Dec. 20, 1938. M. A. TRISLER 2,140,776

CARBURETOR

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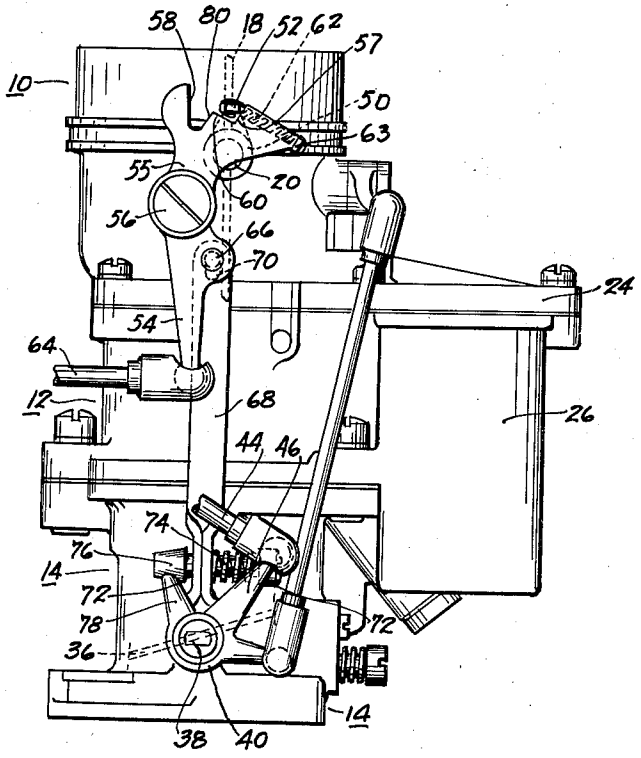
Fig. 1



