Dec. 28, 1948. W. E. LEIBING 2,457,570

CARBURETOR

Filed April 20, 1944

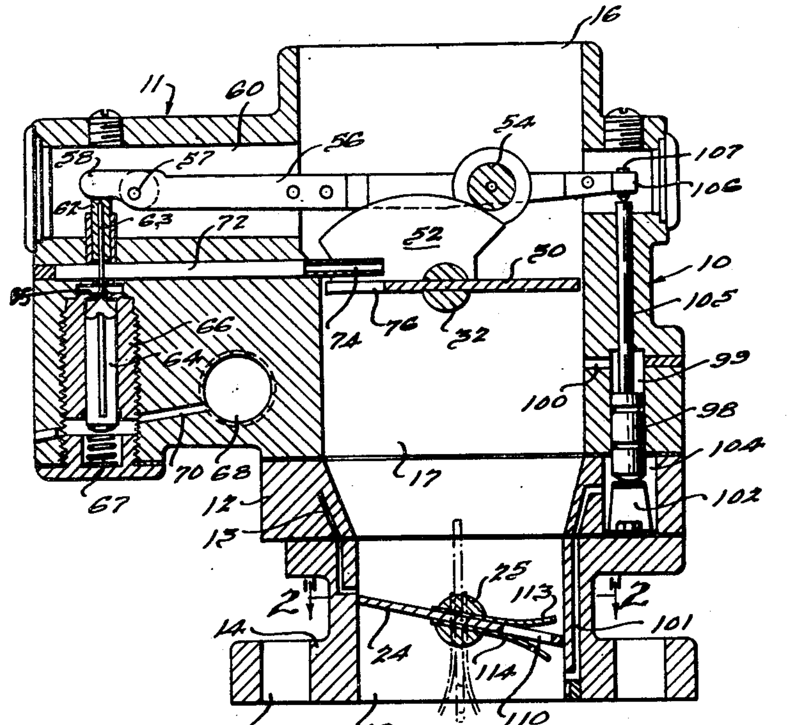

FIG. 1.

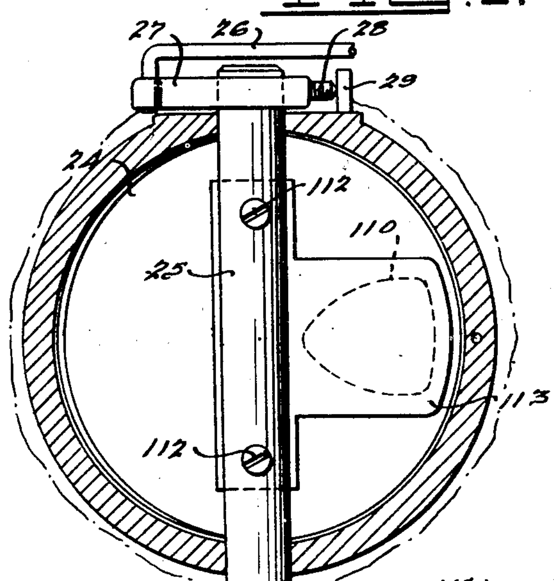

FIG. 2.

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CARBURETOR

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1 Claim. (Cl. 261—39)

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This invention relates to carburetors, and more particularly to a carburetor comprising improved means for controlling the flow of fuel mixture through the induction passage thereof.

An object of the invention is to provide improved means to prevent stalling, due to insufficient flow of fuel mixture, of the engine to which the carburetor is attached.

A further object of the invention is to facilitate starting of the engine, by automatically providing an increased flow of fuel mixture for starting.

A further object of the invention is to control the supply of fuel mixture to the engine in such manner as to cause the engine to idle at substantially constant speed, regardless of temperature, engine load, or other factors.

A further object is to provide simple and economical means incorporated in the throttle, for accomplishing the aforesaid objects.

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 vertical section showing a carburetor embodying one form of the invention;

Fig. 2 is an enlarged sectional view taken on the line 2—2 of Fig. 1.

In Fig. 1, the invention is shown incorporated in a carburetor of the same general type as that disclosed in Leibing and Fageol Patent No. 2,443,464, issued June 15, 1948. The carburetor comprises a main body section **10** having a lateral extension **11**. Below the body section **10** is mounted a heat insulating gasket **12**, which is provided with a passage **13** for connection to an ignition control or the like, for purposes known in the art, and which may also lead to the vacuum cylinder of an economizer of the type disclosed in Leibing and Fageol application S. N. 533,848, filed May 3, 1944. Below the gasket is a throttle body **14**, the body section, gasket and throttle body being internally bored to form an induction passage comprising an air inlet **16**, a mixing chamber **17**, and a mixture outlet **18** which communicates with the intake manifold of the engine (not shown). The air inlet is adapted to receive an air cleaner of known construction (not shown). Holes **22** are provided in the lower flange of the throttle body **14** for bolting the carburetor to the intake manifold of the engine.

