April 6, 1954

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2,674,032

METHOD OF MAKING VALVES FOR LIQUEFIED PETROLEUM GAS LIGHTERS

Filed July 17, 1950

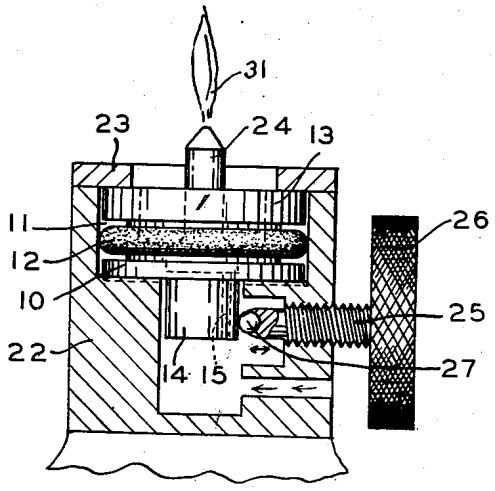

FIG. 1.

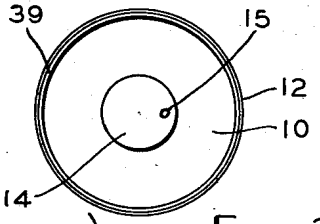

FIG. 2.

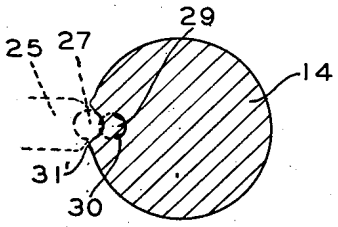

FIG. 4.

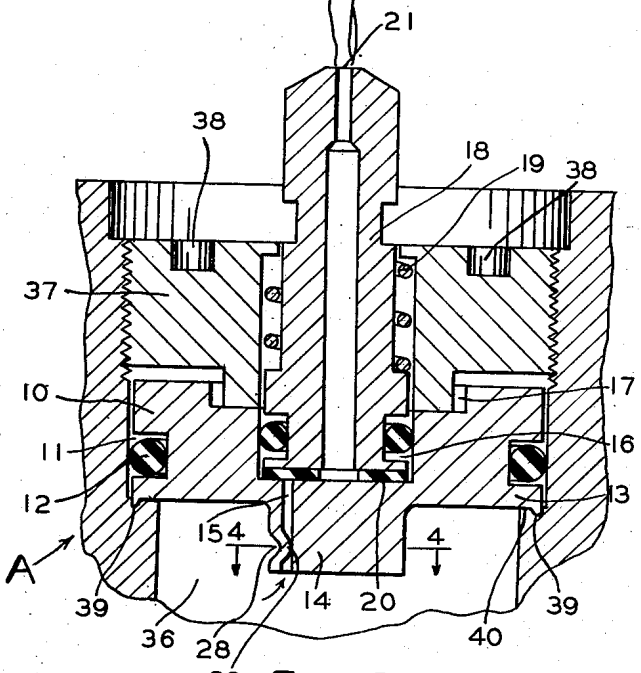

FIG. 3.

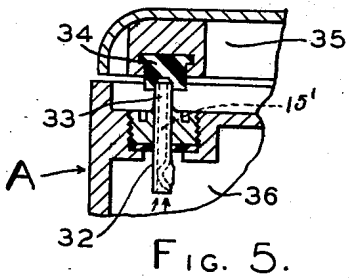

FIG. 5.

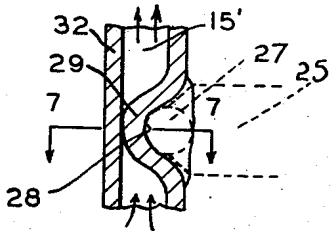

FIG. 6.

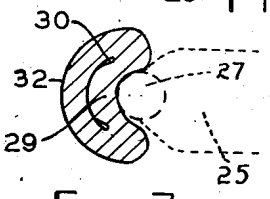

FIG. 7.

