

Aug. 10, 1937.

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2,089,758

ELECTRICAL APPARATUS

Filed June 11, 1935

3 Sheets-Sheet 1

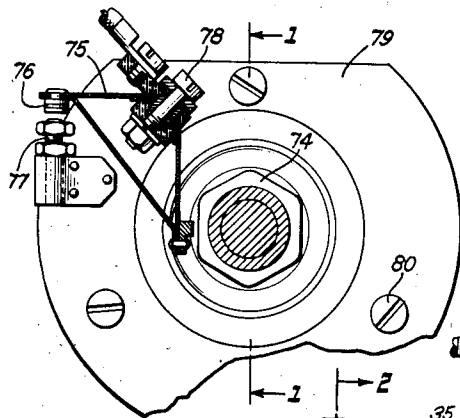


Fig. 5

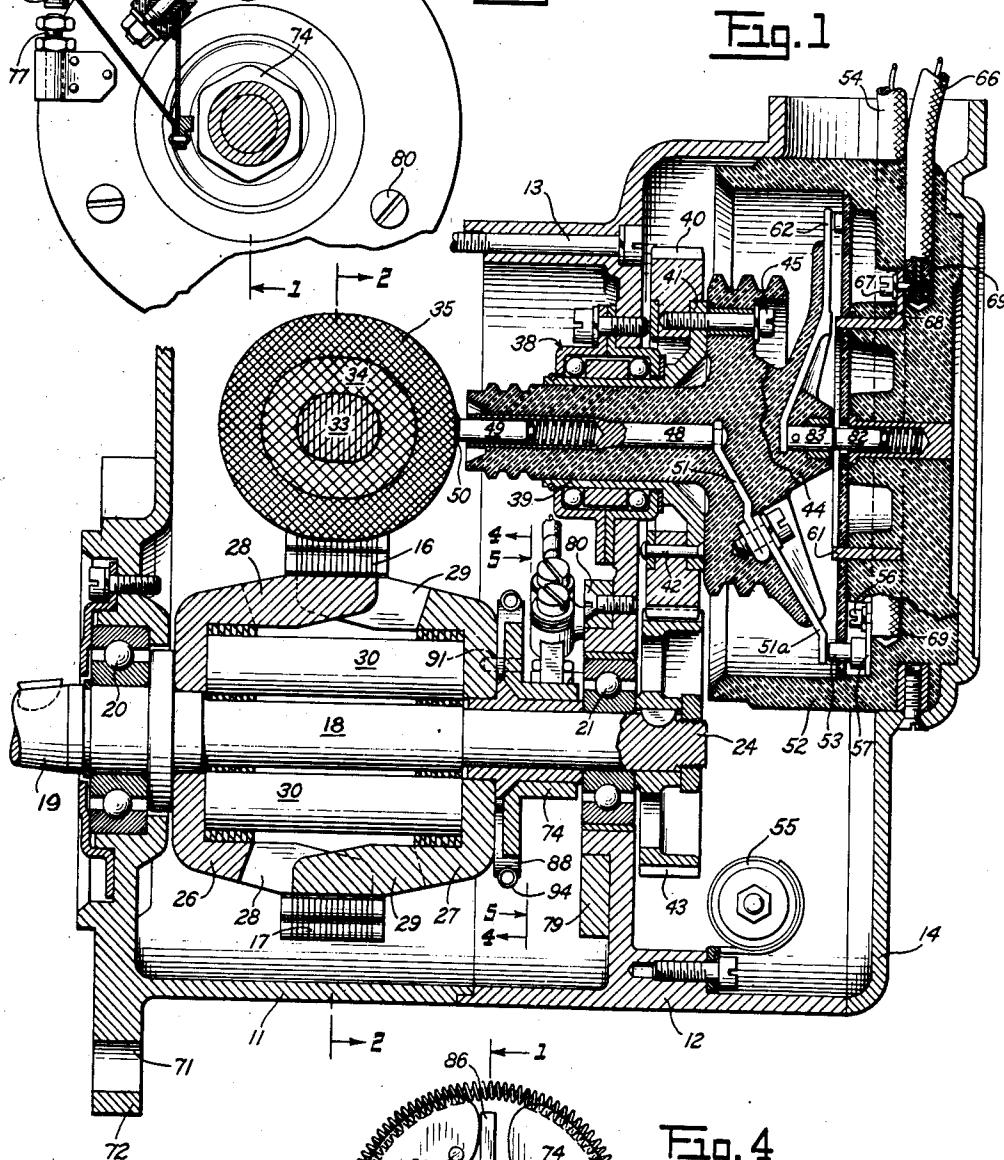


Fig. 1

