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Medrick

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[54] AUTOMATIC CHOKE CONTROL FOR ENGINES

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[52] U.S. Cl. ..... 123/119 F, 261/39 B

[51] Int. Cl. F02m 1/10

[58] Field of Search ..... 123/119 F; 261/39 R, 39 B

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[57] ABSTRACT

An automatic choke control for a carburetor of an internal combustion engine having a loosely coiled bimetallic thermostatic spring generally centered in a cylindrical housing means. One end of the spring is anchored in the housing means and the other end is operatively connected with a movable choke valve pivotally mounted in the air-fuel induction passage of a carburetor. Means are provided for passing a stream of heated air over the thermostatic spring and this means includes an air induction passage in the cylindrical housing means extending generally tangentially with respect to the housing and with respect to the coils of the thermostatic spring and an air exhaust passage located generally centrally of the housing. This structure forms a vortex of heated air in heat transfer relationship to the thermostatic spring.

8 Claims, 3 Drawing Figures

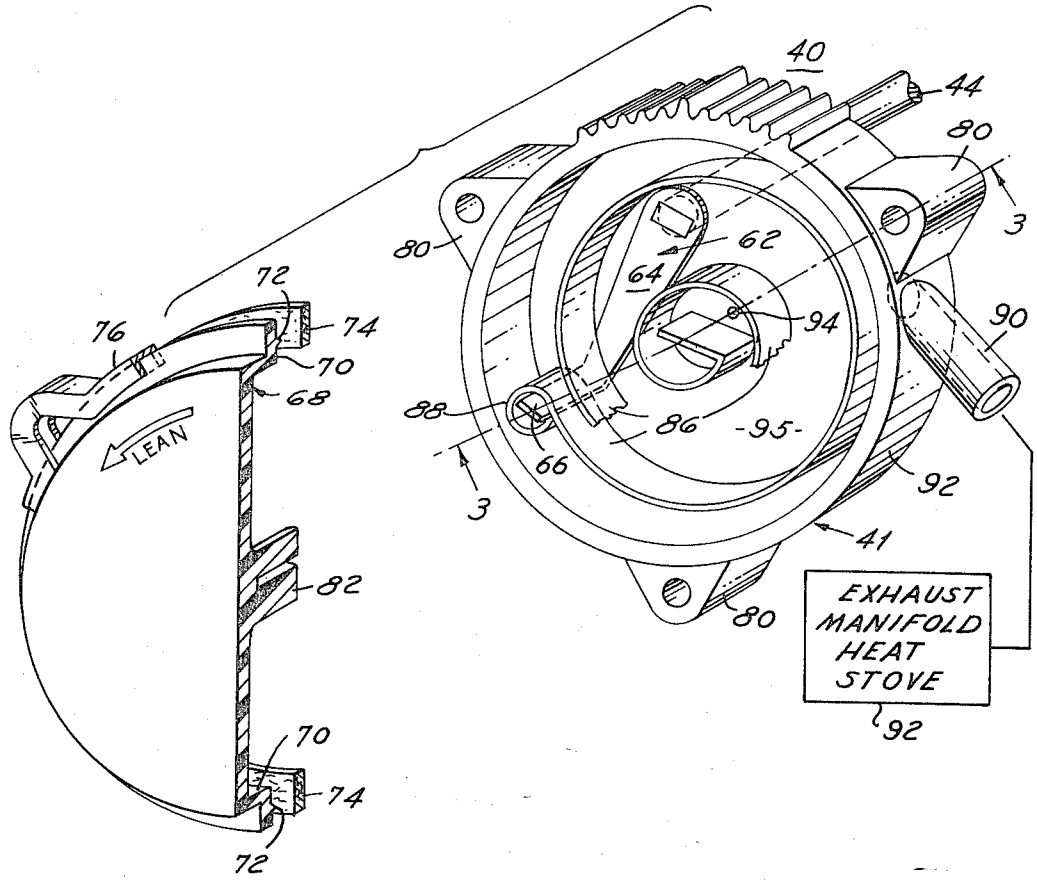


FIG. 1

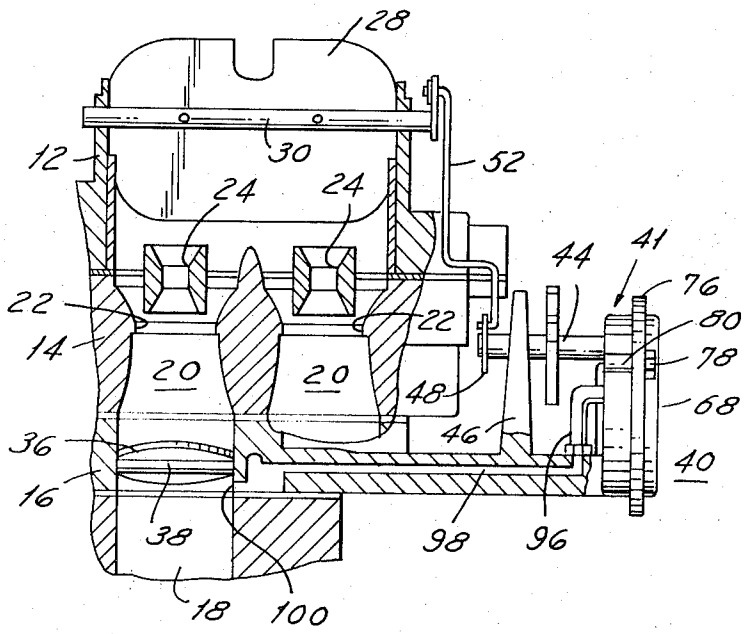

28
30
12
52
24
24
44
41
76
22
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68
36
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16
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98
96
18
100

FIG. 2

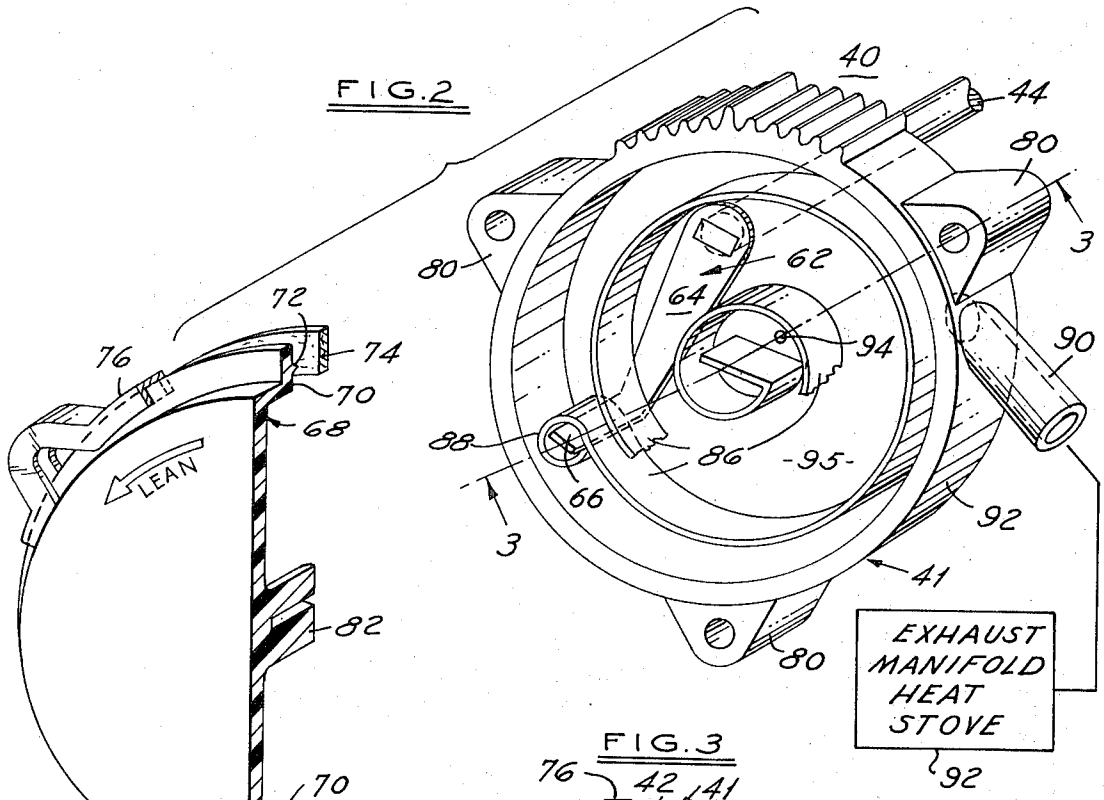
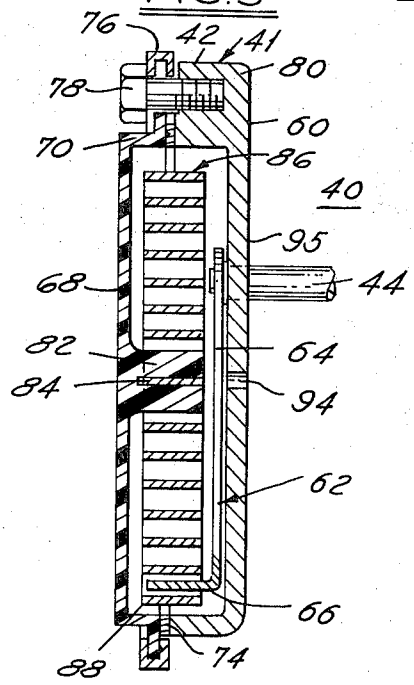

