April 5, 1949. R. D. FAGEOL 2,466,090

ENGINE ATTACHMENT

Filed March 1, 1946 2 Sheets-Sheet 1

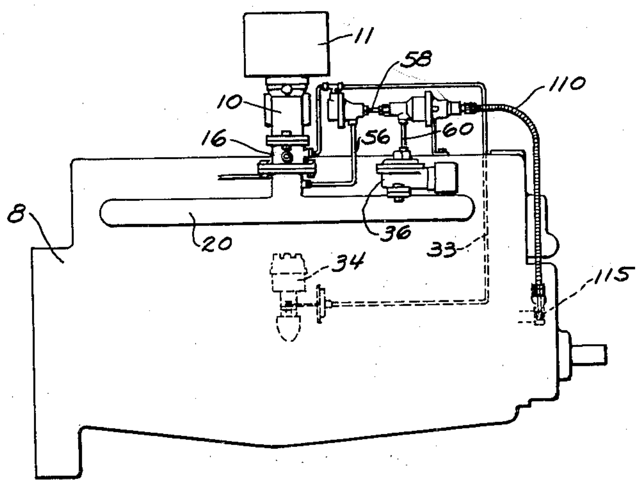
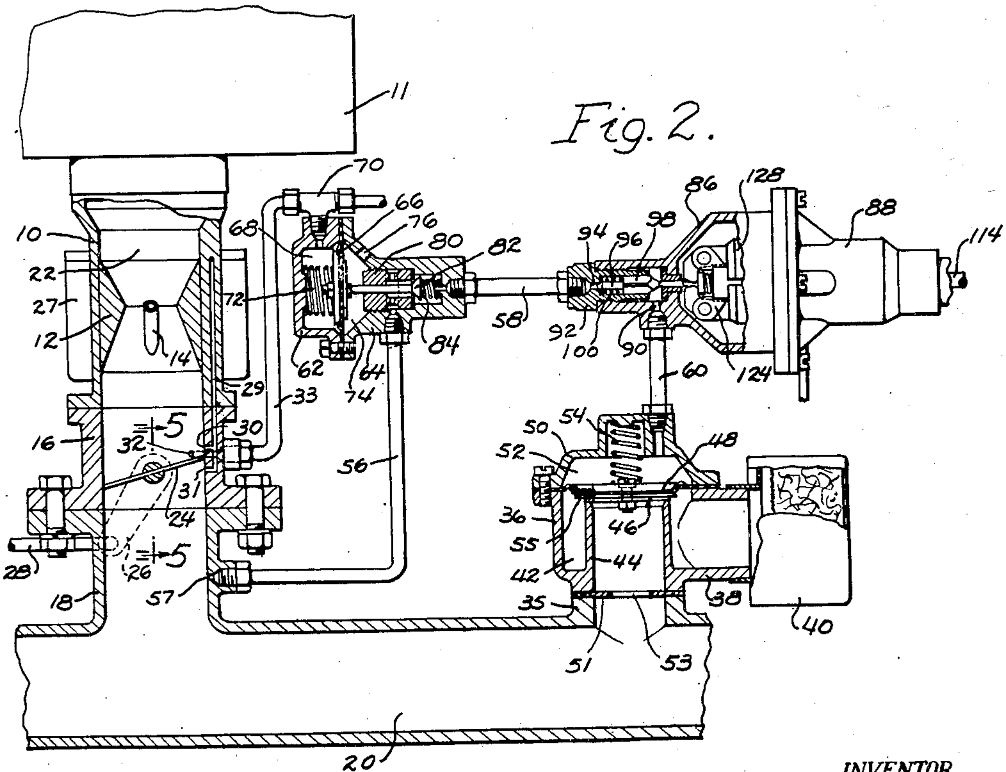


Fig. 1.



