United States Patent [19]

Webster

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[54] **DISPOSABLE LIGHTER**

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[73] Assignee: **The Gillette Company,** Boston, Mass.

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[52] **U.S. Cl.** **431/254,** 431/276, 431/344, 251/331

[51] **Int. Cl.** **F23q 1/04**

[58] **Field of Search** 431/130, 131, 142, 143, 431/150, 254, 255, 276, 277, 344; 251/331; 137/223

[56] **References Cited**

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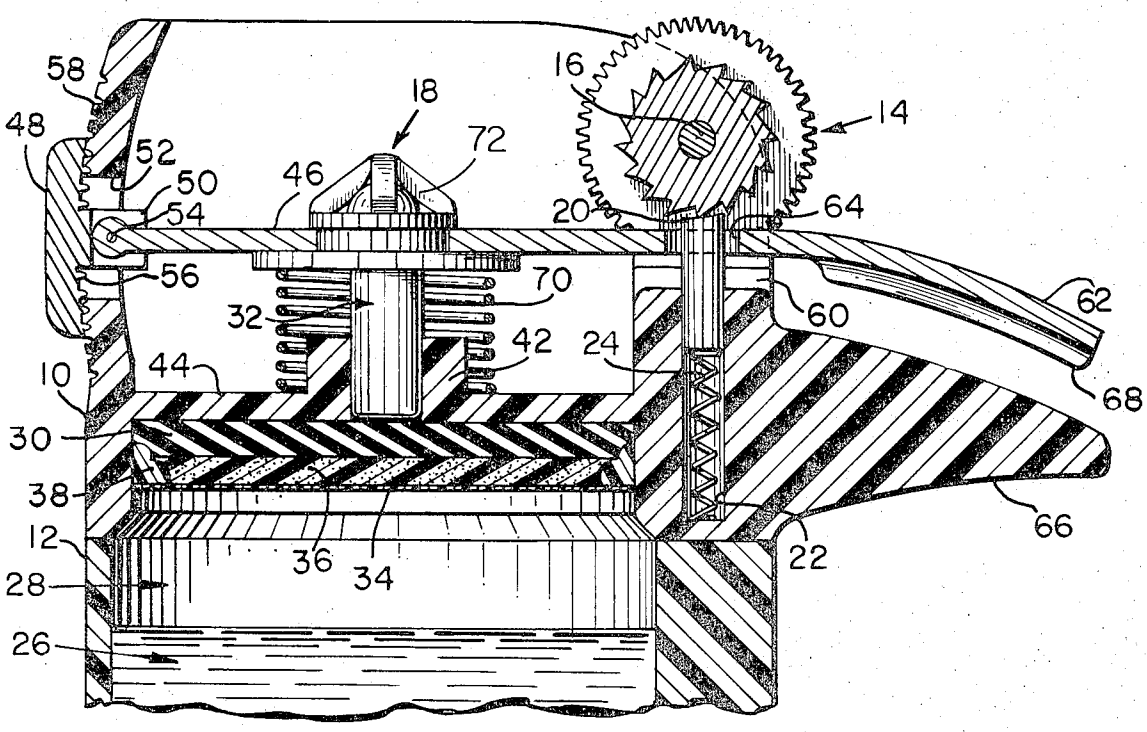
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Primary Examiner—Carroll B. Dority, Jr.

[57] **ABSTRACT**

A gas lighter having a flow adjustable valve actuated by an operating member in combination with a control member. The valve includes a flexible, resilient member which is flexed away from a normally closed position to open a valve port by movement of the control member. Means are provided to adjust the length of the control member stroke, thereby adjusting the flexing imparted to the flexible member, and consequently the rate of fuel flow and the flame height. In one embodiment, openings are provided through the flexible member, with blocking means preventing a flow of fuel until the member is flexed and the openings uncovered. In another embodiment, the flexible member has a normally closed slit that is progressively opened as the member is flexed.

