Nov. 14, 1933. E. B. NOWOSIELSKI 1,935,127

MAGNETO

Filed July 30, 1932. 2 Sheets-Sheet 1

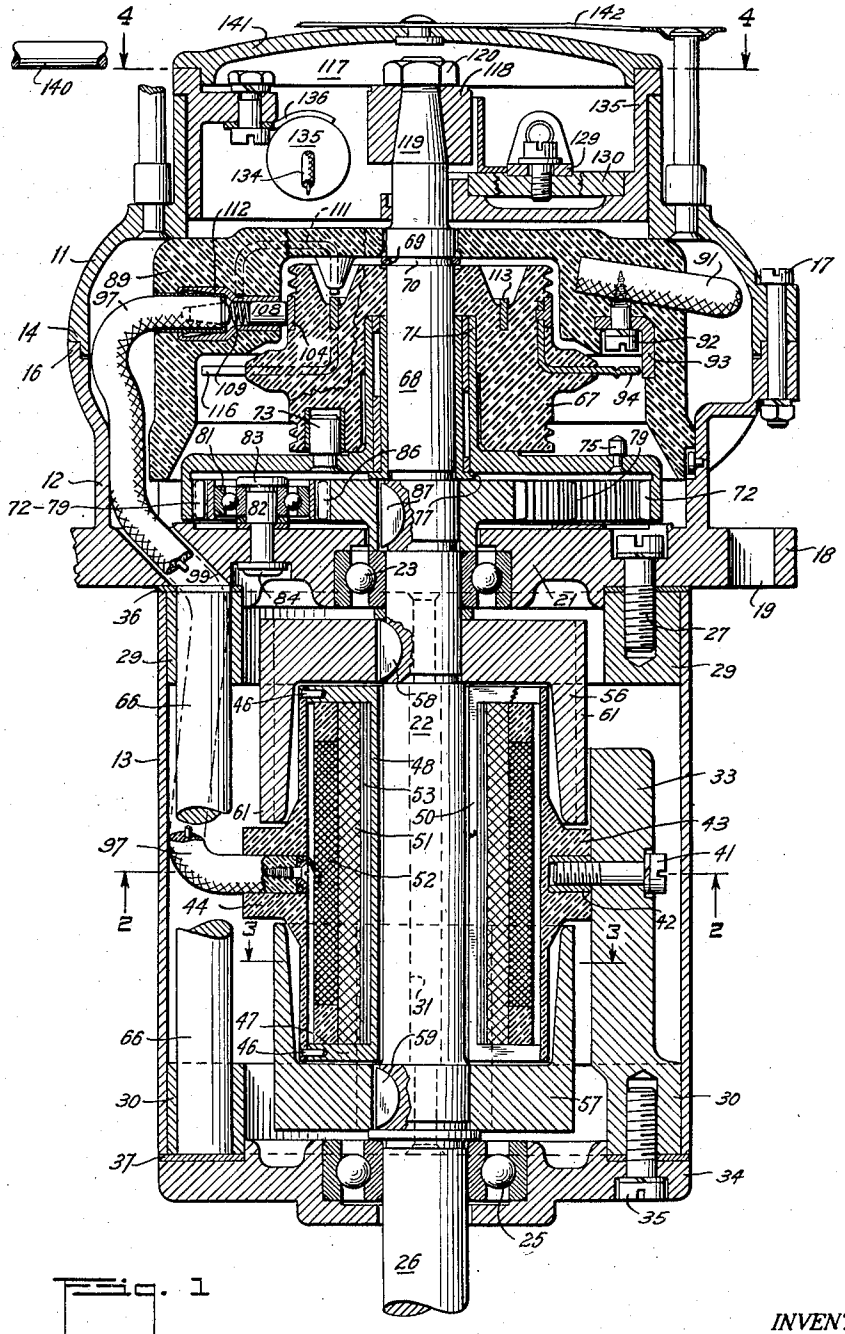


Fig. 1

INVENTOR
Edward B. Nowosielski
BY Martin J. Finnegan
ATTORNEY.

