Oct. 24, 1961 H. B. DONNELL 3,005,486

LIQUID LEVEL CONTROL FOR CARBURETORS

Filed Dec. 12, 1958

Fig. 1.

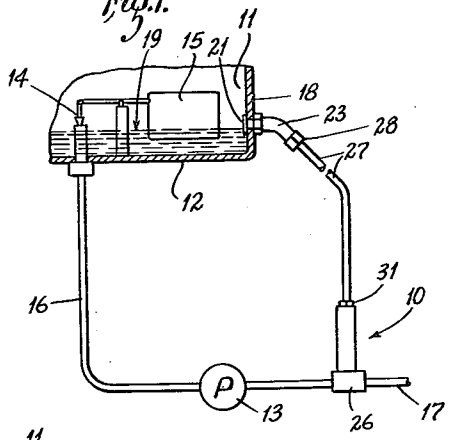
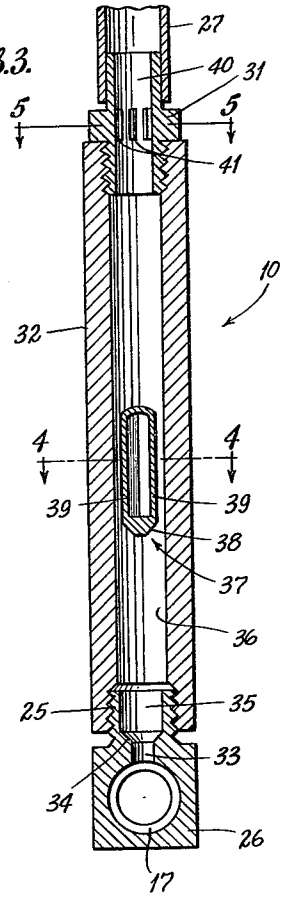


Fig. 3.



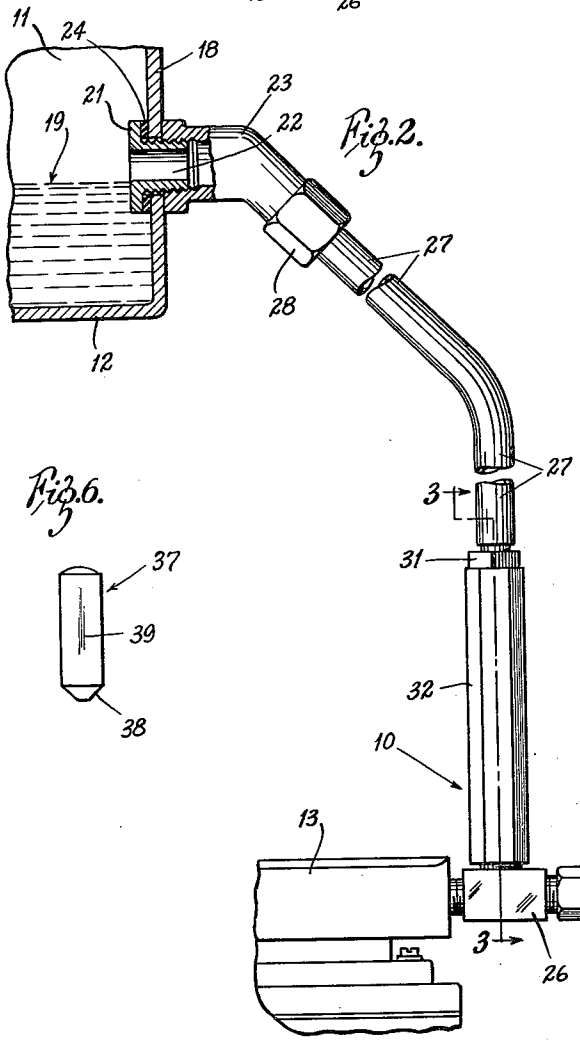


Fig. 2.

Fig. 6.

Fig. 4.

