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MINIATURE AUTOMATIC CHOKE SYSTEM

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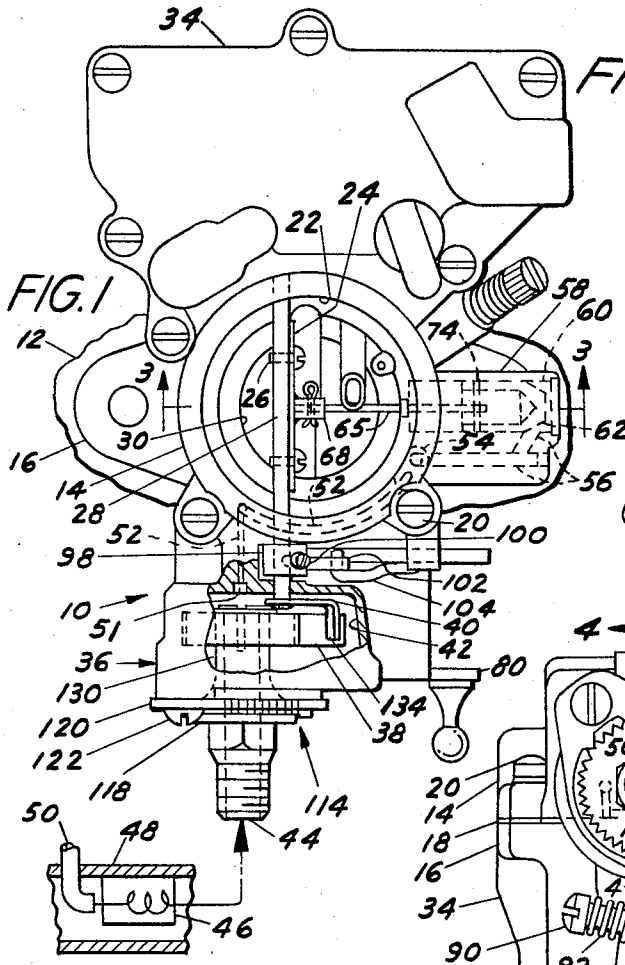


