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ACCELERATING PUMP INLET CHECK VALVE CLOSER

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2 Sheets-Sheet 1

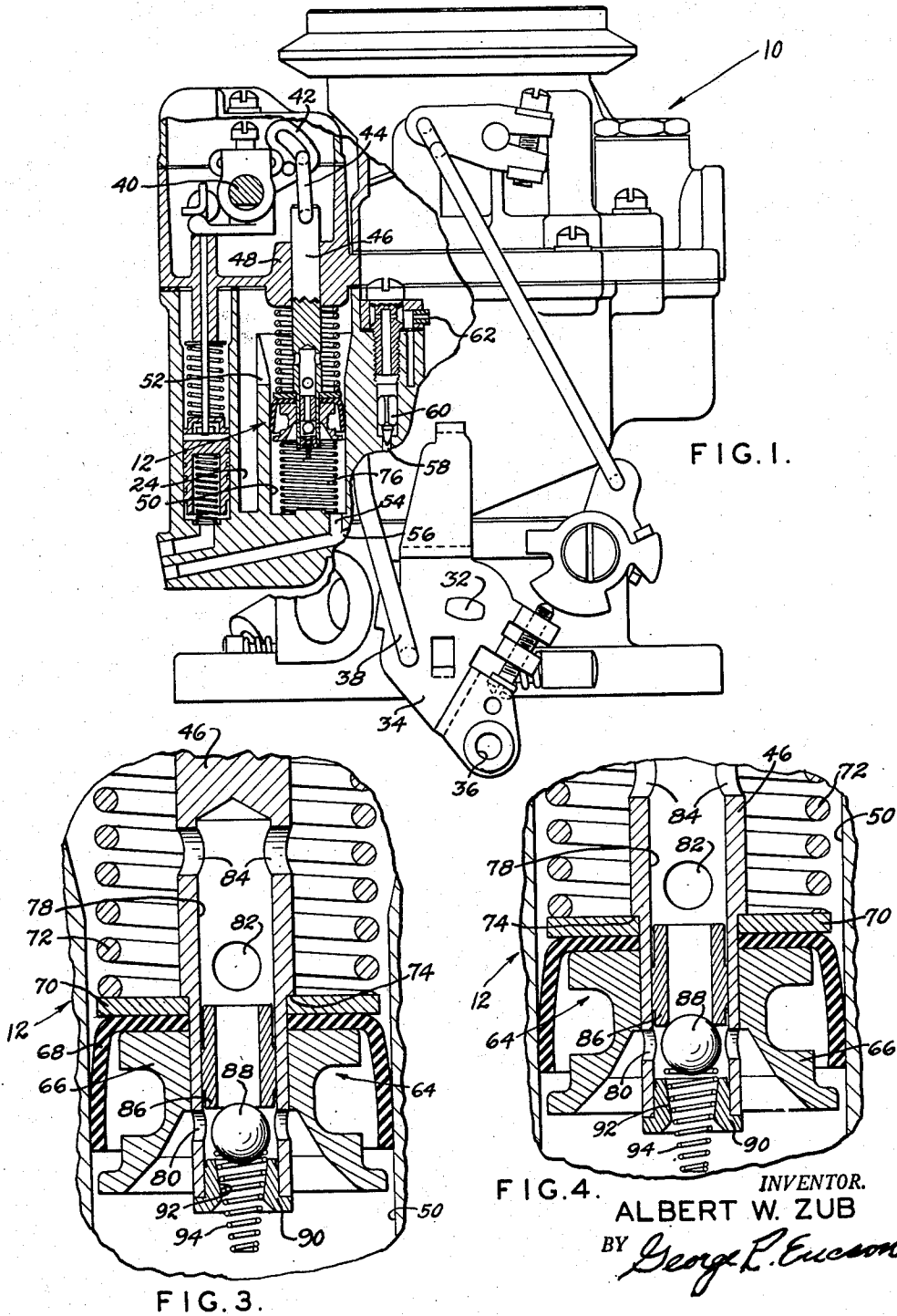


FIG. 4.

