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COMPLETE SPECIFICATION.

Valve Construction.

We, YOSHINAGA PRINCE KABUSHIKI KAISHA, a Corporation of Japan, located at No. 1, 1-chome, Asakusabashi, Taito-ku, Tokyo, Japan, 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 improvements in and relating to a valve construction which, among other possible uses, is particularly adapted for filling the reservoir of pyrophoric lighters such as are used for lighting cigars or cigarettes with gaseous fuel such as butane, propane and other liquefied petroleum gases.

When filling pyrophoric gas lighters with low boiling point liquefied gases, difficulty has been experienced in filling the lighter to the brim of its reservoir, as desired, due to the presence of some residual gas of the fuel within the reservoir. This gaseous residue of fuel trapped in a relatively small tank or reservoir creates a pressure which tends to force the injecting liquid fuel out of the reservoir of the lighter. To eliminate this tendency, many means and devices have hitherto been suggested for accomplishing the full and complete filling of liquefied gas lighter.

In some known devices there is provided a small hole in the filling valve for discharging the gaseous portion of the fuel produced on entering the reservoir to atmosphere. The filling valve of such conventional structure is intended to effect the filling of fuel to a desired volume in a relatively short length of time. The drawback inherent in this type of valve construction is that the size of the discharging hole is restricted by the valve

member for sufficient outlet of the unwanted gaseous fluid and hence the prompt filling of desired liquid fuel is impeded.

Ideally, the hole for expelling gas during fueling the lighter is such that it has a cross-sectional area substantially proportional to the capacity of a given lighter reservoir so that the gasified portion of the fuel in the reservoir is discharged within fractions of a second. When drilling a hole in a valve member, there is encountered another difficulty in positioning the hole in the limited area of the valve without affecting valve operation.

According to the invention, a valve for fueling a pyrophoric lighter (including a reservoir for containing compressed gas), with liquefied gas at its normal pressure, comprises two parts, movable relative to one another, the first part being mounted on the reservoir, and the second part being a valve plunger having a substantially axial passage which is normally rendered closed by force of a spring and is arranged to be opened when the plunger is pushed by a filling container containing the liquefied gas against the action of the spring, and a porous lining adapted to clog the space between the said two parts of the valve, the porous lining being such that, when said reservoir is being fueled, the air or gas in the reservoir can escape through said porous lining but leakage of the fuel in liquid form therethrough is substantially prevented.

The idea underlying the present invention is that a filling valve is provided of such construction that, when a filling container containing liquefied gas is engaged with the filling valve, a by-pass is formed through which the gasified fuel or air from the reservoir can discharge to atmosphere,

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but which permits scarcely any leakage of the fuel in liquid form. In this way, it will be possible to completely fuel the reservoir with the liquefied gas at its normal pressure at any time, i.e. even when the reservoir is filled with residual gas.

In one preferred form of the invention, the filling valve for this purpose is provided with a member which, when the filling container is engaged therewith, allows gas to escape, but which member has a very great resistance to the leakage of the fuel in liquid form. The filling valve has also a valve plunger which is urged by a spring toward a valve seat so as to close the valve opening. When a filling container is engaged with the valve, the plunger is pushed away against the action of the spring to open the valve opening making a passage for the fuel supply and, simultaneously, a by-pass for discharge of the residual gas or air to atmosphere.

The primary object of the present invention is to provide an improved gas lighter filling device for fueling the reservoir of the lighter with liquefied gas while removing the unwanted gasified portion thereof quickly and effectively, for which purpose a by-pass is provided permitting scarcely any leakage of the fuel in liquid form.

Another object of the present invention is to provide an improved gas lighter filling device for fueling the reservoir of the lighter with liquefied gas while removing the unwanted gasified portion thereof quickly and effectively, for which purpose a plurality of pores having a total cross-sectional area larger than that of a conventional discharging hole are used.

Another object of the invention is to provide valve means for filling a pyrophoric lighter with a liquefied gas fuel, said valve means having directly coupled to its base a cylindrical member of a sintered porous metal or unglazed material which is covered with a synthetic resin except where dissipation of the unwanted gas is desired.

A further object of the invention is to provide valve means for fueling a gas lighter which is provided with a cylinder of sintered metal or unglazed material comprising a gas-passing section for discharge of gas and an air-tight section covered with a suitable lining.

