

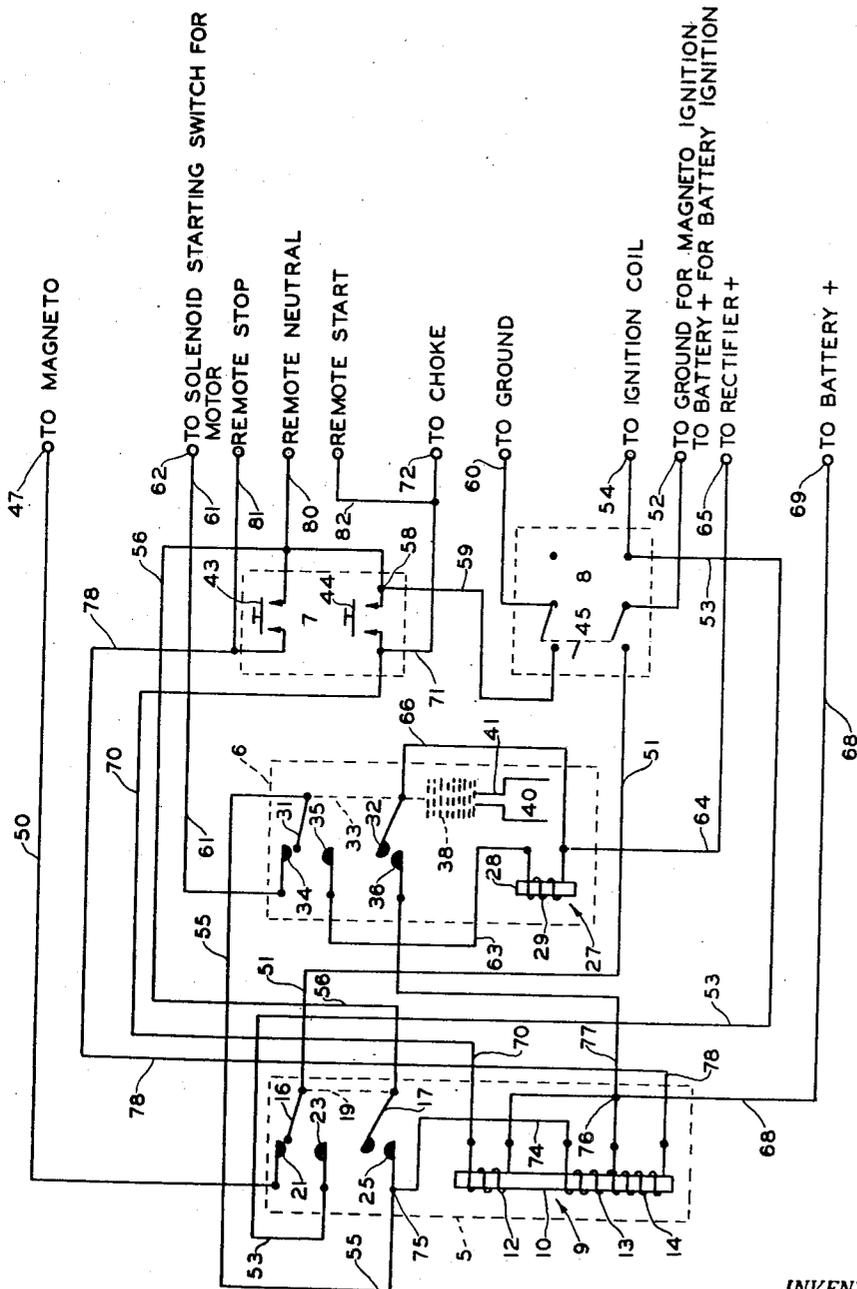
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REMOTE CONTROL SYSTEM

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REMOTE-CONTROL SYSTEM

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The invention described herein 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 remote control systems, and is particularly adapted for use with internal combustion engines.

In the operation of radio systems in the field, it is desirable to generate the necessary energy at some distance from the radio equipment, to avoid objectionable noise and static. In such a situation it is desirable to operate the generating equipment, from the radio apparatus, by remote control. Generating equipment for field use involves an electric generator, an internal combustion engine for running the generator, and a starting motor for the engine. The engine may have battery or magneto ignition and it is one of the objects of the invention to provide remote control for both types of ignition. Another object of the invention is to provide for continuous control of the engine choke, whereby means are provided for remotely actuating the choke only for the duration desired, in contradistinction to the usual means, which operates the choke as long as the starting motor is energized. The latter condition often results in flooding the engine, and is therefore objectionable. A further object of the invention is to provide automatic means for starting the engine if it should fail to start, or should stop, after once pushing the starting button. Other objects and advantages will be appreciated by those skilled in the art after reading the following disclosure.