40
44
80
3
62
64
94
90
88
86
95
66
92
41
EXHAUST MANIFOLD HEAT STOVE
92
72
76
74
70
68
LEAN
82
70
74
72

FIG. 3


76
42
41
80
78
60
70
86
40
95
68
44
82
64
84
94
62
66
88
74

AUTOMATIC CHOKE CONTROL FOR ENGINES

BACKGROUND AND SUMMARY

This invention relates to carburetors for internal combustion engines, and more particularly to automatic choke controls for such carburetors.

At lower engine temperatures, friction within an internal combustion engine increases due to increase in viscosity of the lubricant. In order to prevent stalling of the engine, the idle speed must be increased. Accordingly, a choke mechanism generally is provided to throttle the air intake of the carburetor during cold starting and engine warmup to assure a richer fuel-air mixture.

Generally, the choke apparatus includes a coiled thermostatic spring that rotates the choke valve towards the closed position with decreasing temperatures and progressively opens it as the temperature rises. A manifold-suction responsive device cracks open the choke a predetermined amount when the engine starts. The choke action provides a rich mixture so that sufficient fuel will vaporize to provide smooth starting and running of the cold engine.

The above construction provides satisfactory start and cold engine running conditions, but the rich mixture necessarily results in exhaust gases having fairly high levels of carbon monoxide and unburned hydrocarbons. Accordingly, it is advantageous from the standpoint of fuel economy and low emission levels to reduce the choking operation of the engine as rapidly as possible after the engine is started, consonant with smooth engine operation.

The present invention provides a construction for accomplishing the reduction in the choking operation of the engine as rapidly as possible consonant with smooth engine operations to provide the advantages set forth above. This is done by providing a vortex of hot air that is in heat transfer relationship to the thermostatic spring that is coupled to operate the choke valve. More particularly, an air passage delivers hot air from an exhaust manifold heat stove in a direction generally tangentially with respect to a cylindrical housing which houses a coiled bi-metal choke control thermostatic spring. One end of the spring is affixed to the housing and the other end is attached to a lever which is operatively connected through various mechanisms to the choke valve. At lower temperatures this spring operates to close the choke valve in the air induction passage of the carburetor.

Hot air from the exhaust manifold heat stove is injected into the housing in a direction generally tangentially to the cylindrical housing and to the coils of the spring as soon as the exhaust manifold becomes warm. Preferably, this hot air is injected in a direction opposite to the direction that the spring is coiled. The hot air is exhausted from the housing through a centrally located opening which is preferably connected to a source of vacuum, e.g., the intake manifold of the engine. This forms a vortex of heated air which is in heat transfer relation to the thermostatic bi-metal spring and heated air flows between the coils of the spring to the centrally located opening in the housing.

As a result the hot air is in intimate heat exchange contact with the full length of the thermostatic bi-metal spring thereby causing the spring to heat faster than would ordinarily be the case. This causes the choke valve to open faster than with conventional constructions. Consequently, choking action is reduced in a very rapid manner as soon as the engine is heated sufficiently to no longer require such action. Reduction of the choking action leans the fuel-air mixture and hence reduces the level of unburned hydrocarbons and carbon monoxide found in the exhaust gases of the engine during warm-up operations.

Among the objects of the present invention are to provide an automatic choke construction that will provide good cold weather characteristics and yet reduce to a minimum the output of undesirable emissions; to provide such a construction in which the heating of the coiled thermostatic spring is more accurately controlled for better choke control; to provide such a construction in which there is greater contact of heated air entering the choke housing with the thermostatic spring and generally to improve automatic choke constructions of the type described.

Other objects, features and advantages of the invention will become more apparent upon reference to the succeeding detailed description thereof and to the drawings illustrating a preferred embodiment thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross-sectional elevational view of a portion of a four-barrel carburetor embodying the invention.

FIG. 2 is an exploded perspective view of the choke mechanism of the present invention, and

FIG. 3 is a vertical section through the choke mechanism of the present invention taken on the line 3—3 of FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is obtained by passing a plane through approximately one-half of a known type of four-barrel, downdraft carburetor. The portion of the carburetor shown includes an upper air horn section **12**, an intermediate main body portion **14**, and a throttle valve flange section **16**. The three carburetor sections are secured together by suitable means, not shown, over an intake manifold indicated partially at **18** leading to the engine combustion chambers.

