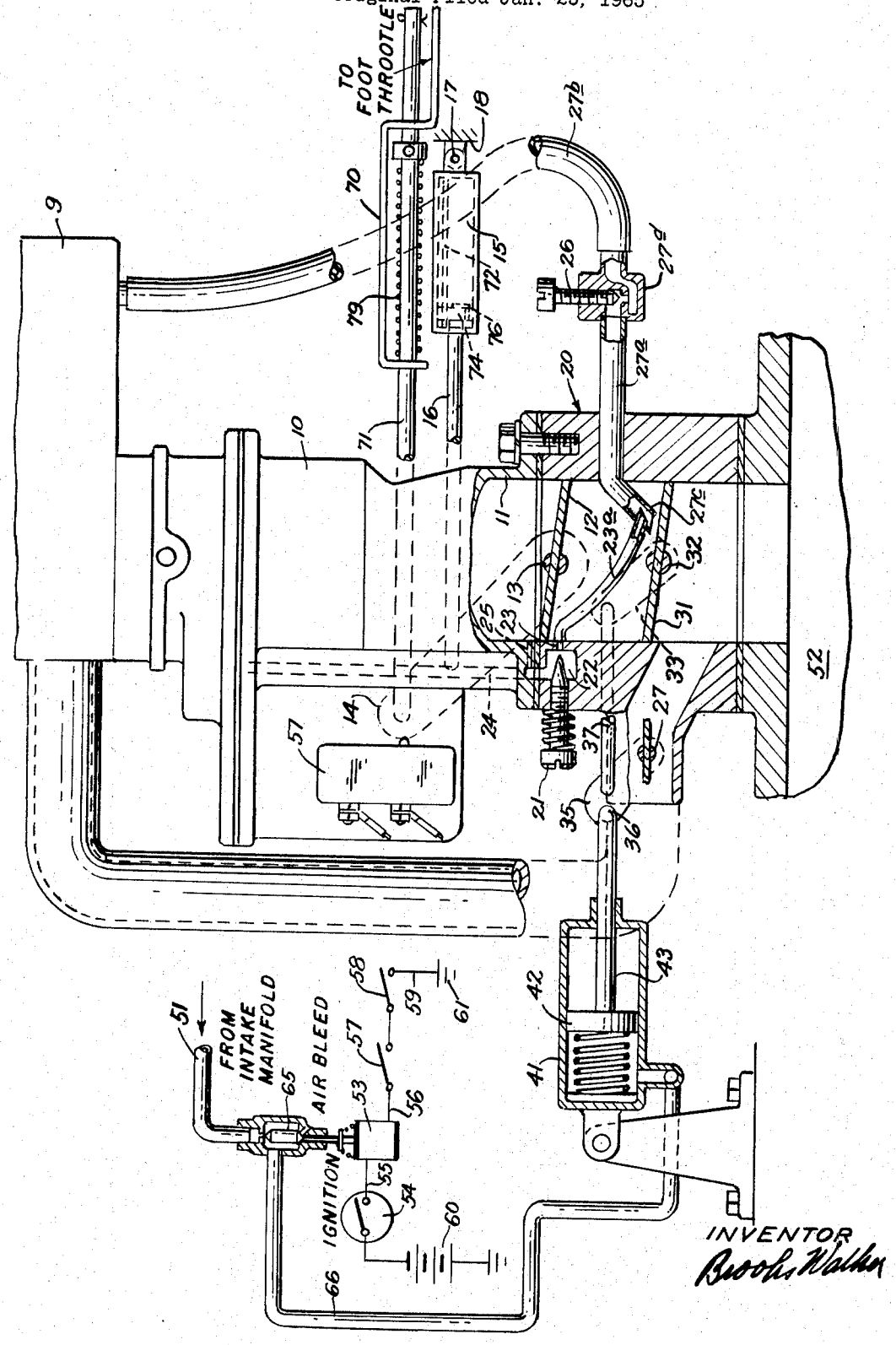
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FUEL FEED SYSTEM

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FUEL FEED SYSTEM

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ABSTRACT OF THE DISCLOSURE

A carburetor having means for introducing a stream of rich fuel and air mixture and a stream of air into the induction conduit on the downstream side of the throttle valve, and means for mixing said streams below said valve and away from the wall of said conduit. A second valve is also provided downstream of said throttle valve and mixing means along with means to close said second valve and open an auxiliary air inlet valve during high speed decelerations.

This application is a continuation of application Ser. No. 427,641, filed Jan. 25, 1965, and now abandoned.