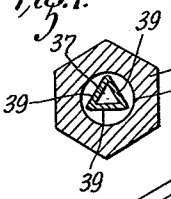
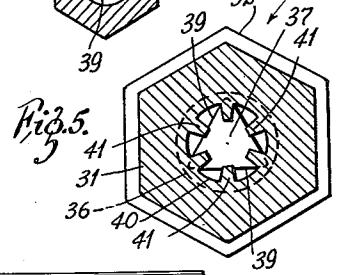


Fig. 5.



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LIQUID LEVEL CONTROL FOR CARBURETORS

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This invention relates to improvements in controls for carburetors and, in particular, is concerned with a fluid level control having a valve mechanism running from the carburetor to the inlet side of the fuel pump to prevent improper operation and flooding of the carburetor.

It has been a problem in the use of carburetors in the past to prevent flooding and use of excess fuel with attendant wastage thereof. This excess fuel, if uncontrolled, will flood through the venturi and intake manifold to the spark plugs and pistons of the engine causing dilution of the engine oil, excessive cylinder and piston ring wear, valve stem wear, and a heavy deposit of carbon. Another direct disadvantage is due to a heavy drain on the battery caused by starting of the engine when flooded. Excess fuel in the carburetor chamber may be attributed to a high float setting, bad needle valve in seat, high fuel pump pressure, or by percolation or flooding of the gasoline within the carburetor chamber.

In my Patent No. 2,758,639, granted August 14, 1956, there was disclosed a mechanism using a restrictor in a tube passing from the carburetor float chamber to the inside of the fuel pump to obviate the difficulties and objections recited above by draining any fuel above the recommended high level line in the carburetor chamber. This recommended high level line is conventionally controlled by the carburetor float and is a little bit lower than the venturi opening in the carburetor. Through the device of my prior invention, excess fuel which may fill up in the carburetor above the recommended level line and thereby cause flooding is caused to drain off gradually back into the system and into the fuel pump. Thus, there is no wastage of gasoline, and the fuel level line seldom increases beyond the recommended level line within the carburetor chamber. However, in the invention of my prior device, although quite a decided advantage over equipment having no such device, it was found that under some circumstances the restrictor in the tube passing from the carburetor float chamber to the inlet side of the fuel pump was either too small to pass gasoline rapidly enough from the float chamber back into the fuel line or was so large that the efficiency of the fuel pump was adversely affected. Also, under some circumstances, the restrictor because of its small opening was subject to clogging.

By means of this invention there has been provided a special valve construction to provide for the passage of excess fluid in the carburetor float chamber back to the inlet of the fuel pump and to provide for closing of this connection when there is no excess fluid that is required to be drained off. A particular feature of this invention resides in the float which is so constructed that it is not subject to impeding the passage of gasoline in the drain tube. The float is further designed for automatic seating and ready unseating when the tubing is emptied of or fills up with gasoline.

The float valve construction and the drain of this invention is very simple to install or repair should maintenance be required for any reason. The device is, however, made of such a simple construction that faulty operation is substantially minimized. As a further feature, however, in the event of any faulty operation, it is an inherent feature of the valve device that it will tend to stick in the closed position in which event the carburetor and fuel pump lines are in the same condition of operation as they would be if they had been unequipped with

the device of this invention and therefore cannot be adversely affected.

Accordingly, it is an object of this invention to provide a carburetor and internal combustion engine with a device for preventing flooding and overflow of the fuel above a recommended level in which the fluid is removed above a recommended level through a drain provided with a float valve which opens upon overflow and closes when the overflow fuel is drained.

Another object of this invention is to provide an internal combustion engine with a device which prevents the fuel within a carburetor from rising above a certain recommended level such that the fuel flooding above this level is removed through a drain provided with a float valve that opens when fuel is passed through the drain upon overflow of the fuel within the carburetor and closes upon a subsidence of the overflow condition.

Yet another object of this invention is to provide an antiflood drain for the carburetor in an internal combustion engine to remove any flooding fuel from the carburetor chamber through a drain passing to the inlet side of the fuel pump with a float valve provided in the drain of special construction to provide for proper seating and to prevent sticking of the float valve to the sides of the drain when it is to be unseated and in which there is a stop means for the float valve restricting its upward movement while still providing for passage of fuel past it.