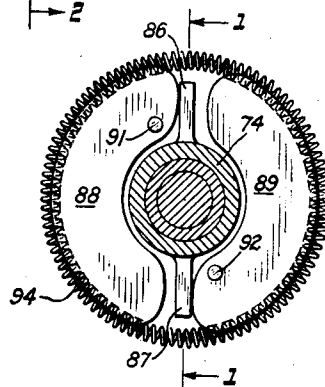


Fig. 4

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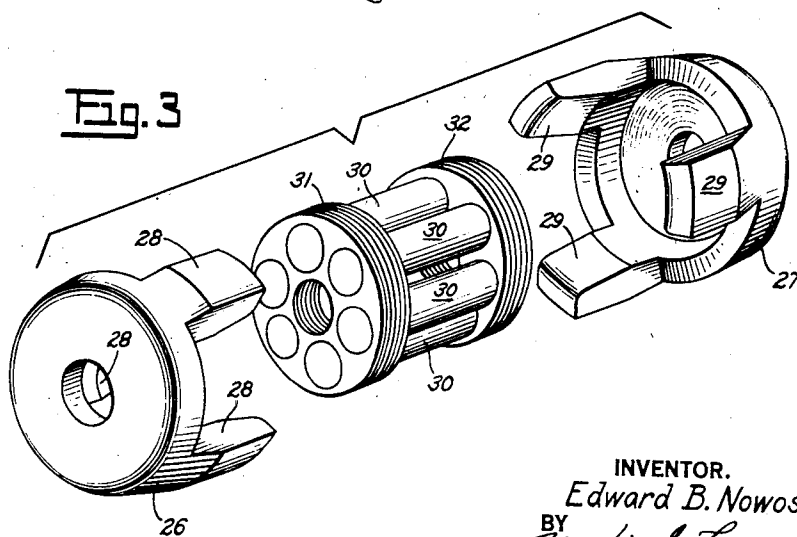
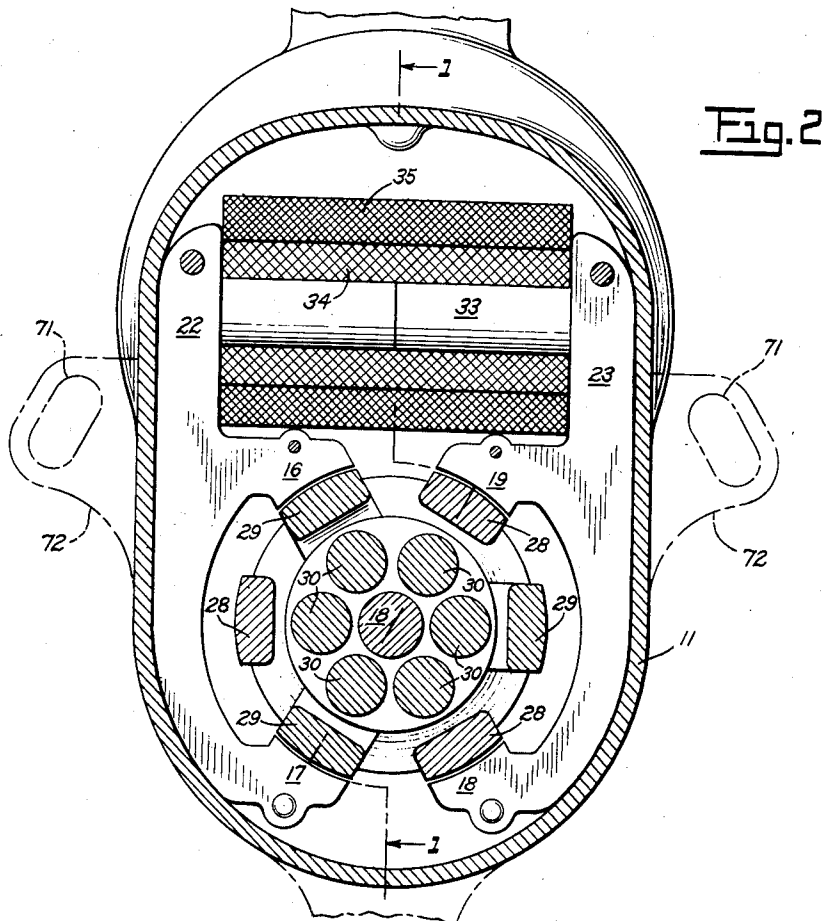
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3 Sheets-Sheet 2



