March 28, 1961 H. A. CARLSON 2,977,100

THROTTLE OPERATED STARTER SWITCH

Filed Jan. 24, 1958

FIG. 1.

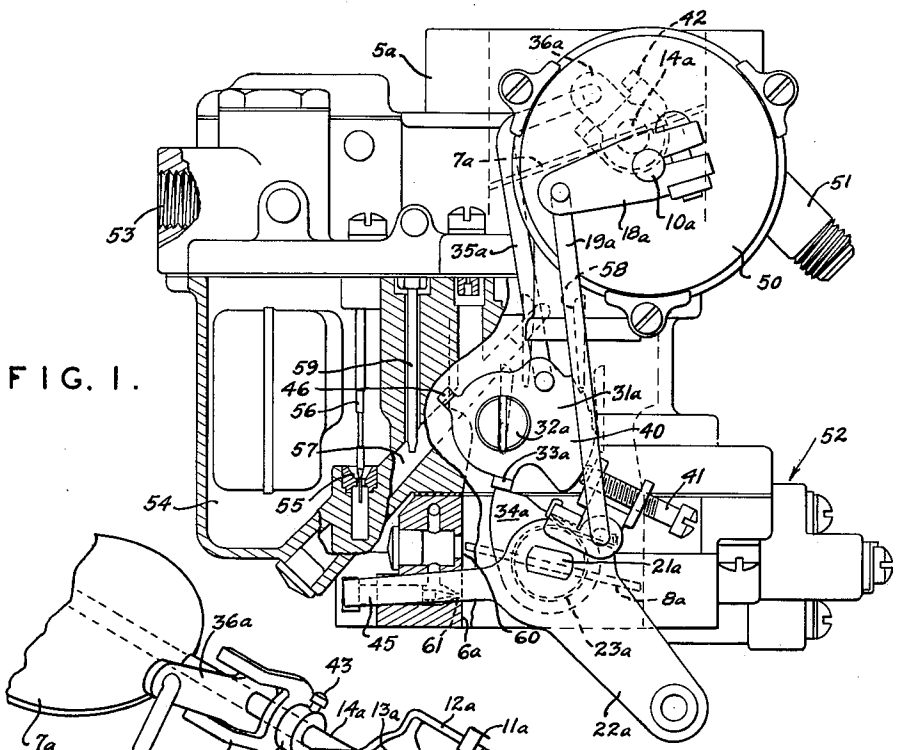


FIG. 2.

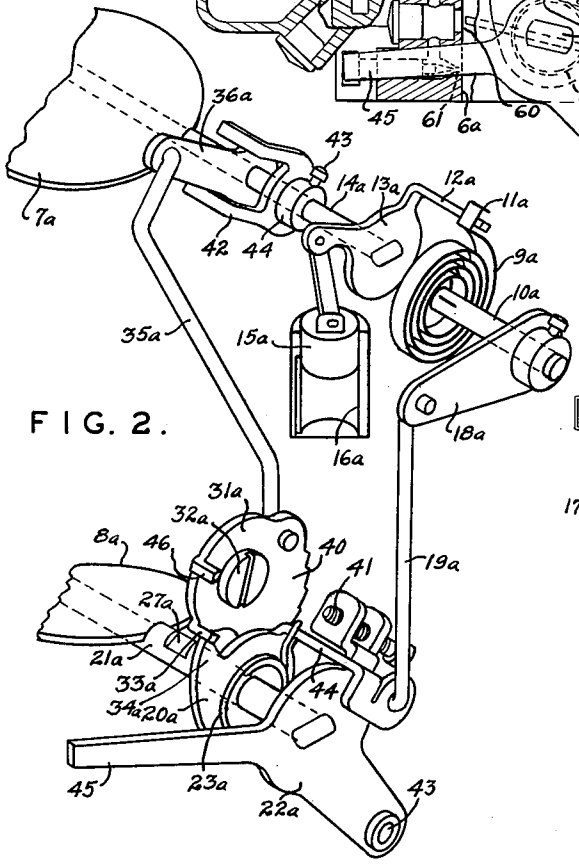
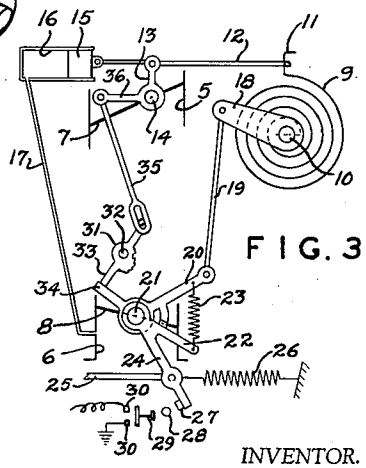


