May 29, 1956 W. I. NISSEN 2,747,394

GAS LIGHTER FUEL REGULATING MECHANISM

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Fig. 1.

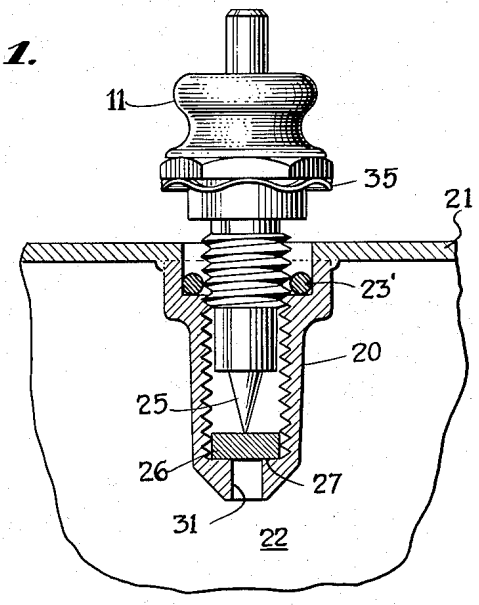

Fig. 2.

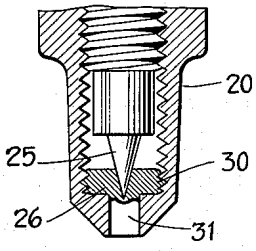

Fig. 3.

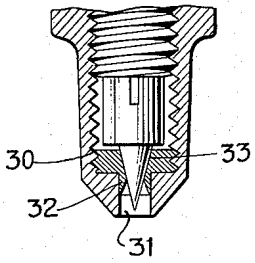

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Fig. 4.

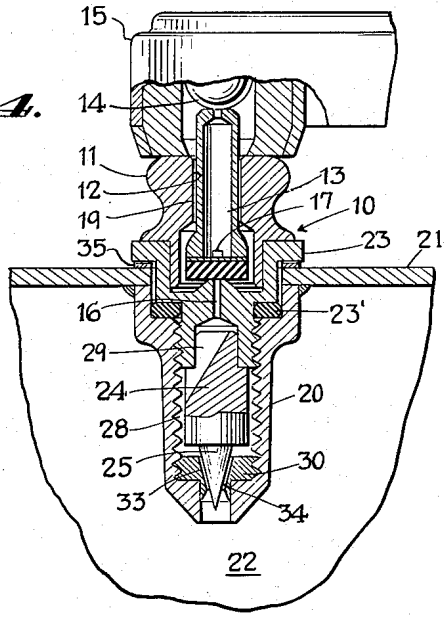
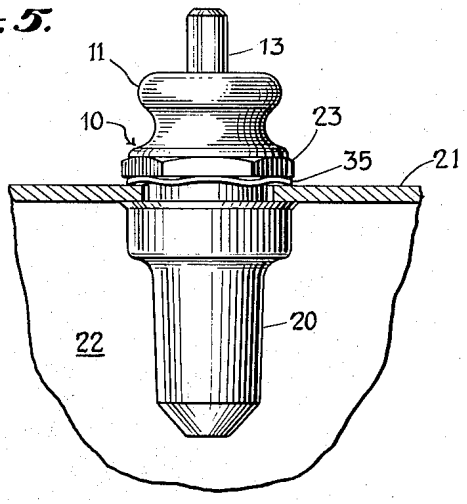


Fig. 5.



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GAS LIGHTER FUEL REGULATING MECHANISM

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4 Claims. (Cl. 67—87)

This invention relates to a novel means and method for adjustably controlling the flow of gas through the burner in lighters such as are used for lighting cigars, cigarettes and pipes and which utilize butane or other gas under pressure as fuel.

Such lighters are now being marketed in which a filter plate and small orifice are interposed between the fuel valve of the gas burner and the fuel reservoir for controlling the flow of gas under pressure from the fuel reservoir through the burner. The filter is provided primarily to prevent foreign particles from passing from the fuel reservoir to clog the orifice, while the minute size of the orifice itself is relied upon to meter the flow of gas. This type of orifice must of necessity be precisely formed to exactly the cross-sectional area required to secure the desired size of flame. Due to the inherent characteristics of the gaseous fuel employed, the diameter of such an orifice must necessarily be minute to achieve satisfactory flame height, and therefore its accurate formation to precisely the required size has posed a problem of considerable magnitude. Experience has shown that standardization of flame height throughout a line of lighters is most difficult and expensive with this type flame regulation, and the resulting flame height may be uncertain. Furthermore, such construction obviously does not afford adjustment of the flame height according to the preference of the individual user once the lighter has been initially assembled and adjusted by the manufacturer.

