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CARBURETOR

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FIG.2.

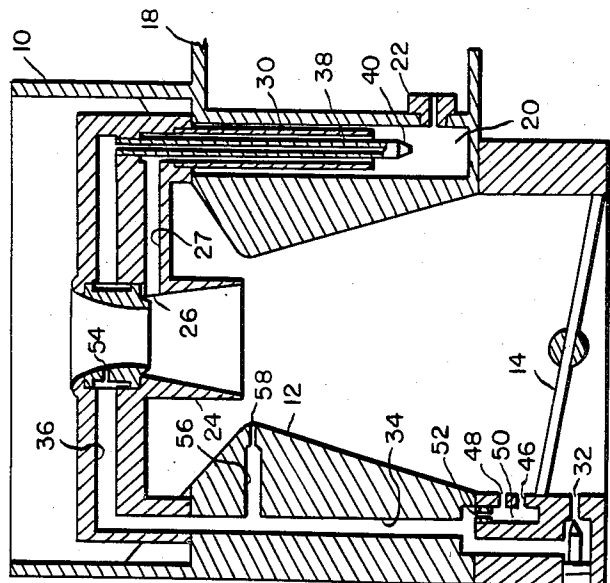
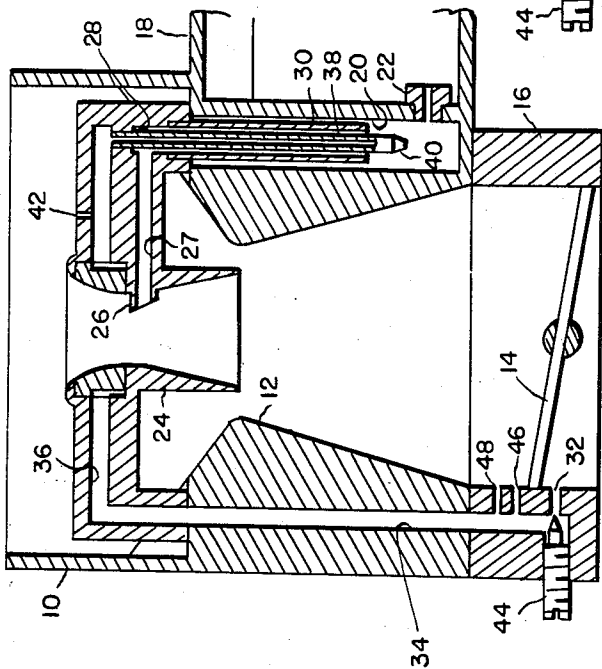


FIG.1.

(PRIOR ART)



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CARBURETOR

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4 Claims. (Cl. 261-41)

The present invention relates to a carburetor and more particularly, to improvements therein relating to the control of idle air bleed in the idle transfer system.

It is an object of the present invention to provide in a carburetor an idle air bleed including bleed passages connected to the idle fuel passage and extending into the throat or throats of a venturi or venturis in the carburetor.

It is a further object of the present invention to provide an idle system in a carburetor which eliminates the usual air bleed connected to a source of air at substantially atmospheric pressure and substituting therefor an air bleed connected to a source of air at the vacuum existing in the throat of the venturi, which air bleed under certain conditions operates to deliver fuel to the venturi of the carburetor.

It is a further object of the present invention to provide in a carburetor a transfer system having a plurality of transfer ports connected by passages to a chamber, and a restricted air passage connecting said chamber to the idle fuel passage of the carburetor.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a diagrammatic sectional view of a conventional carburetor illustrating essential operating features thereof as employed prior to the present invention.

Figure 2 is a diagrammatic sectional view of a carburetor embodying the features of the present invention therein.

In Figure 1 the carburetor comprises a barrel 10 having its interior formed to provide a main venturi 12 therein and including a manually operable throttle 14 located downstream from the venturi. As illustrated herein, the throttle 14 is provided in a separate body portion 16 but this is of course not essential. In proximity to the barrel 10 is a fuel bowl 18 containing an inlet valve controlled by a float of usual type which is therefore not illustrated. The barrel 10 is formed with a vertically extending passage forming a main well 20 communicating with the lower portion of the bowl 18 through a metering orifice 22. If pressure within the well equals pressure within the bowl it will be appreciated that fuel will fill the well to the same level as existing in the bowl.