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Patented Apr. 6, 1954

2,674,032

UNITED STATES PATENT OFFICE

2,674,032

METHOD OF MAKING VALVES FOR LIQUEFIED PETROLEUM GAS LIGHTERS

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Application July 17, 1950, Serial No. 174,182

2 Claims. (Cl. 29—157)

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This invention relates to a method of making a valve for liquified petroleum gas cigarette lighters, where the lighter is provided with a body in which liquified petroleum is stored under pressure and which is permitted to escape through our valve in the form of a gas which is ignited (ordinarily by a pyrophoric flint) to provide a flame. The flame is maintained as long as the gas from the storage chamber of the lighter is allowed to escape through our valve and out of the nozzle positioned beyond our valve which may be closed in a suitable manner to shut off the escaping gas which automatically extinguishes the flame.

The drawings illustrate only a portion of the lighter body which forms the chamber for the liquified petroleum fuel and gas. The lighting means for the escaping gas is not shown in the drawings, and such means may be pyrophoric or other suitable igniting means to light the escaping gas.

A primary feature resides in providing an extremely simple valve, and we have designed the same from a single piece of material which is adapted to be formed by our method to provide a predetermined orifice through which the gas fuel may escape In carrying out our method, a small hole is drilled at a predetermined point through the body of the valve which may be forty thousandths of an inch more or less in size. After the hole is drilled longitudinally through the body of our valve at a predetermined point, the next step is to place the same in a fixture which will support the body in a manner so that ignitable gas may be passed through the hole which has been drilled in the first operation. While the valve member is held in this fixture and while gas is passing through the hole previously formed therein, the next step of the method consists in forcing a ball bearing ended tool against the side wall of the body of the valve adjacent the small longitudinal hole formed therein. This operation presses the side wall into the drilled hole in a manner to close the same by the bending of the wall into the hole passageway.

The operation of the ball bearing ended forming tool is controlled by the operator to obtain the proper size flame from an improvised nozzle which has been inserted in the top of the valve. When the operator has operated the ball bearing ended tool to sufficiently close off the opening in the hole by the bending of the side wall into the same, the ball bearing ended tool is released and the gas pressure in the fixture is shut off until another valve member is placed therein for testing.

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The shank of the valve forms the body through which the longitudinal hole is drilled, and the predetermined drilling point is ordinarily at one side of the center of the shank adjacent the outer side wall of the shank. This provides a thinner wall adjacent the longitudinal hole formed in the shank against which the ball bearing ended tool is adapted to press.

Similar results may be obtained by bending the wall of a small tube inwardly by the ball bearing ended tool to squeeze the wall against the opposite wall of the tube so as to form a predetermined minute orifice through which the gas may escape by a predetermined rate of flow through our fixed valve.

It is important that the hole through the shank of the body of the valve be properly positioned and that the material of the shank in the valve act as a support or a reinforcing means, so that the outer wall of the shank adjacent the hole may be bent inwardly without fracturing the metal. The deforming of the metal transversely of the hole is accomplished by our method in a manner so as to reinforce the metal, which has been deformed, to overcome any cold flow of the metal when the pressure of the ball bearing ended tool has been released.

It is well known that when metal is deformed into a form, particularly when it is bent from its original form into a new shape, the metal has a certain tendency to cold flow or move from the formed position. In this case, it is essential that the metal be so bent as to be arched or curved with a reinforcing arch or bridge formation which will tend to hold the metal in the form that it has been bent. This we accomplish by the curved nature of the bending which forms reinforcing arches at the bend which are adapted to hold the metal in the formed position so as to rigidly fix the metal against the restricted orifice, preventing any cold flow or recovery of the metal into its former shape.

Thus, by our method we accomplish the forming of a microscopic restricted orifice or passageway of a predetermined size so as to get just the right flow of gas through our fixed valve which insures a definite or a predetermined size or length of flame at the nozzle of the lighter.

The flame may vary to a small degree at different atmospheric temperatures owing to the variation of the pressure in the reservoir of the lighter. By our method, we are able to make a one-piece fixed valve which will maintain a flame of the proper size under varying atmospheric conditions and temperatures, which is very desir-

able in a cigarette lighter where liquified fuel is used and which operates under pressure turning into a gas at the point of the flame. It is important that our valve remain with a fixed predetermined orifice which is too small or minute to be formed by drilling or machining the metal of the valve; however, with our method, the valve body may be made in any suitable manner from metal of the desired nature and density so that the body of each valve may be uniformly formed on a screw machine or in any other manner.

