Aug. 28, 1951 C. ZELLWEGER 2,565,903

PYROPHORIC LIGHTER

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Fig.1

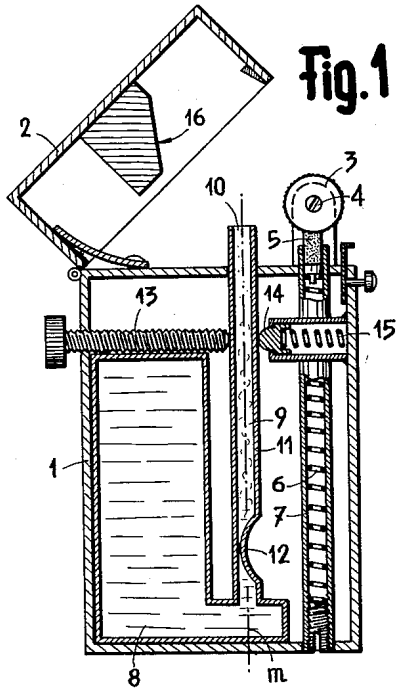

Fig.2

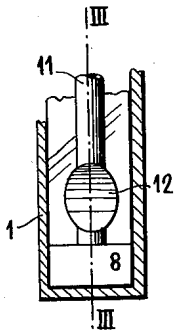

Fig.3

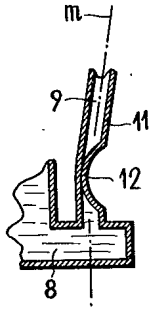

Fig.4

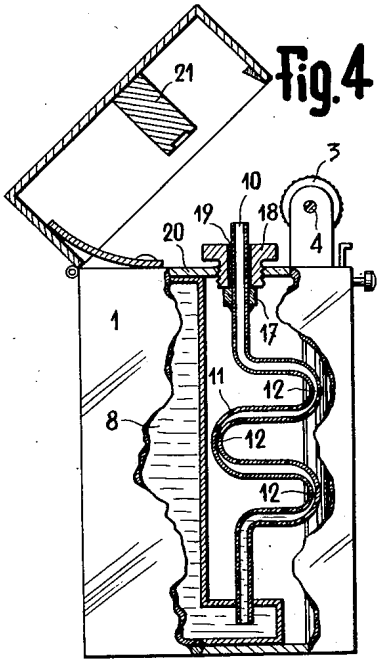

Fig.5

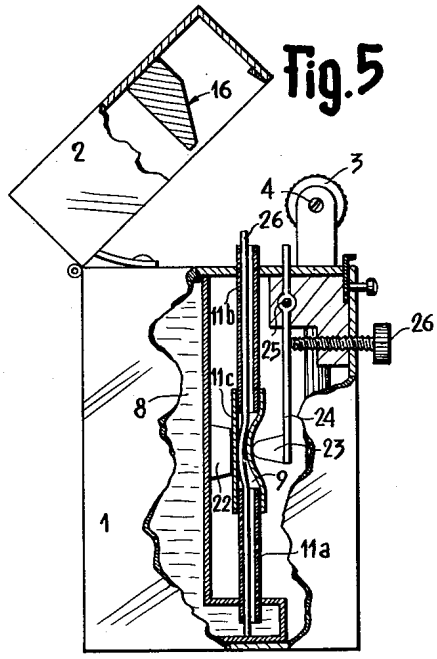

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Fig.7

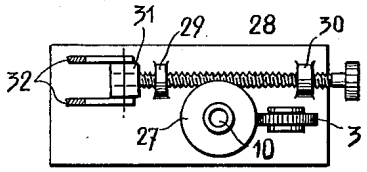

Fig.6

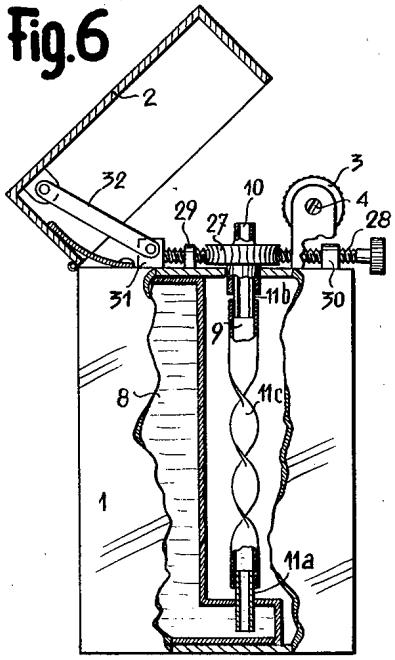

Fig.8

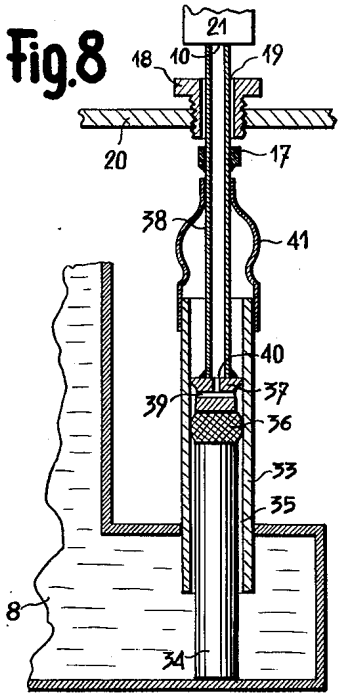

Fig.9

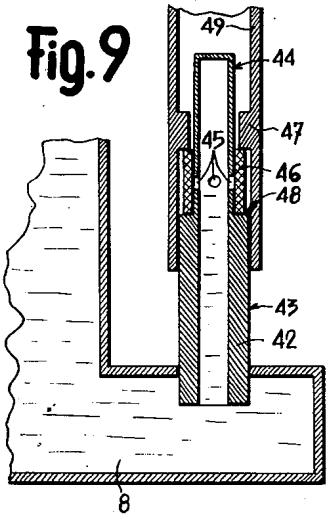

Fig.11

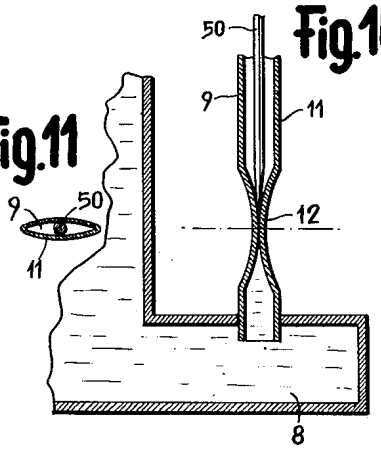

Fig.10

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PYROPHORIC LIGHTER

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Application December 17, 1948, Serial No. 65,777
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3 Claims. (Cl. 67—7.1)

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On the market are available various combustible fluid lighters, that is to say of which the container contains a liquid or gaseous fuel at the normal temperature of use, that is to say about 20° C. Some of these lighters are provided with a feed member allowing of adjustment of the delivery of fuel feeding the flame of the lighter. These adjusting devices are generally constituted by blades, needle adjusters, valves and other known devices of this type wherein the adjustment of the delivery is obtained by modification of the position of a movable member relatively to a stationary member. It is, however, extremely difficult to render this type of adjusting devices entirely fluidtight to fluids.

The present invention has for its object a device for supplying fuel under pressure to the flame of a lighter with fluid fuel contained in a container secured to the body of the lighter or removable. The device is distinguished from known devices by the fact that it has a passage of which at least a portion of one of the walls is deformable and of which the deformation determines the free passage area for the fuel.

Some forms of construction of the device according to the invention are shown diagrammatically and by way of example with reference to the accompanying drawings, wherein:

Fig. 1 is a sectional view of a lighter provided with a device according to a first form of construction.

Fig. 2 is a view in partial section of the device.

Fig. 3 is a view in partial section on the line III—III of Fig. 2.

Fig. 4 is a view in section of a lighter provided with a second form of construction of the device.

Fig. 5 is a view in section of a lighter provided with a third form of construction of the device.

Fig. 6 is a view in section of a lighter provided with a device according to a fourth form of construction.

Fig. 7 is a view in plan of the lighter shown in Fig. 6, the cover being removed.

Fig. 8 is a view in partial section, to a larger scale of a lighter provided with a device according to a fifth form of construction.