Yet another object of the invention is to provide a filling valve for pyrophoric lighters for liquefied gas fuel having a cylinder of sintered metal or unglazed and porous material which is covered with a partially recessed metal cylinder connected to the valve base.

Sintered metals to serve the purpose may be obtained from the usual metal-

lurgical powder which is formed by pressure into a cylinder, as desired, and thereafter heated, to produce resultant fine pores interlinked between sintered metal particles. Porosity in the cylinder depends upon the size and density of metal particles and forming pressure applied. These factors will determine whether or not the size of the pores is large enough to permit passage of not only air but also of liquid.

In accordance with the invention, the porosity should preferably be such as to exclusively permit flow of gas, and the material used to blank off the porosity may be vinyl chloride, polyethylene or the like having a suitable viscosity when molten.

Other and more specific features of the invention will be apparent from the following detailed description taken in conjunction with the accompanying drawings which form a part of this Specification and illustrate, by way of example, a preferred embodiment of the invention.

In the drawings:—

Fig. 1 is a vertical sectional view of a filling valve means embodying the invention in one of its forms, shown in the closed position;

Fig. 2 is a vertical sectional view of the valve in the open position, illustrating in which manner the neck of a filling container is engaged in the valve;

Fig. 3 is a sectional view of a modified form of the valve, in the open position;

Fig. 4 is a vertical sectional view of another modified form of the valve, in the open position;

Fig. 5 is a cross-sectional view of a segment of the material of the sintered metal cylinder used in the valve of Fig. 4, illustrating the gas passing section and the blanked off section, respectively;

Fig. 6 is a vertical sectional view of a filling valve assembly embodying the invention in another form, shown in the open position, with a filling container engaged therein;

Fig. 7 is a perspective view of a cylinder of sintered metal or unglazed material covered at the circumference with a partially recessed metal cylinder which is used in the valve construction shown in Fig. 6; and

Fig. 8 is a perspective view of a cylinder of sintered metal or unglazed material, a portion of which being cut away to show the interior which is lined except at the position where the unwanted gas is released.

Referring now to the drawings, Figs. 1 and 2, the wall of the reservoir of the lighter is indicated by 10. The filling valve comprises two parts 11 and 12 movable one relatively to the other. The first or

fixed part 11 is secured to the wall 10 and is formed by a body including cylindrical walls and having, on its upper portion, a recess 13, a centre bore 14, a neck 15 beneath said bore, which bore contains a vertical and loosely fitting movable valve plunger 12, and having, on its lower portion, a recess 16.

The valve plunger 12 is bored axially to provide a fuel passage 17. Said plunger 12 has, at its upper portion, a flange-like part 18 of larger diameter than the plunger, and a hollow needle 19 fixed thereto. This flanged portion 18 bears against one of the ends of a coiled spring 20 positioned in the central bore 14 of the cylindrical part 11, and the other end of the spring rests against an upper circular surface 21 of the neck part 15 of said cylindrical part 11.

The lower end of said plunger 12 is screwed into a guide block 22 in the recess 16, which is adapted to position the plunger 12 in the fixed part 11. Embedded into the upper surface of the guide block 22 is a circular fluidtight packing 23, preferably consisting of a rubber washer, which abuts to a valve seat 24 under the neck part 15 of the fixed cylindrical part 11. Said packing prevents any leakage of the gas and liquid.

For effecting the discharge of the expanded gas or air remaining in the reservoir or gas expanding in the reservoir during fueling, which gas is part of liquefied gas fuel supplied from a filling container 25, the filling valve of the invention is provided with a circular lining 26 located on a shoulder 27 of the fixed part 11 beneath the flanged portion 18 of the plunger 12. This lining 26 is made of porous materials such as sintered metals having very fine meshes (though it is not limited thereto, and non-woven fabrics or coated synthetic resins can be used for the lining 26). A ring of porous ceramic or porous metals may also be used. Such porous materials have fine interconnected pores distributed therethrough thereby providing a multitude of fine tortuous passages through which the gas may flow through the lining 26 up into the opening to atmosphere.

In Fig. 2 the filling container 25 is shown in engagement with the valve, the closing plug 28 of the filling container 25 being pierced by the hollow needle 19 fixed to the valve plunger 12, by pushing down the filling container 25. The valve plunger 12 will be lowered against the force of spring 20, and the fluidtight packing 23 forced away from the valve seat 24. The liquefied gas stored in the container 25 can pass through the needle, the bored fuel passage 17 of the plunger 12, the recess 16,

a free space 29 between the inner wall of a fixed part 11¹ and the guide block 22, and an open end 30 of the fixed part 11¹ for entering the reservoir of the lighter.