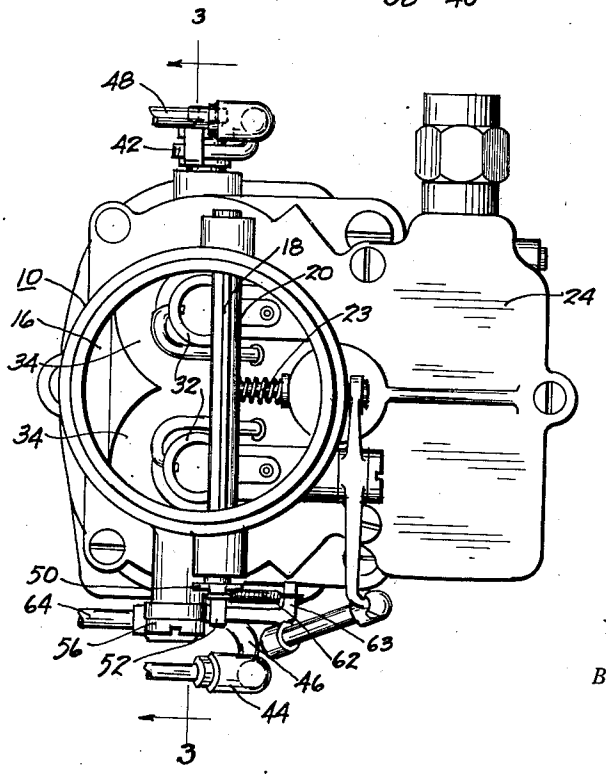


Fig. 2

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Fig. 3

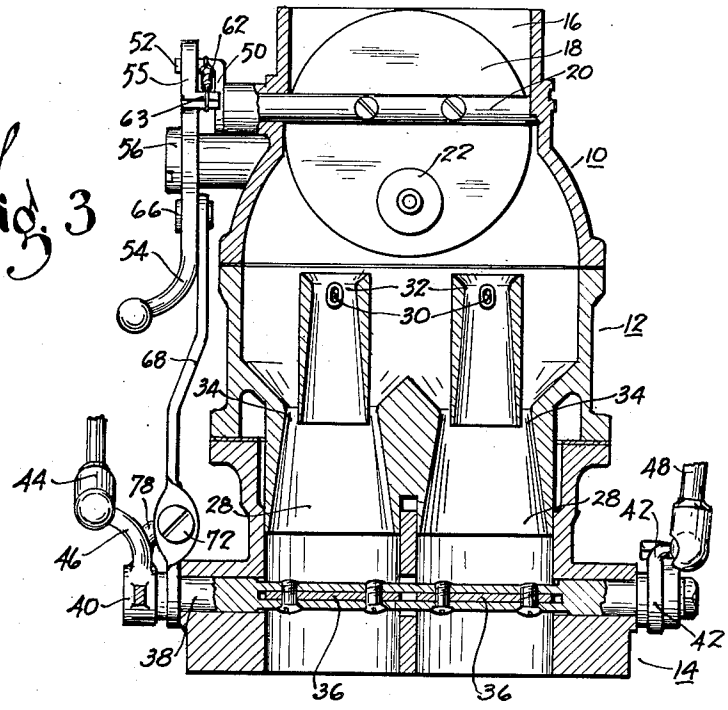


Fig. 4

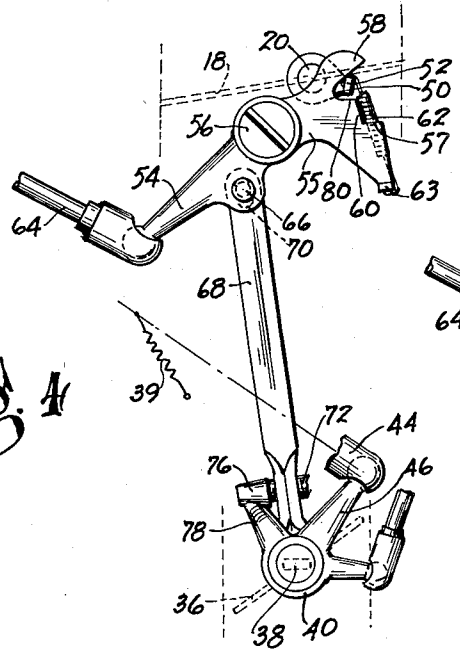
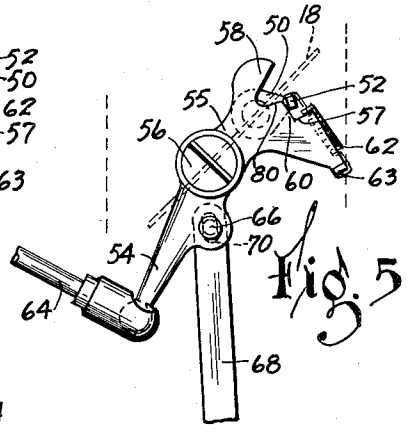


Fig. 5



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UNITED STATES PATENT OFFICE

2,140,776

CARBURETOR

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Application December 5, 1934, Serial No. 756,031

13 Claims. (Cl. 261—52)

This invention relates to carburetors and more particularly to means for controlling the choke and throttle valves of carburetors.

To insure proper operation of internal combustion engines using liquid fuel, it is necessary that the combustible mixture supplied to the engine, by the carburetor, be richer when the engine is cold than when it is operating at normal temperature. This is due to the fact that the liquid fuel will not evaporate to form a combustible mixture as quickly when cold as it will when subjected to the heat of the engine when operating at normal temperature.

It is also necessary to prevent the engine from stalling that it operate at a higher speed when cold than when it is operating at normal temperature. To obtain best results it is desirable that the choke and throttle valves be interconnected in such a manner that the position of the throttle valve be influenced by the position of the choke valve. The present invention provides a novel interconnecting linkage between the choke and throttle valves operative to prevent the throttle valve from completely closing when the choke valve is moved toward the closed position.

The quantity of air required by the carburetor varies rapidly under various operating conditions of the engine. It is therefore impossible for the operator to manually control the choke valve of the carburetor to provide the most desirable combustible mixture to the engine. If too great a quantity of air is admitted the mixture formed in the carbureting passage will be too lean and the engine will stall. If insufficient air is supplied the resulting mixture will be too rich and the engine will choke and stall due to the presence of an incombustible rich mixture in the cylinders of the engine. The excess fuel will seep down between the rings of the pistons and the cylinder walls to the crankcase and dilute the lubricant contained therein. Overchoking thus results in a waste of fuel and the resulting poor economy of operation of the engine.

