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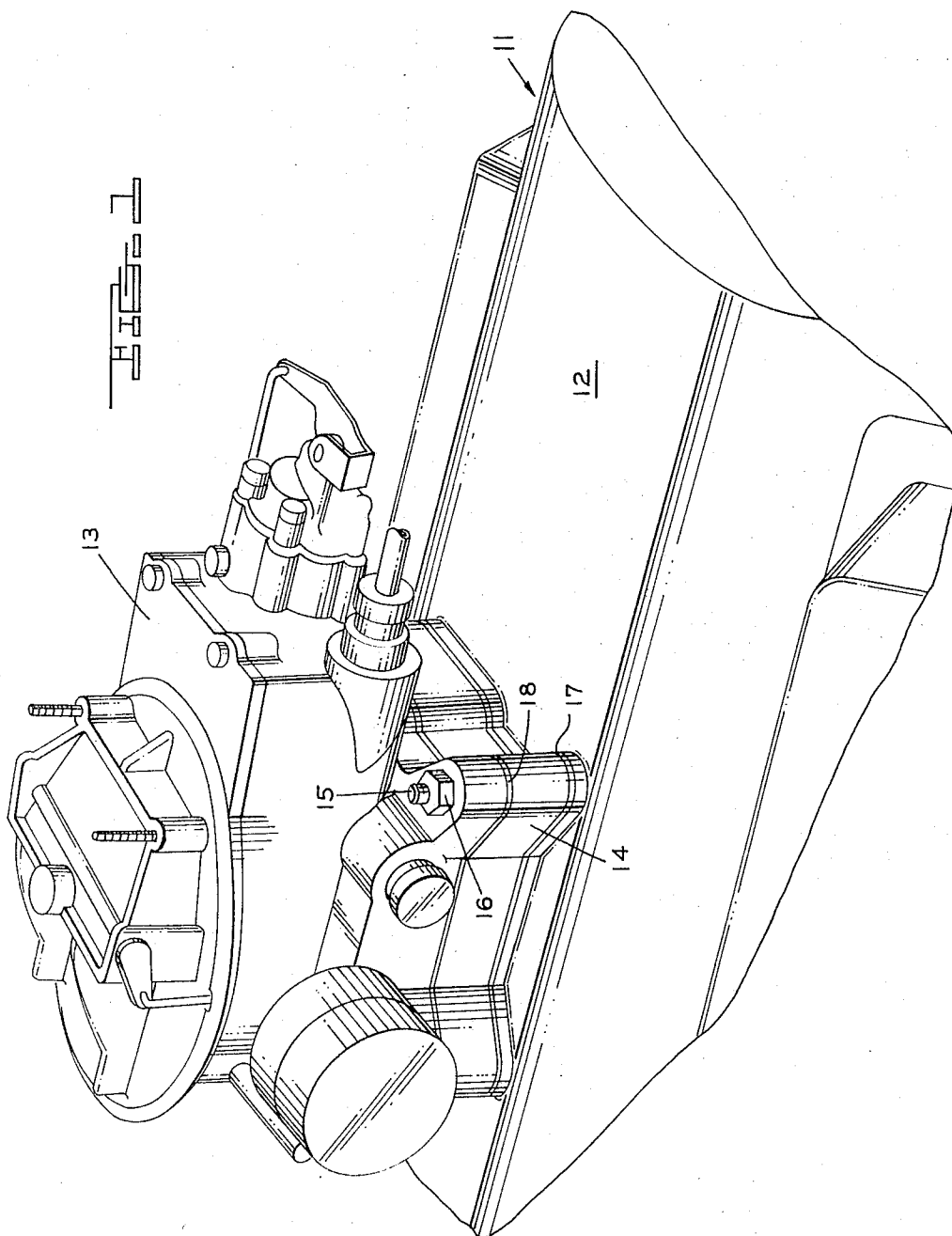
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AUTOMATIC IDLE SPEED-UP DEVICE

