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PATENT SPECIFICATION 966,967

DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvements relating to Valves for Filling Reservoirs with Liquefied Gas.

We, LA NATIONALE S.A. a Corporation organised under the laws of Switzerland, of 2 rue des Falaises, Geneve, Switzerland, and RONSON CORPORATION, a Corporation organised under the laws of the State of New Jersey, United States of America, of 1 Ronson Road, Woodbridge, New Jersey, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement :—

This invention relates to valves for filling reservoirs with liquefied gas.

It is an object of the invention to provide a valve for filling a reservoir, such as in a smoker's lighter, with a liquefied gas, by means of a refill vessel having a connecting member or spout.

According to the present invention, there is provided a valve for filling a reservoir with liquefied gas supplied from a refill vessel having a spout, said valve being actuable by the spout of the refill vessel and having an inlet passage for the transmission of liquefied gas from the spout to the reservoir and an exhaust passage for placing the reservoir in communication with the atmosphere, wherein the valve comprises a fixed part and a movable part, and a sealing member which co-operates with the fixed and movable parts such that when the valve is closed the sealing member engages the fixed and movable parts to close the inlet and exhaust passages and when the valve is opened by application of the spout of the refill vessel to the movable part one passage is opened by the movement of the movable part relative to the sealing member and the other passage is opened by a movement of the sealing member relative to the fixed part.

[*Price* 4*s.* 6*d.*]

Embodiments of the invention will now be described, by way of example, with reference to the accompanying drawings in which :—

Figs. 1 and 2 are sectional elevations of a first form of a valve, in the closed and open position, respectively;

Figs. 3 and 4 and Figs. 5 and 6 also show in the closed and open position, respectively, two alternative forms of valve; and

Figs. 7 and 8 show two further forms of valve.

The valve described with reference to Figs. 1 and 2 comprises a fixed part made in two sections, 1 and 2. Sections 1 has a threaded portion 3 enabling the valve to be fixed into a corresponding threaded bore on a reservoir for liquefied gas so that the latter may be refilled. Fluid-tightness between the valve and the reservoir is ensured by a washer 4. The lower part of section 1 has on its outer wall an annular rib forming a lock for an internal annular shoulder 5 on section 2. Sections 1 and 2 are a force fit so as to constitute in effect a single part. The base of section 1 has a central aperture which is defined by an annular rib 6. A movable part 7 moves in this central aperture and is subject to the action of a compression spring 8 bearing, on the one hand, against a shoulder 9 on part 7 and, on the other hand, against base 10 of section 2. The movable part 7 has a blind longitudinal bore 11 terminating in a hollow needle 12 at one end and in a transverse bore 13 at the other end, the bores 11 and 13 and the needle 12 forming part of the inlet passage. The lower end of the movable part 7 is slidable in a hole 14 in the base 10.

The valve has a sealing member consisting of a washer 15 of a flexible resilient sub-

stance located in the interior of the fixed part and abutting with one of its faces against the annular rib 6, due to the pressure exerted on it by the shoulder 9. The washer 15 bears with its outer edge against section 2 and with its inner edge against the periphery of the movable part 7 where the transverse bore 13 opens. In the space between the annular rib 6 and the wall of section 2 is located a washer 16 of undulating shape, the function of which is to keep the washer 15 in place. This space is connected with the interior of the reservoir by an aperture 17 which forms part of the exhaust passage.

In the closed position of the valve as shown in Fig. 1, the sealing member, consisting of the washer 15, is compressed between the shoulder 9 of the part 7 and the annular rib 6 which prevents all connection between the interior of the reservoir and the exterior. Fig. 2 shows the valve in the open position, this opening being effected by a downwards displacement of the part 7 against the action of the spring 8 by reason of the force exerted by a spout or connecting piece 18 of a refill vessel. This spout comprises a so-called lozenge of a resilient substance 19 which is pierced by the hollow needle 12. Due to the displacement of the movable part 7, the washer 15 is deformed from its normal configuration by a shoulder 22 on the movable part and the upper face of the washer is separated from the annular rib 6 to effect opening of the aperture 17. Gas can thus exhaust or escape from the reservoir to atmosphere through aperture 17 and across the space defined by section 2 and the annular rib 6; this space is not completely closed as the washer 16 undulates. The gas can thereafter escape towards the exterior by virtue of clearance existing between the part 7 and the central aperture of the fixed section 1 which is defined by the annular rib 6, and by the clearance existing between the internal wall of section 1 and the spout 18 of the refill vessel.

