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AUTOMATIC CHOKE

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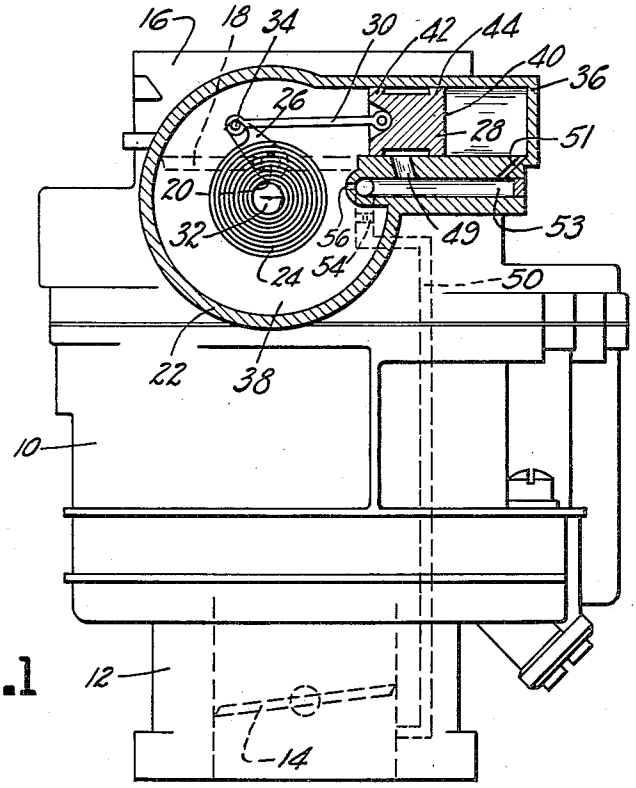


FIG. 1

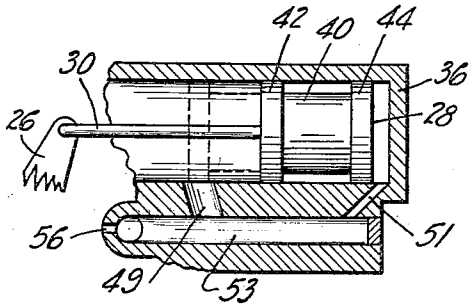


FIG. 2

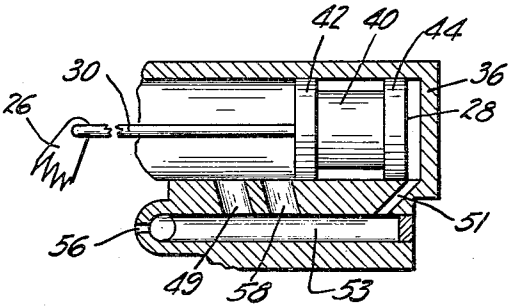


FIG. 3

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AUTOMATIC CHOKE

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The present invention relates to carburetors for internal combustion engines and more particularly to a choke control device for said carburetors.

One of the types of the automatic choke devices widely used commercially on automotive carburetors consists of a thermostatic element responsive to engine temperature for closing the choke valve when the engine is cold and a piston responsive to manifold vacuum for moving the choke valve to a partially open position when the engine begins to fire. The vacuum port in the side wall of the cylinder housing the piston is connected by a conduit to the induction passage on the engine side of the throttle. This conduit usually has a bleed passage opening into the thermostat housing for drawing heated air into said housing.

In devices of this type, if it is desired to increase the amount of heated air flowing from the exhaust stove through the thermostat housing the size of the bleed passage must be increased thereby reducing the vacuum available for operating the piston. A further disadvantage of this type of device is that there is a tendency for air to flow between the piston and cylinder wall throughout the operation of the device resulting in the depositing of sand and dust in this restricted space causing the piston to bind.

It is therefore one of the principal objects of the present invention to provide a piston and cylinder construction for the aforesaid choke control device which remains free of sand, dust, or other foreign materials.

Another object of the invention is to provide a choke control device which allows the amount of heated air drawn through the thermostat housing to be easily increased without decreasing the initial opening force on the piston.

Another object of the invention is to provide an automatic choke control device which is readily responsive to engine operating conditions.

A further object of the invention is to provide a choke control device in which the parts can be easily arranged to suit any particular type of carburetor or engine installation.

