July 17, 1962 TAISHO IKETANI 3,044,504

INJECTION VALVE IN A LIQUEFIED GAS LIGHTER

Filed Aug. 7, 1961

Fig. 1

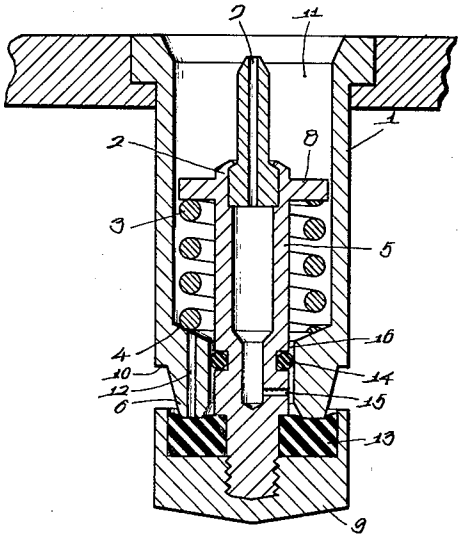


Fig. 2

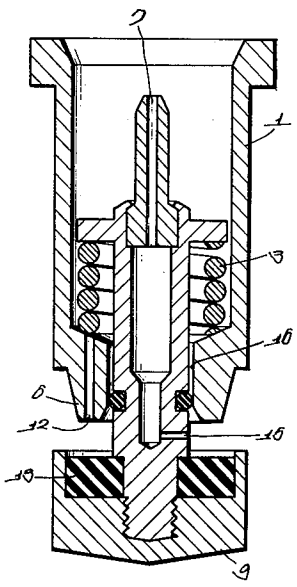


Fig. 3

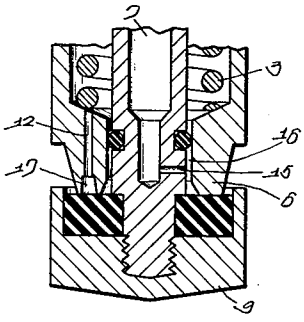


Fig. 4

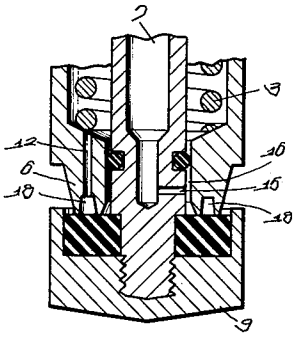
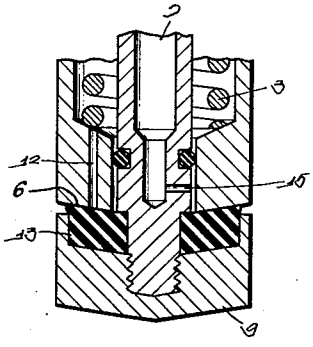


Fig. 5



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INJECTION VALVE IN A LIQUEFIED GAS LIGHTER

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The present invention relates to an improvement of an injection valve in a liquefied gas lighter.

It is one object of the present invention to provide an injection valve in a liquefied gas lighter, wherein a fuel injection passage and a carbureted gas discharge passage are opened and closed simultaneously by opening and closing a valve seat formed on the bottom of a valve body, and the quantity of fuel to be filled is controlled by making the discharge passage larger than the injection passage and, thereby, a danger of an excess filling of fuel is avoided.

In the known valve mechanism of such kind, it is constructed in such a manner that after a carbureted gas discharge passage has been opened, an injection opening is opened, and also after the injection opening has been closed, the discharge passage is closed, and in the injection of liquefied gas, the injection opening is closed with awaiting the overflow of fuel from the discharge opening, and liquefied gas is injected while up to the discharge opening is later closed, and thereby the quantity of liquefied gas to be filled is controlled and a danger of an excess filling of fuel has been avoided. However, in such a system, upon the filling of fuel, loss of the fuel cannot be eliminated and also since the quantity of the fuel to be filled was controlled by a difference in time between the closings of the discharge opening and injection opening, a definite quantity of fuel could not be supplied and also the avoidance of an excess filling of fuel could not be effected definitely. For this reason, in the known structures, an arrangement, according to which the injection opening and the discharge opening were proposed to open and close simultaneously, and the quantity of fuel to be filled was controlled by providing the discharge opening at a very different place from the injection opening. However, in this system, a position to be provided of the discharge opening was limited and in order to avoid an excess filling of fuel the length of the valve mechanism itself was requested to construct in a very long manner.

