

PATENT SPECIFICATION (11)

1 397 329

1 397 329

- (21) Application No. 59964/72 (22) Filed 29 Dec. 1972 (19)
 (31) Convention Application Nos. 2954/71 (32) Filed 29 Dec. 1971
 4244/71 29 Dec. 1971
 91100/72 11 Sept. 1972
 127 149/72 2 Nov. 1972
 114 702/72 17 Nov. 1972 in



- (33) Japan (JA)
 (44) Complete Specification Published 11 June 1975
 (51) INT. CL.² F23Q 2/16
 (52) Index at acceptance
 F4F 9B1A 9B3A 9D3 9DX 9E1A 9E3 9EX 9EY

(54) IMPROVEMENTS IN CIGARETTE LIGHTERS

(71) I, YOSHITAKA NAKANISHI, of 12-9, 5-chome, Yawata, Ichikawa-shi, Chiba-ken, Japan, a citizen of Japan, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an improved gas lighter, more particularly to a disposable gas lighter employing a liquefied gaseous fuel such as butane.

Gas lighters of this kind are well-known to the public. Conventional gas lighters of this kind have such defects as the liquefied gas is apt to leak out and the flame is very unstable and does not keep a constant height.

An object of the present invention is to provide a gas lighter in which leakage of gas does not occur.

Another object is to provide a gas lighter which may be provided with means for regulating the gas flame to a uniform height.

According to the present invention, there is provided a gas lighter comprising a cylindrical valve casing having a bottom wall, a valve cap threadedly connected within the valve casing, and a hollow cylindrical packing accommodated within the valve casing, the outer peripheral surface of the cylindrical packing being in gas-tight contact with the inner peripheral surface of the valve casing, the upper end of the packing being in gas-tight contact with the lower end of the valve cap, and the lower end of the packing being in contact with the bottom wall of the valve casing so as to provide a valve chamber defined by the valve casing, and the valve cap and the packing, the packing being provided with an integral barrier wall for separating the packing into upper and lower chambers, the barrier wall having an aperture therein to allow communication between the upper and lower chambers.

Insofar as the orientation of the lighter has to be defined for the proper construction

tion of the description and claims, this orientation is that shown in Figures 1 and 4.

The valve chamber may be provided with a part of a burner nozzle therewithin, a valve for closing a gas passage communicating with the nozzle and a gas-pressure reducing means for blocking the gas flow through the gas passage.

The gas-pressure reducing means may comprise at least two elastic, gas-permeable reducing discs and a rigid, gas-impermeable barrier disc, at least one side of which may be roughened, inserted between the permeable reducing discs.

In the accompanying drawings:

Fig. 1 is a front view of an embodiment of a gas lighter in accordance with the present invention.

Fig. 2 is a plan view of the gas lighter shown in Figure 1 on an enlarged scale.

Fig. 3 is a plan view similar to Fig. 2 from which is eliminated a wind shield and a nozzle cap.

Fig. 4 is a sectional view on an enlarged scale taken along the line 4—4 of Fig. 2.

Fig. 5 is a perspective view on an enlarged scale of a metal plate provided within the gas lighter.

Fig. 6 is a sectional view similar to Fig. 4 showing a detail of the gas lighter of the present invention in an alternative embodiment, features of which are transposable to the embodiment of Figure 4.

Fig. 7 is a schematic drawing showing the process for welding a blocking pin to a gas injecting opening provided on a fuel tank of the gas lighter.

Fig. 8 is a schematic drawing showing the process for injecting a fuel into the tank of the gas lighter.

Fig. 9 is a perspective view in an enlarged scale showing a nozzle cap for the gas lighter.

Fig. 10 is a front elevation showing a part of the gas lighter when packaged.

Referring now to Figs. 1—4.

A gas lighter according to the present in-

vention comprises a gas tank (1) containing liquified gas, a nozzle (2) for releasing gas from the gas tank, a valve (3) for opening and closing the gas-flow passage, a reducing means (4) for lowering the gas pressure, a manually operable ignition means (5) composed of a spark wheel (5a) for igniting gas spouting through the opening of the nozzle, a flint (5b) and a lever (6) for opening the valve by lifting up the nozzle.

