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CARBURETOR

Filed April 4, 1932

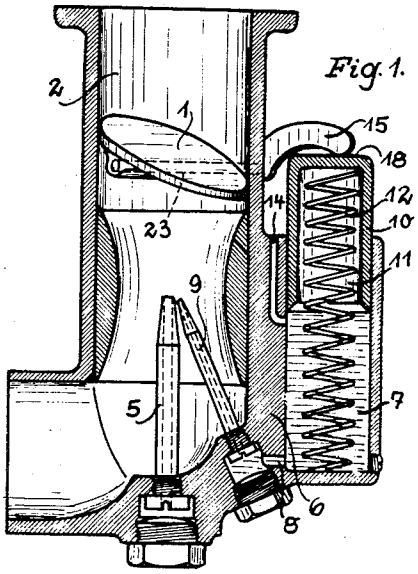


Fig. 1.

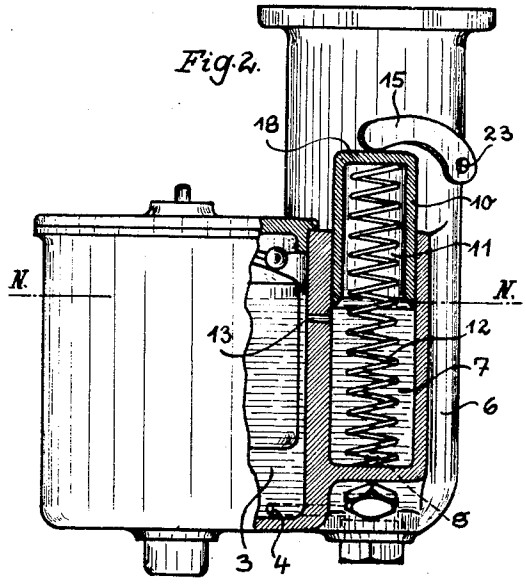


Fig. 2.

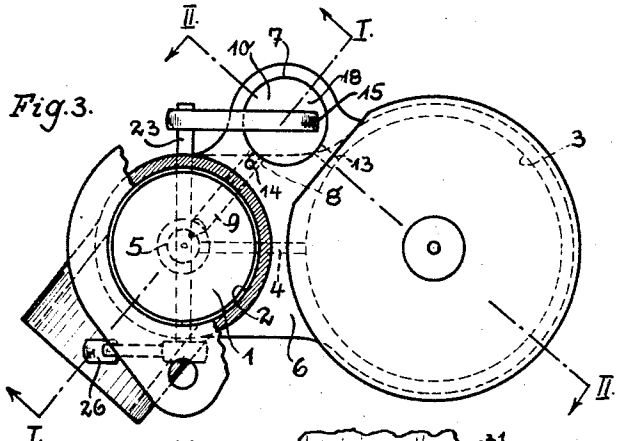


Fig. 3.

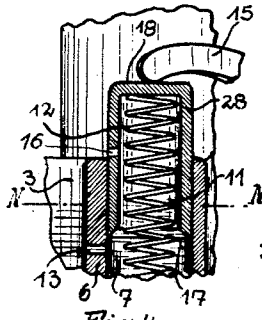


Fig. 4

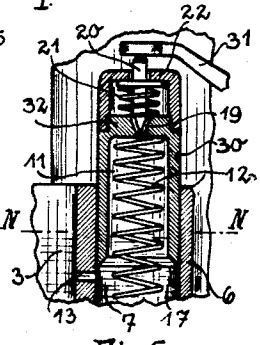


Fig. 5.

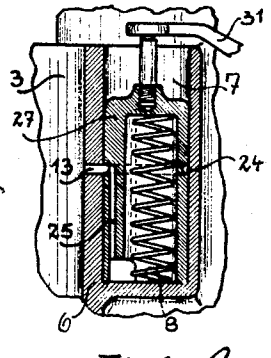


Fig. 6.

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CARBURETOR

Application filed April 4, 1932, Serial No. 603,181, and in Germany April 9, 1931.

