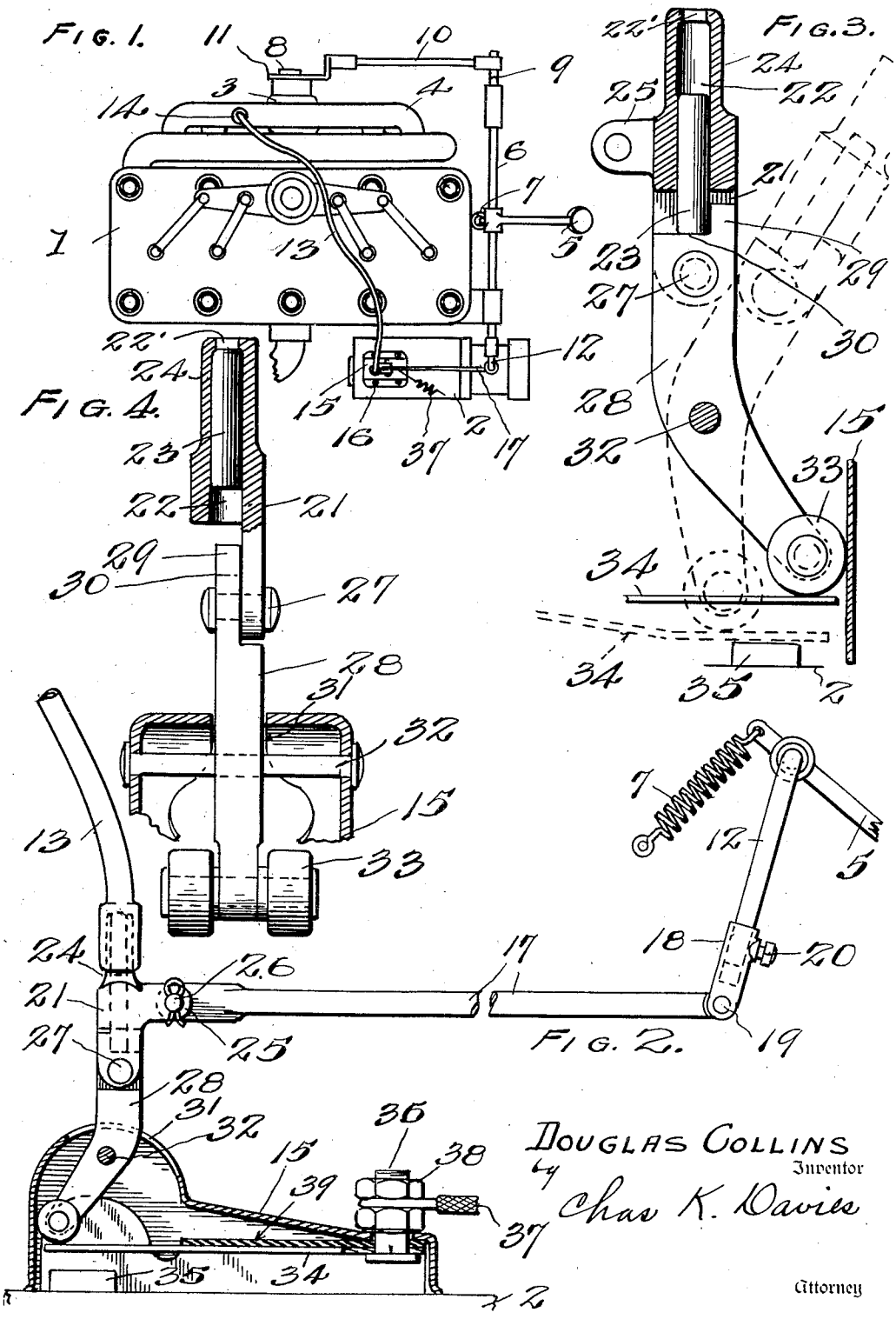
June 7, 1932. D. COLLINS 1,862,006

THROTTLE AND STARTER CONTROL MECHANISM

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THROTTLE AND STARTER CONTROL MECHANISM