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2 Sheets-Sheet 1



MICHAEL J. THOMAS
INVENTOR

BY *John R. Faulkner*
Ernest A. Butler
ATTORNEYS

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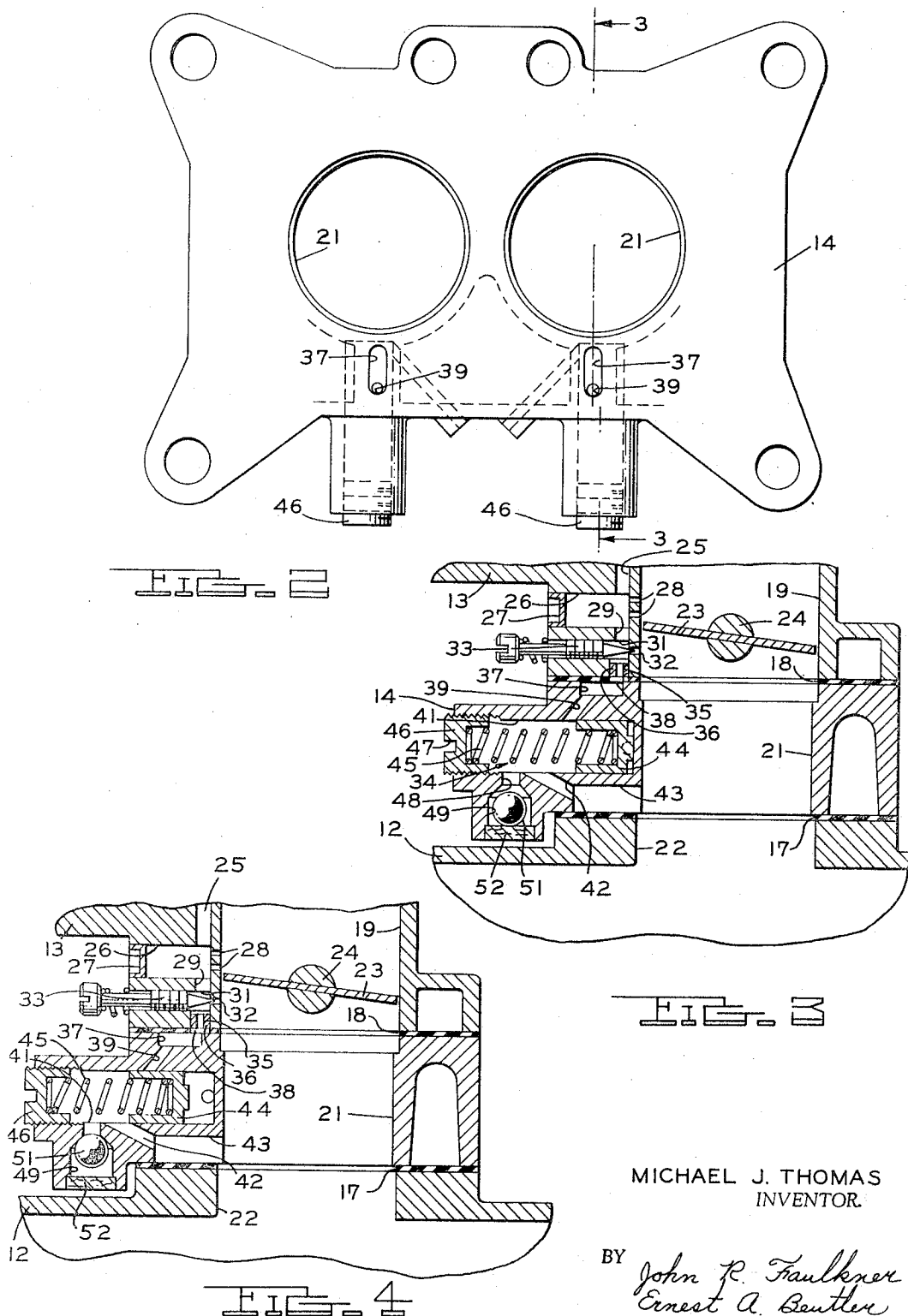
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MICHAEL J. THOMAS
INVENTOR

BY *John P. Faulkner*
Ernest A. Bentler
ATTORNEYS

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AUTOMATIC IDLE SPEED-UP DEVICE

Michael J. Thomas, Dearborn, Mich., assignor to Ford Motor Company, Dearborn, Mich., a corporation of Delaware

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6 Claims. (Cl. 261-41)

This invention relates to a charge forming device for an internal combustion engine and, more particularly, to a charge forming device embodying an automatic idle speed-up that prevents the engine from stalling when unusually high loads are placed upon it at idle.