Fig. 9 is a view in partial section to a larger scale of a device according to a sixth form of construction.

Fig. 10 is a view to a larger scale of another form of construction, the passage being closed.

Fig. 11 is a sectional view the passage being open.

According to the form of construction shown in Figs. 1 to 3, the lighter is provided with a body 1

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fitted with a cover 2. The latter is hinged to the body 1 by means of a hinge.

In the same manner as other known lighters, that shown in Fig. 1 is provided with a lighting device comprising a friction wheel 3 turning on a spindle 4 secured to the body 1 and against which a pyrophoric element 5 is applied by means of a spring 6 located in a tube 7 secured to the body 1. The latter encloses a fuel tank 8, containing a fluid fuel under pressure and connected by a passage 9 to a burner formed, in the example shown in Fig. 1, by the orifice 10 of the passage, which is located in proximity to the friction wheel 3. The passage 9, limited by the inner wall of a metal tube 11, is provided with a device for feeding fuel to the burner. This device is formed by a local crushing 12 of the walls of the tube 11 which is thus provided at this point with a reduction in its internal cross section, a local increase in its flexibility and a curvature of its centre line *m*.

The feed device is provided with two stops 13 and 14. One, 13, adjustable in position, is movable in the directions of flexing of the tube 11; the other 14 located along the axis of movement of the stop 13, subjected to a resilient action tending to maintain the tube 11 in contact with the stop 13. This resilient action is generated by a spring 15 bearing against the body of the lighter.

The operation of the device described is as follows:

When by a thrust applied to the tube 11 the flexing increases the curvature in the vicinity of the constriction, the compression of the fibres in the interior of the curvature and the extension of the fibres on the outside of the curvature result in an approach of the two walls of the tube which may even, if the flexing is sufficient, come into contact with one another and close completely the passage 9. When however, the flexing takes place in the opposite direction, it produces an enlargement of the passage left free for the passage of the fuel.

By modifying the position of the adjustable stop 13, it becomes possible to modify the cross sectional area of the passage remaining free at the point of crushing 12 and thus to adjust the delivery of fuel feeding the burner 10 or the flame of the lighter when this is lighted. A sufficient movement of the adjustable stop 13 in a direction towards the right of Fig. 1, even provides the possibility of closing completely the passage connecting the tank to the burner.

In the form of construction shown, a cam 16

secured in the cover, is arranged in such a manner as, during the closing of the cover, to push the end of the tube 11 towards the right of Fig. 1 by an amount sufficient to produce the complete closure of the passage 9 when the cover is in the closed position. On the contrary, when opening the cover, the action of the cam 16 disappears, the tube returns, under the action of the spring 15, into contact with the stop 13, thus re-establishing communication between upflow and downflow parts of the passage 9.

It will be understood that in a modification of the feed device described above, the metal tube 11 may be replaced by a tube of any other material having a sufficient modulus of elasticity to allow of the resilient deformation of its walls at the crushing point 12 so as to produce closure of the passage 9 and the re-establishment of communication between its upflow and downflow parts.

By the selection of the material forming the tube 11 and the treatments of the latter it is possible to achieve that the natural resiliency of the tube at the point of crushing tends to maintain this always in one extreme position, in which the passage is open or closed. In this case it is possible to omit one of the stops acting on the tube 11.

In order to further improve the fluidtightness obtained by the coming into contact of the internal walls of the tube 11, it is possible in a modified form of construction of the device described, above, to provide the tube 11 with an inner lining of resilient material softer than that of the walls of the tube and promoting intimate contact between the opposite inner walls of the passage 9.

It will be understood that the device above described may be conceived in multiple ways and different forms of construction some of which are set out hereinafter by way of example and with reference to the accompanying diagrammatic drawing.

In the form of construction according to Fig. 4, the tube 11 is bent a number of times and its cross section is constricted at the point of each successive bend by crushing its walls.

