Nov. 18, 1941. B. BEARD 2,263,027

CARBURETOR FAST IDLE SYSTEM

Filed Aug. 15, 1938

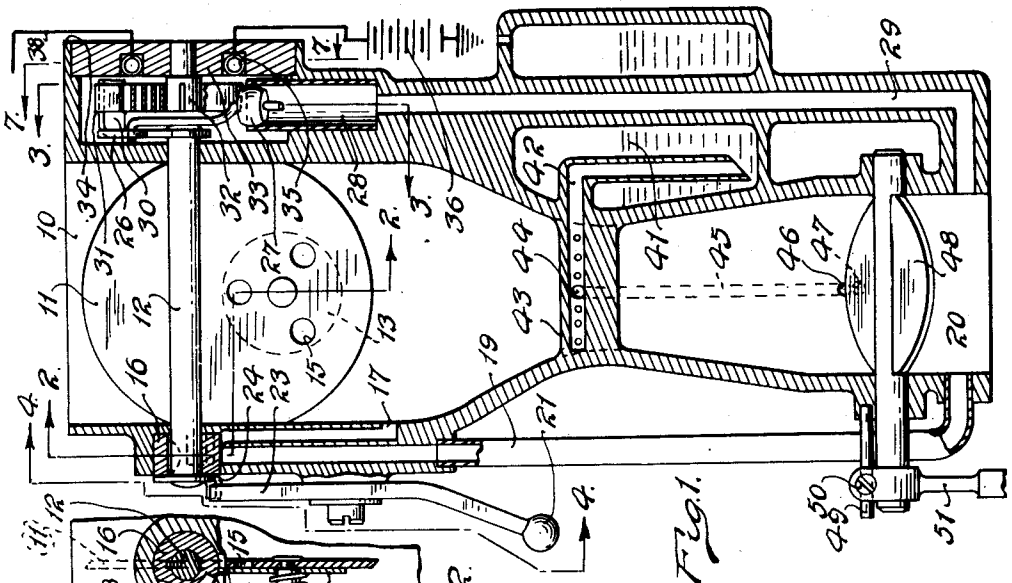


Fig. 1.

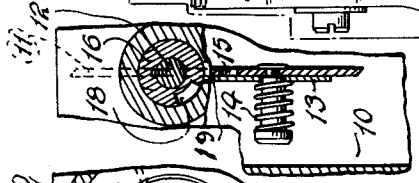


Fig. 2.

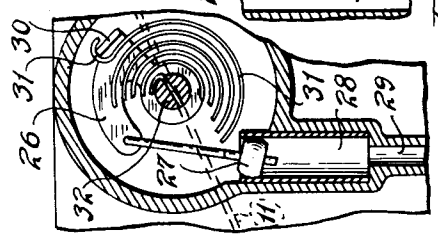


Fig. 3.

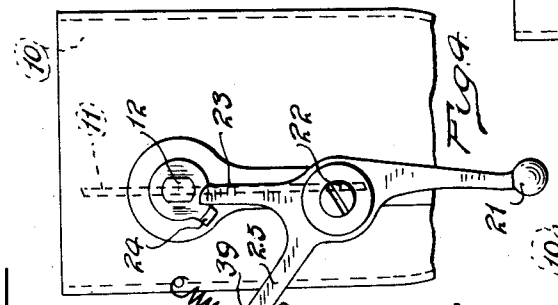


Fig. 4.

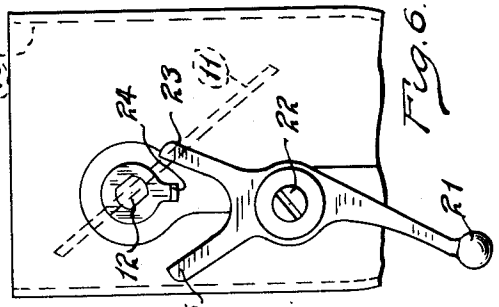


Fig. 6.

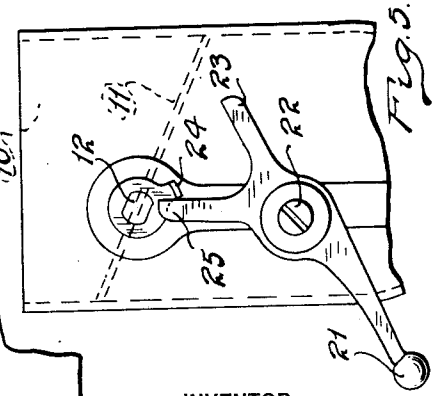


Fig. 5.

