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LIQUID FLOW CONTROL DEVICE FOR COMBUSTION ENGINES

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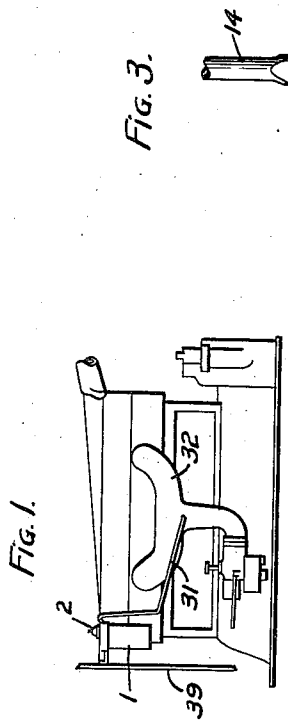


FIG. 1.

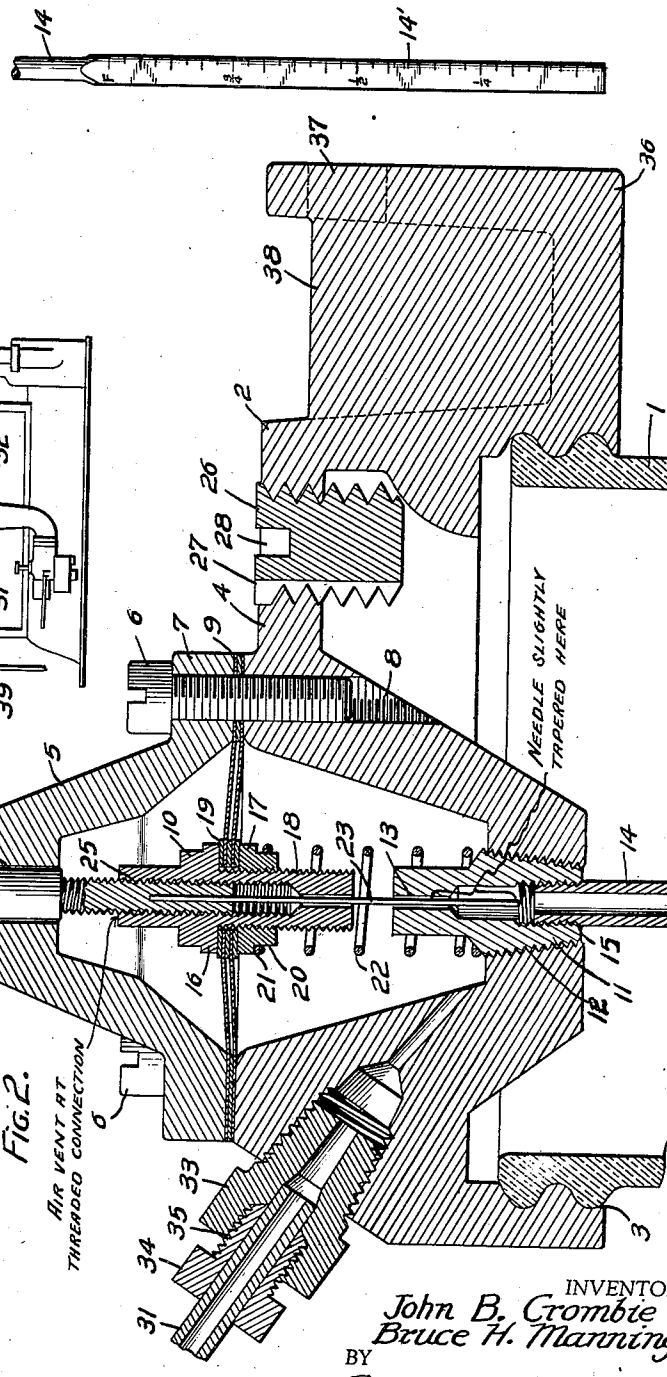


FIG. 2.

FIG. 3.

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LIQUID FLOW CONTROL DEVICE FOR COMBUSTION ENGINES

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5 Claims. (Cl. 261—115)

This invention relates to a system control device for treatment of fuels supplied to combustion engines and particularly pertains to a lubricating control device for a lubricant fed to the intake of said engines in regulated supply in proportion to the load imposed upon them. The vacuum caused by the piston displacement within the cylinder or cylinders automatically controls the system device to regulate the supply of lubricant to the combustion chamber or chambers.

The invention accordingly consists in the features, combinations and arrangements of parts in the construction hereinafter described or claimed for carrying out the above stated object and such other objects as will hereinafter appear in the description.

