

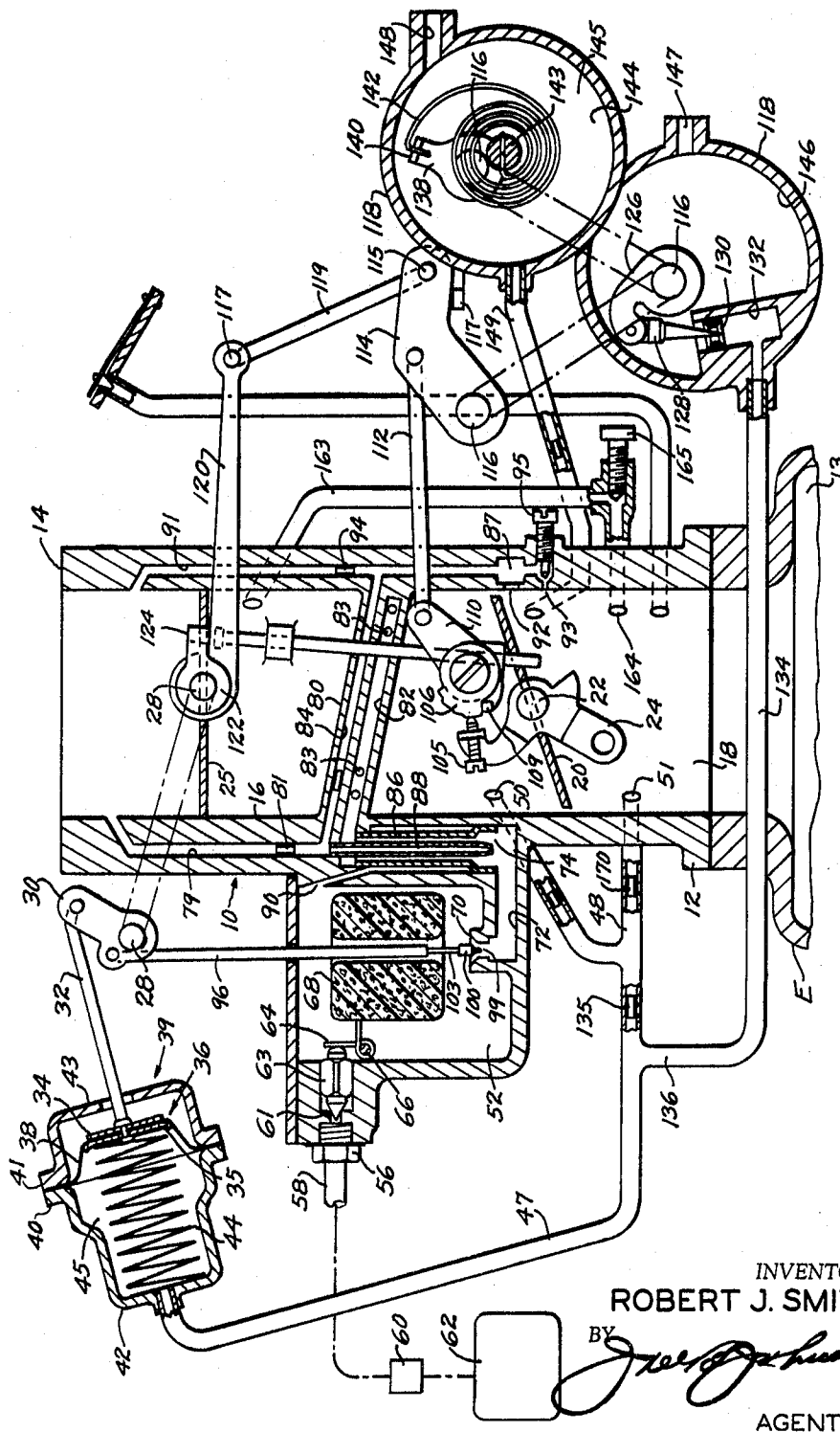
May 3, 1966

R. J. SMITH
CARBURETOR

3,249,344

Filed May 17, 1953

2 Sheets-Sheet 1



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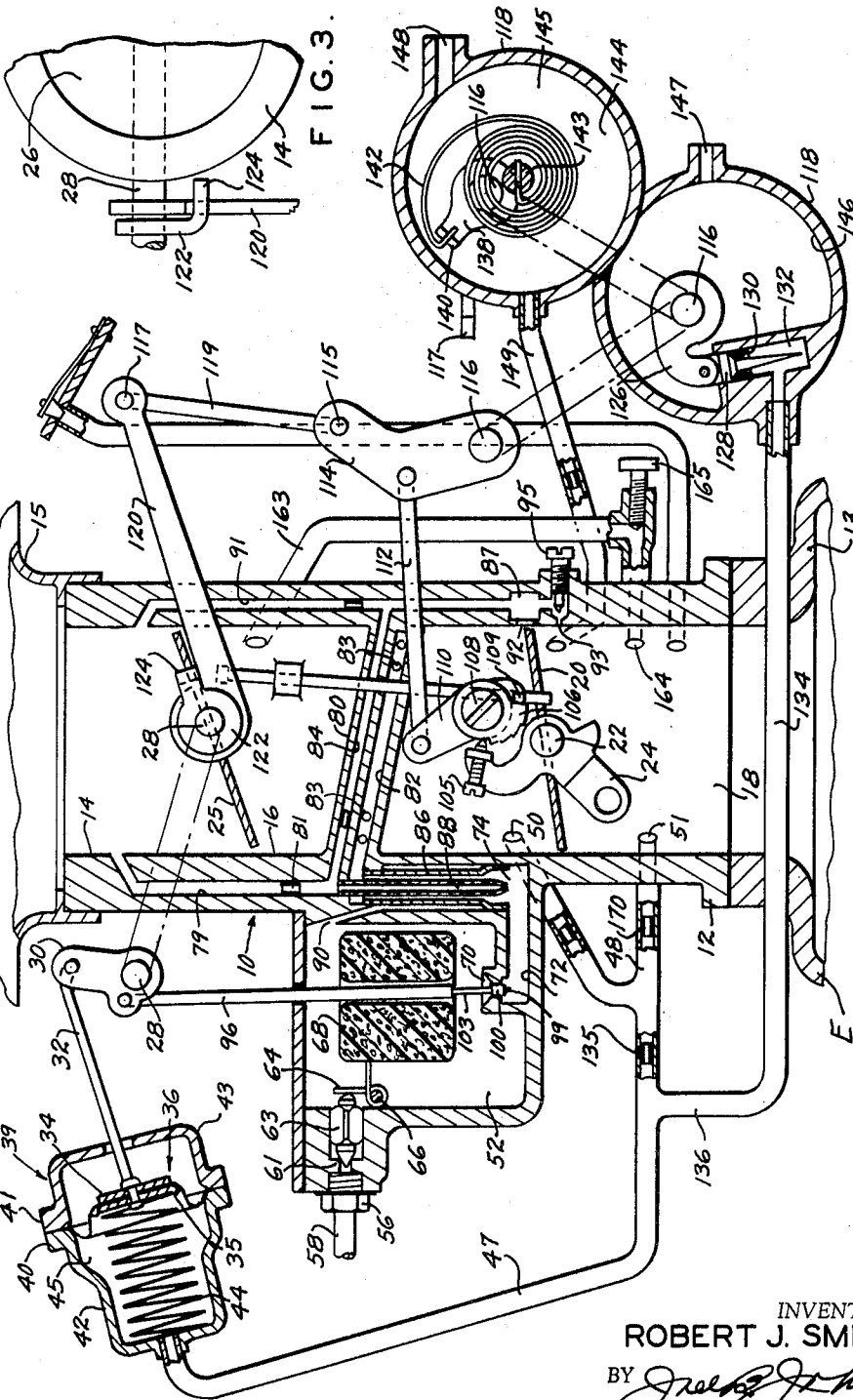
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3,249,344

CARBURETOR

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11 Claims. (Cl. 261—39)

This invention is directed to an air valve carburetor of the type having an air and fuel mixture conduit through the carburetor body. Within the mixture conduit is mounted a manually operated throttle valve for movement between an open and closed position. Upstream from the throttle valve within the mixture conduit is mounted an air valve structure, which in the device of this invention measures the flow of air through the carburetor to meter the fuel flowing to the engine.