Our invention relates to spray carburetors for internal combustion engines which have besides the main spraying nozzle for the fuel and, if necessary, the idle running nozzle, an auxiliary nozzle coordinated to the main nozzle, supplied with fuel by a fuel supply pump actuated with the throttle element. These fuel pumps have for their object, to inject an additional fuel jet into the mixing chamber when starting up the internal combustion engine and opening the throttle valve for enriching the low percentage mixture due to the slight suction effect of the pistons during the starting up period and thus to shorten this starting up period. The old arrangements are open to the objection, that the pump which is connected to the float chamber and to the auxiliary nozzle by means of suction and pressure conduits with interposed check valves, and the piston of which pump is positively operated with the throttle valve, not only supplies fuel to the mixing chamber during the starting up period but also during every further changing of the position of the throttle valve.

The present invention overcomes these objections by the provision of an auxiliary delivery pump controlled by the throttle element, the admission of this auxiliary pump for the fuel into the pump cylinder being opened by the piston only when it is in a predetermined position, corresponding for example to the closing position of the throttle valve.

The carburetor according to this invention possesses the advantage that the piston, due to the play caused in the cylinder by the oscillations of the throttle valve, does not suck fuel at every fresh return movement and forces this fuel into the mixing chamber during its descending movement, but that, for opening the fuel port, the piston must move back to behind a predetermined position, which means that the throttle valve must be first nearly or completely closed when the additional delivery is to take place during the starting up period of the engine.

In the further development of this idea a second control edge is provided on the piston for the fuel admission into the pump cylinder, which edge opens the admission on reaching the lower dead centre position, that is when the throttle valve is completely open. Thus, when the throttle valve is completely open, the auxiliary nozzle remains in constant communication with the fuel tank and thus serves as an additional means for permanently enriching the mixture. This arrangement presents therefore the further advantage, that an additional quantity of fuel is supplied through the auxiliary nozzle to the engine under full load due to the suction effect in the suction pipe, without a separate auxiliary nozzle being required for this purpose which would in turn require a separate control.

Several embodiments of the invention are illustrated by way of example in the accompanying drawing on which:—

Fig. 1 shows a part vertical section along line I—I in Fig. 3.

Fig. 2 is a part section along line II—II in Fig. 3.

Fig. 3 is a top plan view of the carburetor.

Figs. 4 to 6 show in part longitudinal section three modified embodiments of the pump.

The carburetor illustrated in Figs. 1 to 3 consists substantially of a mixing chamber 2 closable by means of a throttle valve 1, a float chamber 3 arranged at the side of the mixing chamber 2 and connected to a main nozzle 5 by means of a conduit 4. In the carburetor casing 6 a cylindrical bore 7 is provided between the float chamber 3 and the mixing chamber 2 and communicates at its lower end through a bore 8 with an auxiliary nozzle 9 extending into the mixing chamber 2. A hollow piston 10, tightly closing against the action of a coil spring 12, provided in the hollow space 11 of the piston 10 and the bore 7, is shiftably arranged in the cylindrical bore 7. The fuel supply into the cylinder 7 takes place through a bore 13 extending through the cylinder wall and leading to the float chamber 3. At the same height as the bore 13 an air exhaust conduit 14 communicating with the atmosphere is provided in the cylinder wall. The piston

10 is controlled by a lever 15 bearing on its cover 18 and rigidly connected to the pivot axle 23 of the throttle valve 1. The adjustment of the throttle valve is effected in well known manner by a lever 26 engaging the opposite end of pivot axle 23.

In the modification shown in Fig. 4 the air exhaust from the pump cylinder 7 takes place through a bore 16 extending through the piston wall, the distance of this bore from the controlling edge 17 of the piston 28 being equal to the distance between the fuel conduit 13 and the edge of the casing controlling the bore 16 in the piston 28.

Fig. 5 shows a bore 19 provided in the cover 32 of the piston 30, this bore being closed in opposition to the action of a spring 21 during the working stroke of the piston 30 by means of a valve pin 20 acted upon by a lever 31 of the throttle valve 1. A cap 22 holds the valve pin in position. During the return stroke of the piston 30 the valve pin is held in closing position by the force of the spring 12 overcoming the force of the spring 21. Only when the piston 30 has almost reached its extreme end position, that is when the fuel admission port is opened, the valve pin 20 is lifted from its seat by the spring 21.

