Oct. 2, 1951 R. W. SLOANE 2,569,782

ECONOMIZER

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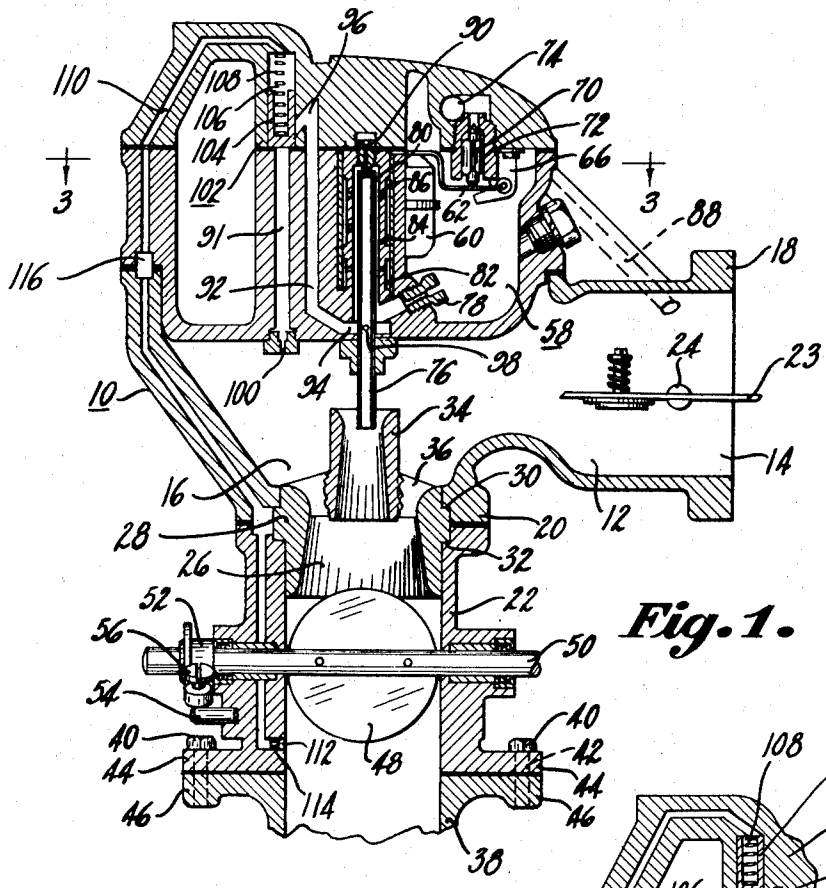


Fig. 1.

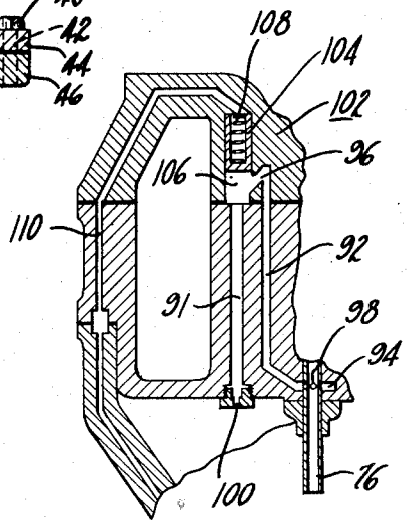


Fig. 2

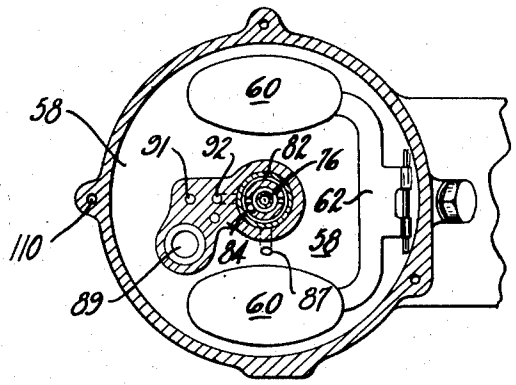


Fig. 3.

Inventor

ROBERT W. SLOANE

By M. A. Hobbs

Attorney

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Robert W. Sloane, Detroit, Mich., assignor to Bendix Aviation Corporation, South Bend, Ind., a corporation of Delaware

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3 Claims. (Cl. 261—54)

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The present invention relates to carburetors for internal combustion engines such as those generally used in automotive vehicles and the like, and more particularly to an economizing and power enrichment system in the aforesaid carburetors for providing an economical fuel-air mixture for normal engine operation and an enriched mixture for high power engine performance.