It is another object of the present invention to provide an improved injection valve in a liquefied gas lighter which avoids entirely the defects of the known structures.

With these and other objects in view, which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIGURE 1 is an axial section of a liquefied gas lighter according to the present invention, the injection opening thereof being shown in closed position;

FIG. 2 is an axial section of an essential part of the liquefied gas lighter according to the present invention, the injection opening thereof being shown in open position;

FIGS. 3, 4 and 5 are fragmentary axial sections of an essential part of other embodiments of the present invention different from those shown in FIGS. 1 and 2.

Referring now to the drawings, and in particular to FIG. 1, a cylindrical skirt **1** having an inner base **4** and to be attached to an outer wall of a reservoir (not shown) of a gas lighter to be opened therein, and a longitudinal opening **16** is axially formed in the inner base **4** to open toward an outer surface **10** thereof. On the outer surface **10**, an annular valve seat **6** is formed and which is disposed around the longitudinal bore **16**. On the valve seat **6**, a discharge passage **12** is formed so as to open into a chamber **11** defined by the cylindrical skirt **1**. A piston-like movable member **2** is contained slidably in the chamber **11**. The lower part of a round stem **5** of the movable member **2** is loosely inserted into the longitudinal bore **16**. A head **9** holding a packing **13** therein is screw threaded on the lowest part of the round stem **5**. A coil spring **3**, while in its compressed state, inserted between a flange **8** of the movable member **2** and the inner base **4** always serves to force the packing **13** upwardly in contact with the under surface of the valve seat **6**.

An O-ring **14** made of synthetic rubber is inserted in an annular groove formed in the periphery of the stem **5** at a position corresponding to that of the longitudinal bore **16**. Accordingly, when the movable member **2** is moved upwardly and downwardly in the chamber **11** of the skirt **1**, the air is sufficiently sealed off by the O-ring **14**.

An injection passage **7** is formed axially at the center of the movable member **2**. The upper end of the injection passage **7** is open and the lower end of the injection passage **7** is connected with an injection opening **15** located between the O-shape ring **14** and the packing **13**. The injection opening **15** is normally open to the longitudinal bore **16**. The diameter of the injection opening **15** is smaller than that of the discharge opening **12**.

In view of the construction as above described, both passage **7** and **12**, normally closed by means of the valve seat **6** and the packing **13**, are opened simultaneously by forcing downwardly the movable member **2** against the action of the coil spring **3**. In other words, the discharge passage **12** has connected the reservoir (not shown) with the open air by disengaging the packing **13** from the valve base **6**, and also the injection passage **7** is immediately opened into the reservoir through the injection opening **15** in communication with the longitudinal bore **16**.

When liquefied gas is desired to be filled into a gas lighter provided with the injection valve, according to the present invention, as above described, the skirt **1** is put at its open end to be in an upward position, and then an injection opening of a filling tank (not shown) is inserted in the injection passage **7** of the movable member **2** and is pressed downwardly against the action of the spring **3**. Then, liquefied gas is injected from the injection passage **7** through the injection opening **15** into the longitudinal bore **16**. The upper part of the longitudinal bore **16** is closed tightly by the O-shape ring **4** and the lower part thereof is closed tightly by the packing **13**, and consequently liquefied gas is filled up therein. Then, when the movable member **2** is further pressed down against the action of the coil spring **3**, the upper surface of the packing **13** is disengaged from the valve seat **6**, and at the same time the discharge passage **7** is opened together with the opening of the injection passage, and consequently, at this time, the loss in quantity of discharged gas is small. When this condition is continued, the liquefied gas is injected into the reservoir, while carbureted gas is discharged.

Upon the continuation of the injection of the liquefied gas, the level of the liquefied fuel in the reservoir is raised, and if the surface of the fuel reaches the level of the bottom end of the discharge passage **12**, the liquefied gas overflows outwardly out of the reservoir. The diameter of the discharge passage **12** is made larger than that of the injection opening **15**, and consequently even when the injection is continued, the level of the liquefied fuel is not raised thereabove. Accordingly, a quantity of liquefied gas to be filled is controlled accurately by the position of the discharge passage **12**, and the excess

filling or the filling up of liquefied gas in the reservoir of the lighter can be safely avoided.

