

Nov. 16, 1954

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2,694,559

AUTOMATIC CHOKE

Filed Sept. 13, 1950

2 Sheets-Sheet 1

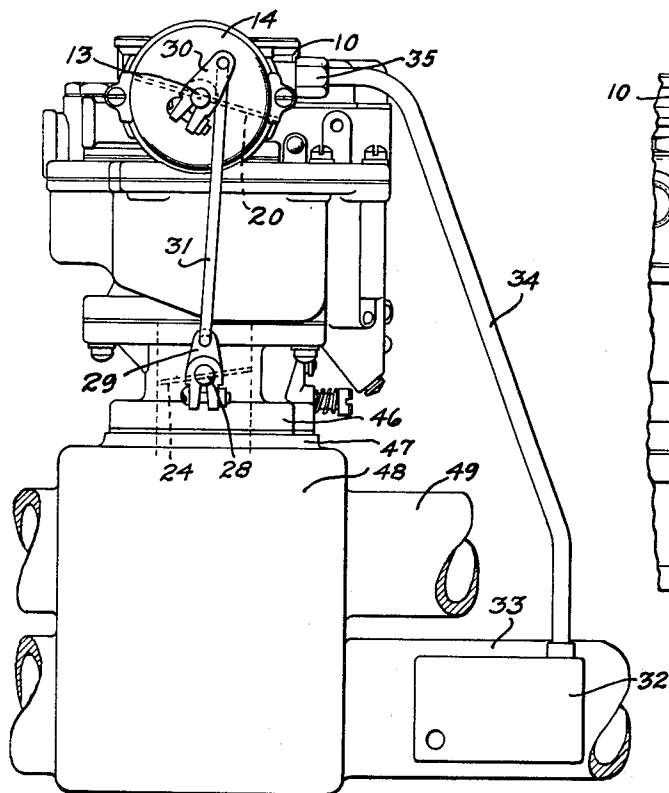


FIG. 1.

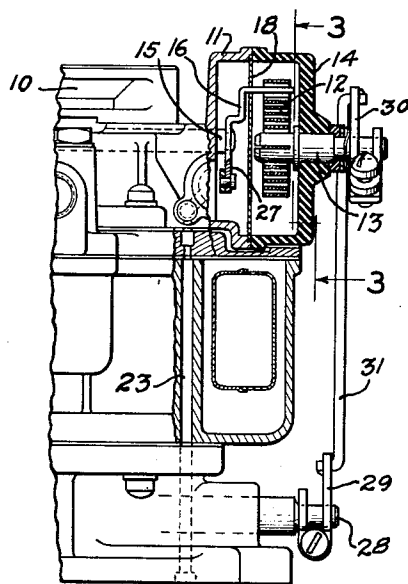


FIG. 2.

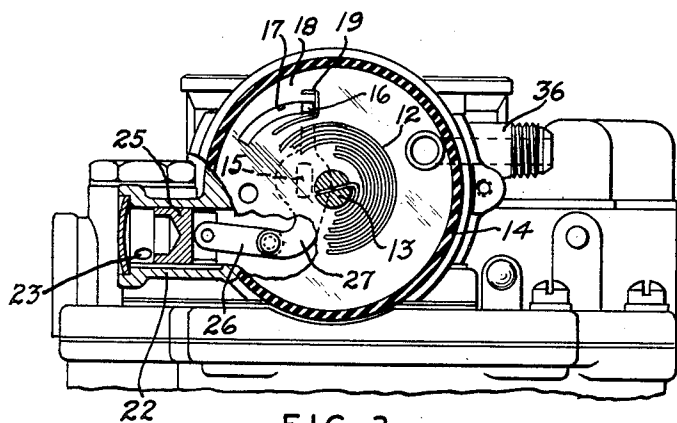


FIG. 3.

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2 Sheets-Sheet 2

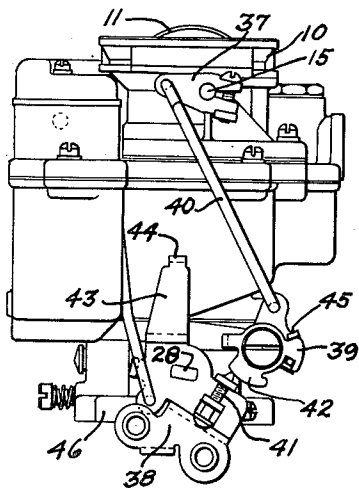


FIG. 4.