These features, together with other details and objects of our valve, will be more fully and clearly hereinafter set forth to fully define the invention.

Figure 1 is a diagrammatic illustration of a fixture for supporting the valve body where it is held while an ignitable gas is introduced through the hole formed in the valve under a predetermined pressure, and the step of our method of deforming the passageway through the valve is carried out.

Figure 2 is a bottom view of our valve showing the hole formed therein.

Figure 3 is a vertical cross section of our fixed valve showing the deformed portion of the metal in the drilled formed hole extending longitudinally through the valve body.

Figure 4 is a section on the line 4—4 of Figure 3.

Figure 5 is a cross section of a portion of a lighter illustrating another form of fixed valve which is made of hollow tubing, the side wall of which is deformed to provide the microscopic passageway through the same.

Figure 6 is a detailed section of the tubular valve shown in Figure 5 shown in enlarged form to illustrate the deformed passageway in the tube.

Figure 7 is an enlarged cross section on the line 7—7 of Figure 6.

The drawings illustrate our valve 10 which is formed with a recess 11 in the head portion for receiving a rubber sealing ring 12.

Projecting from the head portion 13 of the valve 10, we provide a cylindrical shank 14 which is positioned at the bottom of the valve 10 and is adapted to form the solid body through which a small orifice 15 is formed longitudinally by drilling or otherwise.

The orifice 15 may be forty thousandths of an inch more or less in size and adapted to extend from the bottom of the shank 14 to the bottom recess 16 which is formed in the upper head portion 13. A second enlarged recess 17 is formed in the head 13 and is positioned above the recess 16.

When the lighter unit is assembled in a lighter body, a hollow nozzle valve 18 is positioned in the recess 16 and is forced by the spring 19 against the gasket 20 which normally closes the top of the longitudinal passageway 15 formed in the shank 14.

When it is desired to light a flame at the top 21 of the nozzle 18, the same is raised against the action of the spring 19 by a suitable lever not shown in the drawings.

In carrying out our method, first the valve 10 is formed in the desired shape, one form of which is illustrated in the drawings in Figures 1, 2, 3, and 4, and wherein the shank 14 is solid, and the recesses 16 and 17 are formed in the top of the head 13 of the valve 10. The recess 11 provides a retainer groove for holding the sealing ring 12.

The next step of the method is carried out by drilling or forming the longitudinal hole 15 directly through the shank 14 from the bottom of the recess 16 through the bottom outer shank surface 14.

The method includes in its next step, the placing of the valve 10 in the supporting fixture 22 where it is held by the yoke bar 23 and an improvised or temporary nozzle 24 is placed in the recess 16 of the valve. The fixture 22 is provided with a threaded pressure shaft 25 operated by the knurled knob 26 to force the ball bearing end 27 of the shaft 25 against and into the surface of the shank 14 at a point directly adjacent the longitudinal passageway 15.

In carrying out the method when the valve 10 is placed in the fixture 22, the operator lights the gas escaping out of the nozzle 24, as illustrated in Figure 1, which governs the operation of the knurled knob 26. Thus, the operator is able to deform the material in the shank 14 at the hole 15 by making a round or arched depression 28 in the wall of the shank which forms an arch 29 in the material of the shank 14 which projects in curved relation into the passageway 15 sufficiently to form a minute gas passageway 30. The size of the passageway 30 is what regulates the size of the flame 31 when the gas is ignited in the testing unit 22 at the top of the nozzle 24.

In carrying out our method, the deforming of the shank 14, as just described and which forms the recess 28, also causes a slight bulging 31' of the metal of the shank around the depression 28.

The same procedure is followed in deforming the hollow tube 32 illustrated in Figures 5, 6, and 7. In this form of the valve, the tube 32 may form the nozzle 33 at one end which is adapted to be snuffed by the soft rubber closure 34 carried by the cap 35 of the lighter A. The gas chamber 36 holds a supply of compressed liquid fuel and gas which is adapted to escape through the valve 10 or the tube 32.