A butterfly throttle valve **24** is mounted in the mixture outlet **18** on a shaft **25** to control the flow of fuel mixture to the engine. The throttle is controlled by the operator in the usual manner, by means of an accelerator pedal and/or lever con-

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nected by a rod **26** to a throttle lever **27**, fixed to the shaft **25**. Movement of the throttle in the closing direction is accomplished by means of the usual throttle return spring (not shown), and is limited by contact of an adjustable screw **28** with a fixed stop **29**, in the known manner.

An air vane **30** is mounted in the induction passage anterior to the throttle, on an off-center shaft **32**, so that the flow of air into the carburetor tends to rotate it in the clockwise direction as viewed in Fig. 1. A return spring, not shown, tends to return the air vane **30** to the position shown, while fluttering of the vane is preferably prevented by an inertia member of the type shown in the Leibing and Fageol patent above identified.

The connecting means between the air vane and the fuel valve of the carburetor comprises a cam **52** fixed to the air vane in any suitable manner, and positioned to contact a flanged roller **54** rotatably mounted on a control lever **56**. The lever is pivoted, by means of a pin **57**, adjacent one of its ends **58**, to the walls of a recess **60** formed in the extension **11** at the left (Fig. 1) side of the carburetor. This end of the lever is formed with a recess which receives the upper end of a guide member **62**, having a longitudinal bore in which is fixed a stem **63**, the lower end of the stem being fixed in a longitudinal bore formed in a fuel valve **64**. The fuel valve **64** has fluted sides to permit the passage of fuel, and has its operative valve surface tapered to cooperate with a valve seat **65** formed as an integral shoulder in a longitudinally bored plug **66**. A spring **67** urges the valve toward its seat. The fuel valve controls the flow of fuel from a chamber **68** through a passage **70** past the valve and seat and through a transverse conduit **72** to the discharge nozzle **74**.

The air vane **30** is formed with a slot **76** which receives or registers with the fuel nozzle **74** when the air vane has moved slightly away from its closed position, so that at low engine speeds the velocity of the air passing the outlet of the nozzle will be high enough to produce adequate atomization of the fuel. The operating surface of cam **52** may be designed to give any desired ratio between the rate of air flow and the rate of fuel flow at different engine speeds. Fuel may be supplied to chamber **68** of the carburetor at constant pressure by a fuel pump and regulating means such as are disclosed in the Leibing and Fageol patent above identified.

For the purpose of facilitating the starting of the engine when cold and to provide smooth operation while the engine is warming up, a control is provided which increases the fuel supply at low temperature and low manifold vacuum. The fuel control comprises a piston 98 reciprocable in a cylindrical bore 99 in the wall of the carburetor. The upper end of bore 99 is connected by a port 100 to the mixing chamber of the carburetor, and its lower end is connected by a duct 101 to the carburetor outlet posterior to trailing edge of the throttle valve 24. The lower end of the piston is rounded and rests upon the free end of a bimetallic spring thermostat 102, the other end of which is fixed to the bottom of a chamber 104. The upper end of piston 98 has a one-way connection, through a push rod 105, to the free end 106 of lever 56, which carries an adjusting screw 107 threaded thereon and contacting the upper end of the push rod.

The thermostatic spring 102 is so designed that as the temperature drops the free end moves upwardly, raising the end 106 of lever 56, moving roller 54 out of contact with cam 52, and thereby increasing the opening of the fuel valve 64. If the engine is then cranked, an abnormally high rate of fuel discharge from nozzle 74 will take place, supplying a rich mixture to the engine for starting. The suction produced by the engine at cranking speed is insufficient to produce any movement of piston 98, but as soon as the engine begins to operate under its own power, the suction produced thereby is transmitted through duct 101 to chamber 104, drawing piston 98 downwardly against the yielding force of the thermostat and partially or wholly, depending on the temperature and the degree of manifold vacuum, neutralizing the force of the thermostat, thus decreasing the richness of the mixture, as is desirable.

If, after the cold engine has commenced to operate under its own power, the throttle is quickly moved to open position, the absolute pressure in the intake manifold will rise, while the absolute pressure in the mixing chamber 17 will drop slightly. These pressure changes, operating upon the lower and upper end of piston 98, will permit it to be moved upwardly by the force of the thermostatic spring 102, which will result in moving the fuel valve 65 to a more open position to enrich the mixture during the interval while the engine is gathering speed. When the engine has reached a predetermined speed, however, the air vane 30 will be opened by air flow to the point where cam 52 will again come into contact with roller 54, from which point the fuel control means 98, 105 ceases to affect the fuel mixture. The fuel control thus enriches the mixture only while the air vane is operating within about the first one-fourth of its opening movement. As the engine warms up due to continued operation, the force exerted by the thermostat 102 becomes gradually less, until roller 54 remains in contact with cam 52 even at lower engine speeds, and the normal operation of the carburetor is resumed.