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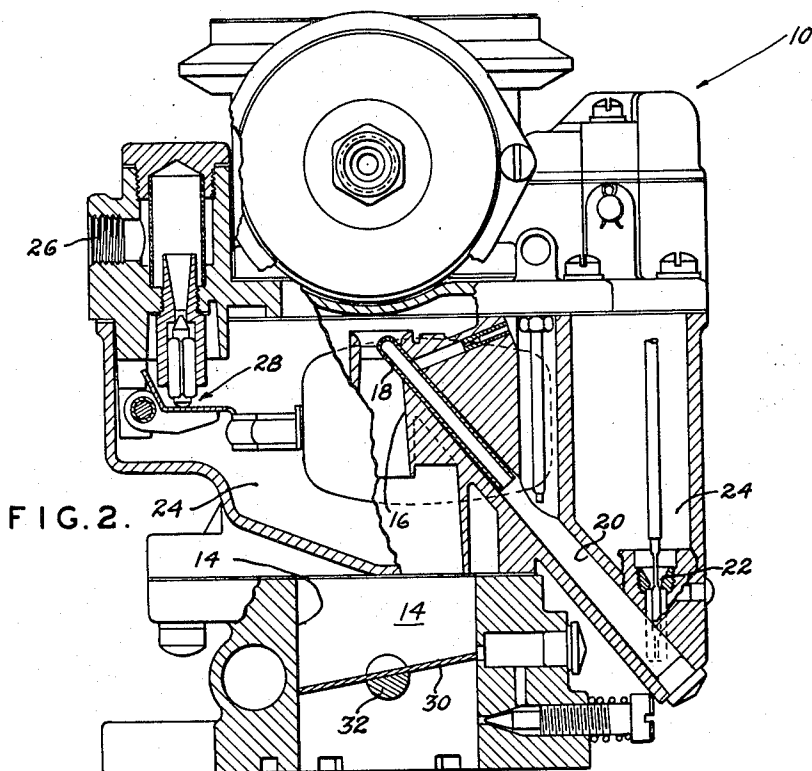
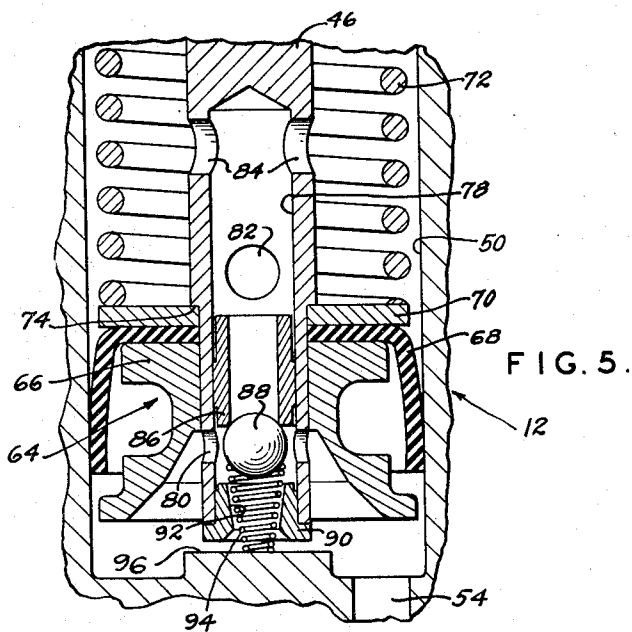
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2 Sheets-Sheet 2



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ACCELERATING PUMP INLET CHECK VALVE CLOSER

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2 Claims. (Cl. 261—34)

The present invention relates to accelerating pumps for automotive carburetors, and more particularly to a novel accelerating pump inlet check valve control which prevents fuel being sucked through the pump chamber at full throttle.

Briefly, the invention comprises an improvement in an accelerating pump arrangement of the type in which fuel is introduced into the pump chamber through the hollow stem of the pump piston. In such an arrangement, the hollow interior of the stem is usually provided with an inlet check valve in which a caged ball is adapted to engage a seat disposed thereabove. Whenever the stem and the attached piston moves upwardly, the ball is displaced from its seat and fuel may flow by gravity through the inlet check valve into the pump chamber. On the downward stroke of the piston, the ball is seated so that fuel may be pushed from the pump chamber through a conventional outlet passage for discharge into the mixture conduit of the carburetor.

