Oct. 17, 1967 T. C. SCHULTZ 3,347,216

CHOKE CONTROL DEVICE

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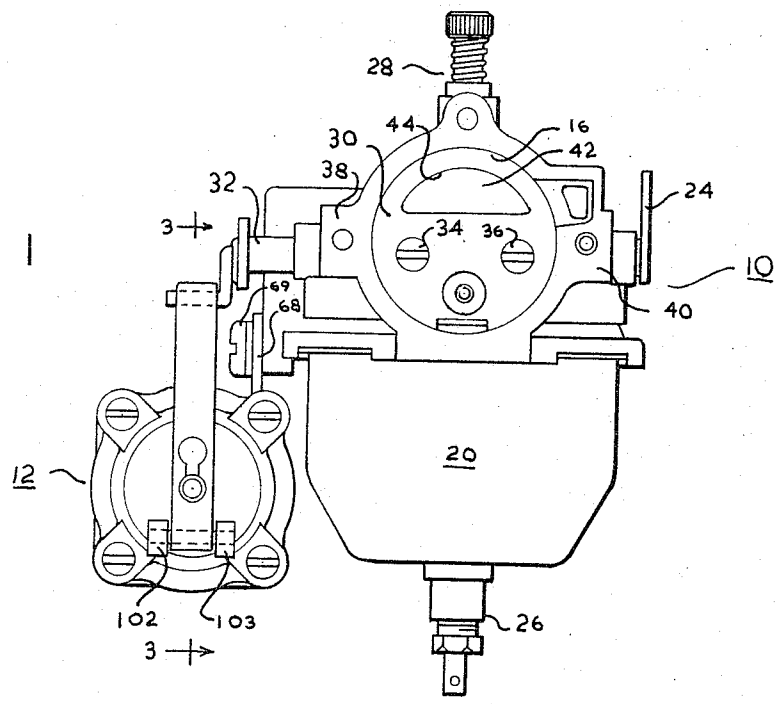
FIG. 1



