

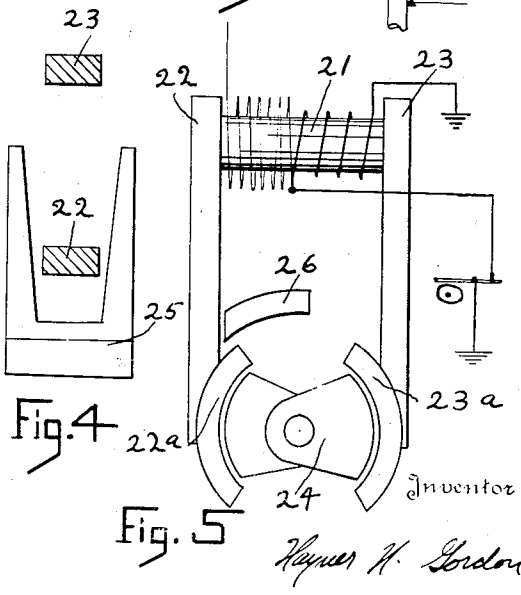
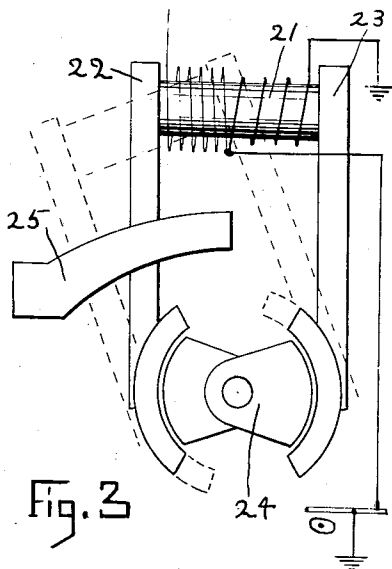
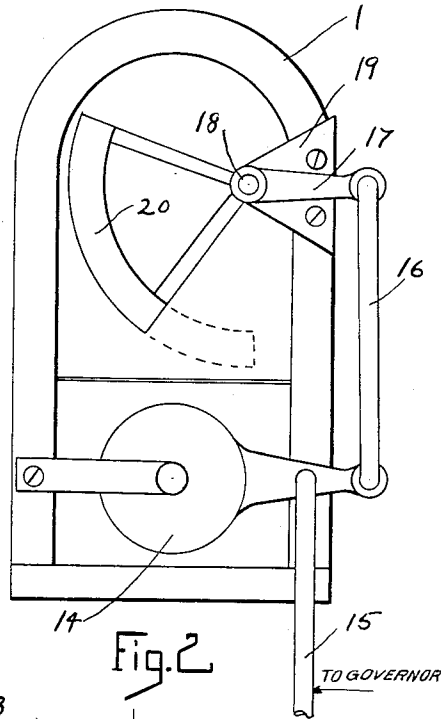
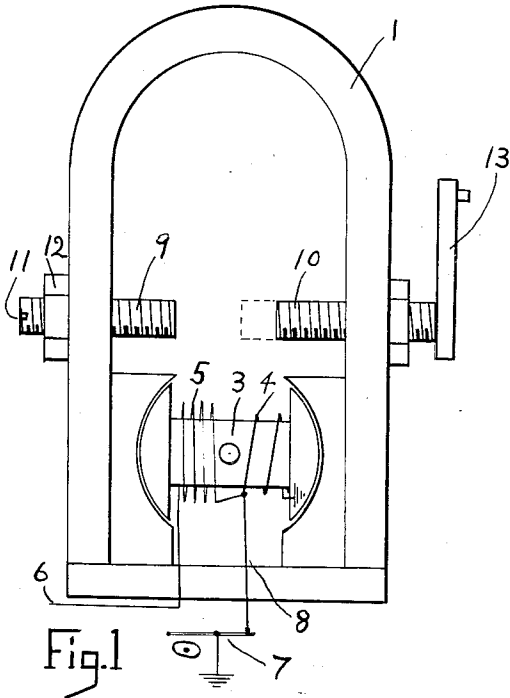
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H. H. GORDON

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FLUX CONTROL FOR MAGNETOS

Filed Nov. 20, 1917



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UNITED STATES PATENT OFFICE.

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FLUX CONTROL FOR MAGNETOS.

Application filed November 20, 1917. Serial No. 203,027.

To all whom it may concern:

Be it known that I, HAYNER H. GORDON, a citizen of the United States of America, residing at Washington, in the District of Columbia, have made new and useful Improvements in Flux Controls for Magnetos, of which the following is a full and complete specification, reference being had to the accompanying drawings, which form part of the specification.

This invention relates broadly to structure in which an electric current is generated, or set up in a winding by subjecting the same to a variation in magnetic flux, and relates more particularly to the provision of means for regulating the rate of flux change independently of the means that produces the flux change.