Liquified gas under pressure contained in the refill vessel can reach the reservoir by flowing through the hollow needle 12, the bores 11 and 13 and the space defined by the lower portion of part 7 and the inner wall of section 2. It can be seen that this space is connected with the interior of the lighter by virtue of two orifices 20 and 21 which are formed in the bottom of section 2.

Thus, in operation of this valve, when the part 7 is displaced the exhaust passage opens by the removal of the upper face of washer 15 from the annular rib 6 and then the inlet passage opens by the deformation of the inner edge of the washer 15 uncovering the transverse bore 13.

When the reservoir is nearly full of liquefied gas, the gas escapes through aperture 17 and comes out in the form of droplets by way of the passage allowed between section 1 and the spout 18. The user is thus warned that the reservoir is full and he must withdraw the refill vessel which allows part 7 to return to the position shown in Fig. 1 under the action of the spring 8. The valve then closes again as does the refill vessel, the closing of the latter being ensured by the lozenge 19 which is compressed in such a manner that the hole made by the needle 12 closes on its own accord when the needle is removed.

Figs. 3 and 4 show a simpler embodiment in which the fixed part is in a single unit 1. This part has, as before, a threaded portion 3, a sealing washer 4 and an annular rib 6 defining a central aperture. Below this rib 6 is located a sealing member consisting of a washer 15 which is much thinner than washer 15 as shown in Figs. 1 and 2. The movable part of the valve consists of a rubber membrane 23 which is located on the side of the washer 15 remote from the face which is arranged to engage with the annular rib 6. The central portion of this membrane 23 is enlarged and bears against the washer 15 to close its central aperture which constitutes the inlet passage. The membrane 23 has a series of ports 24 disposed about the enlarged portion of the periphery which is circular in plan view and held in position by a rim 25 of part 1. In the upper section of Fig. 3 the end of the spout 18 of the refill vessel can be seen. This end is of the form shown to ensure the correct functioning of the valve. This spout 18 has a longitudinal bore 26 for the passage of liquid gas, this bore terminating at the end of the spout 18 where there are recesses 27. The spout 18 has two shoulders 28 and 29 increasing in diameter, the shoulder 29 being pierced by milled recesses 30. The spout itself does not carry any closure means and it is fixed on a refill vessel including a valve whose opening is governed by a displacement of the spout 18 in relation to the said vessel.

When the spout 18 is inserted into the valve its end bears against the enlarged portion of the membrane 23 while its shoulder 28 abuts the inner edge of the washer 15 so as to form a fluid-tight seal. The spout may be inserted in the central aperture until shoulder 29 abuts on an annular wall 31 which carries the rib 6. At this stage the washer 15 and the membrane 23 occupy the positions shown at Fig. 4 and when the valve on the refill vessel is open liquid gas can flow into the reservoir by way of bore 26, the milled recesses 27 and the inlet passage comprising the space between the washer 15 and the membrane 23 and the ports 24 in the membrane 23

while a part of the gas present in the reservoir may escape through the exhaust passage comprising the space between the washer 15 and the rib 6 and the aperture 17, then through the milled recesses 30 and finally through the space existing between the inner wall of the fixed part and the spout 18.

In the valve shown in Figs. 5 and 6 the fixed part 1 is tubular. The inner face of this fixed part has an annular groove 32 pierced by a radial bore 17 which emerges on the outer face of part 1. The sealing member comprises a rubber ring 15 circular in plan view which is located partly in this groove 32. The movable part 7 is located within the fixed part 1 and is urged by a spring 8 outwardly with respect to the reservoir. This movable part 7 has a shoulder 33 which, under the action of the spring 8, bears against the ring 15 to hold it firmly against the upper edge of the groove 32 and effect closure of the valve. The lower portion of part 1 is substantially the same as the lower part of section 2 in the member shown in Figs. 1 and 2, and it has two ports 20 and 21.

