Jan. 30, 1934. S. F. HUNT 1,945,191

CARBURETOR

Filed May 4, 1931 2 Sheets-Sheet 1

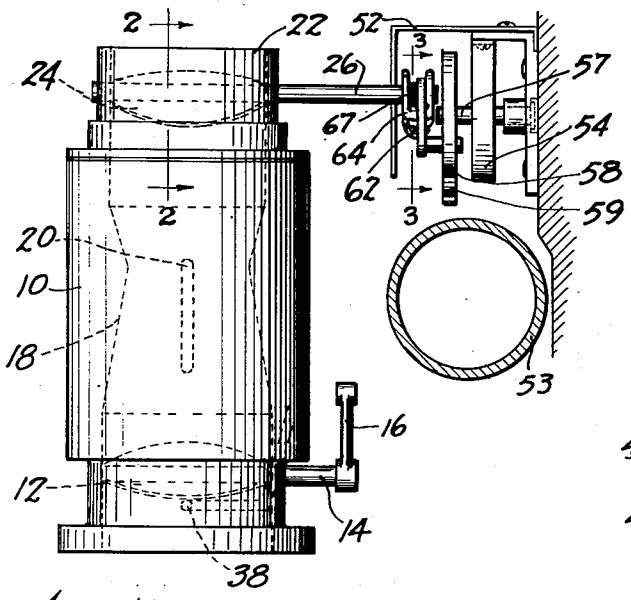

Fig. 1

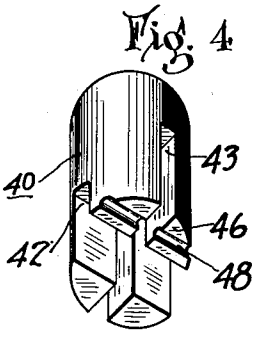

Fig. 4

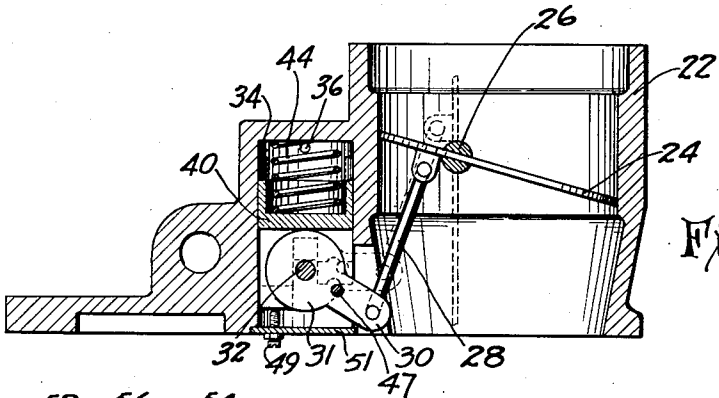

Fig. 2

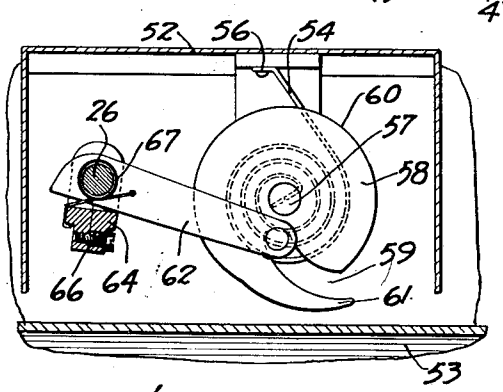

Fig. 3

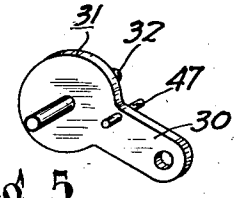

Fig. 5

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CARBURETOR

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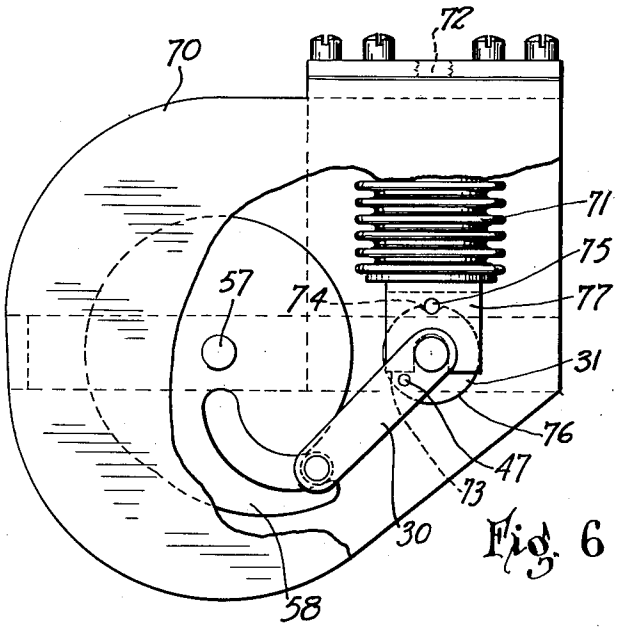

Fig. 6

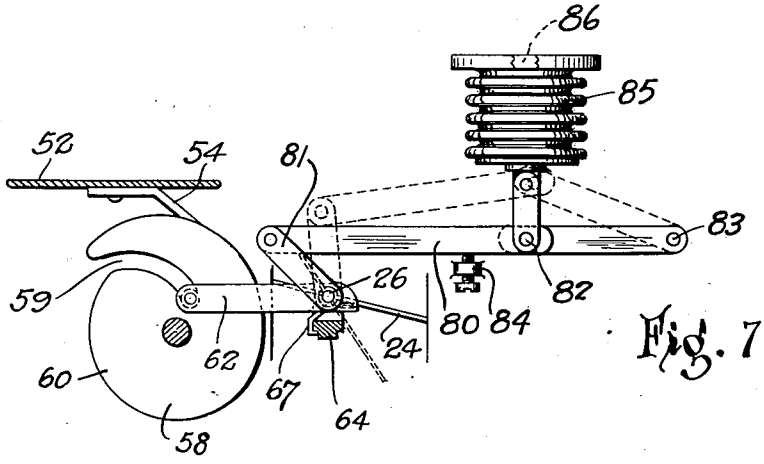

Fig. 7

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Patented Jan. 30, 1934 1,945,191

UNITED STATES PATENT OFFICE

1,945,191

CARBURETOR

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Application May 4, 1931. Serial No. 534,795

38 Claims. (Cl. 123—124)

This invention relates to carburetors and more particularly to carburetor choke valves adapted for use in connection with internal combustion engines.

Internal combustion engines ordinarily require an abnormally rich mixture for starting purposes, and this is usually supplied by restricting the air inlet to the carburetor by a manually operated choke valve. Various automatic devices have been heretofore suggested for operating the valve with the idea of eliminating the manual control, but all of them, insofar as I am aware, have made no provision for an increased force to hold the valve in its fully closed position. Prior to the present invention, it has been customary in automatic control devices to close the valve by a spring which obviously exerts a decreased closing force as it nears its free position, and which free position corresponds to the closed position of the valve. It is believed that the resistance to opening should be increased in the closed position of the valve and a mechanism accomplishing this function is an important feature of this invention.

Automatic chokes also preferably include a heat responsive device, or thermostat, for controlling the valve in accordance with temperature and, since the need for choking diminishes rapidly as the temperature increases, the thermostat ordinarily opens the choke at a temperature below the maximum encountered. The usual practice heretofore has been to provide a stop for the wide-open choke position and to select a thermostat that has sufficient strength to withstand the stresses imposed upon it by the higher temperatures.

The present invention has for its principal object the provision of an automatic choke which functions in accordance with the needs of the engine and which can respond to temperature changes without imposing undue stresses on the operating parts at abnormal temperatures.

Another object of the invention is to provide a choke which is held resiliently closed, and which presents an increased resistance to opening at or about its fully closed position.

Another object of the invention is to provide a choke valve in which the thermostatic element is permitted an over-travel beyond the wide-open position of the valve.

Another object of the invention is to provide a thermostatic choke control that will positively open and close the valve without being subjected to high stresses at temperatures beyond those corresponding to the wide open position.