I have found that these difficulties can be eliminated by interposing between the burner valve and the fuel reservoir, instead of a minute orifice, a fuel passageway of such diameter that it can be drilled without difficulty and is not relied upon to meter the flow of fuel, and then providing between this passageway and the fuel reservoir, a uniquely formed, adjustable fuel flow regulating orifice located in the burner housing at the position formerly occupied by the filter plate, and which may be adjusted exteriorly of the lighter casing. To form this orifice, a slug of lead or other suitable deformable material which will retain a permanent set, is dropped loosely into the burner housing so as to overlie an aperture at the lower or fuel intake end thereof. A threaded stem having a conical piercing pin at its lower end is then inserted from above into the burner housing and its piercing pin is forced into the slug, thereby expanding the peripheral portions of the slug outwardly into tight engagement with the interior walls of said valve body to form a gas tight seal therewith without the need of any independent sealing member. This peentration of the pin into the slug is continued until the slug has been punctured by the pin, thereby forming an inverted frustroconical seat in the slug which is precisely shaped to conform to the conical surface of the piercing pin. The stem is then lifted to retract the pin slightly from the thus formed seat a distance sufficient to define an annular orifice or passage therebetween of any size required to produce the desired flame height at the burner. I have found that the rate of flow of gas to the burner may be thus precisely controlled with assurance that the desired height of flame may be thereby secured in a simple and reliable manner.

Other and more specific objects, features and advantages of the invention hereof will appear from the detailed description given below in conjunction with accompanying drawings which form a part of this specification and illustrate by way of example a preferred embodiment of the invention. For clearness the device is shown much enlarged in size, the actual diameter of the housing hereinafter referred to being usually only a fraction of an inch. In the drawings:

Fig. 1 is an elevational view illustrating the initial step in the method of adjustably controlling the flow of gas to the burner, namely dropping the slug into the valve body and forcing the piercing pin into the same.

Fig. 2 is a partial elevational view similar to Fig. 1 but showing the relationship of the piercing pin and lead slug after the former has been partially screwed down into the latter.

Fig. 3 is a view similar to Fig. 2 except showing the piercing pin penetrating completely through the lead slug, with the peripheral portions of the latter locked in sealing relation with the interior of the valve body.

Fig. 4 is a vertical sectional view of the adjustable fuel regulating valve of the invention in operating condition with the piercing pin thereof backed away from its seat.

Fig. 5 is an elevational view of the fuel regulating valve and its external adjusting means.

Referring now in more detail to the drawings and particularly to Fig. 4, there is shown an adjustable lighter valve and burner assembly **10** constructed in accordance with the invention. This burner structure is provided with an exterior burner post **11** which may be of known construction, having a central aperture **12** within which a fuel valve **13** is mounted, the illustrated form of valve being normally held closed by the action of a ball **14** carried by a closure cap **15** of a lighter operating mechanism (not shown), for example as in the patent to Alexander H. Aronson, No. 2,637,990. The particular fuel valve **13** shown is of the type disclosed in the patent to Ray L. Burchett, No. 2,672,038, designed to produce a flame suitable for cigarette and cigar lighting purposes when in the upright position, but if inverted a jet-like flame suitable for pipe lighting. However it should be understood that the particular type of fuel valve to be employed is not essential to the present invention. When the closure cap is in the closed position as shown, the base of the valve **13** seats over a fuel passage **16**, thereby preventing the flow of gas through the burner. On the other hand when the cap is raised, gas under pressure issues through passage **16**, lifting the valve **13** and then passing out at the tip of the burner either via a transverse passage **17** leading to a central bore **18** formed in the valve and also through a passage **19** formed by reason of clearance existing between the valve and the burner post, or through the central bore of the stem valve alone, depending upon whether the said lighter is in upright or inverted position. Constructions as thus far described have heretofore been known and used.

The novel aspects of this invention will now be described. Referring again to Fig. 4, it will be noted that an internally threaded housing **20** is soldered or otherwise suitably secured within and sealed to a wall **21** of the lighter casing, within which is located the fuel reservoir **22**. A rotatable nut **23**, in which is formed the fuel passage **16**, is provided with cavities on opposite sides thereof into which the burner post **11** and a stem **24** having a conical piercing pin **25**, are respectively press fitted so as to form an integral unit.

Referring now to Figs. 1–4, successive stages of providing for fine regulation of the flow of gas through the burner are there illustrated. A slug **26** made of lead or some other suitable metal or material capable of being easily deformed and yet retaining a permanent set, is dropped loosely into the housing **20**, thereby coming to rest on a shoulder **27** formed at the lower end thereof. Said slug is of generally circular shape and is of course

properly dimensioned, so that its descent in the housing will not be obstructed by the internal threads of the latter. The rotatable nut **23**, carrying the stem **24** with its conical piercing pin **25**, is then inserted in the housing and said point forced down into the lead slug until the threads of the nut engage those of the valve body. A clearance **28** is left between the stem **25** and the housing **20** and said stem is provided with a passage **29** which affords communication between said clearance and the opening **16**. Continued downward movement of the piercing point is then effected by screwing the nut **23** into the housing **20**. As the piercing pin is forced further and further into the slug **26**, the peripheral portions thereof expand radially outwardly into the threads of the housing until a permanent locking, gas-tight seal is effected therewith as shown as **30** in Fig. 2. Ultimately the pin pierces completely through the slug as shown in Fig. 3, thereby displacing some of the material thereof downwardly and outwardly into sealing relationship with the walls of the fuel aperture **31** at the bottom of the housing, as shown at **32** in Fig. 3. By this piercing action a fuel flow regulating orifice is formed, having an inverted frustro-conical surface **33** which conforms with microscopic precision to the surface of the piercing pin.