Fig. 6 shows the valve in the open position which is effected by displacing the movable part 7 through the action of the spout 18 of the refill vessel. As described with reference to Figs. 3 and 4, this spout has a longitudinal bore 26 and apertures 27 to allow the passage of liquid gas between the end of the spout 18 and the upper face of the movable part 7. The spout also has a shoulder 34 which bears against the ring 15 to move it against the lower edge of the groove 32. In this position the seal 15 acts as a stop member for the spout 18 and the blocking of this spout 18 may be used to open the valve on the refill vessel. It will be seen that in the position shown in Fig. 6 the compression of the ring 15 between the shoulder 34 of the spout 18 and the lower edge of the groove 32 separates in a fluid-tight manner the inlet passage formed by the apertures 27 and by the space between part 7, the ring 15 and part 1 and the exhaust passage formed by the radial bore 17, the space between the upper edge of the groove 32 and the ring 15, and the space between the spout 18 and the inner wall of the fixed part 1.

Fig. 7 shows an embodiment which is similar to that shown in Figs. 3 and 4. In this embodiment, the membrane (23) is replaced by a metal valve-closure member 35 subject to the action of a spring 8 and which constitutes the movable part of the valve. The closure member bears against the lower face of the washer 15 which is the sealing member. As in the embodiment in Figs. 3 and 4, the upper face of the washer 15 co-operates with the annular rib 6 to close the exhaust passage which also includes a bore 17. The fixed part is made in two sections 1 and 2 as shown in Figs. 1 and 2.

Referring now to Fig. 8 the movable part consists of a tubular member 36 capable of sliding freely in an aperture 37 on the fixed part 1. Stop means which consist of an exterior annular shoulder on the tubular member 36 and a corresponding shoulder on the recess 37. limit replacement of the movable part 36 outwardly relative to the reservoir. The inner end of the aperture 37 is surrounded by an annular rib 6 against which abuts a membrane 38 of a flexible resilient substance which constitutes the sealing member. This membrane has a series of ports 39 which are formed opposite an annular groove 40 formed in that end of the tubular member 36 which points towards the interior of the reservoir.

In the closed position of the valve, as shown in Fig. 8, the membrane 38 is pressed against the annular rib 6 and against the lower edge of the tubular member 36 by the pressure obtaining in the interior of the reservoir. The valve is opened by the insertion of spout 18 into the central aperture of the member 36. This spout is shown in the upper part of Fig. 8 and has, as in the embodiments shown in Figs. 3 and 6, a longitudinal bore 26 and apertures 27 formed on its far end to avoid the bore 26 being closed up by the membrane 38. The spout 18 has also a shoulder 29 which bears against the bottom of part 1 on the one hand and against the upper edge of the member 36 on the other. The shoulder 29 is formed with an aperture 30. When the spout is applied to the valve it moves the membrane 38 away from contact with the inner edge of the groove 40 while moving member 36 downwards so that the outer edge of the groove 40 moves the membrane 38 away from the annular rib 6. In this position the valve has two separate passages for inlet and exhaust; the inlet passage is formed by the central aperture of the member 36, the space between the inner edge of groove 40 and the membrane 38, and the ports 39 in the membrane 38. The exhaust passage is formed by a radial bore 17 terminating in the annular space surrounding the rib 6, the space between this rib and the membrane 38, and the space between the member 36 and the aperture 37 of the fixed part 1 and the milled aperture 30. These two passages are separated from each other by a zone of contact between the outer edge of the groove 40 in the member 36 and the membrane 38.

WHAT WE CLAIM IS:—

1. A valve for filling a reservoir with liquefied gas supplied from a refill vessel

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displacement

while a part of the gas present in the reservoir may escape through the exhaust passage comprising the space between the washer 15 and the rib 6 and the aperture 17, then through the milled recesses 30 and finally through the space existing between the inner wall of the fixed part and the spout 18.