12 Claims, 8 Drawing Figures



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SHEET 1 OF 2

Fig. 1

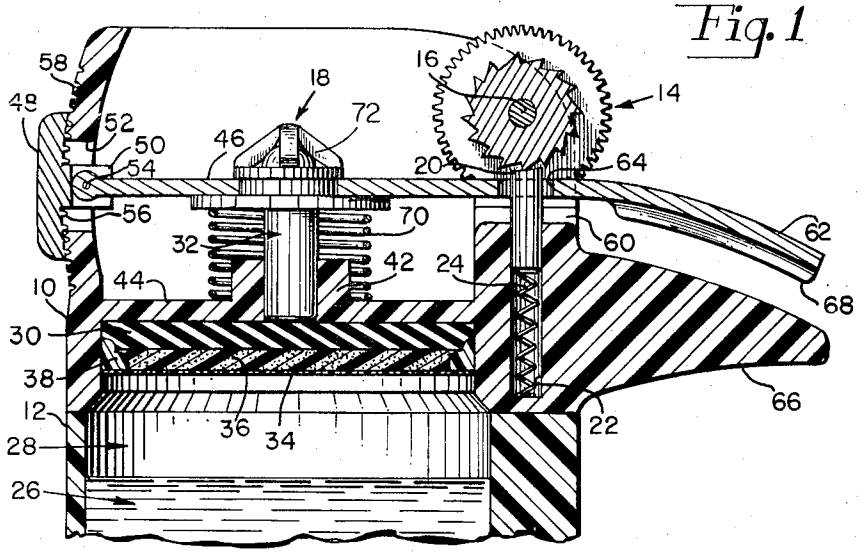


Fig. 2

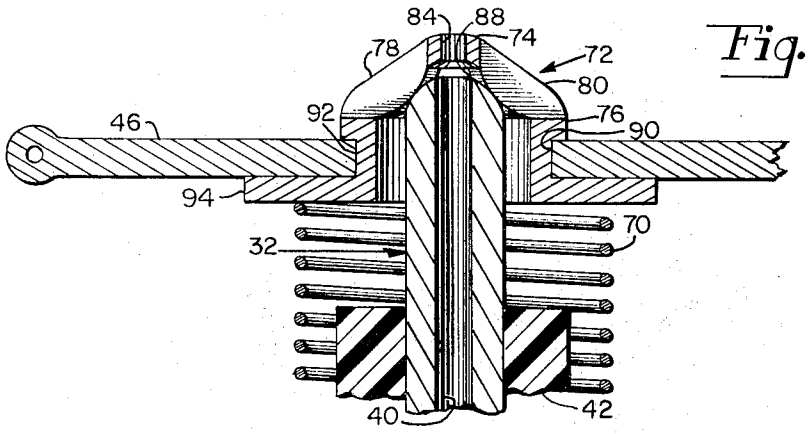


Fig. 3

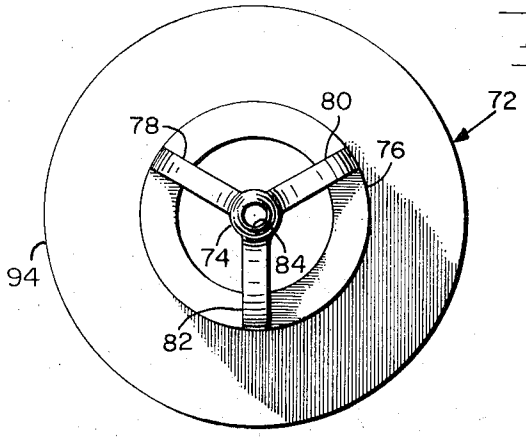


Fig. 4

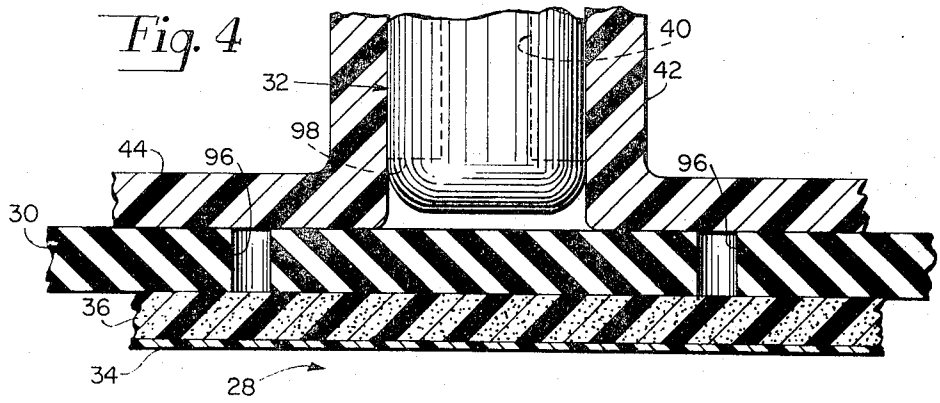
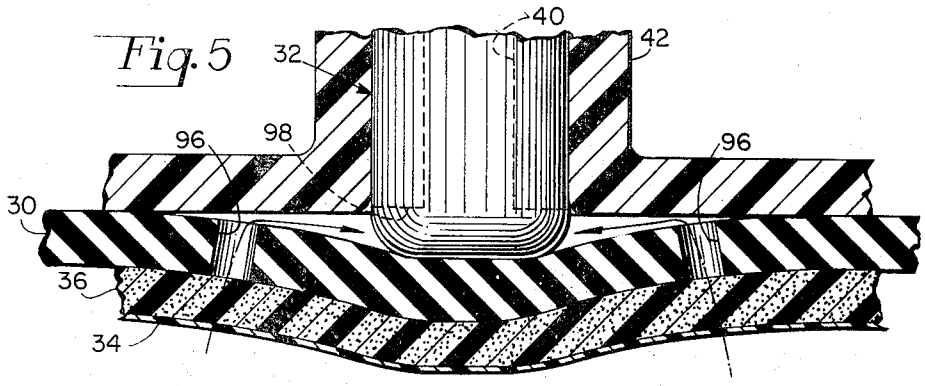