The valve (3) and the reducing means (4) are accommodated within a cylindrical valve casing (7), which is integrated with a bottom wall (9) having an opening (8), and at the upper part thereof, is integrally connected with the top wall (10) of the fuel tank.

A cylindrical packing (14), made of an elastic and corrosion-proof material such as rubber, synthetic resin or the like, is provided with a cylindrical member (11), having a barrier wall (12) integral therewith and having an aperture (13) therein and extending in a radial direction from the inner peripheral surface of the valve casing (7) at the inner peripheral surface of the lower part thereof, while the outer peripheral surface of the cylindrical packing is pressed against the inner peripheral surface of the valve casing (7) due to gas pressure within the fuel tank so as to interfere with the gas flowing on the contact surface of the cylindrical packing within the valve casing. The valve casing is threadedly connected with a cylindrical valve cap (15) at the inner surface of the upper part thereof and the lower end of the valve cap (15) is in gas-tight contact with the upper end of the cylindrical packing (14), thus interfering with the gas flow on the contact surface of the cylindrical packing (14) with the valve cap (15), as well as interfering with the gas flow through the interspace of the threadedly connected portion between the valve casing and the valve cap.

A valve seat (16) is inserted into an upper chamber of the cylindrical packing (14) and into a lower chamber thereof are inserted a reducing disc (17) made of filter paper, other reducing discs (18), (19) having gas permeability and elasticity like those of a foamed material, a barrier disc (20) having impermeability as well as rigidity like those of a metallic material interposed between the reducing discs (18, 19) and a packing (21). The reducing discs (18), (19) are able to control the gas flow by changing the compression thereof by the process hereinafter described. Moreover, the reducing discs (18), (19), the barrier disc (20), the valve seat (16) and rubber packing (21) respectively are so small in size as to be picked up by tweezers, therefore these parts are firstly inserted into the upper and the lower cham-

bers of the cylindrical packing (14), subsequently the cylindrical packing is inserted within the valve casing (7), whereby the reducing discs, the barrier disc and rubber packing can easily and rapidly be assembled.

It is required to provide an annular interspace for the gas flow between the outer peripheral surface of the barrier disc (20) and the inner peripheral surface of the cylindrical packing (14). Therefore, the diameter of the barrier disc is smaller than that of the cylindrical packing.

Fig. 5 shows an example of an improved barrier disc (20) which is provided with grooves (22) formed on one surface thereof, and the grooves are adapted to be in contact with the reducing disc (19). Now, by compressing the reducing disc (19) through the barrier disc (20), there occur portions of higher and lower compressibility on the reducing disc due to the grooves so as to be able to make the gas flow smoothly. Depending on the gas flow, such phenomenon as the flame becoming larger at the instant of igniting the gas, then gradually becoming smaller as time elapses can be prevented, thus the flame is kept at a constant height as well as the gas flow being controlled smoothly. The grooves (22) may be formed on both surfaces of the barrier disc (20), moreover the grooves may intersect each other, or the disc may have a rugged surface.

The upper end of the valve cap (15) projects out of the opening formed on the upper end of the valve casing (7) and the projecting portion is formed to be integral with an adjusting wheel (23). A cylindrical member (24) formed integrally with the valve seat (16) is inserted within the valve cap, and the upper end surface of the cylindrical member (24) is engaged with the shoulder (25) of the valve cap. In this way, when the adjusting wheel (23) of the valve cap is turned in either direction for displacing the valve cap upward or downward, the direct holding-down force against the cylindrical member (11) of the cylindrical packing (14) and the holding-down force against the barrier wall (12) through the valve seat (16) effected by the lower end of the valve cap are changed, thus resulting in variation in the compression of the reducing discs (18) and (19) so as to control the exhausting capacity of gas as mentioned above. In order to define the maximum and minimum limits of the control, a pin (26) projecting on the adjusting wheel (23) is adapted to be inserted into an arcuate groove (22) provided on the top wall (10) of the fuel tank (1) for adjusting the angle to be allowable for turning the wheel.