Nov. 14, 1933. E. B. NOWOSIELSKI 1,935,127

MAGNETO

Filed July 30, 1932 2 Sheets-Sheet 2

Fig. 2

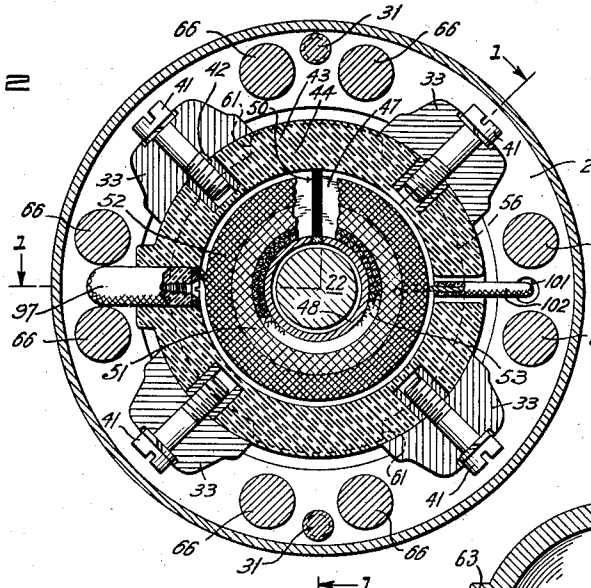


Fig. 3

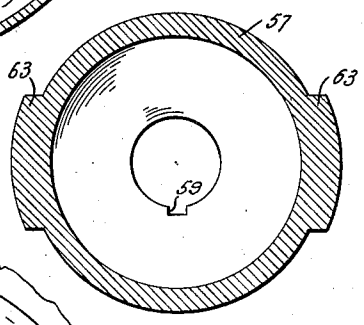


Fig. 4

INVENTOR.
Edward B. Nowosielski
BY
Martin J. Finnegan
ATTORNEY.

Patented Nov. 14, 1933

1,935,127

UNITED STATES PATENT OFFICE

1,935,127

MAGNETO

Edward B. Nowosielski, Bloomfield, N. J., assignor, by mesne assignments, to Eclipse Aviation Corporation, East Orange, N. J., a corporation of New Jersey

Application July 30, 1932. Serial No. 627,048

12 Claims. (Cl. 123—149)

This invention relates to magnetos, and more particularly to high tension magnetos adapted extending from the housing of the internal comengines.

One of the objects of the present invention is to provide a novel magneto structure which is small and light, but powerful and efficient.

Another object is the provision of a unitary magneto distributor involving distinct but interconnecting compartments for the magneto rotor and distributor, the latter being preferably of the jump-spark type.

Another object of the invention is to provide a unitary magneto-distributor of compact and symmetrical design and particularly characterized by the substantially coaxial alignment of the major parts, and further characterized by the novel mounting of the induction coil with respect to the inductor and cooperating field elements of the magneto. In this connection, a feature of the invention is the mounting of the induction coil within and concentrically of the inductor elements constituting the rotor of the magneto, thus obtaining an unusual degree of compactness and symmetry in the relative positioning of the parts of the device.

These and other objects of the invention will become apparent upon an inspection 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 this purpose to the appended claims.

In the drawings,

Fig. 1 is a central longitudinal section of the device embodying the invention, the section being taken along line 1—1 of Fig. 2;

Fig. 2 is a transverse sectional view taken along line 2—2 of Fig. 1;

Fig. 3 is a sectional view of a detail taken along line 3—3 of Fig. 1; and

Fig. 4 is a view in elevation taken along the line 4—4 of Fig. 1.