To avoid flow of fuel to the engine when it is stopped, the valve seat 65 is formed of soft metal such as soft brass, and the valve 64, which is of harder metal, is accurately fitted thereto, as by pressure which deforms or swages the shoulder of the seat in the known manner, while spring 67 is of sufficient stiffness to retain the valve firmly on its seat. In order that the cam 52 shall not unseat the valve while the engine is not running, the cam is so shaped that, in the position of the parts shown in Fig. 1, the lever 56 is in such position that it permits the valve 64 to seat. The initial tension of the spring which holds the air vane closed is so adjusted that the suction produced by cranking the engine, though slight, is sufficient to rotate the air vane through an angle of approximately 10 degrees, which brings another portion of cam 52 into contact with roller 54 and moves valve 64 off its seat by a sufficient distance to supply fuel for starting.

Throttle 24 is preferably mounted in a slotted or split shaft 25, and the trailing half of the throttle, shown at the right in Fig. 1, is provided with an aperture 110, the shape of which may be varied to suit the operating characteristics of the engine or any other factors which need to be taken into account. Overlying the aperture 110 and fitted within the slot of throttle shaft 25 by means of the usual screws 112 is a thin resilient leaf member 113, which may be formed of a sheet of spring steel of about .01 inch thickness, shaped to overlie and overlap the aperture 110, but normally curved upwardly therefrom as shown in Fig. 1. A similar leaf member 114 may if desired be fitted to the posterior surface of throttle 24, merely for the sake of symmetry, so that when the throttle is in the wide open position shown in broken lines in Fig. 1 the fuel mixture will not be deflected from a symmetrical pattern, and equal distribution of the fuel mixture to the cylinders will not be interfered with.

The throttle mechanism just described operates as follows. When the cold engine is stopped and the operator desires to start it, he cranks the engine in the usual manner, but he need not open the throttle, since the leaf 113 permits sufficient fuel mixture to pass through the aperture 110 to start the engine. As soon as the engine begins to operate under its own power, the increased vacuum generated by the engine will draw the leaf 113 toward its closed position to a point where only enough fuel mixture is supplied to the engine to maintain its normal idling speed. While the engine is cold, the increased internal friction of the engine will tend to cause it to operate below its normal idling speed, in which case the manifold vacuum will be below normal, and leaf 113 will move to some intermediate position where the opposing forces of manifold vacuum and resiliency are balanced, at which position a sufficient amount of fuel will be passed through aperture 110 to maintain the idling speed of the engine at approximately normal. When the engine has warmed up to the point where it idles at normal speed, the manifold vacuum is sufficient to draw leaf 113 to its closed position. However, if at any time when an engine is operating, the engine, for any of various reasons, falters or begins to slow down below its normal idling speed, the leaf 113 will open to such an extent as to increase the rate of flow of fuel mixture past the throttle and thereby restore the idling speed to normal and prevent stalling of the engine. This is particularly likely to occur in automobiles equipped with any of the various types of fluid drive, in which the momentum of the automobile is not available to crank to engine if it stalls while the vehicle is being propelled by its own momentum. The device also corrects automatically for maladjustment of the throttle stop screw 28; if said screw is set produce too low an idling speed, leaf 113 will open sufficiently to restore the idling speed to normal.

It will be seen that the leaf 113 moves to open position when the throttle is opened to any material extent, but under these conditions the position of the leaf has no effect on the operation of the carburetor. The curvature of the leaf increases from the base to the free end, so that a much higher degree of suction is required to fully close the leaf than is required to partially close it.

It will be understood that many changes may be made in the device disclosed without departing from the spirit of the invention as defined in the appended claim. The invention is therefore not limited to the particular form shown and described, but may be considerably varied within the skill of artisans in this art.

I claim:

In an internal combustion engine comprising an induction passage designed to communicate with the intake manifold of the engine, an air vane in said induction passage movable toward open position by the flow of air therethrough, a fuel nozzle positioned adjacent said air vane and cooperating therewith to produce a combustible fuel-air mixture under all conditions of engine operation and constituting the sole source of such mixture in the carburetor, means controlled by temperature and suction for enriching said mixture for starting, a manually operable disk throttle posterior to said fuel nozzle and controlling said induction pasage, said throttle being provided with an aperture spaced from said edges for by-passing additional fuel

mixture, and a resilient valve member mounted upon the anterior face of the throttle and overlying said aperture and held by its resilience spaced anteriorly from said aperture to permit fuel mixture from said nozzle to pass therethrough but movable by suction posterior to the throttle only when the throttle is in or near its closed position and the absolute pressure posterior to the throttle is below a predetermined value to a position wherein it restricts said aperture.

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