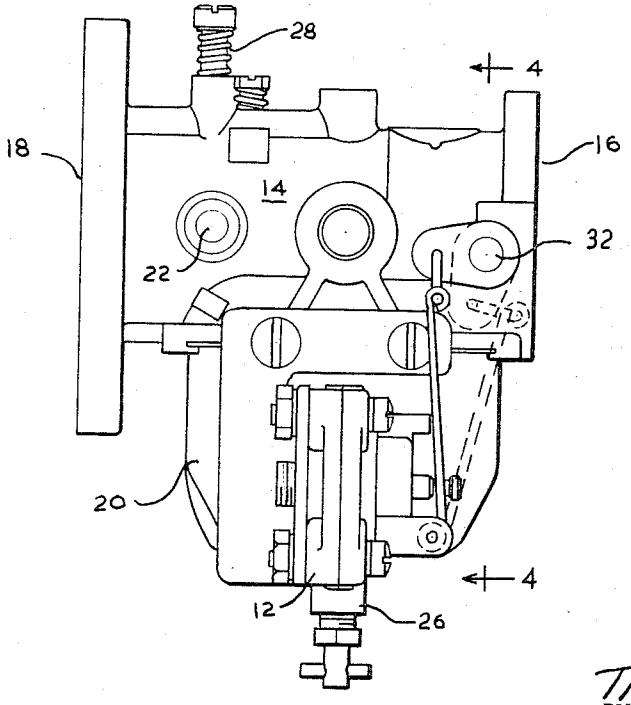


FIG. 2

INVENTOR.
THOMAS C. SCHULTZ
BY
James L. McBrien
ATTORNEYS

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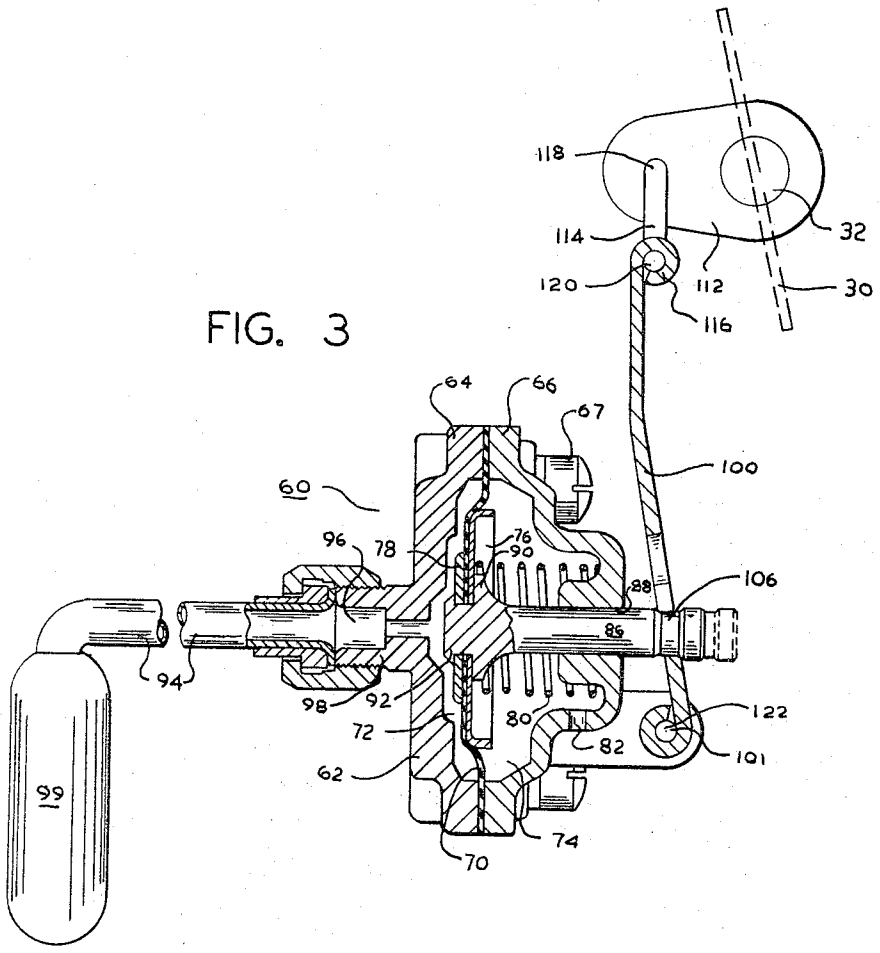
FIG. 3



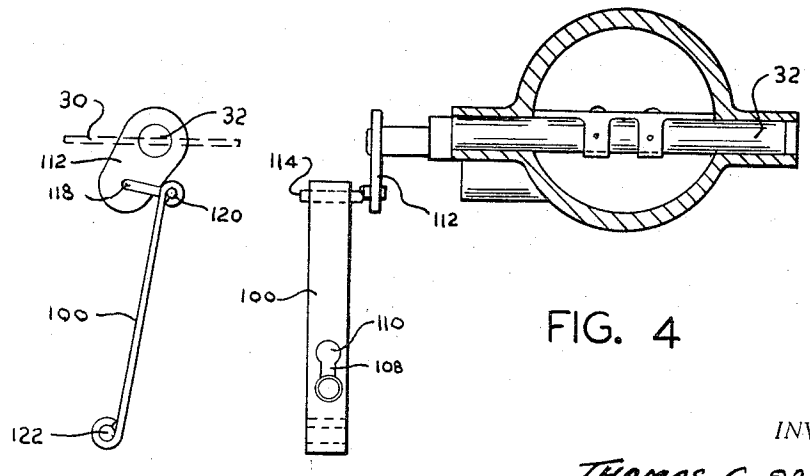


FIG. 4

FIG. 5

INVENTOR.

THOMAS C. SCHULTZ

BY

James L. O'Brien

ATTORNEYS

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CHOKE CONTROL DEVICE

Thomas C. Schultz, Detroit, Mich., assignor to The Bendix Corporation, a corporation of Delaware

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7 Claims. (Cl. 123—119)

ABSTRACT OF THE DISCLOSURE

A choke locking device for an engine carburetor having one end of a toggle linkage connected to the choke lever and the other end of the toggle linkage connected to the body of the carburetor in a manner such that the toggle linkage forms a straight line when the choke is in the closed position thereby preventing opening of the choke in combination with a temperature responsive movable member to alter the straight line relationship when the engine becomes self-operative to allow the choke to open.