This invention pertains to a fuel feeding system, generally of the carburetor type, that is adapted to reduce the unburned hydrocarbons, particularly at closed throttle high speed decelerations.

Many devices to shut off the fuel to idle during high speed decelerations have been patented such as: 2,415,336, H. A. Carlson, Feb. 4, 1947, Carburetor Degasser; 2,212,936, A. C. Hoof, Aug. 27, 1940, Gas Eliminator and Fuel Economizer; 2,395,748, M. Mallory, Feb. 26, 1946, Degasser for Internal Combustion Engine; 2,420,786, M. Mallory, May 20, 1947, Degasser for Internal Combustion Engine.

Some have used two butterflies in the main carburetor throat, one as a throttle and the other on the engine side of the throttle to shut off the carburetor from supplying fuel and air to the engine during such high speed closed throttle decelerations, such as: 2,075,790, C. A. Christensen, Apr. 16, 1937, Degasser for Internal Combustion Motors; 2,420,786, M. Mallory, May 20, 1947, Degasser for Internal Combustion Engines.

One feature of this invention is to combine the air to idle with adjustable flow fuel to idle in the same passage that terminates on the engine side of the throttle and remote from the main walls of the carburetor main throat and other means that admit auxiliary air to enter on the engine side of the second shut off butterfly on high speed closed throttle decelerations.

Another feature is to have an air port sufficient to provide most of the air to idle between the throttle and secondary shut off valve, a port to admit fuel to idle located between the throttle and second butterfly in the main air passage through said carburetor so that when throttle and second butterfly valves both are closed the leakage of air past the second shut off butterfly valve will not create a high suction between said two butterfly valves and said idle fuel port to provide better and simpler fuel shut off during high speed deceleration than is available with existing carburetors.

Another object is to provide a linkage operated by a single motor that will automatically close the shut off butterfly valve on the engine side of the throttle butterfly and simultaneously automatically open an auxiliary air valve to admit auxiliary fuel free air on the engine side of said shut off butterfly valve when the engine is operating above a predetermined speed at closed throttle position. This gives improved and simple no fuel limited intake suction operation during such high speed decelerations.

Another object is to provide a single motor to automatically shut off the idle fuel and open an auxiliary air valve to the manifold on the engine side of the second close off butterfly valve.

Another object is to provide a simple electrical circuit for controlling a suction controlling solenoid valve to operate the motor that automatically closes the shut off valve and opens the auxiliary valve during high speed closed throttle deceleration by combined electrical and engine developed suction power, with fast positive opening and closing idle fuel flow control action.

Another object is to provide a simple solenoid actuated combination valve that controls the flow of engine produced suction to the motor that operates the carburetor shut off valve to open said flow of suction in one position of said solenoid to operate said motor and to connect said motor to atmosphere by a bleed in said valve when said solenoid is in the non-energized position to provide a simple and inexpensive control for shutting off the flow of fuel to the motor and opening an auxiliary valve during high speed decelerations.

Other features will be pointed out in the attached specification and claims.

I have illustrated my invention in the accompanying drawing, which is a side elevation of a carburetor, partly cut away and partly diagrammatic, illustrating one form of the invention.

In the drawing I have shown a carbuertor **10** having a main induction passage **11**. A throttle valve **12** of the butterfly type is mounted on throttle shaft **13**. An arm **14** controls the throttle shaft **13** and throttle **12**. A dash pot **15** is connected to throttle arm **14** by connecting rod **16**. Dash pot **15** is pivotly mounted to anchor **18** by pin **17**. Throttle body **20** supports throttle shaft **13** in suitable bearings. Idle fuel adjustment screw **21** controls the flow of rich idle fuel and air entering passage **22** and idle port **23** from passage **24** in the usual manner. Transfer port **25** may be used in the conventional manner. Tube **23*a*** may conduct the rich idle fuel air mixture to be moved to tube **27*c*** near the center of main throat **11** between throttle butterfly **12** and shut off butterfly **31**.

Most of the air to idle may be controlled by idle air screw **26** which controls the air passage past valve **27*d*** to passage **27*a*** from conduit **27*b*** which leads from air cleaner **9** and bypasses butterfly valve **12**.

A shut off butterfly valve **31** is mounted on shaft **32** which also mounts control arm **33**. Auxiliary air valve **27** is mounted on shaft **34** and is controlled by auxiliary valve arm **35**.

