

Aug. 15, 1950

L. D. BOYCE
ENGINE STARTING DEVICE

2,518,658

Filed Oct. 3, 1945

4 Sheets-Sheet 1

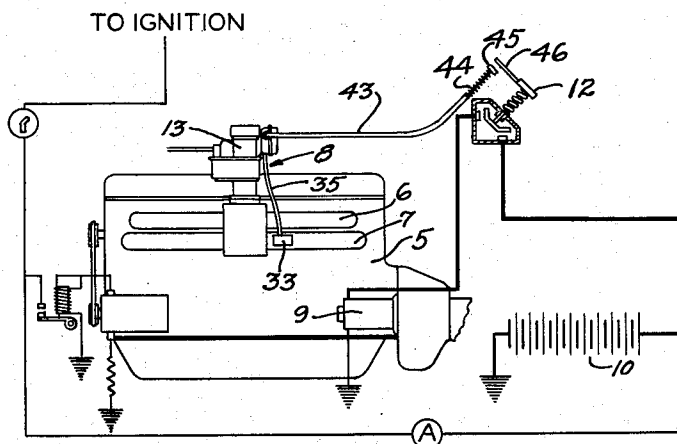


FIG. 1.

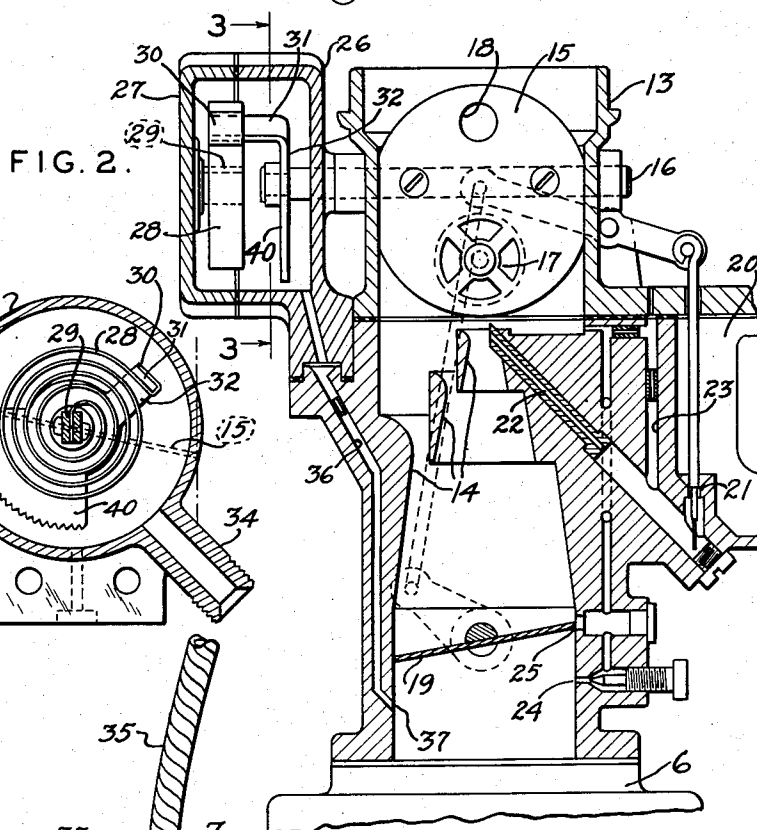


FIG. 2.

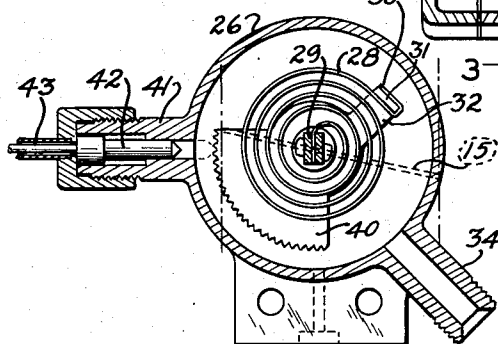
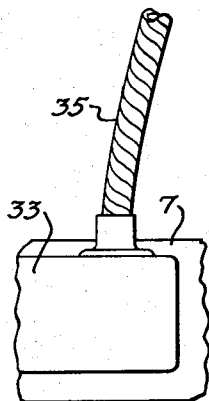


FIG. 3.