To obviate this difficulty the present invention incorporates a novel choke actuating mechanism wherein the quantity of air supplied to the carburetor is dependent upon the requirements of the engine.

It is therefore an object of this invention to provide an interconnecting linkage between the choke and throttle valves operative to prevent the throttle valve from completely closing when the choke valve is moved toward the closed position.

Another object of the present invention is to provide means for progressively varying the idling speed of the engine in accordance with the position of a manually actuated choke valve.

Still another object is to provide means for actuating a pressure responsive choke valve wherein the choke valve may be positively closed or positively opened, or resiliently urged toward the closed position and subject to actuation in the opening direction by the force of the air entering the carburetor.

A still further object of the invention is to provide a pressure responsive choke valve having stop members to limit the movement of the valve in both directions, manual means to control the effective movement of the choke valve, and to vary the yielding force urging the choke valve toward the closed position.

Other objects and advantages of this invention will be apparent from the following detailed description, together with the accompanying drawings, submitted for purposes of illustration only, and not intended to define the scope of the invention, reference being had for that purpose to the subjoined claims.

In the drawings wherein similar reference characters refer to similar parts throughout the several views:

Figure 1 is a side elevation of a carburetor embodying the invention;

Fig. 2 is a plan view of the same;

Figure 3 is a section on the line 3—3 of Figure 2;

Figure 4 is a diagrammatic view showing the positions of the parts when the choke valve is in closed position; and

Figure 5 is a view similar to Figure 4 showing the choke valve in the partially open position.

Referring more particularly to Figure 1 there is shown a carburetor having an upper or air-horn section 10, a middle or fuel reservoir section 12, and a lower or throttle body section 14.

The upper or air-horn section 10 is provided with an air inlet passage 16 having an unbalanced choke valve 18 rotatably mounted therein on a choke shaft 20. A spring-pressed poppet relief valve 22 slidably mounted on a stem 23 is positioned in the larger face of the choke valve 18. The lower portion of the air horn section 10 is provided with a flange 24 to form a cover for the fuel reservoir 26 carried by the middle body section.

The middle body section 12 divides into two sections to form two parallel closely adjacent mixing chambers 28. Liquid fuel is supplied to

the mixing chambers 28 from the fuel reservoir 26 through fuel discharge nozzles 30 positioned to discharge at the most restricted sections of the primary venturis 32 which in turn discharge at the most restricted sections of the secondary venturis 34.

A combustible mixture is formed by the air entering the air inlet passage 16 and the fuel drawn from the fuel nozzles 30. The flow of combustible mixture through the mixing chambers 28 is controlled by the throttle valves 36 fixed to a throttle shaft 38, journalled in the walls of the throttle body section 14. A crank 40 having a plurality of arms is fixed to one end of the throttle shaft 38 and an arm 42, provided with an overrunning connection between the shaft 38 and the arm 42 is received at the other end of the shaft 38.

The throttle valves 36 may be actuated in the usual manner through a linkage comprising the link 44 and the arm 46 carried by the crank 40, or the link 48 and the arm 42 through the overrunning connection between that arm and the shaft 38. The throttle valve 36 is yieldingly urged toward the closed position by the usual throttle return spring 39.

The choke valve 18 may be actuated by a crank 50 fixed to the choke valve shaft 20. The crank 50 is provided with an ear 52 extending laterally therefrom.

Means are provided whereby the choke and throttle valves are interconnected in such a manner that as the choke valve 18 is moved in the closing direction, the throttle valves 36 are opened a small amount to permit the engine to idle at higher than normal speed.

A lever 54 is pivotally mounted on a stud 56 fixed in the walls of the air-horn section 10, preferably between the choke and throttle shafts and offset with respect thereto. The upper end 55 of the lever 54 is provided with two stop members 57 and 58 and a laterally extending surface 60 between the stop members. The ear 52 extending laterally from the crank 50 fixed to the choke shaft 20 extends into the space between the stop members 57 and 58. The lower surface of the ear 52 is designed to contact with the surface 60 under certain conditions and the stop members 57 and 58 are designed to positively engage the ear 52 to rotate the crank 50 and move the choke valve 18 to the fully open and closed positions respectively. Means including a spring 62, connecting the ear 52 with an ear 63 carried by the lever 54, are provided whereby the choke valve 18 may be yieldingly urged in the closing direction as the lever 54 is rotated in the clockwise direction as viewed in Figure 1. As the lever 54 is rotated to close the choke valve the spring 62 is tensioned, thereby applying an increasing force on the ear 52 and the crank 50 to move the choke valve 18 toward the closed position.