FIG. 1

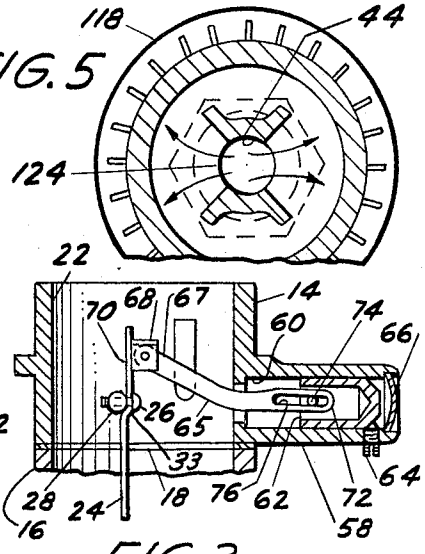


FIG. 3

FIG. 5

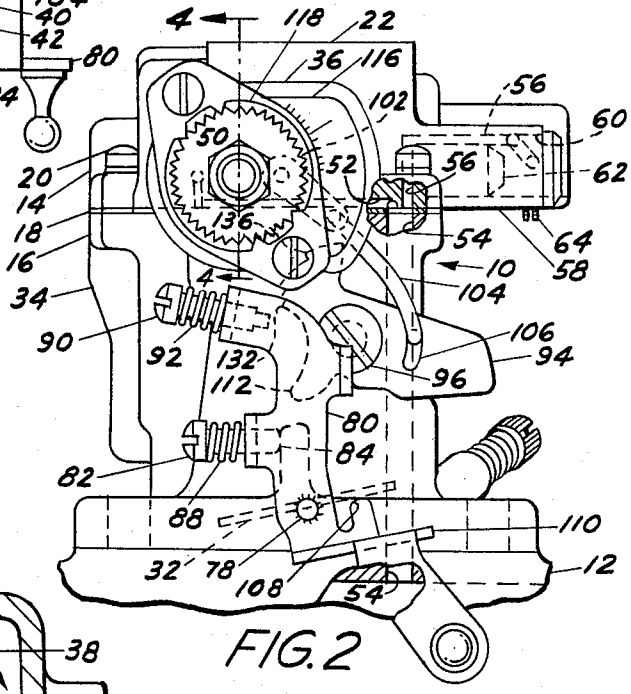


FIG. 2

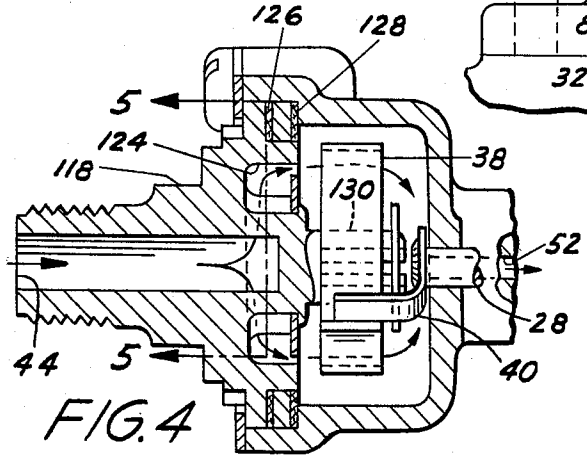


FIG. 4

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MINIATURE AUTOMATIC CHOKE SYSTEM

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This invention relates generally to internal combustion engine carburetors used on the so-called "compact" cars, and more particularly to a novel automatic choke system for the same.

Smaller type carburetors had to be developed for use with the relatively new "compact" cars. Consequently, there arose a need for a completely new and more compact automatic choke system which would operate satisfactorily with such a carburetor and be simple and inexpensive to fabricate.

Accordingly, it is a primary object of the invention to provide a novel automatic choke system which meets the above mentioned requirements.

Other more specific objects and advantages of the invention will become apparent when reference is made to the following description and accompanying illustrations wherein:

FIGURE 1 is a top view of a carburetor embodying the invention;

FIGURE 2 is an elevational view of the carburetor shown by FIGURE 1;

FIGURE 3 is an enlarged cross-sectional view taken on the plane of line 3—3 of FIGURE 1 and looking in the direction of the arrows;

FIGURE 4 is an enlarged cross-sectional view of the automatic choke housing assembly, taken on the plane of line 4—4 of FIGURE 2 and looking in the direction of the arrows; and

FIGURE 5 is a cross-sectional view, taken on the plane of line 5—5 of FIGURE 4 and looking in the direction of the arrows.

Referring now to the drawings in greater detail, FIGURE 1 illustrates a compact carburetor **10** mounted on an engine intake manifold **12**. The carburetor **10** may comprise upper and lower portions **14** and **16**, separated by a gasket **18** therebetween (FIGURE 2) and secured to each other in some suitable manner, such as by screws **20**.

The upper and lower portions **14** and **16** comprise an induction passage **22**, an unbalanced choke plate **24** secured, as by screws **26**, to an off-center choke shaft **28**, a venturi **30**, and a throttle plate **32**. The choke plate **24** contains a bend **33** formed at the point adjacent the shaft **28**, for a purpose which will be described later. A fuel reservoir **34** is formed as an integral part of the upper and lower portions **14** and **16**, and it contains the usual float assembly (not shown) and outlets to the various fuel systems.

The automatic choke housing **36** is formed as an integral part of the upper portion **14**. The choke shaft **28** is operatively connected to a bimetallic thermostat element **38**, positioned in the automatic choke housing **36**, by means of a choke lever **40** which is fixedly attached to the end of the choke shaft **28**. The integral choke housing **36** permits ready alignment of the choke shaft **28** through a single machined hole and eliminates the need for a seal, these being two inherent disadvantages in carburetors wherein the choke housing is a separate body.

It can be seen in FIGURE 1 that the center of the bimetallic thermostat element **38** and the center of the choke shaft **28** are not on the same axis. This particular configuration produces approximately a 2 to 1 leverage advantage, which results in lower costs because less material is required in the bimetallic element structure. In other words, the predetermined choke plate movement desired for a particular temperature change is accomplished with a bimetallic thermostat element **38** considerably shorter than would otherwise be required if the centers were on the same axis, since temperature rate of the element **38** varies directly with the length of the element.