In the form shown, the magneto of the present invention comprises a sectional casing having three major portions 11, 12 and 13; the latter being of non-magnetic material, and the first two being in the form of castings having interlocking edges 14 and 16 adapted to abut and be held in registering alignment by suitable means 17. The section 12, which is the intermediate section, is also preferably flanged as indicated at 18, the flange being apertured as indicated at 19 for reception of suitable means (not shown) by which the unit may be mounted vertically on a flange extending from the housing of the internal combustion engine, with the lower portion 13 of the unit extending into the engine housing.

The section 12 is further provided with an inwardly extending flange or transversely disposed portion 21 centrally apertured to permit passage therethrough of the rotor shaft 22, the free rotation of the shaft 22 being facilitated by the provision of suitable bearings 23 and 25. The transversely disposed portion 21 of the section 12 is further apertured to receive one or more screws or equivalent members 27 threadedly engaging an annular member 29 constituting one of two magnetic elements, the other of which is indicated at 30, as having laterally extending therefrom a plurality of arms 33 arranged in equally spaced angular relation and extending substantially beyond the center of the casing section 13 which encloses them, and is held in spaced relation with member 29 by a plurality of non-magnetic supporting rods 31. An end plate 34 is secured to the annular magnetic member 30 by suitable fastening means 35 and serves to retain the bearing 25 in place on the projecting portion 26 which couples the rotor with the engine driven element (not shown). Annular sealing discs 36 and 37 may be interposed between plate 34 and member 30, and partition 21 and member 29 respectively.

As indicated best in Fig. 2, the arms 33 extending from the annular member 30 are four in number, and are in quadrantal relation; each of the arms receives a fastening screw 41 extending within radially drilled openings, bushed as at 42, provided at equal angular intervals in the central portion 43 of a sleeve 44 of insulating material. This sleeve 44 is secured by suitable means 46, located at the extreme ends thereof, to flanges 47 of a tubular magnetic spool 48 which surrounds the non-magnetic shaft 22 and is in turn surrounded by the primary and secondary windings 51 and 52 respectively, of the generating coil. It has been found that the electro-magnetic efficiency of the unit is increased by splitting the spool 48 longitudinally and inserting an insulating strip 50 in the gap thus provided, the strip 50 being preferably of rubber or other compressible material permitting expansion of the spool, should it become heated by reason of long continued operation of the magneto. A plurality of straight sections 53 of soft iron wire extend along the entire length of the cylindrical portion of the spool with the ends thereof abutting the opposite flanges of the spool with which they thus

cooperate to form the magnetized core of the induction coil 51—52. The magnetic circuit further includes a pair of rotating cup-shaped inductor elements 56 and 57 disposed adjacent the ends of the spool 48 and suitably keyed as indicated at 58 and 59, respectively, to the shaft 22, so as to rotate therewith in response to rotation of the member of the engine to which the shaft is geared in the usual manner, not indicated.

As shown, each of the inductor elements includes a plurality of (herein shown as two) extended portions or polar projections 61—61 and 63—63; the pole pieces 61 of the element 56 being in quadrantal relation with the pole pieces 63 of the element 57. As shown best in Fig. 2, a plurality of permanent magnets, herein shown as round bars 66, are provided in pairs at equally spaced angular intervals about the axis of core 53, these bars 66 being retained in position in corresponding openings provided in the members 29 and 30, as indicated in Fig. 1. From this arrangement it is apparent that each pair of bar magnets 66 is magnetically coupled to form in effect parts of a continuous magnetic path, the direction of which is such that upon rotation of the field elements 56 and 57 therewithin, there will be generated the desired current in the primary winding 51; the core 53—48 of which cooperates with the elements 56 and 57 in completing the magnetic circuit.

Mounted in the casing sections 11 and 12 is a rotary distributor spool 67 of suitable insulating material, the spool being retained in position upon extension 68 of the shaft 22 by the provision of a split ring 69 located in the circumferential groove 70 on the shaft adjacent the outer face of the spool, while the inner face abuts an extended hub 71 of an internally toothed annulus or ring gear 72, to which gear the distributor rotor 67 is locked for rotation therewith by any suitable means, such as the stud connection indicated at 73. A second stud 75 projects toward the distributor contact finger (to be described) and thus provides the usual safety spark gap. Relative rotation between the gear 72 and the shaft 68 is facilitated by the provision of sleeve bearing 76 disposed within the hub 71 of the gear 72 and surrounding the shaft 68, and having a flange 77 serving to hold the gear 72 against axial displacement.