Upon separating the packing 23 from said seat 24, the remaining gas or air and the above mentioned expanded gas can escape to atmosphere through the open end 30, the free space 29, the recess 16, the annular passage 31 between the plunger 12 and the neck part 15, the centre bore 14, the lining 26 made of porous material, and the recess 13. At this time, the flanged portion 18 of the plunger 12 abuts to and presses the lining 26, where the compressed lining 26 satisfactorily prevents the leakage of the fuel in liquid form, but allows the gas or air to escape to atmosphere.

According to the preferred embodiments of the invention, the gas partly expanded in the recess, which is supplied from the container 25, at the time of charging the liquefied fuel as well as the remaining gas or air can be discharged to atmosphere quickly in the above-mentioned manner. When the liquefied gas fuel supplied from the container 25 enters into the reservoir through said entering passages thereof, the remaining gas or air and/or non-liquefied gas in the reservoir which create a pressure to prevent complete filling, can be discharged to atmosphere in gaseous form through said escaping passages thereof. It is thus possible to supply liquefied gas to the reservoir of the lighter with ease until the reservoir is essentially full thereof.

The second form of construction of filling valve shown in Fig. 3 is similar to the first and only differs therefrom by the fact that the spring 20a of this second valve construction is lodged under the guide block 22a having side slits 31. Consequently one of the ends of the spring 20a rests against a spring seat 32 screwed onto the lower end of the fixed part 11a of the filling valve secured to the wall 10a of the lighter, which seat having a centre hole 33 communicating with the reservoir.

In this second form, there is also shown an example of a ring-type lining 34 located on a shoulder 27a of the fixed part 11a, using a porous metal. In this case, it will be necessary to interpose a shock absorber ring 35 made of a rubber-like material between the porous metal 34 and the flanged hard portion 18a of the plunger 12a, in order to protect said metal 34.

In Fig. 3 the filling container 25 is shown in engagement with the valve, the closing plug 28 of the filling container 25 being pierced by the hollow needle 19a fixed to the flanged portion 18a of the valve plunger 12a, by pushing down the filling container 25. The valve plunger 12a will be lowered against the force of spring 20a and the

fluidtight packing 23a forced away from the valve seat 24a. The liquefied gas stored in the container can pass through the needle 19a, the bored fuel passage 17a of the plunger 12a, the recess 16a, the free space 29a between the inner wall of the fixed part 11a and the guide block 22a, the side slits 31 thereof, a recess 36 in which said spring 20a is located, and the centre hole 33 for entering the reservoir. Simultaneously the remaining gas or air and/or the above mentioned expanded gas in gaseous form can be discharged to atmosphere through said centre hole 33, said recess 36, said side slits 31, said free space 29a said recess 16a, the annular passage 31a between the plunger 12a and the neck part 15a, the porous metal lining 34 and the recess 13a.

Reference to Fig. 4 shows the reservoir of the lighter surrounded by a wall 110. The filling valve comprises two parts 111 and 112, the one being secured to the wall 110 of the reservoir and formed integrally with a cylindrical wall, as shown, and the other being positioned in the centre of the valve and movable vertically through a centre bore 114 in the cylindrical wall. This wall member 111 contains, in its upper portion, a recess 113, a centre bore 114 and a neck 115 beneath said bore and has mounted in its lower portion a cylinder 118 of sintered metal divided into a gas-passing section 116 not treated with synthetic resin and an air-tight section 117, respectively. The movable part or plunger 112 is provided at its upper portion with a disc member 120 and a hollow needle 121 fixed thereto. The disc member or flange 120 bears against one end of a coil spring 122 inserted in the centre bore 114 of the cylindrical member 111, while the other end of the spring bears against the upper circular surface 123 of the neck part 115 in the wall 111.

The lower end of the plunger 112 is screwed into a guide block 124 in the sintered metal cylinder 118 which is adapted to position the plunger with respect to the fixed wall member 111. A circular fluid-tight packing 125 is embedded in the upper face of the guide block 124. This packing preferably comprises a rubber washer which abuts the valve seat 126 underlying the neck 115 of the fixed cylindrical wall 111. The packing 125 is adapted to prevent possible leakage of gas or liquid of the fuel.

