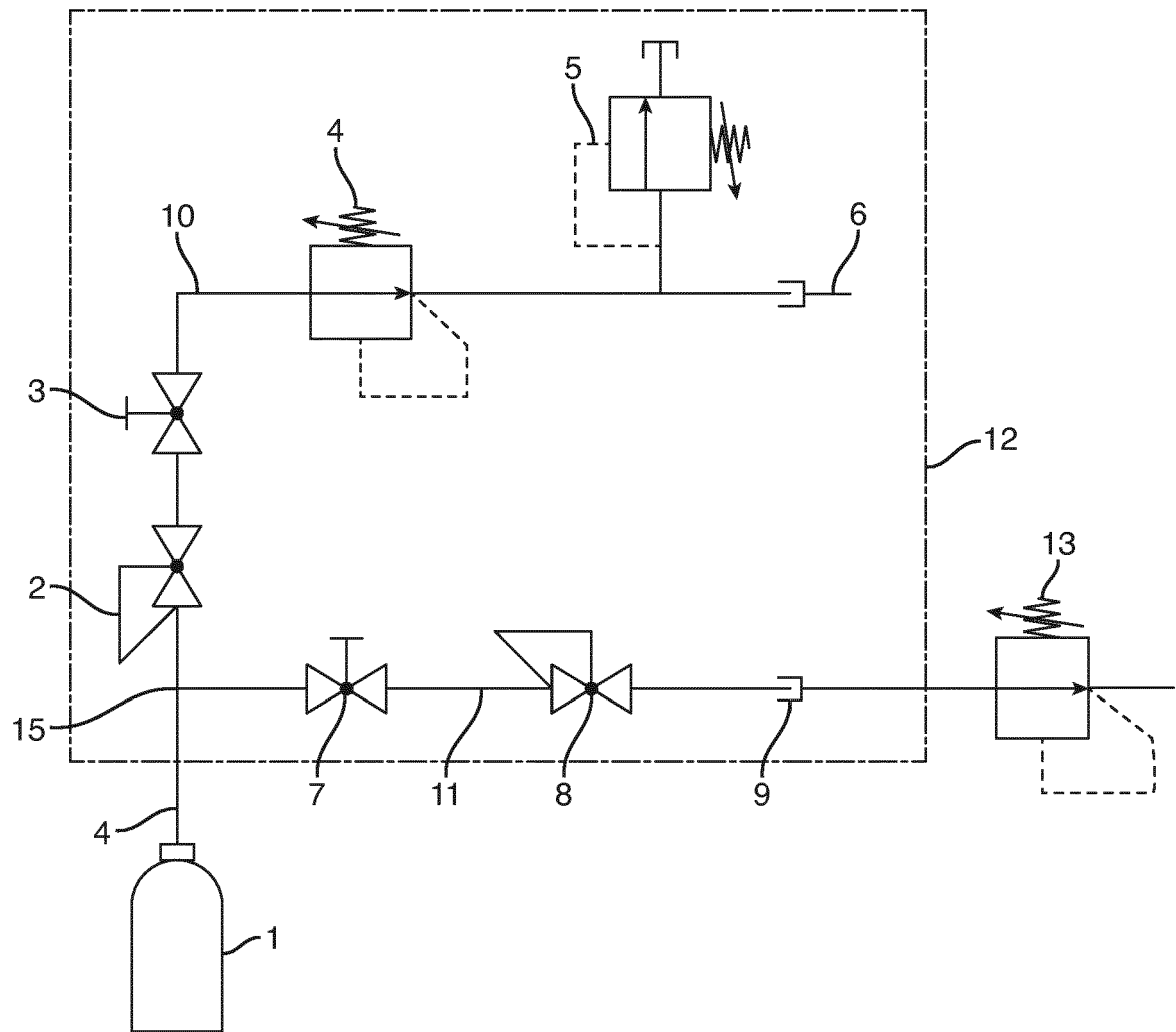


FIG. 1

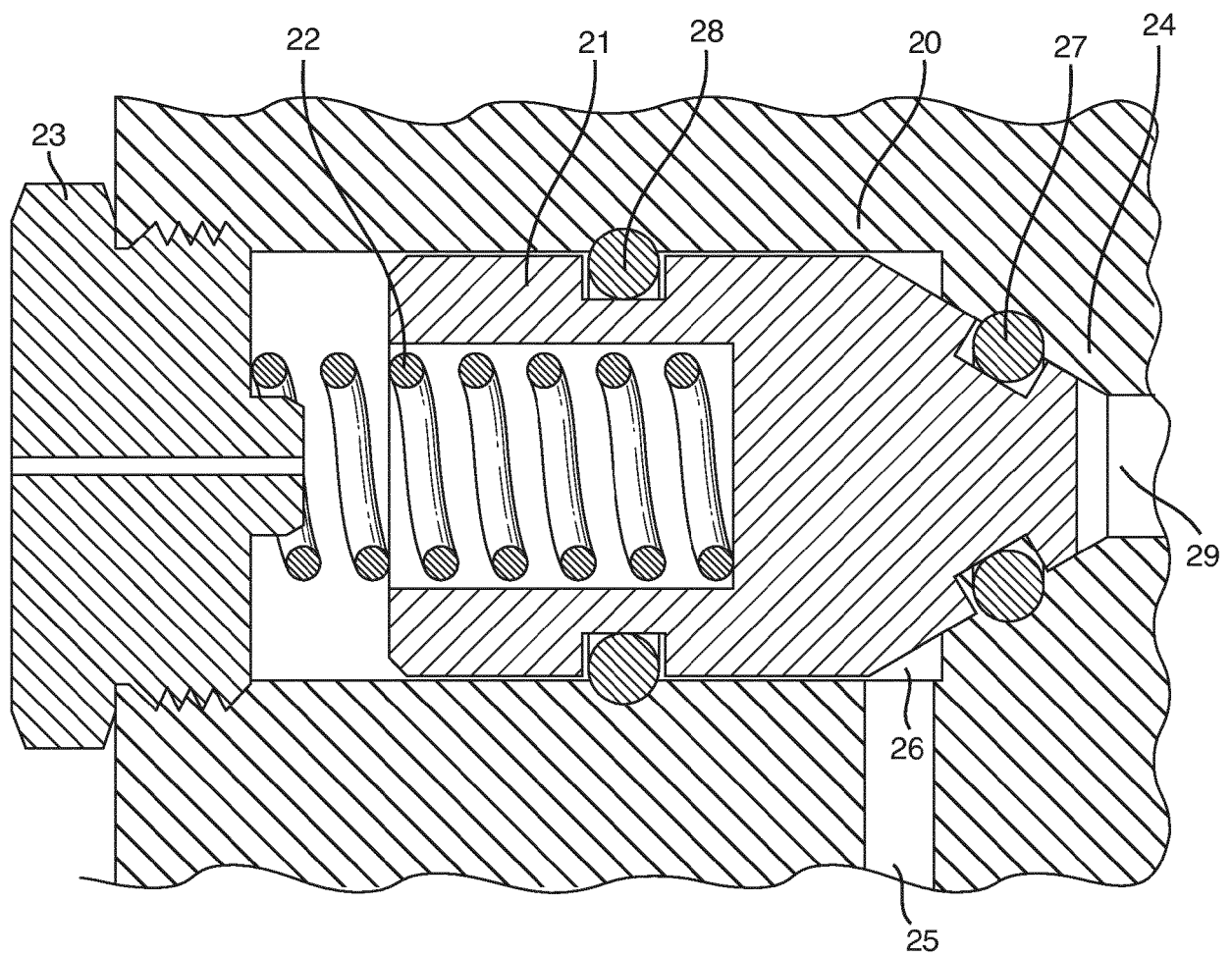


FIG. 2A

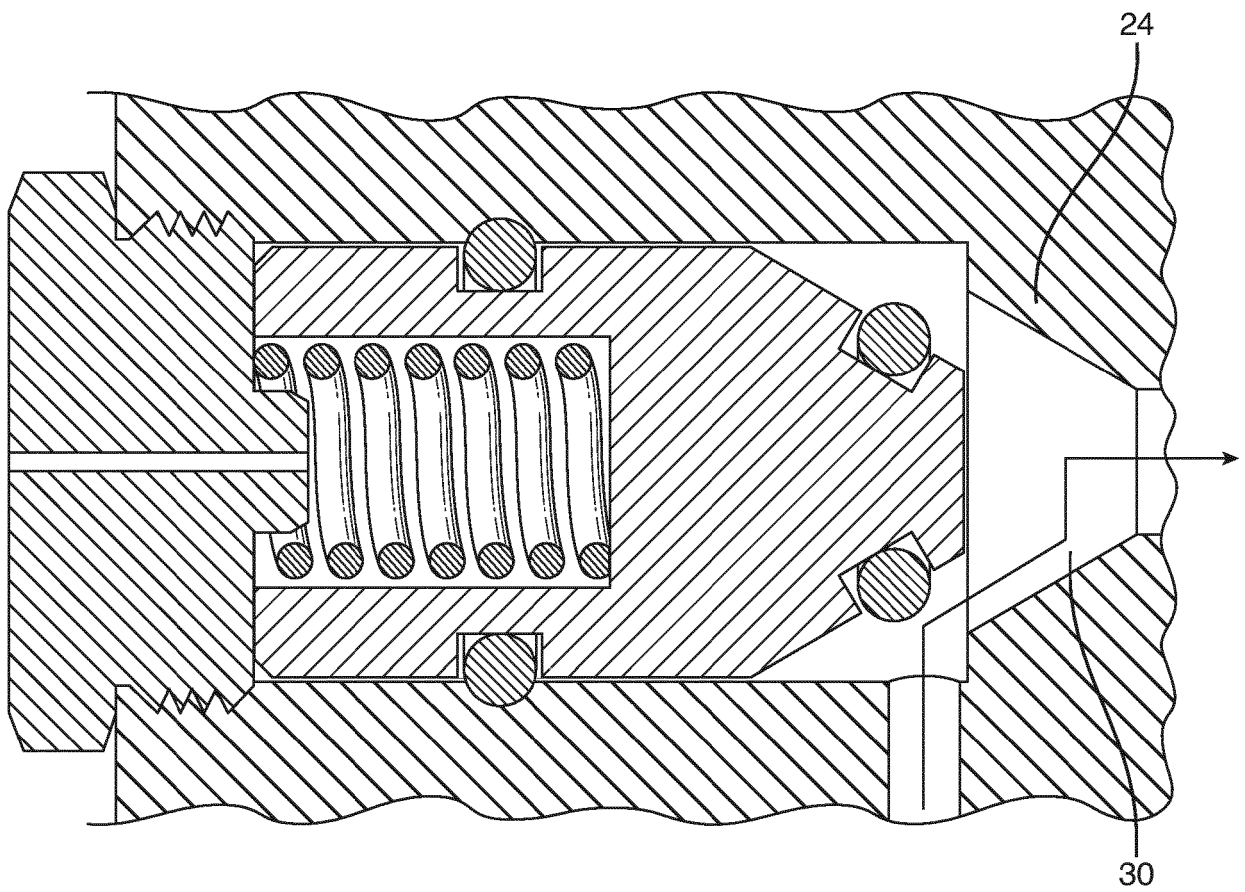


FIG. 2B



EUROPEAN SEARCH REPORT

Application Number
EP 17 18 4046

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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	EP 1 400 742 A1 (LUXEMBOURG PATENT CO [LU]) 24 March 2004 (2004-03-24)	1,2,4-6	INV. F17C13/04
Y	* figure 1 *	3	
Y	* paragraph [0039] - paragraph [0047] *		
Y	----- WO 03/054441 A1 (AIR LIQUIDE [FR]; BRUAT JOSYANE [FR]; L HEVEDER CLARISSE [FR]) 3 July 2003 (2003-07-03)	3	
A	* page 1 - page 3; figure 1 *	1,2,4-6	

			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 11 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 4046

5 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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11-09-2017

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