One of the primary objects of the present invention is to provide, in a carburetor for an internal combustion engine, a fuel system for giving high economy in normal engine operation and for giving power for speed and high power engine output, wherein the transition from the economy range to the power range is smooth and sufficiently rapid to satisfy engine fuel requirements.

Another object of the invention is to provide in the aforesaid carburetors a system in which the fuel is thoroughly emulsified to obtain high economy while the engine is running in the normal operating range.

Another object of the present invention is to provide in the aforesaid carburetors a system for giving an economical fuel-air mixture through the normal operating range and an enriched mixture through the power output range by controlling the quantity of air bled into the main discharge nozzle.

Still another object of the invention is to provide an economizer and power enrichment mechanism readily responsive to changes in engine operating conditions, wherein the enrichment given to the fuel-air mixture during the accelerating period is substantially proportional to the increase in air flow through the induction passage.

A further object is to provide in a carburetor a simple and highly reliable mechanism for giving maximum economy in the normal operating range of an engine and for giving an enriched fuel-air mixture for high power performance.

Still another object of the invention is to provide a dependable and long wearing economizing and power enrichment system for the aforesaid carburetors, in which are provided a minimum number of moving parts and which may be readily assembled in operating position in said carburetors.

Another object is to provide an economizing and power enrichment mechanism for an internal combustion engine which is simple in design and economical to manufacture.

Further objects and advantages of the invention will appear hereinafter from the following

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description when read with reference to the accompanying drawings. Although the detailed description and drawings disclose but one specific embodiment of my economizing and power enrichment system in combination with only one type of carburetor, it is to be understood that variations in structure of the elements comprising the invention, as well as adaptations of the invention to other types of carburetors, are possible without departing from the scope of my present invention. I therefore contemplate the use of any or all such variations and adaptations as properly fall within the scope of the appended claims.

In the drawings:

Figure 1 is a vertical section through a carburetor of an internal combustion engine showing the relationship of the present economizing and power enrichment system to the various other elements comprising the carburetor;

Figure 2 is a fragmentary view showing the economizing and power enrichment system in position for normal engine operation; and

Figure 3 is a section taken on line 3—3 of Figure 1.

With reference to Figure 1 of the drawings, the present economizing and power enrichment device is shown assembled in a horizontal inlet type carburetor, which for the purpose of illustrating the present invention may be considered conventional in design, including all the principal features usually present in a float type carburetor for internal combustion engines. In the carburetor, an air intake 10 contains a horizontal induction passage 12 therethrough having an air inlet 14 and air outlet 16, the air inlet being provided with an external flange 18 for receiving an air filter or horn (not shown), and the air outlet being provided with a flange 20 for mounting said air intake on a downdraft throttle body 22. A choke valve 23 is mounted on shaft 24 in the inlet 14 and is adapted to be actuated by either a manual or automatic control mechanism (not shown) connected to one end of said shaft. A large venturi 26 is disposed in the outlet of the induction passage 12 of the air intake 10 and extends into the top portion of throttle body 22, said venturi being secured in place by the seating of an annular rib 28 of the Venturi tube in adjacent recesses 30 and 32 of the main and throttle bodies respectively. A small or secondary venturi 34 is disposed in the large venturi and held in spaced relation thereto by an arm 36 extending diametrically across the throat of the large

venturi and preferably being formed integrally with the small and large venturis.

The throttle body 22 which is secured to the air intake 10 is mounted on intake manifold 38 and secured thereto by machine bolts 40 inserted in holes 42 of external flange 44 of the throttle body and flange 46 of the manifold. Throttle valve 48 is mounted on shaft 50 in the induction passage of the throttle body and is actuated by a throttle valve lever 52 mounted on one end of shaft 50, the opposite end of shaft 50 being adapted to receive a governor for controlling the position of said throttle valve in accordance with some engine operating condition. A pin 54 seated in the external surface of the throttle body, in cooperation with a screw 56 mounted in the throttle valve lever, serves as a stop for limiting the closing movement of said throttle valve.