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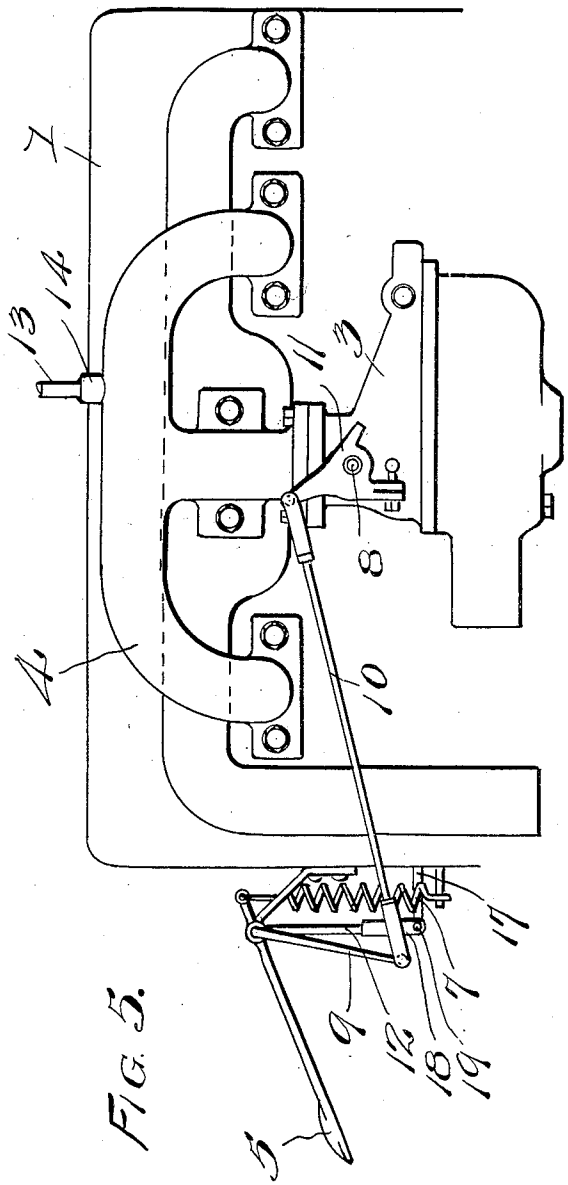


FIG. 5.

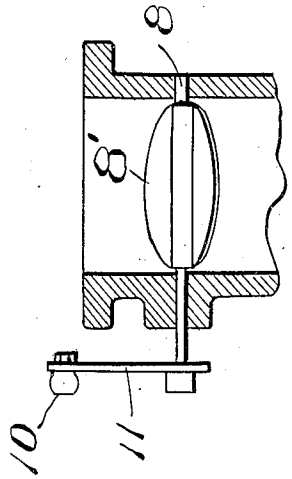


FIG. 6.

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UNITED STATES PATENT OFFICE

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THROTTLE AND STARTER CONTROL MECHANISM

Application filed January 15, 1931. Serial No. 508,977.

My present invention relates to an improved throttle and starter control mechanism for use in connection with internal combustion engines employed for the propulsion of aircraft, watercraft, and landcraft. In carrying out my invention I utilize the usual pedal mechanism or "accelerator" by means of which the throttle valve or fuel supply valve is controlled, in connection with the starter-motor employed for cranking the engine. I also avail myself of the action of the suction, created in the cylinders of the engine, for rendering inoperative the starter control device or mechanism, when the engine is running.

By the utilization of the starter control and mechanism of my invention the starter knob or button that is usually depressed by the foot, to close the starter circuit and energize the starter-motor, is dispensed with, and the circuit maker of the starter motor is automatically closed as the throttle pedal or accelerator is depressed.

With the equipment of my invention, the starting of the engine is materially simplified by eliminating the necessity for using the foot to depress the starter-knob to close the starter circuit, and the foot is therefore left free to depress the accelerator or throttle pedal, after the ignition circuit has been closed as usual by hand, for supplying fuel mixture to the engine. Thus the admission of fuel to the cylinders and the closing of the circuit for the starter-motor are synchronously controlled by the one movement of the throttle pedal or accelerator.

The parts may readily be adjusted to and attached for operation with various types of throttle control mechanism for internal combustion engines, without material alterations or changes in the throttle mechanism, and without interfering with either the pedal control or the existing manual control devices of the throttle mechanism. By use of the attachment of my invention the starter-motor is automatically energized at the instant when the fuel supply is at the proper capacity for insuring the most or maximum efficiency of the starter and of the engine at the time of starting.

The invention consists on certain novel features of construction in the starter control-lever and connections, and in novel combinations and arrangements of parts involving the starter-control lever and the throttle control mechanism, as will hereinafter be more fully set forth and claimed.

In the accompanying drawings I have illustrated one complete example of the physical embodiment of my invention wherein the parts are combined and arranged according to the best mode I have thus far devised for the practical application of the principles of my invention. The structure exemplified in the drawings has been put in actual and successful operation in combination with the throttle control of an internal combustion engine employed for propelling an automobile. It will be apparent that changes and alterations may be made in the exemplified structure when the device of my invention is attached to and utilized with other types of throttle control mechanism. As is well known, the engines for aircraft, watercraft, and automotive land vehicles, utilize different types of throttle control mechanism, but, so far as I am aware, the starter-control device of my invention is readily adapted for use with most accelerators or throttle-controls now in use, and with the switch or circuit-maker for the engine starter-motor.

Figure 1 is a top plan view showing a conventional internal combustion engine, or as much thereof as is necessary to illustrate the installation therewith of the device of my invention.