The carburetor according to the invention operates in the following manner:

Let it be supposed that the auxiliary nozzle has to supply fuel during the starting up period of the engine. The throttle valve 1 is completely or almost completely closed and the engine sucks the fuel necessary for the idle running through an idle running nozzle (not shown). The piston 10 of the pump is pushed by the spring 12 into its upper dead centre position opening the fuel supply into the cylinder 7 through the bore 13. The air escapement channel 14, or 16 (Fig. 4) or the valve 19, 20 (Fig. 5) is opened, so that the fuel fills the pump cylinder up to the height of the mouth of the air escapement conduit 14 in the cylinder wall (Fig. 1) or up to the height of the fuel level N—N in the float chamber 3 (Figs. 4 and 5). If now the throttle valve 1 is opened, the piston 10, or 28, 30, is pressed into the cylinder 7 by the lever 15 or 31 against the action of the spring 12, closes the fuel admission bore 13 and at the same time the air escapement channel 14, or 16, 19, or 20 and during its further downward movement forces the fuel out of the cylinder 7 through the auxiliary nozzle 9 into the mixing chamber. As the fuel cannot escape out of the pump cylinder through the narrow bore of the nozzle 9 as would correspond to the inward movement of the piston 10, 28 or 30, the air enclosed in the space 11 of the piston 10, 28 or 30 is compressed forming an air cushion which forces the fuel through the nozzle 9 thus relieving the same. The provision of the air cushion therefore presents the advantage, besides preventing fractures of the tube and cylinder, that the discharge period of the fuel through the nozzle is lengthened or that the jet is discharged in uniform thickness without being affected by variations in the movement of the piston. After the quantity of fuel has been completely forced out of the cylinder 7 through the auxiliary nozzle 9, due to the complete opening of the throttle valve 1 and consequent movement of the piston 10, 28 or 30 into its lower dead centre position, the piston 10, 28 or 30 moves backwards and forwards in the cylinder 7 according to the movements of the throttle valve 1 without further fuel being supplied by the pump. Only when the piston 10, 28 or 30 is moved back into its upper dead centre position by the spring 12, after the throttle valve 1 has been closed, or at an earlier moment according to the position of the fuel admission bore 13, the fuel conduit and the air escapement channel are again opened so that the pump cylinder 7 again fills with fuel. The pump therefore supplies a quantity of fuel determinable by the dimensions of the cylinder only after the piston 10, 28 or 30 has reached a certain selectable position.

If the auxiliary nozzle 9 is to be employed at the same time as secondary nozzle for enriching the mixture when the engine is running under full load or at any other predetermined time, the bore 16 (Fig. 4) in the piston may be so arranged that when the piston is in its lowest or any predetermined position, the bore 16 connects the fuel admission port 13 with the interior of the cylinder. Or, as shown in Fig. 6, a second control edge is produced in the piston wall 27 (Fig. 6) by a groove 24 communicating with the pump cylinder through the bore 25 (Fig. 6). The groove 24 is so arranged that it opens the fuel admission port 13 when the piston 27 is in its lower dead centre position, that is when the throttle valve 1 is completely open, and communicates with the atmosphere when the piston is in its upper dead centre position, that is forms the air outlet for the cylinder. When the piston 27 (Fig. 6) is in its lower dead centre position, fuel is sucked, due to the suction effect in the mixing chamber 2, from the float chamber 3 through the channels 13, 24, 25 and 8 into the nozzle 9 and flows out of this latter. In any other positions of the piston 27 or of the throttle valve 1 the annular channel 24 remains closed or will be likewise shut off from the outside by the lower edge of the piston 27 at the latest when the fuel admission 13 is being closed.

With the dimensions and stroke proportions of the form of construction illustrated in Fig. 4 the air escapement channel 16 can form the second control edge of the piston 28 for the fuel admission and, when the piston is in its lower dead centre position, the com-

munication between the fuel admission 13 and the nozzle 9.