Fig. 5



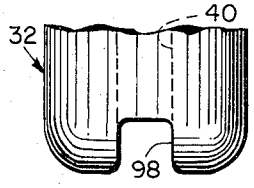


Fig. 6

Fig. 7

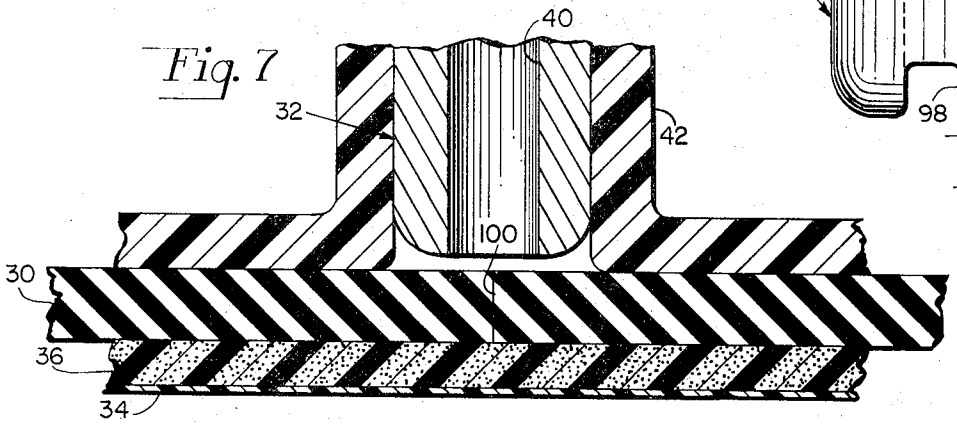
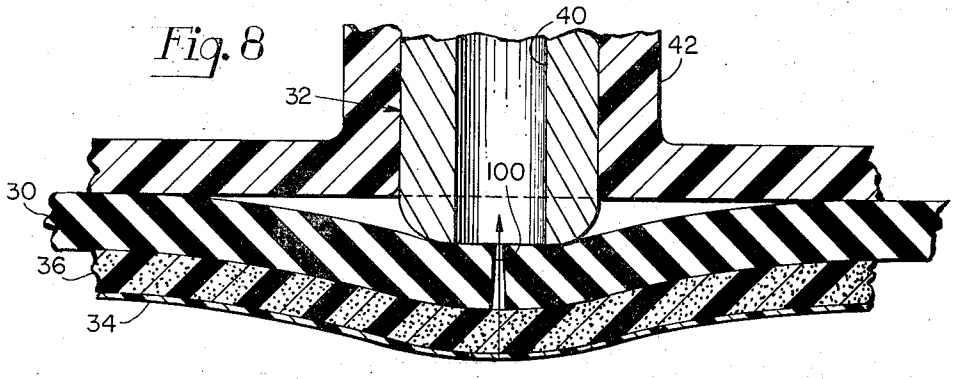


Fig. 8



DISPOSABLE LIGHTER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to gas lighters, and more particularly to lighters in which a flow of gas is initiated by movement of an operating member.