Meshing with the teeth of the gear 72 are a number of planetary gears or pinions 79, one of which is shown in elevation in Fig. 1, and another in section, said pinions being preferably three in number and mounted on ball bearings 81 provided on studs 82 equally spaced about, a circle concentric with the axis of shaft 68, having heads 83 and 84 at opposite ends thereof for retaining the assemblies in position in the transversely disposed portion 21 of the section 12. A pinion 86 constitutes the sun gear of the planetary transmission and is keyed to the shaft 68, as indicated at 87, the sun gear 86 being of proper diameter to mesh with the pinions 79 and thus drive the gear 72 and the distributor spool 67 at the proper ratio as determined by the number of pole pieces 61, 63, and the number of cylinders in the engine with which the magneto is to be used, and also depending upon whether the drive to the shaft 26 is direct or through gearing.

A suitable distributor block 89 is mounted in proximity to spool 67 and is provided with a plurality of equally spaced openings adapted to receive a corresponding number of high tension spark plug cables 91 held in place therein by suitable screws 92, each of which also retains in place a strip 93 of conducting material disposed adjacent the path of rotation of the distributor finger 94, so that the strips 93 successively receive high tension current, as the current jumps from the finger 94 to the successive strips 93. As shown in Fig. 4, the cables 91 are all grouped to enter the casing through the single opening 96, while the cable 97 which connects the secondary winding 52 of the induction coil with the distributor finger 94, passes through a suitable opening 99 drilled obliquely in the transversely disposed wall 21 of the casing section 12 at a point intermediate two of the bar magnets 66, as indicated in Fig. 2. Between the opposite pair of bar magnets 66, an opening 101 is provided for entrance of the cable 102 leading from the primary winding 51 of the induction coil to the interrupter mechanism, to be described.

The connection between the cable 97 and finger 94 is preferably effected by the provision of a conducting ring 104 embedded in the distributor spool 67 and secured to the inner end of the finger 94. A spring pressed contact 108 is in constant engagement with the ring 104 as the distributor rotates, and the current thus passes from the cable through the spring 109 and contact 108 to the ring 104 and then to the finger 94 and across the gap to the cables 91 in proper sequence.

In the event that the magneto is to be associated with a booster magneto, the current may be fed thereto from the cable 97 by providing a conducting strip 111 preferably moulded in the distributor block 89 with one end engaging a conducting sleeve 112 contacting the members 108 and 109 and its other end projecting from the block in position to permit a spark to jump across to the projecting surface of a conducting ring 113 embedded in distributor spool 67 in a position substantially concentric with the ring 104, but insulated therefrom and adapted to be electrically engaged by one end of a finger 116, the outer end of which projects from the distributor rotor into position to permit a spark to jump across to the strips 93 in sequence, the fingers 116 and 94 being properly spaced to provide the proper timing interval between the sparks produced by one, and the corresponding sparks produced by the other. In Fig. 1, these fingers are shown out of their true relative positions in order to clarify the illustration.

In order to properly control the interruption of the current generated in the induction coil, there is provided a compact and simple structure mounted in the reduced portion 117 of the casing section 11. This interrupter structure as shown in Figs. 1 and 4, comprises a cam 118 secured to the tapered end 119 of the shaft extension 68 and held thereon by suitable means 120 herein shown in the form of a nut engaging the threaded end of the shaft. As shown, the cam has four cam portions adapted to engage an insulated piece 121 which in turn strikes the free end of a resilient contact strip 122, on which is mounted a contact stud 123 normally held in engagement with a similar stud 124, by virtue of the bias of the spring 122 to this position. The contact 124 is in turn mounted on a finger 127 depending from the terminal post 128 secured to an adjustable bracket 129 clamped to a plate 130 mounted on the sleeve 135, the angular position of which is adjustable relatively to casing section 117 by movement of link 140.

