Jan. 30, 1934. S. F. HUNT 1,945,192

CARBURETOR

Filed Jan. 25, 1933

Fig. 1

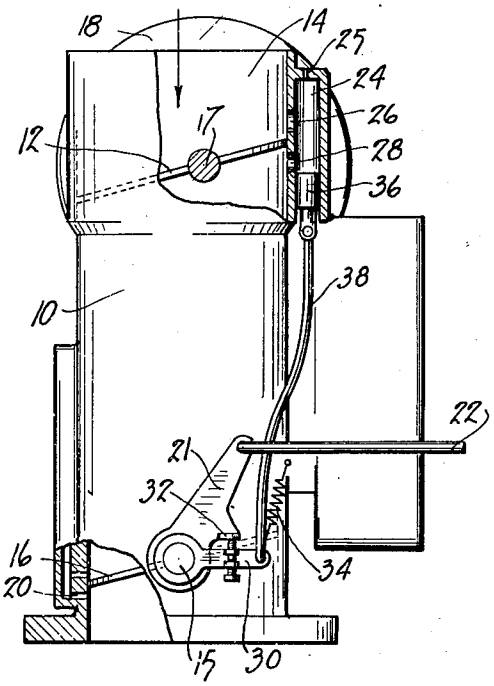


Fig. 2

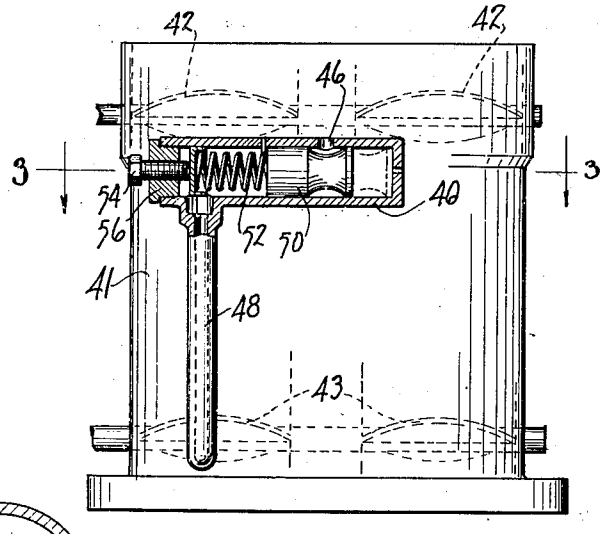
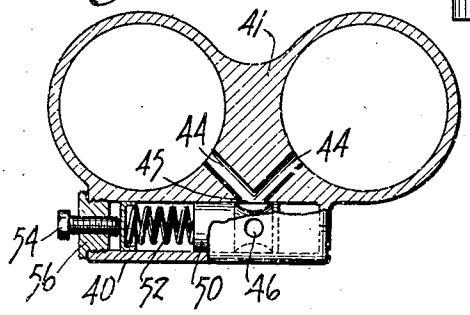


Fig. 3



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1,945,192

CARBURETOR

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6 Claims. (Cl. 123—119)

This invention relates to automatic control mechanism for internal combustion engine carburetors, and has for its principal object the provision of a throttle controlled means for positively producing a lean mixture for idling the engine with a closed throttle.

It is old in the art to provide a thermostat for automatically setting the choke valve of a carburetor to regulate the richness of fuel mixture produced by the carburetor as a function of temperature. The copending application of Hunt and Olson Serial No. 575,025, filed November 14, 1931, discloses an arrangement of this kind. An unbalanced choke valve is frequently used in arrangements of this kind and such valve is usually provided with a pressure-responsive auxiliary valve which opens in advance of the main valve to admit a limited amount of air to the carburetor. When the throttle is closed to cause mixture to be drawn into the engine through the idling nozzle of the carburetor a high vacuum is built up in the engine and too much fuel is drawn into it to be burned by the air admitted by the auxiliary valve and since the main valve is held closed by the thermostat while the engine is cold, the engine is liable to stall because the mixture is too rich.