2. Description of the Prior Art

Several gas lighters have been developed in which a single movement of the operator's thumb first turns a spark wheel and then operates a lever which causes combustable gas to flow through a valve. In normal use the delay between these two actions is small, and a spark will be located above the valve outlet to ignite the gas when it appears. These lighters are generally light weight, relatively inexpensive, and frequently of the disposable variety.

Currently available lighters are frequently of the "on-off" variety, with a preset flame height that cannot be adjusted. Flame adjustment has been found to be a highly desirable feature, however, and a number of lighters have been developed with various designs for controlling the flame height. These latter devices generally employ a screw type mechanism in which a control member is rotated to either vary the gap between a valve port and a seal, or to adjust the pressure applied to a compressible valve member.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a gas lighter with a novel and improved flame control mechanism. A further object is the provision of a lighter with such a mechanism that is inexpensive to manufacture, and that guards against accidental changes in the flame setting.

Another object is the provision of a novel and improved lighter with a moveable flow control member, in which the flame height is proportional to the amount by which the control member is moved when the lighter is actuated.

Still another object is the provision of a lighter in which fuel is permitted to pass through a valve by flexing of a flexible resilient member located between a fuel chamber and outlet orifice, and in which the rate of fuel flow is determined by the amount the member is flexed.

In the accomplishment of these and other objects, the present invention provides a gas lighter with an inexpensive and secure flame adjustment control, in which a valve means is interposed between a fuel chamber and an outlet orifice to control the flow of fuel therebetween. The valve means includes a flexible, resilient member of gas impermeable material that forms a valve port and is mounted to the lighter body for movement between a normal position in which the valve is closed, and a flexed position in which the valve is open. Means for actuating the valve include an operating member and a control member engageable with the flexible resilient member, the control member being adapted to move the flexible resilient member to its flexed position in response to movement of the operating member to an actuating position. Ignition means adjacent the outlet orifice produce sparks to ignite the fuel when the valve is open.

To enable use of the lighter with a liquid fuel, a liquid impermeable, gas porous membrane is secured to the lighter between the fuel chamber and the valve to reduce liquid fuel in the chamber to a gaseous flow at the valve. A layer of foamed material is sandwiched between the flexible resilient member and the membrane to enhance recovery of the member from a flexed position.

The flexible resilient member is adapted to open the valve port to the passage of fuel, with the rate of fuel flow varying in proportion to the amount the member is flexed. In one embodiment, the valve port is formed by an open passageway through the flexible resilient member, and blocking means are carried by the lighter body in registry with the passageway, the blocking means being positioned to normally contact the flexible resilient member and block the flow of fuel through the passageway. The flexible resilient member is progressively spaced away from the blocking means as the member is progressively flexed by movement of the control member; the rate of fuel flow through the passageway, and consequently the flame height, is controlled by the total space adjustment between the blocking means and the flexible resilient member.

In another embodiment, the valve port comprises a narrow slit cut through the flexible resilient member, the slit being closed when the resilient member is in its normal position and progressively opened as the resilient member is progressively flexed.

A particular embodiment is described for controlling the amount of member movement, and thereby the rate of fuel flow, in which structure defining a pivot axis is provided at one end of the operating member, the other end of the operating member forms a thumb rest, and the control member engages an intermediate portion of the operating member. The pivot axis defining structure abuts an exterior surface of the lighter body, and includes incremental adjustment means matching with corresponding means on the lighter surface for adjustably locking the said structure into one of several vertically spaced positions. Adjustment of the position setting varies the length of the control member stroke, and thereby the amount by which the control member flexes the flexible resilient member when the operating lever is moved to an actuating position by being pivoted about the pivot axis defining structure.

In a preferred embodiment, the control member comprises a valve stem that is movable by the operating member between a raised position at which the flexible resilient member is in its normal position, and a lowered position flexing that member to open the valve port. An elongated bore extends through the stem from its lower portion to the outlet orifice, the lower end of the bore forming an inlet for fuel from the valve port. The lighter also includes a spring means urging the operating member upwardly to keep the valve closed at all times except when the operating member is actuated. In another feature of this embodiment, the valve stem has a rounded upper surface which abuts a cap carried on an intermediate portion of the operating member. The cap includes an orifice in fuel flow alignment with the outlet from the stem bore, and is adapted to move the valve stem downwardly and flex the flexible resilient member when the thumb rest is depressed.