The present invention relates to an automatic choke, and more particularly to a device for locking the choke valve in closed position while the engine is being started.

In conventional automotive and air-cooled engine carburetors, the choke valve is offset and spring loaded so that the air flow created upon firing of the engine will open the valve sufficiently to provide the required air to sustain operation. However, in order to provide the required air during the initial self-operation of the engine, the offset valve and spring loading relationship must be such that the choke valve will be opened with relatively little air flow until the engine is operating normally. In many engines, however, the suction created during cranking is sufficient to cause the choke valve to open and thereby reduce the richness of the fuel-air mixture to the point where the cold engine cannot be started. This difficulty cannot be effectively corrected by adjusting the relationship of the spring force urging the valve closed and the degree of offset of the valve, since the degree of suction created during the cranking operation and during the initial self-operation of the engine may be substantially the same, or the difference too small to permit effective and reliable adjustment to obtain proper choking during cranking and initial running of the engine. It is therefore one of the principal objects of the present invention to provide a mechanism for controlling the operation of an offset choke valve, which effectively retains the choke valve in closed position while the engine is being cranked to give the proper enriched starting mixture, and then soon thereafter partially releases the choke valve when the engine starts to give the required air for sustaining engine operation.

Another object of the invention is to provide an automatic choke control device which positively holds the choke in closed position regardless of the cranking speed of the engine or the degree of vacuum created during starting, and which controls the choke after starting to give the required enriched mixture until the normal operating temperature of the engine has been reached.

Still another object of the invention is to provide a relatively simple, reliable choke control device of the pneumatic type which effectively provides the required enriched mixture during cranking and thereafter varies the opening of the choke valve in accordance with engine temperature and operating conditions to give the required fuel-air mixture through the warming up period of the engine.

A further object is to provide an automatic choke device which can be readily adapted to various engines and adjusted to satisfy the starting requirements from one engine to another, and which will perform satisfactorily

under various operating conditions without manual adjustment or control.

Additional objects and advantages of the invention will become apparent from the following description and accompanying drawings, wherein:

FIGURE 1 is a front elevational view of a carburetor with the present automatic choke control device mounted thereon in operative position;

FIGURE 2 is a side elevational view of the carburetor and choke control device shown in FIGURE 1;

FIGURE 3 is an enlarged fragmentary cross sectional view of the choke control device, the section being taken on line 3—3 of FIGURE 1;

FIGURE 4 is a fragmentary cross sectional view of a portion of the carburetor and choke control linkage, illustrating the manner in which the device operates, the section being taken on line 4—4 of FIGURE 2; and

FIGURE 5 is an elevational view of the choke control linkage shown in the preceding figures.

Referring more specifically to the drawings, numeral **10** designates generally a carburetor and **12** the pneumatic automatic choke device embodying the present invention. For the purposes of the present description, carburetor **10** may be considered a conventional float type carburetor from an air-cooled engine, consisting of body **14** having an induction passage with an air inlet **16**, a fuel-air mixture outlet **18**, and a float chamber **20** disposed beneath and supported by carburetor body **14**. A throttle (not shown) is disposed in the induction passage on throttle shaft **22** controlled manually by a suitable linkage connected to lever **24**. The fuel is supplied to the float chamber through valve **26** and is discharged in the induction passage through a main discharge nozzle (not shown) and through an idle system controlled by valve **28**.

A choke valve **30** is mounted on shaft **32**, offset with the larger portion of the valve above shaft **32**, and is secured to the shaft for rotation therewith by screws **34** and **36** extending through the valve and threaded into shaft **32**. The shaft is journalled in bosses **38** and **40** and extends laterally to the left, as viewed in FIGURES 1 and 4 for receiving the operating mechanism of the automatic choke. The choke valve, being offset with respect to the induction passage, is urged in the open direction by vacuum in the induction passage downstream from the choke valve and the opening thereof is opposed, under certain conditions hereinafter described, by a spring forming a part of the choke control device. Valve **30** contains a poppet valve **42** consisting of a leaf spring secured to the inner side of valve **30** and seating over opening **44** in the choke valve. The poppet valve spring calibration is such that the poppet valve will remain closed during cranking and will open under the high intake vacuum created promptly when the engine has started running.