The internal combustion engines that power motor vehicles are called upon to drive numerous accessories. Such accessories as power steering pumps and air conditioning compressors place a considerable load upon the engine. In many instances, the driving load of these accessories is the greatest during engine idle operation. For example, the output load of a power steering pump is greatest during parking maneuvering that is normally done at idle speeds. The air conditioning compressor also must continue to operate during long idle periods as are experienced in city traffic driving. Most conventional engines do not develop sufficient power at their normal idle speeds to drive these accessories at full output. It is necessary, therefore, to provide some means to advance the idle speed when these accessories are being operated at their maximum output.

Many different forms of devices have been proposed to open the throttle valve of the carburetor to increase idle speed during accessory operation. Although the systems have met with varying degrees of success, they are all somewhat unsatisfactory inasmuch as they operate through the throttle linkage. As a result, they must be adjusted frequently and may, in some instances, interfere with normal throttle operation.

It is, therefore, the principal object of this invention to provide an automatic idle speed-up device that does not operate upon the throttle valve of a charge forming device.

It is a further object of this invention to provide a supplemental fuel system for a charge forming device that automatically speeds up the engine to prevent stalling during idle.

A charge forming device for an internal combustion engine embodying this invention includes an induction passage. A throttle valve is provided to control the flow through the induction passage. An idle discharge circuit discharges fuel into the induction passage at a point contiguous to the idle position of the throttle valve. An idle speed-up discharge circuit discharges additional fuel into the induction passage at a point posterior to the throttle valve. The idle speed-up circuit includes a pressure responsive valve member that controls the fuel discharge of the idle speed-up circuit. The pressure responsive member is responsive to the pressure in the induction passage posterior to the throttle valve and is adapted to open when the induction system vacuum fails to exceed normal idle vacuum.

As a further feature of the invention, it is proposed to form the idle speed-up circuit as a part of a spacer that is interposed between a carburetor and an intake manifold. The speed-up circuit communicates with the fuel circuit of the carburetor and the pressure responsive valve member is positioned in the spacer. This construction permits modification of the engine to embody the speed-up circuit with no other change than the addition of the spacer.

Further objects and advantages of this invention will become more apparent when considered in conjunction with the accompanying drawings, wherein:

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FIGURE 1 is a partial perspective view of an internal combustion engine embodying this invention;

FIGURE 2 is a top plan view of the spacer embodying the idle speed-up circuit;

FIGURE 3 is a cross-sectional view taken substantially along the line 3-3 of FIGURE 2;

FIGURE 4 is a cross-sectional view, in part similar to FIGURE 3, showing the parts of the discharge circuit in another position.

Referring now in detail to the drawings, an internal combustion engine embodying this invention is indicated generally by the reference numeral 11. The engine 11 includes an induction system comprised of an intake manifold 12, a carburetor 13 and a spacer 14. The carburetor 13 and spacer 14 are secured to the intake manifold 12 with the spacer 14 interposed between the carburetor 13 and the manifold 12 by a plurality of studs 15 and nuts 16. A gasket 17 is positioned between the intake manifold 12 and the spacer 14 and a gasket 18 is positioned between the spacer 14 and the carburetor 13.

A pair of induction passages are formed by the carburetor 13, spacer 14 and intake manifold 12 for delivering a combustible charge to the cylinders of the engine. Each of the passages comprise a passage 19 formed in the carburetor 13, a passage 21 formed in the spacer 14, and a passage 22 formed in the intake manifold 12. The induction passages 21 and 22 are coaxially disposed. A throttle valve 23 is supported in the carburetor induction passage 19 upon a throttle valve shaft 24 for controlling the flow.

The carburetor 13 may be of any conventional type that includes a fuel source and fuel discharge circuits for delivering fuel to each of the induction passages 19. The carburetor that has been depicted is of the Ford two barrel type and is described in detail in the 1964 Ford Shop Manual. The carburetor comprises an idle fuel circuit in addition to a main fuel circuit (not shown.)