While the above arrangement is, on the whole, simple and effective, it has been found to have one disadvantage which manifests itself particularly when the throttle is held in its wide open position. Under this latter condition, suction due to the venturi effect developed in the mixture conduit is sufficient to draw fuel from the accelerating pump chamber and to open the inlet check valve. While the pump inlet check valve remains open, there is nothing to prevent continuous flow from the bowl through the pump to the mixture conduit, especially under the particular condition of a full open throttle and high engine speeds. This added fuel is not normally taken into account by the fuel metering system during the calibration of the carburetor and, of course, it causes the mixture to become excessively rich.

It is a primary object of the present invention, therefore, to provide a novel inlet check valve control which is adapted to close the inlet check valve of a carburetor accelerating pump when the associated carburetor throttle is advanced toward wide open position.

The foregoing and additional objects and advantages will be apparent from the following description, taken in conjunction with the accompanying drawings, in which:

Fig. 1 is an elevational view of a carburetor, a portion of the view being shown in section so as to disclose an accelerating pump which incorporates the present invention;

Fig. 2 is another elevational view of the carburetor of Fig. 1, but taken from the opposite side, and having parts, including an accelerating pump discharge nozzle, shown in section;

Fig. 3 is an enlarged fragmentary sectional view showing the check valve control of the present invention along with associated parts when the throttle is closed.

Fig. 4 is a view similar to Fig. 3, but with the parts shown in the positions they normally occupy during throttle opening; and

Fig. 5 is a view similar to Fig. 3, but with the parts

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shown in the positions they normally occupy when the carburetor throttle is held wide open.

Referring to the drawings more particularly by means of reference numerals, there is shown in Figs. 1 and 2 an automotive carburetor 10 having a novel accelerating pump assembly 12, the latter being shown to best advantage in Fig. 1. Aside from the pump assembly 12, the carburetor 10 is of well known construction and will therefore be described only insofar as certain of its parts relate directly to the operation of the pump assembly 12.

Fig. 2 shows the carburetor 10 to include a vertical downdraft mixture barrel or conduit 14 provided with a primary venturi 16 adapted to withdraw fuel from a main fuel nozzle 18. Fuel is supplied to the nozzle 18 by way of a fuel passage 20 and a conventional metering orifice 22 which communicates the passage 20 with a fuel reservoir 24. Fuel enters the carburetor 10 through an inlet 26, and the usual float and needle valve assembly 28 is provided to maintain a constant level of fuel in the reservoir 24.

A throttle valve 30 is provided adjacent the lower end of the barrel 14 and functions in a well known manner to control the rate of flow of a suitable fuel-air mixture from the carburetor 10 to an associated engine manifold (not shown). The throttle valve 30 is fixed to the rotatable shaft 32, one end of which extends outside the body of the carburetor 10. As best shown in Fig. 1, this extended end of the shaft 32 carries a control plate 34 having an opening 36 for attachment of an appropriate linkage (not shown) for controlling the position of the throttle valve 30.

Referring further to Fig. 1, a rod-like link 38 is pivotally connected to the control plate 34 and extends generally upwardly therefrom to operate a countershaft 40. A slotted arm 42 fixed on countershaft 40 is connected by an appropriate link 44 in the slot to the upper end of a piston stem 46 which extends slidably through a guide boss 48 into a cylindrical pump chamber 50. This arrangement being conventional to provide spring actuation of the pump piston during throttle opening and positive return during throttle closing, it will be understood that rotation of the control plate 34 in a direction to open the throttle valve 30 will permit downward movement of the piston stem 46 by expansion of spring 72.

It will be noted that the pump chamber 50 is located within the reservoir 24, and that a notch 52 is formed in a wall of the chamber 50. The lower end of the notch 52 is at a level which is well below the constantly maintained level of fuel in the reservoir 24, thus insuring a continuous supply of fuel for the accelerating pump assembly 12.

