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CARBURETOR

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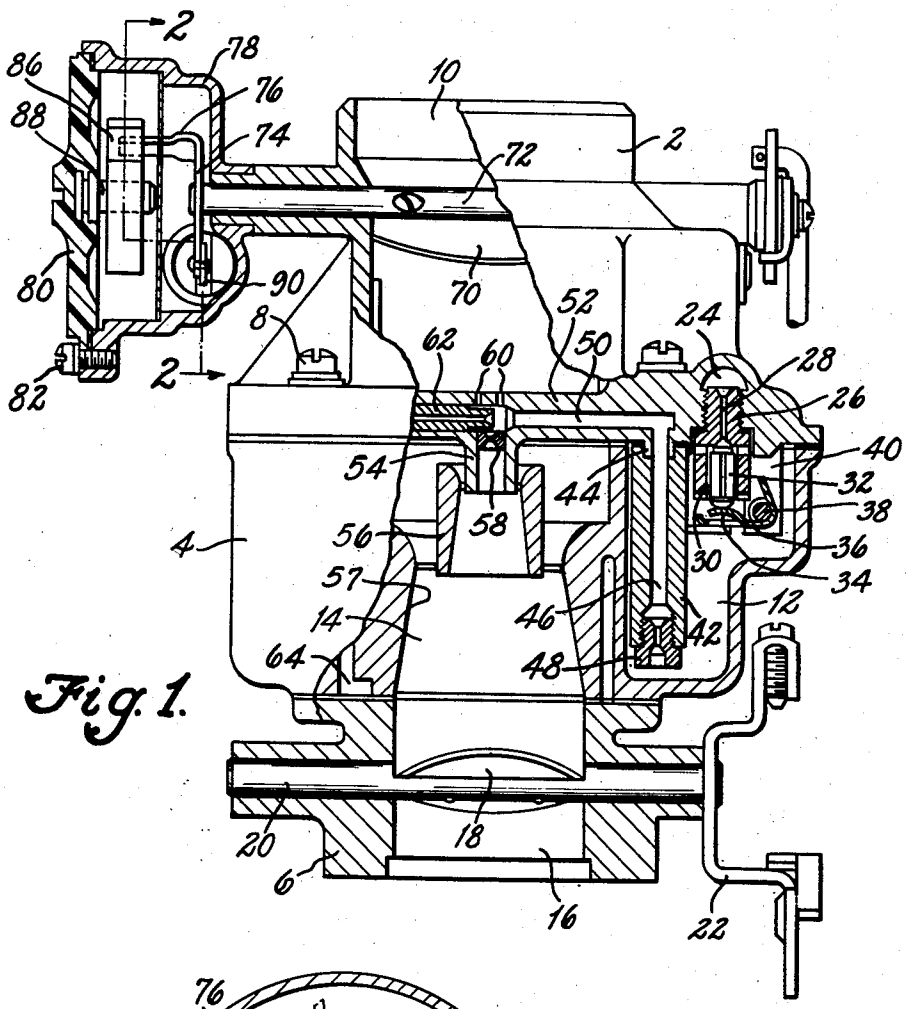


Fig. 1.

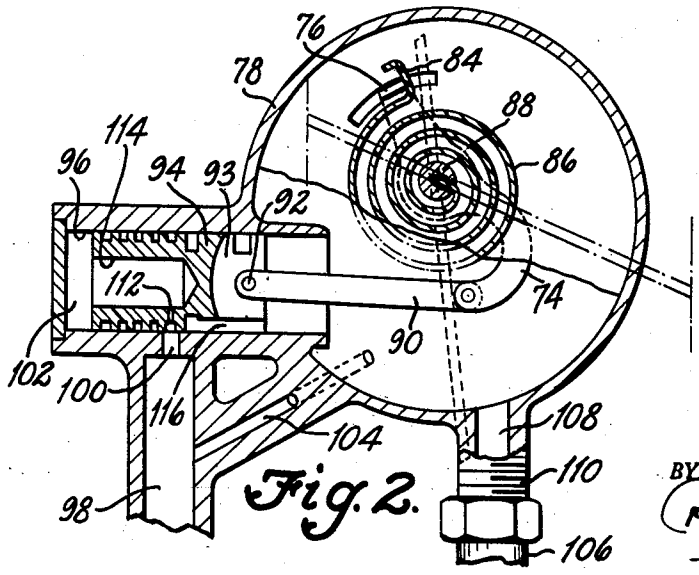


Fig. 2.

