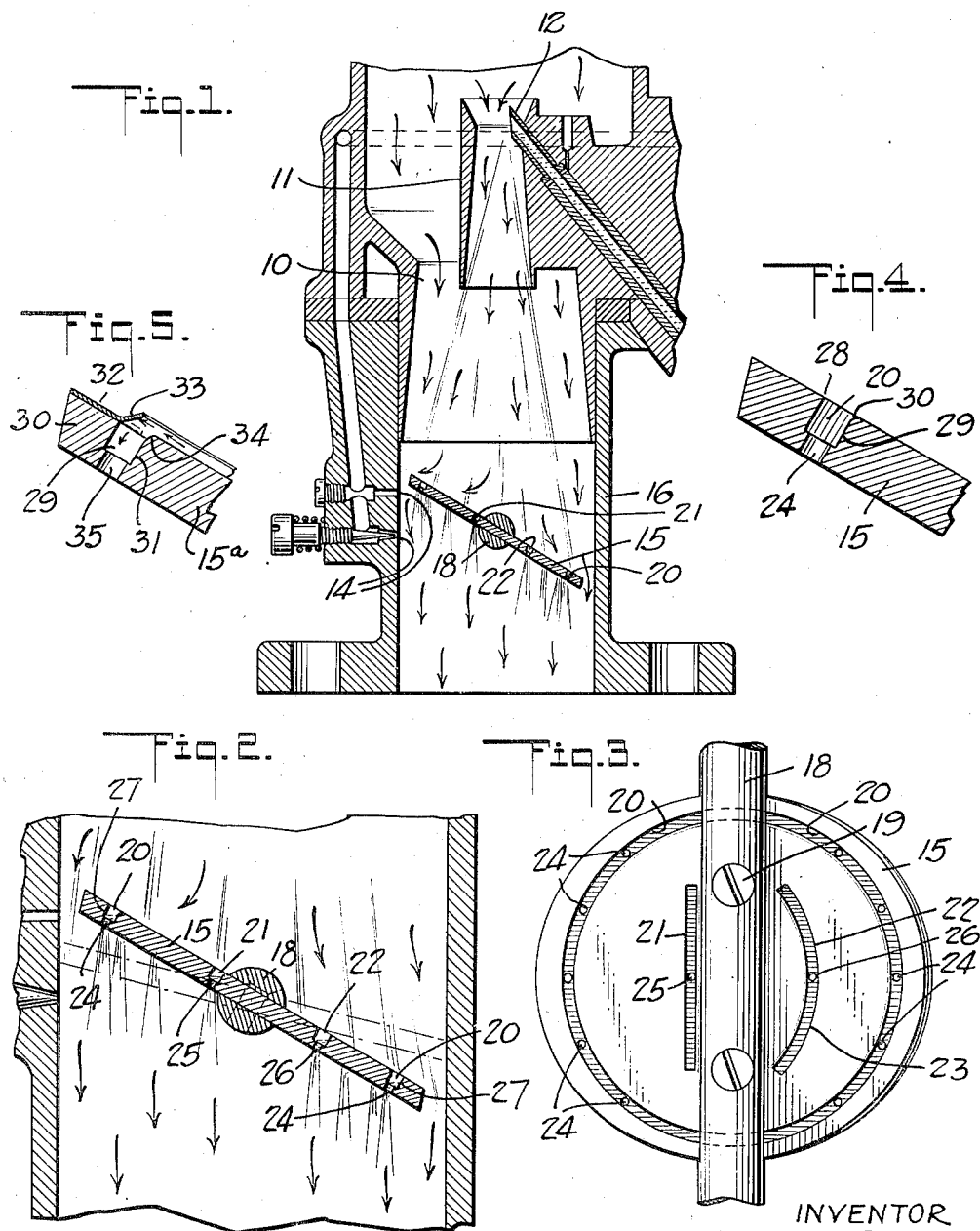


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CARBURETOR

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CARBURETOR

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This invention relates generally to carburetors for internal combustion engines.

The invention is broadly directed to improved means for insuring complete atomization or pulverization of the fuel and for preventing heretofore unavoidable movement of globules of fuel past the throttle valve after discharge of the mixture from the Venturi tube.

While I have elected to show the invention applied to a "down-draft" carburetor, it is understood that this shall not be deemed a limitation, as the invention can be used in combination with any well known type of carburetor employing a throttle valve in the mixing chamber for controlling admission of the mixture to the engine.

An important object of the invention is to provide a valve of such form and construction as to enable utilization of suction at the engine side of the carburetor to effect positive atomization or pulverization of the fuel at the engine side of the valve.