Figure 2 is a side view, partly in section and partly broken away for convenience of illustration, showing the device in operative position for closing the circuit of the starter-motor when the throttle is opened.

Figure 3 is an enlarged view, partly in section, showing the flexible control lever in rigid position for closing the circuit, the lever being shown as viewed from the rear of Figure 2.

Figure 4 is a view showing the lever partly in section, with the lever housing, or part thereof in section, and with the parts in position assumed when the engine is running.

Figure 5 is a view in side elevation at the carbureter side of the motor showing the throttle control mechanism.

Figure 6 is a detail sectional view showing the throttle valve and connections.

In order that the general arrangement and utility of the device of my invention may readily be understood I have indicated in Figure 1 a top plan view of a conventional internal combustion engine 1, with the starter-motor 2 at one side thereof and the carbureter 3 indicated at the opposite side of the engine, and located below the intake manifold designated as 4.

The usual pedal or accelerator foot-lever 5 is indicated at the rear end of the engine and in position readily accessible to the foot of the driver of an automobile, and this pedal is fixed rigidly on and adapted to turn the rock shaft 6 that extends transversely of the engine and is journaled in front of the inclined foot board or floor in front of the driver's seat. A conventional coiled spring 7 is connected at one end of the pedal and anchored at its other end, so that the pedal is depressed, and the shaft 6 is turned clockwise in Figure 2 against the tension of the spring. As the rock shaft is turned clockwise the throttle or fuel valve of the engine is opened, and when the pedal is released, by the removal of the foot, the spring returns the rock shaft and pedal to normal position to close the throttle.

The usual manually operated throttle mechanism, controlled from the steering wheel of an automobile, is also connected with the throttle mechanism, but this manually operated mechanism is omitted from the drawings for convenience of illustration.

I utilize the rotary or rocking movement of the rock shaft for operating the starter control device of my invention without interfering with the performance of the functions of the rock shaft in controlling the throttle valve. Thus, as seen in Figure 1, the shaft 8 of the throttle device is turned to open or close the throttle valve 8′ by the use of the downwardly extending crank arm 9 at one end of the shaft 6, and the link 10 connects this arm with the fan shaped crank plate or lever 11 on the throttle shaft 8.

The throttle mechanism is converted to my use by employing the other end of the rock shaft 6, and for this purpose a crank arm 12 is mounted on the shaft and extends downwardly therefrom.

Thus, in this particular type of automobile engine the throttle mechanism is actuated at one side of the engine as seen in Figure 5 from one end of the rock shaft, and my starting control mechanism is actuated at the other side of the engine as seen in Figure 1 from the opposite end of the rock shaft.

In connection with the starting control-mechanism I employ a flexible hose 13, which at one end 14 is attached to the intake manifold 4 of the engine, and I avail myself of the action of suction, or the tendency toward the formation of a vacuum in the cylinders of the engine and intake manifold, for automatic operation of the starter-control device, after the engine is started.

Because of the various differences in the arrangement and location of parts of an engine, such as the carbureter, starter or starter-motor, and intake manifold, employed on many types of engines, the parts utilized in my mechanism may be located and supported on various accessories of the engine, but as one exemplification of the equipment for an engine I have shown a supporting housing 15 that is secured, as by screws 16 on the top of the casing for the starter-motor 2.

The control device for the operation of the circuit maker of the starter, and the circuit maker itself, are supported from the starter casing, in front of the crank arm 12, and this arm operates the control device through a push rod 17 disposed above the starter, and pivotally connected to a socket sleeve 18 on the free end of the crank arm 12. The sleeve of the push rod is pivoted to the rod at 19, and the sleeve is adjusted on the end of the crank arm and fixed in adjusted position thereon by means of a set screw 20.

At its forward or front end the push rod is pivotally connected with a floating, flexible lever device that includes an upper arm or section 21 having therein a cylindrical suction chamber 22 in which a connector pin 23 is freely carried and adapted to reciprocate.

By means of a nipple portion 24 of this lever arm, one end of the flexible hose 13 is attached to the lever, and this hose communicates with the interior of the suction chamber 22 of the lever arm, which chamber, as seen in Figures 3 and 4 is open at its lower end to the atmosphere, and at its upper end is fashioned with a restricted seat as 22′.

When the engine is not running, and due to the absence of suction in the engine, the pressure above and below the connector pin 23 is equalized, and the pin is free to fall by gravity to the position of Figure 3. When the engine is running, and suction is present in the engine, manifold 4, and the suction hose, atmospheric pressure through the open lower end of the suction chamber 22 lifts the connector pin against the seat 22′ and atmospheric pressure holds the pin in the position of Figure 4.

Thus when the engine is not running, the connector pin is always in the position of Figure 3 to render operative the starter control device, while on the other hand, when the engine is running, the collector pin is in inoperative position, and the starter control device is rendered inoperative.

