This invention relates to a novel and improved lighter construction, and more particularly to a lighter employing butane as a fuel.

Most commercially available lighters employ a liquid flammable fuel to saturate a wick. The wick is exposed to sparking action and ignites to provide the desired flame. The use of volatile fluid and the inherent properties of the wick structure cause the fuel supply to be exhausted quickly. Refilling such conventional lighters with fuel is an operation which usually results in fluid being spilled and leaving an undesirable odor.

Accordingly, it is an object of the present invention to provide a lighter of economical construction which may be discarded when the fuel supply is exhausted.

Another object of the invention is the provision of a lighter having positive valve operation to insure reliable and instant lighting.

Another object of the invention is the provision of a lighter which is formed in sections and joined by an improved sealing process.

Another object of the invention is the provision of a cigarette lighter of improved construction having a novel valve arrangement for filling the lighter.

Another object is the provision of a lighter having adjustable means for controlling the height of the flame while insuring that the adjustment will not be changed accidentally.

A further object of the invention is the provision of a lighter which may employ interchangeably a number of caps of different design.

These features are realized in a lighter construction comprising a hollow body portion adapted to contain a flammable fuel such as butane, which remains liquid at low temperatures and/or high pressures, but which changes to its gaseous form at atmospheric temperature and pressure. The hollow body portion contains first and second interconnecting chambers having communicating passages between the chambers and a bottom portion thereof. Extending into the fuel chambers is a valve assembly controlling the release of the fuel. The rate of fuel release is controllable by means of an adjustment wheel at the top of the valve. A spark wheel assembly is eccentrically mounted on a wind shield so that actuation of the spark wheel causes an end of the wind shield to be lifted upwards. The wind shield engages the valve so that when the spark wheel is actuated the wind shield opens the valve with a positive action, thereby insuring the escape of fuel. The wind shield is biased normally to hold the valve in closed position. The body portion of the lighter is molded in two parts and assembled by the use of an undercut metallic ring positioned between the two parts and subjected to an electromagnetic field in an induction heating operation. The plastic portions adjacent the ring are melted and flow into the undercut portions of the ring to lock in place the assembled parts.

The foregoing and other objects and advantages of the invention will be apparent from the following more particular description of a preferred embodiment of the invention, as illustrated in the accompanying drawings, in which:

FIG. 1 is a cross-sectional view of an assembled lighter in elevation;

FIG. 2 is a cross-sectional view of the lighter taken along lines 2-2 in FIG. 1;

FIG. 3 is an exploded perspective view of certain elements of the spark and valve assemblies;

FIGS. 4, 5, and 6 are views of the body portion taken along the lines indicated in FIG. 1;

FIG. 7 is an unassembled cross-sectional view showing the body portions and sealing ring;

FIG. 8 is an assembled cross-sectional view of the body prior to sealing by induction heating);

FIG. 9 is a cross-sectional view of the body after the sealing operation.

The invention will be described with more particularity by making reference to the drawings in which the same numerals will be used throughout the various figures to indicate identical parts. In FIG. 1 the lighter is shown as comprising a body portion 1 having interior fuel chambers 3 and 5 interconnected at the top and bottom portions by passageways 7 and 9, respectively. A base member 11 is sealed to the bottom portion of the body 1 by the induction heating of metallic ring 13 with undercut portions. The body and base members are constructed of a thermoplastic material which is softened by heating ring 13 and flows in the undercut portions of ring 13 to form a mechanically strong hermetic seal.

The base member 11 is provided with apertures 15 and 17 to serve as filling and venting apertures, respectively. Soft rubber seals 19 and 21 are mounted in apertures 15 and 17 to serve as closure members for the fuel chambers 3 and 5, respectively. This arrangement permits the filling of the fuel chambers under pressurized conditions by inserting filling and venting needles through the rubber seals 19 and 21 to insert fuel and simultaneously withdraw air from the fuel chambers.

A top member 23 is mounted on the body portion by means of a pin 25, which extends under the upturned ear portions 27 and 29 of spring member 31. Spring member 31, FIG. 3, has lower tab portions 38 and 40 with cut out portions 42 and 44, which serve to anchor the spring on the plastic body portion. The spring 31 is mounted on the body portion by heating and pressing into the plastic body. This construction permits the top member to be detached easily, thereby facilitating the replacement of the top with other tops of different design if desired. Top 23 is held in both open and closed positions by the action of spring 31 against pin 25.

A wind shield member 33 is pivotally mounted on the upturned arm members 35 and 37 of spring 31. This mounting is accomplished by means of interwoven tab portions, such as 39, formed in wind shield member 33. These tab portions pivot about points 41 and 43 on arms 35 and 37, respectively.

A single cylindrical member 45 contains a spark wheel surface 47, finger wheel surfaces 49 and 51, and shaft ends 53 and 55. The unitary member 45 is mounted for rotation in wind shield member 33 through holes 57 and 59.

Journaled in windshield 33 in holes 57 and 59 is a finger stop member 61. Member 61 has a serrated upper portion 63, and is mounted on shaft 65 which also carries a rivet to reinforce the upstanding walls of wind shield 33 and hold them in position. A spring member 67 biases the wind shield 33 in a clockwise direction by acting upwardly on the underside of finger stop member 61.