The lever 54 may be actuated in the usual manner through a manually operable linkage including the link 64 connected with the lower end of the lever 54. The lever 54 carries a pin 66 between stud 56 and the connection with the link 64. The pin 66 is preferably offset with respect to the center line of the lever 54 to place it in line with the choke and throttle shafts, when the choke valve 18 is in the fully open position.

A link 68 preferably rotatably mounted at its lower end on the throttle shaft 38 is provided with a slot or lost motion connection 70 at its upper end to engage the pin 66 carried by the lever 54. Threaded through the link 68 is an adjustable stop screw 72 having a locking spring 74 to prevent rotation of the screw by vibration during normal operation of the device. The stop screw 72 engages a stop member 76 carried by an arm 78 of the crank 40 when the throttle valves 36 are moved toward the closed position.

The operation of this device is as follows. When the operator wishes to start the engine while it is cold he pulls the choke button or other member (not shown) connected to the link 64, thereby rotating the lever 54 in the clockwise direction from the position shown in Figure 1 to the position shown in Figure 4. As the lever 54 is rotated in the clockwise direction the spring 62 exerts a force on the crank 50 to move the choke valve 18 toward the closed position. When the lever 54 reaches the position shown in Figure 4 the stop member 58 carried by the lever 54 engages the ear 52 and positively moves the choke valve 18 to the full closed position.

As the lever 54 is rotated, the link 68 is rotated in the counterclockwise direction about the throttle shaft 38. The adjustable stop screw 72, carried by the link 68, engages the stop member 76 to rotate the throttle shaft 38 in the counterclockwise direction and open the throttle valves 36 to the starting position as shown in Figure 4.

The starting mechanism of the engine is then actuated. The suction of the engine is transmitted past the throttle valves 36 to the carburetor, and the choke valve being held tightly closed, a rich combustible mixture, suitable for starting the engine when cold, is produced.

As soon as the engine begins to operate on its own power the operator moves the choke actuating mechanism a small amount in the opening direction. The lever 54 is thereupon rotated a small amount in the counterclockwise direction. The stop member 58 moves out of contact with the ear 52 and the choke valve 18 is then merely resiliently urged in the closing direction by the spring 62. The force of the air entering the air inlet passage 16 and impinging upon the unequal areas of the valve 18 will force it open, against the resistance of the spring 62, an amount sufficient to supply an adequate quantity of air for proper operation of the engine.

The contour of the upper end 55 of lever 54 is such as to permit the choke valve to have varying ranges of movement for different positions of the lever 54. In the position of the parts shown in Figure 4, the choke valve is positively held in the fully closed position. When the choke button is pushed inwardly a short distance, the ear 52 contacts the surface 80. In this position the valve 18 is free to open a small amount by the force of the air entering the air inlet passage 16, the extent of this movement being determined by the amount of clearance between the edges of the ear 52 and the stop member 58 on the one hand, and the surface 80 on the other hand.

When the choke button is pushed inwardly to a further extent, the surface 80 engaging the edge of the ear 52 forces the ear to rotate a small amount in the counterclockwise direction to move the ear to the top of the surface 60, as shown in Figure 5. The choke valve 18 is thereby positively opened a small amount to prevent the engine from becoming flooded with an excessively rich mixture, and is free to open to a greater extent due to the force of the air entering the air inlet passage 16. At the same time, the tension of the spring 62, connecting the ears 52 and 63, is decreased, thereby decreasing the resilient force urging the choke valve 18 toward the closed position.

When the engine is completely warmed up, the operator moves the choke button to the full open position. Stop member 57 thereupon engages the ear 52 and positively moves it to a position to rotate the crank 50 and open the choke valve 18 to the fully open position shown in Figure 1, whereupon the stem 23 of the spring pressed relief valve 22 will come into contact with the walls of the air-horn section 10 to prevent the choke valve 18 from rotating beyond the fully open position.

