An overflow type carburettor provided with fuel supply valve which closes the fuel inlet of the carburettor when the fuel supply pressure is not applied. Further the carburettor may be provided with a fuel channel which communicates with the lower end of the fuel feed duct leading to the fuel spray nozzle and the bottom of the fuel well of the fuel chamber. This carburettor is free from leaking of fuel even when the stop-cock of the fuel supply duct is left open, and provides stabilized engine operation even when the vehicle is driven in an extremely inclined position.

13 Claims, 5 Drawing Figures
Fig. 4

Fig. 5
OVERFLOW TYPE CARBURETTOR

BACKGROUND OF THE INVENTION

This invention relates to an improvement of the overflow type carburettor in which no float is used but the fuel level is maintained by means of an overflow partition over which excess fuel flows to be returned to a fuel tank or fuel pump.

The overflow type carburettor has long been known and has been mainly used for small size internal combustion engine vehicles such as scooters, motorcycles and small size agricultural all-purpose tractors. But the prior art carburettors of this type are unsatisfactory in the following points.

In the case of motor cycles, the fuel tank is usually positioned higher than the carburettor, and fuel is freely fed by gravity to the fuel chamber of the carburettor. Excess fuel overflows the partition and is returned to the fuel tank by means of a recirculating pump. A stopcock is provided in the tubing connecting the fuel tank and the fuel chamber, and this stopcock must be closed when the engine is not operated. If the cock is inadvertently left open when the engine is not operating, the fuel may fill the fuel chamber, flow out of the carburettor and/or penetrate into the engine cylinders, since the circulating pump is not operated then, either.

In the case where the fuel tank is positioned beneath the engine and fuel is fed into the fuel chamber by a feed pump, if the stopcock is left open when the engine is not operating, the fuel chamber will empty since the fuel stored therein gradually returns to the tank, and this causes trouble when operation of the engine is started again.

The overflow type carburettors of the prior art do not provide stabilized engine operation when the vehicle is extremely inclined. If a vehicle is inclined more than 30°, the prior art overflow carburettor usually does not work well, because the fuel level in the fuel chamber of the carburettor falls and fuel is not fed to the engine smoothly.

In the prior art overflow carburettor, when fuel is supplied to the fuel chamber by means of a supply pump there is considerable flow of fuel in the fuel chamber, which is sometimes swirling. This swirling effect influences the fuel feed to the fuel nozzle, and thus the feed of the fuel to be sprayed in the fuel-air mixing chamber often fluctuates and thus smooth operation of the engine is impaired.

As an overflow carburettor has no float in the fuel chamber, and therefore, the fuel in the fuel chamber is shaken harder than a float carburettor and the shaken fuel spatters and often penetrates the air vent to clog it.

The object of this invention is to provide a novel overflow type carburettor which is free from the above-mentioned defects and is more versatile than the overflow carburettor of the prior art and thus can be used for vehicles which are driven in an extremely inclined state such as snowmobile.

SUMMARY OF THE INVENTION

In the general aspect of this invention, an overflow type carburettor provided with a fuel supply valve which closes the fuel inlet of the fuel chamber (fuel well) of the carburettor when no fuel supply pressure is applied is provided. With this, the fuel does not drain from the carburettor and the fuel chamber is never emptied even when the engine is not operated.

In another aspect of this invention, an overflow type carburettor in which a plurality of air vents are provided in the head space of the fuel chamber is provided. No prior art overflow carburettor is provided with a plurality of air vents in the fuel chamber. Said air vents open in the head space of the fuel chamber at different positions. Thus, communication between the head space of the fuel chamber and the atmosphere is always maintained by some vent or vents which are exposed to the gaseous phase in whichever direction the carburettor is inclined.

In still another aspect of this invention, an overflow type carburettor in which a fuel channel which communicates with the lower end of the fuel feed duct leading to the fuel spray nozzle and the bottom of the fuel chamber. The fuel channel has two or more branches, the end of each of which forms an opening to the fuel well provided with a valve, which closes the opening when the fuel channel lies horizontal and closes the opening when the carburettor is inclined and the opening is raised high. Thus the carburettor can maintain some fuel head and introduction of air to the fuel feed duct is prevented even if the carburettor (vehicle) is deeply inclined.