In an air valve carburetor of this type, the air valve is biased into a closed position. During engine operation, the differential of air pressure on opposite sides of the air valve is used to open the air valve against the closing bias. Also, flow of air into the mixture conduit exerts a dynamic air pressure on the unbalanced valve which tends to also open the air valve against the closing bias. The closing bias is normally applied by a spring connected to the air valve. The opening forces resulting from the air pressures in the mixture conduit downstream of the valve may be applied by the unbalanced construction of the air valve alone or by the use of an air motor connected to the air valve and responsive to subatmospheric air pressures in the mixture conduit downstream of the air valve. A carburetor of this second type is shown and described in the copending application of Cook et al., Serial Number 276,472, filed April 29, 1963, and in copending application of Forrest W. Cook and James T. Bickaus, Serial No. 276,499, filed April 29, 1963.

When the engine is cold during starting the closing spring biases the air valve to a closed position, where it provides a choking effect on the engine. This results in an enriched mixture for engine starting. However, if the engine is warm, no choking action is desirable during engine starting so that the air valve must be held in an open position to prevent too rich a starting mixture.

It is therefore an object of this invention to provide an air valve carburetor of the type described in which means are provided to retain the air valve open during starting when the engine is warm.

It is a further object of this invention to provide a carburetor having an air valve which is responsive to engine temperature and operation to provide an optimum fuel and air mixture during engine starting.

It is another object of this invention to provide an air valve carburetor including engine temperature responsive means to position the air valve whereby optimum engine choking is provided during engine starting.

The invention is one in which the open position of the air valve of the carburetor is determined by means responsive to engine temperature so that a proper choking of the engine results. The engine temperature responsive means also includes a stop to retain the air valve opened when the engine is warm and little or no choking is required.

FIGURES 1 and 2 are views in elevation of an air valve carburetor showing a portion of an engine manifold to which the carburetor is attached and portions of the carburetor schematically shown.

The carburetor shown in the figures has a body portion 10, which is connected at a flanged end 12 to an intake manifold structure 13 of engine E. The other end of the carburetor body is formed with an air horn section 14 mounting an air filter 15 (FIGURE 2), through which air passes into the carburetor. Passing through the car-

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buretor body 10 from the air horn 14 is a mixture conduit 16 opening at one end into the intake manifold 13 at 18 and through which air from the air filter 15 passes to the engine. Mounted in the manifold end of the mixture conduit 16 is a throttle valve 20, fixed to a throttle shaft 22 journaled for rotational movement in appropriate bearing surfaces in the carburetor body 10. Fixed to one end of the throttle shaft 22 is a manually operable lever 24 for moving the throttle 20 from a closed to an open position. In the closed position the throttle 20 is across the mixture passage 16, as indicated in FIGURE 2, to prevent the flow of air therethrough. The throttle may be moved from this closed position to a wide open position.

Mounted upstream of the throttle and across the air horn section 14 of the carburetor is an air valve 26. As indicated in FIGURE 1, valve 26 closes the air horn passage and extends across the mixture passage 16. When in this closed position, the air valve prevents flow of air through the mixture passage 16. Air valve 26 is fixed eccentrically to a shaft 28 journaled in the carburetor body for rotational movement. Shaft 28 extends through the carburetor substantially parallel to the throttle shaft 22.

A short lever arm 30 is fixed to and extends from the air valve shaft 28. Lever arm 30 is loosely connected to one end of an actuating rod 32, the other end of which is fixed to a backing plate 34 of a diaphragm assembly 36 of a servo motor 39. The diaphragm assembly consists of a flexible diaphragm 38 of rubber or appropriate material, which has its center fixed between the pair of plates 34 and 35. The attached end of operating rod 32 may be spun over to lock the plates tightly together with the diaphragm 38 in-between. The peripheral edge of diaphragm 38 is sandwiched between the flanged rims 40 and 41 of cup housings 42 and 43, respectively. Rims 40 and 41 are tightly fastened together by any appropriate means as by machine screws, for example, extending through the housing flange 40 into the adjacent portion of the carburetor body 10. A spring 44 is mounted within the housing 42 with one end abutting the closed end of the housing and its other end biased into contact with the center of plate 35 of the diaphragm assembly. Spring 44 biases the diaphragm assembly 30 in a direction to close the air valve 26.