This invention also relates more particularly to high tension magnetos of the type which comprise a high tension winding and a low tension or choke winding, superimposed upon a core which is subjected to a variable magneto motive force. The variation in the magneto motive force is produced by either rotating the core carrying windings in a magnetic field, or else by the use of a magnetized rotor operating in conjunction with a fixed core and pole piece. In either case, a flux change is set up in the core, which change has a variable rate which approaches a sharp maximum twice each revolution of the rotor or core in the two pole magnetos, which flux change however, is opposed by the choke winding, which is normally short circuited and which, as soon as a flux change tends to take place in the core, sets up a counter magneto motive force, which tends to resist such change. At points of maximum rate of flux change however, the choke winding circuit is suddenly opened by some external means, such as a circuit breaker, and the hitherto repressed flux change is allowed to take place in the core, thereby setting up a potential in the high tension winding with a consequent breaking down of the spark gap to which the high tension winding is connected. The spark thus formed continues to burn in the form of an arc, for the breaking down of the spark gap has closed the high tension winding or circuit, and the current flowing in this winding has a regulative action upon the flux change taking place in the core.

This type of magneto operates very satisfactorily at low or normal engine speeds, but when operated at the extremely high speed demanded in the modern eight or twelve cylinder motors, the intensity of the flux change becomes so great as to cause overheating from eddy currents set up in the magnetic core structure and from the high current density in the short circuited choke winding. Also in a magneto which is designed to give a good spark at starting when rotated at the extremely high speed demanded, the spark becomes so hot that the sparking points of plugs are soon burned away, or become overheated causing pre-ignition and in addition the counter magneto motive force set up by the choke windings at extremely high speed causes serious complications in the armature reaction of the magneto. This same action is also present in the low tension magneto, such as is used in make and break ignition, the structure of this type of magneto being similar to that just described, with the exception that no secondary winding is used, the low tension or choke winding being directly connected to the spark producing electrodes.

It is the general object of this invention to provide a magneto structure in which the rate of flux change through a current producing winding may be controlled independently of the means which produces such flux change.

It is a further object of this invention to provide a magnetic leakage path around a current producing winding, the magnetic reluctance of said path being capable of automatic variation in accordance with the character and periodicity of the current produced in the winding.

It is a further object of this invention to provide a magnetic leakage path around a current producing winding, the magnetic reluctance of said path being capable of automatic variation in accordance with the phase relationship between the current impulses set up in the current producing winding, and the means for causing a flux change to take place in the winding.

It is a still further object of this invention to provide a magneto which may be operated satisfactorily at high speeds without excessive heating and excessive armature reaction.

Further objects of this invention will appear from the following disclosure.

For the purpose of rendering this invention more clear reference is had to the accompanying drawings, in which Figs. 1 and 2 show one embodiment of the invention as applied to a magneto of the rotating coil type and Figs. 3, 4 and 5 show another embodiment of the invention as applied to a magneto of the inductor type.

In the form shown in Fig. 1, a permanent magnet 1 is provided with pole pieces between which revolves a laminated armature 3 carrying the choke winding 4 and the secondary winding 5, the secondary being connected to a distributor or to plugs by a lead 6 while the low tension winding, one end of which is grounded, is connected to a circuit breaker 7 by a lead 8. Mounted in the limbs of the magnet 1 are two projections 9 and 10, the projection 9 being adjustable by means of the screw driver slot 11 and the lock nut 12 while the projection 10 is adjustable by means of the crank 13, these projections forming a magnetic leakage or shunt path for the magnetic flux.

The crank 13 may be manually operated but is preferably connected to some form of automatic governor so that the position of the projection 10 may be automatically controlled by the speed of the engine. At low speeds and for starting, the member 10 is in the position indicated by the full lines in Fig. 1 while at high speeds the same is advanced into the dotted line position. It is thereby readily seen that the members 9 and 10 form a shunt path of variable magnetic resistance, the proportions of which may be so designed as to enable the magneto to produce sparks having a fixed energy value throughout the range of speed at which the magneto is operated, more or less of the magnetic flux leaking across the path provided by the projections 9 and 10 at higher speed.

Fig. 2 shows a slight modification of this structure in connection with the same type of magneto. The usual interrupter mechanism is enclosed in the adjustable casing 14, which is controlled by the rod 15 which is connected to any suitable form of spark regulative mechanism. Simultaneously movable by the rod 15 is a rod 16 connected to an arm 17 carried upon a pivot shaft 18 mounted in turn upon a plate 19, which is fastened by suitable means to the magnet. An arc shaped piece of soft iron 20 is also fastened to the shaft 18. As the timer is advanced into an earlier spark position by the upward movement of the rod 15, which may be controlled either manually or by some type of governing device actuated by the engine, the piece 20 is swung down into the dotted line position by means

of the rod 16, thereby providing a magnetic shunt path of more or less reluctance, the reluctance of the same decreasing as the timer is advanced in accordance with the increase in speed of the motor.