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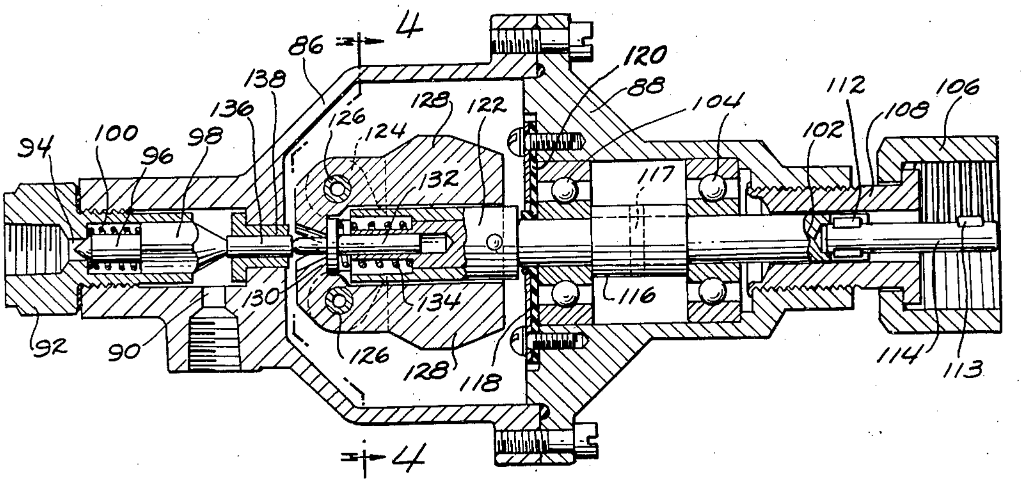

Fig. 3.

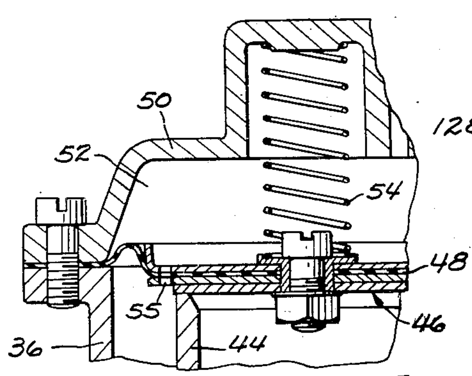

Fig. 6.

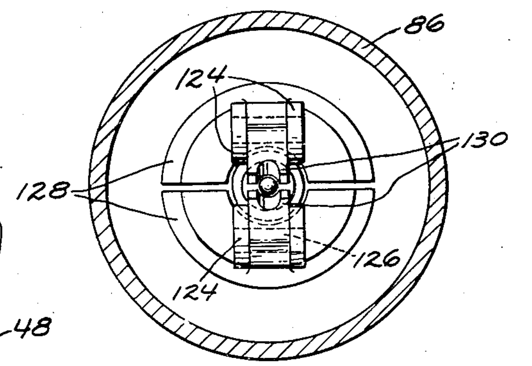

Fig. 4.

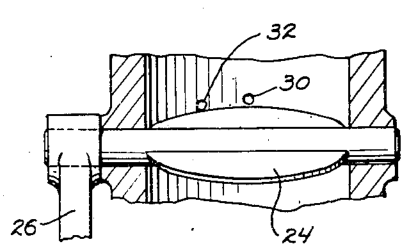

Fig. 5.

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UNITED STATES PATENT OFFICE

2,466,090

ENGINE ATTACHMENT

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Application March 1, 1946, Serial No. 651,185

20 Claims. (Cl. 123—97)

1

This invention relates to an attachment for an internal combustion engine, and more particularly to mechanism associated with the carburetor of such engine and operative under certain conditions to prevent the generation of offensive gases.

Most carburetors in commercial use at the present time comprise an idling nozzle discharging liquid fuel posterior to the throttle when the latter is in closed position, which fuel is mixed with air to form the idling mixture. Undesirable evolution of gases, sometimes called gassing, is likely to occur when the engine is being driven by the momentum of the vehicle, as when a bus is coasting to a stop. It is usually more pronounced in engines of large vehicles than in smaller ones, and is caused by incomplete combustion of the motive fuel, usually due to an insufficient supply of air, in proportion to the supply of fuel, to the engine.

Undesirable evolution of gases is likely to occur whenever the throttle is in closed position and the engine speed is above, say, 600 R. P. M. Under such conditions the manifold vacuum is usually high, say above 24″ of mercury. Unless these conditions prevail simultaneously, gassing does not usually occur; if the throttle is not fully closed, sufficient air will be supplied to the engine to bring about normal combustion conditions; if the engine speed is below, say, 600 R. P. M., the volume of air passing the throttle even in its "closed" position will be adequate to prevent the development of abnormally high manifold vacuum; and if the manifold vacuum is not abnormally high the amount of fuel being drawn into the induction passage will not be so excessive as to cause any considerable evolution of unburnt gases.