Another object is to provide a carburetor the throttle valve of which is designed to insure greater economy in the consumption of fuel than was possible heretofore.

Another object is to provide a carburetor having a valve the form of which insures complete atomization of the fuel at all normal speeds of the engine.

Another object is to provide a carburetor having a valve, the form of which insures against direct passage of fuel globules to the engine, such as experienced heretofore incident to unavoidable trickling of the raw fuel down the inner walls of the carburetor body after impingement of the mixture against the valve, the absence of the said fuel globules from the engine serving to prevent premature accumulation of carbon in the cylinders.

A further object is to provide a carburetor having a throttle valve characterized by a multiplicity of spray nozzles formed and disposed to receive the fuel as it discharges from the float chamber in the customary manner and to convert the fuel into downwardly discharging columns or jets of fine mist, the effective velocities of which will be controlled automatically and remain effectively constant as the engine is operating and which will enable a properly atomized mixture to be delivered to the engine when starting the engine, the arrangement being such as to eliminate almost entirely any necessity of "choking".

A further important object is to provide a valve characterized by means for causing entrapment of the fuel on the nozzle portions of the valve and for disposing the fuel at the nozzles from which the fuel will be effectively discharged by suction induced at the engine side of the carburetor.

In the accompanying drawing,

Figure 1 is a vertical section through a portion of a carburetor showing an application of the invention thereto;

Figure 2 is a vertical section on an enlarged scale through the body of the carburetor showing the throttle valve closed in dot-and-dash lines and partly opened in full lines;

Figure 3 is a plan view of the throttle valve removed from the carburetor;

Figure 4 is a section on a greatly enlarged scale through a portion of the throttle valve.

Figure 5 is a view similar to Figure 4, showing a slightly modified form of the invention.

In the accompanying drawing are shown those structural features of a carburetor deemed necessary for a comprehensive understanding of my invention. The carburetor is of the down-draft type and includes a primary venturi 10, auxiliary venturi 11, a main discharge jet 12, the latter adapted to connect as usual with a float chamber, not shown. The carburetor is also provided with the customary idle discharge holes correlated with a throttle valve 15. The throttle valve, except for those features to be presently pointed out, can be mounted and same is intended to be controlled in the customary manner. I particularly stress the fact that no material changes in the general construction of any well known make of carburetor need be made in order to adapt same to my improved form of throttle valve.

The valve disk 15 employed herein is slightly ovate in plan, as is necessary because of the angle at which it is set in the body 16, the latter formed for attachment to the intake manifold of an engine, whereby the vaporized fuel mixture can be taken into the cylinders of the engine, according to engine practice. The edges of the valve 15 are beveled, as shown, to conform to the contacting surfaces of the inner walls of the body 16. The valve is centrally disposed in the slot 17 of the shaft 18 and secured in place on the shaft by screws or the like 19.

Formed in the upper surface of the disk 15 are grooves 20, 21 and 22, the groove 20, in plan, being substantially of the same shape as the disk and disposed very near the marginal edges thereof. The groove 21 extends parallel to the shaft 18 at one side thereof and the groove 22 is disposed at the opposite side of the shaft and, in plan, same is in the form of an arc of a circle which is eccentric to the disk 15, whereby to present a concave wall 23 in parallel spaced relation to a convex wall 24, each bowed toward the periphery of said disk.

The disk is formed with an annular series of equidistantly spaced apart very small orifices 24, the upper ends of which open into the groove 20 and their opposite ends onto the bottom face of the disk.

The disk is formed with a very small orifice 25, the upper end of which enters the straight groove 21. The lower end of this orifice opens onto the lower face of the disk. A similar very small orifice 26 in the disk extends through the disk and enters the groove 22.

While I show ten of the orifices 24 and one each of the orifices 25 and 26, it is to be understood that changes in the arrangement as well as the number of the orifices employed can be made without departing from the spirit of the invention.

In operation, the valve 15 is controlled in the manner common to this general type of valves. With the valve in the position shown in Figures 1 and 2, a mixture of fuel and air discharging into the mixing passage of the body 16 impinges against the grooved upper surface of the valve 15 and by the force of suction induced at the engine side of the body, portions of the mixture will pass to the engine manifold over the peripheral edges of the valve and through the nozzle orifices 24, 25 and 26. With the valve disposed at the angle shown in full lines in Figure 2, the arcuate groove 22 in which orifice 26 is provided will occupy an elevation slightly lower than the axis 18, whereby the branches of the groove at the respective sides of said orifice will incline downwardly toward said orifice. The linear groove 21 will be disposed slightly above the valve axis 18. It will be noted that as regards the outer wall 27 of each of the grooves 20, 21 and 22, same is disposed substantially at right angles to the upper face of the valve, the same terminating in a sharp edge 28. The wall 29 of each groove which is nearest the axis 18 is also at right angles to the upper face of the valve, but here it will be noted that it is slightly curved at 30 to merge directly onto said top surface of the valve.