The contact 122 is suitably insulated from the binding post 128 and has electrical connections

with the lead 102 previously described, and with a clip 133 adapted to receive a lead 134 passing to the condenser 135 which is grounded to the casing as indicated best at 136 in Figs. 1 and 3. A cover 141 is removably held in place by the usual means 142, and completes the assembly and renders the entire casing protected against inductive interference with radio apparatus which may be employed on the craft on which the magneto is installed.

There is thus provided a unitary structure embodying a magneto and a distributor which is compact and symmetrical in construction and wherein the parts are readily accessible for adjustment or replacement. Since the magneto is constructed so as to be completely shielded, the same is adapted for use adjacent radio apparatus, without producing any objectionable effects. By reason of the mounting of the generating windings within the rotating portions of the magneto proper, and the arrangement of the magnetic field and permanent magnets as shown, an extremely efficient magnetic action is obtained in a unit of unusually small and symmetrical proportions.

Although but one embodiment of the invention has been shown and described, it is to be understood that this embodiment is not exclusive of modifications which can be employed, and which may utilize only some of the features of the present invention. Reference is therefore to be had to the appended claims for a definition of the scope of variations intended to be embraced herein.

What is claimed is:

1. In a magneto, a pair of spaced apart annular members one of which has a plurality of magnets integral therewith and extending toward but terminating short of the other, said magnets being angularly spaced and equidistant from the common axis of said annular members, a pair of inductor members having pole pieces equal in number and angular spacing to said magnets, a generating coil mounted within said pole pieces, said coil having a core the ends of which are disposed adjacent the confronting faces of said inductor members, and means extending through said coil for rotating said inductor members to produce a current flow through said coil by the flux reversals through the core resulting from the movement of said pole pieces in an annular path between said core and magnets.

2. In a magneto, a substantially cylindrical casing, a permanent field magnet mounted thereon, a generating coil mounted within said field magnet, said coil having a hollow cylindrical core, a shaft passing through said hollow core and having inductor members adapted to magnetically coact with the poles of the magnet to produce flux reversals through said core a plurality of times during each revolution of the rotor, a cam driven by said shaft and having a corresponding plurality of lobes, circuit breaking means for said coil mounted in said casing and having a cam follower adapted to be actuated by said cam, a distributor mounted between said cam and coil and in coaxial alignment therewith, and means for drivably connecting said shaft and distributor.

3. In a magneto, a substantially cylindrical casing, a permanent field magnet mounted thereon, a stationary generating coil mounted within said field magnet, a shaft passing through said coil and having inductor members adapted to induce an alternating current in said coil when rotated by said shaft, said alternations being effected a plurality of times during each revolution of the rotor, circuit breaking means for said coil mounted in said casing and adapted to be actuated by rotation of said shaft, a distributor between said circuit breaking means and coil and axially aligned with said coil, and means for drivably connecting said shaft and distributor.

4. In a magneto, a substantially cylindrical casing, a generating coil mounted within said casing, said coil having a hollow cylindrical core, a shaft passing through said hollow core and having inductor members adapted to magnetically coact with the poles of the magneto to produce flux reversals through said core, a plurality of times during each revolution of the rotor, a cam driven by said shaft and having a corresponding plurality of lobes, circuit breaking means for said coil mounted in said casing and having a cam follower adapted to be actuated by said cam, a distributor mounted between said cam and coil and in coaxial alignment therewith, and means for drivably connecting said shaft and distributor.

5. In a magneto, a substantially cylindrical casing, a generating coil mounted within said casing, a shaft passing through said coil and having inductor members adapted to induce an alternating current in said coil when rotated by said shaft, said alternations being effected a plurality of times during each revolution of the rotor, circuit breaking means for said coil mounted in said casing and adapted to be actuated by rotation of said shaft, a distributor between said circuit breaking means and coil and axially aligned with said coil, and means for drivably connecting said shaft and distributor.