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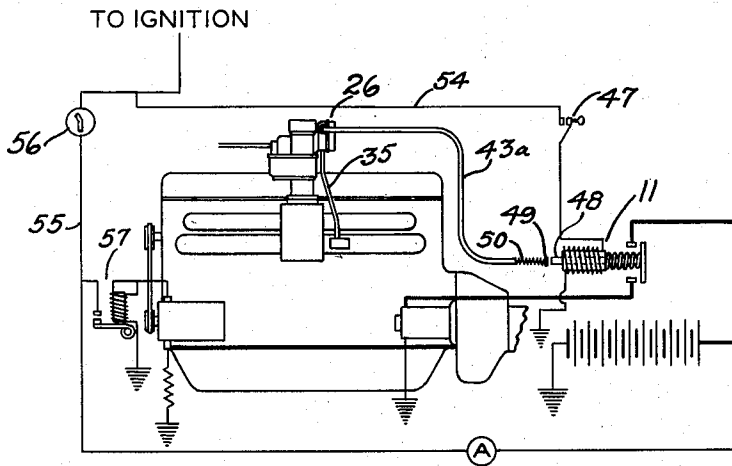


FIG. 4.

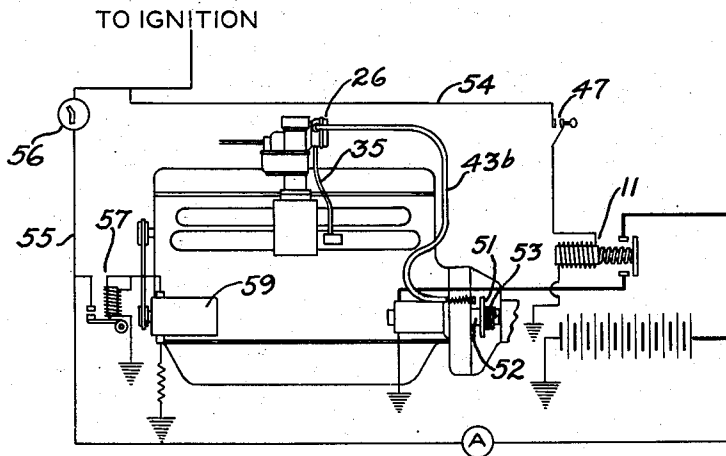


FIG. 5.