Other objects, features and advantages of the invention will be seen from the following detailed description, in conjunction with the drawings, in which:

FIG. 1 is a cross-sectional view of the upper part of a lighter embodying the invention;

FIG. 2 is an enlarged cross-sectional view of portions of an actuating mechanism for the lighter;

FIG. 3 is a top view of a component of the valve action mechanism shown in FIG. 2;

FIGS. 4 and 5 are partial sectional views of the valve employed in the embodiment of FIG. 1, shown respectively in closed and open positions;

FIG. 6 is a side elevational view of the lower portion of the valve stem shown in FIGS. 4 and 5, illustrating details of the fuel inlet passage; and

FIGS. 7 and 8 are sectional views of another valve embodiment suitable for use in the embodiment of FIG. 1, shown respectively in closed and operating positions.

DETAILED DESCRIPTION OF PARTICULAR EMBODIMENTS

Having reference first to FIG. 1, a gas lighter has a body with upper walls 10 enclosing a valve mechanism and lower walls forming a fuel chamber 12. A spark wheel 14 is mounted on spindle 16 at the upper end of the lighter adjacent a fuel outlet 18, and contacts a flint 20 held in a flint tube 22 and urged upwardly by a spring 24. The fuel chamber 12 is flooded with a liquid fuel 26 such as butane that emits a head of butane gas 28. Between the fuel chamber 12 and fuel outlet 18 is a valve mechanism, to be described in greater detail hereinafter, which includes a flexible, resilient member 30 composed of an elastomeric material, and a valve control member 32. A thin, gas porous but liquid impermeable membrane 34 and a layer of foamed material 36 separate the flexible member 30 from the fuel chamber 12. Elements 30, 34, and 36 extend across the full inside area of the lighter and are attached to the lighter wall 10 by a heat seal or ultrasonic weld 38.

Control member 32, which also functions as a valve stem, is penetrated by an elongated bore 40 running from top to bottom. It is held against lateral movement withhin a tube 42 formed at the center of a disk 44 that spans the interior of the lighter. An operating member 46 is mounted at one end on a vertically adjustable pivot axis defined by structure including a base member 48, an arm 50 extending therefrom through an opening 52 in lighter wall 10 and carrying a post 54 for pivotally receiving the operating member 46. Small transverse beads 56 are formed on the inward facing surface of base member 48 and engage a corresponding series of transverse furrows 58 on the exterior surface of lighter wall 10. The pivot axis structure is readily adjustable by incremental, generally vertical amounts to impart a similar adjustment to the engaged end of operating member 46. A degree of horizontal tension is present in member 46 that locks the pivot axis structure into an assigned position, until another adjustment is made to change the alignment of beads 56 with furrows 58. The lighter wall 10 may be canted inwardly or curved along a circular arc to avoid loading the operating member 46 with excessive longitudinal stresses when pivot base member 48 is placed in an off-center position.

The intermediate portion of operating member 46 engages the valve control member 32, the other end of member 46 extending outwardly from the side of the lighter through an opening 60 and forming a thumb rest 62. An opening 64 is provided in the member 46 to give the flint 20 access to the spark wheel 14. Stop 66 limits the range of vertical movement for thumb rest 62, the range being further reduced by depending flanges 68 on the under side thereof. The vertical position of control member 32 is determined by the position of thumb rest 62, depression of the thumb rest serving to push the control member down into flexible member 30. A spring 70 is provided about the control member 32 to maintain the control member and operating member 46 at a normally raised position when the thumb rest is not actuated.

Operating member 46 engages the control member 32 by means of a slightly resilient cap 72, shown in detail in FIGS. 2 and 3. The cap 72 includes an upper ring 74 secured to a lower annular ring 76 by shaped struts 78, 80, and 82. A small opening 84 is provided in ring 74 as a gas orifice and forms the emitted gas into a desirable flame shape. The upper surface 88 of control member 32 is rounded spherically and the lower surfaces of struts 78, 80 and 82 curved convexly, whereby the cap 72 sits in three point contact on control member 32, and small cap movements that accompany pivotal movement of control member 46 can be accommodated without disrupting the flow of fuel. The operating member 46 is attached to the cap 72 by means of an interior opening 90, approximately equal in diameter to the diameter of a shallow annular groove 92 in the lower cap ring 76. An annular flange 94 extends outwardly from the lower ring 76 to form the bottom wall of groove 92 and an upper base for spring 70. The operating member 46 is secured to the cap by press-fitting into the groove 92.