The sintered metal cylinder 118 connected to the lower end of the cylindrical wall 111 and enclosing the guide block 124 is schematically illustrated in Fig. 5. The section designated at 117 is formed fluid-tight with a synthetic resin *b* which is impregnated in between metal particles *a*.

The other section 116 not treated with synthetic resin consisting of a number of fine pores *c* distributed between metal particles *a* provides a multitude of passages for flow of gas. It is to be noted that aggregated cross-sectional area of these pores is greater than the cross-sectional area of the gas outlet hole of a conventional filler valve. Any gaseous portion of fuel introduced into the reservoir of the lighter can be readily removed by dissipation through the porous section 116 of the metal cylinder 118.

Referring to Fig. 4, a fuel bottle or filling container 127 is shown as engaged with the valve, the plug member 128 of the container being pierced through by the hollow needle 121 fixed to the valve plunger 112. The fuel bottle or filling container 127 is pushed into engagement with the filling valve in the usual manner, when the valve plunger 112 is lowered against tension in the spring 122 until the fluid-tight packing 125 leaves the valve seat 126. Consequently, the liquefied gas from the container 127 passes through the needle 121, fuel passageway 119 of the plunger 112, past, not through sintered metal cylinder 118 since the porous part 116 is diametrically opposite the outlet of the passage 119, open space 129 between the air-tight wall 117 of the cylinder 118 and the guide block 124 and an open end 130 of the cylinder 118 into the reservoir of the lighter.

The portion of the fuel gasified in the reservoir when injected therein from the supply bottle 127 finds its way up through the wall of the porous section 116 of the metal cylinder 118 and flows through the valve seat 126, a passage 131 between the neck part 115 and the plunger 112 and the centre bore 114 up into the opening 113 and thence out to the atmosphere through a porous ring 26¹ which will pass expanded gas even when compressed. The gasified portion of the fuel on discharge to the atmosphere mingles with the liquefied gas being supplied from the container 127. It will be understood, however, from the different physical properties of gas and liquid that the gasified portion passes easily up through the passage 131 without interfering with liquid from the filling container 127 being injected through the space 129 into the reservoir of the lighter.

A modified filling valve construction shown in Fig. 6 in accordance with the invention may be observed to be substantially identical with the above described form of construction but differs therefrom in that the spring 122a of the modified valve is lodged under a guide block 124a provided with side slits 132. With this construction, it will be seen that the spring 122a bears at one end thereof against a

spring seat 133 screwed into the lower end of the fixed wall member 111a of the valve secured to the wall 110a of the lighter, the spring seat 133 being provided with a centre hole 134 communicating with the reservoir of the lighter.

A cylinder 118a (Fig. 7) of sintered metal or similar unglazed material is mounted in the spring seat 133. The cylinder 118a is formed inside an air-tight wall 117a which has a recess 116a located immediately beneath the fixed wall member 111a. With this construction, the gasified portion of the fuel passes through the recess 116a into the valve member. Hence, the sintered metal cylinder 118a as used in this mode of construction functions substantially in the same manner as does the cylinder 118 illustrated in Figs. 4 and 5. If unglazed or porous materials are used in the same way as in the sintered metal cylinder 118a, the difficulty inherent in the unglazed materials in bonding to metals can be eliminated.

Fig. 6 illustrates the filling container or bottle 127a in engagement with the valve, the plug 128 of the bottle 127a being pierced through by the hollow needle 121a fixed to the flanged portion 120a of a valve plunger 112a when the bottle 127a is pushed inwardly. Pushing the bottle 127a into engagement with the valve will lower the valve plunger 112a against compression in the spring 122a, and a fluid-tight packing 125a will be forced away from the valve seat 126a. Consequently, the liquefied gas on supply from the fuel container 127 passes through the hollow needle 121a, fuel passage 119a of the plunger 112a, air-tight section 117a of the sintered metal cylinder 118a, side slits 132, recess 135 wherein the spring 122a is seated and centre hole 134 finally into the reservoir of the lighter.

With this construction, the gasified portion of fuel supply in the reservoir passes through the part of the sintered metal cylinder 118a exposed by the recess 116a in the side of the spring seat 133 and down the valve seat and up through a passageway 131a between the neck 115a and the plunger 112a and through an expanded gas passing ring 34¹ into an opening 113a for discharge to the atmosphere.