FIG. 3.



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THROTTLE OPERATED STARTER SWITCH

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8 Claims. (Cl. 261—39)

This invention relates to charge forming means for internal combustion engines. Dwight L. Gordon et al. Patent 2,694,559 illustrates means for relaxing the choke closing tension of the automatic choke thermostat in an automotive carburetor when the throttle valve is opened. This action has been found necessary in some carburetor installations due to excessive richness of the mixture during the warmup period when the throttle valve is opened for acceleration. However, the Gordon et al. thermostat relaxing means cannot be used, for instance, where a throttle operated starting switch, as in Coffey Patent Re. 22,385, is also used, since in partially opening the throttle valve to close the starter switch for cold starting, the thermostat closing tension would be undesirably relaxed.

Consequently, it is the main object of the present invention to provide means whereby a carburetor equipped with thermostat tension adjusting means operated by opening of the throttle, as in the Gordon et al. patent, may be used in conjunction with a throttle operated starting switch, as in the Coffey reissue patent. This object is accomplished by providing a yielding, operative connection between the throttle valve and the choke control thermostat, which, after the engine is started, adjusts the thermostat tension, as in the Gordon et al. patent, together with a choke actuated latch which positively prevents the thermostat adjusting action of the above mentioned yielding operative connection during cold starting. The latch has a lost motion connection to the choke valve permitting breathing of the latter during cranking, while permitting opening of the throttle to its switch engaging position without affecting the thermostat tension.

In the accompanying drawings which illustrate the invention:

Fig. 1 is a side view of an automotive carburetor illustrating the invention, parts being broken away and sectioned.

Fig. 2 is an isometric, exploded view showing the parts forming the automatic choke control and interconnection between the choke control and throttle valve.

Fig. 3 is a diagram illustrating the principal parts of the present invention.

First, with reference to Fig. 3, there is illustrated an air inlet member 5 and mixture outlet 6 controlled, respectively, by an unbalanced choke valve 7 and a butterfly throttle valve 8. The choke valve is provided with automatic choke control mechanism, including a coiled thermostat 9 with its inner extremity secured to a rotatable pintle 10 and its outer extremity hooked at 11 to form a one-way connection, through link 12 to a bell crank arm 13 rigidly secured to choke shaft 14. Secured to the other end of link 12 is a suction piston 15 which works in a cylinder 16 connected by a passage 17 to the mixture outlet posterior to throttle 8.

Rigid with pintle 10 is an arm 18 connected by a link 19 to a bell crank arm 20 loosely received upon throttle shaft 21. A second bell crank has an arm 22 resiliently connected to arm 20 and the thermostat by a coiled

spring 23. The latter bell crank has a second arm 24 connected by a link 25 to the accelerator pedal in the driver's compartment, bell crank 22, 24, of course, being rigidly connected to throttle shaft 21 for actuation of throttle valve by means of the accelerator pedal. A throttle return spring is shown at 26.

Also formed on arm 24 is a starter switch actuator 27 which, as illustrated in Coffey Patent Re. 22,385, acts through a ball 28, and plunger 29, when the associated engine is not running and the throttle valve is opened a predetermined distance, to close switch points 30 and thereby energize the starter circuit and crank the engine.