The interior of housing 42 forms a chamber 45 with diaphragm 38 and is sealed except for an air passage 47 schematically shown in the figures and connecting into a first branch passage 48 opening into the intake manifold opening 18 through a port 51. Another second branch 49 of passage 47 extends through a port 50 into the mixture conduit 16 between the closed position of throttle valve 20 and the air valve 26. The air motor just described and its function is claimed in the aforementioned application Serial No. 276,499.

Formed within the body 10 of the carburetor is fuel bowl 52 adjacent to the mixing conduit 16. A fuel inlet fitting 56 extends through the fuel bowl wall to provide fuel access to the bowl 52. The fuel fitting 56 is connected in any appropriate manner to an inlet fuel line 58 leading from a fuel pump 60 which sucks fuel from a fuel tank 62. The fuel inlet line 58, fuel pump 60 and fuel tank 62 are only schematically shown in FIGURE 1.

Fuel fitting 56 connects with a short passage having a valve seat 61 which is controlled by a needle valve 63 operated from a float lever 64 pivoted within the fuel bowl at 66 and having a free end attached to a float 68. The float controlled inlet needle 63 operates in a well-known manner. As the fuel in bowl 54 reaches a predetermined level, the float will force the pointed end of needle 63 into the valve seat to prevent additional flow of fuel into the bowl.

In the bottom of each fuel bowl there is a fuel jet 70 having a calibrated passage therethrough connected to a fuel passage 72 leading to a fuel well 74 formed in the carburetor body in the wall of mixing conduit 16.

Extending across mixture conduit 16 is a tubular cross member 80 formed with a main fuel passage 82 and an idle fuel passage 84. An apertured fuel tube 86 extends downwardly into the well 74. The upper end of tube 86 is opened and connects with the fuel passage 82. Coaxially mounted within the fuel tube 86 is an idle fuel tube 88, with its upper open end connecting with the fuel passage 84. Fuel tube 88 is closed except for a small restriction at its lower end suspended within the fuel well 74. An air passage 90 of predetermined size forms an air bleed passage from the fuel bowl 52 leading into the upper portion of well 74 to provide air flow into the main fuel passages. Passage 79 extends from the air horn 14 to the idle fuel passage 84 to provide a controlled air bleed through restriction 81 to the idle system. Another air passage 91 extends from the upper end of the air horn 14 and connects the idle fuel passage 84 to an idle chamber 87. A restriction 94 in passage 91 controls the amount of air bled into the idle system through passage 91.

Within the fuel bowl 52 there is mounted a fuel metering rod 96 which is connected at its upper end to an arm of lever 30 fixed to the air valve shaft 28. The other end of metering rod 96 has variations in rod thickness, consisting of an intermediate portion 100 of optimum thickness and a minimum thickness portion 103. The connection of metering rod 96 to the air valve shaft 28 provides simultaneous operation of the metering rod with the air valve so that fuel flow through the carburetor may be proportioned to the air flow as measured by air valve 26. Metering rod 96 is more fully described and claimed in application Serial No. 293,411, filed July 8, 1963, by James T. Bickhaus and Forrest W. Cook.

An arm of the throttle lever 24 carries a screw 105 for contacting a fast idle cam 106 freely pivoted on a screw shaft 108 and in an eccentric manner so that gravity will bias the cam 106 in a counterclockwise direction. A second lever 110 is also freely mounted for rotation on screw shaft 108 and is connected by a link 112 to a control lever 114 fixed to a shaft 116 journaled for free rotation in a cup housing 118.

Fixed to an intermediate portion of shaft 116 for rotation therewith is a second lever 126 carrying at its free end a tapered metering valve 128. The upper end of valve 128 is pivotally mounted on the free end of lever 126 so as to pivot relative thereto. The tapered end of the metering valve 128 extends into a restriction 130 having a passage therethrough of predetermined size which leads into an air chamber 132 in the housing 118. Air chamber 132 is connected by an air passage 134 to the air passage 47. The tapered metering valve 128 and its function is described and claimed in copending application of Forrest W. Cook, James T. Bickhaus and Robert J. Smith, Serial No. 276,472, filed April 29, 1963. A third lever 138 is fixed at the other end of the shaft 116 for rotation therewith. Lever 138 is bifurcated at its free end 140 to receive one end of a bimetallic thermostatic spring 142 fitted into the bifurcation 140 so as to move the lever 138. The other end of spring 142 is fixed to a stationary shaft 143 extending from the cup housing 118.