Another object of the invention is to provide a choke valve in which the closing force is decreased immediately after the initial opening of the valve.

Other objects and features of the invention relating to the arrangement of parts and details of manufacture will appear from the following description in connection with which I have illustrated certain embodiments of the invention in the accompanying drawings, in which:

Figure 1 is a view of a carburetor with my improved choke valve installed thereon and showing the arrangement of the operative parts;

Figure 2 is a sectional view taken in the direction of the arrows 2—2 of Figure 1;

Figure 3 is a sectional view taken on lines 3—3 of Figure 1, showing the arrangement of the thermostat and the choke operating cam;

Figure 4 is a perspective view of the vacuum operated piston;

Figure 5 is a perspective view of the actuating arm which contacts with the vacuum operated piston;

Figure 6 is a view showing a modification of the vacuum operated device; and

Figure 7 is a further modification showing a control of the valve by a vacuum controlled toggle joint.

Referring to the drawings, 10 is a carburetor of the down-draft type, although the type is immaterial, and the choke is equally adaptable to any of the well-known carburetors. Within the carburetor are Venturi tube 18, fuel jet 20, and a throttle valve 12, rotatably mounted on a shaft 14 to which is connected an operating lever 16. Air intake 22 of the carburetor has an unbalanced choke valve 24 rotatably mounted on shaft 26 in position to be opened by the pressure of the inflowing air.

A link 28 is pivotally connected to one side of the valve 24 and has its opposite end pivotally connected to arm 30 of lever 31 that is journalled in the body of the carburetor by shaft 32. Lever 31 is located beneath a cylinder 34 having its upper portion subjected to the vacuum in the carburetor on the engine side of throttle valve 12, the connection being made by means of opening 36 which leads through a passage or pipe (not shown) to the opening 38 immediately below the valve 12. Cylinder 34 contains a piston 40 having a slot 42 slidably engaging shaft 32, and a slot 43 within which the arm 30 may move. The piston 40 is pressed downwardly by a spring 44 and has its lower face 46 in engagement with a pin 47, which in the lowest position of the piston, rests within an arcuate notch 48. Notch 48 is so formed as

to increase the mechanical advantage of piston 40 to hold choke valve 24 in its full closed position, and to impose an increased opening resistance until pin 47 moves out of the notch 48 and contacts the adjacent flat face 46 of the piston 40, whereupon the resistance to opening is substantially proportionate to the force of spring 44 and increases with the upward movement of piston 40. A stop screw 49 is preferably provided in plug 51 which provides an adjustment for limiting the lower position of piston 40.

Choke operating shaft 26 is projected outwardly from the carburetor and extends into a casing 52 within which is a heat responsive or thermostatic device 54 mounted adjacent the engine exhaust pipe 53. The thermostatic device preferably comprises a spirally wound expansive member 54 having one end secured to the casing 52 at 56 and its opposite end secured to a rotatable shaft 57. A cam 58 is secured to shaft 57, and is provided with an inwardly extending slot 59, a concentric portion 60, and a projecting hooked portion 61.

Within slot 59 is slidably mounted one end of a lever 62 having its opposite end pivotally mounted on choke valve shaft 26. A bracket 64 is secured to the end of shaft 26 by any desired means, such as clamp screw 66, and has an abutting face adapted to contact with lever 62 and permit bracket 64 to have a slight tilting movement with respect to the lever. A spring 67 is spirally wound about shaft 26 and has its opposite ends coacting between lever 62 and bracket 64 in a manner to urge choke valve 24 toward its closed position, or in a counterclockwise direction as shown in Figure 2.