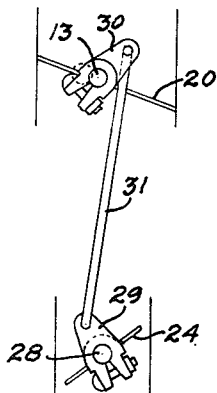


FIG. 5.

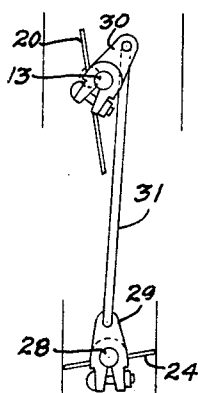


FIG. 6.

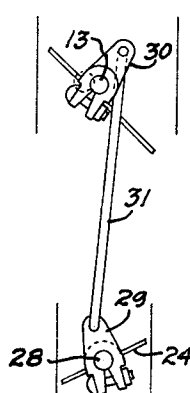


FIG. 7.

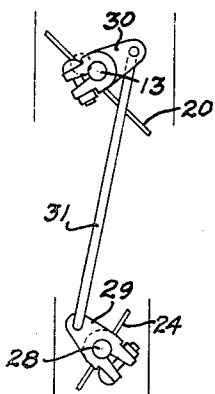


FIG. 8.

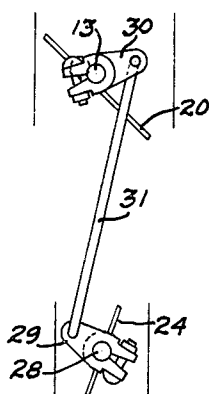


FIG. 9.

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2,694,559

AUTOMATIC CHOKE

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Application September 13, 1950, Serial No. 184,696

3 Claims. (Cl. 261—39)

This invention relates to internal combustion engines and consists particularly in a novel automatic choke control therefor.

The automatic choke control now customarily used with internal combustion engines of the automotive type has an unbalanced choke valve, a thermostatic coil connected to the choke valve in such a manner as to tend to resiliently close the choke valve when the engine temperature is low, and a suction motor which applies an opening force to the choke valve when the engine starts to run under its own power. This type, as described in greater detail in Coffey Patent No. 2,085,351 is well adapted to manufacture by high production methods and has proven generally satisfactory. However, in some cases, it has been found that during the warm-up period, in case the engine should be subjected to a heavy load, the suction motor and the direct force of air applied to the unbalanced choke are insufficient to hold the choke valve open far enough to insure the supply of a proper, driving mixture. This is because the suction produced by the engine drops when the throttle valve is opened, permitting the partly heated thermostat to move the choke valve toward closed position. The effect becomes quite pronounced as the throttle moves from say, half to full open position and may result in bucking of the engine or even stalling.

The mentioned condition is frequently experienced in hilly or mountainous country where it may be necessary to negotiate a steep grade during the warm-up period. The excessively rich condition resulting is further aggravated by reduced atmospheric pressure at high altitudes which not only reduces the quantity of air entering the carburetor, as is well known, but also decreases the effectiveness of the suction motor unit of the automatic choke.

Another problem encountered with this type of choke control is that during a long pull, even though the engine is operating at normal temperature, insufficient warm air may be supplied to the choke controlling thermostat through the usual heating mechanism to retain the thermostat in its fully heated condition with the result that the choke valve may be slightly closed due to cooling of the thermostat. This will result in a loss of power whereupon the operator, instinctively, will depress his throttle slightly which only aggravates the difficulty.

The main object of the present invention is to overcome the above mentioned disadvantages sometimes experienced with the use of the Coffey type of automatic choke control.

A more detailed object is to provide novel means for reducing the tension applied to the choke valve upon opening movement of the throttle valve at such time as the thermostat is not fully heated.

These objects and other more detailed objects hereafter appearing are attained by the device illustrated in the accompanying drawings in which:

Fig. 1 is a side view showing a portion of the manifold of an internal combustion engine of the automotive type with a carburetor mounted thereon embodying the invention.

