ABSTRACT OF THE DISCLOSURE

A gas lighter has a cartridge containing fuel under pressure, and has a head assembly provided with a screw with a tapered end. Turning movement of the head assembly relative to the cartridge drives the end of the screw into the cartridge to permit escape of pressurized fuel along the helix path of the threads and out through a flame port in the head assembly. The height of the flame is regulated by turning of the head assembly along the threads.

This invention relates to a gas lighter or candle using pressurized fuel such as, for example, butane.

The principal object of this invention is to provide an improved lighter construction having a minimum number of parts, and particularly well suited for economical manufacture on a quantity production basis. Another object is to provide a device of this type which is rugged and dependable and not apt to get out of working order. Another object is to provide such a device in which the fuel tank or cartridge is disposable when the supply of fuel is exhausted, and a fresh cartridge readily installed.

These and related objects are achieved by providing a head assembly having a screw with a tapered end, and a cartridge containing fuel under pressure, and having an internally-threaded element for reception of the screw. Turning movement of the head assembly relative to the cartridge causes the screw to pierce the cartridge and allow pressurized fuel to pass along the helix path of the threads to an outlet port in the head assembly. The screw has four functions: (a) it serves as the sole connecting means between the head assembly and the fuel cartridge; (b) it pierces the cartridge to permit escape of fuel under pressure; (c) it provides a helix path for conveying the fuel to a flame port in the head assembly; and (d) it serves as both a regulator valve and shut-off valve for adjusting the height of the flame, and for extinguishing the flame.

Other and more detailed objects and advantages will appear hereinafter.

In the drawings:

FIG. 1 is a perspective view showing a preferred embodiment of this invention.

FIG. 2 is a longitudinal sectional view taken substantially on the lines 2—2 as shown in FIG. 1.

FIG. 3 constitutes an enlargement of the upper portion of FIG. 2.

FIG. 4 is a transverse sectional view taken substantially on the lines 4—4 as shown in FIG. 2.

FIG. 5 is an exploded view partly in section, showing the manner of assembly of the screw with respect to the head of the casting.

FIG. 6 is a sectional elevation on an enlarged scale, showing the screw assembled in the head casting.

Referring to the drawings, the lighter device generally designated 10 comprises a cartridge 11 containing fuel under pressure, and a head assembly 12. As shown in the drawings, the cartridge 11 comprises a cylindrical container or tank formed of thermoplastic material suitable for injection molding. One end of the cartridge 11 is closed by an end wall 13, and the other end is closed by a plug element 14, also formed of thermoplastic material. The plug element may be sealed to the wall of the cartridge 11 in any preferred or convenient manner. We have found that the conventional technique of spinning the plug element with respect to the cartridge to form a heat seal 15 gives satisfactory results. A flange 16 on the plug element 14 rests on a shoulder 17 on the cartridge 11.

The chamber 18 within the cartridge 11 may contain open cell polyether foam, and pressurized fuel such as butane fills the chamber 18 and the foam. A filling opening 19 in the bottom wall 13 provides for initial introduction of the fuel into the chamber 18, and this opening is later closed by a spinning process.

The closure element 14 is provided with an internal recess 22 which contains a pressure regulator assembly generally designated 23. This assembly 23 comprises a series of disks and is described in detail in our co-pending application Ser. No. 730,309, filed of even date herewith, entitled "Gas Flow Regulator for Lighter." The barrier wall 24 of the closure element 14 is initially imperforate, so that the pressurized fuel is confined within the cartridge 11 and cannot escape.

The head assembly 12 includes a head casting 26 and a metal screw 27 fixed to the casting. The casting 26 is designed so that it may be produced by low cost die casting procedures, and the screw 27 is a screw machine part. As best shown in FIG. 5, the screw 27 has a portion with external threads 28 and a smooth portion 29. The lower end of the screw 27 is provided with a tapered point 31. The casting 26 is provided with an outer peripheral skirt 32 and an inner concentric sleeve 33, defining an annular space 34 between them. As best shown in FIGS. 5 and 6, the wall 36 is provided with radiating channels 37. The screw 27 is assembled relative to the casting 26 by pressing the smooth portion 29 into the interior of the central sleeve 33 until the upper end of the screw 27 engages the end wall 36. The channel 30 in the wall of the sleeve 39 communicates with the channels 37 in the casting 26, and the latter communicates with the axial passage 38 which leads to the flame port or outlet port 39. The port 39 emerges into the interior of the chamber 41, projecting into the recess. After assembly, the casting 26 and screw 27 function as a single integral unit.

The casting 26 may be knurled or otherwise roughened on its outer surface, as shown at 42 and 43, to facilitate manual grasping of the head assembly 12 for turning it with respect to the cartridge 11. The plug element 14 is provided with a central upstanding tubular portion provided with internal threads 45. When the screw 27 is threaded into the plug element 14, the lower tapered end 31 first punctures the barrier wall 24. Turning movement of the head assembly 12 in the opposite direction then lifts the tapered end 31 of the screw to permit flow of fuel under pressure through the regulator assembly 23, and through the small opening pierced in the barrier wall 24, and through the clearance space between the internal threads 45 and external threads 28. The screw threads thus form a helix path for flow of fuel under pressure to the upper end of the plug element 14. The fuel under pressure then flows upward through the axial channel 30 and radial channels 31 to the passageway 38 and to the outlet port 39.