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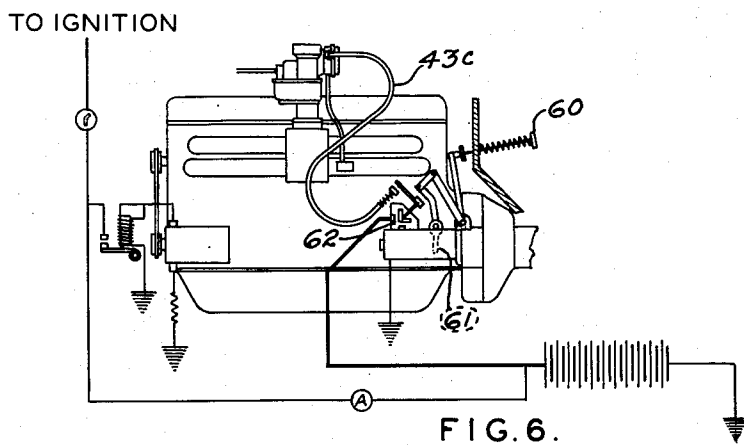
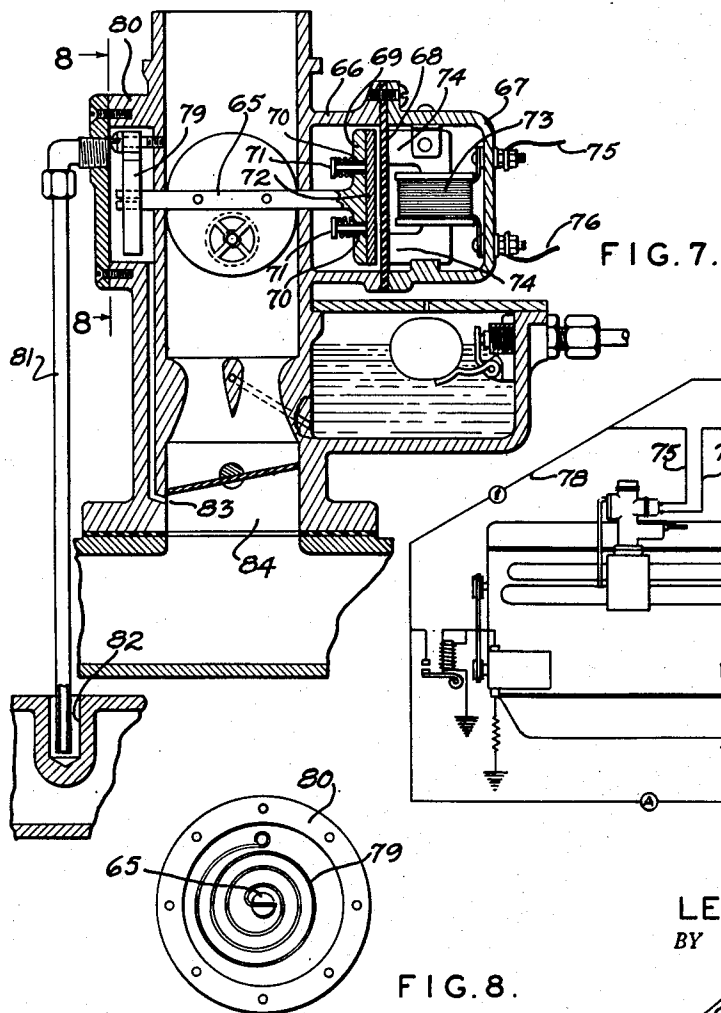
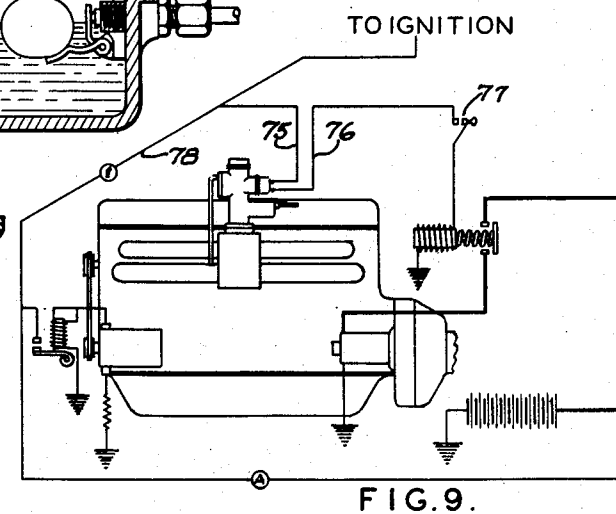
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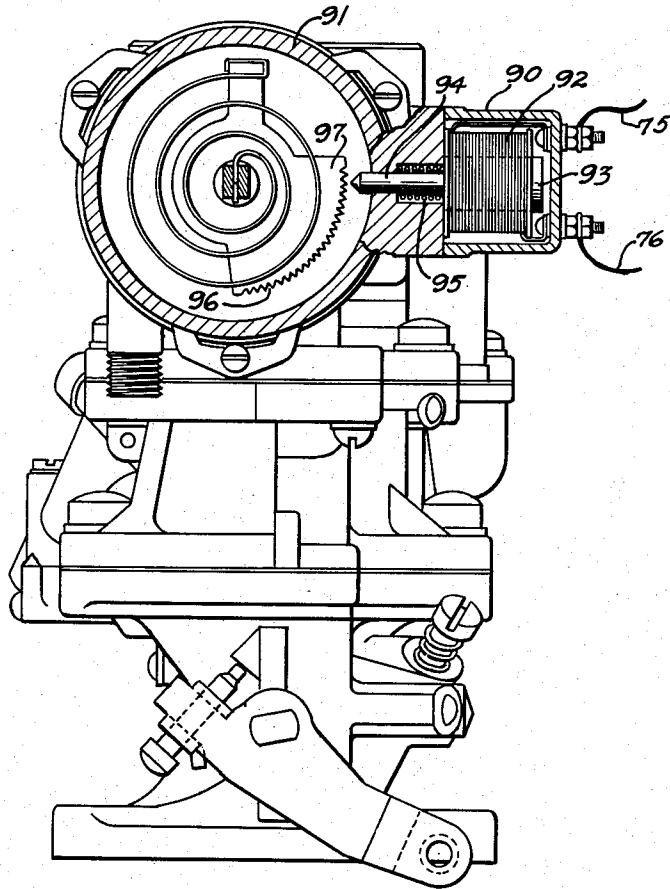


FIG. 10.