In devices of this character there are several objections heretofore experienced, some of which are that the devices are complex in structure involving many parts which are expensive to manufacture, assemble and keep in operation. Moreover, they are not efficient in operation and do not function to supply a continuous, steady regulated feed of the fluid.

It is the aim of the present invention to provide a structure which is entirely automatic in its operation, is economical to manufacture and is efficient and dependable in operation; it comprises a minimum number of parts and is positive in its operation.

For a better understanding of the invention reference may be made to the accompanying drawing, in which

Fig. 1 is a side elevation of a conventional motor vehicle internal combustion engine provided with a device illustrating the present invention;

Fig. 2 is a cross sectional view of the valve control unit; and

Fig. 3 is a detailed view of the fuel supply end conduit provided with a graduated scale.

Referring specifically to the drawing, wherein one preferred embodiment is illustrated to typify the invention, numeral 1 designates a fuel or lubricating container, preferably of some transparent material such as glass, having a valve unit, designated generally by numeral 2, screw-threadedly or otherwise attached thereto as at 3. The valve unit is preferably a sectional construction comprising a base section 4 and a cap or top closure section 5 which may be advantageously secured to the base section 4 by any suitable means typified by a number of bolts 6 adapted to project through a marginal flange 7 on the cap or top section and be screw-threadedly or otherwise engaged with perforations 8 in the base section. A member typified by diaphragms 9 is adapted to be clamped between the cap and base section and provide means upon which the movable portion of the valve 10 may be mounted and actuated to and from a valve seat member 11 which is associated with the base member 4, preferably by screw-threaded engagement 12. This valve seat member 11 is preferably tapered on its periphery wall to mate with a correspondingly tapered recess in the base section in order that the two parts may be screwed together and effect a tight seal between the mating parts.

While one diaphragm member is sufficient for the operation of the device it is deemed preferable to provide two or more similar diaphragms inasmuch as they are made of very thin flexible material, such as, rubberized fabric or the like, and by having more than one diaphragm the possibility of any perforations or ruptures therein which would impair the operation of the device is less likely. While rubberized fabric is preferable as the material from which the diaphragms are made it is not to be understood that the diaphragms or either of them may not be made of any other material. The valve seat member 11 is provided with a constricted bore 13 through which the fuel is adapted to be drawn from the supply container 1, there being a supply conduit or tube 14 screw-threadedly or otherwise connected with the valve seat member at 15, said tube 14 projecting into the container 1 and terminating somewhat short of the bottom of the container 1. A portion 14^1 of the conduit 14 which projects into the fluid in the container 1 is advantageously provided with a graduated scale for purposes hereinafter more fully set forth.

The movable portion of the valve unit 10 is provided with an annular flange 16 having a seat cooperating with a seat on the end of collar 17 which is screw-threadedly connected with a neck portion 18 on the movable valve portion 10. The central portions of the diaphragms are perforated to fit over the neck 18 so that the diaphragm may be clamped in position between the seat on the annular shoulder 16 and the collar member 17. In order to prevent the clamping element from cutting the margins of the diaphragms suitable washers 19 of metal or of any desirable material may preferably be interposed between the diaphragms and the clamping elements 16 and 17. The collar member 17 may be advantageously provided with a reduced neck portion 20 to provide a ledge 21 to provide a seat for one end of a coil spring 22 which is mounted between the diaphragms and the bottom of the base section 4 under compression to keep the valve normally opened. Within the movable portion of the valve unit 10 a needle stem 23 is advantageously mounted in an adjustable member 24 which is screw-threadedly or otherwise attached at 25 with the element 10, thereby permitting manual preliminary adjustment of the

needle stem relatively to the member 10. It will be noted that the head of the adjustment member 24 is sufficiently small in diameter to reciprocate in the recess 30 without contacting with the walls of the recess. To receive a suitable tool for manually adjusting member 24, its top end may be advantageously provided with a groove 29. The base section 4 is also provided with a recess to receive a closure plug 26 preferably screw-threadedly engaged therewith. In or along one side of the closure plug, there is formed a small recess 27 to provide a small air passage to permit operation of the vacuum feed through the valve unit to the combustion engine from the fluid supply container 1. The closure plug also may be conveniently provided with any means, typified by a transverse groove 28 in its upper end whereby same may be readily assembled with and disassembled from the base section to permit filling the container 1 with a supply of fluid.

The fluid supply device is adapted to be attached to the combustion engine or to any support, such as a part of the vehicle frame 39, by means of an angle abutment or boss 36 having an upstanding arm in which recesses 37 are formed to receive attaching bolts. The upstanding arm may be reenforced by an integral fin or web 38 connecting it with the base section 4.