The carburetor in the present instance is provided with a booster venturi 24, the outlet thereof which is located substantially in the throat of the main venturi 12 and which is adapted to establish a higher vacuum in its throat. Adjacent the throat of the booster venturi 24 is a main fuel nozzle 26 communicating by intersecting passages 27 and 28 with the interior of a main tube 30, the lower end of which is open and extends toward the bottom of the main well 20.

As is well understood, air drawn through the barrel of the carburetor by the action of the internal combustion engine to which the carburetor is attached, produces a reduced pressure or vacuum within the venturis. This

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vacuum existing at the end of the main nozzle 26 causes liquid fuel to be discharged from the nozzle where it is broken up or atomized by the rapid movement of air through the booster venturi. Generally, atmospheric pressure or a pressure approaching atmospheric exists within the bowl and the pressure differential between the pressure of the bowl and the pressure at the outlet of the main nozzle causes the fuel to spray out of the nozzle into the air stream.

When the engine is running with the throttle 14 closed, a high vacuum is produced downstream from the throttle 14. In order to supply fuel to keep the engine running under these conditions there is provided an idle fuel system. This system includes an idle port 32 located downstream from the throttle 14 and connected by passages 34 and 36 to the idle tube 38 which terminates in a restricted metering inlet orifice 40 located in the lower portion of the well 20. Communicating with the passage 30 is an air bleed 42. The air bleed 42 serves a number of separate functions. These functions are (A) to provide air to form an emulsion of fuel and air for discharge by the idle port 32 and the ports provided by the transfer passages 46 and 48; (B) to control the metering pressure differential at the idle fuel orifice 40; and (C) to provide a syphon break at a high point in the idle system passages.

When the throttle is closed as illustrated in Figure 1, the high vacuum maintained beneath the throttle causes fuel to flow from the well 20 past the restricted inlet orifice 40 of the idle tube 38, through the passages 36 and 34, and out the idle port 32. The flow of fuel under these conditions may be adjusted as required by a needle valve 44. The air bleed 42 causes the fuel to be mixed with air as it passes through the passage 36 so that it is more readily atomized when it sprays out of the idle port 32.

In order to control the supply of fuel to the engine in a desirable manner as the throttle is gradually moved from fully closed toward open position, a pair of transfer passages 46 and 48 are provided which terminate in transfer ports located just upstream from an edge of the throttle when the throttle is in fully closed position. The ports thus provided are arranged to be sequentially traversed by the edge of the throttle and thus transferred in effect from upstream of the throttle to downstream thereof. Thus, as the throttle is moved in a clockwise direction toward open position, fuel first flows through the passage 46 and then through the passage 48, thus supplementing the fuel flowing through the idle port 32 and causes an acceleration of the engine as the throttle is opened from its curb idle position.

With the throttle in its fully closed position, it will be appreciated that substantially atmospheric pressure exists in the barrel of the carburetor above the throttle and accordingly, the passages 46 and 48 at this time operate as air bleeds, bleeding air into the fuel-air mixture or emulsion flowing through the passage 34.

Movement of the throttle to a position in which it sequentially traverses the ports provided by the passages 46 and 48 also has the effect of causing the idle port 32 to discharge a richer mixture into the manifold since the air bleeding function of the ports 46 and 48 is eliminated as they become subjected to the reduced pressure or higher vacuum existing below the partially open throttle.

Referring now to Figure 2, certain specific changes in the carburetor structure are illustrated and the purpose and function of these changes will be described in detail. Insofar as the carburetor parts shown in Figure 2 are identical with those shown in Figure 1, the same reference numerals have been applied.

In order to cause the carburetor to deliver a leaner mixture in the transfer range than is possible or practical

with the system previously described, a specific modification of the transfer system is provided. In this case the carburetor is formed with a relatively enlarged chamber 50 to which the idle passages 46 and 48 extend. Between the chamber 50 and the idle fuel passage 34 is provided a restricted orifice member 52.