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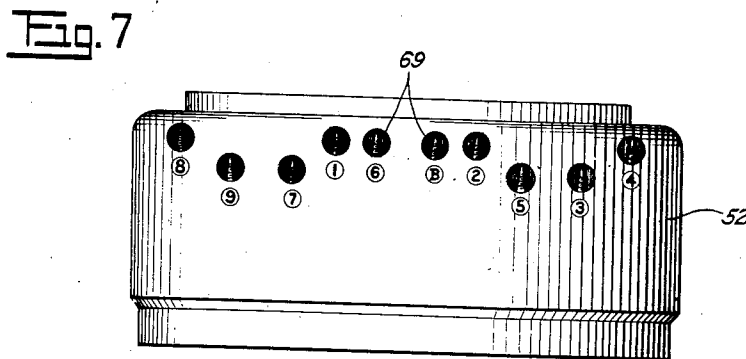
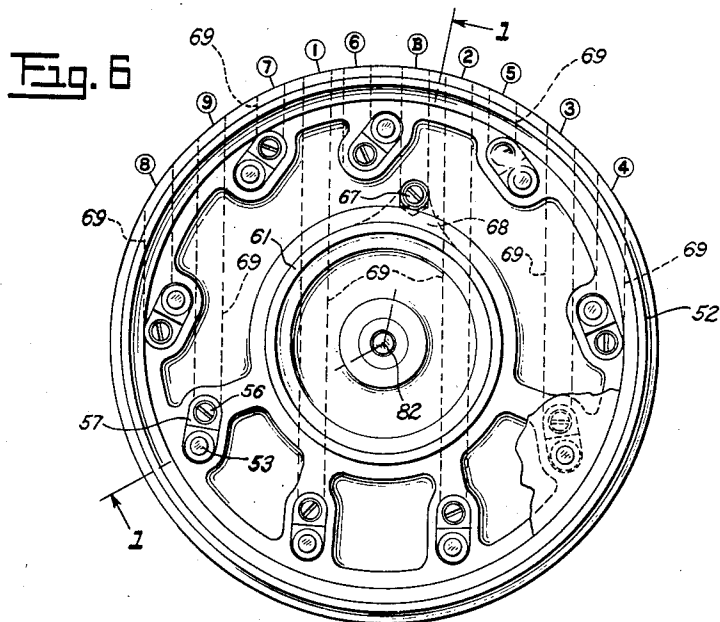
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ELECTRICAL APPARATUS

Filed June 11, 1935

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,089,758

ELECTRICAL APPARATUS

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Application June 11, 1935, Serial No. 26,052

9 Claims. (Cl. 171-209)

This invention relates to magneto-electric generators, and more particularly to a high tension magneto of the type used for ignition purposes in internal combustion engines.

5 An object of the invention is the provision of a novel magneto of the inductor type, in which the magnetic circuits are extremely compact, yet of high efficiency.

10 Another object of the invention is the provision of a novel magneto in which parallel bar magnets are used. Instead of being mounted in the stationary frame, as in my Patent No. 1,853,220 of April 12, 1932, the bar magnets are mounted in the inductor rotor assembly, and the method
15 of such mounting is another feature of the invention.