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

Figure 1 is a side elevation in which an automatic choke control device is shown in cross section;

Figure 2 is an enlarged, fragmentary, cross sectional view of the cylinder of the choke control device shown in Figure 1 with the piston in the position occupied; and Figure 3 is a fragmentary, cross sectional view of the piston and cylinder of the choke control device, showing a modified form of my invention.

Referring more specifically to the drawing, numeral **10** designates the main body of a downdraft carburetor, **12** a throttle body, **14** a throttle valve and **16** an air horn in which is mounted a choke valve **18** on a shaft **20**. The shaft is off-set from the center of the induction passage to unbalance the choke valve so that air flow through

the induction passage will tend to open the valve. The carburetor contains in addition to those elements mentioned, a main fuel system, idle system, accelerating pump, fuel bowl and power enrichment jet, usually found in conventional float type automotive carburetors. A description of these elements here is not necessary since their construction is well known.

The choke valve **18** is controlled by an automatic choke unit mounted on the air horn at one end of a shaft **20** and consisting principally of a housing **22**, a thermostat **24** of a coiled bi-metallic material connected to the choke shaft through a lever **26**, and a vacuum actuated piston **28** connected to lever **26** by a rod **30**. The housing is in communication, through a tube, with a stove (not shown) mounted on the exhaust manifold of the engine. The thermostat is anchored at its center to a fixed pin **32** and is hooked at its outer end over a pin **34** on the free end of lever **26**. As the engine cools, the thermostat uncoils and urges the lever in a counter-clockwise direction, i. e. in the direction to close the valve. After the engine has started to run under its own power and commences to warm, the thermostat gradually coils upon itself and backs the free end thereof away from the pin **34** thus permitting the choke valve to open under the influence of air flow in the induction passage. Since the larger portion of the unbalanced valve is on the side moving downwardly as the valve opens the valve tends to move to and stay in open position and must be positively moved to and held in closed or partly closed position. In the unit shown in the drawing, the thermostat is capable of positively moving the choke valve only toward closed position although in some installations it may be desirable to secure the free end of the thermostat to pin **34** so that the choke valve will be positively moved toward open position.

Piston **28** is disposed in a cylinder **36** and consists of a cylindrical member **40** formed with lands **42**, **44** on either end.

The cylinder **36**, which is closed at one end and connected directly at the other end with chamber **38** of the housing, is connected at ports **49** and **51** along the cylinder wall to the induction passage on the engine side of the throttle valve by conduits **50** and **53**. A bleed **56** in the conduit **53** connects chamber **38** of the housing through restriction **54** and conduit **50** with the induction passage on the engine side of the throttle valve. The port **49** is of substantially larger diameter than the port **51** and is positioned in the side wall of the cylinder between the closed and opened end thereof so as to be closed off by the piston **28** when the choke valve is in a closed position as shown in Figure 1. Port **51** is located in the side wall of the cylinder adjacent the closed end of said cylinder. After the engine begins to fire the manifold vacuum is transmitted through conduit **50**, restriction **54**, conduit **53** and port **51** in the side wall of the cylinder subjecting the piston **28** to the full force of engine vacuum causing the piston to move rapidly in a direction to open the choke valve. At a predetermined value of choke opening land **42** on the piston **28** uncovers port **49** establishing communication between conduit **53** and chamber **38** whereby the vacuum in the closed end of the cylinder is substantially reduced. Continued movement of the piston toward the wide open position, shown in Figure 2, is caused by a combination of forces from the unbalanced choke valve and the reduced manifold vacuum transmitted through the port **51**. The land **42** has a width smaller than the diameter of port **49** to prevent the vacuum from holding the piston against the side wall of the cylinder as the land passes over the port, as shown by the dotted lines in Figure 2.

With this arrangement, as the port **49** is uncovered greater quantities of heated air are drawn into the cham-

ber 38 of the thermostatic housing so that the thermostat may more quickly respond to engine temperature changes. A further result of the uncovering of port 49 is the reduction of vacuum in the closed end of the cylinder to the extent that practically no air will pass between piston 28 and the cylinder 36 and then through the port 51 so that there will be little or no tendency for sand or dust to be deposited between the piston and the cylinder. It has been discovered that by forming a relatively sharp trailing edge on the land 42 that any sand or dust deposited on the cylinder wall behind the piston will be readily carried into the chamber 38 as the choke valve returns to the closed position.