The upper arm 21 of the control lever is provided with a pair of perforated ears 25,

and by means of the pivot pin 26 the push rod is pivoted to this lever arm. By means of another pivot pin 27 the lower end of the upper arm 21 is pivoted to a lower arm 28 of the control lever, and this lower arm 28 has a lug 29 and a notch 30 adjacent the lower end of the suction cylinder 22 and for co-action with the lower end of the connector pin 23.

This arm 28 of the lever is adapted to swing in a slot 31 of the housing 15, and the arm 28 has a stationary pivot pin 32 supported in the walls of the housing and extending transversely thereof.

A pair of anti-friction rollers 33, of insulated material, are journaled in the free end of the lever arm 28 and located within the housing, in position to rest against the inner side of the front wall of the housing 15 when the control lever is in position for operation. These insulated anti-friction rollers are at all times in frictional contact with the top face of the free end of a conductor plate or blade 34 of resilient material or metal that forms the movable contact member of the circuit maker for the starter-motor 2. The stationary member of the circuit maker is indicated at 35, supported on the starter 2 and enclosed by the housing, and located in position for contact from the free end of the blade 34 when the latter is bent downwardly by the action of the rollers as indicated by dotted lines in Figure 3, and in this position the circuit maker for the starter is closed.

At the rear end of the housing the resilient conductor blade is supported by a bolt 36 passing through an opening in the blade and in the top wall of the housing, and the terminal or connector of the wire 37 is secured on this bolt (as a terminal post) by the nuts 38.

With the ignition switch of the engine closed, and with the parts in position indicated by Figures 2 and 3, the pedal 5 is depressed to rock the shaft 6 and open the throttle valve, and this same movement of the rock shaft causes a forward movement of the push rod 17. The forward movement of the push rod causes the control lever to swing on its pivot 32, thus closing the circuit maker for the purpose of starting the motor of the starter 2, and thereby cranking the engine.

When the engine is thus cranked or started, suction is created in the cylinders of the engine, and consequently the connector pin 23 is elevated from position of Figure 3 to that of Figure 4, thus disconnecting the upper, rigid portion of the control lever, and permitting the arm 21 to be flexed with relation to the lower arm 28 of the lever, and as long as the engine is running this flexibility exists in the upper part of the lever. The upper arm thus becomes flexible for the reason that the arm 21 may swing on pivot 27 with relation to the pivoted arm 28 of the lever.

As is usual with drivers starting the engine, it is the custom to depress the pedal 5 against the tension of spring 7 and release the pedal, and this depression and release are repeated, for the purpose of manipulating the throttle valve in controlling the admission of mixture or fuel to the engine cylinders. This repetition of depressing and releasing the pedal may be accomplished without disturbing the lower part of the control lever, for the reason that the upper arm 21 is free to swing on its pivot 27 after the connector pin 23 has been withdrawn from the notch 30 of the lower arm of the lever.

The first push movement of the rod 17 swings the rollers 33 to dotted position of Figure 3 to close the starter circuit, and thereafter, the first pull movement on rod 17 swings the control lever back to position in Figure 2. The arms 28 swings with a snap, to close the circuit, due to the resiliency of the blade 34, and the lever is temporarily held in this position, until the pull of rod 17 returns the lever to position of Figure 2.

The parts may accurately be adjusted to insure synchronism in feeding the fuel supply and closing the starter switch, whereby the engine is cranked and supplied with fuel, and then the starter is automatically cut out and its power withdrawn.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In starting mechanism for internal combustion engines, the combination with the fuel control mechanism and starter switch, of a flexible control lever for the switch and connections from said lever to the fuel control mechanism, and means under control of suction from the engine to permit flexing of the lever when the engine is running.

2. In starting mechanism for internal combustion engines, the combination with the fuel control mechanism and starter switch, of a flexible control lever for the switch, a connector member for preventing flexing of the lever, and means under control of suction from the engine for withdrawing the connector member and thereby permit flexing of the lever.

3. In starting mechanism as described, a flexible control lever, a connector member to prevent flexing of the lever, and means under control of suction for releasing the connector member to permit flexing of the lever.

4. In starting mechanism as described, the combination with a flexible pivoted control lever, of an arm pivoted thereon and provided with a suction chamber, a connector pin reciprocable in said chamber, and means on the control lever for co-action with the pin to prevent flexing of the pivoted arm.

5. In starting mechanism as described, the combination with a pivoted control lever having an end notch and lug, of an arm pivoted on the control lever adjacent the notch and lug, said arm having a suction chamber therein, and a connector pin in said chamber, said pin being adapted under gravity to engage the notch and lug, and under the action of suction being adapted for release from said notch and lug.

In testimony whereof I affix my signature.

DOUGLAS COLLINS.