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INTERNAL-COMBUSTION ENGINE

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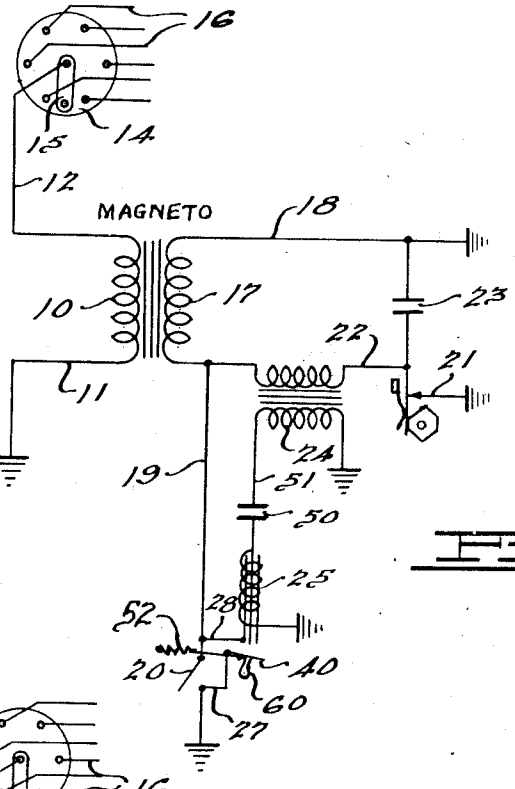


FIG. 1.

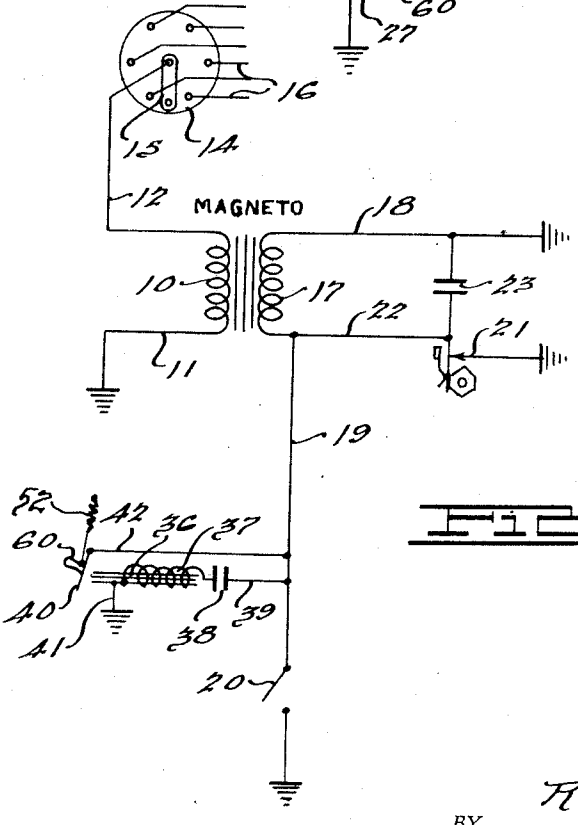


FIG. 2.

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INTERNAL-COMBUSTION ENGINE

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13 Claims. (Cl. 123—146.5)

This invention relates to internal combustion engines and to the control of electric systems, and more particularly to the control of electric ignition systems for internal combustion engines.

In the design of internal combustion engines there is usually a maximum speed beyond which the engine should not be operated as to do so would subject it to undue vibration and perhaps to breakage or other injury. The conventional governor connected to the throttle, for the purpose of limiting the engine speed, is not satisfactory under some conditions since with such governor control full throttle opening is not always obtainable when needed.

The present invention is designed more particularly for use in boat engines where there may be several engines under the control of one operator and where a runaway engine could not be stopped by throttling in time to prevent injury to it.

The present invention therefore seeks to definitely discontinue operation of the engine at a given maximum speed and make it necessary for the operator or engineer to manually restore the engine to operating condition. In the form of the invention here shown, this is accomplished without dependence upon throttle control or strictly mechanical control.