Still another object of this invention is to provide an antiflood drain for a carburetor in an internal combustion engine to remove any flooding fuel from the carburetor chamber through a float valve to a fuel pump, in which the float valve and its housing can be made of simply constructed elements that require no maintenance and repair and is extremely simple to install or remove.

Further objects of this invention will appear in the detailed description which follows, and will be further apparent to those skilled in the art.

For the purpose of illustration, there is shown in the accompanying drawings a preferred embodiment of this invention. It is to be understood that these drawings are for the purpose of example only and that the invention is not limited thereto.

In the drawings:

FIGURE 1 is a schematic view showing a fragmentary portion of a carburetor connected to a fuel pump and provided with the drain and float valve of this invention;

FIGURE 2 is a view in elevation showing the carburetor in section connected to the drain and float valve which are connected to the inlet side of the fuel pump;

FIGURE 3 is an enlarged view in vertical section showing the valve housing with the valve in an intermediate position just prior to seating or just after being unseated;

FIGURE 4 is a view in section taken on the line 4—4 of FIGURE 3 showing the float valve construction;

FIGURE 5 is a view in section taken on the line 5—5 of FIGURE 3 showing the construction of the upper limit stop for the float valve; and

FIGURE 6 is an enlarged view showing the construction of the float valve.

In FIGURES 1 and 2 the control device or drain means shown generally indicated at **10** is connected between the float valve chamber **11** of the fragmentary portion of the carburetor **12** and the inlet side of the fuel pump **13**. As more generally shown in FIGURE 1, the carburetor **12** is provided in its float chamber with a float valve **14** and a float **15** which controls the passage of fuel from the fuel pump **13** through conduit **16** into the carburetor. The inlet to the fuel pump from a conventional fuel tank (not shown) is through a conduit **17** of conventional size, for example ⅛ or ¼ inch tubing and

as high as ⅜ inch for heavy duty equipment, these sizes representing nominal internal diameters.

The control device **10** is connected to the wall **18** of the carburetor chamber at the recommended liquid level line **19**. This connection is made by means of a threaded nipple **21** which fits through a hole in the wall **18** so that the opening **22** within the nipple is in registry at its bottom with the recommended fluid level line **19**. In a large number of cars that are today equipped with sight level plugs which at their bottom are flush with the liquid level, this opening is already provided and the plug need merely be removed and the nipple inserted. In other carburetors a hole may have to be tapped. The nipple **21** is secured to a flanged elbow **23** of the control device and is sealed and further secured against the possibility of any leakage by a gasket **24** which should be chosen from a conventional material that is resistant to the action of fuel. The lower end of the control device is connected to a nipple **25** of three-way opening T-fitting **26** which is inserted between the fuel pump **13** and the inlet fuel line **17**.

The control device, which is shown in more particular detail in FIGURES 2 and 3, includes a long piece of conventional ⅛ or ¼ inch or larger tubing or piping **27** made of copper or gasoline and heat resistant plastics which may be connected to the elbow **23** by a coupling **28**. The lower end of the tubing **27** is received in a union **31** which in turn is connected to a control valve housing **32**. The lower end of the valve housing **32** is connected to the nipple **25** of the T-fitting **26**.

As shown more particularly in FIGURE 3, the nipple of the fitting is provided with an opening **33** which communicates with a valve seat **34** having a 45° angle seat. The valve seat in turn communicates with an enlarged opening **35** which is more or less flush with the bore **36** of the valve housing.

The union **31** has an internal bore **40** which is provided, as shown more particularly in FIGURE 5, with a number of radially inwardly extending fins or stop elements **41**. These elements provide an upward limit for the travel of the float valve while insuring the continuance of flow of gasoline past the float member.

The float member **37** is best shown in FIGURES 3, 4 and 6. As shown in FIGURE 5, the float member may be formed of a hollow triangular piece of plastic tubing provided with an integral cap at the top and having a sealed bottom **38** provided with tapered 45° angle walls so as to seat within the valve seat **34**. The cross-sectional configuration of the float member is as shown in FIGURE 4 where it is noted that it is composed of three triangular walls **39**. The relationship of the triangular sections of the float members to the internal bore **36** is such as to provide a loose fit to effect a vertical position which insures proper seating yet at the same time does not restrict the upward and downward travel of the float member within the bore. The float member may be made of conventional plastic such as nylon or other similar gasoline resistant plastic. The bottom member **38** may be conveniently secured to the float member by thermoplastic sealing and the like. It will be noted that in this feature should there be any leakage of liquid, the liquid will enter through the bottom and entrapped air at the top will still insure the proper float characteristics of the float.