In some installations, it is sufficient merely to cut off the supply of idling fuel to prevent gassing, the device shown in Leibing Patent No. 2,214,964 being one means of accomplishing this purpose. However, cutting off the supply of liquid fuel to the engine under the conditions above outlined does not necessarily prevent gassing, since in some engines liquid fuel collects in the intake manifold, during normal operation of the engine, in considerable quantity, and when the manifold vacumm rises to an inordinately high value, this fuel is rapidly vaporized, mingling with an inadequate supply of air to produce offensive gases. In such installations, it is therefore necessary, if gassing is to be prevented, that a supply of air, additional to that furnished by the carburetor, be introduced into the manifold in such quantity as

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to produce a fuel-air mixture which is too lean to burn in the engine.

In many installations, it is not sufficient to control the cutting off of the fuel or the introduction of air in terms only of manifold vacuum and throttle position. The speed of the engine is also a necessary criterion under some circumstances. One reason for this is that a fuel-air mixture of given richness will ignite and burn completely in the cylinders if the engine is operating slowly, say at idling speed, but will not ignite and burn completely if the engine is operating at a higher speed.

In some prior art devices, the voltage of the electrical current produced by the automobile generator has sometimes been used as an index of engine speed, to thereby control the point at which the fuel was to be cut off, or auxiliary air was to be introduced to the manifold. In modern types of cars, however, this index is not a satisfactory one, since generators are now often provided with voltage regulators which partially or entirely cut out the operation of the generator when the battery is fully charged, so that under such conditions the voltage output of the generator may be low while the speed of the engine is high.

It is an object of the present invention to provide means responsive to throttle position and engine speed to introduce an excess quantity of air to the intake manifold, in order to prevent the generation of offensive gases and the accompanying evils of crankcase dilution and wastage of fuel.

It is a further object of the invention to provide a mechanism responsive to engine operating conditions to lower the manifold vacuum to such point that gassing will be prevented.

A further object of the invention is to provide mechanism controlled directly by engine speed for introducing auxiliary air to the induction passage, to thereby prevent waste of fuel and incomplete combustion thereof in the cylinders.

A further object of the invention is to provide means operated by centrifugal force derived from engine operation for controlling the admission of auxiliary air to the induction passage under certain operating conditions.

A further object is to provide apparatus of the type indicated which may be attached to engines wherein the carburetor and other parts are not specially formed or drilled to receive such apparatus, so as to make it unnecessary in such cases to replace the carburetor or other part with one so specially drilled or formed.

A further object of the invention is to provide apparatus of the type indicated wherein the parts need not be held to close tolerances, and which shall not require adjustment in the field.

A further object is to provide such apparatus wherein the application of suction to the control of the admission of auxiliary air is facilitated by the use of valves which are under substantially all operating conditions either in the fully open or fully closed position.

Further objects and advantages of the invention will be apparent from the following description, taken in connection with the appended drawings, in which:

Fig. 1 is a schematic view in vertical elevation of on automobile engine having mechanism associated therewith which embodies the present invention;

Fig. 2 is an enlarged sectional view of the carburetor and associated mechanism;

Fig. 3 is a detail sectional view of the speed responsive mechanism;

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 2; and

Fig. 6 is an enlarged sectional view of the air valve mechanism shown in Fig. 2.

It is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the drawings is shown an internal combustion engine 8 provided with a downdraft carburetor of known type, comprising a main body section 10 provided with an air cleaner 11 and having a venturi 12 (Fig. 2) and main nozzle 14. The body section 10 is secured to a throttle body 16 which in turn is bolted to the header 18 of the intake manifold 20, the carburetor and intake manifold together forming an induction passage 22. The induction passage is controlled by a throttle valve 24 by means of a throttle lever 26 and a control rod 28 which connects the throttle lever to the accelerator pedal or other mechanism, not shown, at the operator's station. The carburetor may be provided with other features commonly found in present-day carburetors but not shown in the drawing, such as a choke valve of automatic or manual type. Fuel is supplied to the main nozzle from a reservoir or float chamber 27, which also supplies fuel through a passage 29 to an idling nozzle discharging through ports 30, 31 located immediately anterior and posterior, respectively, to the upstream edge of the throttle valve 24, in known manner.