The choke control device **12** includes a pneumatic unit **60** consisting of a housing **62** having sections **64** and **66** secured together by a plurality of screws **67** extending through holes in the margins of section **66** and threadedly seating in holes in the margins of section **64**, unit **60** being supported on the side of the carburetor body by a bracket **68** secured thereto by screws **69**. A fluid-impervious diaphragm **70** is secured at its marginal edge between housing sections **64** and **66** in fluid-tight relation, thus forming two separate chambers **72** and **74** on the left and right-hand sides thereof, as viewed in FIGURE 3. The diaphragm is reinforced by stiffening plates **76** and **78** on the right and left sides of the diaphragm, and is urged toward chamber **72** by a coil spring **80** reacting between stiffening plate **76** and the inner end wall of section **66**, chamber **74** being vented to ambient air by one or more ports **82** in the wall of section **66**. A stem **86** extends through the center of diaphragm **70** and is

secured thereto by outwardly extending annular flanges **90** and **92**, which rigidly clamp reinforcing plates **76** and **78** against the diaphragm to form an effective seal between the diaphragm, stem and plates, and extends through opening **88** in the end of section **66** and projects outwardly therefrom for connection with the choke linkage, to be more fully described hereinafter. Chamber **72** is connected by a tube **94** and conduit **96** in stem **98** to a bulb **99** located in the muffler, exhaust passage or manifold. The bulb, tube **94**, conduit **96** and chamber **72** form, in effect, a closed chamber, filled with a gas which expands as the manifold temperature rises and urges diaphragm **70** to the right, as viewed in FIGURES 2 and 3, moving stem **86** axially to the right from the position shown in full lines to the position shown in broken lines.

Stem **86** is connected to shaft **32** by a linkage consisting of lever **100** pivoted at its lower end on pin **101** rigidly supported by two bosses **102** and **103** mounted on section **66** of housing **62**. Lever **100** is operatively connected to stem **86** by a reduced diameter portion **106** on stem **86** which seats in a slot **108** of lever **100**, the larger diameter portion of stem **86** on opposite sides of portion **106** forming abutments for engaging the lever on either side of slot **108** and for pivoting the lever angularly, as illustrated in FIGURE 2 in broken lines. An enlarged opening **110** at the upper end of slot **108** is provided to permit the reduced diameter portion **106** to be inserted in the slot. The upper end of lever **100** is connected to shaft **32** by a lever **112** extending radially from the end of shaft **32** and a crank-like lever **114** pivotally connected at one end to lever **112** and at the other end to the upper end of lever **100**, the upper end of lever **114** extending through a hole in lever **112** and the lower end thereof extending through an eye **116** in lever **100**. Lever **112** is rigidly secured to shaft **32** and rotates therewith as the choke valve is moved between opened and closed positions by lever **100**, as will be more fully explained hereinafter.

In order to retain the choke valve in closed position during cranking, a toggle-like relationship is provided between levers **112**, **114** and **100** as determined by the position of pivot point **118** between levers **112** and **114**, pivot point **120** between the lower end of lever **114** and lever **100**, and the pivot point **122** provided by pin **101** at the bottom of the latter lever. The three pivot points **118**, **120** and **122** are on substantially a straight line when the choke valve is fully closed; preferably, however, pivot point **120** is slightly offset to the left, as viewed in FIGURE 3, so that the slight downward rotation of lever **112** will not "break" the toggle relationship between the several pivot points. It is thus seen that while the choke valve is closed, as illustrated in FIGURE 3, the relationship of pivot points **118**, **120** and **122** forms a positive stop means to prevent lever **112** and shaft **32** from rotating, and thereby positively holds the choke valve in closed position. Lever **100** remains in the position shown in FIGURE 3 until the engine starts, and as soon as the engine fires and the gas in bulb **99** expands, the pressure in chamber **72** increases, and the lever is moved by the diaphragm **70** and stem **86** to the right, as viewed in FIGURE 3, initially breaking the toggle relationship between pivot points **118**, **120** and **122**, and thereafter rotating lever **112** of shaft **32** in the counter-clockwise direction to open the choke valve.