As the operator progressively pushes the choke button in, thereby rotating the lever 54 in the counterclockwise direction, the pin 66 rotates the link 68 in the clockwise direction. The link 68 being rotatably mounted on the throttle shaft 38, rotates about that shaft, thereby moving the adjustable stop 72 away from the stop member 76 so that the throttle valve may be moved to a more nearly closed position by the throttle return spring 39, so that the idling speed of the engine is progressively reduced to normal.

It thus appears that the present invention provides means for cracking the throttle valve automatically upon actuation of the choke valve preparatory to starting the engine, without the necessity of manual operation on the part of the operator.

The invention also provides means for operating the engine at a relatively high speed when it is cold and at progressively lower speeds as the engine is warmed up to normal operating temperatures.

It will be understood of course that this invention may also be applied to a carburetor wherein the choke valve is actuated automatically in accordance with the engine operating variables such as temperature, manifold vacuum, and other factors.

While the invention has been described with particular reference to a preferred illustrative embodiment it is not intended to limit the scope of the invention to the details shown and described as various modifications may be made therein without departing from the spirit of the following claims.

I claim:

1. In a carburetor having a main carbureting passage with choke and throttle valves mounted therein on shafts journalled in the walls of said main carbureting passage, a throttle opening mechanism interconnecting said choke and throttle valves and comprising a lever pivoted to the walls of the main carbureting passage and provided with a pair of spaced stops and a cam surface therebetween, an ear fixed to said choke shaft to be engaged by said stops and cam surface and rotated thereby, and a spring connecting said ear to one of said stops.

2. A down draft plain tube carburetor having choke and throttle valves, means including a lever to actuate the choke valve, and means including a stop member fixed to the throttle valve and a link pivotally mounted with respect to the throttle valve and actuated by said lever through a lost motion connection to move the throttle valve from the closed position when said lever is actuated to close the choke valve.

3. In a carburetor having an air-horn section forming an air inlet passage and a carbureting passage, an unbalanced choke valve controlling the flow of air into the air inlet passage, a shaft therefor, a throttle valve controlling the flow of fluid through the carbureting passage, a shaft therefor, means including a lever pivoted to the air-horn section to actuate the choke valve, stop means including a link rotatably mounted on the throttle shaft and actuated by said lever, a lost motion connection between said link and said lever, a stop member fixed to the throttle shaft and operable by said link to progressively move the throttle valve from the closed position when the choke valve is moved toward the closed position and to progressively return the throttle valve to the closed position as the choke valve is moved toward the open position.

4. In a carburetor having an air-horn section forming an air inlet passage, an unbalanced choke valve controlling the flow of air into the air inlet passage, a shaft therefor, a carbureting passage, a throttle valve controlling the carbureting passage, a shaft therefor, an arm having a laterally extending ear fixed to the choke shaft, means including a lever pivotally mounted on the air horn section and engaging said laterally extending ear to actuate the choke valve, a stop member fixed to the throttle shaft, a link pivotally mounted on the throttle shaft and engaging said lever, an adjustable stop member carried by said link and adapted to engage the stop member fixed to the throttle shaft, and means to actuate said lever to close the choke valve and to move the throttle valve from closed position an amount proportional to the closing movement of the choke valve.

5. In a carburetor having an air-horn section forming an air inlet passage, an unbalanced choke valve controlling the flow of air into the air inlet passage, a shaft therefor, a carbureting passage, a throttle valve controlling the carbureting passage, a shaft therefor, yielding means urging the throttle valve toward the closed position, an arm having a laterally extending ear fixed to the choke shaft, means including a lever pivotally mounted on the air-horn section and engaging said laterally extending ear to actuate the choke valve, stop means carried by the lever to limit the movement of the choke valve in both directions, yielding means connecting the ear to the lever to urge the choke valve toward the closed position, a stop member fixed to the throttle shaft, a link pivotally mounted on the throttle shaft and engaging said lever, a lost motion connection between the link and lever, an adjustable stop member carried by said link and adapted to engage the stop member fixed to the throttle shaft, and means to actuate said lever to close the choke valve and to progressively move the throttle valve from closed position as the choke valve progressively moves toward the closed position and to permit the throttle valve to be progressively returned to the closed position as the choke valve is progressively moved toward the open position.