A suction operated motor **41** has a piston **42** and a piston rod **43**, which is pivotally secured to auxiliary air control arm **35** by pivot pin **36**. Tie rod **37** connects auxiliary air control arm **35** to shut off valve **31** and control arm **33** so that when shut off valve **31** is suddenly closed auxiliary air valve **22** will be suddenly opened to shut off the fuel flow from the carburetor **10** to the engine and open the auxiliary air valve **27** to reduce the magnitude of suction in the engine intake manifold when decelerating above a predetermined speed with a closed throttle over the suction that would have been generated if the auxiliary air valve were not opened. The circuit for controlling motor **41** may include tube **51** which is connected to the engine intake manifold **52** and to combination valve **65**. Solenoid **53** could be connected through the ignition system key switch **54** by wire **55** to one terminal of battery **60** and then by wire **56** through throttle switch **57** (which is closed when the throttle **12** is closed and is shown both in the diagram at the left and attached to the carburetor) and governor actuated or speed sensing switch **58** (closed above a predetermined speed) and by wire **59** to ground **61**. This circuit energizes solenoid **53** when the throttle is closed and the engine is operating above a predetermined speed as sensed by switch **58**.

When the solenoid 53 is energized, valve 65 moves down as shown opening flow from line 51 to line 66 so that engine intake suction will suddenly move piston 42, rod 43, arm 35, to open auxiliary valve 27 and close shut off valve 31. This position is shown in FIG. 1. In this position shut off valve 31 is closed and auxiliary air valve 27 is open to reduce the suction below shut off valve 31. Air to idle entering through tube 27*a* and 27*b* between shut off valve 31 and throttle valve 12 stops or greatly reduces the suction on and flow of fuel through idle fuel and air port 23 as on closed throttle high speed decelerations.

The Carlson, Hoof, and two Mallory patents named do not have two tandem butterflies, one to cut off the carburetor and idle fuel.

Control of the throttle butterfly may be by soft link 70 as resisted by dash pot 15. Dash pot 15 may include piston 74 connected to piston rod 16. Metering pin 72 and the fluid in the dash pot 15 may control the maximum time of throttle opening to around 2 seconds with more resistance as the throttle starts to open when the pressure of the spring 79 in the soft link 70 will be the greatest on sudden tramp down of the foot throttle compared to the resistance of the dash pot to rapid motion as the throttle 12 is nearly open and the pressure on the spring 79 is much reduced. This can be accomplished by metering rod 75 having a variable flat with a lasser flat for the portion where piston 74 is located at closed throttle 12 than at the portion where piston 74 is passing over metering rod 72 when throttle valve is almost open. A check valve 76 covers a port through piston 74 to allow much less resistance to throttle closing rate by dash pot 15 than the resistance to throttle opening rate. Such action of a throttle dash pot and soft link is described in my co-pending application, Ser. No. 183,629, now Patent No. 3,216,707, entitled "Carburetor" with dash pot control. These controls give much improved anti-smog control of the carburetor and idle fuel.

The Christensen reference shows two butterflies but no path for the air to idle introduced between the two valves so that the throttle valve has to be partly open to idle and air to idle must pass the throttle valve. A secondary valve 16 must be provided to reduce the suction between the two butterflies in the main air path through the carburetor. If a generator is used as a speed senser as in Christensen, it usually starts generating at about 500 to 600 r.p.m. rather than around 1000 to 1200 which is more desirable from a non-stall idle fuel on and off control.

I have illustrated my invention in these various forms; however, many other variations may be possible within the scope of this invention.

To those skilled in the art to which this invention relates many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and description herein are purely illustrative and are not intended to be in any sense limiting.

I claim as my invention:

1. A carburetor for an internal combustion engine including a main induction passage through said carburetor, a throttle butterfly valve in said main induction passage, a second butterfly valve on the engine side of said throttle valve in said induction passage, a port for air to idle entering between said two valves to introduce air to idle on the engine side of said throttle valve, means to introduce idle fuel between said two valves, means for mixing the streams of air and idle fuel passing through said port and means, an auxiliary air valve and auxiliary air passage connected to said main air passage on the engine side of said second valve to introduce air to the intake manifold when said second valve is closed and said auxiliary air valve is open, and power means for automatically closing said second valve and simultaneously automatically opening said auxiliary air valve to shut off flow of fuel and air through said carburetor and introduce auxiliary air to said intake manifold on the engine side of said second valve under certain engine operation conditions.