In the valve shown in Figs. 5 and 6 the fixed part 1 is tubular. The inner face of this fixed part has an annular groove 32 pierced by a radial bore 17 which emerges on the outer face of part 1. The sealing member comprises a rubber ring 15 circular in plan view which is located partly in this groove 32. The movable part 7 is located within the fixed part 1 and is urged by a spring 8 outwardly with respect to the reservoir. This movable part 7 has a shoulder 33 which, under the action of the spring 8, bears against the ring 15 to hold it firmly against the upper edge of the groove 32 and effect closure of the valve. The lower portion of part 1 is substantially the same as the lower part of section 2 in the member shown in Figs. 1 and 2, and it has two ports 20 and 21.

Fig. 6 shows the valve in the open position which is effected by displacing the movable part 7 through the action of the spout 18 of the refill vessel. As described with reference to Figs. 3 and 4, this spout has a longitudinal bore 26 and apertures 27 to allow the passage of liquid gas between the end of the spout 18 and the upper face of the movable part 7. The spout also has a shoulder 34 which bears against the ring 15 to move it against the lower edge of the groove 32. In this position the seal 15 acts as a stop member for the spout 18 and the blocking of this spout 18 may be used to open the valve on the refill vessel. It will be seen that in the position shown in Fig. 6 the compression of the ring 15 between the shoulder 34 of the spout 18 and the lower edge of the groove 32 separates in a fluid-tight manner the inlet passage formed by the apertures 27 and by the space between part 7, the ring 15 and part 1 and the exhaust passage formed by the radial bore 17, the space between the upper edge of the groove 32 and the ring 15, and the space between the spout 18 and the inner wall of the fixed part 1.

Fig. 7 shows an embodiment which is similar to that shown in Figs. 3 and 4. In this embodiment, the membrane (23) is replaced by a metal valve-closure member 35 subject to the action of a spring 8 and which constitutes the movable part of the valve. The closure member bears against the lower face of the washer 15 which is the sealing member. As in the embodiment in Figs. 3 and 4, the upper face of the washer 15 co-operates with the annular rib 6 to close the exhaust passage which also includes a bore 17. The fixed part is made in two sections 1 and 2 as shown in Figs. 1 and 2.

Referring now to Fig. 8 the movable part consists of a tubular member 36 capable of sliding freely in an aperture 37 on the fixed part 1. Stop means which consist of an exterior annular shoulder on the tubular member 36 and a corresponding shoulder on the recess 37. limit replacement of the movable part 36 outwardly relative to the reservoir. The inner end of the aperture 37 is surrounded by an annular rib 6 against which abuts a membrane 38 of a flexible resilient substance which constitutes the sealing member. This membrane has a series of ports 39 which are formed opposite an annular groove 40 formed in that end of the tubular member 36 which points towards the interior of the reservoir.

In the closed position of the valve, as shown in Fig. 8, the membrane 38 is pressed against the annular rib 6 and against the lower edge of the tubular member 36 by the pressure obtaining in the interior of the reservoir. The valve is opened by the insertion of spout 18 into the central aperture of the member 36. This spout is shown in the upper part of Fig. 8 and has, as in the embodiments shown in Figs. 3 and 6, a longitudinal bore 26 and apertures 27 formed on its far end to avoid the bore 26 being closed up by the membrane 38. The spout 18 has also a shoulder 29 which bears against the bottom of part 1 on the one hand and against the upper edge of the member 36 on the other. The shoulder 29 is formed with an aperture 30. When the spout is applied to the valve it moves the membrane 38 away from contact with the inner edge of the groove 40 while moving member 36 downwards so that the outer edge of the groove 40 moves the membrane 38 away from the annular rib 6. In this position the valve has two separate passages for inlet and exhaust; the inlet passage is formed by the central aperture of the member 36, the space between the inner edge of groove 40 and the membrane 38, and the ports 39 in the membrane 38. The exhaust passage is formed by a radial bore 17 terminating in the annular space surrounding the rib 6, the space between this rib and the membrane 38, and the space between the member 36 and the aperture 37 of the fixed part 1 and the milled aperture 30. These two passages are separated from each other by a zone of contact between the outer edge of the groove 40 in the member 36 and the membrane 38.