The valve mechanism is shown in greater detail in FIGS. 4–8. Membrane 34, approximately one mil thick with a pore size in the range of 0.1–15 microns, and preferably 1–5 microns, passes gaseous fuel upwardly to the valve but keeps out liquid fuel. The gas passes through a layer 36 of foamed material such as polyurethane before reaching flexible member 30. The flexible member 30 provides a valve port for fuel flow from the fuel chamber, and is moveable between a normal position in which the valve is closed and a flexed position in which the valve is open. In one embodiment of the invention, shown in FIGS. 4–6, the flexible member 30 is pierced on opposite sides of the control member 32 by a plurality of openings 96 that form gas passageways. A notch 98 is cut across the bottom of member 32, which also serves as a valve stem, to admit gas into the valve stem bore 40. As shown in FIG. 4, the stem 32 does not bear against the flexible member 30 to any significant degree when it is in a raised position, and the upper surface of the flexible member lies in contact with the lower surface of disc 44, blocking any flow of fuel through openings 96 to the stem bore 40. When the stem 32 is lowered, the flexible member 30 is flexed and the interior portion thereof moves downward into the foam layer 36, spacing the openings 96 away from disc 44. Gas can now flow up through the openings 96, across the gap between disc 44 and flexible member 30, and up through stem bore 40. The gas flow rate is limited primarily by the size of the gap; progressively increasing the downward displacement of stem 32 progressively increases the gap, thereby producing a greater flow rate and a correspondingly higher flame.

Another valve embodiment, shown in FIGS. 7 and 8, features a narrow slit 100 cut through the flexible member 30 immediately below the stem bore 40. In the normally unflexed position the slit is closed by flexible

member **30** and no gas can enter the stem bore **40.** When the stem **32** is depressed to flex the flexible member **30** and move its interior portion downward, the slit **100** opens and admits a flow of gas directly into the stem bore **40.** The more the stem **32** is lowered the wider the slit **100** opens, and the greater is the gas flow. Since gas enters from directly beneath stem bore **40,** the bottom of stem **32** may be flat, eliminating the need for the notch **98** employed in the previous embodiment.

The operation of the lighter is as follows: An operator grips the lighter in one hand with his thumb upon the spark wheel **14.** By quickly moving his thumb downward to rotate the wheel, a shower of sparks is delivered to the vicinity of fuel outlet **18.** In the natural follow-through thumb rest **62** is quickly pushed down to stop **66,** pivoting the operating member **46** to lower the control member **32** into flexible member **30,** which flexes and moves downward. A flow of gas is thereby initiated into the stem bore **40,** through either a plurality of openings **96** or a slit **100** in flexible member **30.** Liquid fuel is meanwhile contained within the fuel chamber **12** by gas porous membrane **34.** The gas flows upward and out through the stem bore **40** and cap opening **84** for ignition by the sparks. So long as thumb rest **62** is depressed a steady flow of gas is produced and a level flame maintained.

The height of the flame is determined by the setting of the pivot axis structure. Upward adjustment of the pivot base member **48** reduces the effective stroke of the control member **32** into the flexible member **30,** reducing the flexing of that member and thereby decreasing the gas flow rate through the valve, as described above. Conversely, the flame height may be increased by moving pivot base member **48** to a lower setting, thereby increasing the effective stroke of the control member **32** into flexible member **30** and producing a greater flexing of that member and a consequent increase in the gas flow rate.

While particular embodiments of the invention have been shown and described, various modifications thereof will be apparent to those skilled in the art. For example, other schemes by which gas passageways may be opened by flexing a flexible resilient member can be envisioned. It is therefore not intended that the invention be limited to the disclosed embodiments or to details thereof, and departures may be made therefrom within the spirit and scope of the invention as defined in the claims.

What is claimed is:

1. A gas lighter comprising in combination a body forming in part a fuel chamber, an outlet orifice, valve means between said fuel chamber and outlet orifice controlling the flow of fuel therebetween, valve actuating means, and ignition means adjacent said outlet orifice, said valve means including a valve member movable between a normal position in which said valve is closed and a second position in which said valve is open, and said valve actuating means including an operating member, structure defining a pivot axis at one end of said operating member, the other end of said operating member forming a manually engageable actuating surface, and a control member, said control member engaging an intermediate portion of said operating member, said control member adapted to open said valve in response to the movement of said operating member to an actuating position and said pivot axis defining structure having an adjustable position setting to vary the amount by which the control member opens the vlave when the operating member is moved to an actuating position by pivoting about said pivot axis defining structure, the rate of fuel flow varying with the amount by which said valve is opened.