The downflow portion of the tube 11 carries a ring 17 secured rigidly. The latter is held in contact with a stop 18 adjustable in position, by the natural resiliency of the tube in its bent portions. When this resiliency proves insufficient, the ring 17 may be held in contact with the stop 18 by the action of a spring. The stop 18 is formed by a screw having an axial bore 19 providing a passage for the tube 11 and screwed into the upper wall 20 of the body 1 of the lighter. The cover carries a pusher 21 adapted to act, during the closing of the cover, on the end of the tube 11 and to push it back a sufficient amount so as to produce such a deformation of the walls at the crushed points such that their corresponding parts come into contact with one another and close the passage 9 in a fluidtight manner.

Further by adjusting the axial position of the stop 18 it is possible for the user to adjust the free cross sectional area in the bends formed by the tube 11 and thus to adjust the delivery of fuel feeding the flame of the lighter.

In the form of construction shown in Fig. 5, passage 9 is formed by two sections of rigid tubing, of which one forms the upflow 11*a* and the other the downflow 11*b*, connected together by a flexible and resilient sleeve 11*c*. A portion of the sleeve 11*c* is pressed against a stationary support 22 by a stop 23 adjustable in position. The latter is secured to the end of one of the arms of a double armed lever 24 pivoted on a stationary pivot 25. An adjusting screw 26 permits of modifying the position of the stop 23 relatively to the stationary support 22 and thus modifying the cross sectional area of the passage 9 at the point of crushing of the sleeve produced by the stop 23. The cover carries a cam 16 which, on closing the cover, acts on the free end of the lever 24 so as to move the stop 23 in the direction of the support 22 by an amount sufficient to produce such a deformation of the sleeve 11*c* that the inner walls of the latter come into contact with one another and close the passage 9 completely. As the form of construction of the device shown in Fig. 5 is provided for supplying the flame with a liquid fuel at the normal temperature of the chamber and at atmospheric pressure, the passage 9 has a capillary element 26' passing completely therethrough and dipping into the reserve of liquid fuel and assuring the supply to the flame by capillarity. The capillary element 26 is thus more or less compressed at the point of crushing according to the value of the thrust applied by the stop 23.

In the form of construction shown diagrammatically in Figs. 6 and 7, the passage 9 is formed by a tube 11 twisted upon itself in the form of a helix. The upper end of this tube carries a toothed flange 27 gearing with a tangential screw or worm 28. The latter is guided in guides 29, 30 in which it can slide and turn. On the free end of this screw is mounted a nut 31, to which is hinged one end of a rod 32. The other end of the rod is hinged to the cover 2.

By imparting to the worm 27 a movement of rotation in one direction or the other, the user can twist the tube 11 more or less about itself and in consequence produce the resilient deformations of its walls which modify the free cross sectional area of the passage 9 and thus adjust the feed of fuel to the flame. During the closing of the cover, the rod 32 presses the tangent screw 28 towards the right of the drawing, said screw, in the manner of a rack, imparting to the toothed wheel 27 a movement of rotation in a clockwise direction. This rotation of the toothed wheel 27 produces a torsion of the tube 11 about its axis whereby its opposite internal walls come into contact and thus produce a fluidtight closure of the passage 9. As shown in Fig. 6 the tube may be provided with an upflow section 11*a* secured rigidly to the reservoir 8 a rigid downflow section 11*b* to which the toothed wheel 27 is secured and an intermediate section 11*c* of pliant and flexible material such as rubber, which alone is subjected to deformation by torsion. However, in a modified form of construction the passage 9 may be formed by a tube made in a single metal piece which is twisted spirally in its central portion.

In the form of construction according to Fig. 8 the fuel reservoir 8 is provided, fixed rigidly thereto in a fluidtight manner, with a tube 33 sliding on a rod 34 secured rigidly to the bottom of the reservoir 8. The rod 34 is of a diameter smaller than the internal diameter of the tube 33 so as to provide an annular passage 35. A plasto-resilient element 36 placed into the tube 33 rests on the end of the rod 34 and is applied to this by a piston 37 carried by a hollow piston rod 38, guided in an axial bore 19 of a screw 18 screwed into the wall 20 of the body 1 and forming a stop for a ring 17 secured rigidly to the piston rod.