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CARBURETOR

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1 Claim. (Cl. 261—39)

This invention relates to carburetors for internal combustion engines, particularly engines for automotive vehicles and more specifically to automatic choke mechanism operable to automatically control the position of an air inlet valve for the purpose of controlling the fuel-air ratio of the mixture supplied to the engine.

Automatic choke devices operable to move a choke or air inlet valve to different positions in response to variations in engine temperature and/or suction are commonly provided in carburetors at the present time. These devices generally include an unbalanced valve in the carburetor air inlet which is subject to pressures created by the air entering the carburetor, is also controlled by a thermostat which exerts a force to hold the valve closed at low temperatures and also by a suction operated member connected to the valve and responsive to variations in suction posterior to the throttle, which exerts a force tending to open the valve as such suction increases.

It is the purpose of the present invention to provide a carburetor having a choke valve and means for automatically positioning the choke valve in response to variations in temperature and engine suction which includes a suction operated member which is effective to move the choke valve to a predetermined position, when the engine is started with the choke valve in closed position, but which is rendered substantially ineffective at such predetermined position of the valve, so that for a considerable part of the opening movement of the choke valve, the suction operated means is ineffective and again becomes effective after the choke valve has made a further predetermined opening movement.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Figure 1 is a vertical section, partly in elevation, of a conventional down-draft carburetor, embodying the present invention; and

Figure 2 is a detail section on the line 2—2 of Figure 1.

This application relates to a device which might be considered an improvement on the device disclosed in the application of Lawrence C. Dermond, S. N. 438,771, filed June 23, 1954, now Patent No. 2,808,244, dated October 1, 1957. In the device disclosed in the Dermond application, a piston which is connected to the choke valve is slidable in a cylinder to which the engine suction, which is maintained posterior to the throttle, is communicated through a conduit which connects with the side of the cylinder at such a point that the conduit is blocked by the piston after the relatively small movement of the choke valve, which takes place when the engine first becomes self-operative. This renders the suction conduit substantially ineffective and it remains ineffective throughout the remainder of the opening movement of the choke valve which is effected by the pressure differential across the choke valve itself as the engine temperature progressively increases and the force of the thermostat is reduced.

In some installations, this mechanism does not effect opening of the choke valve rapidly enough after the valve reaches a certain position and the mixture becomes slightly too rich for best engine operation during the latter part of the engine warm-up period and the last 20 to 30 degrees of movement of the choke valve. In the device disclosed and claimed in this application the means for communicating suction to the piston, such as disclosed by Dermond, is rendered ineffective in just the same way as in the device of Dermond, but is rendered effective again after the choke valve is approximately 60 degrees open and remains effective throughout the rest of the movement of the valve to its full open position. This results in somewhat more rapid movement of the choke valve toward open position in that part of its operating range, above 60 degrees open, and produces a slightly leaner mixture in that part of the valve's movement.

Except for the change in the operating means for the choke valve which has been referred to, the device disclosed is of just the same construction as that shown in the Dermond application, but it should be noted that as shown, the position of the fuel supply tube which conveys fuel from the fuel chamber to the fuel inlets has been reversed and such tube is at the right side of the fuel chamber, as seen in Fig. 1 instead of on the left side, as in Dermond.

The carburetor comprises three castings, 2, 4 and 6 suitably secured together by screws 8, or in any suitable way. The casting 2 is the air inlet casting having a passage 10 for admission of air. The casting 4 is the fuel chamber casting and has a constant level fuel chamber 12 therein, in which fuel is maintained at a substantially constant level by mechanism which will be very briefly described later. The passage 10 communicates with a chamber or passage 14 centrally located in the casting 4 into which fuel is introduced and which forms the mixing chamber of the carburetor.

The casting 4 is immediately above and secured to the casting 6, which is the outlet casting, and is secured in any suitable way to the intake manifold of the engine. An outlet passage 16 is formed in the casting 6 and connects with the passage 14, the passages 10, 14 and 16, forming a continuous intake passage through the carburetor through which air entering the inlet flows and is mixed with fuel to form a combustible mixture which flows through the outlet passage 16 to the engine.

The flow of mixture from the carburetor is controlled by a suitable throttle valve 18 secured to a shaft 20 suitably journalled for rotation in the walls of casting 6. This throttle is manually operated in the usual manner by means of an arm 22 secured to one end of the shaft 20 and is variably positioned to control the volume of mixture supplied to the engine and the speed thereof.