In the operation of the present choke control device, starting with a cold engine, the pressure in the temperature sensitive bulb **99**, tube **94**, and chamber **72** is of such volume that spring **80** holds the diaphragm and, consequently, stem **86**, in the position shown in FIGURE 3 and in full lines in FIGURE 2. With stem **86** and lever **100** in this position, the pivot points **118**, **120** and **122** are in substantial alignment, thus forming the toggle relationship which positively holds lever **112** in its raised position and the choke valve in its closed position. While the engine is being cranked, the toggle relationship of the three pivot points is maintained and the choke valve is held in closed position. The small amount of air required for the enriched starting mixture is provided by leaf-spring **42**, which opens in response to the vacuum created during cranking. As soon as the engine fires, the required amount of air initially is likewise provided by valve **42** in the choke valve. Thereafter, as the heat in the exhaust pipe or manifold heats bulb **99**, the gas therein expands, moving diaphragm **70** and stem **86** to the right, as viewed in FIGURE 3, thus moving lever **100** in the clockwise direction and breaking the toggle relationship between pivot points **118**, **120** and **122**. Inasmuch as the choke valve **30** is on an offset shaft, the air flow through the carburetor intake passage urges the choke valve in the opening direction to provide sufficient air throughout the warming up period of the engine. While the engine is passing through the warming up period, the full opening of the choke valve is resisted by spring **80**, the force of which is transmitted to the choke valve by stem **86** and levers **100**, **114** and **112**, and choke shaft **32**. Spring **80** permits the choke valve to vary its position in response to variations in the pressure differential across the choke valve while the engine is operating during the warming up period. When the engine has become fully warm, the expansion of the gas in bulb **99** urges the diaphragm **70** fully to the right, as viewed in FIGURE 3, thus moving stem **86** and levers **100**, **114** and **112** to the position shown in FIGURE 5, and moving the choke valve to the fully opened position.

The present choke control device can be effectively used in conjunction with other types of automatic chokes, including the bi-metallic and vacuum types. While only one embodiment of the present device has been described in detail herein, various changes and modifications may be made without departing from the scope of the invention.

I claim:

1. A choke control device for a carburetor having a body, an induction passage, a shaft and an offset choke valve in said passage mounted on said shaft and a poppet valve in said choke valve, and for an engine having an exhaust passage: comprising a unit responsive to engine temperature for controlling the choke valve, including a housing with a chamber, a movable wall for said chamber, a bulb in the engine exhaust passage, a conduit connecting said bulb with said chamber, a stem movable axially by said movable wall, a lever movable angularly by said stem and extending at one end toward said shaft and having a pivot means at the other end thereof, a lever extending radially from and being fixedly secured to said shaft for angular movement, and a member pivotally connected at one end to said first mentioned lever and at the other end to said second mentioned lever, said levers and member being in such relation to one another that the pivotal connections of said member and the pivot means of said first mentioned lever are on a straight line when said choke is in closed position and said unit is in cold engine position, thereby locking said choke in closed position regardless of manifold vacuum until said straight line relationship is altered by movement of said stem.

2. A choke control device for a carburetor having a body, an induction passage, a shaft and an offset choke valve in said passage mounted on said shaft, and for an engine having an exhaust passage: comprising a unit responsive to engine temperatures for controlling the choke valve, including a housing with a chamber, a movable wall for said chamber, a bulb in the engine exhaust passage, a conduit connecting said bulb with said chamber, a stem movable axially by said movable wall, a lever movable angularly by said stem and extending at one end toward said shaft and having a pivot means at the other end thereof, a lever extending radially from and being fixedly secured to said shaft for angular movement, and a member pivotally connected at one end to said first mentioned lever and at the other end to said second mentioned lever, said levers and member being in such

relation to one another that the pivotal connections of said member and the pivot means of said first mentioned lever are on a straight line when said choke is in closed position and said unit is in cold engine position, thereby locking said choke in closed position regardless of engine manifold vacuum until said straight line relationship is altered by movement of said stem.

