Sept. 6, 1938. G. E. PICKUP 2,129,100

FLUID CONTROL MEANS

Filed Dec. 28, 1934

Fig. 1.

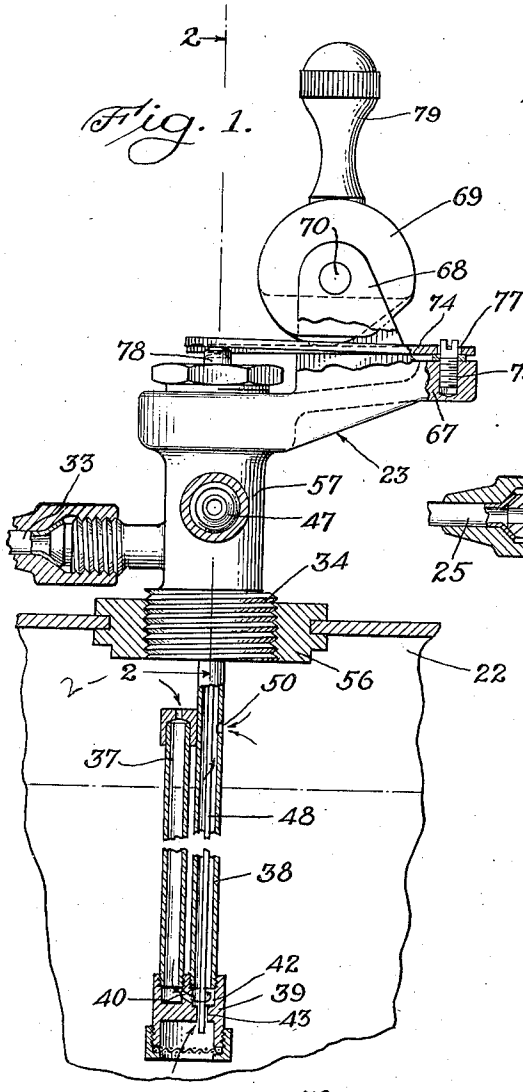


Fig. 2.

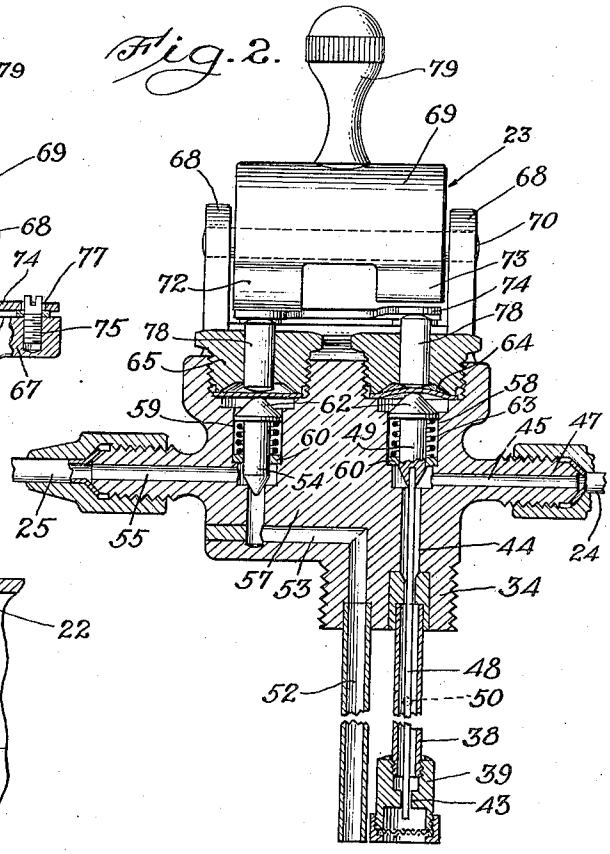


Fig. 3.