Fuel is supplied to the fuel chamber 12 through a passage 24 formed in the wall of casting 2 and communicating with this passage is a nipple 26 threaded in the wall of casting 2 and having a passage 28 which conveys fuel from passage 24 to chamber 12. The nipple 26 is enlarged at its lower end to form a cylindrical chamber 30 in which is received a valve 32 which controls flow through passage 28. This valve is freely movable and its lower end rests on a tang 34 cut out from an integral with a plate or bracket 36 which is secured to a float (not shown), and is pivoted on a pin 38 mounted in lugs 40 which are integral with and depend from the casting 2 into the chamber 12. When the fuel reaches a predetermined level, the float is raised enough to move the valve 32 against its seat to close

passage 28. This is a conventional float valve construction and forms no part of the present invention.

A tube 42 is secured at its upper end in any suitable way to an annular rib 44 projecting from the casting 2 and has a fuel passage 46 formed therein to convey fuel from the chamber 12 to the carburetor mixing chamber. A calibrated plug 48 is screwed into the lower end of tube 42 and meters the fuel supplied to the mixing chamber. The passage 46, at its upper end, connects with a cross-passage 50 formed in a bridge member 52 which extends across the mixing chamber and is integral with the casting 2. The passage 50 supplies fuel to the main nozzle 54 which extends into a small venturi tube 56 positioned in the mixing chamber and extending into a large venturi 57 which forms the wall of the mixing chamber. A plug 58 having a restricted orifice therein is positioned in the main nozzle to aid in atomizing the fuel. Air is admitted to the passage 50 through two small passages 60 to mix with the fuel flowing therethrough.

Positioned in the bridge piece 52 at the right of the main nozzle is a sleeve 62 having a passage therethrough for idling fuel and at its right end, this sleeve is somewhat reduced in size so that it is spaced from the wall of the passage 50, as shown in Fig. 1. The fuel which flows through the sleeve 62 ultimately reaches the passage 64 which supplies fuel to idling fuel supply inlets (not shown), which deliver fuel adjacent the edge of the throttle valve 18.

The admission of air to the passage 10 is controlled by an automatically operated choke valve 70 secured to a shaft 72 suitably journalled for rotation in the wall of the casting 2. This shaft has secured to the left end thereof, as seen in Fig. 1, an arm 74 which has a horizontally extending portion 76. The shaft 72 extends into a housing 78 which is a part of casting 2 and is provided with a removable and adjustable cover-plate 80 which may be either metal or a suitable plastic and is held in any adjusted position by screws 82. The arm 76 at the end of the choke shaft and cooperating parts, about to be described, are positioned in this housing.

The arm 76 is engageable by the hooked end 84 of a thermostat 86, the other end of which is secured to a pin 88 which is fixed in the cover-plate 80, as shown in Fig. 1. Upon reduction of temperature, the hooked end 84 moves counter-clockwise to engage the extension 76 of arm 74 and exerts a pressure thereon to hold the choke valve in closed position, as shown in Fig. 2. By adjustment of plate 80, the pin 88 is rotated and changes the pressure exerted by the thermostat at any given temperature to hold the choke valve closed.

The lower end of the arm 74, as seen in Fig. 2, is pivotally connected to a link 90 which is pivotally connected to a cross-pin 92 extending across a slot 93 in the right end of a piston 94 slidable in a horizontal cylinder 96 integral with the housing 78 and to which the suction maintained in the intake passage posterior to the throttle 18 is communicated through a passage 98. The passage 98 may connect with the carburetor outlet between the throttle and the manifold or with the intake passage in the manifold itself. The particular position of this connection is not material as long as it is on the engine side of the throttle.

The mechanism so far described is substantially the same as that shown in the Dermond application previously referred to.

In the device disclosed herein, the passage 98 connects with the cylinder 96 by means of an orifice 100 in the side wall of the cylinder. This orifice is of rectangular shape, as shown, but may be triangular or of any other shape desired, and the orifice is positioned relatively close to the position occupied by the end of the piston when the choke valve is in its closed position, so that the orifice will be blocked by the side wall of the piston when the choke valve has made a relatively small opening movement, approximately 20%, for example. When the passage 100 is blocked as described, there may be some slight leakage past the piston so that some degree of suction might be communicated to the space 102 at the left of the piston, but there would also be leakage of air past the piston from the right end thereof so that any effect of suction in the space 102 is substantially nullified. Therefore, after the piston reaches the position where the orifice 100 is blocked, there is substantially no force produced by suction which is then effective to move the piston further to the left.

The choke valve will be moved to a position to block the orifice 100 substantially immediately after the engine starts to run under its own power and this position of the valve is that which has been found most desirable for the valve to occupy at the beginning of the warm-up operation of some particular engine. For some other engine, it might be desirable for this movement of the choke valve to be increased or decreased and this can be accomplished within limits, by changing the position of the orifice 100.