In the form of the invention shown in Figure 6, I have shown the vacuum control and thermostatic control mounted in a unitary housing 70 within which is mounted a thermostat and its operating cam 58, and a vacuum operated bellows 71, which is adapted to be connected with the body of the carburetor by opening 72. The lower portion of the bellows 71 is provided with a member 77 having a face 73 contacting with pin 47 on the operating arm 30 and a pin 75 which rests within a notch 74 formed in the periphery of the circular portion 76 of the lever 31. In the lowest position of the bellows, pin 47 preferably has a slight clearance with the lower edge 73 of the member 77 and lever 31 is resiliently held in the position shown, until pin 75 has been forced from the notch 74, whereupon pin 47 engages face 73 and the inherent resiliency of the bellows 71 tends to increase in a substantially direct rate as the lever 31 is rotated in a clockwise direction. In this form of the invention, thermostat shaft 57 may be connected to the choke shaft 26 in the same manner as that shown in Figure 1.

In the form of the invention shown in Figure 7, the modification consists in the substitution of a vacuum controlled toggle joint for the piston or bellows shown in the other constructions. In this form of the invention, a lever 81 is secured to choke valve shaft 26 and has its outer end pivotally connected to a toggle 80 having a hinge joint 82 and a pivotal connection to a fixed support at 83. Adjustable stop 84 is provided to limit the downward movement of the toggle joint 80 and preferably causes it to assume very nearly a straight line position in the closed position of the choke valve 24. Toggle 80 is pivotally connected intermediate its ends to a vacuum operated device or bellows 85, which is adapted to be connected with the body of the carburetor through opening 86. In this form of the invention, the valve 24, in its closed position, has an increased force against opening imposed upon it by the straight line position of toggle 80 and the inherent resiliency of the bellows 85. The thermostat mechanism is the same as that described in connection with Figure 3.

In the operation of the invention with particular reference to the forms shown in Figures 1 to 5, inclusive, the initial start of the engine is ordinarily made with a cold thermostat and with the choke valve in the position shown in full lines in Figure 2. The starting operation is accomplished by any desired means and the engine is cranked in the usual manner.

The vacuum developed by the cranking operation is insufficient to lift piston 40 against the resistance of spring 44 and valve 24 is substantially locked in its closed position by the pressure of pin 47 within the notch 48. As soon as the engine starts, the vacuum above the throttle is increased and piston 40 is moved upwardly and removes the pressure upon pin 47. Thereupon, valve 24 may be moved by air flow in a clockwise direction against the tension of spring 67 until bracket 64 has the outer portion of its side face in contact with lever 62, which movement is preferably not over 10 or 15 degrees. After the engine is started, the hot gases in exhaust pipe 53 transmit heat to the thermostat 54 which rotates cam 58 in a clockwise direction as viewed in Figure 3, and moves the end of lever 62 to the outer portion of slot 59. This movement of lever 62 rotates valve 24 in a clockwise position until the valve reaches the position shown in dotted lines in Figure 2. At this point in the valve movement, lever 62 emerges from slot 59 and further rotation of the cam 58 under the influence of increased heat, permits the cam to freely rotate with the end of lever 62 in sliding contact with the concentric portion 60 of the cam without further movement of the choke valve. Upon stopping of the engine, the thermostat 54 as it cools will rotate cam 58 in a counter clockwise direction and the end of lever 62 will be caught by the hook portion 61 and directed inwardly into slot 59, to a position corresponding to the closed position of the choke valve 24 as shown in full lines in Figure 2.

In the operation of the forms shown in Figures 6 and 7, a similar result will be obtained, although in Figure 6, the resistance against initial opening is secured by a pin riding in a notch 74 formed on the periphery 76 of the circular portion of lever 31, and in Figure 7, the resistance is obtained by the straight line position of the toggle.

While I have illustrated and described certain embodiments of my invention, it is understood that this showing and description are illustrative only, and that I do not regard the invention as limited to the forms shown and described, or otherwise, except by the terms of the following claims.

I claim:

1. A carburetor choke comprising, an air actuated valve, resilient means for closing the valve, vacuum controlled means for modifying the effect of the closing means, and additional means for varying the effect of the control in accordance with the valve position.

2. A carburetor choke valve comprising an air actuated valve, and a control therefor including a device exerting a greater force to hold the valve in a closed position, than in a partially closed

position, and means to render the control inoperative under certain conditions.

3. A carburetor choke comprising an air actuated valve, a spring device for holding the valve closed, means whereby the device exerts a greater closing force in the closed position of the valve than in the partially closed position, and automatic means for rendering the member inoperative to close the valve under normal operative conditions.