20 These and other objects of the invention will become apparent upon an examination of the following specification when read with reference to the accompanying drawings illustrating the preferred embodiment thereof. It is to be understood, however, that the drawings are merely illustrative and are not designed to indicate the limits of the invention, reference being had for
25 this purpose to the appended claims.

In the drawings,

Fig. 1 is a vertical longitudinal section of a device embodying the invention;

30 Fig. 2 is a transverse view along the section line 2-2 of Fig. 1;

Fig. 3 is an exploded perspective of the rotor assembly;

Fig. 4 is a view in elevation along line 4-4 of Fig. 1;

35 Fig. 5 is a view in elevation along line 5-5 of Fig. 1;

Fig. 6 is a transverse diagrammatic view of the distributor block; and

40 Fig. 7 is a top end view of the distributor block.

In the form shown, the magneto of the present invention comprises a main casing or frame of suitable non-magnetic material such as aluminum, and consisting of sections 11 and 12 suitably attached as by means of the screws 13.

45 One end of section 11 and a transverse wall of section 12 are adapted to support suitable anti-friction bearings 20 and 21 and an armature or rotor shaft 18 is journaled therein, with one end portion 19 projecting outside the casing and provided with suitable attaching means whereby the shaft may be driven from a rotary part of the engine.

50 A composite inductor rotor is mounted upon the shaft 18 to rotate therewith, and includes a

pair of inductors 26 and 27 having overlapping arms 28 and 29 arranged in interdigital relation, the zone of overlapping being substantially adjacent the middle portion of the casing section 11. These inductors are formed of suitable mag-
5 netic material and the arms thereof are adapted to rotate in sequence past two pairs of arcuate pole pieces 16, 17, 18 and 19, which are preferably constructed of laminated soft iron, and which are located as shown best in Fig. 2.

10 The bar magnets 30 are mounted in the inductors 26 and 27 by the novel method and means indicated best in Fig. 3, and including two sets of stacked magnetic laminae 31 and 32 of a diameter to register snugly in the circular re-
15 cesses of the inductors, each lamina being in turn perforated to receive one end of each bar magnet 30. In this fashion there is obtained a unitary, permanent magnetic assembly fitting into the inductors in such a manner as to insure an
20 exceptionally high degree of magnetic efficiency in the matter of the density and volume of the flux "take-off" as between the inductors on the one hand and the bars on the other.

25 A suitable induction coil having a laminated soft iron core 33 and primary and secondary windings 34 and 35 respectively, is mounted cross-wise of section 11 within the upper part thereof and with the ends 22, 23 of the core 33 brought
30 downwardly to form the arcuate pole pieces above described, and thus complete the magnetic circuit.

35 The transverse wall of casing member 12 supports a suitable anti-friction bearing 38 adjacent the coil 34, 35 and a sleeve 39 is journaled therein. A gear 40 is rigidly attached to turned flange 41 of said sleeve by suitable means such as rivets 42, and is arranged to mesh with and be driven by a pinion 43 suitably keyed upon the
40 end 24 of the rotor shaft 22. The pitch diameters of pinion 43 and gear 40 and the number of inductor arms are chosen so as to provide the proper number of flux reversals per revolution of the engine crankshaft, having in mind the number of cylinders in the engine with which the
45 magneto is to be used. In the form illustrated there are six inductor arms 28 and 29 and the magneto is adapted to be used with a nine-cylinder engine so that the gear ratio is chosen accordingly.

50 A rotary distributor spool 44 having a body of suitable insulating material is mounted within the sleeve 39, being retained therein by suitable means such as the screws 45 passing through the flange 41 of sleeve 39 and suitable openings in the
55

spool. A conductor 48 extends centrally through the inner portion of spool 44 and is provided at its inner end with a spring pressed contact member 49 which is adapted to contact with the terminal 50 of the high tension winding of the induction coil. A radially disposed conductor 51 is in engagement with conductor 48 at the end of the latter, the outer end of member 51 extending outwardly of rotary member 44 to form a distributor finger 51^a.