Thus, instead of treating the cylinder of sintered metal or unglazed material to be fluid-tight except a portion through which the gas is dissipated, a metal cylinder 136 which is by itself air-tight may be covered over said sintered or porous cylinder leaving a recess for removal of gas there-through. This modification of the invention is particularly suited where an unglazed cylinder is used which would otherwise be somewhat difficult for mounting in the valve.

A further modification of the valve construction according to the invention is characterized by employment of a lining 137 as shown in Fig. 8 to cover the internal wall of a sintered or unglazed cylinder having a multitude of pores distributed there-through. The lining 137 consists of a suitable material where porosity is to be maintained while a synthetic low polymer or rubber material insoluble in liquefied gas is applied by coating or blowing to the inner circumference of the cylinder, so that there will be a part 116b of the cylinder left unlined for providing a passage for flow of air and gas. The resulting fluid-tight section of the cylinder is shown at 117b. The cylinder 118b internally lined as shown in Fig. 8 may be joined by an adhesive to the base of a filling valve similar to the construction embodied in Fig. 4.

Although the present invention has been disclosed as to some of its specific embodiments herein above merely for purposes of illustration, various other changes and modifications may be made as will be obvious to those skilled in the art without sacrificing any of the advantages of the invention or departing from the scope of the appended claims. Particularly, it will be understood that the porous material which is liquid-tight but capable of passing gas.

WHAT WE CLAIM IS:—

1. A valve for fueling a pyrophoric lighter (including a reservoir for containing compressed gas), with liquefied gas at its normal pressure, the valve comprising two parts, movable relative to one another, the first part being mounted on the reservoir, and the second part being a valve plunger having a substantially axial passage which is normally rendered closed by force of a spring and is arranged to be opened when the plunger is pushed by a filling container containing the liquefied gas against the action of the spring, and a porous lining adapted to clog the space between said two parts of the valve, the porous lining being such that, when said reservoir is being fueled, the air or gas in the reservoir can escape through said porous lining but leakage of the fuel in liquid form therethrough is substantially prevented.

2. A valve as claimed in Claim 1, wherein the valve plunger has a fluid-tight packing which normally renders closed the axial passage of said plunger.

3. A valve as claimed in either Claim 1 or Claim 2 in which the plunger is provided with a flanged portion which is urged into contact with the porous lining on opening of the valve, whereby the space between the two parts of the valve is

spring seat 133 screwed into the lower end of the fixed wall member 111a of the valve secured to the wall 110a of the lighter, the spring seat 133 being provided with a centre hole 134 communicating with the reservoir of the lighter.

A cylinder 118a (Fig. 7) of sintered metal or similar unglazed material is mounted in the spring seat 133. The cylinder 118a is formed inside an air-tight wall 117a which has a recess 116a located immediately beneath the fixed wall member 111a. With this construction, the gasified portion of the fuel passes through the recess 116a into the valve member. Hence, the sintered metal cylinder 118a as used in this mode of construction functions substantially in the same manner as does the cylinder 118 illustrated in Figs. 4 and 5. If unglazed or porous materials are used in the same way as in the sintered metal cylinder 118a, the difficulty inherent in the unglazed materials in bonding to metals can be eliminated.

Fig. 6 illustrates the filling container or bottle 127a in engagement with the valve, the plug 128 of the bottle 127a being pierced through by the hollow needle 121a fixed to the flanged portion 120a of a valve plunger 112a when the bottle 127a is pushed inwardly. Pushing the bottle 127a into engagement with the valve will lower the valve plunger 112a against compression in the spring 122a, and a fluid-tight packing 125a will be forced away from the valve seat 126a. Consequently, the liquefied gas on supply from the fuel container 127 passes through the hollow needle 121a, fuel passage 119a of the plunger 112a, air-tight section 117a of the sintered metal cylinder 118a, side slits 132, recess 135 wherein the spring 122a is seated and centre hole 134 finally into the reservoir of the lighter.

With this construction, the gasified portion of fuel supply in the reservoir passes through the part of the sintered metal cylinder 118a exposed by the recess 116a in the side of the spring seat 133 and down the valve seat and up through a passageway 131a between the neck 115a and the plunger 112a and through an expanded gas passing ring 34 into an opening 113a for discharge to the atmosphere.

Thus, instead of treating the cylinder of sintered metal or unglazed material to be fluid-tight except a portion through which the gas is dissipated, a metal cylinder 136 which is by itself air-tight may be covered over said sintered or porous cylinder leaving a recess for removal of gas there-through. This modification of the invention is particularly suited where an unglazed cylinder is used which would otherwise be somewhat difficult for mounting in the valve.