6. A carburetor having an air-horn section, a choke shaft extending through the air-horn section and offset from the axis thereof, a choke valve fixed to the choke shaft, an arm fixed to the choke shaft, an ear fixed to the arm and extending laterally therefrom, means including a lever pivotally mounted on the air-horn section to actuate the choke valve, stop members carried by said lever to engage said ear and limit the movement of the choke valve in two directions, yielding means urging said ear toward one of said stop members, and a cam member positioned between the stop members and adapted to engage said ear to limit the movement thereof in accordance with the position of said lever.

7. A carburetor having an air horn section, a

choke shaft extending through the air-horn section and offset from the axis thereof, a choke valve fixed to the choke shaft, an arm fixed to the choke shaft, an ear fixed to the arm and extending laterally therefrom, means including a lever pivotally mounted on the air-horn section to actuate the choke valve, stop members carried by said lever to engage said ear and limit the movement of the choke valve in two directions, yielding means urging said ear toward one of said stop members, a cam member positioned between the stop members and adapted to engage said ear to limit the movement thereof in accordance with the position of said lever, a carbureting passage, a throttle shaft extending through said passage, a throttle valve fixed to the throttle shaft, yielding means urging the throttle valve toward closed position, a stop member carried by the throttle shaft, a link pivotally mounted on the throttle shaft and engaging said lever, a lost motion connection between the link and lever, and adjustable means carried by the link and engaging said stop member to move the throttle valve from closed position when the choke valve is moved toward the closed position.

8. A choke control lever adapted to receive an actuating member at one end, and having spaced stop members at the other end adapted to receive therebetween a choke lever, a laterally extending surface between the stop members adapted to engage said choke lever to limit the range of movement of said choke lever under certain operating conditions, an extension on the control lever designed to receive a resilient member adapted to urge said choke lever toward one of said stop members, and means to pivot the control lever between the two ends.

9. In a carburetor having an air inlet, a pressure-responsive valve controlling said air inlet, yielding means urging the valve toward closed position, a pair of spaced stop members cooperating to limit the range of pressure responsive movement of the valve, and control means including a lever pivoted on the carburetor to vary said range and to simultaneously vary the rate of travel of the choke valve and the force exerted by the yielding means.

10. In a carburetor having a body section including an air inlet passage, a pressure responsive choke valve controlling the air inlet passage, a shaft therefor, actuating means for the choke valve including a lever rotatably mounted on the body section, a pair of spaced stop members and a cam surface carried by one end of the lever, an arm fixed to the choke shaft, a projection carried by the arm adapted to be engaged by the spaced stop members and to engage the cam surface to vary the rate of movement of the choke valve with respect to the rate of movement of the lever, and yielding means urging the projection toward one of the stop members.

11. A carburetor having a body section including a vertically disposed air inlet passage, an unbalanced choke valve controlling the air inlet passage, a shaft therefor, actuating means for the choke valve including a lever pivotally mounted on the body section eccentric with respect to the choke shaft, a pair of spaced stop members and a cam surface carried by one end of the lever, an arm fixed to the choke shaft, an ear carried by the arm adapted to be engaged by the spaced stop members and to engage the cam surface to increase the initial rate of closing movement of the choke valve with respect to the rate of movement of the lever, and yielding means urging the ear toward the stop member limiting the closing movement of the choke valve.

12. In a carburetor a pressure responsive choke valve, control means including a pair of spaced stop members limiting the movement of the choke valve to a predetermined range, yielding means urging the choke valve toward one of the stop members while permitting pressure to urge it toward the other, and means to vary the force exerted by the yielding means.

13. A carburetor having a pressure responsive air inlet valve, control means including a pair of spaced stop members limiting the movement of the air inlet valve, yielding means urging the air inlet valve toward one of the stop members, manually operative means to vary the force exerted by the yielding means, and a cam member positioned between the stop members to vary the range of movement of the air inlet valve.

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