The present invention improves upon the devices of the prior art by providing an arrangement which positively admits a sufficient quantity of air when the throttle is closed, to produce a lean mixture that causes the engine to idle fast and thus prevent stalling. In its preferred form the apparatus of the present invention is provided with ports which bypass the choke valve, these ports being either in addition to the small valve carried by the choke or in lieu thereof. The ports are closed when the throttle is partly opened to start the engine and are opened when the engine is running and the throttle closed for idling. Air admitted through the ports thins down the mixture and stalling of the engine is prevented. The apparatus may also be arranged to open the ports at wide open throttle to permit scavenging a flooded condition of the engine.

My invention will be best understood from a detailed description and claims which follow, reference being had to the accompanying drawing in which a preferred embodiment of the invention is shown by way of example and in which:

Figure 1 is an elevational view of a carburetor, partly in section, showing the apparatus of the invention applied thereto;

Figure 2 is an elevational view of a carburetor showing the application of a modified form of the invention thereto, with the apparatus shown partly in section; and

Figure 3 is a cross sectional view taken substantially along the line 3—3 of Figure 2 looking in the direction of the arrows.

In the drawing I have shown, by way of example, a plain tube down draft carburetor 10, equipped with an unbalanced choke valve 12 located in the air inlet horn 14 and a butterfly throttle 16 for controlling the mixing chamber. A thermostat 18 is connected to the shaft 17 of the choke valve and tensioned to close that valve when the engine is cold. Preferably the thermostat is located adjacent to the exhaust manifold of the engine so as to be heated by heat radiated therefrom when the engine is running. Adjacent the closed position of the throttle is an idling nozzle 20 through which fuel mixture is drawn when the throttle is closed to run the engine at idling speed. A control lever 21 is fixed on the shaft 15 of the throttle to permit operation to the same by the rod 22 as required in the operation of the engine.

A cylinder 24 is built into the casing of the carburetor adjacent the choke valve and connected to the air horn by a port 26 located anterior to the valve and also by a second port 28 located posterior to it. Normally, when the choke valve is closed, as it will be when the engine is not running and is cold so that the thermostat will be tensioned, air may bypass the valve by passing through port 26 into cylinder 24 thence through port 28 into the mixing chamber. The quantity of air thus admitted to the mixing chamber will depend in part upon the cross sectional area of the ports 26 and 28. The valve 12 may be provided with a small poppet valve, not shown, through which a small quantity of air may be drawn into the mixing chamber, or it may be a plain valve, as shown, arranged to fit snugly in the air horn so as to minimize leakage of air past it when the valve is closed.

Throttle shaft 15 carries a loose lever 30 upon which is mounted an adjusting screw that bears against an ear 32 on lever 21. A pull spring 34 extends between the free end of lever 30 and the casing of the carburetor and is tensioned to rotate the lever on shaft 15 to keep the adjusting screw against the ear. A piston 36 is fitted in cylinder 24 and arranged to be moved therein by a rod 38 pivotally connected thereto and to the free end of lever 30.

When it is desired to start the engine, rod 22 is actuated to set throttle 16 to starting position, which is at about one fourth open. Ear 32 is raised by this movement and moved away from the adjusting screw. The tension of spring moves lever 30 counterclockwise on shaft 15 to raise piston 36 so as to block ports 26 and 28. As the engine is turned at cranking speed the low vacuum built up in the carburetor draws a mixture of fuel and air into the engine, which

mixture is rich in fuel because of the limited amount of air available. When the engine fires, rod 22 is moved to close the throttle and ear 32 pushes down on the adjusting screw to move lever 30 against the tension of spring 34, and piston 36 is moved to unblock the bypass ports. More air is admitted and the richness of the fuel mixture graded down to cause the engine to idle fast. As the engine warms up, the tension of thermostat 18 decreases and valve 12 is permitted to open and admit more air to further grade down the richness of the mixture, the thermostat being arranged so that the valve will be fully opened when the engine has reached its normal operating temperature, at which time the richness of the fuel mixture is controlled by the adjustment of the carburetor rather than by the setting of the choke valve.

The arrangement shown in Figure 1 permits scavenging a flooded engine by setting the throttle to wide open position and cranking the engine. With the throttle in wide open position piston 36 is moved upwardly in cylinder 24 past port 26 and the choke valve bypass is opened to permit air to be drawn into the carburetor. Cylinder 24 is vented at 25 to permit the piston to move to the end wall thereof without encountering an air cushion.

