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IGNITION SYSTEMS FOR INTERNAL COMBUSTION ENGINES

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FIG. 1.

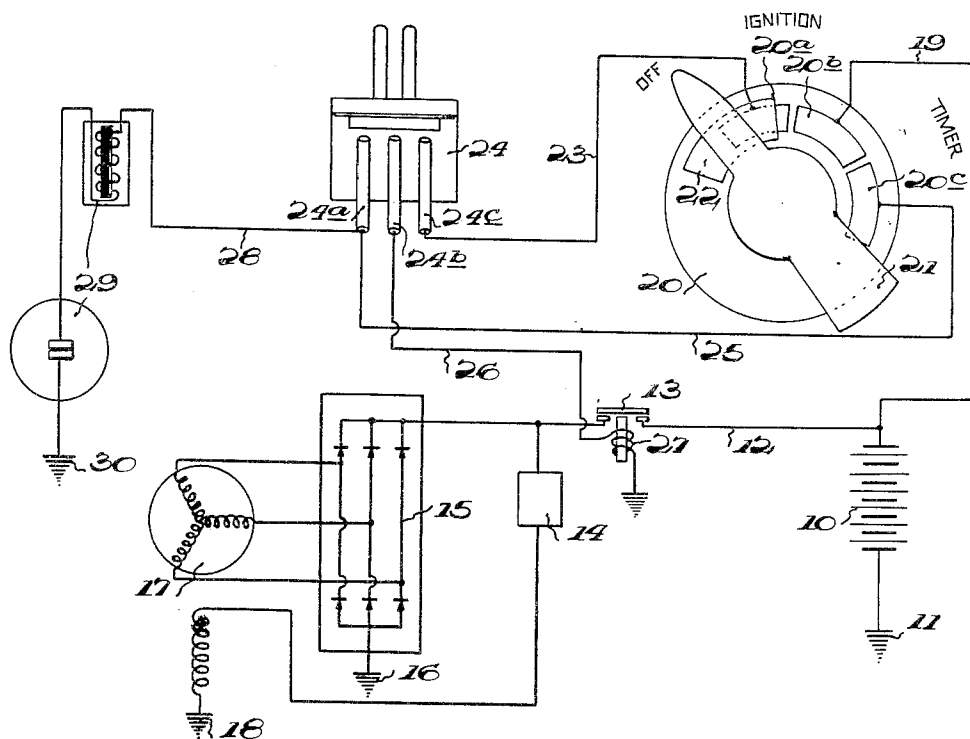


FIG. 2.

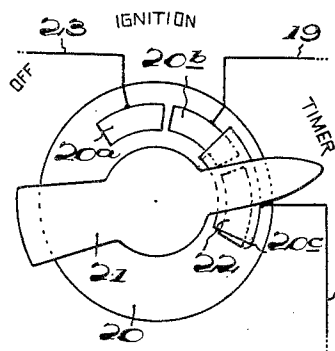
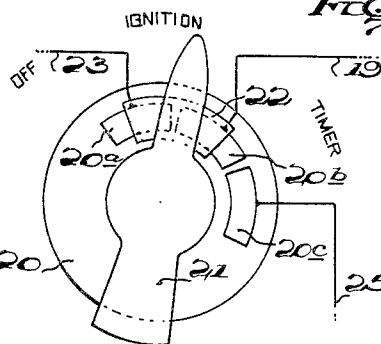


FIG. 3.



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IGNITION SYSTEMS FOR INTERNAL COMBUSTION ENGINES

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1 Claim. (Cl. 307—10)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein, if patented, may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to controls for the ignition systems of internal combustion engines, especially those engines which employ starting motors energized from a storage battery, as is conventional in the automotive field.

The principal object is to provide a circuit and cooperating switches which will prevent discharge of the battery when the ignition circuit is inadvertently left closed, and which will insure that all the current is available for starting the engine, no current going to the alternator (generator) field when the engine is being started. Other objects and advantages will be apparent from the following description of the preferred embodiment of the invention shown in the accompanying drawings forming a part of this specification.

In said drawings,

Fig. 1 is a diagram of the preferred circuit, shown connected to the well known Leece Neville alternator system used on Army ordnance vehicles, the ignition-timer switch being shown in "off" position;

Fig. 2 is a view of the same ignition-timer switch but shown in "timer" position;

Fig. 3 is a view of the same switch shown in "ignition" position.