Positioned immediately anterior to the upstream edge of the throttle when the same is in closed position is an orifice or port 32 which communicates with a conduit 33 leading to vacuum spark control mechanism at the distributor 34. The provision of such port, conduit and spark control mechanism is common in many carburetors, the suction transmitted through the conduit being utilized to advance and retard the ignition in accordance with varying engine conditions.

The intake manifold is provided, at any convenient location, with a second header 35 to which is secured an air valve body 36 formed with an unrestricted air inlet 38. In order to prevent entry of dust through the inlet 38, the inlet may be provided with an air cleaner 40 of any suitable type, or if desired may be connected to the air cleaner 11, so that a single air cleaner will serve for both devices. Whichever arrangement is used, the inlet 38 may be spoken of as bypassing the throttle 24, in that it provides a second path for flow of air from atmosphere to the intake manifold. Air entering through the inlet 38 passes to an annular passage 42 surrounding a tubular member 44 which communicates directly with the intake manifold. Manifolds of heavy duty engines are in many cases provided with an auxiliary header such as is shown at 35; but where the device of the present invention is to be applied to a manifold not so provided, the manifold may be drilled and tapped to receive a suitable adapter which will connect the air valve body to the manifold.

The upper edge of member 44 forms a seat for an air valve 46 which is mounted on a flexible diaphragm 48, of larger area than the valve, so that the valve can be opened by manifold vacuum applied to the upper surface of the diaphragm. The periphery of the diaphragm is retained between flanges on the body 36 and a cover member 50, and forms with the cover member a suction chamber 52. A spring 54 normally holds the valve 46 closed, and is of such stiffness as to open under relatively light suction. A restricted orifice 55 in valve 46 permits air to pass at a limited rate of flow to the suction chamber 52 whenever there is suction in the chamber. This bleeding action has no effect on the operation of the air valve 46 so long as suction is being transmitted to the chamber 52, but permits the air valve to close quickly when the suction is cut off, as hereinafter explained.

In order to restrict the inflow of air through the air valve mechanism, a gasket 51 may be interposed between the body 36 and the header 35, the gasket being provided with an orifice 53 having less air-flow capacity than the carburetor, so that with the throttle 24 closed and the air valve 46 open, the degree of vacuum in the manifold will be higher than it is with the throttle open and the air valve closed.

As above mentioned, it is desired to open the valve 46 and admit auxiliary air to the intake manifold only when the throttle is closed and the engine speed is high. The mechanism for accomplishing this will now be described.

Manifold vacuum is transmitted from the intake manifold to chamber 52 through a port 57 located at any convenient point posterior to the throttle 24, as in the header 18. The port 57 communicates with a conduit comprising a tube 56, a second tube 58, and a third tube 60 which is connected to the cover member 50 of the air valve mechanism and communicates with the suction chamber 52.

Between tubes 56 and 58 is a suction responsive mechanism which will now be described. The mechanism comprises a housing formed in two sections 62 and 64, between which is interposed a flexible diaphragm 66 which with section 62 forms a suction chamber 68. A T-fitting 70 connects the chamber 68 to the conduit 33, so that any suction existing at port 32 will be applied to the chamber and will tend to move the diaphragm to the left in opposition to the force of a compression spring 72 which tends to move the diaphragm to the right.

A plug 80 is threaded in a bore formed in section 64 and forms a seat for a movable valve member 82 which controls the communication between tubes 56 and 58. The stem of the valve member 82 rests against a plate which is carried by diaphragm 66, and which normally holds the valve in open position. A compression spring 84 urges the valve toward closed position, but is of less force than spring 72, so that when no suction is applied to the chamber 68 the valve 82 will remain open. The chamber 74 on the opposite side of diaphragm 66 is vented to atmosphere through an orifice 76, to prevent air-cushion effect, and to prevent any suction which may be transmitted along the stem of valve 82 from affecting the action of the diaphragm 66.

It will be seen that when the throttle is closed, substantially atmospheric pressure obtains at port 32 and no suction is applied to chamber 68. Under these conditions, the spring 72 acts to hold the valve member 82 off its seat, so that manifold vacuum is transmitted through tube 56 to tube 58. But as soon as the throttle is moved even slightly toward open position, manifold vacuum is applied to port 32 and thence to chamber 68, drawing the diaphragm to the left and permitting the spring 84 to close the valve 82.