Main body portion **14** contains the usual air-fuel mixture induction passages **20** having fresh air intakes at the air horn ends, and connected to manifold **18** at the opposite ends. The passages are each formed with a main venturi section **22** containing a booster venturi **24** suitably mounted for cooperation therewith, by means not shown.

Air flow through passages **20** is controlled in part by a choke valve **28** mounted in unbalanced relationship on a shaft **30** which is rotatably mounted on side portions of the carburetor air horn, as shown. Flow of fuel and air through each passage **20** is controlled by a conventional throttle valve **36** fixed to a shaft **38** rotatably mounted in flange section **16**. The throttle valves are rotated in a known manner by depression of the vehicle accelerator pedal, and move from an idle speed position essentially blocking flow through passages **20** to a wide open position essentially at right angles to the position shown.

The rotative position of choke valve **28** is controlled by the automatic choke control mechanism **40** of the

present invention. The latter includes a hollow housing **41** that is apertured for supporting rotatably one end of a choke lever operating shaft **44**. The other end of the shaft **44** is rotatably supported in a casting **46**. A bracket or lever portion **48** is fixed on the left end portion of shaft **44** for mounting the end of a rod **52** that is connected to choke valve shaft **30**. It will be clear that rotation of shaft **44** in either direction will correspondingly rotate choke valve **28** to open or close the carburetor air intake, as the case may be.

Referring now to FIGS. **2** and **3** of the drawings, the automatic choke control mechanism **40** of the present invention includes the housing **41** which may have a portion **42** formed as an aluminum die casting and has means not shown for attaching it to the side of the carburetor **12**. The choke lever operating shaft **44** is journaled in the choke housing portion **42** and is operatively connected to operate the choke valve **28** of the carburetor **12** as described above. A generally L-shaped thermostatic spring lever **62** has one leg **64** secured to the end of the shaft **44** within the choke housing portion **42** and has the other end **66** extending in generally parallel spaced relation to the shaft **44**.

A choke cap **68** forms a portion of the choke housing **41** and is adapted to close the open side of the choke housing portion **42**. The choke cap **68** is formed of molded plastic and is generally circular or cylindrical in form. A peripheral flange **70** is provided to hold the cap in assembled position on the choke housing portion **42**. A circumferential ridge **72** on the flange **70** is in sealing engagement with the gasket **74** interposed between the choke cap **68** and the choke housing portion **42**.

A choke cap retainer washer **76** extends about the cap **68** and is held in position by a series of screws **78** threadably engaged in bosses **80** spaced about the periphery of the choke housing portion **42**. The retainer washer **76** is of the general form indicated in the drawing and is formed so as to resiliently engage and press the circumferential ridge **72** of the flange **70** of the choke cap **68** against the gasket **74**.

The choke cap **68** is provided with a central inwardly projecting boss **82** which is slotted to receive the diametrically extending inner end **84** of a thermostatic spring **86**.

The thermostatic spring **86** is formed of a strip of loosely coiled bi-metallic material that lies within the choke housing **41**. The outer end **88** of the spring **86** is formed into a loop that engages the leg **66** of the thermostatic spring lever **62** as indicated in the drawings.

The choke housing **41**, preferably the choke housing portion **42**, is provided with a hot air passage **90** extending through the generally cylindrical peripheral side wall **92** of the choke housing portion **42**. The passage **90** is connected to an exhaust manifold heat stove **92** which supplies a stream of hot air to the automatic choke control mechanism **40** a short time after the engine is started. The air passage **90** extends generally tangentially of the generally cylindrical peripheral side wall **92** of the choke housing portion **42** and in a direction opposite to the direction in which the thermostatic spring **86** is coiled. An exhaust passage or opening **94** is located centrally of the choke housing **41**, i.e., in the end wall **95** of the housing portion **42** and communicates with the intake manifold **18** via conduit **96**, passage **98** in the carburetor body and port **100** located just below throttle valve **36**.

The port **100** is always under a slight vacuum due to the throttling of the air flow by the venturi **22** and the throttle valve **36**. Consequently, the heated air that enters the passage **90** exits from the choke housing **41** via the exhaust passage or opening **94** and then flows through the conduit **96**, the passageway **98** and the port **100** into the intake manifold **18**. The hot air from the exhaust manifold heat stove **92**, it can readily be appreciated, is injected tangentially with respect to the generally cylindrical side wall **92** of the choke housing portion **42** and therefore generally tangentially with respect to the coils of the bi-metal spring **86**. Moreover, in the preferred form of the invention this air is injected tagentially and in a direction opposite to that in which the thermostatic spring **86** is coiled.