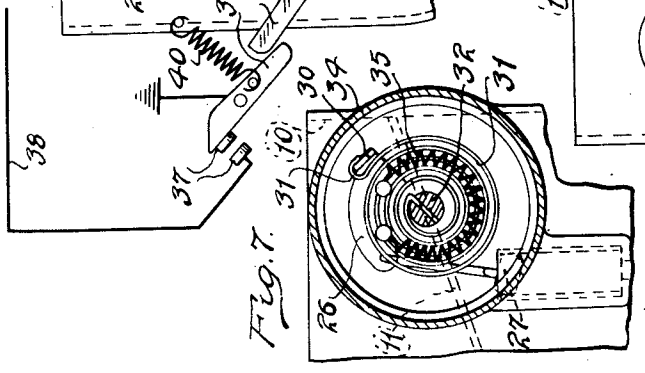


Fig. 7.

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Patented Nov. 18, 1941 2,263,027

UNITED STATES PATENT OFFICE

2,263,027

CARBURETOR FAST IDLE SYSTEM

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Application August 15, 1938, Serial No. 224,921

7 Claims. (Cl. 261—39)

The object of this invention is to provide a fast idle when starting an engine.

In the method in common use today a movable cam engages with the throttle stop. The movement of this cam is controlled by the position of the choke. This involves a certain amount of mechanism which imposes a frictional load on the automatic choke. In order to eliminate this when a semi-automatic choke is used, a manual control is arranged to operate the cam against which the throttle stop engages, and this manual control is arranged to release the choke so that it may assume an automatic position, and when the manual control is moved to the position which positively opens the choke, the normal idle is reestablished. The difficulty here is that when the manual control is left in the position which permits the automatic choke to function automatically, the idle is always in the fast idle position.

I have discovered that if I draw air from between the choke valve and the throttle valve and by-pass this around the throttle valve into the mixture outlet, I increase the depression in the mixing chamber and thereby cause more fuel to flow down the low speed passage and also to issue from the main fuel nozzle as the case may be, depending on the particular nozzle construction used.

With my invention, therefore, the choke valve automatically by-passes additional air from the mixing chamber around the throttle when the choke valve is in the closed position, and at the same time, an increase in fuel flow results. When the choke valve is released and allowed to operate automatically, it automatically eliminates the extra air and fuel for the fast idle the moment conditions warrant the choke valve assuming the wide open position.

In the drawing:

Figure 1 shows in cross sectional elevation the preferred form of my invention.

Figure 2 shows a cross sectional elevation taken on plane 2—2 of Figure 1.

Figure 3 shows a view taken on plane 3—3 of Figure 1.

Figure 4 shows an outside elevation taken on plane 4—4 of Figure 1.

Figure 5 is a view similar to Figure 4.

Figure 6 is a view similar to Figure 4.

Figure 7 is a cross sectional elevation taken on plane 7—7 of Figure 1.

In the figures, 10 is the air entrance. 11 is an unbalanced choke valve mounted therein on the shaft 12. 13 is an automatic by-pass valve mounted on the choke valve 11. This valve is supported by a spring 14 and admits air through the by-pass openings 15. 16 is a fast idle control valve mounted on the end of the choke shaft 12. 17 is the fast idle by-pass leading from the air entrance below the choke valve and communicating with an opening 18 in the by-pass valve 16. 19 is the by-pass passage leading from the valve 16 to the mixture outlet of the carburetor 20. 21 is the manual control lever for the choke valve. It is mounted on a pivot 22 and carries an arm 23 which, in the position shown in Figure 4, engages with an ear 24 which is on a plate rivetted to the choke shaft 12. The choke lever 21 carries another arm 25 which in Figure 5, is shown engaging with the ear 24 of the choke shaft 12 to hold the choke valve in the closed position.

In Figure 6 the arms 23 and 25 are shown with the ear 24 out of contact with both arms, so that the choke valve is then free to assume any position determined by conditions.

Rivetted to the other end of the choke shaft 12 is a stamping having an arm 26 to which is connected a vacuum piston 27 which reciprocates in the cylinder 28 which communicates through a passage 29 with the mixture outlet 20. The arm 26 carries an ear 30 which engages with a thermostat 31, which thermostat in anchored to a stationary pin 32 carried in the cover 33 of the thermostat housing 34. This thermostat is adapted, when cold, to move the arm 26 to the right in Figure 3, so as to hold the choke valve 11 in the closed position, the arm 26 being mounted on the shaft 12. In the cover 33 of the thermostat housing is located a heating coil 35. This heating coil 35 is placed in an electric circuit shown diagrammatically in Figures 1 and 4.

The heating coil is connected to a battery 36 and also to a switch 37 through a conductor 38. This switch 37 is operated by a lever 39 which engages with the arm 25 so that when the choke control lever 21 is in the position shown in Figure 4, the switch 37 is opened, the choke valve is held open and no current flows. A spring 40 is provided to hold the switch 37 closed when the arm 25 of the lever 21 is no longer in contact with the lever 39. A constant level fuel supply chamber 41 is shown diagrammatically in Figure 1 communicating with a fuel passage 42, a cross bar nozzle 43, from which low speed fuel discharges through a by-pass orifice 44 down to the low speed tube 45, and issues through the low speed fuel outlets 46 and 47 which are under the influence of the throttle valve 48 located in

the mixture outlet 20. An idle stop 48 is provided with which the adjustable idle stop screw 50 is adapted to engage. 50 is carried on the throttle lever 51.