One of the objects of the invention is to provide control for an electric system such that the main circuit is grounded or otherwise rendered inoperative through the medium of another circuit tuned to a given frequency of the main circuit.

Another object of the invention is to provide the electric ignition circuit of an engine with a control circuit tuned to ground the ignition circuit at a predetermined frequency thereof.

Another object of the invention is to provide means for discontinuing the operation of an engine at a predetermined speed through grounding of the magneto ignition circuit by a control circuit tuned to a predetermined frequency of the magneto circuit.

Another object of the invention is to provide an engine magneto ignition circuit with a control consisting of a magnetic grounding switch operated by a circuit tuned to a predetermined frequency of the ignition circuit.

Other objects of the invention will appear from the following description taken in connection with the drawing, which form a part of this specification, in which:

Fig. 1 is a diagrammatic view of a portion of an engine ignition system showing a control circuit in series with the magneto circuit;

Fig. 2 is a view similar to Fig. 1 showing a control circuit in parallel with the magneto circuit.

The invention relates to the control of a main electric ignition circuit by another circuit tuned to a given frequency of the main circuit. The main circuit can be a magneto ignition circuit for an internal combustion engine that is grounded by means of the control circuit when the frequency of the ignition circuit corresponds to the predetermined fixed frequency of the control circuit.

The invention is shown with control circuits in series and parallel respectively with magneto ignition circuits of a conventional high tension type. Such ignition systems have similar secondary circuits consisting of magneto coil 10 grounded at one end by conductor 11 and connected at the other end by conductor 12 with rotor 15 of distributor 14. The wires leading from the distributor to the engine spark plugs are indicated by numeral 16.

Referring to the magneto ignition system shown in Fig. 1, a primary magneto coil 17 is grounded at one end by conductor 18 and the other coil end is connected to ground by conductor 19 having manually operated switch 20 therein. The primary coil end connected with conductor 19 is also connected with grounded contact breaker or interrupter 21 by conductor 22, and conductors 18 and 22 are connected with condenser 23.

Provision is made to cut out the engine ignition system by grounding the primary circuit when the engine attains a predetermined speed resulting in a predetermined frequency in the magneto primary circuit. Such control of the primary circuit in Fig. 1 consists of a series inductance capacitance circuit tuned to resonate with a given frequency of the magneto primary circuit. A transformer 24 is connected in the conductor 22 between breaker 21 and conductor 19, and a magnetic switch or relay is connected between said transformer and the ground so that it may shunt the magneto primary circuit to ground around the switch 20. This magnetic switch comprises a grounded inductance coil 25 in series with the transformer 24 and condenser 50, and a switch 40 connects to ground through the conductor 27. There is also a conductor 28 connecting the core of the inductance coil 25 with conductor 19. The grounding switch 40 is held in either its grounding or non-grounding position by an over-center spring 52 and it is provided with a handle or knob 60 by which it may be reset or manually withdrawn from its grounding position.

This control circuit with its magnetic grounding switch is so tuned that, when the primary circuit reaches the predetermined frequency the two circuits resonate and the resultant flow of current through the inductance coil 25 magnetizes the core thereof which in turn automatically operates the switch to grounding position. This grounding of the conductor 19 through conductor 28, switch 40 and conductor 27 interrupts the opera-

tion of the magneto, and consequently the engine ignition, and the motor stops. In order to start the engine after being stopped in this manner, it is necessary to manually open switch 40.

Referring now to Fig. 2, the magneto primary circuit is similar to that heretofore described and the same reference numerals have been utilized. The control circuit in this form of the invention is in parallel with the magneto primary circuit and consists of a magnetic switch or relay for automatically grounding the primary circuit of the magneto when the latter reaches a given frequency. One end of an inductance coil 37 is connected to ground along with its core, by conductor 41, and the other end is in series with the condenser 38 which is in turn connected to conductor 19 by means of conductor 39. A direct grounding of conductor 19 may be effected through conductor 42 and switch 40 which latter is yieldingly held in either of its grounding or non-grounding positions by an over-center spring 52. The connections of both conductor 39 and conductor 42 to conductor 19 are between conductor 22 and switch 20.

