March 15, 1938. F. A. KOMMER 2,111,399

CARBURETOR

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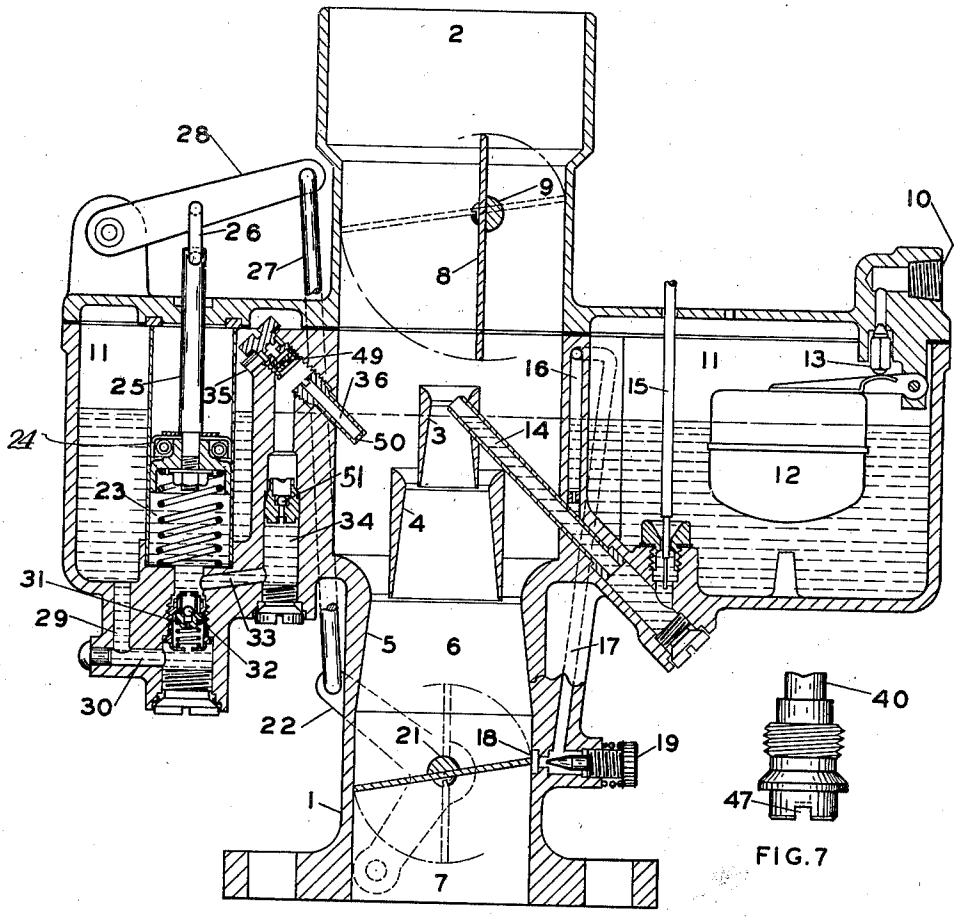



FIG. 1




FIG. 7

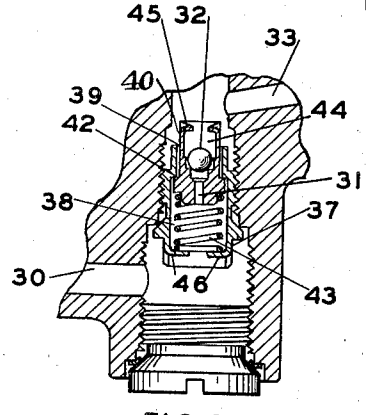



FIG. 2




FIG. 4

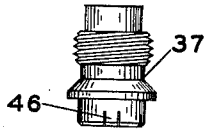



FIG. 5

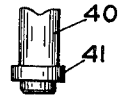



FIG. 3

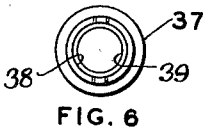



FIG. 6

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## CARBURETOR

Fred A. Kommer, St. Louis, Mo.

Application November 27, 1934, Serial No. 754,940

7 Claims. (Cl. 261—34)

This invention relates to carburetors for internal combustion engines and to devices of this kind having, in addition to a main fuel supply device, an accelerating pump to provide immediate additional fuel as required for increases in engine speeds. It more particularly relates to by-pass relief valves for controlling the quantity of fuel discharged into carburetor mixing chambers by accelerating pumps which are subject to varying actuating forces.

In the design of present day carburetors of the above character wherein an accelerating pump of pressure injection type is connected to a throttle valve, it becomes necessary to vary the quantity of fuel discharged by the pump to meet the requirements of various throttle opening movements. It will be seen that upon a sudden opening of the throttle valve to a full open position, the vacuum in the intake manifold will drop very low, and a full capacity discharge from an accelerating pump which has been designed to meet requirements for rapid part throttle acceleration would be excessive at this time, inasmuch as additional fuel is usually also admitted thru the main fuel supply system for top end speed.