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UNITED STATES PATENT OFFICE

2,518,658

ENGINE STARTING DEVICE

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Application October 3, 1945, Serial No. 620,124

2 Claims. (Cl. 123—179)

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This invention relates to starting devices for internal combustion engines and consists, particularly, in novel means to control the richness of the fuel mixture supplied during starting.

The present types of automatic choke carburetors embody unbalanced, thermostatic choke valves to facilitate cold starting and warm-up of the engine. The thermostat yields to permit opening of the valve during cranking because of the direct action of suction thereon. However, I have found that it is desirable, at least in some cases, to prevent such "breathing" of the choke valve during cranking. Previous choke locking devices have caused movement of the choke to the fully closed position during starting, regardless of temperature. This may result in excessive richness of the mixture and "loading" when a start is made after the engine is fully or partially heated.

It is an object of the present invention to provide means for locking the choke valve in whatever position it has previously assumed upon initiation of the starting of the engine.

It is a more detailed object to provide a locking device for the choke valve which is mechanically controlled with the automatic starter button or pedal.

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

Fig. 1 is a side view of an internal combustion engine with the invention applied thereto, the electrical system being illustrated diagrammatically.

Fig. 2 is a vertical section showing the carburetor and choke control considerably enlarged.

Fig. 3 is a vertical section on line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 1 but showing a modification.

Fig. 5 is a similar view showing still another modification.

Fig. 6 is a similar view showing another modification.

Fig. 7 is a view similar to Fig. 2 but showing still another modification.

Fig. 8 is a detail section taken on line 8—8 of Fig. 7.

Fig. 9 is a side view of an engine embodying the form in Fig. 7 and showing the wiring system diagrammatically.

Fig. 10 is a view, partly in section, showing a modified form of magnetic brake for the choke valve.

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The engine 5 in Fig. 1 has the usual intake and exhaust manifolds 6 and 7, carburetor 8 mounted on the intake manifold, and starter motor 9. The starter motor is operated from storage battery 10 by starter pedal 12 which in addition to controlling the motor circuit may also move the starter pinion against the fly wheel in a well known manner.

The carburetor comprises a downdraft induction conduit 13 having a series of Venturi tubes 14. The admission of air into the upper end of the conduit is controlled by an unbalanced, butterfly choke valve 15 mounted on shaft 16 and carrying a spring seated, inwardly opening poppet 17. The choke also has a fixed opening 18. The discharge of mixture into the intake manifold is controlled by the usual throttle valve 19. Adjacent the induction conduit, there is provided a constant level bowl 20 having a main metering element 21 through which fuel is supplied to main nozzle 22, discharging into smallest venturi 14, and idling passage 23 discharging through ports 24 and 25 in the wall of the induction conduit.

Choke shaft 16 extends beyond the induction conduit into a housing 26 having a cover 27. A coiled, bi-metal thermostat 28 has its inner extremity secured to a pintle 29 projecting from cover 27. The outer end of the thermostat is hooked, as at 30, about the end 31 of an L-shaped lever 32 rigidly attached to choke shaft 16. A stove 33 mounted on the exhaust manifold is connected to a threaded boss 34 on the thermostat housing by a tube 35. A suction connection 36 also extends from the housing to a port 37 in the wall of the induction conduit posterior to throttle 19.

A sector 40 is rigidly attached to the choke shaft within the thermostat housing, in the present instance, being formed as an extension of L-shaped lever 32. Projecting laterally from the housing is a threaded boss 41 receiving a pointed detent 42 disposed, upon inward movement thereof, to engage the periphery of toothed sector 40 and lock the choke in any position it has previously assumed. A Bowden wire cable 43 connects the detent through an over-run spring 44 to an actuator button 45 adjacent the extension 46 on pedal 12. The connection is such that upon depression of the pedal to energize the starter motor, the detent will be mechanically operated to engage the toothed segment and lock the choke. Spring 44 permits continued depression of the pedal after the choke is locked.

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Other linkage means may be substituted for the Bowden wire cable shown.