The cup housing 118 is divided into a pair of chambers 145 and 146 by an imperforate wall structure 144 extending transversely across the housing. This wall 144 prevents the interference of air flow through one chamber with the air flow conditions of the other chamber. Chamber 146 is connected to the atmosphere through a vent 147. Chamber 145 is connected to a source of heated air such as a stove connected to the exhaust manifold of the engine. Air from the stove is brought through an inlet fitting 148 into the chamber 145. Chamber 145 is connected by an air passage 149 to the carburetor

flange 12 at a point downstream of the throttle 20. Because of subatmospheric air pressure conditions in the manifold 18 during engine operation, air will flow from the manifold stove through the hot air conduit and fitting 148 into the chamber 145 and from the chamber through passage 149 into the manifold. Also, atmospheric air will flow through vent 147 into chamber 145 and when the valve 128 is open from chamber 145 through passage 134 into passage 47.

In operation, the engine is cranked to operate the fuel pump and to force fuel into the inlet fitting 56 of the carburetor. With the float valve in a lowered position, fuel will flow into the fuel bowl until the float 68 is raised to a predetermined position at which point the needle valve 62 is closed to prevent further flow of fuel into the fuel bowl. Fuel will flow from the fuel bowl by gravity through the metering jet 70 into fuel passage 72 and to a level in the fuel well 74 equal to the level of fuel in the fuel bowl.

One side of diaphragm 36 of the air motor is exposed to the air pressure within chamber 45, which is connected to port 50 in mixture conduit 16 between air valve 26 and throttle valve 20. The other side of diaphragm 36 is exposed to atmospheric pressure, which is substantially that of air in the air horn 14 upstream of air valve 26.

Starting

During cranking of the engine with the throttle open, the engine turns over to pump air through the carburetor. With the engine cold, spring 44 of the servo motor holds air valve 26 closed. Servo motor spring 44 also biases the metering rod 96 through lever 98 to its uppermost position, so that the small diameter starting portion 99 of the metering rod is respectively positioned within the metering jet 70 to enable a sufficient amount of fuel to flow into the fuel nozzle bar 80. Sufficient air to start the engine passes through an aperture 25 in the air valve 26 and into the mixture passage 16. Fuel to start engine is drawn out of the fuel well 75 and the nozzle bar passages 82 and 84 by the manifold vacuum extending upstream of the open throttle 20 to the nozzle bar 80. The fuel passes into the mixture conduits through the main nozzle ports 83 and the idle ports 95 and 97.

Cold engine operation

When ambient conditions are below a temperature of about 75° F., the thermostatic spring 142 biases lever 138, shaft 116 and lever 114 in a clockwise direction to a terminal position determined by a fixed stop 117 extending from housing 118 as shown in FIGURE 1. In this position, operating lever 114 and link 112 have moved the fast idle cam 106 in a clockwise direction against gravity bias by the aid of a lug 109 fixed to lever 110 in the path of rotation of cam 106. After the engine has started and the throttle lever 24 manually released, the adjustment screw stop 105 on the throttle lever 104 will contact the highest portion of the cam 106 and hold the throttle in a slightly open position so the engine will operate at a fast idle speed. The idle speed of the engine provides a subatmospheric pressure within the intake manifold opening 18 in the order of 18 to 20 inches of mercury negative pressure. This negative pressure will be effective upstream of throttle 20 to cause a depression below air valve 26. This low pressure will be sensed through port 50 and passage 47 to the servo motor 39, which will operate to partially open the air valve 26 and permit flow of sufficient air past throttle 20 for the cold idle operation.

Idle fuel is drawn from the nozzle ports 83. Also, air passing the air valve 26 sweeps around the upper edge of throttle 20 and will draw air and fuel from the idle ports 95.