In certain types of magnetos the primary and secondary windings are located upon a coil supporting structure and a variable magnetic flux is supplied thereto by means of a rotating polarized inductor. In such types of magneto the coil supporting structure is usually angularly movable about the axis of rotation of the inductor shaft and carries fastened thereto, the interrupter mechanism for the choke winding. By such an arrangement the coil supporting means is angularly moved together with the interrupter structure when the spark is advanced or retarded thereby permitting the interrupter mechanism to always function at the peak of a magnetic surge irrespective of the advanced or retarded position of the interrupter mechanism.

Figs. 3 and 4 illustrate an adaptation of the present invention to such structure, in which 21 represents a coil carrying the usual choke and secondary windings supported by the pole pieces 22 and 23 between which the inductor 24 rotates. In Fig. 3 the full lines represent the position of the coil supporting structure when the spark is fully retarded for starting and the dotted lines represent the position which the coil supporting structure assumes when the spark is fully advanced. A crotch shaped member 25 is fixedly supported at one side of the coil supporting structure, the same being shown in plan view in Fig. 4. It will be seen that as the coil supporting structure assumes the advanced spark position shown in the dotted lines in Fig. 3 that the same will lie more or less inside of the crotch shaped member 25 which therefore provides a magnetic leakage path of more or less magnetic resistance.

Fig. 5 shows a further modification of this structure in which a stationary member 26 is fastened between the polar projections 22 and 23. It will be evident that as the coil supporting structure is rotated to the left for the advanced spark position that the circular polar base 23^a will approach the end of the fixed member 26 which thereby provides a variable magnetic shunt path.

While permanent magnets are shown in all the figures as a source of magnetic energy it is, of course, obvious that electromagnets could be used for this purpose without departing from the spirit of the invention.

What I claim is:

1. In an ignition system for internal combustion engines, means for generating a high tension current, including a core hav-

ing thereon a winding, means to produce a change of magnetic flux in said core to produce a current in said winding, a magnetic leakage path to shunt a part of the magnetic flux around said winding, and means for automatically varying the reluctance of said leakage path in accordance with the speed of the engine.

2. In an ignition system for an internal combustion engine, a spark producing winding mounted upon a core, means operated by the engine for causing a periodic flux change in said core to energize said winding a magnetic leakage path also subjected to periodic flux change for controlling the rate of flux change in said core, and means for decreasing the reluctance of said leakage path as the periodicity of flux change increases.

3. In a magneto, the combination of a source of magnetic flux, parallel paths therefor, means in one of said paths for generating an igniting current, and means varying the ratio of magnetic flux in the two paths.

4. In a magneto, the combination with a source of magnetic energy of a core, means for generating a current comprising a high tension winding and a choke winding, a circuit interrupter connected in circuit with said choke winding, means to advance and retard the time of functioning of said circuit interrupter relative to a fixed point in the time cycle of the magneto, and means to simultaneously adjust the reluctance of a magnetic leakage path for shunting a portion of the magnetic flux around said core.

5. In a magneto, the combination with a current producing winding of a means for producing a flux change in said winding, timing mechanism to adjust the time of such flux change relative to a fixed point in the time cycle of the magneto, a magnetic leakage path to shunt a portion of the magnetic flux outside of said current producing winding, and means to adjust said spark timing mechanism and simultaneously control the magnetic reluctance of said leakage path.

6. In a high tension magneto, the combination with a spark producing winding of

rotating means for producing a flux change in said winding, timing mechanism whereby the time of functioning of said spark producing winding may be determined, supplemental means for controlling the rate of flux change in said winding independently of the speed at which the magneto is operated, and means for simultaneously adjusting said timing mechanism and varying the magnetic reluctance of said supplemental means for controlling the rate of flux change in said winding.

7. In a system for the production of energy, the combination with an internal combustion engine, of a magneto comprising a source of magnetic energy, a core, means for generating a current comprising windings upon said core, means for producing a variable magnetic flux in said core said means being actuated by said engine and a magnetic leakage path for shunting a portion of the magnetic flux outside of said current producing windings, the reluctance of said magnetic leakage path being controlled by the speed of the engine.

8. In an ignition system for an internal combustion engine, a spark producing winding mounted upon a core, means operated by the engine for causing a periodic flux change in said core to energize said winding, a magnetic leakage path also subjected to the periodic flux change for controlling the rate of flux change in said core, and means for automatically decreasing the reluctance of said leakage path as the periodicity of flux change increases.

9. In an ignition system for an internal combustion engine, a spark plug, a high tension winding adapted to furnish electrical energy to said spark plug, means operated by the engine in synchronism therewith for causing a flux change for energizing said winding, a magnetic shunt path also subjected to said flux change, and means for automatically varying the reluctance of said magnetic shunt path in accordance with variations in engine speed.

In testimony whereof I have hereunto set my hand.

HAYNER H. GORDON.