The bimetallic element **38** in the choke housing chamber **42** is warmed by air entering through the choke housing inlet **44** from a suitable stove **46**, which could be located in the usual exhaust manifold **48**. A cold air tube **50** may, of course, communicate between the exhaust manifold **48** and any suitable cold air source such as some point (not shown) through the wall of the induction passage **22** above the choke plate **24**.

The choke housing chamber **42** is subjected to vacuum from the intake manifold **12** through an opening **51** and a vacuum passage **52** in the upper portion **14**. As better seen in FIGURE 2, the vacuum passage **52** intercepts a larger passageway **54** extending vertically through the lower portion **16** to the intake manifold **12**. A conduit **56** communicates between the top of the passageway **54** and a piston housing **58**.

The piston housing **58** comprises a chamber **60**, a vacuum responsive piston **62** slidably mounted therein, a manually adjustable stop **64** extending through the wall thereof, and a press-fitted end cap **66** for sealing off the rear piston cavity from the atmosphere (FIGURE 3). The piston **62** is operatively connected to the choke plate **24** by a link **65**. The link **65** is pivotally connected at its one end **67** to a bracket **68** fixedly attached to the smaller side **70** of the choke plate **24**, the other end **72** of the link **65** being connected to a pin **74** extending through the front portion of the piston **62**. The pin **74** rides in a lost-motion-producing slot **76** in the end **72** of the link **65** for a purpose to be described later.

The throttle plate **32**, fixedly attached to a throttle shaft **78**, is controlled by a throttle lever assembly **80** rigidly fastened to the throttle shaft **78**. Maximum closing movement of the throttle plate **32** is limited by means of an idle adjusting screw **82** abutting against a boss **84** formed on the lower body portion **16**. The idle screw **82** is prevented from vibrating loose from the throttle lever assembly **80** by a tension spring **88**. A fast idle cam screw **90** is held in adjustment on the throttle lever assembly **80** by a second tension spring **92**. The fast idle cam screw **90** is free at times, as will be described later, to abut against some one of the steps of a fast idle cam **94** which is pivotally mounted on the lower body portion **16**, as at **96**. The fast idle cam **94** is operatively connected to the choke shaft **28** by means of a bracket **98** and screw **100** and two pivotally connected links **102** and **104**, the latter being free to ride in an override slot **106** in the fast idle cam **94**.

Maximum opening movement of the throttle plate **32** is limited by the protrusion **108** on the throttle lever **80** abutting against the boss **84**. Also, extension **110** of the throttle lever will at times contact lug **112** formed on the fast idle cam **94**, thereby causing dechoking to occur.

FIGURE 2 further illustrates the choke housing cover assembly **114** which comprises a choke housing plate **116**, a thermostat cap and baffle assembly **118**, a thermostat cap clamp **120** and thermostat cap clamp screws **122**.

FIGURE 4 is an enlarged view of the complete automatic choke housing assembly **36** demonstrating the passageway **124** into the choke housing chamber **42** for the hot air which enters through the cap inlet **44**. Gaskets **126** and **128** may be located on the two sides of the choke housing plate **116**. This figure also illustrates the bimetallic thermostat element **38** mounted on an anchor

extension 130 of the thermostat cap and baffle assembly 118. It should be readily apparent that this construction permits ready readjustment of the bimetallic thermostat element 38 setting by loosening the screws 118 so as to disengage the thermostat cap clamp 120 from the serrated outer edge of the cap and baffle assembly 118, and turning the latter to the desired "richer" or "leaner" setting before retightening the screws 122.

FIGURE 5 illustrates the routing of the hot air through the thermostat cap inlet 44 and thence through the passageways 124 which may be cast into the thermostat cap and baffle assembly 118.