When the engine is started at low temperature, the choke valve will be yieldingly held in its closed position by the thermostat. Upon depression of pedal 12, the starter motor will be energized to crank the engine and, coincidentally, to engage detent 42 and sector 40 and lock the choke. This locking action occurs in whatever position the choke may have assumed previously and prevents the opening or "breathing" of the choke valve under the influence of the cranking suction. Some air for starting will be admitted through fixed orifice 18. When the engine fires and runs under its own power, poppet 17 will be opened to admit additional air. Promptly, pedal 12 will be released, withdrawing detent 42 from the locking segment and releasing the choke to be further opened by direct action of suction to the extent permitted by the thermostat. Thereafter, the choke is under the exclusive control of the thermostat and the pressure in the induction conduit until starter pedal 12 is again actuated.

In Fig. 4, a starter button 47 is substituted for pedal 12 in the previous form. This button closes the starter circuit through solenoid 11. The solenoid armature has an extension 48 which, when the solenoid is energized, actuates a button 49 and, through spring 50 shifts Bowden wire cable 43a to engage the choke locking detent and sector as in the previous form.

The form in Fig. 5 is similar to that in Fig. 4 except that choke locking Bowden wire cable 43b is actuated by a collar 51 on starter motor shaft 52. This collar is loose on the motor shaft and moves with the starter pinion toward the engine fly wheel when the starter motor is energized. When the engine starts to run under its own power, the pinion and collar 51 automatically retract under the influence of the usual bending spring 53.

In this figure, as well as the previous form, a wire 54 leads from starter button 47 to the battery and a second wire 55 supplies battery current to the usual ignition circuit containing ignition switch 56. A generator cut-out is shown at 57.

Fig. 6 shows controlling elements, as in Fig. 1, but starter pedal 60 first actuates a yoke 61 inside the starter motor housing to move the starter pinion against the fly wheel teeth and then closes switch 62 to supply current to the starter motor. The final movement of the starter pedal after engagement of the pinion and which closes the switch also actuates a choke locking detent, as 42 in Fig. 3, through Bowden wire cable 43c.

In Fig. 7, choke shaft 65 extends sidewardly into a control housing including inner part 66 and outer part 67 separated by a non-magnetic wall 68. The end of the choke shaft within portion 66 of the housing carries a disk 69 having a pair of openings, as at 70, loosely receiving pins 71 projecting from a metallic disk 72. Portion 67 of the casing mounts an electro-magnet 73 having pole pieces 74 extending toward metallic disk 72 and normally spaced therefrom by non-magnetic wall 68.

As shown in Fig. 9, wires 75 and 76 for energizing the electro-magnet are connected one to starter switch 77 and the other to a lead 78 which extends to the battery. Thus, upon closing

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of the starter switch 77, metallic disk 72, which serves as an armature, is drawn against wall 68 and applies substantial braking force resisting opening of the choke valve. When the starter button is opened, the brake is released and the unbalanced choke plate permitted to open under the direct action of air flow as far as permitted by thermostat 79 mounted in a housing 80 opposite the brake housing. A tube 81 leads from a stove forming depression 82 in the exhaust manifold to housing 80 and the latter is connected by an orifice 83 to the outlet portion 84 of the carburetor induction conduit.

Fig. 10 shows a modified form of magnetic brake for the choke valve. In this figure, a housing 90 projecting from thermostat housing 91 mounts a solenoid coil 92 having an armature 93 which operates detent 94. The armature and detent are normally urged towards the right or active position by a coil spring 95. Wires 75 and 76 are connected to the coil, as in the previous form for supplying energizing current thereto. When the solenoid is energized, detent 94 is urged to the left into locking engagement with the toothed or serrated edge 96 of sector 97 rigid with the choke shaft. When so energized, the solenoid locks the choke valve in whatever position it has previously assumed.

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.

I claim:

1. In combination with an internal combustion engine having an induction conduit provided with an unbalanced choke valve for controlling the admission of air thereto, a thermostat for urging said valve toward closed position when the temperature is low, a sector carried by said valve and movable therewith, said sector having a toothed periphery, a braking detent device mounted in position to cooperate with the periphery of said sector, a manual control for initiating starting of the engine, and linkage connecting said control and said device for moving said detent device into engagement with said sector to lock said choke valve.

2. In combination with an internal combustion engine having an induction conduit provided with an unbalanced choke valve for controlling the admission of air thereto, a thermostat for urging said valve toward closed position when the temperature is low, a sector carried by said valve and movable therewith, a braking device associated with said sector, a manual control for initiating starting of the engine, and linkage forming an overrunning connection between said control and said device for moving said device into engagement with said sector to lock said choke valve.

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