Between the tubes 58 and 60 is connected a speed responsive mechanism of the same general type as that disclosed in the copending application of William E. Leibing, Serial Number 599,352, filed June 14, 1945 now Patent No. 2,443,465, issued June 15, 1948. It comprises a casing formed in two sections 86, 88 (Fig. 3), the section 86 being formed with a port 90 communicating with tube 60. In the end of section 86 is mounted a plug 92 having an air passage 94 therein connected to tube 58 and controlled by a needle valve 96. The valve 96 has fixed thereto a guide member 98 which is longitudinally reciprocable in the plug, and is urged toward open position by a helical spring 100. The member 98 is of known construction, being triangular in cross section so the fluid may pass longitudinally therepast.

A shaft 102 is journaled in bearings 104 within the casing section 88. A fitting 106 is mounted on a sleeve 108 threaded into the section 88, and secures the end of a sheath 110 (Fig. 1) which houses a flexible cable (not shown). The cable is secured by means of a connecting member 114 to the end of shaft 102, the member 114 being provided at its ends with radially extending lugs 112, 113 which engage corresponding grooves or sockets in the shaft and cable to form a driving connection. The other end of the cable is connected, in known manner, to a rotating part of the engine, indicated at 115 (Fig. 1), so that when the engine is operating at any given speed the shaft 102 will be rotated at the same speed, or at some proportional speed. In some installations it is possible to connect the shaft 102 directly to the shaft of the distributor, thus eliminating the flexible cable.

A sleeve 116 (Fig. 3) is secured by a pin 117 to the shaft 102 and serves to space the bearings 104 from each other. An annular plate 118 is mounted in overlying relation to the left (Fig. 3) bearing and is fitted with a gasket 120 to prevent leakage of oil between the interiors of sections 86 and 88 by reason of its overlying contact with the shaft 102.

To the left end of shaft 102 is fixed a flyweight carrier 122 which is provided with diametrically opposed forwardly and outwardly extending arms 124. Upon the arms 124 are mounted, by means of pivot pins 126, a pair of centrifugally actuated members or flyweights 128, the ends of which are generally semi-circular in cross section, as shown in Fig. 4. At their left (Fig. 3) ends the flyweights are formed with inwardly extending fingers 130 which bear against a circular flange formed on a pin 132 which is reciprocably seated in an axial bore in the shaft 102. A spring 134 bears against the flange of pin 132 and urges the pin toward the left (Fig. 3), thus tending to retain the flyweights in the retracted position shown in the drawings.

A floating pin 136 (Fig. 3) mounted in a sleeve 138 between the guide member 98 and the rounded forward end of the pin 132, so that longitudinal movement of the pin 132 opens and closes the valve 96, while the contact between the rotating pin 132 and the non-rotating pin 136 is designed to produce a minimum of friction.

The initial tension of spring 134 is such that at engine speeds under some predetermined value, such as 600 R. P. M., the flyweights 128 will remain in the position shown in the drawings, but at speeds above that value they will move outwardly through a sufficient distance to permit the spring 100 to open the valve 96 so as to permit transmission of the manifold vacuum in full strength to the diaphragm 48 (Fig. 2). For functional purposes, therefore, the valve 96 may be considered as being always fully open or fully closed.

In the operation of the device, the air valve 46 remains closed under all normal operating conditions of the engine. If the throttle is closed the valve 82 will be open, but if the engine speed is below the critical value, the valve 96 will be closed, so that manifold vacuum will not be transmitted to the diaphragm 48. If the throttle valve is fully open and the engine speed is above the critical value, substantially atmospheric pressure will obtain at port 32 and valves 82 and 96 will both be open; but the manifold vacuum at port 57 will not be sufficient to open the air valve 46, since the strength of spring 54 is such as to maintain the air valve closed under such conditions but to permit it to open when the manifold vacuum is somewhat higher, say at 5" of mercury.