As can be seen from the drawings, the bi-metal spring **86** substantially fills the cavity formed by the choke housing **41**. It will also be noted by reference to FIG. **2** that the exhaust passage or opening **94** that is under a vacuum via the structure previously decribed, is located at the center of the coiled thermostatic spring **86**. Thus, the hot air that is injected tangentially through the passage **90** from the exhaust manifold heat stove **92** forms a vortex that has an axis coincident to the axis or center of the exhaust passage or opening **94** and coincident with the axis of the coils of thermostatic bi-metal spring **86**. Consequently, the heated air is in contact with a major portion of the length of the coiled thermostatic spring **86**. This provides for a very efficient heat transfer between the hot air injected into the choke housing **41** via air passage **90** and the whole of the thermostatic spring **86**. This rapid heat transfer rapidly heats the bi-metal spring **86** thereby rapidly opening the choke valve **28** as soon as hot air is available in the exhaust manifold heat stove and this air is available shortly after the internal combustion engine is started.

Thus the present invention provides an automatic choke control mechanism in which the choke valve is opened as rapidly as possible after the internal combustion engine is started and is sufficiently warm to provide heat to the choke mechanism. At this time, of course, the throttling action of the choke valve is no longer needed and the rapid opening of the choke valve leans the fuel air mixture thereby reducing the amount of unburned hydrocarbons and carbon monoxide contained in the exhaust gases emitted from the engine as rapidly as is feasible.

What I claim and desire to secure by U.S. Letters Patent is:

1. An automatic choke control for use with a carburetor having an air-fuel induction passage and a choke valve pivotally mounted across the passage, said automatic choke control comprising a housing having a generally cylindrical side wall mounted on said carburetor, a coiled thermostatic spring positioned in said housing, one end of said spring being anchored in said housing, means operatively coupling the other end of said thermostatic spring with said choke valve for positioning said choke valve in response to the temperature of said thermostatic spring, means coupled to said housing for injecting a stream of heated air into said housing in a direction generally tangential with respect to said generally cylindrical side wall of said housing, said housing having an exhaust passage positioned

therein approximately on the axis of said generally cylindrical side wall whereby a vortex is formed in heat transfer relationship to said thermostatic spring.

2. The combination of claim 1 in which said thermostatic spring is formed in a loose coil, said first mentioned end of said thermostatic spring is anchored approximately on the axis of said generally cylindrical side wall of said housing adjacent said exhaust passage and said other end of said thermostatic spring is positioned radially outwardly of said first end.

3. The combination of claim 2 in which said means for injecting a stream of heated air into said housing in a direction generally tangential with respect to said generally cylindrical side wall is positioned to inject said stream of heated air in a direction opposite to that in which said thermostatic spring is coiled.

4. The combination of claim 1 and further comprising an intake manifold, the carburetor being mounted on said intake manifold and means connecting said exhaust passage to said intake manifold.

5. The combination of claim 1 in which said means coupled to said housing for injecting a stream of heated gas into said housing comprises an exhaust manifold heat stove.

6. An automatic choke control mechanism for use with an internal combustion engine, the combination comprising a carburetor having an air induction passage, a choke valve pivotally mounted in said air induction passage, a housing mounted on said carburetor, a thermostatic spring positioned in said housing, one end of said spring fixed in said housing, means operatively coupling the other end of said thermostatic spring with said choke valve for positioning said choke valve in response to the temperature of said thermostatic spring, and means coupled to said housing for providing a vortex of heated air in said housing in heat transfer relationship to said thermostatic spring, said thermostatic spring being formed in a loose coil with the axis of the coil being positioned generally coincident with the axis of said vortex of heated air, said housing having a generally cylindrical side wall and an end wall, and said means for providing a vortex of heated air comprising an opening in said end wall positioned approximately on the axis of the coil of said thermostatic spring and means for injecting heated air into said housing in a direction substantially tangential to said generally cylindrical side wall.

7. The combination of claim 6 in which the internal combustion engine includes an intake manifold connected to the air induction passage, and means are provided for connecting said opening in said end wall of said housing with said intake manifold.

8. The combination of claim 7 in which the internal combustion engine is provided with an exhaust manifold heat stove and said means for injecting heated air into said housing comprises a passage connected to said exhaust manifold heat stove and to said generally cylindrical side wall of said housing.

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