Also, when the pressing down of the filling fuel tank is released, the movable member **2** is lifted by the action of the spring **3**, and consequently the packing **13** is raised, so as to press the valve seat **6** and to close the injection opening **15** and the discharge passage **12**. Thus, the overflow of liquefied gas from the discharge passage **12** is stopped and at the same time the stoppage of fuel from the injection opening is effected. Accordingly, loss of the overflowing can be held to a minimum.

Further, in this construction, it is feared that upon the opening of the valve, liquefied gas injected from the injection opening **15** may be discharged in the form of liquid from the discharge passage.

Some examples of the improvements on the above point are shown in FIGS. 3, 4 and 5.

In FIG. 3, a discharge passage **12** opened at a higher level than the under side of the valve seat **6** is formed at its lower part with a conically formed chamber **17**. The purpose of this conically formed chamber **17** is to prevent the direct entrance of liquid fuel injected from the injection opening **15** into the discharge passage **12** by impinging it on the coned surface and carbureting it in the cone formed chamber **17**.

In FIG. 4, instead of the cone formed chamber **17** shown in FIG. 4, a coned ring-like groove **18** is provided, into which the discharge passage **12** is opened.

In FIG. 5, in order to reduce the total finishing works on all the parts in the skirt **1**, shown in FIGS. 3 and 4, a valve seat **6** is formed in the form of a cone projecting slightly toward the center thereof, and on a part of its inclined surface a discharge passage **12** opens. In this example, a packing **13** closing the discharge passage **12** and a longitudinal bore **16** is formed in the form of the inclined lower surface of a movable member **2**.

As above described, in this form, the injection passage **7** and the discharge passage **12** open in the valve seat **6**, and these passages are adapted to be opened and closed by moving the movable member **2** up and down axially. Also, the diameter of the discharge passage is larger than that of the injection opening **15** so as to control a quantity of fuel to be filled in the reservoir, and consequently upon the filling of liquefied gas fuel, loss of the discharge of carbureted gas and liquefied gas can be held at a minimum, and also the filling quantity of liquefied gas can be effected accurately.

While I have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claim.

I claim:

An injection valve for a lighter for liquefied gas fuel comprising

a cylindrical skirt immovably secured to a casing constituting a fuel reservoir,

a longitudinal member movable axially in said cylindrical skirt between closed and open positions of said injection valve,

said longitudinal member having a fuel charging passage extending therethrough from an outer portion to an inner portion thereof and a radial passage extending from said inner portion to the periphery of said member,

said outer portion including a part adapted to engage a filling container to permit the feeding of fuel from said filling container to said fuel charging passage,

said longitudinal member having at its inner end a head of a diameter larger than that of the greater portion of said longitudinal member and defining an annular recess at its outermost face,

a packing ring received in said annular recess and moving with said longitudinal member,

said cylindrical skirt being open at both ends and including an inwardly extending annular shoulder at its inner end portion, said annular shoulder having an inner diameter substantially equal with the outer diameter of the greater portion of said longitudinal member, in order to permit an axial movement of said longitudinal member in said cylindrical skirt,

said cylindrical skirt including also at its inner end an annular seat engaging the outer face of said packing ring in the closed position of said injection valve and being spaced apart from said outer face of said packing ring in the open position of said injection valve,

said cylindrical skirt further having a discharge passage at its inner portion and extending from said annular seat into said skirt member and communicating with the space outwardly of said annular shoulder, so that said discharge passage is closed upon engagement of said annular seat on said packing ring,

a sealing ring disposed between the outer periphery of said longitudinal member and the inner face of said inner end portion of said cylindrical skirt and outwardly of said valve relative to said radial passage,

said longitudinal member having a flange at its outer portion, and

a spring engaging the inner face of said flange and said annular shoulder of said cylindrical skirt, respectively, and urging said longitudinal member into its outermost, valve closing position,

so that in the closing position of said valve said fuel charging passage, as well as said discharging passage are closed from the atmosphere, while in the open position of said valve, upon inward movement of said longitudinal member, communication through said fuel charging passage and discharge through said discharge passage are possible.

References Cited in the file of this patent

FOREIGN PATENTS

1,127,374 France ---------- Aug. 6, 1956