The advantage of the new arrangement is a considerable saving in fuel as, since long as the fuel admission channel 13 is closed by the piston 10, 27, 28 and 30, the pump supplies no fuel. Moreover, due to the omission of movable valve parts, the pump is considerably simpler and cheaper to produce and is more reliable than the old pumps. The employment of the new arrangement is of course not limited to carburetors for internal combustion engines, but can be advantageously used everywhere where a liquid has to be supplied under conditions similar to those described. Further, the construction may be varied within wide ranges without a departure from the gist of the invention.

We claim:

1. In a spray carburetor controlled by a throttle valve, in combination with said throttle valve, an auxiliary fuel supply pump, comprising a cylinder having a fuel admission port and a fuel outlet port, a piston in said cylinder adapted to open said fuel admission port only when in a position corresponding to a predetermined position of the throttle valve, one of the parts of said pump having an air escapement port, and means for closing said air escapement port at the latest simultaneously as the fuel admission port is shut by said piston.

2. In a spray carburetor controlled by a throttle valve, in combination with said throttle valve, an auxiliary fuel supply pump, comprising a cylinder having a fuel admission port and a fuel outlet port, a piston in said cylinder adapted to open said fuel admission port only when in a predetermined position, one of the parts of said pump having an air escapement port, means for closing said air escapement port at the latest simultaneously as the fuel admission port is shut by the piston, and a bore in said piston adapted to connect said fuel admission port with said fuel outlet port when the piston is in its lowermost position.

3. In a spray carburetor controlled by a throttle valve, in combination with said throttle valve, an auxiliary fuel supply pump, comprising a cylinder having in its wall a fuel admission port and an air escapement port at the same height as said fuel admission port, and a piston in said cylinder controlled by said throttle valve and adapted to control with its lower edge said fuel admission port and said air escapement port.

4. In a spray carburetor controlled by a throttle valve, in combination with said throttle valve, an auxiliary fuel supply pump, comprising a cylinder having in its wall a fuel admission port and a fuel outlet port, a hollow piston open at its lower end being movable in said cylinder and adapted to control with its lower edge said fuel admission port, said cylinder having an air escapement port adapted to be closed at the latest as the fuel admission port is closed by said piston, a return spring for said piston in said cylinder, and an oscillatable lever keyed at one end on the axle of said throttle valve and adapted to force down with its free end said piston when the throttle valve is opened.

5. In a spray carburetor controlled by a throttle valve, in combination with said throttle valve, and auxiliary fuel supply pump, comprising a cylinder having in its wall a fuel admission port and a fuel outlet port, a hollow piston open at its lower end being movable in said cylinder and adapted to control with its lower edge said fuel admission port, said piston having an air escapement port adapted to be closed at the latest simultaneously as the fuel admission port is closed by said piston and further adapted to connect said fuel admission port with said fuel outlet port when said piston is in its lowermost position.

6. In a spray carburetor controlled by a throttle valve, in combination with said throttle valve, an auxiliary fuel supply pump, comprising a cylinder having a fuel admission port and a fuel outlet port, a hollow piston open at its lower end being movable in said cylinder and controlled by said throttle valve and having an annular groove and a connecting channel extending from said groove to the interior of said hollow piston, said piston adapted to control said fuel admission port with its lower edge, said cylinder adapted to close said groove at the latest simultaneously as said fuel admission port will be closed, said groove in combination with said connecting channel adapted to connect the fuel admission port with the fuel outlet port when the piston is in its lowermost position.

7. In a spray carburetor controlled by a throttle valve, in combination with said throttle valve, an auxiliary fuel supply pump, comprising a cylinder having a fuel admission port and a fuel outlet port, a hollow piston open at its lower end being movable in said cylinder and adapted to control said fuel admission port with its lower edge, an end plate at the upper end of said piston, a pivot axle for said throttle valve, an oscillatable lever keyed at one end to said axle and bearing with its other end on said end plate, a return spring for said piston in said pump cylinder, and an air escapement valve in said end plate adapted to be controlled by said oscillatable lever actuating said piston.

In testimony whereof we affix our signatures.

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