The pump assembly 12, to be more fully described hereinafter, is adapted to force fuel from the lower end of the pump chamber 50 through the illustrated passages 54, 56, and 58, past an outlet check valve 60 disposed in the latter, and ultimately out of a discharge nozzle 62 into the mixture conduit 14. This pumping or squirting action is, of course, effected whenever the throttle valve 30 is advanced. The reasons requiring a device which will provide additional fuel in the conduit 14 under such a condition are well understood by those familiar with the automotive carburetor art.

Directing attention now to the pump assembly 12, and more particularly to the illustrations of the same in Figs. 3, 4, and 5, it will be noted that the chamber 50 contains a reciprocable piston assembly 64 comprising a piston 66, a resilient cup-shaped gasket 68, and a washer 70. Each of these three elements of the assembly 64 is press fitted on the piston stem 46 against shoulder 74, and reciprocable as a unit within the chamber 50. A compression spring bears against the top of the washer 70 and has its upper end in abutment with the aforementioned guide boss 48.

Under certain circumstances, which are without significance in respect to the present invention, the pump assembly 12 may include a second compression spring 76 to retard piston movement near the end of the pump stroke. Spring 76 is below the piston 66 and acting in opposition to the spring 72, as illustrated in Fig. 1. Inasmuch as the spring 76 is not essential to the instant disclosure, however, it has been eliminated from Figs. 3, 4, and 5 for the sake of clarity.

The lower end of the piston stem 46 is hollow, forming a tubular portion 78 which extends from below the piston upwardly through the piston assembly 64 into the pump chamber above the piston assembly. The wall of the tubular portion 78 is provided with outlet apertures 80 below piston assembly 64 and with inlet apertures 82 and 84 just above the piston assembly 64 and near the upper end of the portion 78, respectively.

A check valve seat 86 is firmly secured, as by pressing, within the tubular portion 78 intermediate the outlet apertures 80 and the inlet apertures 82. The lower end of check valve seat 86 is adapted to seat the inlet check valve 88 which is caged between the seat 86 and a valve stop or cage 90 pressed into the lower end of the tubular portion 78. The cage 90 is provided with a conical passage 92 complementary in contour with a conical compression spring 94 inserted therein. This passage retains spring 94 in cage 90 in engagement with the check valve 88.

With the throttle closed as illustrated in Fig. 3, the check valve 88 is positioned slightly spaced from its seat by the spring 94. When the throttle opens, check valve 88 engages its valve seat 86, closing the inlet passage 78 through the piston assembly 64. Valve closing is effected by pressure below the piston on initial movement of the piston due to throttle opening.

Referring now to Fig. 5, it will be noted that the bottom of the pump chamber 50 is provided with a pedestal 96 which is engaged by the spring 94 as the piston stem 46 nears the lower limit of its maximum reciprocal movement. This condition occurs adjacent full open position of the throttle valve 30, and, as is clear from Fig. 5, spring 94 is compressed between the pedestal 96 and the ball 88, the latter being thereby forcibly seated by the resilient reaction of the spring.

Operation

During normal operation of the carburetor 10, the upper end of the pump chamber 50, and particularly the notch 52 therein, is at all times immersed in the fuel contained in the reservoir 24. It is apparent, therefore, not only that a constant supply of fuel will be maintained above the piston assembly 64, but also that the fuel supply will be substantially continuously communicated through either the apertures 82 or the apertures 84 down at least to the lower end of the sleeve 86. Furthermore, whenever the ball 88 is spaced from the seat 86, as illustrated in Fig. 3, fuel will flow past the ball 88 and through the apertures 80 and 92 so as to fill, and to maintain full, the portion of the chamber 50 below the piston assembly 64, as well as the passages 54 and 56, and at least all but a portion of the passage 58 above the check valve 60. If the throttle valve 30 be now advanced for the purpose of acceleration, the piston stem 46 will, by virtue of its above-described mechanical connection to the valve 30, be advanced downwardly. The resulting tendency of the fuel to flow upwardly through the sleeve 86 will cause the check valve 88 to move against the lower end of the check valve seat 86. This closing of the pump inlet causes fluid pressure to be developed below the piston assembly 64, which pressure is sufficient to force fuel through the passages 54, 56 and 58, and out through the discharge nozzle 62 into the mixture conduit 14.