A float chamber or fuel bowl 58 is mounted directly above the vertical section of the induction passage and contains therein a pair of floats 60 which are supported by a bifurcated arm 62 on a bracket 66 adjacent a fuel inlet valve 70 and which are adapted to regulate the flow of fuel into the carburetor fuel bowl by controlling fuel valve 70 in accordance with the quantity of fuel in said fuel bowl. Valve 70 is slidably received in valve sleeve 72 which forms a discharge aperture for the fuel inlet conduit 74, said valve being supported and retained in said sleeve by arm 62. A main discharge jet 76 having its discharge end in the secondary venturi 34 delivers metered fuel from the main metering orifice or jet 78 and annular fuel passage 80 to the induction passage in accordance with the flow of air entering the engine. When the throttle valve is opened during the operation of the engine, fuel is drawn by the suction in the venturis from fuel bowl 58 through main metering orifice 78, upwardly into passage 80 surrounding the main discharge jet 76 and is then discharged from said jet into the induction passage. A passageway 82 formed by sleeve 84 surrounds annular passage 80 and is connected to said annular passage by a plurality of small calibrated orifices 86 distributed over sleeve 84, said calibrated orifices together with an air vent 87 connecting the air space above the fuel in bowl 58 with passageway 82, being adapted to serve as air bleeds for the main discharge nozzle when the main metering jet is in operation. The lower set of holes provides a source of idling fuel when the idling system (not shown) is in operation during the time the throttle valve is in closed or substantially closed position. A conduit 88 connecting the air inlet 14 of the induction passage with the space above the fuel in the float chamber maintains the air pressure in said chamber nearly equal to the atmospheric pressure or equal to the pressure between the venturi and an air filter mounted on flange 18. A vacuum actuated accelerating pump 89 is shown in Figure 3 situated near the main discharge nozzle in float chamber 58, and is adapted to discharge fuel through accelerating jet 90 located at the upper end of nozzle 76.

The economizing and power enrichment system forming the subject matter of the present invention includes a vertical conduit 91 communicating with the induction passage adjacent the fuel discharge nozzle 76, a second vertical conduit 92 communicating with an annular well 94 at the discharge nozzle and a passage 96 connecting the two vertical conduits adjacent the upper ends thereof. The annular well 94 is disposed at

a level below the annular fuel passage 80 and main metering jet 78 and communicates with the interior of the discharges nozzle 76 through a plurality of equally spaced ports 98 in the wall of said nozzle. A replaceable calibrated orifice 100 is provided in the entrance of conduit 91 so that the air flow through the system may be readily adjusted to the most satisfactory amount.

A valve generally shown at 102 has been included in the economizing and power enrichment system for interrupting the flow of air therethrough when the engine is operating in the power range, and consists of a reciprocable piston 104 disposed in a cylinder 106 at the upper end of conduit 91 and in alignment therewith, a spring 108 for urging said piston downwardly to its closed position and a conduit 110 connecting the upper end of cylinder 106 with the induction passage on the engine side of the throttle valve, as shown at 112, in order to subject the top side of piston 104 to engine suction. When piston 104 is in its lowermost position in cylinder 106, it separates passage 96 and conduit 91 from one another and prevents the flow of air through the power enrichment system. As engine suction increases, as when the throttle valve is closed, piston 104 is lifted into the upper portion of cylinder 106 in opposition to spring 108, thus uncovering the end of passage 96 and permitting the flow of air through said system into the discharge nozzle 76. A replaceable restriction 114 may be provided in conduit 110 in order that the effective size of said conduit can be adjusted to the desired capacity by merely changing the restriction, said restriction preferably being disposed adjacent the induction passage or at a point of juncture between two parts of the carburetor, as at 116, to facilitate the removal and replacement of the restriction. If a governor throttle valve is disposed in the induction passage below throttle valve 48, conduit 110 should be extended to a point in the induction passage below the governor throttle valve.

When the throttle valve is closed or only partly open for moderate speed or normal engine operation, the engine suction in the induction passage on the engine side of throttle valve 48 lifts piston 104 to the upper end of cylinder 106, thus exposing the passage 96 to the air in conduit 91. The air flowing through the economizing system and ports 98 into the discharge jet has the effect of lessening the Venturi suction on the fuel posterior to the metering jet 78 so that the differential across said metering jet and the flow of fuel therethrough are decreased, thus diminishing the quantity of fuel delivered to the induction passage per volume of air flow therethrough. In holding down the fuel flow from the nozzle by the admission of air thereinto, an economical fuel mixture for normal part throttle engine operation is provided. When speed and full power are required, the throttle valve is moved to wide open position and during such movement the suction in the induction passage on the engine side of throttle valve 48 is decreased appreciably, thus permitting spring 108 to overcome engine suction in cylinder 106 and to lower piston 104 to the position at which passage 96 is closed, thus preventing air from flowing through the economizing system into the discharge nozzle. As a result, the quantity of fuel delivered by the main discharge nozzle 76 is increased so that the additional fuel required for speed and high power output is provided. Since, in the present carburetor, the enrichment of the fuel-air mixture

for speed and high power is supplied by a system in which the fuel is already flowing in the direction to be discharged, the greater demand of the engine for additional fuel is readily met.