Under cold engine operation, with shaft 116 biased by spring 142 to its position shown in FIGURE 1, the metering valve pin 128 is out of the air restriction 130 so as to provide a bleeding of air through passages 134 and

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136 to passage 47 and through passage 49 to the mixture conduit. This air bleed slightly increases the pressure within the servo motor chamber 43 which, with the spring 44, closes the air valve 26 slightly from a position it would otherwise have. This results in a higher depression area between the air valve and throttle 20, which induces a richer fuel flow from the nozzle ports 83 and optimum engine performance for cold engine operation. The amount that valve 26 is closed by air bled through passage 134 may be adjustably controlled by the size of a restriction 135 placed in passage 47 between passage 134 and passage 49. This restriction may be in the range of 0.025" to 0.040" in diameter to provide the desired effect.

During engine operation, because of the subatmospheric pressure in the manifold inlet 18, there is a continuous flow of air from the exhaust manifold stove through the housing chamber 144 and passages 149 which is directed upwardly against throttle 20. When the engine begins to run, the air in the exhaust manifold stove becomes heated and the flow of air into the housing chamber 144 becomes warm. The heated air in housing chamber 144 warms the thermostatic coil 142 and causes it to relax and to move the lever 138 in a counterclockwise direction from the position of FIGURE 1. This rotates shaft 116 and lever 126 so as to move the metering valve pin 128 into the passage of restriction 130.

As coil 142 is increasingly heated, the valve 128 progressively cuts down bleeding of air through passage 134 so that pressure in motor chamber 43 decreases and motor 39 slowly moves air valve 26 farther open. This lowers the depression of air pressure in the region of the nozzle bar 80 and lessens the flow of fuel from the nozzle apertures 83. Further heating of the coil 142 provides an additional counterclockwise movement of the metering pin 128 until it seats within the passage of restriction 130 to prevent all flow of air through passage 134 to passage 47, and to stop further rotation of lever 114 in its counterclockwise direction, at which time the engine has reached a normal operating temperature. With air passage 134 closed, pressure within servo motor chamber 43 drops to a value sensed by ports 50 and 51 alone. Air valve 26 now takes a part open position determined by a predetermined pressure drop across the air valve. This pressure drop can be preselected to retain the optimum flow of fuel from nozzle apertures 83 during warm engine operation with a part open throttle.

When the engine has warmed to a normal operating temperature as described, thermostatic spring 142 rotates shaft 116 and levers 114 and 110 to their positions indicated in FIGURE 2. When the throttle is now operated, the idle stop screw 105 releases the fast idle cam 106 and permits it to drop by gravity. If the throttle is subsequently released for idling conditions, the screw 105 will contact the lowest cam position and allow the throttle to take a substantially closed position. Idle fuel is now drawn by manifold vacuum mainly from the idle chamber 87 through the idle port 93 and in the manner described above. Air flows through the idle bleed passages 79 and 91 and the bypass passage 163, controlled by the adjustment screw 165.

Warm engine operation

When the engine is running and the throttle is opened from its closed position, the air pressure at port 50 drops from atmospheric and the air pressure in motor chamber 45 is reduced until diaphragm 36 is pressed inwardly against the bias of spring 44. The air valve 26 then takes a position determined by servo motor 39, in which the difference in air force on the opposite sides of diaphragm 36 balances the bias of spring 44. As throttle 20 is moved to change the amount of air flowing to the engine, the servo motor 39 will change the position of air valve 26 to retain substantially the same pressure drop across the air valve. The air valve 26 is thus a device for measuring air flow through the carburetor to the engine.

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The value of spring 44 is selected to retain a pressure drop across the air valve at all times. This spring determines the proper relationship between the amount of air flowing through the carburetor and the angular position of the air valve, which positions the proper portions of metering rod within jet 70. The shape metering portions of rod 96 are calibrated to give sufficient fuel flow through jets 70 to provide maximum power at any speed of the engine at wide open throttle up to the full air capacity of the carburetor. The optimum air-fuel ratio is maintained with a full open air valve by the increased depression around the nozzle bars 80 due to increased manifold vacuum at higher speeds.

Hot starting

When the engine is stopped and allowed to stand after a hot, fast run, it is difficult to start the engine if the air and fuel mixture supplied is overly rich. It is necessary, under these conditions of hot starting, to retain the air valve 26 in an open position, to permit sufficient air to flow to the engine and to position rod portions 100 within jets 70 to minimize fuel flow, so that a proper air and fuel mixture is obtainable for starting. A closed valve 26 would provide too rich a mixture and cause "flooding."