The idle fuel circuit comprises an idle passage 25 that extends through the carburetor from the fuel bowl (not shown) to a point contiguous to the normal idle position of the throttle valve 23 as shown in FIGURES 3 and 4. The idle passage 25 is intersected by an enlarged transversely extending passage 26 that is closed at its outer end by a plug 27. Idle transfer holes 28 extend from the enlarged passage 26 into the induction passage 19 at points above but closely spaced to the normal idle position of the throttle valve 23. An idle discharge passage 29 extends from the enlarged passage 26 toward the lower face of the carburetor 13. The idle discharge passage 29 is intersected by a horizontally extending passage 31 that terminates at an idle discharge port 32. An adjustable needle valve 33 is positioned in the passage 31 for the adjustment of the idle fuel discharge.

During normal engine idle operation fuel will pass through the passages 25 and 29 and out of the idle discharge port 32 into the induction passage 19. Air enters the idle transfer holes 28 to mix with the idle fuel that is discharged. As the throttle valve 23 is opened from its idle position, the idle transfer holes 28 are successively opened to the induction system vacuum that exists below the throttle valve 23. As the idle transfer holes 28 are successively exposed to this vacuum, they will cease to function as air bleeds and will discharge additional fuel into the induction passage 19.

The idle circuit heretofore described will provide sufficient fuel flow to maintain normal idle operation under most conditions. In the event that a greater load is positioned upon the engine it will tend to stall. An idle speed-up circuit is provided to increase the rate of fuel and air flow into the induction system under this condition to prevent stalling. The idle speed-up circuit is indicated generally by the reference numeral 34.

The idle speed-up circuit 34 is formed primarily in

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the spacer 14 and receives its fuel from a fuel passage 35 that extends from the idle circuit of the carburetor 13 through its lower face. A metering jet 36 is positioned in the passage 35 to regulate the rate of fuel flow. The passage 35 opens into a cavity 37 formed in the upper face of the spacer 14 through an aperture 38 in the gasket 18. A diagonally extending fuel passage 39 interconnects the cavity 37 with a horizontally extending bore 41. A speed-up discharge outlet 42 extends from the bore 41 to a cavity 43 that is formed in the lower face of the spacer 14. The cavity 43 is in open communication with the induction passage 21 formed in the spacer 14.

The fuel discharge of the idle speed-up circuit is controlled by a shuttle piston valve 44 that reciprocates in the bore 41. The piston valve 44 is normally biased by a coil spring 45 to an open position (FIGURE 3). The coil spring 45 is confined within the bore 41 by a threaded cap 46 that is received in the open end of the bore 41. The cap 46 is slotted, as at 47, to permit adjustment of the preload on the coil spring 45 to regulate the operation of the piston valve 44.

The rear surface of the piston valve 44 is exposed to induction system pressure by the idle speed-up discharge outlet 42. During normal idle operation, the induction system vacuum is relatively high and the piston valve 44 is drawn to the left to compress the coil spring 45 (FIGURE 4). Under this condition there will be no fuel discharge from the idle speed-up circuit 34 because the piston valve 44 closes the fuel passage 39. Should an engine driven accessory place an unduly high load upon the engine, induction system vacuum will decrease. The coil spring 45 will then urge the piston valve 44 to the right (FIGURE 3). This opens the passage 39 and permits the idle speed-up discharge circuit to experience induction system vacuum. Fuel will then be discharged from the discharge outlet 42 into the induction passage 21 to increase the engine idle speed and stabilize engine operation. When the engine operation returns to normal, the induction system vacuum will again draw the piston valve 44 to the left to stop the fuel discharge.

Under some circumstances it may be desirable to bleed additional air into the idle speed-up circuit for optimum engine operation. To accomplish this result, an air bleed passage 48 extends vertically through the spacer 14 and opens into the bore 41 at the rear of the piston valve 44. The passage 48 has an enlarged mouth 49 that supports ball type valve 51. A wafer air filter 52 may be positioned across the passage mouth 49 to retain the ball 51 in place and to filter the additional air.

During normal idle operation the induction system vacuum will draw the ball 51 upwardly (FIGURE 4) to close the air bleed passage 48. As the induction system vacuum decreases due to an increased load on the engine, the ball 51 will fall opening the passage 48 and permitting additional air to enter the idle speed-up discharge circuit (FIGURE 3).