Assuming, for purposes of illustration, that the engine is cold and is being cranked, the thermostatic element 38 will be in its unwound condition by virtue of the accelerator pedal (not shown) having been depressed, thereby releasing the fast idle cam screw 90 from the lowest step 132 of the fast idle cam 94 where it would normally have remained from the previous engine operation. This would rotate the projection 134 of the lever 40 to its extreme counterclockwise position. The lever 40, being secured to the choke shaft 28, rotates the shaft 28 counterclockwise, thereby causing the choke valve 24 to assume a position which substantially closes off the flow of air through the carburetor induction passage 22, as well as causing the fast idle cam high step 136 to be presented to the fast idle cam screw 90 once the accelerator pedal is released.

While the engine is being cranked with the choke plate 24 being biased in a closed position as described above, engine manifold vacuum acting on the piston 62 through the passageway 54 and conduit 56, along with the associated air-flow acting upon the unbalanced choke plate 24, may cause the choke plate 24 to open slightly. Once the engine has fired and becomes self-sustaining, the resulting higher manifold vacuum acting upon the piston 62, against the tension of the thermostatic element 38, will open the choke plate 24 to a position determined by the manually adjustable stop 64. This position is maintained during fast idle while the fast idle cam screw 90 is positioned against the highest step 136 of the fast idle cam 94, the throttle plate 32 being cracked enough to provide the fast idle necessary to run a cold engine.

While the engine warms up, hot air is circulated through the choke housing 36 via the thermostat cap inlet 44 and the passageways 124 and out through the opening 50. This warms the bimetallic thermostat element 38, causing it to release its tension on the choke shaft 28 via the choke lever 40, allowing the unbalanced choke plate 24 to gradually open under the force of the increased air-flow through the induction passage 22. During this warm-up process while the fast idle cam 94 is being held at some one of its steps by the fast idle cam screw 90, as the choke shaft 28 rotates, the link 104 is free to slide downwardly in the lost motion slot 106 of the fast idle cam 94.

Engine manifold vacuum will of course, still be acting on the piston 62 through the passageway 54 and conduit 56, holding it against the adjustable stop 64. Hence, the lost motion slot 76, along with the hollow piston structure will permit the link 65 to move further into the piston 62.

Referring now to FIGURE 3, it may be noted that the larger and smaller sides of the choke plate 24 are off-set by virtue of a bend being formed therebetween, as illustrated. The result of this is that, for any particular angular rotation of the plate 24, more air will pass by the upper edge than would be the case if both sides were on the same plane, due to the outer edge of the upper side being automatically displaced further away from the wall of the induction passage 22 than would be the case if it were not off-set from the other side. It should be apparent that this is a very desirable feature, in view of the relatively small diameter induction passage 22 which is inherent in a compact carburetor design. Without the bend, in order to have the plate 24 open far enough during the initial warm-up stage, there would remain only a very small angle in which to rotate to a fully open choke plate position during the remaining warm-up stages.

The movement of the choke plate 24, of course, ties in directly with the various warm-up positions of the throttle plate 32, through the fast idle cam and the associated linkage. Without the offset choke plate configuration, the second step of the fast idle cam 94 would have to be longer than that illustrated, in order for the throttle plate 32 to be maintained open far enough to permit sufficient air to pass by during the initial warm-up process. This, of course, would eliminate some or all of the space available for additional steps, due to the physical limitations, and the engine would be idling much too fast during the final stages of warm-up, thereby tending to make it difficult during the last stages of choking prior to the choke becoming fully open to shift gears, when a standard transmission is involved, and tending to cause the vehicle to creep, at red lights, for example, when an automatic transmission is involved.

From the above, it should be readily apparent that a novel automatic choke system has been provided which is capable of efficient and economical operation in conjunction with a particular compact type carburetor. It is also apparent that simplicity, as well as low construction, operating and maintenance costs, have been emphasized in this automatic choke system so as to further the economy goals behind the development of the relatively new "compact" cars.

Although but one embodiment of the invention has been shown and described, it is conceivable that various modifications may be made without exceeding the scope of the appended claims.