It will be recalled that passages 46 and 48 are themselves relatively small and afford a restriction to flow of fuel or air therethrough. Inasmuch as communication of the chamber 50 with the idle passage 34 is further restricted by the orifice member 52, it will of course be apparent that the flow from the passage 46 and/or the passage 48 to the passage 34 is doubly restricted. As a result, during periods of curb idle fuel is delivered to the engine through the idle port 32. The fuel-air mixture delivered to the idle port 32 by the improved construction illustrated in Figure 2 is richer than would be delivered by the system shown in Figure 1. This results from the fact that the air bleed from the passages 46 and 48 is further restricted by the restricted orifice member 52. This being the case, needle valve 44 will require adjustment to decrease the area of the port 32 so that the total idling air-fuel ratio for the engine remains the same as in Figure 1.

During the idle transfer operation when the throttle 14 opens sufficiently to subject the transfer passages 46 and 48 to the reduced pressure existing in the engine manifold, the amount of fuel which is discharged from the transfer passages 46 and 48 is also less than would normally be delivered since the supply of fuel to these passages under the described conditions is restricted the orifice member 52. At the same time, the enrichment of the fuel discharged from the idle port 32 under these conditions is reduced, since the original amount of air bled through the transfer passages had previously been reduced.

In other words, with the modification illustrated in Figure 2, a restriction of the passage leading to the idle port by the needle valve 44 is required because less air is bled into the idle fuel mixture through the passages 46 and 48. At the same time, when the throttle is opened to place the transfer passages 46 and 48 below the throttle and thus, subject to the increased manifold vacuum, less fuel is supplied than would be the case with the prior art structure illustrated in Figure 1. At the same time, there is less enrichment of the fuel supplied through the idle port 32 as a result of transfer operation of the passages 46 and 48 so that a leaner mixture is delivered. Thus, the mixture delivered under curb idle conditions tends to be richer than would be delivered from the prior art system shown in Figure 1, but in the transfer range a leaner mixture is delivered.

It is further pointed out that the arrangement of the plurality of transfer passages 46 and 48 in association with a chamber 50 connected through the restricting orifice member 52 provide a new and improved construction. In the present stage of development of modern carburetors, there is a practical limit to the smallness of size of passages which may be drilled or otherwise formed in the parts. One obvious limitation is in the actual production of the small passages. Secondly, a problem of maintaining extremely small passages free and clear of obstruction is another limitation. In the present construction the passages 46 and 48 are of relatively small size but both of these passages are in series with the restricted passage provided through the orifice member 52. Thus, the net result of the system accompanied by the series arrangement of the restricting orifice member 52 and the transfer passages is the same as if the transfer passages themselves were of substantially smaller size. By this arrangement it is thus possible to provide passages of a size practical to produce by drilling and practical to maintain open and free from obstructions, which nevertheless operate as though they were of

much smaller size due to their series arrangement with one or more additional restrictions.

Referring again to Figure 1, it will be recalled that air bleeds into the idle system through the passage 42 when the throttle is fully closed in curb idle position. At this time air is also bled into the idle system through the transfer passages 46 and 48. As the throttle 14 is opened, the vacuum below the throttle diminishes and, due to increased air flow, a vacuum is produced at the throat of the main venturi 12 and an even greater vacuum is produced at the throat of the booster venturi 24. Under these conditions air is admitted into the idle system through the passage 42 and the mixture of fuel and air is discharged both through the idle port 32 and the ports provided by the transfer passages 46 and 48.

As the throttle 14 is opened still further, air pressure below the throttle increases and the air pressure in the throats of the venturis diminishes with an increase in air flow. Eventually, the air pressure at the venturis 12 and 24, and consequently the pressure existing at the main fuel discharge nozzle 26, becomes the lowest pressure in the system. When this occurs, air from all higher pressure areas connected thereto will flow toward the main nozzle. Thus, air will flow from the interior of the barrel through the idle port 32, the transfer passages 46 and 48, and the air bleed passage 42 into the idle system and thence through the idle tube 38 and the idle fuel restriction 40 into the main well 20 from where it is drawn and discharged through the main nozzle 26.