6. In a magneto, a substantially cylindrical casing, a permanent field magnet mounted thereon, a generating coil mounted within said field magnet, said coil having a hollow cylindrical core, a shaft passing through said hollow core and having inductor members adapted to magnetically coact with the poles of the magnets to produce flux reversals through said core a plurality of times during each revolution of the rotor, a cam driven by said shaft and having a corresponding plurality of lobes, circuit breaking means for said coil mounted in said casing and having a cam follower adapted to be actuated by said cam, a pinion on said shaft intermediate said cam and inductor members, and a distributor mounted for rotation on but relatively to said shaft, and means for drivably connecting said pinion and distributor.

7. In a magneto, a substantially cylindrical casing, a permanent field magnet mounted thereon, a generating coil mounted within said field magnet, a shaft passing through said coil and having inductor members adapted to induce an alternating current in said coil when rotated by said shaft, said alternations being effected a plurality of times during each revolution of the rotor, circuit breaking means for said coil mounted in said casing and adapted to be actuated by rotation of said shaft, planetary gearing driven from said shaft, one gear of which is provided with a hub spaced from but concentric with said shaft, and a distributor secured on said hub.

8. In a magneto, a substantially cylindrical casing, a permanent field magnet mounted thereon, a generating coil mounted within said field magnet, a shaft passing through said coil and having inductor members adapted to induce an

alternating current in said coil when rotated by said shaft, said alternations being effected a plurality of times during each revolution of the rotor, circuit breaking means for said coil mounted in said casing and adapted to be actuated by rotation of said shaft, a gear on said shaft intermediate said circuit breaking means and coil, and a distributor connected to said gear for rotation therewith.

9. In a magneto, a substantially cylindrical casing having a transversely disposed wall dividing said casing into compartments, a generating coil mounted within one of said compartments, a distributor mounted within the other of said compartments, a shaft extending through both said compartments and having inductor members thereon adapted to induce an alternating current in said casing when rotated by said shaft, and means for drivably connecting said shaft and distributor including a gear secured on said shaft, another gear connected to said distributor, and intermediate planetary gears mounted on said transversely disposed wall.

10. In a magneto, a substantially cylindrical casing having a transversely disposed wall dividing said casing into compartments, a generating coil mounted within one of said compartments, a distributor mounted within the other of said compartments, a shaft extending through both said compartments and having inductor members thereon adapted to induce an alternating current in said casing when rotated by said shaft, and means for drivably connecting said shaft and distributor including a plurality of gears mounted in the transversely disposed wall of said casing and rotatable about axes angularly spaced but equally distant from said shaft.

11. In a magneto, a substantially cylindrical casing having a transversely disposed wall dividing said casing into compartments, a generating coil mounted within one of said compartments, a distributor mounted within the other of said compartments, a shaft extending through both said compartments and having inductor members thereon adapted to induce an alternating current in said casing when rotated by said shaft, and means for drivably connecting said shaft and distributor including a planetary gear train having a gear secured on said shaft, another connected to said distributor, and intermediate gears mounted on said transversely disposed wall, and current conducting means extending through said wall and electrically connecting said coil and distributor.

12. In a magneto, a substantially cylindrical casing having a transversely disposed wall dividing said casing into compartments, a generating coil mounted within one of said compartments, a distributor mounted within the other of said compartments, a shaft extending through both said compartments and having inductor members thereon adapted to induce an alternating current in said coil when rotated by said shaft, means for drivably connecting said shaft and distributor including a plurality of gears mounted in the transversely disposed wall of said casing and rotatable about axes angularly spaced but equally distant from said shaft, and current conducting means extending through said wall for electrically connecting said coil and distributor.

EDWARD B. NOWOSIELSKI.