A valve seal (27) resting on the valve seat (16) is made of an elastic material such as rubber or synthetic resin and is forcibly

inserted into the bore (28) of the nozzle (2) through the lower end thereof, thus the nozzle is adapted to be idly engaged within the valve cap so that the upper part of the nozzle passes through a packing (29) to be extended upwardly from the upper end of the valve cap. An annular space (31) for gas flow is provided between the nozzle and the valve cap by means of a boss (30) which is formed to be integral with the outer peripheral surface of the nozzle, and the annular interspace is intercommunicated with the bore (28) of the nozzle through a transverse slot (32) in the nozzle,

A coil spring (33) is provided in the annular space (31) and one end thereof is anchored to the boss while the other end thereof is anchored to the packing (29) so as to press the nozzle (2) downward for closing the valve and keeping the same in a closed condition.

The operative lever (16) for displacing the nozzle upward and downward has at one end thereof a forked member (34) which engages an annular groove (35) of the nozzle, and at the other end is provided with a holding part (36) to be pushed by a thumb. An appropriate portion between the holding part and the forked member is adapted to be supported by a fulcrum (37) formed integrally with the top wall (10) of the fuel tank (1).

The pressurizing part of the lever is displaced by the coil spring (33) and furthermore may be lifted up by a leaf spring (38) bent in a V-shape (see Figure 6). The valve is more securely closed with the aid of the coil spring (33).

Moreover, one end of the leaf spring (38) is inserted into a groove (39) obliquely provided in the top wall (10) of the fuel tank (1) and the other end of the spring is in contact with the lever (6), whereby the spring is readily fixed to the fuel tank (refer to Fig. 6).

The spark wheel (5a) is attached to a forked member (41) by means of a pin (42), and a cylinder (43) closed at the bottom extending downward from the forked member (41) is supported by a cylindrical holder (44) formed integrally with the top wall (10) of the fuel tank and the cylinder (43) passes through an aperture (45) provided on the lever, whereby the lever is attached to the tank. The flint (5b) is inserted into a bore (46) of the cylinder (43) and the top end of the flint is adapted to be pressed against the spark wheel (5a) by a coil spring (47) which is inserted within the bore (46).

A wind shield (48) surrounding the spark wheel (5a) and the nozzle (2) is mounted to be secured over a partial wall (49) projecting on the top wall (10) of the tank (1). The wind shield is provided on the top surface thereof with an opening (50) through

which the flame passes. The peripheral margin (51) of the opening is bent downwardly, thus the flame is constricted by the peripheral margin, thereby preventing the user from getting burned. Furthermore, the side wall (52) of the wind shield is provided with apertures (53) for obtaining complete combustion of gas as well as for preventing the wind shield from being heated up. The upper surface (54) of the wind shield is about the same height at both ends thereof and has a downwardly curved surface forming a depression so as to facilitate the operation for spinning the spark wheel and for holding down the lever (6) by means of a thumb.

A cap (55) formed of synthetic resin having flexibility as well as self-supportability seals the opening of the nozzle (2) (see Figure 9). For this purpose, the cap (55) comprises a sleeve (56) engaged gas-tightly with the forward end of the nozzle tube, a neck portion (57) extending from the sleeve in an axial direction thereof to be divergent lengthwise, and a knob portion (58) formed at the top of the neck portion. The inner circumferential surface of an aperture (59) provided on the sleeve is formed to be engageable elastically and gas-tightly with the outer circumferential surface of the upper end of the nozzle. The neck portion (57) passes through the opening (50) in the wind shield so that the knob portion (58) extends through the opening (50) to be positioned above the wind shield (48) so as to be readily removable from the nozzle.

In spite of the projection of the head portion, since it has flexibility, the packaging of the gas lighter is able to be carried out advantageously, because of the neck portion (57) being readily bent when a gas lighter is placed on a mount or a paste-board (60) and fastened to be wrapped with a heat shrinkable film (62), the packaging is conveniently carried out because the neck portion (57) is easily engageable within or removable from a narrow spaced opening of the nozzle surrounded by the wind shield (see Figure 10).