Any globular deposits of fuel impinging upon the top surface of the valve will be broken up and the liquid of which the globules are composed caught by the grooves 20, 21 and 22, and by reason of the suction induced at the engine side of the carburetor, passed at high velocity through the orifices 24, 25 and 26 in the form of finely divided liquid jets. In consequence of the forms and arrangements of the grooves 20, 21, and 22, it follows that the liquid fuel will be effectively arrested thereby and prevented from directly contacting the vertical walls of the mixing passage in which the valve is mounted, hence insuring delivery to the intake manifold of the engine of uniformly atomized or pulverized mixture at all normal speeds of the engine.

A butterfly valve formed and constructed as herein set forth functions to more effectively cause the fuel to be atomized at the openings between substantially diametrically opposite sides of the valve and adjacent substantially diametrically opposite sides of the valve passage in body 16, and due to the fact that raw portions of liquid, in the form of objectionable carbon forming globules, are acted upon by the top surface of the valve and broken up and trapped in the grooves 20, 21 and 22, then converted into high velocity jets at the orifices 24, 25 and 26, it manifestly follows that an engine can be operated with a material saving in fuel.

It follows also that the high velocity fuel sprays induced as aforementioned will be distributed over a very large area of the valve and that the sprays formed at the orifices 24 will act to

break up any objectionable particles of liquid fuel that may be whipped over the top surface of the valve and discharged into the aforesaid diametrically opposite openings between the valve and the walls of the valve passage.

Because of the more complete atomization of the fuel as herein provided for, it is found in practice that even at idling speeds of the engine, the necessity for choking the engine can be almost entirely eliminated, hence reducing to a minimum the formation of carbon in the engine cylinders heretofore resulting from the feeding of rich mixtures to the cylinders when starting a cold engine.

I have stated that the walls of the grooves 20, 21 and 22 occupying the greatest radial distance from the vertical center of the valve are sharpened and disposed at right angles to the top surface of the valve. As a result thereof, liquid whipped across said top surface in response to high velocity currents in the valve passage will be caught by said sharp edges and effectively directed into said grooves, the curved edges 30 of the walls of said grooves nearest the center of the valve assisting in guiding the liquid into said grooves. The grooves 21 and 22 are relatively long and the position of the former relative to the axis 18 being such that liquid impinging against the valve in the plane of the axis will be largely arrested by said groove. At the low side of the valve, or to the right, as shown in Figures 2 and 3, the groove 22 functions substantially the same as groove 21 but inasmuch as this groove is disposed of at the low side of the valve, its is of arcuate contour to enable drainage of liquid in the groove to the orifice 26 to take place.

The orifices 24, 25 and 26 are all of needle valve formation. This is to say, they are of small diameter as compared to the thickness of the metal from which the valve is formed, thus insuring formation of exceedingly fine, high velocity fuel jets beneath the valve. The diameter of each of said orifices is also small as compared with both the depth and the width of the groove of which it is a part, hence the grooves are of large liquid capacity relative to the combined areas of said orifices, thereby affording timely conversion of the accumulated or arrested liquid into fully divided atoms.

I do not propose to limit myself to any exact proportions of parts employed and shall expect to make such changes as fall within the spirit and intention of the invention, and scope of the hereto annexed claims.

To the best of my knowledge, it is entirely new in the art to provide a butterfly valve characterized broadly by a valve body or disk having nozzles by means of which liquid fuel discharging toward the engine side of a carburetor can be converted into high velocity sprays and discharged toward the engine side of the carburetor by suction induced at said engine side of the carburetor. This feature will, therefore, be broadly claimed and the claims construed to embrace any well-known equivalent of the orifices 24, 25 and 26.

Furthermore, to the best of my knowledge, it is new as disclosed herein to provide a butterfly valve with means broadly to arrest undesirable portions of liquid fuel at the top surface of the valve and pass same to the orifices of nozzle portions of the valve for conversion of the liquid into sprays. The claims will, therefore, be construed to include any well-known equivalent of

the grooves 20, 21 and 22. The grooves, broadly speaking, are receptacles in which liquid fuel can be contained and the currents induced beneath the valve utilized to pass the liquid from the receptacles in the form of flared jets in which the liquid will be in a finely divided state.