In still another aspect of this invention, an overflow type carburettor provided with said fuel channel which further has as the overflow partition, a cylindrical wall surrounding the fuel feed duct is provided. The fuel well formed by the cylindrical wall is separated by a horizontal partition into an upper section and a lower section, and an annular hole surrounding the fuel feed duct is provided in the horizontal partition so that the upper section and the lower section communicate with each other. The carburettor is practically operable in whichever direction the vehicle may be inclined.

In still another aspect of this invention, an overflow type carburettor, in which a baffleboard which extends under the opening of the air vents, is provided. This further contributes to stabilized engine operation.

The carburettor of this invention can be easily manufactured by those skilled in the art guided by the attached drawings, and therefore there is no necessity to explain the manufacture thereof.

BRIEF EXPLANATION OF THE ATTACHED DRAWINGS

FIG. 1 is a longitudinal elevational cross-sectional view of an embodiment of the carburettor of this invention.

FIG. 2 is a traverse elevational cross-sectional view of the carburettor of FIG. 1 along line A — A in FIG. 1.

FIG. 3 is a plan view of the carburettor of FIG. 1, showing the connection with the engine.

FIG. 4 is a traverse elevational cross-sectional view of the fuel chamber of another embodiment of the carburettor of this invention.

FIG. 5 is a cross-sectional view of another example of the fuel supply valve used in the carburettor of this invention.

DETAILED DESCRIPTION OF THE INVENTION

A preferred embodiment of this invention is shown in FIGS. 1 through 3. In these drawings, member 1 is a
fuel-air mixing channel, 2 is a throttle valve for fuel-air mixture, 3 is a fuel nozzle, 4 is an air inlet, 5 is a fuel-air mixing chamber, 6 is a fuel chamber which is positioned on the underside of the fuel air mixing chamber. The fuel chamber is separated by an overflow partition 7 into a well or pool for fuel 8 and an overflow drain section 9. In the fuel well 8 are provided, a fuel supply valve 10 at the bottom and a fuel feed duct 11 at the center. In the overflow drain section 9 are provided, a drain outlet 12 at the bottom and a baffleboard 13 at the top.

The fuel supply valve 10 may be a ball valve for example. In FIG. 1, the valve comprises a ball 16 which closes the opening of fuel supply tubing 14 by virtue of the resilient force of a spring 15 supported by a suitable supporter 17. The valve closes the fuel inlet when no pumping force (fuel supply pressure) is applied to the fuel supplied. (The carburettor of this invention is used for an engine provided with a fuel supply pump.) The valve may be surrounded by a filter net or a flow-regulating member made of a porous material 20.

An alternative structure of the fuel supply valve is shown in FIG. 5. This is a diaphragm valve, and this is installed between the fuel chamber of the carburettor and the fuel supply pump. In FIG. 5, member 51 is a valve body, 52 is a diaphragm, 53 is an atmospheric pressure chamber, 54 is a fuel chamber of the valve, 55 is a spring, 56 is a stopper attached to the diaphragm 52, 57 is a passage communicating with the fuel supply pump, 58 is a fuel feed duct communicating with the fuel chamber of the carburettor, and 59 is a through hole. This valve functions as follows.

When the engine is not operating, that is, when the fuel supply pump is not working, the diaphragm 52 is pressed by the spring 55 and the stopper 56 closes the fuel passage. But when the engine is in operation, the pressure of the fuel opens the stopper and the fuel flows into the fuel chamber of the carburettor. It is advantageous that a through hole 59 in the atmospheric pressure chamber 53 is arranged so as to communicate with the engine manifold. By this the atmospheric chamber is maintained at sub-atmospheric pressure and this will make the diaphragm more responsive.

The fuel feed duct 11 communicates with a spray nozzle 3 at the upper end thereof and it contains a jet orifice 18 therein. The fuel feed duct 11 communicates with the fuel well 8 by a horizontal fuel channel 19 which runs beneath the bottom of the fuel well 11 and opens to the well at both ends 21 and 22 thereof as shown in FIG. 2. At the openings 21 and 22 are provided valve chambers 23 and 24, in which a free ball valve 25 or 26 is placed respectively.