The air bleed controlling valve may be designed to open when the induction system vacuum fails to exceed any desired pressure by changing the weight of the ball 51. The pressure at which the piston 44 opens may be varied by changing the preload upon the coil spring 45. The air and fuel valves may be set to open simultaneously or sequentially as desired. It is to be understood that the valves shown are exemplary of a preferred embodiment of the invention. Other changes in the valves or in the form that the idle speed-up circuit may take may be made without departing from the spirit and scope of the invention, as defined by the appended claims.

I claim:

1. A charge forming device for an internal combustion engine comprising an induction passage, a throttle valve for controlling the flow through said induction passage, an idle discharge circuit for discharging fuel into said induction passage at a point contiguous to the idle position of said throttle valve, an idle speed-up discharge

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circuit communicating with said idle discharge circuit for discharging additional fuel into said induction passage at a point posterior to said throttle valve, an air passage communicating with said idle speed-up discharge circuit for bleeding air into said circuit for mixture with the fuel discharged into said induction passage, and pressure responsive valve means for controlling the air and fuel flowing into said induction passage through said idle speed-up discharge circuit, said pressure responsive valve means being responsive to the pressure in said induction passage posterior to said throttle valve and being adapted to open when the induction system vacuum fails to exceed normal idle vacuum, said pressure responsive valve means comprising a first valve member for controlling fuel flow and a second valve member for controlling air flow.

2. A charge forming device for an internal combustion engine comprising an induction passage, a throttle valve supported in said induction passage for controlling the flow therethrough, a fuel source, an idle discharge circuit interconnecting said fuel source with said induction passage at a point contiguous to the idle position of said throttle valve, an idle speed-up discharge circuit interconnecting said idle discharge circuit and said induction passage at a point posterior to said throttle valve, an air passage for bleeding air into said idle speed-up discharge circuit for mixture with the fuel discharged into said induction passage, and pressure responsive valve means for controlling the rate of discharge of said idle speed-up discharge circuit, said pressure responsive valve means being responsive to the pressure in said induction passage posterior to said throttle valve and being adapted to open when the induction system vacuum fails to exceed normal idle vacuum.

3. A charge forming device as defined by claim 2 wherein the pressure responsive valve means comprises a first valve member for controlling fuel flow and a second valve member for controlling air flow.

4. An induction system for an internal combustion engine comprising an intake manifold, a carburetor, a spacer, means fixing said carburetor and said spacer to said intake manifold with said spacer being interposed between said carburetor and said intake manifold, said carburetor, spacer and intake manifold defining an induction passage, a throttle valve in said carburetor for controlling the flow through said induction passage, a fuel source in said carburetor, an idle discharge circuit in said carburetor for discharging fuel from said fuel source into said induction passage contiguous to the idle position of said throttle valve, an idle speed-up circuit extending from the idle discharge circuit of said carburetor into said spacer, said idle speed-up circuit opening into the portion of the induction passage defined by said spacer, and pressure responsive valve means for controlling the discharge of fuel from said idle speed-up circuit, said pressure responsive valve means being responsive to the pressure in said induction passage posterior to said throttle valve and being adapted to open when the induction system vacuum fails to exceed normal idle vacuum.

5. An induction system for an internal combustion engine comprising an intake manifold, a carburetor, a spacer, means fixing said carburetor and said spacer to said intake manifold with said spacer being interposed between said carburetor and said intake manifold, said carburetor, spacer and intake manifold defining an induction passage, a throttle valve in said carburetor for controlling the flow through said induction passage, a fuel source in said carburetor, an idle discharge circuit in said carburetor for discharging fuel from said fuel source into said induction passage contiguous to the idle position of said throttle valve, an idle speed-up circuit extending from the idle discharge circuit of said carburetor into said spacer, said idle speed-up circuit opening into the portion of the induction passage defined by said spacer,

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an air bleed extending through said spacer and opening into said idle speed-up circuit for mixing air with the fuel discharged from said idle speed-up circuit, and pressure responsive valve means for controlling the air and fuel discharge of said idle speed-up discharge circuit, said pressure responsive valve means being responsive to the pressure in said induction passage posterior to said throttle valve and being adapted to open when the induction system vacuum fails to exceed normal idle vacuum.

6. An induction system as defined by claim 5 wherein the pressure responsive valve means comprises a first valve member for controlling fuel flow and a second valve member for controlling air flow.

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HARRY B. THORNTON, *Primary Examiner.*

T. R. MILES, *Assistant Examiner.*