4. A carburetor choke comprising an air actuated valve, means for holding the valve closed, and means modifying the effect of the holding means in accordance with the position of the valve.

5. A carburetor choke comprising an air actuated valve, a spring for holding the valve closed, and means modifying the effect of the spring in accordance with the position of the valve.

6. A carburetor choke comprising an unbalanced air valve, and a linkage secured to said valve, a spring coacting with the linkage to close the valve, said linkage being arranged to have an abrupt change in mechanical advantage as the valve reaches the fully closed position.

7. A choke for a carburetor comprising an air actuated valve, a piston normally exerting a force tending to close the valve, means to increase the mechanical advantage of the force exerted by the piston when the valve is closed, and means to raise the piston.

8. A choke for a carburetor comprising an air actuated valve, a piston normally exerting a force tending to close the valve, means to increase the mechanical advantage of the force exerted by the piston when the valve is closed, and means for neutralizing the force exerted by the piston including a conduit connecting the space adjacent one face of the piston with the interior of the carburetor.

9. A carburetor choke comprising a movable valve, a spring pressed piston, a controlling member movable with the valve and engaging the piston, the engaging surfaces of the member and piston being arranged to exert a greater resistance to initial movement than to subsequent movement of the valve.

10. A carburetor choke comprising a movable valve, a spring pressed piston, a controlling member movable with the valve and engaging the piston, the engaging surfaces of the member and piston being arranged to exert a greater resistance to initial movement than to subsequent movement of the valve, and means whereby said piston may be operated by suction to separate the engaging surfaces.

11. A carburetor choke comprising, a movable valve, and means for resisting the opening of said valve including a vacuum controlled member imposing a resistance to the initial opening of the valve and a decreased resistance thereafter.

12. A carburetor choke comprising, a movable valve, and means for resisting the opening of said valve including a vacuum controlled bellows imposing a resistance to the initial opening of the valve and a decreased resistance thereafter.

13. A carburetor comprising, an air passageway, a choke valve therein, and operating means therefor including a cam adapted to move the valve to both closed and open positions.

14. A carburetor comprising, an air passageway, a choke valve therein, and operating means therefor including a cam adapted to move the valve to both closed and open positions, said operating means being adapted to continue its movement beyond the full open position without producing further movement of the choke valve.

15. A carburetor comprising a choke valve, operating means therefor including a member adapted to positively open and close the valve, said member being adapted to move beyond the open position of the valve without actuating the same.

16. A carburetor comprising a choke valve, operating means therefor including a rotary cam adapted to positively open and close the valve, said cam being adapted to rotate beyond the open position of the valve without actuating the same.

17. A carburetor comprising a choke valve, operating means therefor including a rotatable member having an inwardly extending groove and a concentric surface adjacent thereto, and a member secured to the valve within the groove adapted to be moved thereby during a predetermined rotary movement and contact the concentric surface upon further movement.

18. A carburetor comprising a choke valve, operating means therefor including a rotatable member having an inwardly extending groove and a concentric surface adjacent thereto, a member secured to the valve within the groove adapted to be moved thereby during a predetermined rotary movement and contact the concentric surface upon further movement and heat responsive means to rotate the member.

19. A carburetor comprising an air actuated choke valve, means for closing the valve, means for increasing the effect of the closing means as the valve approaches the closed position, and heat responsive means to nullify the effect of the closing means at increased temperatures.

20. A carburetor comprising an air actuated choke valve, means for closing the valve, means for increasing the effect of the closing means as the valve approaches the closed position, and heat responsive means to nullify the effect of the closing means at increased temperatures, and a connection between the heat responsive means and the valve whereby the heat responsive means is movable relative to the valve after the same is fully open.

21. A carburetor choke comprising an air actuated valve, a lever secured thereto, a toggle connecting the lever to an anchorage, and a fluid operated device connected to the toggle intermediate its ends.

22. A carburetor control comprising a thermostat, a member actuated thereby, said member being arranged to stop at a predetermined point, and said thermostat being adapted to move beyond said point upon further temperature change.