Spring 34 is shown as a pull spring for the sake of clarity in the drawings. Preferably the spring is a helix wound around shaft 15 and anchored to the lever and casing.

In Figures 2 and 3 I have shown a modified form of apparatus applied to a double barrel carburetor. In this embodiment a cylinder 40 is formed on the casing of the carburetor 41 adjacent the choke valves 42. Air ducts 44 lead from a port 45 in the cylinder to the mixing chamber, opening into that chamber immediately posterior to the choke valves 42. A port 46 in the wall of cylinder 40 adjacent port 45 leads to the outside of the carburetor. A suction duct 48 extends between the cylinder 40 and the posterior face of the throttle 43. A piston 50, fitted in cylinder 40, is urged to the right therein, Figure 3, by spring 52, and the tension of spring 52 is adjusted by a screw 54 threaded through a plug 56 that is fixed in the end of the cylinder to close the same. When it is in the right hand end of cylinder 40, piston 50 blocks ports 45 and 46 so that air cannot be drawn therethrough into the mixing chamber from the outside of the carburetor. When the choke valve 42 is closed and the engine rotated at cranking speed, a rich mixture will be produced for starting. When the engine begins firing and throttle 43 is closed for idling, a high vacuum is built up in the intake manifold posterior the throttle and piston 50 is drawn to the left, Figure 3, against the tension of spring 52. Ports 45 and 46 are unblocked by this movement of the piston and the choke valve is by passed so that more air can be drawn into the mixing chamber to produce a lean mixture for idling, even though choke valve 42 remains closed.

In most engines the vacuum produces at cranking speed equals about four inches of mercury, and the manifold vacuum, with closed throttle, builds up to about sixteen inches when the engine is firing. Preferably spring 52 is tensioned so that piston 50 will not be moved until the vacuum exceeds the maximum produced in starting, and a rich mixture for starting is assured. When the throttle is wide open, as for rapid accelerating, the vacuum may fall sufficiently to permit spring 52 to restore piston 50 to its normal position and block port 46, but this will be without effect since the choke valve will be opened or cracked and sufficient air will be supplied therethrough.

While I have chosen to show my invention by describing particular embodiments of it, I have done so by way of example only as I am aware that the specific apparatus shown can be modified by one skilled in the art within the teachings of the invention.

What is claimed is:

1. In control mechanism for an internal combustion engine carburetor having a choke valve and a throttle, a thermostat tensioned to control the degree of opening of the choke valve to regulate the richness of the mixture produced by the carburetor as a function of engine temperature, and means controlled by the throttle for by-passing the choke valve when the throttle is in closed position to provide a leaner mixture than the thermostat is set to produce for idling the engine.

2. In a control mechanism for an internal combustion engine carburetor having a choke valve and a throttle, a thermostat tensioned when cold to bias the choke valve closed, by-pass means extending around said choke valve, and means controlled by the throttle for governing said by-pass means to permit and to prevent the flow of air therethrough.

3. In a control mechanism for an internal combustion engine carburetor having a choke valve and a throttle, a thermostat tensioned when cold to bias the choke valve closed, by-pass means extending around said choke valve, a piston arranged to govern air flow through said by-pass means, and means for setting said piston to permit air to flow through said means when the throttle is closed.

4. In a control mechanism for an internal combustion engine carburetor having a choke valve and a throttle, a thermostat tensioned when cold to bias the choke valve closed, ports leading out of said carburetor on the posterior and anterior sides of said choke valve, a duct connecting said ports, and a piston connected to the throttle and actuated thereby to block said duct between said ports when the throttle is in starting position.

5. The combination with an internal combustion engine carburetor having a choke valve and a throttle, of a by-pass duct extending around the choke valve to supply air to form a lean mixture for idling when the valve is closed, and valve means connected to said throttle and actuated thereby to block the duct when the throttle is in starting position and to permit air to flow therethrough when the throttle is in closed and wide open positions.

6. In an internal combustion engine carburetor, a throttle having a shaft, an arm fixed on said shaft to actuate the throttle to control the engine, a lever journaled on said shaft, a choke valve, an air duct by-passing said choke valve, a plunger connected to said lever, and means for moving said lever to cause the plunger to block said duct when the throttle is set in starting position and to open said duct when the throttle is set in fully opened and fully closed positions.

SCOTT F. HUNT.