A valve member 69 having a peripheral flange 71 is held in position by wind shield member 33, which engages the flange 71 by interwoven portions 73 and 75 (FIG. 2). The butane fuel in chambers 3 and 5 escapes through passageway 7, porous discs 77 and around rubber washer 79 up through the hollow valve member 69, where it is ignited by the action of the sparking surface 47 acting on flint 81. It will be appreciated from the description that the valve member 69 is forced down tightly against rubber washer 79 by the action of spring 67 biasing wind shield member 33 in a clockwise direction, thereby closing aperture 80. The valve member 69 is automatically
opened to allow the escape of fuel when the spark wheel is actuated and finger stop member depressed to move the wind shield member 33 in a counterclockwise direction. This insures that there will be no escape of fuel when the lighter is not being used, while providing for a positive supply of fuel when ignition is attempted.

The amount of fuel escaping when valve member 69 is raised is regulated by the spacing of adjustment screw 83 with respect to rubber washer 79. The adjustment screw 83 is provided with an upper peripheral portion containing teeth 85 and a lower V-shaped slot 84. Slot 84 insures that the flow of fuel will not be cut off by rubber washer 79 during use. A knurled nut member 87 fits over the teeth 85 in mating fashion to provide a means for adjustment. A projection 89 on the knurled nut 87 rides between ears 27 and 29, which serve as limit stops to prevent the range of valve adjustment from exceeding a desired value. The top member 23 completely encloses the adjusting mechanism to insure that the valve adjustment will not be changed accidentally while the lighter is not in use.

The manner in which the base member 11 is sealed to body portion 1 will be seen by referring to FIGS. 7 to 9 of the drawings. FIG. 7 is an unassembled view of base member 11, metallic ring 13 and body portion 1 showing the configuration of the mating parts. Ring 13 has an undercut configuration so that the plastic of base member 11 and body portion 1 can flow into the undercut portions and form a firm mechanical joint. When the parts have been assembled mechanically, as shown in FIG. 8, the assembly is placed in the electromagnetic field generated by an induction coil 91. This electromagnetic field generates eddy currents in metallic ring 13, causing the ring 13 to heat sufficiently to melt the adjacent plastic. During this generation the body 1 and base 11 are compressed by exerting a downward force on body 1 and an upward force on base 11 to facilitate. As the plastic melts and flows into contact with ring 13, the final joint shown in FIG. 9 results. The flow of the plastic produces a hermetic seal, and the interlocking of the plastic in the undercut portions of ring 13 assures a strong mechanical joint to withstand the high internal pressures of the butane within fuel chambers 3 and 5.

While the invention has been shown and described with particular reference to a preferred embodiment, it will be understood by those skilled in the art that various changes in form and details may be made without departing from the spirit and scope of the invention. What is claimed is:

1. A lighter comprising a hollow body portion containing first and second chambers interconnected at their top and bottom portions and adapted to store a flammable fuel, valve means for controlling the escape of said flammable fuel, a spark assembly for igniting said fuel as it escapes, and means for inserting fuel into said chambers, said means for inserting fuel including a pair of rubber seals through which filling and venting tubes may be inserted to inject a flammable fuel while allowing the air within said body portion to be displaced, whereby said chambers are completely filled.

2. A lighter comprising a hollow body portion adapted to contain a flammable fuel, valve means for controlling the escape of said flammable fuel, a wind shield, means pivotally mounting said wind shield on said body portion, resilient means normally urging said wind shield into a first position, and a spark producing wheel rotatably mounted on said wind shield, said wind shield acting against said valve means in said first position to hold said valve means in a normally closed position.

3. The combination according to claim 2 wherein said means for pivotally mounting said wind shield on said body portion includes inturned integral projections on said wind shield which serve as a pivotal axis.

4. The combination according to claim 2 wherein the relative positioning of said spark producing wheel and said means for pivotally mounting said wind shield is such that the manual pressure required for rotation of said spark wheel will cause said wind shield to assume a second position in which said valve means is no longer held closed, whereby said flammable fuel is released for igniting by the action of said spark wheel.

5. The combination according to claim 4 wherein said wind shield and said valve means are coupled for movement together, thereby positively opening said valve means every time said spark wheel is actuated.

6. The combination according to claim 2 wherein said spark producing wheel comprises as an integral assembly a rotatable shaft member, a friction surface for engaging a flint, and finger wheel means to facilitate manual rotation of the assembly to produce a spark.

7. The combination according to claim 2 wherein said hollow body portion comprises two chambers interconnected at their top and bottom portions.

8. The combination according to claim 2 wherein said valve means is adjustable to control the amount of fuel escaping and further includes means to limit the adjustment of said valve means, said means to limit being normally enclosed within a top member whereby the height of the flame produced will not accidentally be made excessively high or changed when the lighter is not in use.

9. The combination according to claim 2 including means for inserting fuel into said hollow body portion, said means for inserting fuel including a pair of rubber seals through which filling and venting tubes may be inserted to inject a flammable fuel while allowing the air within said body portion to be displaced, whereby said body portion is completely filled.

References Cited by the Examiner

UNITED STATES PATENTS

1,099,716 6/14 Neubert 18–59
2,635,724 4/53 Anderson 67–71
2,774,393 12/56 Swan 141–330 X
2,836,044 5/58 Zellweger 67–71
2,897,524 3/59 Fink 18–59
2,973,758 3/61 Murish 141–330 X
2,986,027 5/61 Lockwood 67–71
3,048,591 8/62 Iketani 67–71
3,085,601 4/63 Zellweger 67–71
3,088,201 5/63 Gruber et al. 67–71
3,102,988 6/63 Meyers 67–71
3,122,907 3/64 Gilberton 67–71

FOREIGN PATENTS

1,150,042 7/57 France.

OTHER REFERENCES

German Printed Application No. 1,115,071, 10/61.

EDWARD J. MICHAEL, Primary Examiner.