At the ceiling of the fuel chamber in the shade of the baffleboard 13, air vents 27 and 28 are provided. They penetrate through the wall of the fuel-air mixing chamber and open in the fuel-air mixing channel. In FIGS. 1 and 2, the two vents join together and open in the mixing channel by a common opening 29 on the center line of the mixing channel. But they may have independent openings.

The fuel feed duct 11 and the overflow drain outlet 12 are positioned on the longitudinal center line and thus the carburettor is installed in the engine so that an inclination of the engine occurs with this longitudinal center line as the axis of rotation. In the case of a wheeled vehicle for instance, the carburettor is installed in the engine so that this longitudinal center line is in alignment with the longitudinal center line of the vehicle. FIG. 3 shows such an arrangement of the carburettor, a fuel tank and a fuel supply pump. In this drawing, member 30 drawn in broken line is an engine manifold, 31 is a fuel tank and 32 is a fuel supply pump, 33 is a fuel supply pipe, and 34 is a fuel recirculation duct. In FIG. 3, fuel chamber 6, overflow partition 7, fuel supply valve 10, fuel feed duct 11, fuel channel 19, valve chambers 23 and 24, ball valves 25 and 26 are shown in broken lines, too.

A small size vehicle such as motorcycle is often tilted or tipped extremely in the direction perpendicular to the direction of the motion of the vehicle. Especially in the case of a snowmobile, it is often driven tipped to the side almost 90° in order to remove the snow piled thereon. The carburettor of this invention can be used for such a vehicle that is driven in such an extremely inclined position.

Again refer to FIG. 2, and suppose that the carburettor of this embodiment is installed in a vehicle in the above-described manner. If the vehicle is tilted to the right with respect to FIG. 2, the left side inlet 21 of the fuel channel 19 is raised high and is exposed to the gaseous phase or the head space in an extreme case. However, the inlet of the fuel channel is closed by the ball valve 25 by virtue of gravity, and, therefore, neither excess fuel is supplied to the spray nozzle nor only air is fed to the nozzle, but fuel continues to be almost normally supplied through the right side inlet 22.

As the overflow drain outlet 12 is positioned on the axial line of inclination and air vents are provided on both sides of the axial line, the fuel level determined by the position of the drain outlet 12 is secured and the head space is maintained at the atmospheric pressure whether the vehicle is inclined to the right or to the left. That is, with this carburettor, the engine can be almost normally operated even when the vehicle is inclined or tipped, since fuel head is maintained at an operating level all the time, although it may be lower or higher than the normal level as determined when the engine is level. It will be noted that the fuel level is lowered as the vehicle is inclined to some extent, but the level is raised again as the inclination approaches 90° and at 90° the fuel level is a little higher than at the normal position.

If a vehicle in which the carburettor of this invention is to be installed is a vehicle, which may be inclined not in a definite direction, such as an agricultural vehicle, and if the carburettor can be made on a little larger scale, it will be advantageous to construct the fuel chamber as shown in FIG. 4.

In this embodiment, the overflow partition is not a straight wall as that of FIGS. 1 and 2 but is a cylindrical wall surrounding the fuel feed duct 11 as shown at 41 in FIG. 4. Thus the overflow drain section is provided outside of the cylindrical overflow partition as shown at 9 in FIG. 4. Usually a plurality of drain outlets 12 are provided in the overflow drain section 9 but they are not necessarily positioned on the longitudinal central line. The fuel well 8 is separated into an upper section 8' and a lower section 8'' by a horizontal partition 42 and an annular hole 43 is provided around the fuel feed duct 11. Member 44 is a fuel supply duct communicating with the fuel tank, and there is a small through-hole 45 open in the lower section 8'' and there is another small through-hole 46 open in the upper section 8'.
course, although it is not shown in FIG. 4, a fuel supply valve such as shown in FIG. 1 or FIG. 4 is provided.

In the carburettor of FIG. 4, the fuel channel 19 has more than two branches. Thus in whichever direction a vehicle is inclined, the ball valve that is positioned at the highest level closes the corresponding branch of the fuel channel so as to prevent introduction of air into the fuel duct 11.