Therefore in accordance with my invention, means are provided to hold the air valve 26 open during hot starting conditions and prevent a choking action of the air valve. In accordance with the invention, control lever 114 is connected by a link 119 to a lever 120 rotatably mounted on the end of air valve shaft 28. Fixed at this end of the air valve shaft 28, for rotational movement therewith is a short lever 122 having a lug portion 124 extending over the lever 120.

The position of the operating lever 114 in FIGURE 2 is that which it takes when the shaft 116 is rotated to the fullest extent in the counterclockwise direction by the spring 142 when the engine is hot. In this position, the pivot 115 between lever 114 and link 119 has passed over center of a straight line between shaft 116 and the pivot 117 between link 119 and lever 120. Thus, a toggle linkage is formed by lever 114 and link 119. This over-center toggle condition retains the lever 120 in its uppermost position, as viewed in FIGURE 2, where lever arm 124 will strike lever 120 and retain the air valve 26 in an open position. An optimum opening for valve 26 for hot engine starting conditions is between 25 to 30 degrees from its closed position. As the engine cools, and the thermostatic spring 142 tensions, the lever 114 will be rotated clockwise and will break the toggle stop. The air valve is then closed by spring 144 for a cold start, as described above and indicated in FIGURE 1.

I claim:

1. A carburetor comprising a body structure having an air and fuel mixture conduit therethrough, a throttle valve mounted across said mixture conduit for movement from an open position to a position closing said mixture conduit, means for operating said throttle valve, an air valve mounted within said mixture conduit for movement from a position closing said mixture conduit to an open position in response to air flow through said mixture conduit, a spring connected to said air valve and biasing said air valve toward said closed position, a lever arm fixed to said air valve shaft for rotational movement therewith, a first lever rotatably mounted at one end on said air valve shaft, said first lever being movable from a first position representing cold engine operation to a second position representing warm engine operation, said lever arm having a lug for engaging a surface of said first lever when said lever arm moves in a direction to close said air valve, said lug being movable away from said surface upon additional opening of said air valve, said second position being in the range of approximately 25-30 degrees from the closed position of said air valve, a second lever mounted at one end on said body structure for rotation between fixed positions, a link between said first

and second levers, and means pivotally joining the other ends of said first and second levers to spaced portions of said link whereby said link forms a toggle joint with said second lever in one of said fixed positions thereof to hold said first lever against rotation and in the path of rotation of said lever arm to prevent rotation of said air valve to its closed position, and temperature responsive means to break said toggle joint in response to change in ambient temperature.

2. A carburetor comprising a body structure having an air and fuel mixture conduit therethrough, a throttle valve mounted across said mixture conduit for movement from an open position to a position closing said mixture conduit, a lever fixed to said throttle and movable therewith for operating said throttle valve, an air valve shaft journaled for rotation in said body structure and extending transversely across said mixture conduit anteriorly of each throttle valve, an unbalanced air valve fixed to said air valve shaft within said mixture conduit for rotational movement therewith in response to air flow from a position closing said mixture conduit to an open position, a spring connected to said air valve and biasing said air valve toward said closed position, a lever arm fixed to said air valve shaft for rotational movement therewith, a first lever rotatably mounted at one end on said air valve shaft, said first lever being movable from a first position representing cold engine operation to a second position representing warm engine operation, said lever arm having a lug for engaging a surface of said first lever when said lever arm moves in a direction to close said air valve, said lug being movable away from said surface upon additional opening of said air valve, said second position being in the range of approximately 25-30 degrees from the closed position of said air valve, a second lever mounted at one end on said body structure for rotation between two fixed positions, a link between said first and second levers, and means pivotally joining the other ends of said first and second levers to spaced portions of said link whereby said link forms a toggle joint with said second lever in one of said fixed positions thereof to hold said first lever against rotation and in the path of rotation of said lever arm to prevent rotation of said air valve to its closed position, and temperature responsive means to move said second lever out of said one fixed position to break said toggle joint in response to change in ambient temperature.