2. A device as defined in claim 1 wherein said mixing means comprises a conduit connected at one end to an idle fuel source, a conduit connected at one end to an air source, and each of the conduits having their opposite ends intersecting.

3. A device as defined in claim 2 further including means in each conduit for adjusting the flow of fluid therethrough.

4. A device as defined in claim 1, said power means being constructed to operate automatically to shut said second valve and open said auxiliary air valve when said throttle valve is closed and said engine is operating above a predetermined speed.

5. A carburetor having a main air passage therethrough, an engine to which said carburetor is attached for supplying a combustible mixture to said engine, a throttle butterfly in said air passage to control the flow of carbureted air and fuel to said engine, a second valve in said air passage on the engine side of said throttle valve, a fuel passage for introducing fuel to idle said engine on the engine side of said throttle butterfly but on the upstream side of said second valve, an air conduit for introducing air to idle said engine, said conduit being separate from said fuel passage for fuel to idle, both said fuel passage and said air conduit terminating at a port located in said main air passage between said throttle valve and said second valve so that when both valves are closed and said engine is decelerating the suction in the main air passage between said throttle valve and said second valve will be much lower due to air entering through said air conduit than if said air were not entering said air conduit between said throttle valve and said second valve.

6. A carburetor having a main air passage therethrough, an engine to which said carburetor is attached to supply fuel to power said engine, a first and a second butterfly valve in tendem in said main air passage, said second valve being between said first valve and said engine, said first valve being a throttle valve, a port for introducing idle fuel and air to idle between said two valves, a second port benig located between said valves, and means for closing each of said two valves, said port remaining open when both said valves are closed as during a high speed deceleration, said port admitting air between said valves to greatly reduce the suction between said valves when both are closed and said engine is decelerating at high speed compared to similar operation of said valves and engine if said port did not admit any air during such operations.

7. A carburetor having a main air passage therethrough, an engine to which said carburetor is attached to supply fuel to power said engine, a first and a second butterfly valve in tandem in said main air passage, said second valve being between said first valve and said engine, said first valve being a throttle valve, means for introducing idle fuel between said two valves, a port to admit most of the air to idle, said port being located between said valves, and means for closing each of said two valves, said port remaining open when both said valves are closed as during a high speed deceleration, said port admitting air between said valves to greatly reduce the suction between said valves when both are closed and said engine is decelerating at high speed compared to similar operation of said valves and engine if said port did not admit any air during such operations, a solenoid, a suction operated motor, multiple valve means for admitting engine developed suction to said motor when energized and for admitting atmospheric air to said motor when not energized, the circuit for operating said solenoid including a throttle operated switch, and a second switch operated by variations in the engine speed, means actuated by said motor for closing said second valve rapidly when said throttle valve is closed and when said engine is above a

predetermined engine speed as in high speed decelerations.

8. A carburetor having a main air passage therethrough, an engine to which said carburetor is attached to supply fuel to power said engine, a first and a second butterfly valve in tandem in said main air passage, said second valve being between said first valve and said engine, said first valve being a throttle valve, means for introducing idle fuel between said two valves, a port to admit most of the air to idle, said port being located between said valves, and means for closing each of said two valves, said port remaining open when both said valves are closed as during a high speed deceleration, said port admitting air between said valves to greatly reduce the suction between said valves when both are closed and said engine is decelerating at high speed compared to similar operation of said valves and engine if said port did not admit any air during such operations, a port on the engine side of said second valve in said main air passage for admitting much more air than necessary to idle said engine and a third valve for controlling the flow of auxiliary air through said port, said motor having means for simultaneously opening said third valve when it closes said second valve, the operation of said second valve in closing and said third valve in opening being rapid when operating at closed throttle above a predetermined engine speed and also rapid in closing said third valve and opening said second valve whenever said throttle is opened as during a high speed deceleration.

9. A carburetor for internal combustion engines comprising a main induction passage, a valve in said passage, means for introducing a stream of rich fuel and air mixture through the wall of the passage on the downstream side of the valve, means to introduce a stream of air to idle through said wall at a zone displaced from said first introducing means, and means for mixing said streams below said valve and away from the wall.

10. A device as defined in claim 9 wherein the mixing means comprises a conduit connected to a source of rich fuel and air mixture and a conduit connected to a source of air, the free ends of said conduits intersecting.

11. A device as defined in claim 10 wherein one of the conduits terminates within the end of the other conduit.

12. A device as defined in claim 10 wherein the mixed streams are discharged thru a common orifice located a substantial distance from the wall of the passage on the downstream side of the valve.

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