When this carburettor is inclined, the fuel surface in the lower section 8 of the fuel well 8 is maintained at the level determined by the lowest edge 47 of the annular hole 43, in whichever direction the carburettor may be inclined.

Another aspect of this invention is the provision of a baffleboard under the air vents as shown in FIG. 1 and FIG. 2. The baffleboard prevents penetration into the air vents of fuel splattered by agitation of fuel caused by vibration of the engine and jolting of the vehicle.

The arrangement of the carburettor and the fuel mixing chamber is not limited to that represented by FIGS. 1 through 3. It is of course possible to arrange so that the orientation of the fuel channel 19 and air vents is perpendicular to that of the longitudinal axis of the fuel-air mixing chamber.

Although the invention has been explained with reference to a few specific embodiments which include many aspects of this invention in combination, it must be understood that each aspect has an inventive merit per se.

What we claim is:

1. An overflow carburettor comprising, a fuel chamber, an overflow drain section, an overflow partition separating said fuel chamber and said overflow drain section, an outlet return means for excess fuel to a fuel tank from said overflow section, an inlet means to the fuel chamber connectable to a fuel supply pump and entering the fuel chamber below the fuel level, a fuel supply valve at the fuel inlet of the fuel chamber and forming part of the carburettor structure, said valve being operable to close the fuel inlet when fuel supply pressure from the pump is not applied.

2. The carburettor as set forth in claim 1, wherein the fuel supply valve comprises a ball valve, and a resilient means to hold said ball valve in a closed position.

3. The carburettor as set forth in claim 1, wherein the fuel supply valve comprises a diaphragm valve and a resilient means to hold said diaphragm in a closed position.

4. The carburettor as set forth in claim 1, wherein a plurality of air vents are provided in the fuel chamber, which vents open in the head space of the fuel chamber at spaced different positions, whereby irrespective of the inclination of the carburettor at least one vent is free of fuel.

5. The carburettor as set forth in claim 4, wherein there is provided a plurality of vents spaced apart, a common duct into which the plurality of vents join together, an air inlet into which the duct opens, said duct opening into the air inlet in the elevational plane containing the longitudinal center line of the air inlet.

6. The carburettor as set forth in claim 5, wherein there is provided a central fuel feed duct, a fuel channel communicating with the lower end of said fuel feed duct with two or more branches in said channel having inlet ends at opposed points in the bottom of the fuel chamber, a valve at the end of each of said branches which valve closes the opening of the branch when the inlet opening of the branch is raised and exposed to a gaseous phase.

7. The carburettor as set forth in claim 6, wherein each valve is a ball valve.

8. The carburettor as set forth in claim 7, wherein there are two branches forming a straight channel both ends of which open at the bottom of the fuel well.

9. The carburettor as set forth in claim 8 wherein a plurality of air vents are provided which open in a head space of the fuel chamber at different spaced positions.

10. The carburettor as set forth in claim 6, wherein the overflow partition comprises a cylindrical wall surrounding the central fuel feed duct, a horizontal partition separates the fuel chamber into an upper section and a lower section, said horizontal partition being provided with an annular hole surrounding the fuel duct, and a fuel supply duct extends from the fuel inlet to supply both the upper section and the lower section.

11. The carburettor as set forth in claim 10, wherein the fuel channel communicates with the lower end of the fuel feed duct, two branches of said channel communicate with the lower end of the fuel chamber and, a ball valve is provided at the fuel chamber end of each branch.

12. The carburettor as set forth in claim 4, wherein there is provided a baffleboard in the fuel chamber which baffle extends under the inlet openings of the air vents.

13. The carburettor as set forth in claim 6, wherein the baffleboard is provided in the fuel chamber to extend under the openings of the air vents.
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION


Inventor(s) Yoshio NISHIHARA and Isamu OHASHI

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the introductory page the Foreign Application Priority Data (ICIREPAT 30) should be "Nov. 10, 1971 Japan...46-90086"

Signed and sealed this 8th day of October 1974.

(SEAL)
Attest:

McCoy M. Gibson Jr.  C. Marshall Dann
Attesting Officer  Commissioner of Patents