What we claim as our invention is:

1. In an internal combustion engine carburetor having an induction passage and adapted to be mounted on an engine intake manifold, an automatic choke system comprising a first housing including a cover assembly with a warm air inlet therethrough and an anchor extension extending from said cover assembly into said first housing; temperature responsive means mounted on said anchor extension; a second housing including a pressure responsive piston; a common passageway adapted to be connected from said intake manifold to a point adjacent said first and second housings; a first conduit communicating between said common passageway and said first housing; a second conduit communicating between said common passageway and said second housing; a choke shaft extending across said induction passage and into said first housing; linkage means between said choke shaft and said temperature responsive means; a choke plate fixedly secured to said choke shaft, said choke plate having the portion on one side of said choke shaft off-set from the portion on the other side of said choke shaft; and second linkage means pivotally connected at its one end to the portion of said choke plate which swings upwardly to open and slidably connected at its other end to said pressure responsive means.

2. In an internal combustion engine carburetor having an induction passage subjected to a source of engine manifold vacuum, an automatic choke system comprising a first housing including a bimetallic thermostat spring; a choke shaft extending across said induction passage and into said first housing, said choke shaft having its axis displaced from the axis of said bimetallic spring so as to provide a leverage advantage in the actuation of said choke shaft by said bimetallic spring, linkage means connecting said choke shaft to the outer end of said bimetallic spring; an unbalanced choke plate fixedly connected to said choke shaft, said unbalanced choke plate having the plane of the smaller side thereof off-set from the plane of the larger side; a second housing including a pressure responsive piston, a manually adjustable stop in said housing for at times being contacted by said piston, additional linkage means connecting the smaller side of said choke

plate to said pressure responsive piston, and a lost motion slot in the piston end of said linkage means for receiving said additional linkage means; a first passageway leading from said source of manifold vacuum to a point intermediate said first and said second housing; a second passageway communicating between said first passageway and said first housing; a third passageway communicating between said first passageway and said second housing; and a fast idle cam associated with said choke shaft by means of a plurality of links and a lost motion slot in said fast idle cam.

3. In an internal combustion engine carburetor body having an induction passage therethrough, an automatic choke assembly, said assembly comprising a housing integral with said carburetor body; a cover on said housing; a cap assembly rotatively mounted on said cover; said cap assembly having a warm air inlet therethrough, an extension into said housing and an outer serrated face; clamp means positioned in a constant location against said serrated face and having notches for mating with said serrated face; temperature responsive means mounted on said extension; a choke shaft extending through said induction passage and into said housing at a point intermediate said extension and the outer end of said temperature responsive means; linkage means connecting said choke shaft to said outer end of said temperature responsive means; and a choke plate fixedly secured to said choke shaft in said induction passage, said choke plate having the portion on one side of said choke shaft off-set from the portion on the other side of said choke shaft; and second linkage means pivotally connected at its one end to the portion of said choke plate which swings upwardly to open and slidably connected at its other end to said pressure responsive means.

4. In an internal combustion engine carburetor body

having an induction passage therethrough, an automatic choke assembly, said assembly comprising a housing integral with said carburetor body; a cover assembly rotatively mounted on said housing; said cover assembly having a warm air inlet therethrough, an extension into said housing and an outer serrated face; clamp means positioned in a constant location against said serrated face and having notches for mating with said serrated face; temperature responsive means mounted on said extension; a choke shaft extending through said induction passage and into said housing at a point intermediate said extension and the outer end of said temperature responsive means; linkage means connecting said choke shaft to said outer end of said temperature responsive means; and a choke plate fixedly secured to said choke shaft in said induction passage, said choke plate having the portion on one side of said choke shaft off-set from the portion on the other side of said choke shaft; and second linkage means pivotally connected at its one end to the portion of said choke plate which swings upwardly to open and slidably connected at its other end to said pressure responsive means.

References Cited by the Examiner

UNITED STATES PATENTS

1,034,531	8/1912	Stump	251—305 X
2,026,947	1/1936	Leibing	261—65
2,771,282	11/1956	Olson et al.	261—39 X
2,776,821	1/1957	Davis	251—305 X
2,918,266	12/1959	Hamilton	261—39
3,180,576	4/1965	Herman	261—39 X

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