It is an object of this invention to provide a new and improved device whereby a portion of the fuel under pressure in an accelerating pump may be by-passed into the carburetor float bowl when the pressure exceeds a predetermined point.

It is a further object of this invention to provide a by-pass relief valve in a reciprocating piston type accelerating pump subject to variable pressures.

It is a further object of this invention to provide an automatic and dependable means of controlling the quantity of fuel discharged from an accelerating pump in accordance with the requirements of the engine.

Other objects and advantages will appear from the following description and accompanying drawing, referring to which:

Figure 1 is a diagrammatic representation of a carburetor embodying my invention.

Figure 2 is an enlarged sectional view showing the by-pass relief valve and portions of communicating passages.

Figure 3 is a side elevation of the relief valve inner cylinder.

Figure 4 is a plan view of the inner cylinder shown in Figure 3.

Figure 5 is a side elevation of the relief valve cage.

Figure 6 is a plan view of the relief valve cage shown in Figure 5.

Figure 7 is a side elevation of the by-pass relief valve unit.

Referring to the drawing reference numeral 1 indicates the main body of a carburetor, having an air inlet 2, venturis 3 and 4 and 5 and a mixing chamber 6, and an outlet 7. The admission of air to the carburetor is controlled by the choke valve 8 affixed to shaft 9 for rotation and may be operated either manually or automatically. The carburetor is supplied with fuel thru the intake 10, and the fuel level substantially as indicated, is maintained in the constant level chamber 11 by conventional means usually including a float 12 and needle valve 13. Fuel is supplied to the primary venturi 3 thru the main discharge nozzle 14 and the supply may be varied by a metering rod 15 which may be actuated by an inter-connection to the throttle or by vacuum or by any other suitable means.

A conventional adjustable idle device, composed of passages 16 and 17 leading to the idle port or ports 18 and having an adjustment screw 19, is provided for low speed operation. A throttle valve 20 is mounted for rotation on shaft 21 and may be operated in any manner thru lever 22 which is affixed to the shaft. In order to supply additional fuel for acceleration, an accelerating pump is provided comprising a cylinder 23 and a piston 24 arranged to reciprocate in the cylinder and attached to piston rod 25. The accelerating pump shown in the drawing is operatively connected to the throttle valve thru links 26, 27 and levers 22 and 28. It may, however, be operated by vacuum and spring means and it will be understood that the construction of the accelerating pump or means for operating same, form no part of this invention.

Fuel is drawn into the accelerating cylinder from the float chamber thru passages 29, 30 and thru orifice 31, passing the intake ball check 32 as the same is lifted from its seat by the upward surge of fuel as piston 24 moves upward. The effect of restriction 31 in limiting the inflow of fuel is to insure the formation of an air space between the top of the fuel and the piston, whereby an air cushioned discharge is obtained. It will be understood that the capacity of the fuel pump is substantially greater than the maximum required discharge. Fuel is discharged into the mixing conduit thru passages 33 and 34 passing discharge ball check 51 and thru discharge jet 36, and restriction 50.

To permit the by-passing of fuel back into the float bowl, a relief valve is provided comprising a sleeve 37 having a bore 38 and a smaller bore 39, a

smaller cylindrical check valve cage 40 loosely mounted within sleeve 37 and having a flange 41 near its lower end disposed to seat against shoulder 42 between bores 38 and 39 and a spring 43 which normally tends to urge cage 40 upward against seat 42. Cage 40 is designed to permit the inclusion therein and convenient assembly therewith of the intake check ball 32, and is crimped along its upper edge, as at 45, to loosely maintain the ball in position. To provide for convenient and secure assembly of cage 40 and and spring 43 within the sleeve 37, tangs 46 formed at the lower extremity of the sleeve are bent inwardly after the parts are assembled. The recesses 47 formed by bending the tangs form screw driver slots to ficilitate assembling the unit by means of cooperating threads on sleeve 37 and the adjacent portion of the carburetor body. To prevent the suction within the mixing chamber from drawing fuel thru the accelerating pump discharge passages during high speed operation, air is introduced into the passage 34 from the float chamber, thru passage 35 which is closed during pump operation by the upward pressure of fuel against the disk check 49.

In operation, when the pump piston is quickly depressed to its full extent due to rapid, full opening of the throttle, substantial pressure will be applied to the cage member 40 so as to depress the same against spring 43, permitting a part of the pump discharge to be by-passed between the loosely fitting walls of cage 40 and sleeve 37 and thence back into the fuel bowl. But, if the throttle is opened only partly, or if it is opened slowly, the entire pump discharge can escape through restriction 50 without producing sufficient pressure in the pump cylinder to depress cage 40 and open the by-pass valve.