When the parts are in position shown in Fig. 3, no gas can pass from reservoir **22** to the burner. However, by reversely rotating or back threading the nut **23** to the position shown in Fig. 4, an annular fuel flow regulating orifice **34** is provided between the pin and slug. With the parts in this latter position, gas is free to pass via said orifice **34**, clearance **28**, pasage **29** and opening **16** to the burner valve **13**. The effective flow of fuel through this orifice **34** can be precisely regulated from the exterior of the lighter casing simply by rotating the nut **23** in one direction or the other. As this post is rotated, the cross sectional area of the orifice **34** will be varied to increase or decrease flame height as desired.

So long as the orifice **34** is more restricted than passage **16**, adjustment of the orifice **34** will sufficiently control the rate of fuel flow.

When desired, the piercing pin may be forced further through the slug to thereby redefine the wall **33** of the orifice **34**. Hence pasage **16** can be made large enough to be drilled in ordinary fashion without requiring special manufacturing techniques as heretofore.

A sealing ring **23'**, preferably formed of rubber-like material, is positioned on the underside of the nut **23** so as to be compressed between opposed shoulders formed on the same and the housing **20** when these members are threaded together. To maintain the precise position of the piercing pin relative to the orifice seat once the same has been set as desired by adjustment of the nut **23**, a spring steel wave washer **35** is provided under the nut **23** and is designed normally to be held in compression between the same and the outer wall of lighter casing **21**. This washer thus acts as a friction lock against accidental shifting of the nut **23**.

Although a prefered embodiment of the invention is herein disclosed for purposes of explanation, various modifications thereof, after study of this specification, will be apparent to those skilled in the art to which the invention pertains. Reference should accordingly be had to the appended claims in determining the scope of the invention.

I claim:

1. A gas fueled lighter of the character described, comprising a casing having therein a reservoir constructed to hold fuel under pressure, a burner structure mounted on a wall of said casing, said burner structure having a hollow housing interposed between the reservoir and the mouth of the burner, said housing having passages therein affording communication respectively with the reservoir and the mouth of the burner, a slug of deformable material supported within said housing and interposed between said passages, and a tapered piercing pin having its surface of symmetrical configuration with respect to the longitudinal axis of the pin, said pin being mounted to move between positions wherein it respectively penetrates through the slug to deform the latter and thereby define a tapering orifice through the slug having a wall conforming precisely in configuration to the surface of the penetrating portion of the pin, and other positions wherein said pin is partially withdrawn with respect to said orifice to thereby regulate the height of the flame produced by the lighter.

2. A gas fueled lighter of the character described, having a reservoir for containing fuel under pressure, a burner structure mounted on a wall of the reservoir, a valve member carried within the burner structure, which valve member is mounted to move between open and closed positions, said burner structure having an internally threaded housing extending inwardly of said valve member and reservoir wall, a metallic slug supported within said housing and interposed between said valve member and reservoir, a nut member having a portion located exteriorly of said reservoir wall and also having a portion extending inwardly of said reservoir wall into threaded engagement with said housing, said latter portion carrying a tapered pin, said valve member being also carried by said nut member, and said slug having therethrough a tapered orifice provided with a wall complementary in configuration to the surface of said pin, whereby the effective size of said orifice may be altered by twisting said exterior portion of the nut member to alter the spacing between said pin and said orifice wall and thereby regulate the height of the flame produced by the lighter when said valve member is open.

3. In a lighter construction having a gas burner and a housing through which gas flows to the mouth of said burner, the method of adjustably controlling the flow of gas through the burner which comprises first loosely positioning a slug of deformable material in said housing, then forcing a tapered piercing pin through the slug to thereby puncture the same and form therein an orifice seat whose wall conforms precisely to the surface of the piercing pin and simultaneously expand said slug into sealing engagement with the housing, and finally partially withdrawing the piercing pin with respect to said orifice to thereby regulate the height of the flame produced by the lighter.

4. A gas fueled lighter of the character described, having a reservoir for containing fuel under pressure, a burner structure mounted on a wall of the reservoir, a valve member carried within the burner structure, which valve member is mounted to move between open and closed positions, said burner structure having a housing extending inwardly of said valve member, a slug of deformable material supported within said housing and interposed between said valve member and reservoir, said slug having its outer portions expanded into sealing engagement with said housing, a tapered piercing pin interposed between said valve member and slug, and means for moving said pin longitudinally of the housing between positions wherein it respectively penetrates through said slug to deform the latter and thereby define an orifice through the slug having a wall conforming to the surface of the penetrating portion of the pin, and other positions wherein said pin is partially withdrawn with respect to said orifice to thereby regulate the height of the flame produced by the lighter when said valve member is open.

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