A suitable distributor block 52 is mounted in the upper portion of the end section 14 in proximity to spool 44, and is provided near its periphery with a plurality of contact points 53 with which the high tension spark plug cables 54 (only one being shown) are adapted to connect, by means of suitable binding posts 56 and short strips 57, set into the non-conducting material of the block. It will be understood that the stationary distributor points or terminals 53 extend along the block 52 adjacent the path of rotation of the rotary distributor finger 51^a to successively receive the high tension current therefrom, in the usual manner.

The central part of the distributor block 52 may be provided, if the magneto is to be associated with a booster magneto, with a cylindrical insert 61 having its outer face extending sufficiently close for electrical engagement with a radially disposed conductor 62 which is carried by the distributor spool 44, at an angle to the conductor 51 (such, for example, as in my Patent No. 1,921,427) and adapted to electrically connect cylinder 61 with the points 53 in succession. The booster magneto cable 66 energizes cylinder 61 by reason of the connection screw 67 holding the cable to the flange 68 of ring 61. Each cable 54, as well as cable 66, enters its individual, vertically bored recess 69 in block 52. Only two of these ten parallel recesses 69 are visible in Fig. 1, but all appear in Figs. 6 and 7. By staggering the parallel tunnels as shown, an important saving in thickness, as well as diameter of the block is effected.

Openings 71 are tapped in the ears 72 of section 11 whereby the magneto may be bolted upon a suitable bracket or shelf, with the shaft 22 in driving connection with a suitable rotatable part driven from the engine.

It will be noted that the inductor arms 28 are always of one polarity, while the inductor arms 29 are always of the opposite polarity. During the operation of the device, if for instance the inductor arms 28 are north poles and arms 29 are south poles, when an arm 28 is opposite the pole piece 19 and an arm 29 is opposite pole piece 17, then the flux is from the north poles of the magnets 30 through the annular pole piece 31 to the inductor 26, through the inductor arms 33 to the pole pieces 18, 19, through the core 23 of the induction coil and back to the pole pieces 16, 17 then to the inductor arms 29 and through the annular pole piece 32 to the south poles of magnets 30. When the rotor has turned through sixty degrees, so that an inductor arm 29 is opposite the pole piece 19 and an inductor arm 28 is opposite the pole piece 17, then the flux traverses the coil in a reverse direction. It will thus be seen that there are six reversals of flux through the coil during each revolution of the rotor 15.

The cam member 74 is provided with six lobes (Fig. 5) which are arranged to operate interrupter yoke 75 to open the primary circuit contacts 76, 77 during the time that the flux through

the coil is changing most rapidly, and therefore the heaviest current is flowing through the primary winding 34. Yoke 75 is adjustable by means 78, and is mounted on plate 79 (as is also contact post 77) secured to the housing wall by screws 80. In shunt with the circuit interrupter 75 is the usual condenser 55. The interruption of the primary current induces a current of high voltage in the secondary coil 35 which is conducted out through the proper cable 54 to the ignition system of the engine, returning through the body of the engine and the casing of the magneto. Pins 82, 83 provide a means of short-circuiting or grounding the current flowing through arm 62, if and when desired.

For automatic spark adjustment I provide cam 74 with radial extensions 86, 87 (Fig. 4) engageable by the heels of weights 88 and 89 respectively, said weights being mounted to swing about pins 91, 92 extending from the member 27, the swinging thereof being regulated by the restraining action of toroidal spring 94. As the speed increases the weights shift cam 74 slightly in relation to pins 91, 92.

Although but one embodiment of the invention has been shown and described in detail, it is to be expressly understood that the illustrated embodiment is not exclusive, and various other embodiments will now suggest themselves to those skilled in the art, while changes may be made in the construction, arrangement and proportions of parts, and certain features used without other features, without departing from the spirit of the invention. Reference is therefore to be had to the claims hereto appended for a definition of the limits of the invention.