Referring particularly to the drawings, and first to Fig. 1, the system derives energy from a storage battery 10, grounded as at 11, having a conductor 12 leading from its terminal to a line switch 13. Line switch 13, when closed, permits current to flow to a voltage regulator 14 and to a rectifier 15, both of conventional construction. Rectifier 15 is grounded as at 16 and is coupled to a three phase alternator 17, grounded as at 18. Voltage regulator 14 is also connected with the alternator. The alternator is of course mechanically coupled with the engine (not shown) as by a belt, and when it is being driven, it will charge battery 10 at a nearly constant voltage, provided the line switch 13 is closed.

A timing-ignition switch 20 is connected to battery 10 by a wire 19. This switch has three spaced apart contacts 20^a, 20^b, 20^c and has a built-in mechanism (not shown) for holding the pivoted manually moved switch arm 21 for a predetermined time period in the farthest or "timer" position (Fig. 2) and then releasing said arm. Such a mechanism is well known and forms no part of my invention. An arcuate contact 22 is fixed to arm 21 and moves over and makes contact with the fixed contacts 20^a, 20^b, 20^c to close and open certain circuits to be de-

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scribed. Contact 22 momentarily touches all three of said fixed contacts so that there is never an open circuit when the switch arm 21 is moved. Wire 19 from the battery is connected to contact 20^b. Contact 20^a is connected by a wire 23 to a three terminal oil pressure switch 24, specifically to terminal 24^c. Contact 20^c is connected by a wire 25 with terminal 24^a of the oil pressure switch. Another lead 26 couples terminal 24^b with the magnetizing or solenoid coil 27 of the line switch 13. Still another lead 28 couples terminal 24^a with a distributor 29, which is grounded as shown at 30.

With the described system, when switch arm 21 is in its farthest left position, all circuits are broken. This is the "off" position, and the switch itself will be so marked. When it is desired to start the engine, the switch arm is moved manually clockwise to the position of Fig. 2, the "timer" position. Arcuate contact 22 is then in contact with contacts 20^b and 20^c, and a circuit is completed from the positive terminal of the battery 10 through contacts 20^b, 22, 20^c, thence along wire 25 to contact 24^a of the oil pressure switch, thence along lead 28 to the coil of distributor 29, and finally to ground. After fifteen to thirty seconds—the interval depending on the setting of the mechanism—the switch arm 21 automatically snaps over to the position of Fig. 3, the "ignition" position, wherein the starting motor is energized. The battery then sends current through the switch 20, along wire 23 to oil pressure switch 24, thence along lead 26 to distributor 29. At the same time, the battery is connected by conductor 12 to line switch 13, and the coil 27 of the line switch is energized by current flowing from the oil pressure switch 24 through lead 26, so that the line switch closes automatically. The voltage regulator 14, rectifier 15 and alternator 17 are then in circuit, and the battery will receive a charge if the alternator's output is sufficient.

With the described arrangement of parts, there will be no current flowing to the alternator while the engine is being started, all the current (13 amperes or so) being available for the starting motor and distributor. The line switch is automatically closed only after the engine has started and the oil pressure has built up. And if the ignition switch is left on as in Fig. 3, but with the engine still, the battery cannot discharge because the oil pressure switch opens the circuit to the distributor and starting motor, and of course the line switch is also open. In effect, the circuits will be exactly the same as in the "off" position of Fig. 1, even though the ignition switch is on "ignition."

What I claim is:

In combination, a storage battery; an ignition-timer switch having an operator-moved switch arm with a contact fixed thereto and having three fixed contacts spaced and insulated from each other, the contact on the switch arm closing circuits as it passes over the fixed contacts and being large enough to simultaneously touch momentarily all three fixed contacts; said switch having timing means built into it effecting automatic movement of the switch arm from the position of contact with the third fixed contact to the position of contact with the second fixed contact, after a predetermined time interval; an oil pressure switch having three contacts; said oil pressure switch closing when the oil pressure in the lubricating system of the internal combustion engine reaches a certain value; a conductor connecting the first contact of

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the ignition-timer switch with the third contact of the oil pressure switch; another conductor connecting the second contact of the ignition-timer switch with the battery; a third conductor connecting the third contact of the ignition-timer switch with the first contact of the oil pressure switch; an electro-magnetic line switch; a conductor connecting the line switch with the battery; another conductor connecting the coil of the line switch with the second contact of the oil pressure switch; an ignition coil; an additional conductor connecting the first contact of the oil pressure switch with the ignition coil; an alter-

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nator for charging the battery; a voltage regulator between the alternator and the battery; a rectifier connected with the alternator and the battery; the line switch being between the voltage regulator and the battery; the parts being constructed, arranged and connected so that the battery cannot be discharged if the ignition-timer switch is left closed, and so that no current flows to the generator field when the engine is being started, all the current from the battery being available for starting the engine.

No references cited.