A further modification of the valve construction according to the invention is characterized by employment of a lining 137 as shown in Fig. 8 to cover the internal wall of a sintered or unglazed cylinder having a multitude of pores distributed there-through. The lining 137 consists of a suitable material where porosity is to be maintained while a synthetic low polymer or rubber material insoluble in liquefied gas is applied by coating or blowing to the inner circumference of the cylinder, so that there will be a part 116b of the cylinder left unlined for providing a passage for flow of air and gas. The resulting fluid-tight section of the cylinder is shown at 117b. The cylinder 118b internally lined as shown in Fig. 8 may be joined by an adhesive to the base of a filling valve similar to the construction embodied in Fig. 4.

Although the present invention has been disclosed as to some of its specific embodiments herein above merely for purposes of illustration, various other changes and modifications may be made as will be obvious to those skilled in the art without sacrificing any of the advantages of the invention or departing from the scope of the appended claims. Particularly, it will be understood that the porous material referred to herein may be of any material which is liquid-tight but capable of passing gas.

WHAT WE CLAIM IS:—

1. A valve for fueling a pyrophoric lighter (including a reservoir for containing compressed gas), with liquefied gas at its normal pressure, the valve comprising two parts, movable relative to one another, the first part being mounted on the reservoir, and the second part being a valve plunger having a substantially axial passage which is normally rendered closed by force of a spring and is arranged to be opened when the plunger is pushed by a filling container containing the liquefied gas against the action of the spring, and a porous lining adapted to clog the space between said two parts of the valve, the porous lining being such that, when said reservoir is being fueled, the air or gas in the reservoir can escape through said porous lining but leakage of the fuel in liquid form therethrough is substantially prevented.

2. A valve as claimed in Claim 1, wherein the valve plunger has a fluid-tight packing which normally renders closed the axial passage of said plunger.

3. A valve as claimed in either Claim 1 or Claim 2 in which the plunger is provided with a flanged portion which is urged into contact with the porous lining on opening of the valve, whereby the space between the two parts of the valve is



traversed, when the valve is open, solely by a plurality of fine tortuous passages in said lining wherethrough only gas or air can pass.

- 5 4. A valve as claimed in Claim 1, 2 and 3, wherein the porous lining is made of non-woven fabrics.

- 10 5. A valve as claimed in Claims 1, 2, 3 and 4, wherein the porous lining is made of porous metals.

- 15 6. A valve for fueling a pyrophoric lighter (including a reservoir for containing compressed gas), with liquefied gas at its normal pressure, the valve comprising a casing member secured to the reservoir, a valve plunger having an axially bored passage for flow of liquid gas which passage is normally closed by the action of a spring but adapted to be opened by action of the plunger when a fuel bottle is engaged in the valve, and a cylindrical member mounted in the valve base and divided into a gas-passing section for passage of gas therethrough and a fluid-tight section covered with an impermeable lining, whereby the portion of fuel gasifying upon entry into the reservoir can be dissipated to atmosphere through the gas-passing section of said cylindrical member.

- 30 7. A filling valve as claimed in Claim 6, wherein the cylindrical member is constructed of sintered metal.

- 35 8. A filling valve as claimed in Claim 6, wherein the cylindrical member is formed of unglazed, porous material.

9. A filling valve as claimed in Claim 6, wherein the lining used for covering the

fluid-tight section of the cylindrical member is a synthetic resin such as vinyl chloride or polyethylene.

- 40 10. A pyrophoric lighter having a reservoir for compressed gas, including a filling valve for fueling the lighter with liquefied gas comprising a casing member secured to the reservoir, a valve plunger having an axially bored passage for flow of liquid gas which is normally closed by action of a spring but arranged to be opened by action of the plunger when a fuel bottle is engaged in the valve, and a porous cylinder having mounted thereon a partially recessed metal cylinder which is connected to the valve base, whereby, when the valve is open, passage is provided for flow of gas only from the reservoir through that part of the porous cylinder which is exposed by the recess of the metal cylinder.

- 55 11. A filling valve for fueling a pyrophoric lighter constructed and arranged substantially as described hereinbefore with reference to and as shown in the accompanying drawings.

- 60 12. A pyrophoric lighter including a filling valve as claimed in any one of Claims 1, 2, 3, 4, 5, 6, 7, 8, 9 and Claim 11.

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