As an added safety factor in this invention, the valve opening **33** may be made of a restricted size as in the order of 0.025 to 0.080 inch to prevent loss of vacuum in the fuel pump should for any reason the float member become stuck above the valve seat. By this means the small cross-sectional area of the bore **33** will not adversely affect the operation of the fuel pump. However, by the use of the triangular cross section of the float it has been found that films forming between the float member and the internal side walls of the bore **36** of the valve housing are minimized and the sticking of the valve is substantially eliminated, since only point rather than surface contact is involved. It will be understood, therefore, that the bore opening may be varied and may be made larger using the particular float member shown herein. With cylindrical float members in which the surface area contact between the sides of the float member and the interior side walls of the bore **36** will be increased, the bore **33** may be of a restricted cross sectional area for safety purposes. It should be noted that should the float valve become stuck or obstructed in the closed position, the operation of the car will not be adversely affected compared to the operation of a car without the device of this invention installed at all. Thus, in such a circumstance there will be no flow of gasoline through the control device **10** which, of course, is the same condition prior to the installation of the device.

Use

When the fluid level control device **10** is in use in the normal internal combustion engine of a passenger car or the like, it will not change the functioning of the carburetor nor will it affect the operation of the fuel pump adversely when the fuel level line is below line **19**, since the float member **37** will be closed against the valve seat **34** and no fluid obviously will pass through the line. Also, the float member will be kept firmly in seat for two-fold reasons. This is because of its own weight and also because of the vacuum exerted upon it by the fuel pump.

The float member **37** remains seated upon the valve seat **34** when the fluid level **19** is below the orifice **21** because, under that condition, the fuel pump **13** will draw all fluid out of the housing **32**. Thus, the weight of the float member **37**, together with the vacuum effect of the pump **13** will cause the member **37** to rest upon the seat **34** until fluid again flows through the orifice **21** and pipe **27**.

Should the fuel level within the carburetor chamber be caused to be raised above line **19** under normal conditions without the use of the control device **10**, flooding will occur and improper operation will result. By the use of the control device **10**, the fluid level line is prevented from rising above level line **19** or the lower portion of the opening **22**, since all excess fluid is drained out the nipple, through the elbow **23** and conduit **27**, to the interior of the valve housing **32**. Thus, the excess fluid, which under normal conditions floods the carburetor, will fill the valve housing **32** and cause the float valve **37** to open and rise to the point where it contacts the stop element **41** in the union **31**. Thus, wastage is prevented while the excess fluid is also removed from the carburetor through the tubing which acts as a reservoir to eventually recycle it to the fuel pump.

The operation of the control device **10** is effective under any situation where there is too much fuel in the carburetor and the level of fuel is above the recommended level line **19**. Thus, for high float setting, bad seating of the needle valve, high fuel pump pressure, all tending to raise the level **19** under any set of conditions, the control device **10** will operate to correct these features and prevent the rise in level of the fluid above the recommended level line within the chamber of the carburetor. Also, in conditions of percolation where the gasoline boils within the carburetor, excess fuel is drained off through the control device **10** and pressure is reduced so that this and other disadvantageous features are obviated.

The control device of this invention is exceedingly simple to install and requires only that the carburetor chamber wall **18** be tapped at the desired point or that the sight level plug be replaced such that the nipple **21** can be correctly inserted therein. Further, by means of the tubing **27** which may be bent in any desired configuration, communication can be had with the fuel pump in any desired location. All that is required to install the control device in addition to the positioning within

the carburetor, is the insertion of the T-fitting **26** between the fuel pump **13** and the inlet fuel line **17**. After this has been effected, the installation of the control device **10** is exceedingly simple requiring only that the housing **32** be connected to the nipple **25** of the top of the T-fitting after which the device is ready for operation.