Fig. 2 is a partial side view of the carburetor in Fig. 1 on a somewhat larger scale and with portions broken away and sectioned.

Fig. 3 is a detail view on a still larger scale and taken on line 3—3 of Fig. 2.

Fig. 4 is a view of the carburetor in Fig. 1, but taken from the opposite side.

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Fig. 5 is a diagrammatic representation of the choke and throttle valves showing the throttle about one-third open, and the choke valve remaining closed, as in cranking cold.

Fig. 6 is a similar view and showing the throttle in idling position and the choke valve nearly fully open as with almost fully heated thermostat.

Fig. 7 is a similar view, but showing the choke and throttle valves slightly opened.

Fig. 8 is a diagrammatic view showing the throttle valve opened far enough to substantially relax the closing tension applied by the thermostat to the choke valve.

Fig. 9 is a similar view showing the throttle nearly fully open and the choker valve opened accordingly by the unloader mechanism.

The carburetor shown in the figures is of the dual down-draft type including an air inlet horn 10 having mounted at the side thereof a casing 11 which receives a bi-metal thermostat coil 12 with its inner end anchored to a stub shaft 13 journaled in cover 14 of the casing. Choke shaft 15 projects into casing 11 and has an angular lever 16 rigid therewith within the casing. The free end of this lever projects through a slot 17 in a disk baffle 18 secured between the base and cover portions of the thermostat casing and is received within a hook 19 on the outer end of the thermostatic coil. The coil is of the type which unwinds as the temperature lowers so as to rotate lever 16 counterclockwise (Fig. 3) or in a direction tending to close the unbalanced, butterfly type choke valve 20.

The automatic choke control also includes a suction motor consisting of a cylinder 22 projecting from the casing and connected by means of a passage 23 to the induction conduit posterior to the throttle valve 24. A piston 25 works in the cylinder and is connected by a link 26 to a crank 27 which forms an extension of lever 16 rigid with choke valve shaft 15. A groove in piston 25 provides for by-passing a portion of the suction to the interior of the casing for drawing warm air there-through.

Throttle valve 24 is mounted on a shaft 28 journaled in the opposite walls of the mixture conduit. A lever 29 is rigid with one end of the throttle shaft. An arm 30 is rigid with stub shaft 13 to which the inner end of the thermostat is anchored and this arm is connected by a link 31 to throttle shaft lever 29.

Heat is supplied to the thermostat coil under the influence of suction from a stove 32 mounted on exhaust manifold 33 through a tube 34 connected to the automatic choke housing by means of a fitting 35 and nipple 36. This automatic choke control mechanism, except for the journaled shaft 13 and parts 30, 31, and 29, is described and claimed in Coffey Patent No. 2,085,351.

A throttle and choke valve interconnection of more or less conventional type, as shown in Fig. 4, is mounted on the opposite side of the carburetor. This consists of a lever 37 rigidly mounted on the projecting end of choke shaft 15, a throttle operating lever 38 rigidly secured to the exposed end of throttle shaft 28, and a fast idle cam 39 connected to choke shaft lever 37 by means of a link 40. The throttle shaft arm carries an adjustable screw 41 which engages a high point 42 on the fast idle cam, when the choke valve is at least partially closed, to limit closing movement of the throttle valve, under the influence of the usual throttle return spring (not shown), to the fast idle position. A projection 43 on lever 38 has an inward finger 44 for engaging a lug 45 on the fast idle cam, when the throttle valve is nearly fully opened, to force the choke valve slightly open, as in case it is desired to sweep out excess fuel discharged into the manifold during starting. An interconnection of this type is further described and claimed in Carlson Patent No. 2,307,486.