A system controlled by my invention may include an alternating current generator, an internal combustion engine for driving the generator and including an ignition system, an intake manifold and a choke, an electric motor for starting the engine, a battery for starting the motor, and battery-charging means. The apparatus of the invention comprises a starting switch and means automatically operable, on closing the starting switch momentarily, for actuating the ignition system, whether battery or magneto ignition, and also for actuating the choke in such manner that it is continuously under control, said means also functioning to start the motor, whereby the connected engine and the alternator are also started, the mentioned automatic means being adapted to stop the motor, after the engine has started, by disconnecting the battery from the motor, and also being adapted to connect the battery to the battery-charging means after disconnection of the battery from the motor, the

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two latter functions being originated by the partial vacuum within the intake manifold acting on a Sylphon bellows. The apparatus also includes an arrangement whereby a plurality of remote starting and stopping switches may be disposed at, and operated from, various convenient points.

The accompanying drawing is a schematic of one embodiment of my invention. Referring to the drawing for a detailed description, the numerals 5 and 6 indicate relays, while the numerals 7 and 8 indicate switch-carrying panels. The relay 5 comprises an electromagnet 9 having a core 10, on which are wound coils 12, 13 and 14. Switches 16 and 17 constitute the armature of the electromagnet 9 and are both simultaneously actuated thereby, being mechanically connected together, as indicated by the dash line 19. Switch 16 is a double throw switch normally contacting contactor 21 but movable to contact contactor 23 when actuated by electromagnet 9. Switch 17 is a single-throw switch which contacts contactor 25 when actuated by the electromagnet.

The relay 6 comprises an electromagnet 27 having a core 28 and a winding 29 thereon, and is adapted, when energized, to hold an armature which comprises switches 31 and 32. These two switches are also mechanically connected, as indicated by the dash line 33, and therefore move together. Switch 31 is a double-throw switch normally contacting contactor 34 and adapted to contact contactor 35 when actuated. Switch 32 is a single-throw switch adapted to contact contactor 36 when actuated. Switches 31 and 32 are actuated by the contraction of a Sylphon bellows 38, which is connected to the armature, and also connected to the intake manifold 40 of the internal combustion engine, by a tube 41, so that the interior of the manifold communicates with the interior of the bellows. It will be readily understood that the partial vacuum existing in the manifold when the engine is running, allows the atmospheric pressure to effect contraction of the bellows.

The panel 7 carries manually operable, single-pole, single-throw, push-button switches 43 and 44, which are the stopping and starting switches respectively, while panel 8 carries a double-pole, double-throw switch 45, which is thrown to the left for the automatic operation of the apparatus of the invention, and to the right when it is desired to start manually, i. e., by hand cranking.

The elements previously described are electrically connected as follows. In the case of magneto ignition, with the engine shut off, the magneto, at 47, is connected to ground through point

62, by conductor 50, switch 16, conductor 51 and switch 45. The ground prevents the magneto from functioning. Movement of the switch from contactor 21 removes the ground and permits the magneto to function. For battery ignition, switch 16 is connected, by conductor 53, including contactor 23, to the primary of the ignition coil at 54, and is connected, through conductor 51 and switch 45 to the positive of the battery, to energize the ignition coil. To provide for a circuit whereby the motor may be started, the contactor 25 of the switch 17 is connected to one end of switch 31 by conductor 55, while switch 17 is connected, by conductor 56, to contactor 58 of the switch 44, from which a conductor 59 leads, through switch 45, to ground as indicated at 60, and contactor 34 of switch 31, is connected, by conductor 61, to the solenoid starting switch of the motor, as indicated at 62. To energize the winding 29 of electromagnet 27, contactor 35 of switch 31 is connected by a conductor 63 to one terminal of the winding 29, the other terminal of the electromagnet being connected by conductor 64 to the positive terminal of the rectifier or battery charger, as indicated at 65. Said rectifier is connected to the output of the generator driven by the internal combustion engine and is for the purpose of charging the battery. To provide for a circuit for charging the battery from the rectifier, the lower terminal of winding 29 is connected to switch 32 by conductor 66.

The armature-actuating winding or coil 12, of electromagnet 9, has its lower terminal connected, by conductor 68, to the positive terminal of the battery, as indicated at 69, while its upper terminal is connected, by conductor 70, to one terminal of starting switch 44, the same terminal of the switch being connected by conductor 71 to the negative side of the choke, as indicated at 72.

The winding 13 of the electromagnet 9, which winding is adapted to hold the armature after the actuating coil 12 is de-energized, has one of its terminals connected by conductor 74 to conductor 55, at a point adjacent switch 17 as indicated at 75, while the other terminal of this winding is connected at 76, by conductor 77 to the conductor 68, which leads to the positive of the battery at 69. Conductor 77 also leads to contactor 36 of switch 32.

The winding 14 of the electromagnet 9, which winding is adapted to overcome the magnetizing action of holding coil 13, is energized for shutting down the engine, and has one of its terminals connected to conductor 77 and its other terminal connected by conductor 78 to one of the contactors for stop switch 43, the other contactor for this switch being connected to conductor 56, and also connected to ground by conductor 80, which is designated as neutral, and leads to a remote position, as do stop and start leads 81 and 82 respectively, the former 81, being connected to the conductor 78, and the latter, 82, to conductor 71. The three remote conductors, 80, 81 and 82, are provided so that stop and start switches may be connected thereto at any convenient point or points, these switches being in parallel with the local stop and start switches 43 and 44 respectively, with the stop remote switch or switches connectible across conductors 80 and 81, and the start remote switches connectible across conductors 80 and 82. This arrangement provides for the sometimes desirable use of a number of remote switches disposed at different points.