In the form of my invention shown in Figure 5, the disk 15a is substantially like the disk 15 in the preferred embodiment of the invention. However, it will be noted that the groove 29 which functionally corresponds with the groove 20 in said preferred embodiment has its outer wall 30 terminating at an elevation slightly below the elevation of the confronting wall 31 of said groove and there is shown attached to the short wall 30 a baffle or deflector annulus 32 of spring metal, the normal contour of which is as shown, whereby to present a lip 33 which is disposed slightly above the plane of the top face of the disk 15 and in spaced relation to the curved liquid guiding wall 34 of wall 31, whereby any liquid that might tend to be expelled from the peripheral edge of the disk will be positively deflected into the collector groove 29 for subsequent atomization through the nozzle orifice 35. I have stated that the annulus 32 is of spring material and that the lip 33 is normally disposed above the plane of the top face of the disk 15. In consequence of this inherent nature of the annulus, it follows that on initial application of the disk to the shaft 18 the lip 33 can be resiliently depressed into the plane of the top face of the disk, to thus facilitate passage of the disk through the customary slot in said shaft. When the disk is operatively centered relative to the shaft, the lip 33 functions automatically to assume its intended liquid baffling or deflecting position.

While I have shown this modification as applied to the annular groove of the valve disk, it is to be understood that any channels, whether they be like those illustrated at 21 and 22 in the preferred embodiment or whether they be otherwise formed, can, if desired, be equipped with a corresponding baffle or deflecting element.

What is claimed is:

1. A butterfly throttle valve for internal combustion engines having a liquid receptacle on one side thereof, and a nozzle in the throttle valve communicating with the opposite side of the valve for passing liquid from the receptacle in the form of a spray at the opposite side of the valve.

2. A butterfly valve for internal combustion engines, comprising a rhomboidal disk provided with grooves, in one of its faces, one of which is disposed parallel to the axis of the valve and in close proximity thereto and another of which is rhomboidal, the disk having small diameter orifices opening to the respective grooves and having discharge ends opening onto the opposite face of the valve.

3. A butterfly valve for internal combustion engines, comprising a rhomboidal disk provided with grooves in one of its faces, one of which is rhomboidal and another following an arc of a circle and providing a convex wall next to the axis of the disk and a concave wall disposed toward the perimeter of the disk, the disk having small diameter orifices establishing communication between said one face of the disk and the opposite face thereof.

4. A butterfly valve for internal combustion engines, the same having a groove in one face

thereof, said groove having spaced apart walls, one of which is formed to provide a sharp edge at its juncture with said one face of the disk and another of which is formed with a curved edge merging into said one face, the disk having a small diameter orifice extending from the groove to the opposite face of the groove.

5. The combination with a carburetor body having a passage into which fuel can discharge from a supply source; a butterfly throttle valve in said passage onto one face of which the liquid can be impinged when discharged as aforesaid and provided with receptacle means into which the liquid can be received and from which the received liquid can be discharged in spray form from the opposite face of the valve.

6. A valve comprising a tiltable element adapted to be mounted across a passage through which a fuel mist can be conducted, and means on the valve for collecting liquid fuel and for dispatching same from the valve in mist form when suction is induced in the passage at one side of the valve.

7. A throttle valve for internal combustion engines having means into which liquid fuel can be received during movement of the liquid across one face of the valve and from which the liquid can be converted into high velocity jets at the opposite face of the valve.

8. A throttle valve for internal combustion engines having means into which liquid fuel can be received during movement of the liquid across one face of the valve and from which the liquid can be converted into high velocity jets at the opposite face of the valve, said means comprising a grooved portion of said one face of the valve and small diameter jet orifices leading from the grooved portion to said opposite face of the valve.

9. A throttle valve of the class described comprising an impervious disk formed with a groove opening to one side of the disk, means co-operable with the groove for deflecting liquid thereinto from said one side of the disk, and means responsive to engine suction by which liquid collecting in the groove will be caused to discharge from the groove in the form of mist at the opposite side of the disk.

10. A throttle valve of the class described comprising a disk formed with a groove opening to one side of the disk, means co-operable with the groove for deflecting liquid thereinto from said one side of the disk, and comprising an annulus secured to the disk at one side of the groove and provided with a lip overhanging a portion of the groove.

11. A butterfly throttle valve for internal combustion engines comprising a disk having a liquid fuel collecting groove in one face adjacent to and approximately concentric with its periphery; and means defining an orifice in the valve leading from the groove to the other face of the valve.

12. A carburetor throttle valve for internal combustion engines having means adjacent its periphery at one side of the valve to collect liquid fuel from the mixing chamber of the carburetor in response to engine suction; and means in the valve correlated with the first means to cause the collected liquid fuel to be discharged from the other side of the valve towards the fuel intake of the engine in the form of a spray by engine suction.

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