The carburetor has a flange 46 at its lower end which is bolted to a pad 47 on the upper surface of a hot spot structure 48 which communicates with the exhaust manifold 33 and surrounds intake manifold 49, the latter communicating with the carburetor mixture conduit and forming therewith part of the engine induction system. The device operates as follows:

In cold starting, the thermostat will yieldingly hold

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the choke valve closed, as in Fig. 5, and the throttle valve will be partially opened. The relationship of throttle shaft lever 29 and arm 30 are such that during this early part of the throttle movement, stub shaft 13 will be rotated only slightly and, consequently, the closing tension applied to the choke valve only slightly, if any, reduced. This is because in the throttle movement represented from closed throttle to the position of Fig. 5, lever 29 and arm 30 will be moving from positions nearly aligned with link 31, as in Fig. 1. When the engine starts to run under its own power, suction applied to suction motor 22, 25 will pull the choke valve slightly open, as in Fig. 7. In case the manifold should become "loaded" with excess fuel during the starting period, such fuel may be swept out by substantially full opening of the throttle valve, as in Fig. 9, which positively forces the choke valve slightly open. Thereafter, the engine may be cranked a moment to eliminate the excess fuel charge. If, during the part throttle range of operation, as indicated by Figs. 7 and 8, the throttle valve should be opened, resulting in lowering of suction in the intake manifold and, consequently, less suction applied to the suction motor, the choke valve will, nevertheless, be prevented from closing excessively by the rotation of stub shaft 13 which has the effect of winding up the inner end of the thermostat, as would be the case if the temperature were actually increased. This results in a reduction of the closing tension applied to the choke valve in accordance with the degree of opening of the throttle. This relationship is illustrated in Figs. 7 and 8, in the latter of which the throttle valve has been opened farther than in Fig. 7, but the choke valve remains in substantially the same position. The adjustable mountings of arm 30 and lever 29 on their respective shafts provide for careful adjustments of these parts to insure the proper interaction of the valves. The effect due to relaxing of thermostat tension occurs, substantially, during opening of the throttle, prior to the positive opening of the choke valve for unloading purposes and complements this feature. The actual positioning and relationship of arm 30, lever 29, and link 31 are adjusted in accordance with the requirements of the particular engine, as determined by road tests under various load and temperature conditions. It may be found desirable, for instance, to reverse the effect of this linkage upon the thermostat and choke valve during continued opening of the throttle from its closed position by shifting either the arm or lever to pass over center. In the present instance, throttle shaft lever 29 is substantially aligned with link 31, when the throttle valve is closed, so that opening of the throttle valve exerts harmonically increasing opening force upon the choke valve.

Various features may be modified as will occur to those skilled in the art and the exclusive use of all modifications as come within the scope of the appended claims is contemplated.

We claim:

1. In an internal combustion engine, an induction con-

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duit having unbalanced pivoted choke and throttle valves therein, a lever movable with each valve, a thermostat coil having its outer end connected to the choke valve lever and movable in one direction as the temperature lowers to bias said choke shaft lever for applying a closing force to said choke valve, the inner end of said coil being anchored to a shaft, an arm on said shaft, and a link member having one end connected to said arm and the other end connected to said throttle shaft lever for rotating said choke valve shaft upon any movement of said throttle valve, said arm, said link and said lever being so constructed and arranged that as said throttle valve is rotated from closed to open position the choke valve biasing force of said coil is progressively reduced.

2. In an internal combustion engine, an induction conduit having unbalanced pivoted choke and throttle valves therein, a lever movable with each valve, a thermostat coil having its outer end connected to the choke valve lever and movable in one direction as the temperature lowers to bias said choke shaft lever for applying a closing force to said choke valve, the inner end of said coil being anchored to a shaft, an arm on said shaft, and a link member having one end connected to said arm and the other end connected to said throttle shaft lever for rotating said choke valve shaft upon any movement of said throttle valve, said throttle shaft lever being in substantial alignment with said link and said link being disposed substantially entirely on one side of the line-of-centers through said choke and throttle valve axes only when said throttle valve is in its closed position.

3. In an internal combustion engine, an induction conduit having unbalanced pivoted choke and throttle valves therein, a lever movable with each valve, a thermostatic coil having its outer end connected to the choke valve lever and movable in one direction as the temperature lowers to bias said choke valve lever for applying a closing force to said choke valve, the inner end of said coil being anchored to a shaft, an arm on said shaft, a link member having one end connected to said arm and the other end connected to said throttle shaft lever for rotating said choke valve upon any movement of said throttle valve, said arm, said link and said lever being so constructed and arranged that as said throttle valve is rotated from closed to open position the choke valve biasing force of said coil is progressively reduced, and an unloader mechanism for positively opening said choke valve upon a substantial opening of said throttle valve.

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