There may be some slight difference in the position assumed by the choke valve, when it is first moved by engine suction immediately after the engine becomes self-operative, due to the difference in the force exerted by the thermostat at different temperatures. This will be very slight, however, and the high suction effective immediately after the engine starts to run is always effective to move the valve to a position as much as 20% open so that the opening will be blocked by the piston at practically any temperature which may be encountered when starting.

If the suction which is communicated to the cylinder through orifice 100 continued to be effective on the piston after the choke valve has been opened to the extent referred to during the engine warm-up period, it has been found that in some installations the opening of the valve, in this part of its operating range, would be too rapid and the mixture supplied to the engine would be too lean. To prevent this occurrence, the Dermond device was designed and the construction is much the same in this device. After the orifice 100 is blocked when the valve is about 20% open, the subsequent rate of movement of the valve is controlled primarily by the rate at which the thermostat is heated. After the passage 100 is blocked by the piston, further movement of the valve toward open position is brought about solely by the effect of the pressure differential across the valve and this movement will take place only as fast as the force of the thermostat opposing such movement is progressively reduced, as the thermostat is heated.

To heat the thermostat, heated air is drawn through the housing 78 and to this end the suction passage 98 is connected with the interior of housing 78 by a passage 104 formed in the wall of the housing, as indicated in Fig. 2. The suction which is maintained in the passage 98 is communicated to the space in the housing 78 and is effective to draw heated air from a conventional exhaust pipe stove (not shown) through a conduit 106 and through passage 108 formed in a threaded nipple 110 projecting from housing 78 to which conduit 106 is connected by any suitable coupling means. As this heated air is drawn through the housing 78, the force exerted by the thermostat to hold the choke closed becomes progressively less and the valve moves toward open position at a speed dependent solely upon this reduction in the force of the thermostat, unless the throttle is moved toward open position. If the throttle is so moved, there will be an increase in the pressure differential effective on the choke valve which would cause it to move more rapidly toward open position. At the same time, there would be a reduction in the suction in passage 98 and a slower flow of hot air through housing 78, with slower heating of the thermostat, but this would be more than offset by the increase in opening pressure directly on the valve.

During its movement from a position about 20° open to a position about 60° open, the passage **100** is blocked by the wall of the piston, but when the valve reaches the latter position a passage **112**, extending through the piston wall to a central bore **114** therein, which extends for a considerable portion of the piston's length, is brought into registry with the passage **100**. As soon as this takes place, whatever suction is maintained in the passage **98** is communicated to the space **102** with the result that after the choke valve reaches a position about 60° open, its movement toward further open position is stepped up by the effect of suction, so as to prevent any tendency to form an over-rich mixture during the latter part of the engine warm-up period when the choke valve is approaching wide-open position.

The point in the range of movement of the choke valve at which the passage **112** becomes effective can be changed by changing the position of such passage with reference to the length of the piston and the extent of movement of the valve after the passage **112** becomes effective can be modified by changing the shape or area of the passage. In other words, the passage **112** can be of such shape and/or size that it remains in registry with the passage **100** until the choke valve is fully open or it can be designed to go out of registry with passage **100** before the choke valve reaches wide-open position, if it be so desired.

In the device, as shown, when the choke approaches closely to full-open position, a groove or cut-away part of the piston **116** moves into registry with the passage **100**, so that when the coke is in such position heated air is drawn more rapidly through housing **78** than during the opening movement of the choke, but this passage has no controlling effect on the rate of movement of the choke valve toward open position as a similar passage has in the earlier Dermond device. In this device, the valve is substantially fully open before the groove **116** becomes effective, while in the Dermond device such groove becomes effective when the choke valve is about 55° open.

While the embodiment of the present invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

In a charge forming device for internal combustion engines having a constant level fuel supply chamber, an intake passage having fuel and air inlets and a mixture outlet for supplying a combustible mixture to said engine, a throttle valve for controlling the flow of mixture to the engine and a choke valve for controlling the admission of air through said inlet; mechanism for automatically controlling the operation of said choke valve comprising thermally responsive means operable to hold the valve closed at low temperatures, a suction operated piston slidable in a cylinder and connected to the choke valve so as to effect movement thereof when the piston is moved in one direction, a suction passage in the wall of said cylinder, said suction passage being so positioned that it will communicate the engine suction to one end of the piston when the choke valve is in closed position, said piston including a land adapted to completely block said suction passage to prevent suction from moving said piston after the choke valve has made a predetermined opening movement, and a passage in the wall of the piston movable into registry with said suction passage after the choke valve has made a further predetermined opening movement, said passage being effective to again communicate the engine suction to the piston to effect opening of the choke valve.

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