In order to permit closing of the starter circuit, as described, without relaxing the thermostat tension through arm 20 and link 19, etc., a latch 31 is pivotally mounted on the carburetor body at 32 and has a detent portion 33 for cooperating with an arm 34 on the loose bell crank previously mentioned, to positively prevent clockwise rotation of this bell crank. The latch has a lost motion connection to the choke valve through a slotted link 35 and an arm 36. The lost motion in link 35 is sufficient to permit proper breathing of choke valve 7 during cold cranking of the engine, but causes counterclockwise shifting of the latch away from its latching position as shown, when the choke valve is opened substantially, as when the associated engine starts to run under its own power.

In operation, when the temperature is low, thermostat 9 unwinds so as to resiliently close unbalanced choke valve 7. In order to crank the engine, the accelerator pedal is depressed to partially open throttle 8 and cause closing of starter switch points 30. After starting of the engine, as taught in Coffey Re. 22,385, the accelerator pedal is released by the operator, whereupon ball 28 is lifted by engine suction so that, thereafter, movement of the accelerator has no effect upon the starter switch as long as the engine is running.

At the same time, the pressure differential created on opposite sides of unbalanced choke valve 7 and also on opposite sides of suction piston 15, causes opening of the choke valve to a predetermined position. Slotted connection 35 is designed to permit adequate breathing of the choke valve for cranking action to insure proper starting, while causing clockwise shifting of the latch when the engine starts to run to release bell crank 20, 34. However, during the cranking action, when the latch is as shown in Fig. 3, the throttle can be opened independently of and, therefore, without affecting the thermostat adjusting linkage. After starting, when bell crank 20, 34, is released by the latch element, opening of the throttle valve causes clockwise rotation of bell crank 20, 34, and, through linkage 19, 18, tends to relax the choke closing tension of the thermostat, as taught in the above-mentioned Gordon et al. patent. Latch 31, of course, will be held in its unlatched position under all running conditions.

Figs. 1 and 2 show a practical embodiment of the invention in an automotive carburetor. Like parts are given the same reference numerals as in Fig. 3 with the letter *a*. Thermostat mounting pintle 10*a* is shown slightly disaligned from choke shaft 14*a*. Latch 31*a* has an eccentric toothed portion 40 forming the usual fast idle cam for cooperation with an adjusting screw 41 carried by throttle lever 22*a* mounted on throttle shaft 21*a*. Link 35*a* has a lost motion connection with choke shaft 14*a* through a clevis 42 secured to the choke shaft by a set screw 43 in a collar 44. Lever 36*a* is rotatable on the choke shaft, within the limits of clevis 42, which is sufficient to permit breathing of the choke valve during cold cranking when screw 41 is against and holds fast idle cam 40.

Loose disk 20*a* on the throttle shaft is resiliently con-

nected to a tight lever 22*a* by a torsion spring 23*a*. Lever 22*a* has an aperture 43 for connection to accelerator pedal. A finger 44 projecting axially from the periphery of loose lever 20*a* is secured at its extremity to link 19*a* which is connected through a lever 18*a* to adjusting pintle 10*a* at the center of the thermostat. An arm 45 projecting from throttle operating lever 22*a* is in position to engage an axial, peripheral lug 46 on fast idle member 31*a*, 40, when the throttle valve is substantially fully opened, to cause counterclockwise rotation of this fast idle member and, through link 35*a*, partial opening of the choke valve, in the well known manner, for unloading in case the manifold should become excessively charged with fuel during cold cranking. A second lug 33*a*, also projecting axially from the periphery of the fast idle member, serves as a latching detent for interfering with a finger 34*a* on loose lever 20*a* to latch the loose lever and thermostat adjusting linkage when the chock valve is closed for cold starting. After the engine starts to run under its own power, the choke valve moves sufficiently to shift the fast idle member and latching detent to release loose lever 20*a*, as above described. Throttle shaft has a slot 27*a* for operating the starter, as taught in the above mentioned Coffey reissue patent.

Fig. 1 shows a housing 50 which receives the thermostat and suction piston 15*a*. A threaded boss 51 provides for the supplying of hot air to the thermostat housing, for heating the thermostat, and, thence, past suction piston 15*a* to the manifold. Also mounted on the lower part of the carburetor body is the starter switch mechanism, generally indicated at 52, which cooperates with the throttle shaft as described in the above mentioned Coffey reissue patent.