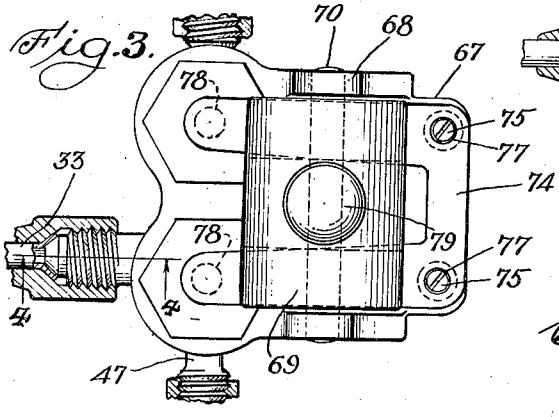
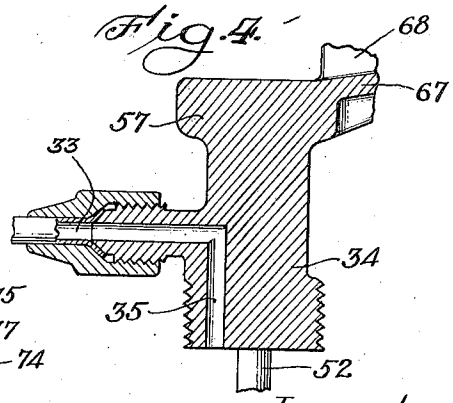


Fig. 4.



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Patented Sept. 6, 1938 2,129,100

UNITED STATES PATENT OFFICE

2,129,100

FLUID CONTROL MEANS

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Application December 28, 1934, Serial No. 759,457

8 Claims. (Cl. 137—21)

This invention relates generally to improvements in fluid control means adapted for use in liquid fuel stoves wherein the fuel is fed to the burner system by air pressure in the fuel tank.

Liquid fuel stoves of the pressure feed type are customarily equipped with a burner system including a generator, manifold and burners, fuel being fed to the generator from a conveniently located pressure fuel tank.

Gasoline is the usual fuel employed for stoves of this type. This fuel must be vaporized thoroughly and mixed with air in order to provide an efficient, combustible mixture. Vaporization of the liquid gasoline is therefore effected by passing it through the generator heated externally by the application of flame from a burner supplied with fuel from the manifold. In order initially to raise the generator temperature as required for starting the stove, a separately controlled pregenerating fuel feed supply independent of the generator is ordinarily employed. After the generator has reached the desired temperature, a liquid feed supply is valved in and the starting fuel supply is shut off. This involves the use of separate specialized pregenerating apparatus and requires the exercise of much skill and care in the several essential manual operations to get the stove into efficient operation. If the pregenerator is not shut off tightly after the generator is working, there is a waste of fuel, and the unnecessary dissipation of the fuel tank pressure because of this unexpected drain may quickly result in an inadequate liquid fuel supply and cause extinguishment of the burner resulting in inconvenience, waste, and loss of time.

An object of the invention is to provide improved fluid control means which is preferably constructed as a unitary device adapted to be mounted upon the liquid fuel tank of a pressure-feed liquid fuel stove for positively, simply and efficiently controlling the fuel flow from the tank both for the starting and running conditions of the stove.

Another object is to provide novel control means of this character by which both the pregenerated fuel mixture feed and the liquid fuel feed lines lead from separate withdrawal means on the tank directly to the generator, but are controllable by a single operating member arranged for automatically closing one feed when the other is opened or for closing both simultaneously.

More specifically stated, it is an object to provide a multiple action valve unit including a pregenerating withdrawal device and a liquid fuel feed withdrawal device both operable by a single control means adapted for automatically opening or closing either withdrawal device or simultaneously closing both devices.

Another object is to provide an improved unitary valve structure including a body to be supported by a liquid fuel tank and having individual, valve controlled passages for withdrawing starting and running fuel, respectively, from the tank.

A further object is to provide means for controlling the withdrawal of starting fuel from a liquid fuel tank and including an improved valve and metering pin construction.

Other objects and advantages will become apparent from the following description and from the accompanying drawing, in which:

Fig. 1 is an enlarged elevational view partly in section of the main fuel feed control valve unit.

Fig. 2 is a sectional view taken substantially along line 2—2 of Fig. 1.

Fig. 3 is a plan view of the control valve device as seen in Fig. 1.