Now the process for producing the fuel tank as well as for sealing the tank after filling it with liquefied gas will be elucidated in detail hereinafter.

The tank (1) is produced by means of, for example, an injection molding process employing synthetic resin having excellent tensile strength, cold and heat resisting property and chemical resistance, such as for instance a polyamide resin, SA resin or polycarbonate resin. The bottom part of the tank (1) has an opening in a similar shape to the shape of the cross-section of the tank and the opening is closed by a bottom lid (63) made of a material having identical properties with those of the tank. The bot-

tom lid is formed around the periphery thereof to be integral with an outer wall portion (64) extending upwardly and an inner wall portion (65) which is higher than the outer wall portion (64) measuring from the bottom part to the upper end thereof, and the lower part (66) of the tank is adapted to be inserted within the groove provided between the outer wall portion and the inner wall portion. Subsequently, before the fuel tank is filled with liquified gas, the contact surface between the bottom part of the tank and the inner and outer wall portions is welded by means of vibration at the lower surface of the bottom lid (63) using, as an example, a tool horn employed in a conventional supersonic apparatus, thus the contact surface is readily welded. Since the welding area securing the inner wall portion of the bottom lid against the wall portion of the tank is more extensive than that of the outer wall portion, great strength can be obtained without spoiling the appearance.

The fuel tank is provided at the top wall (10) thereof with a small inlet (68) to be engageable with a stop plug (67). When the tank is filled with liquefied gas through the inlet, the stop plug (67) made of a material having identical properties with that of the tank is inserted into the inlet. After this stage, a tool horn (69) (see Example 7) of a conventional supersonic welding apparatus, as an example, is put on the head portion of the stop plug and the oscillatory wave caused by a vibrator (70) is transmitted to the stop plug so as to weld the contact surface of the stop plug and the inlet. As welding means for a stop plug and the bottom lid, there can, of course, be applied a high frequency heating deposition process or some other appropriate thermal deposition process besides the supersonic deposition process.

At the welding stage for the stop plug; although the tank has already been filled with liquified gas, welding heat does not cause a volatile reaction of liquified gas in the tank, since the deposition area for welding the stop plug (67) to the tank is smaller than that for welding the bottom lid (63) to the tank, so that the welding operation can be carried out perfectly and readily so as to minimise the number of welds having defective deposition, since the amount of welding heat is minimised thereby reducing the risk of evaporation of liquified gas in the tank with consequent increase in the gas pressure.

If the inlet (68) for injecting liquified gas is too small, when cooled liquified gas is injected under pressure into the tank through the inlet, liquified gas is sometimes vaporized in the air and frozen at the opening of the nozzle. This makes the continuous injecting operation very difficult. In order

to avoid this difficulty, a packing member (72) (see Figure 8) mounted on the forward end of a gas injecting nozzle (71) is forcedly pushed against the inlet (68) of the tank (1), then a rotor (74) of a valve (75) is turned so that a passage (75) of the rotor (74) is able to communicate with a passage (76) of the nozzle (71) and at the same time a passage (77) communicating with the passage (75) in the rotor communicates with a passage (79) connected with a vacuum pump (78). Thus, air in the tank (1) is sucked out by actuation of the vacuum pump (78) to reduce the pressure in the inside of the tank by $\frac{5}{6}$ of an atmosphere. Subsequently, the rotor (74) is rotated through 90° in the counter clockwise direction so that the passage (77) communicates with the passage (76) of the nozzle (71) together with the passage (80) intercommunicating with a passage (82) connected with the liquified gas tank (81), thus liquified gas from the tank (81) is fed to the fuel tank (1) under the suction pressure due to vacuum. In this way, the tank is filled with liquified gas without exposure to the air, so that continuous injection is smoothly carried out in safety causing no trouble due to evaporation of liquified gas, or dispersion in the course of injection operation.