The depression 28 in the tube 32 is formed by the ball bearing ended tool 27 in the same manner as the depression is formed in the shank 14. Thus, an arched portion 29 is formed in the passageway 15' of the tube 32 and the bowing of the arch 29 into the passageway 15' forms a minute gas escapement opening 30, as illustrated in Figure 7.

The fixed valve 10 is held in position in the lighter A by the threaded collar 37 which is positioned by a spanner wrench engaged in the openings 37 to press against the fixed valve 10 in the recess 17 and forcing the body of the valve 10 into biting engagement by the annular sealing ring 39 which engages into the material of the shoulder 40 of the body lighter A to assist in forming a gas tight seal around the base of the fixed valve 10. The annular biting rib 39 is important on the bottom of the head of the valve 10 because it forms a seal at the base of the fixed valve 10 and assists in taking part of the sealing load off of the sealing ring 12 and insures an absolutely gas tight seal around the valve 10.

In carrying out our method, we have found that by placing the valve 10 in the fixture 22 and operating the ball ended tool 27 through the knurled knob 26 of the screw shank 25 that it is necessary to force the end 27 into the metal of the shank 14 sufficiently to reduce the size of the flame 31 from the improvised nozzle 24 to a smaller size and then when the tool 27 is released by backing the same away from the shank 14, the deformed metal will recover suf-

ficiently to increase the size of the flame 31 to the desired extent. In this manner, our method is essential to the forming of the arched portion 29 in the passageway 15 to provide a flame 31 of a predetermined size or height. The arched construction of the depression 28 which forms the arch 29 in the passageway 15, after being formed, becomes a fixed restriction in the passageway 15 which does not change over a period of time. Therefore, our method is essential in the proper forming and setting of the fixed valve 10 and our method provides an adjusted fixed one-piece valve which does not change over a period of time and remains with a fixed minute gas passageway which ordinarily by other means is not possible to secure. The method includes a micrometric adjustment of the setting tool 22 which is readily operated virtually by unskilled labor; however, to obtain the finest adjustment for the minute opening finally obtained in the fixed valve 10, the recovery of the metal after being deformed is readily discerned by the change of the height of the flame when the ball bearing ended tool 27 is released. In this manner, the operator has no trouble in setting the valve.

Therefore, it will be apparent that by an extremely simple valve 10 or tube 32, we provide a fixed valve with a predetermined opening through which gas will escape from the chamber 36 of the lighter A to the nozzle where it is ignited in any suitable manner. The arched portion 29 forms a strong bridge in the passageway 15 or 15' which prevents any change in the opening or openings 30 thereby maintaining a uniform flame at the nozzle of the lighter A with a very slight variation in the height of the flame due to climatic conditions and the pressure of the outer atmosphere. This method of deforming the passageway 15 is important, and it is highly important that the passageway 30 remain constant. Further, the simplicity of a one-piece fixed valve is of primary importance and we have accomplished the same by trial and error method which developed the method herein described and the metal of the fixed valve 22 and the tube 32. There are no moving parts in our fixed valve to get out of order, and for a gas lighter of the character where our fixed valve is used, it is highly important that simplicity is maintained in the manufacture and construction of the same.

We claim:

1. The method of forming a fixed valve for the escapement of gas therethrough in a cigarette lighter, consisting in providing a metal body, then forming a predetermined size hole extending longitudinally through the body, then supporting the valve body in a fixture, and while gas is passing through the same deforming the wall of the hole by gradually applying pressure to reduce the size thereof so that a small initial flame of predetermined size is obtained from the gas passing through the valve while the deforming operation is in progress, and then releasing the deforming pressure which causes the flame from the gas passing through the valve to increase to a final predetermined desired size.

2. The method of forming a fixed metal valve for the escapement of gas in a cigarette lighter consisting in providing a body of metal, then forming a predetermined size hole extending through the body, then deforming a portion of the hole by gradually applying pressure to the wall of the body until the initial flame from the gas passing through the valve is of a predetermined small size, then releasing the applied pressure whereupon a flame will increase to a final predetermined size and the deformed passageway will remain fixed to provide the predetermined size flame.

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