Fig. 4 is a fragmentary sectional view taken substantially along line 4—4 of Fig. 3.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawing and will herein describe in detail, the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

In the form of the invention illustrated herein by way of example, the novel fuel control means is constructed as a unit 23 adapted to be mounted in the wall of a liquid fuel tank 22 of a gasoline stove. A starting fuel feed line conduit 24 and a liquid fuel feed conduit 25 lead from the valve unit 23 to the usual burner mechanism of the stove (not shown).

The fuel tank 22 may be of any desired construction capable of withstanding the pressure necessary for operation of the stove, air being pumped into the tank from any suitable source through a conduit 33 which is suitably connected to a base part 34 of the unit, the latter being adapted to extend into the tank and providing an air inlet passage 35.

To start a liquid fuel stove from a cold state, it should be supplied with a rich mixture of fuel-vapor and air which may be produced by means such as described in my copending application

entitled "Liquid fuel stove", Serial No. 614,901, filed June 2, 1932, now Patent No. 2,067,412, and in the present instance including a pair of parallel tubes 37 and 38 depending from the unit 23 and joined together by a carbureting connector 39. The tube 37 is shorter than its companion and has its upper end above the highest fuel level within the tank so as to withdraw vapor laden air from above the liquid fuel downwardly into the connector 39. Here the air passes through a small angularly positioned bore 40 communicating with a chamber 42 coaxially formed with the end of the tube 38. A small bore or port 43 coaxial with the tube 38 provides a fuel inlet to the chamber 42. Thus, the air issues at a relatively high velocity through the bore 40 into the fuel chamber 42 whereby to cause agitation of the liquid fuel therein and thorough vapor saturation of the air which then passes upwardly through the tube 38. The latter is secured to the fitting 34 coaxially with a passage 44. Fuel mixture passes from the passage 44 into a lateral passage 45 leading through suitable means such as a nipple 47 to which the conduit 24 is connected.

For practical reasons in manufacture, the port 43 is of a diameter larger than necessary, and a wire metering pin 48 is therefore inserted into the port to restrict the effective area thereof. For the same purpose, the metering pin extends upwardly through the tube 38 so as to increase the air velocity through the tube for thoroughly breaking up the small fuel particles to facilitate their entrainment by the air. At its upper end the pin 48 is connected to a valve 49 adapted for controlling the vapor flow from the passage 44.

In order to obtain the greatest heating efficiency from the fuel vapor, it must be proportioned properly with air. In the present device the fuel mixture passing up through the tube 38 will be excessively rich and additional air must be combined with it. I therefore provide a very small port 50 in the tube 37 above the normal liquid fuel line to provide an entrance for the admixture of additional or secondary air with the vapor laden air passing through the tube. This air will enter the tube in a fine stream at considerable velocity and thus mix thoroughly with the vaporous material therein.

Liquid fuel is drawn from the fuel tank through a tube 52 (Fig. 2) also carried by the fitting 34, the latter having a liquid fuel passage 53 controlled by a valve 54. When the passage 53 is open, liquid fuel passes on through a communicating lateral passage 55 leading to the feed conduit 25. The fitting 34, therefore, serves the multiple functions of supporting the pregenerator tube 38 and the liquid fuel withdrawal tube 52 as well as providing the air pressure inlet 35, and reduces to one the usual access openings into the fuel tank for the reception of these devices. Any suitable pressure tight coupling between the tank 22 and the base 34 may be employed but it is herein shown as comprising a bushing 56 mechanically fitted in a suitable aperture in the tank wall and adapted for screw threaded reception of the base.

In prior devices the usual fuel feed arrangement has consisted of independently controlled starting and liquid fuel feeding systems. By the present invention, however, I have provided simplified, material saving means whereby the starting and fuel feed systems are combined into one, and a single device serves by coordinate functions to control the flow of fuel through each branch of the unitary system, as may be required in the operation of the stove. To this end, the base 34 is supplied with an enlarged body 57 having therein similar parallel, cylindrical valve bores 58 and 59 in coaxial communication with the passages 44 and 53, respectively. At their lower ends, the bores 58 and 59 are slightly narrower in order to provide shoulders for locating disk bushings 60.