Leading from the valve unit 2 to the manifold 32 of the engine is a conduit 31. The ends of this conduit may be advantageously associated with the manifold and valve unit by a connection comprising a tapered screw-threaded plug 33 fitting in a correspondingly tapered recess in the base section 4. One end of conduit 31 is received in plug 33 and secured by a gland nut 34 screw-threadedly or otherwise attached thereto at 35.

From the foregoing detailed description of one preferred embodiment of the invention, the operation of the device will be readily apparent. However, to generally describe, when the engine is not running the valve is normally in open position by reason of compression spring 22 which actuates vertically the diaphragms and the movable valve parts 10, 23 mounted thereon away from the valve plug seat member 11. In this condition the valve is open but there will be no tendency for the liquid to be delivered to the vacuum chamber for the reason that there is no variation in pressure between the liquid container 1 and the control chamber. When the engine is started or is idling the vacuum created is greater than when under load and consequently causes a minimum supply of fuel to be fed from the fuel supply container by actuating against the diaphragms to move the valve part 10 and needle 23 towards a closed position. The bore 13 in the valve seat plug is preferably cylindrical in contour and the needle stem 23 is slightly tapering from its central portion towards its lower end, the diameter of the needle ranging from about twenty-nine thousandths of an inch from its middle portion to about twenty-five thousandths of an inch near its bottom end. Thus the conformation of the valve stem in conjunction with the bore 13 is such that the flow of the fuel may be increased in volume as the valve is opened and decreased in volume as the valve is closed. As the valve needle stem 23 is vertically raised or moved away from the valve seat plug the flow of fluid through the orifice 13 is increased in volume. As the valve stem is actuated downwardly the increased thickness of the valve stem at this portion restricts the flow of the fluid through the orifice and when the vacuum is of sufficient degree it may cause the end of the neck portion 18 to seat upon the top edge of the valve seat and shut off the flow of fluid entirely.

When the valve stem is in the position just described it is apparent that the length of the portion of the stem of increased thickness substantially occupies the entire length of the orifice 13 and any foreign matter lodging on the sides of the orifice will be contacted by the portion of increased thickness and cleaned therefrom.

When the engine is under load the vacuum created by the displacement of the piston or pistons is materially less than when the engine is initially started or is idling. Accordingly when the engine is under load the fuel supply is increased as the valve is then opened wider. The chamber in the cap portion is open to the atmosphere by reason of the clearance of the adjustment member 24 from the walls of space 30 and there is also permitted a very slight amount of air to flow around the screw-threads 25 into the vacuum chamber. This flow, however, is small and is not sufficient to interfere with the vacuum but helps to increase the function of the device and prevent siphoning of the fluid from the supply container after the engine has stopped. The air entering the control chamber around the screw threads 25 increases the pressure (that is, decreases the degree of vacuum) within the control chamber and thus effects a slight flow of air up through the supply pipe 31 during conditions of uniform vacuum imposed by the operation of the motor on the control chamber. In other words, the incoming air within the control chamber decreases its negative pressure and, since the motor is constantly creating suction on the control chamber, there will be a constant tendency to equalize the negative pressure between the engine and the control chamber, thus causing the small amount of incoming air to be discharged from the control chamber into the pipe 31. The air passing along the pipe 31 acts frictionally on the liquid adjacent the opening of the pipe 31 into the control chamber and assists the movement of such liquid through the pipe 31 to the intake manifold 32. The liquid is broken up into small droplets upon coming in contact with the combustible fuel flowing from the carburetor through the intake manifold to the individual cylinders. Thus, it is apparent that the liquid will be delivered to the cylinders in a more or less finely divided condition and will be distributed more or less uniformly to the individual cylinders in which the explosion of the combustive gases therein during the operation of the engine will complete the disintegration or atomization of the liquid, causing the liquid to be deposited on the cylinder walls to effect lubrication of the upper part of the cylinder walls. A scale is provided on part 14 of the supply conduit which projects into the fluid supply and it may be readily determined not only how much fluid is in the supply container but it may be readily ascertained how much consumption of fluid there has been for a certain mileage, thereby permitting it to be ascertained whether too much or too little fluid is being fed to the engine. This permits a nice regulation to be made by reason of adjustment member 24 so that the device itself will regularly feed and cause the feed to be controlled rather than permitting an excess flow at one time and a scarcity of flow at another time.

Although the illustrated device has been described as a lubricating control device, it is not

limited to such but may be employed for feeding any fluid into the manifold. The invention pertains to the novel structure and is not limited to any particular use. It could as well be employed for feeding any fluid into the manifold to effect more efficient combustion of the motor fuel.