When the engine is to be started, switches 20 and 40 are opened to permit the magneto primary circuit to be energized. When the speed of the engine reaches its predetermined maximum, the frequency of its magneto primary circuit will be in tune with the natural frequency of the control circuit and this will cause the magnetic switch or relay device to be energized and will move switch 40 to connect conductor 42 with grounded conductor 41, thus grounding the primary circuit of the ignition circuit.

Although the invention has been described in connection with specific embodiments, the principles involved are susceptible of numerous other applications which will readily occur to persons skilled in the art. The invention is therefore to be limited only as indicated by the scope of the appended claims.

What I claim is:

1. In an electric system, the combination with a main circuit, of a control circuit tuned to be energized to a substantially increased degree upon the frequency of the main circuit current increasing to a predetermined point, and means responsive to such energizing of said control circuit for grounding the main circuit.

2. In a high tension magneto ignition system, the combination with a magneto primary circuit, of a control circuit tuned to respond to the frequency of the current of the primary circuit when the latter increases to a predetermined point, and means responsive to a substantially increased current in the control circuit for grounding the primary circuit.

3. In an electric system, the combination with a main circuit, of a control circuit tuned to be energized to a substantially increased degree upon the frequency of the main circuit current increasing to a predetermined point, said control circuit including a magnetic switch actuated by said control circuit for grounding the primary circuit.

4. In an electric ignition system, the combination with a magneto primary circuit, of means grounding said circuit in response to the frequency of the primary circuit current increasing to a predetermined point.

5. In an electric system the combination with a main circuit, of a control circuit having a condenser and an inductance coil, and a switch for grounding the main circuit, said switch being closed by the control circuit and the control circuit being tuned to a predetermined current frequency of the main circuit.

6. In an electric ignition system for engines, a magneto primary circuit, a magnetic switch for grounding the circuit, and means for closing said switch upon the frequency of the current of the primary circuit increasing to a predetermined point.

7. In an electric ignition system for engines, the combination of a magneto primary circuit having a grounded conductor with a manually controlled switch therein in open position when the engine is to be operated, of a shunt ground switch in the circuit, and a series circuit connected with the primary circuit for magnetically closing the shunt switch, said series circuit being so tuned that, when the current flowing in the primary circuit reaches a predetermined frequency the two circuits will resonate, resulting in sufficient flow of current to close said shunt switch.

8. In an electric ignition system for engines, the combination of a magneto primary circuit having a ground conductor controlled by a manually operable switch, a switch operable to shunt ground the manual switch, and a parallel circuit controlling said shunt switch, said control circuit being connected with the primary circuit and tuned to close said shunt switch upon the frequency of the current in the primary circuit reaching an increased predetermined point.

9. In an electric ignition system for internal combustion engines, the combination with a magneto primary circuit, of means for interrupting said primary circuit comprising a grounding magnetic switch and a control circuit tuned to close the switch upon the frequency of the current of the primary circuit increasing to a predetermined point.

10. In an electric ignition system for internal combustion engines, the combination with a magneto primary circuit, of a magnetic switch operable to ground the primary circuit including a control circuit having a relay for operating the switch and tuned to respond to the frequency of the primary circuit current increased to a predetermined point.

11. In an electric ignition system, the combination with a magneto primary circuit, of instantaneously operating means for grounding said circuit in response to the frequency of the primary circuit current increasing to a predetermined point.

12. In an electric system the combination with a main circuit, of a control circuit having a condenser and an inductance coil, a switch for grounding the main circuit, said switch being closed by the control circuit and the control circuit being tuned to a predetermined current frequency of the main circuit, and means for retaining said switch in closed position regardless of current flow.

13. In a high tension magneto ignition system, the combination with a magneto primary circuit, of a control circuit tuned to respond to the frequency of the current of the primary circuit when the latter increases to a predetermined point, and means instantaneously responsive to a substantially increased current in the control circuit for grounding the primary circuit.

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