Each of the valves 49 and 54 may be of the same construction, comprising a cylindrical body tapered at its inner end and having a knob-like head 62 at its outer end. Between the bushing 60 and the head 62 is a compressed helical spring 63 normally acting to keep the valve in extended or open position. Enclosing each of the valve bores is a flexible metal diaphragm 64 held tightly against the escape of fuel or air pressure by means of an externally threaded nut 65. Each nut is chambered to its inner end to permit outward flexing of the diaphragm under the influence of pressure exerted by the spring 58 against the valve head 62. Thus, it will be observed that each of the valves 49 and 54 is entirely enclosed for operation within a liquid and pressure tight chamber.

As herein shown, the device is provided with manual control means having certain defined operative positions and adapted for controlling the valves 49 and 54 simultaneously or in definite sequence. In practice, the control device may be an operator having a plurality such as three operative positions defining a closed position for both valves and an open position for each valve independently of the other. To this end the outer part of the body 57 has a lateral extension providing a platform 67. At opposite sides of the platform are vertical brackets 68 between which is fitted an operator formed as a cam body 69 pivotally supported upon a fixed axis conveniently furnished by a pin 70. At its inner side, the cam body is divided into a pair of eccentric cam faces 72 and 73, adapted for engagement with a cam spring or plate 74. The latter is preferably loosely fitted upon the platform 67, a pair of spaced headless screws 75 in the platform extending upwardly through suitable apertures 77 in the plate and serving to prevent its lateral displacement from position. Preferably, the plate is of U-shape with each spaced leg thereof overlying a cylindrical pin 78 freely slidable axially through the nut 65 which is suitably bored for the purpose.

Each of the pins 78 bears against the outer face of the diaphragm 64 opposite the valve head 62. Thus, when the cam plate legs are depressed, the pins 78 will force the diaphragm 64 inwardly and thereby cause the respective valves to move into closed position. Preferably the cam faces bear against the plate legs at points spaced substantially laterally of the pins so that through the resilience of the plate 74 the necessary operating pressures are transmitted from the cam body to the valves smoothly, uniformly and positively. This prevents wear of the valves or other contacting parts from unequal or excessive pressures which would result from direct operator-to-valve contact where there are manufacturing inaccuracies in the parts.

In order to close both of the valves 49 and 54 when the stove burner system is not in use, the cam faces 72 and 73 are adapted for simultaneously depressing the cam plate legs in one position of the cam body, herein the extreme counterclockwise position the cam body would assume

as seen in Fig. 1. As the cam body is rotated clockwise from this position it moves the cam faces to present successively arranged protruding or receding portions adapted for alternately opening or closing the valves, only one valve being open at a time. Since in the normal operation of a stove the starting feed pregenerator is first utilized, the cam face 73 is arranged to release pressure upon the cam plate and allow the valve 49 to open in the operative position of the cam body immediately following the joint valve closing position thereof. For convenience, this second operative position may be termed the starting position, which presents a relationship of operative parts as seen in Figs. 1 and 2 wherein the cam face 72 maintains closing pressure upon the cam plate while the cam face 73 has released pressure from the cam plate.

After the pregenerator has functioned long enough to permit full operation of the stove, the cam body 69 is adapted to be turned to the extreme clockwise or "on" position wherein the cam face 73 will operate to depress the cam plate and close the pregenerator valve 49 and the cam face 72 will release pressure on the cam plate so that the valve 54 will open the passage 53 and allow the flow of liquid fuel therethrough. To facilitate pivotal movement of the cam body 69, a suitable handle 79 is provided thereon. It will thus be observed that by the simple manipulation of one instrument the fuel supply system for the stove is instantaneously and positively controlled for any one of its plurality of necessary operative conditions. In no event can the starting fuel line or the liquid fuel line be open concurrently with the other.

From the foregoing, it will be evident that I have provided a neat, compact, liquid fuel controlling unit of simplified and highly efficient character, adapted for positive, fool-proof and semi-automatic operation.