WHAT I CLAIM IS:—

1. A gas lighter comprising a cylindrical valve casing having a bottom wall, a valve cap threadedly connected within the valve casing, and a hollow cylindrical packing accommodated within the valve casing, the outer peripheral surface of the cylindrical packing being in gas-tight contact with the inner peripheral surface of the valve casing, the upper end of the packing being in gas-tight contact with the lower end of the valve cap, and the lower end of the packing being in contact with the bottom wall of the valve casing so as to provide a valve chamber defined by the valve casing, and the valve cap and the packing, the packing being provided with an integral barrier wall for separating the packing into upper and lower chambers, the barrier wall having an aperture therein to allow communication between the upper and lower chambers.

2. A gas lighter as claimed in Claim 1 further comprising a burner nozzle displaceable in its axial direction having one end inserted into the valve chamber and the other end positioned outside the valve chamber, a valve accommodated within the valve chamber for closing a gas passage to the nozzle when the burner nozzle is moved in one direction and to open the gas passage when the nozzle is moved in the other direction, and a gas pressure reducing means accommodated within the valve chamber



tom lid is formed around the periphery thereof to be integral with an outer wall portion (64) extending upwardly and an inner wall portion (65) which is higher than the outer wall portion (64) measuring from the bottom part to the upper end thereof, and the lower part (66) of the tank is adapted to be inserted within the groove provided between the outer wall portion and the inner wall portion. Subsequently, before the fuel tank is filled with liquified gas, the contact surface between the bottom part of the tank and the inner and outer wall portions is welded by means of vibration at the lower surface of the bottom lid (63) using, as an example, a tool horn employed in a conventional supersonic apparatus, thus the contact surface is readily welded. Since the welding area securing the inner wall portion of the bottom lid against the wall portion of the tank is more extensive than that of the outer wall portion, great strength can be obtained without spoiling the appearance.

The fuel tank is provided at the top wall (10) thereof with a small inlet (68) to be engageable with a stop plug (67). When the tank is filled with liquified gas through the inlet, the stop plug (67) made of a material having identical properties with that of the tank is inserted into the inlet. After this stage, a tool horn (69) (see Example 7) of a conventional supersonic welding apparatus, as an example, is put on the head portion of the stop plug and the oscillatory wave caused by a vibrator (70) is transmitted to the stop plug so as to weld the contact surface of the stop plug and the inlet. As welding means for a stop plug and the bottom lid, there can, of course, be applied a high frequency heating deposition process or some other appropriate thermal deposition process besides the supersonic deposition process.

At the welding stage for the stop plug; although the tank has already been filled with liquified gas, welding heat does not cause a volatile reaction of liquified gas in the tank, since the deposition area for welding the stop plug (67) to the tank is smaller than that for welding the bottom lid (63) to the tank, so that the welding operation can be carried out perfectly and readily so as to minimise the number of welds having defective deposition, since the amount of welding heat is minimised thereby reducing the risk of evaporation of liquified gas in the tank with consequent increase in the gas pressure.

If the inlet (68) for injecting liquified gas is too small, when cooled liquified gas is injected under pressure into the tank through the inlet, liquified gas is sometimes vaporized in the air and frozen at the opening of the nozzle. This makes the continuous injecting operation very difficult. In order

to avoid this difficulty, a packing member (72) (see Figure 8) mounted on the forward end of a gas injecting nozzle (71) is forcedly pushed against the inlet (68) of the tank (1), then a rotor (74) of a valve (75) is turned so that a passage (75) of the rotor (74) is able to communicate with a passage (76) of the nozzle (71) and at the same time a passage (77) communicating with the passage (75) in the rotor communicates with a passage (79) connected with a vacuum pump (78). Thus, air in the tank (1) is sucked out by actuation of the vacuum pump (78) to reduce the pressure in the inside of the tank by $\frac{5}{8}$ of an atmosphere. Subsequently, the rotor (74) is rotated through 90° in the counter clockwise direction so that the passage (77) communicates with the passage (76) of the nozzle (71) together with the passage (80) intercommunicating with a passage (82) connected with the liquified gas tank (81), thus liquified gas from the tank (81) is fed to the fuel tank (1) under the suction pressure due to vacuum. In this way, the tank is filled with liquified gas without exposure to the air, so that continuous injection is smoothly carried out in safety causing no trouble due to evaporation of liquified gas, or dispersion in the course of injection operation.