What is claimed is:

1. A magneto of the inductor type having a plurality of parallel members of permanently magnetic material, a set of circular magnetic laminae of a diameter greater than that of a circle enclosing said parallel members, and perforated to receive the ends of said parallel members, a plurality of polar masses in magnetic contact with said laminae, and also in magnetic contact with the ends of said parallel members, and means for sending a magnetic flux through said polar masses, laminae, and parallel members, said means including a non-magnetic actuating shaft passing through the center of each lamina and drivably engaging said polar masses.

2. A magneto of the inductor type having a plurality of parallel members of permanently magnetic material, a set of rotatable circular magnetic laminae of a diameter greater than that of a circle enclosing said parallel members, and perforated to receive the ends of said parallel members, a second set of magnetic laminae fixed adjacent thereto, a plurality of interdigitated inductor arms adapted to be brought successively in magnetic contact with said fixed laminae, and also adapted to remain constantly in magnetic contact with said rotatable laminae and the ends of said parallel members, and means for sending a magnetic flux through said inductor arms, laminae, and parallel members, said means including a non-magnetic actuating shaft passing through the center of each lamina and drivably engaging said inductor arms.

3. A magneto of the inductor type having a plurality of parallel members of magnetic material, a set of circular magnetic laminae of a diameter greater than that of a circle enclosing said parallel members, and perforated to receive the ends of said parallel members, a plurality of

polar masses in magnetic contact with said laminae, and also in magnetic contact with the ends of said parallel members, and a set of laminated pole shoes disposed adjacent the path of rotation of said polar masses and with their centers of mass located on a common line passing through the longitudinal axes of a plurality of said parallel magnetic members.

4. A magneto of the inductor type having a plurality of parallel members of magnetic material, a set of magnetic circular laminae of a diameter greater than that of a circle enclosing said parallel members, and perforated to receive the ends of said parallel members, a plurality of polar masses in magnetic contact with said laminae, and also in magnetic contact with the ends of said parallel members, and means for sending a magnetic flux through said polar masses, laminae, and parallel members, said means including a non-magnetic actuating shaft passing through the center of each lamina and drivably engaging said polar masses, said means also including a set of pole shoes disposed adjacent the path of rotation of said polar masses and with the central points of said pole shoes located on a common line passing through the longitudinal axis of said actuating shaft.

5. In a magneto, a rotor comprising a plurality of separate bar magnets having their polar axes parallel to and equally spaced from the common axis of rotation, with their "north" ends all located in a common plane, a "north" polarity inductor ring also disposed in said common plane, a "south" polarity inductor ring at the opposite poles of said magnets, and inductor arms extending from both said rings to cut a common plane intermediate the "north" and "south" ends of said magnets, and circular magnetic laminae having edges contacting each of said bar magnets, said circular laminae having a diameter greater than that of a circle enclosing all of said bar magnets.

6. In a magneto, a rotor comprising a plurality of inductor elements one of which has a pair of depressions in its outer face, a pair of pins extending into said depressions, and means including a pair of weights pivotally mounted on said pins to vary the timing of the current interruption in relation to the angular position of said inductor elements.

7. In a magneto, a sectional housing, a current generating coil in one section of said housing, a plurality of parallel channels in another section of said housing, to receive conductors for carrying the current generated in said coil, terminals for said conductors, said terminals being disposed at right angles to said parallel channels, and having their current receiving faces in a common plane parallel to the plane of said parallel channels.

8. In a magneto, a sectional housing, a current generating coil in one section of said housing, a plurality of parallel channels disposed in staggered relationship in a pair of parallel planes, in another section of said housing, to receive conductors for carrying the current generated in said coil, terminals for said conductors, said terminals being disposed at right angles to said parallel channels, and means rotatable about said common center to electrically connect said coil with said terminals.

9. In a magneto, a rotor comprising a plurality of separate bar magnets constituting parallel branches of a magnetic circuit, and distributed all the way around the rotor and having their polar axes parallel to and equally spaced from the common axis of rotation, with their "north" ends all located in a common plane, means for periodically reversing the magnetic circuit, and circuit completing means including circular magnetic laminae having edges contacting each of said bar magnets.

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