I claim as my invention:

1. A device of the character described, comprising, a body member having a pair of fluid passages therethrough, a separate piston valve controlling the flow of fluid through each of said passages, resilient means for normally moving said valves to open position, a pin extending outwardly from each of said valves, a spring plate having a pair of legs engageable with said pins, and means for simultaneously pressing inwardly on said spring plate legs for closing said valves and arranged also for alternately releasing or depressing said legs for opening one of said valves while the other is closed.

2. A device of the character described, comprising, a body member having a pair of fluid passages therethrough, a separate piston valve controlling the flow of fluid through each of said passages, resilient means for normally moving said valves to open position, a pin extending outwardly from each of said valves, a spring plate having a pair of legs engageable with said pins, and a valve operator embodying a pair of eccentric cam faces one operative upon each of said spring plate legs and operative in one position of said operator to depress both of said spring legs to close said valves and in other positions of said operator to alternately remove pressure from one of said spring legs while maintaining pressure upon the other leg.

3. Means for controlling fuel delivery from a fuel tank to a burner system, including a body secured in the wall of the tank and including a pair of separate flow passages, separate tubes extending from said body into the fuel in said tank respectively connected with said passages for withdrawing liquid fuel or a fuel-air mixture from said tank, separate valves for individually controlling said passages, means carried by said body for closing one valve separately from but simultaneously with the opening of the other valve, and a pair of separate nipples projecting from said body and each communicating with an individual flow passage to receive the communicating ends of ducts to convey fuel-air or liquid fuel, respectively, to the burner system.

4. Means for controlling fuel delivery from a fuel tank to a burner system, including a body secured in the wall of the tank and including a pair of flow passages terminating independently at different points exteriorly of said body, means at the exterior terminating ends of said passages for connecting delivery conduits thereto, tubes extending from said body into the fuel in said tank connected separately with said passages and adapted, respectively, for withdrawing liquid fuel and a fuel-air mixture from said tank, separate valves for controlling said passages, and means carried by said body including a pivoted lever member operative to actuate said valves and having a plurality of operative positions in one of which both of said valves are closed and in others of which one of said valves is open while the other is closed.

5. In combination in apparatus of the character described, a body member adapted to be secured in the wall of a liquid fuel tank and having a pair of passages opening through the side thereof facing the interior of the tank, liquid fuel and fuel-air tubes respectively connected to said passages to extend into the liquid fuel in the tank, parallel bores intersecting said passages and opening toward an exterior portion of said member, plunger valves seating in said bores to control the flow of liquid fuel or fuel air respectively therethrough and having springs coacting therewith to urge the same normally toward one position, flexible sealing diaphragms traversing said bores and enclosing said valves therein, means for securing said diaphragms in position, slideable plungers abutting the outer faces of said diaphragms, a multi-cam-faced operator pivotally mounted upon said member, and means interposed between the cam faces of said operator and said slideable plungers for transmitting operative force thereto for flexing said diaphragms and moving said valves selectively in opposition to said springs.

6. In a valve unit of the character described, a fitting including a part to be secured in the wall of a fuel tank and an enlarged body supported by said part exteriorly of the tank, separate passages in said body communicating through said part with the interior of the tank for withdrawing starting and running fuel respectively therefrom, separate means on different parts of said body communicating with the respective passages for coupling independent delivery conduits therewith, individual valves for controlling flow through said passages, and means carried by said body for actuating said valves.

7. In apparatus of the character described, a fluid control device including a body having a fluid passage, a plunger valve controlling said passage and having engagement means projecting from said body, means for urging said valve toward open position, a resilient arm extending from a fixed support at one side of said engagement means into abutment with said means, and

an operating member movable against an intermediate point of said resilient arm to apply valve closing pressure thereagainst.

8. In combination in a valve unit of the character described, a body to be mounted upon a liquid fuel tank, a tube on said body to extend into the liquid fuel and having a fitting at its mouth ported coaxially with the tube, a passage in said body communicating with said tube, a plunger valve for controlling flow through said passage supported for movement coaxially with said tube, a spring for urging said valve in one direction, means for actuating said valve in opposition to said spring, and a metering pin extending from said valve through said tube and through the port in said fitting.

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