However, when conditions which cause gassing are present (throttle valve closed, engine speed above its critical value), substantially atmospheric pressure will obtain at port 32 and in chamber 68, and valve 82 will be opened. Valve 96 will also be opened due to the engine speed, and manifold vacuum will be transmitted to chamber 52 in sufficient strength to raise valve 46 from its seat. The resulting considerable flow of air into the intake manifold prevents gassing by providing ample air for complete combustion of any fuel in the manifold, or by providing such excess of air that ignition does not occur. The admission of air also has the effect of raising the absolute pressure in the manifold, so that the suction is not sufficient to draw any appreciable quantity of fuel from the idling nozzle 30, 31, since before any fuel can be drawn from the idling nozzle the suction must be sufficient to lift the fuel through an appreciable distance above the level in the float chamber. A fuel cut-off valve is therefore usually unnecessary where the instant invention is used.

The rise in the absolute pressure in the manifold also tends to destroy the suction existing in chamber 52, and thereby to cause valve 46 to close, but due to the restriction at air orifice 53 the inflow of air past the air valve 46 can never lower the vacuum to such extent that closing of valve 46 would actually result. The precise pressure produced by the valve may be varied by substituting another gasket 51 having an orifice 53 of different diameter, such substitution serving to adapt the device to engines of different displacements or other characteristics.

As soon as the operator actuates the accelerator pedal to move the throttle valve from fully closed to partly opened position, the port 32 is subjected to manifold vacuum in such degree as to draw diaphragm 66 to the left and permit valve 82 to close, which cuts off the vacuum from chamber 52, whereupon the port 55 bleeds air into said chamber, causing valve 46 to close and restore the manifold vacuum to normal.

If desired, the unit containing valve 82 may be omitted and the conduit 58 connected directly to a port just posterior to the throttle valve, as in the Leibing application above identified. However, the device as herein disclosed has considerable advantages in sensitivity, and may be applied to carburetors which are not adapted to be connected in the manner just mentioned.

An advantage of the construction herein disclosed lies in the fact that each of the valves 82, 96 and 46 is, for operative purposes, in the fully open or fully closed position substantially at all times. This results from the construction used, wherein port 32, being of small cross section and positioned immediately anterior to the throttle, is either subjected to substantially atmospheric pressure or to manifold vacuum, so that valve 82 either remains fully open or is moved to fully closed position. Likewise, the valve 96, except within an extremely narrow range of engine speed, is either fully closed or is opened sufficiently to permit unrestricted transmission of suction therepast; this effect is to a great extent due to the fact that a relatively slight outward movement of the flyweights 128 causes sufficient movement of valve 96 to move it to a position where it interposes no restriction to the transmission of suction. The valve 46 is likewise at all times either fully closed or is in such position that it creates no restriction to the inflow of air; this is in part due to the factors above discussed, and in part to the construction of the valve itself, which as it approaches closed position is subjected to manifold vacuum transmitted through the tubular member 44, and is thereby moved quickly to its fully closed position.

As a result of the features just mentioned, wide tolerances in the stiffness and other characteristics of the springs 72, 84, 100 and 54 are permissible, since the forces acting on these springs are ample to compress them even though their resistance to compression is above the optimum, or designed, resistance.

A further result is that no adjustment of the springs or other parts is necessary after the apparatus is assembled, so that it is not necessary to rely on adjustments by mechanics to maintain the device in operative condition.

Instead of or in addition to being used to open an air valve as just described, the suction and engine speed responsive mechanism of this invention may if desired be applied to a fuel cut-off valve of the type disclosed in the above mentioned Leibing application, to close the same when gassing conditions occur. Used either way, the operation of the device is not affected by altitude or changing barometric pressure, nor by certain engine operating conditions to which some devices of this kind are sensitive.

Although the invention has been described with special reference to a particular embodiment thereof, it may be embodied in other forms within the skill of artisans in this art, and is not to be considered as limited except in accordance with the terms of the following claims.

I claim:

1. An engine control device for an internal combustion engine having an intake manifold, a carburetor forming with said intake manifold an induction passage, and a throttle controlling said induction passage; a duct communicating with the induction passage at a point immediately anterior to the upstream edge of the throttle, a restricted conduit for admitting air to said manifold to lower the vacuum therein, a valve controlling said conduit, a suction chamber having a wall formed as a flexible diaphragm operatively related to said valve to actuate the same, a connection between the suction chamber and said manifold, two valves in series in said connection, a second suction chamber communicating with said duct and having a wall formed as a flexible diaphragm operatively related to one of said two valves to actuate the same, and centrifugally operated rotary means connected to a moving part of the engine and operatively related to the other of said two valves to actuate the same, the mechanism being so constructed and arranged that said connection is operative to transmit suction from said manifold to said first mentioned suction chamber only when the throttle is closed and the engine speed is above a predetermined value.