WHAT I CLAIM IS:—

1. A gas lighter comprising a cylindrical valve casing having a bottom wall, a valve cap threadedly connected within the valve casing, and a hollow cylindrical packing accommodated within the valve casing, the outer peripheral surface of the cylindrical packing being in gas-tight contact with the inner peripheral surface of the valve casing, the upper end of the packing being in gas-tight contact with the lower end of the valve cap, and the lower end of the packing being in contact with the bottom wall of the valve casing so as to provide a valve chamber defined by the valve casing, and the valve cap and the packing, the packing being provided with an integral barrier wall for separating the packing into upper and lower chambers, the barrier wall having an aperture therein to allow communication between the upper and lower chambers.

2. A gas lighter as claimed in Claim 1 further comprising a burner nozzle displaceable in its axial direction having one end inserted into the valve chamber and the other end positioned outside the valve chamber, a valve accommodated within the valve chamber for closing a gas passage to the nozzle when the burner nozzle is moved in one direction and to open the gas passage when the nozzle is moved in the other direction, and a gas pressure reducing means accommodated within the valve chamber



for reducing the velocity of gas flow to the nozzle.

3. A gas lighter as claimed in Claim 2 wherein the valve contains a valve seat mounted within the valve chamber and a valve seal fixed at the lower end of the nozzle to be in contact with the valve seat, and the gas pressure reducing means comprises at least two gas-permeable elastic reducing discs and a rigid, gas-impermeable barrier disc inserted between the reducing discs.

4. A gas lighter as claimed in claim 3, wherein the barrier disc has a number of grooves for controlling the gas flow on at least one surface thereof.

5. A gas lighter as claimed in claim 3, wherein the valve seat is formed in a cylinder having a peripheral wall for insertion within the valve cap extending upwardly from a bottom portion, and the valve cap has formed on the inner peripheral surface thereof a shoulder for engaging the upper end of the cylinder.

6. A gas lighter as claimed in any preceding claim, further comprising a burner nozzle and a wind shield surrounding a head portion of the burner nozzle, in which the wind shield is formed with a side wall for surrounding the flame at the opening of the burner nozzle, a top wall integrally connected with the upper end of the side wall and an open port formed in the top wall for allowing the flame to pass therethrough, the rim of the port in the top wall being bent in the direction opposite to the flowing direction of the flame.

7. A gas lighter as claimed in any preceding claim, wherein the packing is made of a corrosion-proof elastic material such as rubber or a synthetic resin.

8. A gas lighter as claimed in any preceding claim, further comprising a tank for

liquified gas, a burner nozzle having one end which remains below the upper surface of the tank and the other end extending above the upper surface of the tank, the nozzle being displaceable in the vertical direction, a spark wheel mounted adjacent to a head portion of the burner nozzle, a flint in contact with the spark wheel, an operating lever supported at a fulcrum on the upper surface of the tank and capable of a rocking motion and having one end connected with the burner nozzle while the other end is adapted to be pressed downward while the spark wheel is rotated, and a leaf spring which biases the operating lever upward at one end so as to displace the burner nozzle to a lower position in which a gas passage to the burner nozzle is closed, the leaf spring being bent into a V-shape for supporting at one end the lower surface of the operating lever, while the other end is inserted into an oblique groove formed on the top wall of the tank.

9. A gas lighter as claimed in any of claims 2 to 8, further comprising a cap for the burner nozzle comprising a sleeve made of an elastic material, such as rubber or a synthetic resin, and gas-tightly engaged with a head portion of the nozzle, a flexible neck portion integrally connected at one end thereof with the sleeve, and a knob integrally connected with the other end of the neck portion.

10. A gas lighter, substantially as herein described, with reference to the accompanying drawings.

ELKINGTON AND FIFE,
Chartered Patent Agents,
High Holborn House,
52/54 High Holborn,
London, WC1V 6SH.
Agents for the Applicant.