Conventional carburetor fuel feeding elements, also, are shown in Fig. 1. The fuel is supplied through an inlet 53 to a float operated constant level chamber 54 and, thence, through a main metering orifice element 55, controlled by a metering pin 56, to a main supply nozzle 57 discharging into primary venturi tube 58 within the mixture conduit anterior to the throttle and, through an idle metering tube 59, to ports 60 and 61 adjacent and posterior to the edge of the throttle valve when closed.

The above described diagrammatic representation and practical embodiment are illustrative only and exclusive use of all modifications as come within the scope of the appended claims is contemplated.

I claim:

1. Charge forming means for an internal combustion engine comprising a mixture conduit, choke and throttle valves therein, a thermostat for affecting the action of said choke valve, a device operatively connecting said throttle valve and said thermostat and adapted to adjust said thermostat in accordance with positioning of said throttle valve, mechanism including a stop movable to a position to engage and prevent thermostat adjusting action of said device when the choke valve is closed for cold starting, and means responsive to operation of the engine for shifting said stop away from said position to release said device for thermostat adjusting action thereby.

2. Charge forming means as described in claim 1 in which said thermostat adjusting device is yieldingly connected to said throttle valve to permit action of said throttle valve independently of said adjusting device when said device is engaged by said stop.

3. Charge forming means for an internal combustion engine comprising a mixture conduit, choke and throttle valves therein, a thermostat for closing said choke valve for cold starting, a device yieldingly connecting said throttle valve and said thermostat and operative after starting of the engine for adjusting the force applied by said thermostat to said choke valve as said throttle valve is opened, and mechanism forming an operative connection between said device and said choke valve, said mechanism including a stop to engage and lock said device against movement during initial opening movement of the throttle valve when said choke valve is in its closed cold starting position.

4. Charge forming means as described in claim 3 in which said mechanism includes a lost motion connection between said choke valve and said stop to permit limited movement of choke valve without affecting said device.

5. Charge forming means for an internal combustion engine comprising a mixture conduit, choke and throttle valves therein, an automatic control for said choke valve for closing the same for cold starting, a device operatively connecting said choke control and said throttle valve for adjusting said control in accordance with the position of said throttle valve, a latch to engage said device, and a lost motion connection from said choke valve to said latch, said latch mechanism being operable to prevent choke control adjusting action of said device when said choke valve is in its starting position.

6. Charge forming means as described in claim 5 in which said latch positively prevents choke control adjusting action of said device when said choke valve is closed for cold starting, and said lost motion connection between said choke valve and said latch permits limited movement of said choke valve during cold starting of the engine, said choke valve acting through said connection to move said latch out of engagement with said device responsive to starting of the engine.

7. Charge forming means for an internal combustion engine comprising a mixture conduit, choke and throttle valves therein, a thermostat for urging said choke valve closed for cold starting, a device operatively connecting said throttle valve and said thermostat for adiusting the choke valve closing force of said thermostat as said throttle valve is opened, a latch to engage said device when said throttle valve is closed for preventing thermostat adjusting action of said device when said choke valve is in its cold starting position, a lost motion operative connection between said choke valve and latch for moving said latch to release said device after said choke valve has been substantially opened, said device including yielding means whereby said throttle may be opened to its starting position when said device is latched by said mechanism.

8. Charge forming means for an internal combustion engine comprising a mixture conduit, choke and throttle valves therein, a thermostat for urging said choke valve closed for cold starting, a device operatively connecting said throttle valve and said thermostat for adjusting the choke valve closing force of said thermostat as said throttle valve is opened, a latch to engage said device when said throttle valve is closed for preventing thermostat adjusting action of said device when said choke valve is in its cold starting position, a lost motion operative connection between said choke valve and latch for moving said latch to release said device after said choke valve has been substantially opened, said device including yielding means whereby said throttle may be opened to its starting position when said device is latched by said mechanism, and a starting control operatively connected to said throttle valve for actuation when said throttle valve is opened to its starting position.

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