Operation

When the carburetor is started on a cold day, the choke valve is placed in the position shown in Figure 5 when the choke valve is held in the closed position, in which case the opening 18 places the by-pass 17 in communication with a by-pass tube 19. When the engine is cranked, fuel is drawn up through the tube 42 into the mixture chamber and as some fuel and air pass through 17 and down the passage 19 to the mixture outlet, most of the fuel falls onto the throttle plate 48 and flows by the lip of the throttle into the mixture outlet where it mingles with the air which flows down the passage 19. The moment the engine fires additional air is drawn through the openings 15 past the automatic by-pass valve 13. Under normal starting conditions, however, the choke control lever 21 is in the position shown in Figure 6, in which case the choke valve 11 is free to respond to the action of the vacuum cylinder 28 and the vacuum piston 27, which, the moment the engine fires, tends to open the choke against the action of the thermostat 31 which, when cold, tends to hold the choke valve 11 closed.

A fast idle results from the provision of the by-pass pipe 19 and the opening 17 for the reason that if the choke valve and its by-pass valve 13 and spring 14 are set to establish a depression in the mixing chamber, which will give the necessary fuel flow from the float chamber to the nozzles 42, 43, 44, for the rich starting mixture, then the fast idle air passing around the by-pass 17, 19 to the mixture outlet 20 contains no liquid fuel and merely a trace of fuel vapor, so that it may be considered to be pure air for all practical purposes.

This fast idle air dilutes the atomized excessively rich mixture which passes between the almost closed throttle and the walls of the mixing chamber to the mixture outlet. This throttle is set for the normal hot weather idle, that is to say, it is almost closed. Hence with the small throttle opening, the atomization which takes place when the rich mixture passes the throttle is quite high, but the amount of air carried with it is small and therefore the tendency to form ice is not great. By increasing the fuel flow around the edge of the throttle without increasing the air flow around the throttle, the tendency to freeze the throttle is not as great as if all the air travelled around the throttle as it is the air which is the source of ice.

Meanwhile, electricity will be flowing through the heating coil 35, thereby raising the temperature of the thermostat 31, and thus, in a certain number of seconds, depending on the temperature of the engine and the atmosphere surrounding the engine, the choke valve is released and the suction acting in the cylinder 28 is effective, acting against the piston 27 to open the choke valve 11. Thus, after a given period of time, the choke valve is opened, permitting the engine to be driven away.

As the choke valve opens, the opening 18 in the fast idle valve 16 is moved out of communication with the passage 17, thus cutting off the flow of extra air from between the throttle and the choke valve into the mixture outlet. The fast idle is thus automatically destroyed the moment the choke valve opens. Hence, if the lever 21 is left in the position shown in Figure 6, the fast idle only functions for a few seconds until such time as the choke valve 11 assumes a running position, when the idle is immediately restored to normal.

It will be noted that an idle stop is not shown as this is a well known feature.

What I claim is:

1. Fast idle control means adapted for use with a downdraft carburetor having an air entrance, a choke valve therein, means for opening and closing said choke valve, a mixture chamber, a fuel nozzle discharging therein, a mixture outlet, a throttle valve therein, a by-pass leading from the air entrance adjacent to and on the engine side of the choke valve to the engine side of the throttle valve, a valve therein adapted to be opened by the closing movement of the choke valve and to be closed by an opening movement of the choke valve.

2. A device as set forth in claim 1 in which the choke valve is automatically controlled by the suction in the mixture outlet, and by thermostatic means acting in opposition thereto.

3. A device as set forth in claim 1 in which the choke valve is automatically controlled by the suction in the mixture outlet and by thermostatic means acting in opposition thereto and in which manual means are provided to positively close the choke valve and thereby open the by-pass valve in one position, and in another position to positively open the choke valve and thereby close the by-pass valve, and in an intermediate position to permit the choke and by-pass valves to be automatically controlled by suction and temperature.

4. A device as set forth in claim 1 in which there is an automatic air valve acting as a by-pass around said choke valve from the atmosphere when said choke valve is completely closed.

5. A device as set forth in claim 1 in which the choke valve is unbalanced and resilient means are provided for closing said valve whereby the air entering the carburetor tends to open the choke valve.

6. A device as set forth in claim 1 in which the choke valve is unbalanced and temperature responsive means are provided to resiliently close said valve and means responsive to the suction in the mixture outlet are provided to open the valve and the air entering the carburetor is also adapted to open the choke valve.

7. A device as set forth in claim 1 in which a by-pass is provided around said choke valve leading from the atmosphere to the engine side of said choke valve, an automatic valve in said by-pass adapted to be opened by an air flow therethrough, and in which the choke valve is unbalanced, and temperature responsive means are provided to resiliently close said choke valve, and means responsive to the suction in the mixture outlet are provided to open the choke valve, and the air entering the carburetor is also adapted to open the choke valve.

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