3. A choke control device for a carburetor having a body, an induction passage, a shaft and an offset choke valve in said passage mounted on said shaft: comprising a unit responsive to engine temperature for controlling the choke valve, a lever movable angularly by said unit and extending at one end toward said shaft and having a pivot means at the other end thereof, a lever extending radially from and being fixedly secured to said shaft for angular movement, and a member pivotally connected at one end to said first mentioned lever and at the other end to said second mentioned lever, said levers and member being in such relation to one another that the pivotal connections of said member and the pivot means of said first mentioned lever are on a straight line when said choke is in closed position and said unit is in cold engine position, thereby locking said choke in closed position regardless of engine manifold vacuum until said straight line relationship is altered by movement of said stem.

4. A choke control device for a carburetor having a body, an induction passage, a shaft and a choke valve mounted on said shaft in said passage, and for an engine having an exhaust passage: comprising a unit responsive to engine temperature for controlling the choke valve, including a housing with a chamber, a movable wall for said chamber, a bulb in the engine exhaust passage, a conduit connecting said bulb with said chamber, a stem movable axially by said movable wall, a lever extending radially from and being fixedly secured to said shaft for angular movement, and a pivoted lever movable by said stem on a plane parallel with the plane of rotation of said first mentioned lever and from a point tangent with the end of said first mentioned lever when the choke valve is in closed position and said unit is in cold engine position to a point substantially parallel with said first mentioned lever when the choke valve is in open position and said unit is in warm engine position, and a member pivotally connected at one end to said first mentioned lever and at the other end to said second mentioned lever, said levers and member being in such relation to one another that the pivotal connections of said member and the pivot means of said second mentioned lever are on a straight line when said choke is in closed position and said unit is in cold engine position, thereby locking said choke in closed position regardless of engine manifold vacuum until said straight line relationship is altered by movement of said stem.

5. A choke control device for a carburetor having a body, an induction passage, a shaft and a choke valve mounted on said shaft in said passage: comprising a unit responsive to engine temperature for controlling the choke valve, a lever extending radially from and being fixedly secured to said shaft for angular movement, a pivoted lever movable by said unit on a plane parallel with the plane of rotation of said first mentioned lever and from a point tangent with the end of said first mentioned lever when the choke valve is in closed position and said unit is in cold engine position to a point substantially parallel with said first mentioned lever when

the choke valve is in opened position and said unit is in warm engine position, and a member pivotally connected at one end to said first mentioned lever and at the other end to said second mentioned lever, said levers and member being in such relation to one another that the pivotal connections of said member and the pivot means of said second mentioned lever are on a straight line when said choke is in closed position and said unit is in cold engine position, thereby locking said choke in closed position regardless of engine manifold vacuum until said straight line relationship is altered by movement of said stem.

6. A choke control device for a carburetor having a body, an induction passage, a shaft and a choke valve mounted on said shaft in said passage: comprising a unit responsive to engine temperature for controlling the choke valve, a lever movable angularly by said unit and extending at one end toward said shaft and having a pivot means at the other end thereof, a lever extending radially from and being fixedly secured to said shaft for angular movement, and a member pivotally connected at one end to said first mentioned lever and at the other end to said second mentioned lever, said levers and member being in such relation to one another that the pivotal connections of said member and the pivot means of said first mentioned lever are on a straight line when said choke is in closed position and said unit is in cold engine position, thereby locking said choke in closed position regardless of engine manifold vacuum until said straight line relationship is altered by movement of said unit.

7. In a choke control device for a carburetor having an induction passage, a shaft and a choke valve mounted on said shaft in said passage: a unit responsive to engine temperature for controlling the choke valve, a lever extending radially from and being fixedly secured to said shaft for angular movement, and a pivoted lever movable by said unit on a plane parallel with the plane of rotation of said first mentioned lever and from a point tangent with the end of said first mentioned lever when the choke valve is in closed position and said unit is in cold engine position to a point substantially parallel with said first mentioned lever when the choke valve is in opened position and said unit is in warm engine position, and a linkage pivotally connecting the end of said first mentioned lever with the adjacent end of said second mentioned lever, said levers and member being in such relation to one another that the pivotal connections of said member and the pivot means of said second mentioned lever are on a straight line when said choke is in closed position and said unit is in cold engine position, thereby locking said choke in the closed position regardless of engine manifold vacuum until said straight line relationship is altered by movement of said unit.

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AL LAWRENCE SMITH, *Primary Examiner.*