2. A lighter as claimed in claim **1,** wherein said valve means includes a flexible, resilient member of gas impermeable material forming a valve port, flexing movement of said flexible resilient member opens said valve port to the passage of fuel, and the rate of fuel flow varies with the amount by which said member is flexed.

3. A lighter as claimed in claim **2,** wherein said valve port comprises an open passageway through said flexible resilient member, and further including blocking means carried by said body in registry with said passageway, said means contacting said flexible resilient member in said normal position to block the flow of fuel through said passageway, said blocking means being progressively spaced away from said member as said member is progressively flexed, the rate of fuel flow through said passageway being controlled by the spacing between the blocking means and the flexible resilient member.

4. A lighter as claimed in claim **2,** wherein said valve port comprises a narrow slit through said flexible resilient member, said slit being closed when said resilient member is in said normal position and progressively opened as said resilient member is progressively flexed.

5. A lighter as claimed in claim **1,** wherein said control member comprises a valve stem movable by said operating member between a raised position at which said valve member is in said normal position, and a lowered position to open the valve, said stem having an elongated bore extending from the lower portion thereof to said outlet orifice, the lower end of said bore forming an inlet for fuel from said fuel chamber.

6. A lighter as claimed in claim **1,** and further including spring means urging said operating lever upward.

7. A lighter as claimed in claim **1,** wherein said pivot axis defining structure abuts an exterior surface of said lighter body, said pivot axis defining structure and said exterior surface being provided with matched incremental adjustment means for adjustably locking said pivot axis defining structure into one of several vertically spaced positions.

8. A lighter as claimed in claim **2,** wherein said valve means includes a liquid impermeable, gas porous membrane secured to said lighter body between said flexible resilient member and said fuel chamber, and a layer of foamed material between said flexible, resilient member and said membrane.

9. A gas lighter comprising in combination a body forming in part a fuel chamber, an operating lever pivotably mounted at one end to said body, the other end of said operating lever forming a thumb rest, flexible resilient valve means controlling the flow of fuel from said fuel chamber in proportion to the flexing of said valve means, a valve stem having a rounded upper surface and an elongated bore adapted to receive fuel from said valve means, an outlet for said bore at the top of said stem, a cap carried on an intermediate portion of said operating lever and abutting the upper valve stem surface, said cap including an orifice in fuel flow alignment with said stem bore outlet, and adapted to

move said valve stem downwardly and flex said flexible resilient member when the thumb rest is depressed, spring means urging said operating lever upwardly, and ignition means adjacent said cap orifice.

10. A gas lighter comprising in combination a body forming in part a fuel chamber, a fuel outlet, a fuel flow control assembly comprising a pierced, flexible sheet member of elastomeric material, a thin gas porous but liquid impermeable sheet membrane, and a layer of foam material between said sheet member and said sheet membrane in sandwich relation therewith, said fuel flow control assembly being disposed between said fuel chamber and said fuel outlet, said fuel flow control assembly when flexed adapted to release a supply of fuel from said fuel chamber to said outlet, the rate of fuel flow being determined by the amount said fuel flow control assembly is flexed, a flexing control member for said fuel flow control assembly movable between a raised position and a lowered position, means extending outwardly from said lighter body for moving said control member to a first position flexing said fuel flow control assembly and allowing flow of fuel from said fuel chamber to said fuel outlet, means for restoring said control member to a position at which said fuel flow control assembly is unflexed blocking flow of fuel from said fuel chambers to said fuel outlet, and ignition means adjacent said fuel outlet.

11. A lighter as claimed in claim **10,** and further including means for adjusting the length of the control member movement and thereby adjusting the amount of flexing imparted to said fuel flow control assembly.

12. A gas lighter chargeable with a liquid fuel supply comprising in combination a body forming in part a fuel chamber, a fuel outlet, a fuel flow control assembly between said fuel chamber and said fuel outlet, said fuel flow control assembly comprising a pierced, flexible sheet member of elastomeric material, a thin gas porous but liquid impermeable sheet membrane, and a layer of foam material between said sheet member and said sheet membrane in sandwich relation therewith, said fuel flow control assembly adapted when flexed downwardly to release a supply of fuel from said fuel chamber to said fuel outlet, means to flex said fuel flow control assembly downwardly, and ignition means adjacent said fuel outlet.

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