The size of ports 49 and 51 may be varied in relation to one another in order to vary the effect of vacuum in the closed end of the cylinder. The restriction 54 may be included in conduit 50 so that the amount of vacuum transmitted to the cylinder may be varied from one installation to another.

A modification of my invention is shown in Figure 3 wherein a port 58 is located in the cylinder wall between ports 49 and 51 and axially spaced therefrom. As the choke valve moves toward open position, land 42 on the piston successively opens ports 49 and 58. Opening the additional port 58 to the chamber 38 of the housing causes an increased amount of heated air to flow through the chamber and reduces the vacuum in conduit 53 to the extent that the vacuum in the closed end of the cylinder becomes substantially ineffectual to actuate piston 28. Continued movement of the piston after port 58 opens is effected by the unbalanced choke valve. In this embodiment the vacuum in the closed end of the cylinder may be reduced so that substantially no air flows between the piston and cylinder walls.

By varying the relative sizes of the ports 49, 51 and 58 and the axial spacing thereof in the cylinder wall any desired operating characteristic of the choke control device may be obtained.

Other modifications and arrangements may be made without departing from the scope of the invention.

I claim:

1. In a carburetor, an induction passage, a choke valve and a throttle valve in said passage, a shaft for said choke valve, a lever secured to said shaft, a thermostatic means operatively connected to said lever, a housing for said thermostatic means, a cylinder opening at one end into said housing and being closed at the other end, a piston in said cylinder connected at one end to said lever, a pair of ports having different diameters axially spaced in the side wall of said cylinder, the smaller diameter port located adjacent the closed end of said cylinder, the larger diameter port located between said smaller port and the open end of said cylinder, said larger diameter port adapted to be closed by said piston when the choke valve is closed and adapted to be opened at a predetermined value of choke opening, and a conduit connecting said ports with said passage on the engine side of the throttle.

2. In a choke control device for an engine having an induction passage with a choke valve therein, a cylinder, a piston in said cylinder operatively connected to said choke valve, a plurality of axially spaced ports in the side wall of said cylinder, at least one of said ports adapted to be open throughout the operation of said device, the remainder of said ports adapted to be closed by said piston when the choke valve is closed and to be successively uncovered by said piston as said valve moves toward open position, and a conduit connecting said ports with a source of engine vacuum.

3. In a carburetor, an induction passage, a choke valve and a throttle valve in said passage, a shaft for said choke valve, a lever secured to said shaft, a thermostatic means, a one way connection between said thermostatic means and said lever, a housing for said thermostatic means, a cylinder opening at one end into said housing and being closed at the other end, two longitudinally spaced ports in the side wall of said cylinder, a piston in said cylinder connected to said lever and adapted to close one of said ports when the choke valve is closed and to form an imperforate wall between the other of said ports and said housing, said piston adapted to open said one port at a predetermined degree of choke opening, and a conduit connecting said ports with said passage on the engine side of the throttle.

4. In a carburetor, an induction passage, a choke valve, a cylinder having an open end and a closed end, a piston in said cylinder operatively connected to said choke valve, a conduit connecting said cylinder near its closed end with a source of vacuum, and a port connecting said conduit with said cylinder adjacent the open end of said cylinder, said piston being adapted to alternately fully open and fully close said port as said choke valve is opened and closed respectively.

5. A control device for an internal combustion engine having an induction passage with a choke valve and a throttle valve therein comprising a thermostatic means operatively connected to said choke valve, a housing for said thermostatic means, a cylinder opening at one end into said housing and being closed at the other end, a piston in said cylinder operatively connected to said choke valve, a pair of ports having different diameters in the side wall of said cylinder, the smaller diameter port being located adjacent the closed end of said cylinder, the larger diameter port being located adjacent the open end of said cylinder and adapted to be closed by said piston when said choke valve is in a closed position and to be opened by said piston when said choke valve is opened a predetermined amount, and a conduit connecting said ports with said passage on the engine side of the throttle.

6. A control device for a choke valve, comprising thermostatic means adapted to be connected to said valve, a housing for said means, a cylinder opening at one end into said housing and being closed at the other end, an imperforate piston in said cylinder adapted to be connected to said choke valve, a plurality of ports in the side wall of said cylinder, a portion of said ports being closed by said piston when said choke valve is in closed position and being opened by said piston when said choke valve is opened a predetermined amount, a conduit connecting said ports with a source of vacuum, and a bleed passageway connected to said conduit and being in constant communication with said housing.

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