The control device is extremely rugged by virtue of its simplicity and construction, but should any maintenance or repair work be required, this can be easily accomplished by the disassembly of the various threaded fittings by the use of a wrench as the only tool required. Thus, cleaning, repair and maintenance can be made on the road by the operator of the car, should this for any reason be necessitated. Also, since the control device uses simple parts and equipment, the initial cost is extremely low and virtually no maintenance is needed.

Because of the particular construction of the float member **37** using the triangular cross section, the possibility of sticking to the side of the wall of the valve housing is substantially eliminated. Also, it will be noted that because of this configuration and also because of the use of the finger-like radial stop elements **41**, there will be a full passage of gasoline past the float member when it is in its upwardly limited position. Where desired, float members having a cylindrical configuration can be employed with the particular stop member shown since there will still be flow through the fin elements **41** around the exterior of the float member. There is, however, a somewhat greater chance of sticking of such cylindrical float members. Such members may, however, be made with axial grooves on their periphery to minimize the possibility of large surface area contact with the interior of the valve housing that might cause sticking therein.

In the operation of this control device in the invention herein, it will be apparent that there has been provided a very advantageous system for preventing the flooding of liquid within a carburetor and recycling it to the fuel pump. This is effected without the reduction of the efficiency in the fuel pump, since the float valve member is closed in normal operation against the valve seats. Under conditions of flooding, there is a ready recirculation of the fuel from the carburetor to the fuel pump. Should for any reason there be an obstruction in the flow of liquid, this will normally be effected through the sticking of the valve members against the valve seat due to gravity consideration and the normal flow of fluid. Under such circumstances, and as a result of the inherent safety features of this invention, the operation of the fuel pump in the carburetor will not be adversely affected as brought out above over the normal operation without the use of this invention.

Various changes and modifications of this invention will appear from the description above and will be further obvious to those skilled in the art. Such modifications and changes are within the teaching of this invention and are included within the scope thereof as defined by the claims appended hereto.

What is claimed is:

1. In combination with a fuel pump delivering fuel to a carburetor having a float chamber provided with a float valve therein for metering fuel from said pump to said carburetor, conduit means connected to the inlet side of the fuel pump for delivering fuel thereto, drain means in communication with the carburetor and said fuel pump for preventing the fuel supply within said carburetor from exceeding a fixed high level line independently of the metering action of said float valve, said drain means being in the form of a valve housing having an imperforate top except for a passage forming means connected to the float chamber and contiguous with said level, and said housing being connected at the bottom to the conduit means to the inlet side of the fuel pump, and a restrictor means in the drain means having a free cross-sectional area substantially less than that of the drain means and check valve means in said drain, said last named means comprising a float valve member that closes against a valve seat when the drain is empty and floats away from the valve seat when fuel is in the drain, said valve seat being connected to the restrictor means disposed at the bottom of the valve housing, and said valve member having a conical seating surface and said valve seat having a mating conical surface merging with the inside walls of the valve housing, and stop means at the top of said valve housing limiting the upward movement of said float valve member comprising spaced inwardly extending radial elements that pass fuel therethrough when contacted by the float valve member.

2. In combination with a fuel pump delivering fuel to a carburetor having a float chamber provided with a float valve therein for metering fuel from said pump to said carburetor, conduit means connected to the inlet side of the fuel pump for delivering fuel thereto, drain means in communication with the carburetor and said fuel pump for preventing the fuel supply within said carburetor from exceeding a fixed high level line independently of the metering action of said float valve, said drain means being in the form of a valve housing having an imperforate top except for a passage forming means connected to the float chamber and contiguous with said level, and said housing being connected at the bottom to the inlet side of the fuel pump, said valve housing having a bore, a valve seat at the bottom of the bore, and a vertically elongated float valve member fitting loosely within said housing, said valve member having a conical seating surface and said valve seat having a mating conical surface merging with the inside walls of the valve housing member, said float valve member and said housing being engageable along a vertical edge of said member to minimize adherence to the sidewalls thereof, and stop means at the top of said valve housing limiting the upward movement of said float valve member comprising spaced inwardly extending radial elements that pass fuel therethrough when contacted by the float valve member.

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