23. A carburetor control comprising a thermostat, a member rotated thereby, said member being arranged to stop at a predetermined point, and said thermostat being adapted to move beyond said point upon further temperature change, and hold said member in a predetermined position.

24. Control mechanism for carburetor, comprising a yielding pressure responsive valve, means for modifying the yielding characteristic of the valve, and means varying the effect of the modifying means in accordance with the position of the valve.

25. Control mechanism for a carburetor of an internal combustion engine, comprising a yielding pressure responsive air valve, means responsive to a pressure developed by operation of the engine for modifying the yielding characteristic

of the valve, and means varying the influence of the modifying means in accordance with the position of the throttle.

26. In a fuel mixture control device, a pressure-responsive air valve, yielding means resisting opening movement of the valve, said means being so related to the valve as to exert a maximum resistance when the valve is near its closed position, and fluid pressure controlled means for varying the effect of said yielding means.

27. In a carburetor for internal combustion engines, a pressure actuated air valve, yielding means resisting opening movement of the valve with a force which increases sharply as the valve nears its closed position, and means responsive to pressure variations generated by the engine in its operation for varying the effect of said yielding means.

28. Control mechanism for a carburetor, comprising a pressure-responsive air inlet valve, a thermostat influencing the movement of the valve, and separate means effectively opposing opening movement of the valve only when the valve is near its closed position.

29. In a carburetion system for an internal combustion engine, a pressure actuated air valve, temperature responsive means yieldingly controlling the degree of opening of the valve, toggle mechanism normally maintaining the valve closed, and suction operated means rendering the toggle mechanism inoperative.

30. In combination with the carburetor of an internal combustion engine, a pressure actuated air valve, a thermostat controlling said valve, means becoming operative when the engine is stopped to prevent opening of the valve, and means responsive to a predetermined degree of suction posterior to the throttle for rendering the first mentioned means inoperative.

31. In combination, with a carburetor having a throttle and a pressure actuated choke valve, a thermostat controlling the choke valve, means preventing opening of the choke valve, said means becoming operative when the choke valve closes and means responsive to a predetermined degree of suction posterior to the throttle for rendering the first mentioned means inoperative.

32. In combination with a carburetor having a throttle and a choke valve, toggle means preventing opening of the choke valve, said means becoming operative when the choke valve closes, and means responsive to a predetermined suction posterior to the throttle for rendering the toggle means inoperative.

33. In combination with a carburetor having a throttle and a pressure actuated choke valve, toggle mechanism preventing opening of the choke valve, said mechanism becoming operative when the choke valve closes and becoming inoperative when the suction in the carburetor reaches a predetermined value.

34. In combination with a carburetor having a pressure actuated air valve, toggle mechanism operative in one position to prevent opening of the air valve, temperature-responsive means yieldingly controlling the air valve and operative to move the toggle mechanism to its operative position, and suction actuated means for moving the toggle to an inoperative position.

35. In combination with an internal combustion engine, a carburetor having a choke valve, temperature responsive means yieldingly urging the valve toward closed position, and suction operated means capable of moving the valve to a partially opened position against the force of the temperature responsive means.

36. In combination with an internal combustion engine, a carburetor having a throttle and a pressure responsive choke valve, temperature responsive means yieldingly urging the valve toward closed position and rendered inoperative at high temperatures, and means responsive to suction posterior to the throttle for moving the valve to a partially opened position against the force of the temperature responsive means.

37. In combination with an internal combustion engine, a carburetor having a choke valve, temperature responsive means yieldingly urging the valve toward closed position at low temperatures, additional means resisting opening movement of the valve, and suction operated means operative to render said additional means inoperative and to move the valve to at least partially opened position against the force of the temperature responsive means.

38. In combination with an internal combustion engine, a carburetor having a throttle and a pressure responsive choke valve, means operative below a predetermined temperature to yieldingly urge the valve toward closed position, additional means resisting opening movement of the valve, and means responsive to a predetermined suction posterior to the throttle for rendering said additional means inoperative and for moving the valve to at least partially opened position against the force of the temperature responsive means.

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