The above described operation is desirable since, when the throttle is rapidly opened to its full extent, the manifold suction available for effecting vaporization of the fuel and for drawing the mixture into the firing chambers is substantially decreased, whereby there is likelihood of flooding and gasoline wastage under these adverse suction conditions if the full discharge from the accelerating pump is utilized. In case of only partial or slow opening of the throttle, the intake suction is reduced to a substantially less extent than where the throttle is quickly or fully opened, and consequently a greater quantity of accelerating fuel may be properly atomized and carried to the cylinders. In the latter case, cage 40 is maintained firmly seated against shoulder 42 to seal the by-pass.

The invention is not limited in details to the structure shown but may be modified in various respects as will occur to those skilled in the art and the exclusive use of all such modifications that come within the scope of the appended claims is contemplated.

I claim:

1. The combination with a carburetor having a constant level fuel chamber, an accelerating device, and means including a passage for supplying fuel from said constant level fuel chamber to said accelerating device, of a combination check and relief valve unit threaded into said passage, said unit comprising a cylindrical relief valve cage, a smaller cylindrical check valve cage slidably mounted within and arranged to seat within said relief valve cage, a gravity check ball caged within said smaller check valve cage, and a spring urging said smaller check valve cage upwardly against a seat within said relief valve cage.

2. In a carburetor, a constant level fuel chamber, an accelerating device, an upwardly directed passage for supplying fuel from said constant level chamber to said accelerating device, a gravity check ball in said passage, said gravity check ball being caged within a longitudinally movable ball cage, and said ball cage being yieldably held against a seat within said passage.

3. In a carburetor, a mixing conduit, a constant level fuel chamber, an accelerating device, a passage for supplying fuel from said fuel chamber to said accelerating device, a relief valve in said passage, a check valve incorporated within said relief valve, a discharge passage leading from said accelerating device to said mixing conduit, a check valve in said discharge passage, a restriction in said discharge passage at the point of discharge into the mixing conduit, and a valve controlled air passage admitting air to said discharge passage between said check valve and said restriction only when said accelerating device is not discharging.

4. The combination with a carburetor having a constant level fuel chamber, an accelerating device, and a passage in communication with said fuel chamber and said accelerating device for the purpose of supplying fuel thereto, a combination check and relief valve unit in said passage, said unit comprising an outer cylindrical relief valve cage having a slidably disposed check valve container therein and having a portion of its outer surface threaded for engagement with similar threads within said passage, said portion also having a flange near its lower end for the engagement of a seat within said vertical intake passage to prevent the possible leakage of fuel past said unit.

5. The combination with a carburetor having a constant level fuel chamber and accelerating means including a substantially vertical passage, of a combination by-pass relief and check valve unit disposed within said passage, said vertical passage being in communication with said fuel chamber, said unit comprising an outer cylindrical relief valve cage having a bore extending upward from its lower end and terminating in an offset at the point of entrance of a substantially concentric smaller bore extending downward from its upper end, a cylindrical inner check valve cage of sufficiently smaller diameter to permit the passage of fuel around same when inserted upwardly into the smaller bore of said outer cage, having a flange near its lower end small enough to permit fuel to pass when inserted into the large bore in the lower part of said outer cage, but substantially larger than the smaller bore in the upper part of said outer cage, and capable of preventing the passage of fuel thru said outer cage when seated at the junction of the larger and smaller bores within said outer cage, a bore extending downward within said inner cage and terminating in a square shoulder at the entrance of a substantially concentric smaller bore, and a calibrated restriction therein, a check ball caged within the larger upper bore of said inner cage by the crimping of the upper edges of said cage, a coil spring within the larger bore of said outer cage urging said inner cage upwardly, and inwardly formed tangs at the lower end of said outer cage for the restraint of said spring.

6. In a carburetor a mixing conduit, a throttle valve, a constant level fuel chamber, an accelerating pump comprising a piston arranged for reciprocation within a pump cylinder and opera-

tively connected to said throttle valve, an upwardly directed passage in communication with said fuel chamber and said pump cylinder for supplying fuel thereto, an intake check valve and a by-pass relief valve combined as a separately removable unit and disposed within said passage below the level of the fuel, a discharge passage leading upwardly from said pump cylinder to a point above the fuel level, an intersecting passage extending angularly downward into said mixing conduit and angularly upward into the constant level fuel chamber above the fuel level, a discharge jet disposed in said intersecting passage and extending downwardly into said mixing conduit and having a restriction therein, a check valve disposed within said intersecting passage between the intersection of said vertical discharge passage and the fuel chamber, and arranged to close said passage during discharge operation of the accelerating pump and a discharge check valve in said vertical discharge passage.

7. In a carburetor for internal combustion engines, a pressure type accelerating device having an inlet passage, a constant resistance pressure responsive relief valve in said passage, and an inlet check also in said passage.

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