The foregoing described operation, known as back bleed, is sometimes undesirable in that it may adversely affect the desired metering characteristics of the carburetor. This is overcome in the improved construction shown in Figure 2. In this construction it will be observed that the air bleed 42 has been completely omitted and instead, an air bleed passage 54 provided which extends from adjacent the throat of the booster venturi to the idle fuel passage 36. Preferably also, a second bleed passage 56 is provided extending through a restricted portion 58 to adjacent the throat of the main venturi 12. It will be appreciated that either the bleeds 54 or 56 may be employed, or if desired, both may be provided. With the bleeds 54 and 56 in the position shown, the requirement (A), (B) and (C) previously described are fulfilled during the idle and idle transfer positions of the throttle valve 14. During periods of increased air consumption by the engine on which the carburetor is mounted, the idle air bleeds 54 and/or 56 are subjected to the reduced pressure or increased vacuum produced by the operation of the venturis in which they are located. Thus, as the main discharge nozzle 26 is subjected to reduced pressure, the bleeds are subjected to equally reduced pressure with the consequent reduction or elimination of the previously described back bleed action.

By proper proportioning of the passages, bleeds and restrictions of the idle system, the passages 54 and 56 operate to discharge fuel at high throttle openings and thus, to supplement the discharge of the main fuel supply system through the nozzle 26.

The drawings and the foregoing specification constitute a description of the improved carburetor in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A carburetor comprising an air passage including a venturi, a main nozzle in said venturi, a throttle in said air passage downstream from said nozzle, an adjustably restricted idle port in said passage downstream from said throttle when said throttle is in closed position, a plurality of restricted transfer ports in said passage upstream from said throttle when said throttle is closed but close enough together to be sequentially traversed by one edge of said throttle to become downstream therefrom upon initial opening movement of said throttle, a chamber

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with which said transfer ports communicate, an idle fuel supply passage having branches connecting respectively to said idle port and said chamber, said idle fuel supply passage and the branch connecting to said idle port being substantially unrestricted, and a restriction in the branch leading to said chamber.

2. A carburetor comprising an air passage including a venturi, a main nozzle in said venturi, a throttle in said air passage downstream from said nozzle, an adjustably restricted idle port in said passage downstream from said throttle when said throttle is in closed position, a restricted transfer port in said passage upstream from said throttle when said throttle is closed but close enough together to be traversed by one edge of said throttle to become downstream therefrom upon initial opening movement of said throttle, an idle fuel supply passage having branches connecting respectively to said idle port and said transfer port, said idle fuel supply passage and the branch connecting to said idle port being substantially unrestricted, a restriction in the branch leading to said transfer port, and a bleed passage connecting said fuel supply passage to the throat of said venturi.

3. A carburetor comprising an air passage including a venturi, a main nozzle in said venturi, a throttle in said air passage downstream from said nozzle, an adjustably restricted idle port in said passage downstream from said throttle when said throttle is in closed position, a plurality of restricted transfer ports in said passage upstream from said throttle when said throttle is closed but close enough together to be sequentially traversed by one edge of said throttle to become downstream therefrom upon initial opening movement of said throttle, a chamber with which said transfer ports communicate, an idle fuel supply passage having branches connecting respectively to said idle port and said chamber, said idle fuel supply

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passage and the branch connecting to said idle port being substantially unrestrained, a restriction in the branch leading to said chamber, and a bleed passage connecting said fuel supply passage to the throat of said venturi.

4. A carburetor comprising an air passage including a venturi, a main nozzle in said venturi, a well, a fuel supply passage connecting said well to said nozzle, a throttle in said air passage downstream from said nozzle, an adjustably restricted idle port in said passage downstream from said throttle when said throttle is in closed position, a plurality of restricted transfer ports in said passage upstream from said throttle when said throttle is closed but close enough together to be sequentially traversed by one edge of said throttle to become downstream therefrom upon initial opening movement of said throttle, a chamber with which said transfer ports communicate, an idle fuel supply passage extending from said well and having branches connecting respectively to said idle port and said chamber, said idle fuel supply passage and the branch connecting to said idle port being substantially unrestricted, a restriction in the branch leading to said chamber, and a bleed passage connecting said idle fuel supply passage to the throat of said venturi to deliver fuel thereto under open throttle conditions.

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