displacement

WHAT WE CLAIM IS:—

1. A valve for filling a reservoir with liquefied gas supplied from a refill vessel

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having a spout, said valve being actuable by the spout of the refill vessel and having an inlet passage for the transmission of liquefied gas from the spout to the reservoir and an exhaust passage for placing the reservoir in communication with the atmosphere, wherein the valve comprises a fixed part and a movable part, and a sealing member which co-operates with the fixed and movable parts such that when the valve is closed the sealing member engages the fixed and movable parts to close the inlet ad exhaust passages and when the valve is opened by application of the spout of the refill vessel to the movable part one passage is opened by the movement of the movable part relative to the sealing member and the other passage is opened by a movement of the sealing member relative to the fixed part.

2. A valve according to Claim 1, in which, in the open position of the valve, the sealing member acts as a wall to separate the inlet passage from the exhaust passage.

3. A valve according to Claim 1 or Claim 2, in which the opening of the passages is effected by a deformation of the sealing member from its normal configuration.

4. A valve according to any preceding claim, in which the opening of one passage is effected by a displacement of part or all of the sealing member relative to the fixed part.

5. A valve according to any preceding claim, in which the fixed part is tubular in shape and the sealing member is formed by an apertured washer of flexible and resilient material located in the fixed part and normally bearing with one if its faces against an annular rib on the fixed part to effect closure of the exhaust passage.

6. A valve as claimed in Claim 5, wherein the exhaust passage includes a bore formed in the fixed part and communicating with a space between the washer and the annular rib.

7. A valve according to Claim 5 or Claim 6, in which the annular rib defines a central orifice in the fixed part.

8. A valve according to any of Claims 5 to 7, in which the movable part is biased by spring means to the closed position in which it engages the other face of the washer.

9. A valve according to any of Claims 5 to 8, in which the movable part is located wholly on the side of the washer remote from the face which engages the annular rib and normally engages the washer to close the aperture therein.

10. A valve according to Claim 9, in which the movable part consists of a resilient membrane.

11. A valve according to any of Claims 5 to 8, in which the movable part extends through the aperture in the washer in fluid-tight engagement therewith and is formed with a blind longitudinal bore which opens at the outer end thereof and with a communicating transverse bore the opening of which is so positioned as normally to be sealed by the washer, the said bores forming part of the inlet passage and the said outer end being adapted for connection with the spout of the refill vessel, and in which the movable part is formed with means which engage that face of the washer which engages the annular rib such that when the movable part is displaced to open the valve the washer is deformed so that on the one hand it moves away from the rib to open the exhaust passage and on the other hand it moves away from the opening of the transverse bore to open the inlet passage.

12. A valve according to Claims 1, 2 and 4, in which the fixed part is of tubular shape and is formed internally with an annular groove and with a bore opening into the groove which forms part of the exhaust passage, the sealing member is of annular shape and is located partly in the groove, and the movable part, located within the fixed part, is biased by means of a spring so as to engage the sealing member and to hold it against a side wall of the groove whereby to close both the inlet and the exhaust passages.

13. A valve according to Claim 12, in which the sealing member is arranged in part in the path of the spout such that when the spout of the refill vessel is applied to the movable part to move it against the action of the spring away from the sealing member whereby to open the inlet passage, the spout moves the sealing member so that it engages the other side wall of the groove whereby to open the exhaust passage.

14. A valve according to any of Claims 1 to 4, in which the fixed part is tubular and the movable part is a tubular member loosely slidable in a bore of the fixed part, and having stop members arranged thereon to limit movement of the movable part outwardly with respect to the reservoir, the end of the said bore nearer the reservoir being surrounded by an annular rib against which a flexible resilient membrane which constitutes the sealing member is arranged to bear to effect closure of the exhaust passage, one end of the tubular movable part contacting the membrane to close the inlet passage which is constituted in part by a number of ports in the membrane located opposite an annular groove provided in the edge of said end of the tubular movable part.

15. A valve for filling a reservoir with gas, by means of a refill vessel having a spout, constructed, arranged and adapted to

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operate substantially as hereinbefore described with reference to Figs. 1 and 2, Figs. 3 and 4, Figs. 5 and 6, Fig. 7 or Fig. 8 of the accompanying drawings.

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