2. The invention defined in claim 1, wherein the rotary means comprises a pair of flyweights and a spring having initial tension and operable below a predetermined engine speed to restrain said flyweights against movement in response to centrifugal force.

3. An engine control device for an internal combustion engine having an intake manifold, a carburetor with an induction passage and a throttle therein, and a duct communicating with the induction passage at a point immediately anterior to the upstream edge of the throttle; comprising a conduit for admitting air to said manifold to lower the vacuum therein, a valve controlling said conduit, a suction chamber having a movable element operatively related to said valve to actuate the same, a connection between the suction chamber and said manifold, a plurality of valves in said connection, a second suction chamber communicating with said duct and having a movable element operatively related to one of said plurality of valves to actuate the same, and centrifugally operated engine speed responsive means operatively related to another of said plurality of valves to actuate the same, the mechanism being so constructed and arranged that said connection is operative to transmit suction from said manifold to said first mentioned suction chamber only when the throttle is closed and the engine speed is above a predetermined value.

4. The invention defined in claim 3, wherein each of said movable elements comprises a flexible diaphragm forming a wall of the suction chamber and yieldingly urged in one direction against the force of suction.

5. The invention defined in claim 3, wherein the second suction chamber comprises a flexible diaphragm, and the valve associated therewith is open and the pressure in the suction chamber is substantially atmospheric whenever the throttle is in closed position.

6. In combination with an internal combustion

engine carburetor having an induction passage and a throttle controlling the same; an air valve for admitting auxiliary air to the induction passage posterior to the throttle to prevent generation of offensive gases in the engine, a vacuum chamber having a connection to the induction passage posterior to the throttle and having a movable wall controlling said valve, a valve in said connection, and a suction chamber having a connection to the induction passage immediately anterior to the upstream edge of the throttle when the same is in closed position and having a movable wall controlling said last mentioned valve.

7. The invention defined in claim 6, comprising in addition means directly responsive to engine speed and cooperating with said suction chamber to control said first mentioned connection.

8. In apparatus for preventing generation of offensive gases in an internal combustion engine having an induction passage, a throttle in the induction passage, and fuel supply means communicating with the induction passage; a vacuum chamber communicating with the induction passage at a point immediately anterior to the upstream edge thereof, a vacuum controlled device for introducing auxiliary air into the induction passage posterior to the throttle, connecting means between a point in the induction passage posterior to the throttle and said vacuum controlled device, and separate mechanical means responsive to vacuum in the vacuum chamber and to engine speed for controlling said connecting means.

9. An engine control device comprising a conduit for admitting auxiliary air to the intake manifold of the engine, a valve controlling said conduit, vacuum responsive means controlling said valve, and means controlling the application of vacuum to said vacuum responsive means, comprising a vacuum conduit connecting said vacuum responsive means to the intake manifold, two control valves in series in said vacuum conduit, an engine driven shaft, centrifugally operated members on said shaft controlling one of said control valves, and suction responsive means controlling the other of said control valves.

10. An engine control device comprising a conduit for admitting auxiliary air to the intake manifold of the engine, a valve controlling said conduit, vacuum responsive means controlling said valve, and means controlling the application of vacuum to said vacuum responsive means, comprising a vacuum conduit connecting said vacuum responsive means to the intake manifold, two variable restrictions in series in said vacuum conduit, an engine driven shaft, centrifugally operated members on said shaft controlling the effective cross section of one of said restrictions, and means responsive to conditions of engine operation for controlling the other of said restrictions.

11. For use with an internal combustion engine having a carburetor, said carburetor comprising an induction passage, fuel supply means communicating therewith, and a throttle controlling the induction passage; an auxiliary air passage by-passing said throttle, a valve controlling said air passage, a vacuum actuated diaphragm controlling said valve, a conduit connecting said diaphragm to the induction passage posterior to the throttle, means operative when the engine speed is below a predetermined value to close said conduit, and suction operated means for closing said conduit comprising a diaphragm, a port located immediately anterior to the upstream edge of the throttle when the same is in closed position, and a conduit connected to said port and communicating with said last mentioned diaphragm.