The nozzle 62 has an orifice sufficiently small to restrict flow therethrough and to attain considerable velocity of flow during the action of the piston assembly 64 in the cylinder 50. Whenever the throttle is open, piston assembly 64 is moved downwardly a corresponding amount.

If the throttle is maintained at rest for any substantial period, check valve 88 will open and allow the cylinder to refill below the piston, but, during the pumping action of the piston, the check valve 88 remains seated against the check valve seat 86, and a discharge of fuel at high velocity continues from the nozzle 62.

During the action of the accelerating pump, spring 76 is compressed and spring 72 expands. On throttle closing, this action is reversed.

The relief of pressure below the assembly 64 enables the ball 88 to drop by gravity away from the sleeve 86, whereby any subsequent retraction of the stem 46 upwardly will be accompanied by a replenishing flow of fuel into the space therebelow. The check valve 60, being seated in the absence of fuel flow upwardly through the passage 58, functions to prevent air from being drawn into the pump chamber 50 upon rapid retraction of the pump stem 46 and the pump assembly 64.

In addition to this function, the check valve 60 is at least partially effective to withstand the suction communicated to the passage 58 by way of the nozzle 62. With the sleeve 86 open, this suction, developed by air flow through the mixture conduit 14, would, if not constrained, induce an undesired flow of fuel through the pump assembly 12 and into the conduit 14. It has been found, however, that during full throttle operation of the carburetor 10 at high engine speeds the check valve 60 does permit fuel flow which produces an undesired enrichment of the fuel-air mixture in the mixture conduit 14, and which is not normally accounted for in the conventional calibration of carburetors.

It being a primary object of the present invention to overcome this effect, it will be noted from Fig. 5 that advancement of the piston stem 46 toward a position corresponding to full throttle causes the lower end of the conical spring 94 to be brought to rest upon the pedestal 96 at the bottom of the pump chamber 50. Thus, the spring 94 is caused to be first lifted from its conical seat to close the check valve and then compressed between the pedestal 96 and the seated ball 88, so that the latter is retained in seated position as long as the throttle remains wide open or nearly wide open. The spring 94 and its seat 92 comprise a lost motion resilient means to actuate valve 88 to close. With the check valve 88 closed, the above-described suction-induced flow is eliminated.

Clearly, there has been described a carburetor accelerating pump assembly which fulfills the objects and advantages sought therefor.

It is to be understood that the foregoing description and the accompanying drawings have been given by way of illustration and example. It is also to be understood that changes in form of the elements, rearrangement of parts, and substitution of equivalent elements, which will be obvious to those skilled in the art, are contemplated as within the scope of the present invention which is limited only by the claims which follow.

I claim:

1. A piston stem assembly for use in the accelerating pump of an automotive carburetor, said assembly comprising an elongated stem member, at least one end of said member being provided with a cylindrical bore, a seat fixed in said bore intermediate the length of the latter, a stop fixed in the open end of said bore, a valve disposed loosely in said bore between said seat and said stop, said valve being adapted for closing engagement with the adjacent face of said seat, said stop having a tapered aperture, and a tapered spring disposed loosely in said tapered aperture and extending beyond each end thereof for bodily movement and selective compressive engagement between said valve and a spring engaging surface.

2. In an automotive carburetor, the combination of a mixture conduit, a movable throttle in said conduit, an accelerating pump having a piston in a chamber operated in response to opening movement of said throttle, an outlet for said pump in said mixture conduit exposed to suction during high rates of flow therethrough, a pump inlet,

and an anti-siphoning type of device for said pump comprising, a valve seat in said pump inlet, a check valve for said seat closed by fuel pressure during the discharge stroke of said pump, a spring abutment surface in said chamber, a spring member supported adjacent said valve for bodily movement toward and from said seat with one end normally supporting said valve in spaced relation to said seat and the other end arranged to be engaged against said abutment surface during the discharge stroke of said piston to compress said spring and retain said valve seated to prevent siphoning action on said pump.

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