The operation of the system is as follows. Any one of the starting switches is manually actuated momentarily; coil 12 of electromagnet 9 is thereby energized, energy being derived from the battery, and the circuit is completed through conductors 68, 70, 59 and switch 45, to ground at 60. At the same time, the choke is actuated, but only for as long as the starting button is depressed. The choke may therefore be operated for as long or short a period desired, flooding of the engine being thereby avoided. Coil 12 being energized, the armature, comprising switches 16 and 17, is actuated. Switch 16 thereby breaks contact with contactor 21 so that the normal ground is removed from the magneto ignition circuit, whereupon the latter is allowed to function. In the case of battery ignition, contact of the switch with contactor 23, allows current to be supplied to the primary circuit of the ignition coil at 54, by way of conductors 51 and 53, the circuit being traced from the battery positive at 52 to the ignition coil at 54.

Switch 17 being actuated, the starting relay switch for the motor is closed, connecting the battery to the motor and starting the latter, which starts the engine and its connected generator, the battery-motor circuit racing from the battery at 69 to the solenoid starting switch at 62, by way of coil 12 and switches 44, 17 and 31. At the same time, coil 13 of electromagnet 9 of relay 5 is energized, whereby the switches 16 and 17 are held, allowing the starting button switch to be released. The circuit for energizing coil 13 extends from the battery at 69 to ground at 60.

The engine running, there is a partial vacuum in the intake manifold, which partial vacuum allows the atmospheric pressure to contact the bellows 38, this contraction actuating switches 31 and 32, moving the former into contact with contactor 35 and the latter into contact with contactor 36. Such movement of switch 31 disconnects the battery from the motor, shutting down the latter. At the same time, the electromagnet 29 is energized to hold the switches 31 and 32, energy being derived from rectifier positive or generator at 65, the circuit being completed at terminal 60. The closing movement of the switch 32 connects the rectifier at 65 to the battery so that the latter may be charged, the circuit including conductors 64, and 66, 77 and 68.

Any one of the stopping switches, when pressed, closes the circuit which includes the winding 14 of the electromagnet 9 of relay 5; this winding, as explained above, neutralizes the action of the winding 13, thus allowing switches 16 and 17 to return to inactivated positions, whereby either the magneto is grounded or the battery ignition circuit opened, whichever ignition system is used, thus stopping the engine.

What is claimed is:

1. In a system comprising an internal combustion engine including an ignition system, and a choke, a motor for starting the engine, battery charging means, and a battery for starting the motor: control means comprising a starting switch, a relay comprising an electromagnet and an armature, the electromagnet comprising first and second windings, means for energizing the first winding, on closing the starting switch, to actuate the armature, means operable, on actuation of the armature, to actuate the ignition system, means for actuating the choke only as long as the starting switch is closed, means for energizing the second winding of the electromagnet to hold the armature in actuated position and

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permit opening of the starting switch, means for connecting the battery to the motor to start the latter, means for disconnecting the battery from the motor after the engine has started, and means for connecting the battery to the battery charging means after disconnection from the motor.

2. In a system having an internal combustion engine including an ignition system, an intake manifold, and a choke, a motor for starting the engine, battery charging means, and a battery for starting the motor: control means comprising a starting switch, a relay comprising an electromagnet and an armature, the electromagnet comprising first and second windings, means for energizing the first winding, on closing the starting switch, to actuate the armature, means operable, on actuation of the armature, to actuate the ignition system, means for actuating the choke only as long as the starting switch is closed, means for energizing the second winding of the electromagnet to hold the armature in actuated position and permit opening of the starting switch, means for connecting the battery to the motor to start the latter, means for disconnecting the battery from the motor after the engine has started, and means for connecting the battery to the battery charging means after disconnection from the motor, the two latter means including a pair of switches, and a Sylphon bellows actuated by the partial vacuum within the intake manifold of the engine to close the pair of switches.

3. In a system having an internal combustion engine including an ignition system, a motor for starting the engine, and a battery for starting the motor: control means comprising a starting switch, a relay comprising an electromagnet and an armature, the electromagnet comprising first, second and third windings, means for energizing the first winding on closing the starting switch to actuate the armature, means operable, on actuation of the armature, to activate the ignition system, means for energizing the second winding of the electromagnet to hold the armature in ac-

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tuated position and permit opening of the starting switch, means for connecting the battery to the motor to start the latter, means for disconnecting the battery from the motor after the engine has started, a stop switch, and a circuit including the stop switch and the mentioned third winding, the latter when energized by closure of the stop switch being adapted to neutralize the effect of the second winding to shut off the ignition system, and a plurality of remote switches connected in parallel with the starting and stopping switches.

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