12. In combination with an internal combustion engine carburetor having an induction passage, a throttle controlling the same, and fuel supply means communicating with said induction passage; a restricted air passage by-passing said throttle, suction responsive means controlling said restricted passage, a duct connecting said suction responsive means to the induction passage at a point posterior to the throttle, means for controlling said duct comprising a suction chamber connected to the induction passage at a point immediately anterior to the upstream edge of the throttle when the same is in closed position, and centrifugally operated means responsive to engine speed for controlling said duct.

13. An engine control device for an engine having a carburetor and a manually operated throttle therein; comprising a conduit for admitting auxiliary air to the intake manifold of the engine to lower the vacuum therein, a valve controlling said conduit, means actuated by said vacuum to control said valve, and means controlling the application of vacuum to said vacuum actuated means, comprising a conduit connecting said vacuum actuated means to said manifold, two valves in said conduit, engine driven mechanism operating by centrifugal force to control one of said two valves, and means responsive jointly to the position of said throttle and to suction to control the other of said two valves.

14. An engine control device for an internal combustion engine having an intake manifold, a carburetor, and a manually operated throttle therein; comprising a conduit for admitting auxiliary air to the intake manifold to lower the vacuum therein, a valve controlling said conduit, means actuated by said vacuum to open said valve, and means controlling the application of vacuum to said vacuum actuated means, comprising a conduit connecting said vacuum actuated means to said manifold, a plurality of valves in series in said conduit, means responsive directly to engine speed for controlling one of said plurality of valves, and means responsive jointly to the position of said throttle and to suction in the carburetor to control another of said plurality of valves.

15. An engine control device for an internal combustion engine having an intake manifold and a carburetor including an induction passage and a manually operated throttle; comprising a conduit for admitting auxiliary air to said manifold to lower the vacuum therein, a valve controlling said conduit, a suction chamber having a movable wall connected to said valve to actuate the same, a restricted bleed orifice connecting said suction chamber to atmosphere, a connection between the suction chamber and said manifold, a valve in said connection, and means jointly responsive to the position of said throttle and to suction in the carburetor for controlling said second mentioned valve.

16. An engine control device for an internal combustion engine having an intake manifold and a carburetor with an induction passage; comprising a conduit for admitting auxiliary air to said manifold to lower the vacuum therein, a valve controlling said conduit, a suction chamber

having a movable wall connected to said valve to actuate the same, a restricted bleed orifice connecting said suction chamber to atmosphere, a connection between the suction chamber and said manifold, a valve in said connection, means jointly responsive to throttle position and to suction in the carburetor to control said second mentioned valve, another valve in said connection, and means directly responsive to engine speed for controlling said other valve.

17. In an engine control device for an internal combustion engine having an intake manifold and a carburetor forming with said intake manifold an induction passage and including a manually operated throttle in said induction passage; a conduit for admitting auxiliary air to said induction passage posterior to said throttle, a valve controlling said conduit, means including a vacuum chamber for controlling said valve, and means controlling the application of vacuum to said vacuum chamber, comprising a vacuum conduit connecting said vacuum chamber to said induction passage posterior to said throttle, a plurality of control valves in series in said vacuum conduit, centrifugally operated engine driven members controlling one of said control valves, and suction responsive means controlling another of said control valves.

18. The invention defined in claim 17, wherein said suction responsive means is connected to said induction passage by a port located immediately anterior to the upstream edge of the throttle when the same is in closed position.

19. The invention defined in claim 17, wherein said vacuum chamber is connected to atmosphere by a restricted bleed passage which destroys the vacuum in said vacuum chamber when either of said control valves is closed.

20. In an engine control device for an internal combustion engine having an intake manifold and a carburetor forming with said intake manifold an induction passage and including a manually operated throttle in said induction passage; a conduit for admitting auxiliary air to said induction passage posterior to said throttle to prevent generation of offensive gases in the engine, a valve controlling said conduit and directly subjected to manifold vacuum, means including a vacuum chamber for controlling said valve, and means controlling the application of vacuum to said vacuum chamber, comprising a vacuum conduit connecting the vacuum chamber to said induction passage posterior to said throttle, a control valve in said vacuum conduit, and means responsive to suction in the carburetor at a point immediately anterior to the upstream edge of the closed throttle for controlling said control valve.

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