While we have described one preferred embodiment in detail, it will be understood that detailed construction is for the purpose of illustration and not as a limitation of the invention. Various changes may be made in details of construction without departing from the spirit of the invention.

We claim:

1. A liquid control device comprising a liquid supply receptacle, a liquid delivery conduit adapted to conduct liquid from the supply receptacle to a cylinder of an internal combustion engine, a control chamber communicating with the conduit, said delivery conduit being imperforate at least between the liquid supply receptacle and the control chamber, whereby liquid unmixed with gases will be delivered to the control chamber, a metering valve comprising a seat having a bore forming a part of the conduit and a valve stem cooperating with the bore, and means associated with the control chamber and responsive to the degree of vacuum produced by the operation of the internal combustion engine for supporting and moving the stem relatively to the bore whereby a controlled amount of liquid will be permitted to pass through the valve, and means for admitting a small quantity of air directly from the atmosphere to the control chamber.

2. A fluid control device comprising a liquid supply receptacle, a liquid delivery conduit adapted to conduct liquid from the supply receptacle to a cylinder of an internal combustion engine, a control chamber communicating with the conduit, said delivery conduit being imperforate at least between the liquid supply receptacle and the control chamber, whereby liquid unmixed with gases will be delivered to the control chamber, a metering valve comprising a seat having a bore forming a part of the conduit and a valve stem cooperating with the bore, and means associated with the control chamber and responsive to the degree of vacuum produced by the operation of the internal combustion engine for supporting and moving the stem relatively to the bore whereby a controlled amount of liquid will be permitted to pass through the valve, and means for admitting a small quantity of air directly from the atmosphere to the control chamber, said last mentioned means being provided in the valve element supporting means.

3. A liquid control device comprising in combination a liquid supply receptacle, a control chamber, an imperforate delivery conduit between said receptacle and control chamber, whereby liquid unmixed with gases will be delivered to the control chamber, an outlet conduit adapted to connect the control chamber with the combustion chamber of an internal combustion engine whereby a partial vacuum produced by the operation of the engine will produce a commensurate partial vacuum in the control chamber, a valve assembly adapted to control the admission of fluid to the control chamber, said valve assembly comprising a seat member having a restricted bore forming a continuation of the liquid delivery conduit and a needle-like valve stem having its end movably located in the restricted bore, and means responsive to the degree of vacuum within the control chamber for adjusting the position of the valve stem, said stem being slightly tapered adjacent its free end and the remaining portion of the stem being of such a size as to closely fit within the restricted bore whereby reciprocation of the stem within the bore will tend to clean same.

4. A liquid control device comprising, in combination, a control chamber, adapted to receive and discharge liquid, an outlet conduit adapted to connect the control chamber to the combustion chamber of an internal combustion engine whereby a partial vacuum produced by the operation of the engine will produce a commensurate partial vacuum in the control chamber, a valve assembly controlling the admission of liquid to the control chamber, said valve assembly comprising a seat member having a restricted bore and a tapered needle-like valve stem movably located in the restricted bore, means responsive to the degree of vacuum within the control chamber for adjusting the position of the valve stem, a liquid supply receptacle and an imperforate delivery conduit adapted to extend below the surface of the liquid in the supply receptacle and being connected to the intake end of the valve bore whereby the conduit is closed to the atmosphere from the supply receptacle to the control chamber and whereby the conduit is adapted to conduct the liquid unmixed with air to the control chamber.

5. A liquid control device comprising, in combination, a control chamber adapted to receive and discharge liquid, a liquid supply receptacle, a conduit adapted to extend below the surface of the liquid in the supply receptacle and having its other end communicating with the control chamber, a valve assembly controlling the admission of liquid to the control chamber through said conduit, said conduit being imperforate throughout its length, whereby liquid unmixed with gases will be delivered through the conduit and through the valve, an outlet conduit adapted to connect the control chamber to the combustion chamber of an internal combustion engine whereby a partial vacuum produced by the operation of the engine will produce a commensurate partial vacuum in the control chamber and cause a flow of liquid through the delivery conduit in open positions of the valve, said valve comprising a seat member having a restricted bore and a needle-like valve stem snugly fitting and reciprocable within the restricted bore, said needle-like valve stem having at one end a straight, cylindrical portion substantially equal in length to the length of the restricted bore of the valve seat, whereby movement of the valve stem to a closed position will clean the bore, said valve stem being tapered towards its other end to a cylindrical portion having a diameter approximately four thousandths of an inch less than the diameter of the portion adapted to snugly fit the bore, whereby the flow of liquid through the valve will be restricted to relatively minute quantities.

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