The cover, not shown but assumed to be in the closed position, carries a pusher 21, adapted to act on the end of the piston rod 38 so as to move it axially in the direction of the rod 34 and thus produce a crushing of the element 36. The thrust applied by the piston 37 on the element 36 produces a swelling of the latter in such a manner that the peripheral wall comes into contact with the inner wall of the tube 33. The piston is also provided with bores 39, 40 connecting the empty interior of the piston rod 39 to the empty exterior of the tube 33 in the downflow of the element 36. When the user opens the cover of the lighter, the thrust applied to the piston rod 38 by the pusher 21 disappears in such a manner that under the influence of its natural elasticity, the element 36 tends to assume its original state. Consequently, the piston 37 and its piston rod 38 are moved axially until the ring 17 comes into contact with the screw 18 and the peripheral wall of the element 36 leaves the internal wall of the tube 33 thus allowing an annular passage to subsist enabling the fuel to rise through the bores 39, 40 and the empty interior of the rod 38 up to the burner, formed by the orifice 10. By modifying the axial position of the stop 18, the user has the possibility of modifying the cross section of the annular passage limited by the internal wall of the tube 33 and the peripheral wall of the plasto-resilient element 36 and therefore to adjust the feed of fuel to the flame of the lighter.

Finally a fluidtight joint 41, formed by a sleeve connecting the tube 33 to the rod 38 opposes the escape of the fuel.

In the form of construction of Fig. 9 which is in fact a modification of the form of construction in Fig. 8, the reservoir 8 carries a hollow element 42 closed at its free end and having two parts, one 43 of large external diameter and the other 44 of small external diameter, separated by a shoulder 48. The part 44 is provided with radial holes 45 normally closed by a sleeve 46 of plasto-resilient material mounted tightly on the part 44. A tube 49 sliding on the part 43 has an internal collar 47 bearing against the sleeve 46 which is thus tightened between the collar 47 and the shoulder 48.

By moving the tube 49 axially the user has the possibility of more or less compressing the sleeve 46. But it is known that the axial compression of such a sleeve of plasto-resilient material increases the diameter of its hollow interior. In consequence, a thrust applied to the tube 49 creates, between the internal wall of the sleeve and the external wall of the part 43 of the element 42, a passage enabling the fuel to escape. Thus, by modification of the axial position of the tube 49, the user has the possibility of adjusting the supply of fuel of the flame of the lighter and even of interrupting completely this supply. As in the form of construction shown in Figs. 1 to 8, the device may be provided with a stop, adjustable in position, defining the axial position of the tube 49 when the cover of the lighter is in the open position.

In the modified construction shown in Figs. 10 and 11, the tube 11 is crushed locally at 12 in such a manner that the natural resiliency of the walls tends to close the passage 9 completely. A needle

50 placed into this passage and movable along the axis of the latter, enables the walls of the tube to be spaced apart at the crushed point and thus establish communication between the upflow and downflow parts of this. According to the axial position imparted to the needle the cross sectional area at the point of the crushing 12 is larger or smaller. Adjusting this axial position the user thus has the possibility of adjusting the supply of fuel.

From the foregoing it has been admitted that the operation of the lighter necessitates the placing in communication of the reservoir 8 with the burner 10 when the lighter is open and that this communication should be interrupted when the lighter is closed. In other known lighters it is desired on the contrary to interrupt said communication during the opening of the cover and to re-establish it when closing the latter. It will be understood that all the forms of construction described above may be adapted to such a supply to the flame of the lighter.

I claim:

1. A lighter, comprising, a casing, wall means in the casing and forming a tank holding fuel under pressure, a deformable fuel tube having its inlet in the tank and including a portion having a passage of lesser transverse area than the area of the remaining tube portion, igniting means in the casing in combustion proximity to the outlet end of the tube, adjustable means initially deforming the tube by bending to provide in same the portion of lesser passage area, cover means movable to and from a position covering the outlet end of the tube and the igniting means and means operable by the cover means and deforming the tube to close said tube passage portion of lesser area.

2. The lighter according to claim 1, and wherein the tube includes a transversely crushed portion and the adjustable means initially bends the tube about the crushed portion.

3. The lighter according to claim 1, and wherein the tube includes a transversely crushed portion to provide a passage portion of lesser area and wherein the adjustable means initially deforms the tube by bending about the crushed portion and wherein the operable means further bends the tube about the crushed portion.

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