Sparking means is provided for igniting the fuel escaping from the outlet port 39 to form a flame. As shown in the drawings, this sparking means includes a wheel 47 having a serrated periphery 48 and provided with oppositely extending integral hubs 49. These hubs 49 are received in aligned recesses 50 provided in the bottom wall of the casting 26, and the wheel 47 extends through a slot 51. A portion of the wall 52 is deformed by a staking operation to retain both hubs 49 in position, to prevent disassembly. A solid cylinder of spark-producing mate-
rial 53 is slidably mounted within the integral guide tube 54 provided on the head casting 26, and extends through the opening 55. The coil compression spring 56 within the tube 54 urges the member 53 in an upward direction to contact the periphery 48 of the wheel 47. The lower end of the spring 56 engages the flange 57 which is supported on the rim 60 to hold the sleeve 58 of the interior leg elements 58. It will be observed that the tube 54 and spring 56 are positioned in the annular space 34 between the skirt 32 and the central sleeve 33. The skirt telescopess over the upward extending rim 60 to exclude foreign matter from the annular space 34.

In operation, the cartridge 11 is connected to the head assembly 12 by relative turning movement along the threads 28 and 45, to cause the tapered end 31 of the screw 27 to puncture the barrier wall 24, as described above. The head assembly 12 is then turned in the opposite direction for a part of one revolution to permit gas under pressure to escape through the outlet port 39. The spring 45, wheel 47 is then manually rotated to ignite the fuel and form a flame 62 at the outlet port 39. The protuberance 41 keeps the flame spaced from the floor of the recess 50 to minimize transfer of the heat into the head casting 26. The height of the flame 62 is adjusted by turning the head assembly 12 with respect to the cartridge 11; this relative turning movement changes the spacing of the tapered end 31 of the screw with respect to the opening which it has pierced in the barrier wall 24, and this tapered portion 31 serves as a valve to regulate the height of the flame 62. The maximum height of the flame is pre-set by the regulator assembly 23. In order to extinguish the flame, the head assembly 12 is turned with respect to the cartridge 11 to move the tapered end 31 of the screw 27 back into the barrier wall opening to shut off all flow of gas. From the above description, it will be understood that the screw 27 serves as the sole means securing the cartridge to the head assembly, the screw having an end portion provided with a taper point adapted to pierce a portion of said cartridge downstream from said pressure regulator assembly upon relative turning movement of the cartridge and head assembly, said tapered point thereafter acting as a valve in said pierced portion controlling the rate of flow of fuel, and passage means including a passageway in the head assembly passing from the valve through the passage means to the outlet port.

2. The combination set forth in claim 1 in which the head assembly comprises a body casting and a separate screw, the screw having a knurled portion remote from said end portion press-fitted into the body casting, the knurled portion having at least one channel forming a portion of said passageway.

3. The combination set forth in claim 2 in which the body casting has a cylindrical wall and an end wall, the cylindrical wall receiving the knurled portion of the screw and the end wall having at least one channel forming another portion of said passageway.

4. The combination set forth in claim 1 in which the head assembly has a peripheral skirt telescopically over a rim on the cartridge.

5. The combination set forth in claim 1 in which the head assembly also has a central sleeve positioned interiorly of the skirt and encircling and contacting a portion of said internally-threaded element.

6. The combination set forth in claim 4 in which annular space is defined between the central sleeve and the skirt, and sparking means on the head assembly having a portion thereof positioned in said annular space.

7. In a lighter, the combination of a sealed cartridge containing fuel under pressure and having an internally-threaded element at one end, said cartridge also containing a pressure regulator assembly, a head assembly having an outlet port and a central externally-threaded screw for threaded reception within said cartridge element, the internal and external threads providing a helix passage along the screw, the screw having an end portion provided with a tapered point adapted to pierce a portion of said cartridge downstream from said pressure regulator assembly upon relative turning movement of the cartridge and head assembly, and means forming a passageway in the head assembly leading from said helix passage to said outlet port so that fuel may pass from the pierced cartridge along the helix passage and passageway to the outlet port.

8. The combination set forth in claim 7 in which the head assembly has a recess in one end and a central protuberance extending into the recess, the outlet port being positioned in said protuberance.

9. In a lighter, the combination of a sealed cartridge containing fuel under pressure and having an internally-threaded element at one end, said cartridge also containing a pressure regulator assembly, a head assembly having an outlet port and a central externally-threaded screw for threaded reception within said cartridge element, the internal and external threads providing a helix passage along the screw, the screw having an end portion provided with a tapered point adapted to pierce a portion of said cartridge downstream from said pressure regulator assembly upon relative turning movement of the cartridge and head assembly, and said tapered point thereafter acting as a valve controlling escape of fuel from said cartridge, means forming passing a passageway in the head assembly leading from said helix passage to said outlet port so that fuel may pass from the pressure regulator assembly through the pierced cartridge along the helix passage and passageway to the outlet port, whereby relative turning movement of the cartridge and head assembly along the threads may regulate the rate of flow of fuel.

10. In a lighter, the combination of a sealed cartridge containing fuel under pressure and having an internally-threaded element at one end, a head assembly having an outlet port and a central externally-threaded screw for
threaded reception within said cartridge element, the internal and external threads providing a helix passage along the screw, the screw and said element constituting the sole means securing the cartridge to the head assembly, the screw having a tapered end portion adapted to pierce a portion of said cartridge upon relative turning movement of the cartridge and head assembly, and thereafter act as a valve controlling escape of fuel from said cartridge, means forming a passageway in the head assembly leading from said helix passage to said outlet port so that fuel may pass from the pierced cartridge along the helix passage and passageway to the outlet port, and sparking means on the head assembly for igniting a flame at said outlet port, whereby relative turning movement of the cartridge and head assembly along the threads may regulate the size of the flame and also extinguish it.