3. A carburetor comprising a body structure having an air and fuel mixture conduit therethrough, a throttle valve mounted across said mixture conduit for movement from an open position to a position closing said mixture conduit, a lever fixed to said throttle and movable therewith for operating said throttle valve, an air valve shaft journaled for rotation in said body structure and extending transversely across said mixture conduit anteriorly of said throttle valve, an unbalanced air valve fixed to said air valve shaft within said mixture conduit for rotational movement therewith in response to air flow from a position closing said mixture conduit to an open position, a spring connected to said air valve and biasing said air valve toward said closed position, a lever arm fixed to said air valve shaft for rotational movement therewith, a first lever rotatably mounted at one end on said air valve shaft, said first lever being movable from a first position representing cold engine operation to a second position representing warm engine operation, said lever arm having a lug for engaging a surface of said first lever when said lever arm moves in a direction to close said air valve, said lug being movable away from said surface upon additional opening of said air valve, said second position being in the range of approximately 25-30 degrees from the closed position of said air valve, a second lever mounted at one end on said body structure for rotation between two fixed positions, a link between said first and second levers, and means pivotally joining the other ends of said first and second levers to spaced portions of said link

whereby said link forms a toggle joint with said second lever in one of said fixed positions thereof to hold said first lever against rotation and in the path of rotation of said lever arm to prevent rotation of said air valve to its closed position, and temperature responsive means to move said second lever progressively from either of said two fixed positions in response to change in engine temperature.

4. The invention of claim 3, including a fast idle lever rotatably mounted on said carburetor in the path of movement of said throttle lever, said fast idle lever having a plurality of stop portions of successively increasing heights to hold said throttle at correspondingly more open positions for varying the speed of engine idle operation, and linkage means connecting said fast idle lever with said second lever for movement therewith in response to engine temperature.

5. The invention of claim 4 wherein said linkage means positions said fast idle lever with a low stop portion thereof in the path of said throttle lever when said second lever is in said one fixed position.

6. The invention of claim 5 wherein said linkage means positions said fast idle lever with a high stop portion thereof in the path of said throttle lever when said second lever is in the other of said two fixed positions.

7. A carburetor comprising a body structure having an air and fuel mixture conduit therethrough, a throttle valve mounted across said mixture conduit for movement from an open position to a position closing said mixture conduit, a lever fixed to said throttle and movable therewith for operating said throttle valve, an air valve shaft journaled for rotation in said body structure and extending transversely across said mixture conduit anteriorly of each throttle valve, an unbalanced air valve fixed to said air valve shaft within said mixture conduit for rotational movement therewith in response to air flow from a position closing said mixture conduit to an open position, a spring connected to said air valve and biasing said air valve toward said closed position, a lever arm fixed to said air valve shaft for rotational movement therewith, a first lever rotatably mounted at one end on said air valve shaft, said first lever being movable from a first position representing cold engine operation to a second position representing warm engine operation, said lever arm having a lug for engaging a surface of said first lever when said lever arm moves in a direction to close said air valve, said lug being movable away from said surface upon additional opening of said air valve, said second position being in the range of approximately 25-30 degrees from the closed position of said air valve, a second lever mounted at one end on said body structure for rotation between two fixed positions, a link between said first and second levers, and means pivotally joining the other ends of said first and second levers to spaced portions of said link whereby said link forms a toggle joint with said second lever in one of said fixed positions thereof to hold said first lever against rotation and in the path of rotation of said lever arm to prevent rotation of said air valve to its closed position, and engine temperature responsive means to move said second lever progressively into said first fixed position when said engine is at a normal operating temperature and to move said second lever progressively into the second one of said two fixed positions thereof when said engine is cold relative to normal operating temperatures.

8. The invention of claim 7 wherein said engine temperature responsive means includes a temperature responsive spring having one end fixed and the other end thereof connected to said second lever to move said second lever between said two fixed positions.

9. The invention of claim 8 wherein said engine temperature responsive means also includes structure for applying heat from the engine to said temperature responsive spring.

10. The invention of claim 8 including a fast idle lever

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rotatably mounted on said carburetor in the path of movement of said throttle lever, said fast idle lever having a plurality of stop portions of successively increasing heights to hold said throttle at correspondingly more open positions for varying the speed of engine idle operation, and linkage means connecting said fast idle lever with said second lever for movement therewith in response to engine temperature.

11. The invention of claim 10 wherein said linkage means positions said fast idle lever with a low stop portion thereof in the path of said throttle lever when said second lever is in said one fixed position.

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