Operation

In the operation of an internal combustion engine equipped with the carburetor described herein, the suction in the induction passage on the engine side of the throttle valve when said valve is closed or only partly open, draws piston 104 into the upper portion of cylinder 106, as shown in Figure 2, in opposition to the force of spring 108 urging said piston to the closed position. While the piston is held in the upper portion of cylinder 106, the suction created by air flow through the venturis draws fuel through the discharge nozzle from annular passage 80 and air from the economizing and power enrichment system through conduit 91, passage 96, conduit 92, well 94 and ports 98 thereof. This air forms an emulsion with the fuel which readily vaporizes in the induction passage of the carburetor and in the intake manifold. Piston 104 remains in its lifted position as long as engine suction is sufficient to overcome the force of the spring 108 urging the piston to its closed position. The time at which piston 104 will open or close passage 96 when the throttle valve is open or closed can be approximately predetermined by correlating the calibration of spring 108 and the effective size of restriction 114 in conduit 110. The calibration of said spring and effective size of the restriction preferably are so correlated that piston 104 will be moved to the position at which passage 96 is closed when the throttle valve approaches wide open position.

When the suction in the induction passage is dissipated by the opening of the throttle valve for an increase in speed or power, piston 104 moves to the lower end of cylinder 106, as shown in Figure 1, closing passage 96 and interrupting the flow of air through conduits 91 and 92 to well 94 and into the discharge nozzle. As a result of the decreased supply of air, the effect of the Venturi suction on the fuel pressure in the fuel system posterior to the metering jet 78 is increased so that said fuel pressure decreases causing a greater differential across said metering jet and a greater flow of fuel therethrough; consequently the quantity of fuel in relation to the volume of air flowing through the induction passage is increased.

From the foregoing description of the present invention it is apparent that a comparatively simple economizing and power enrichment system or mechanism has been developed to give reliable and economical service over a long period of time, and, because of its simplicity, the aforesaid system or mechanism is readily adapted to many different designs of the float type carburetor. The modifications necessary to adapt the present system or mechanism to carburetors other than the specific embodiment given for illustration herein will be apparent to those skilled in the art.

I claim:

1. In a carburetor having an induction passage: a discharge nozzle, a constantly open air bleed communicating with said nozzle, a conduit communicating at one end with said discharge nozzle posterior to said air bleed and at the other end with said induction passage for bleeding air into said nozzle, a valve in said conduit for controlling the flow of air therethrough, said valve including a cylinder interposed between two sections of said conduit, a passageway connecting one end of said cylinder to said induction passage for transmitting engine suction to said cylinder, a reciprocable piston in said cylinder separating therein said passageway from said conduit and adapted to be actuated in response to engine suction, and a spring adapted to urge said piston to a position for fully interrupting the air flow through said conduit.

2. In a carburetor having an induction passage with a throttle valve therein: a discharge nozzle, a constantly open air bleed communicating with said nozzle, a conduit communicating at one end with said discharge nozzle posterior to said air bleed and at the other end with the induction passage anterior to the throttle valve for bleeding air into said nozzle, a valve in said conduit for controlling the flow of air therethrough, said valve including a cylinder interposed between two sections of said conduit, a passageway connecting one end of said cylinder to said induction passage posterior to said throttle valve, a piston in said cylinder separating said passageway from said conduit and adapted to be actuated by engine suction, and a spring adapted to urge said piston to a position for fully interrupting air flow through said conduit.

3. In a carburetor with an induction passage having therein a choke valve, a throttle valve and a fuel nozzle between said valves: a well around said nozzle connected with the interior thereof by a plurality of ports, a duct forming a constantly open air bleed for said well, a conduit communicating at one end with said discharge nozzle posterior to said well and at the other end with said induction passage between said valves for bleeding air into said nozzle, a valve in said conduit for controlling the flow of air therethrough, said valve including a cylinder interposed between two sections of said conduit, a passageway connecting one end of said cylinder to said induction passage posterior to said throttle valve for transmitting engine suction to said cylinder, a reciprocable piston in said cylinder separating therein said passageway from said conduit and adapted to be moved by engine suction to a position permitting air flow through said conduit, and a spring adapted to urge said piston to a position for fully interrupting air flow through said conduit, whereby air is permitted to bleed through said conduit into said discharge nozzle only when the throttle valve is in closed or in part throttle position.

ROBERT W. SLOANE.

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