Feb. 2, 1932. T. J. HARLEY 1,843,222

ROTOR FOR MAGNETOS

Filed Jan. 29, 1930

Fig. 1.

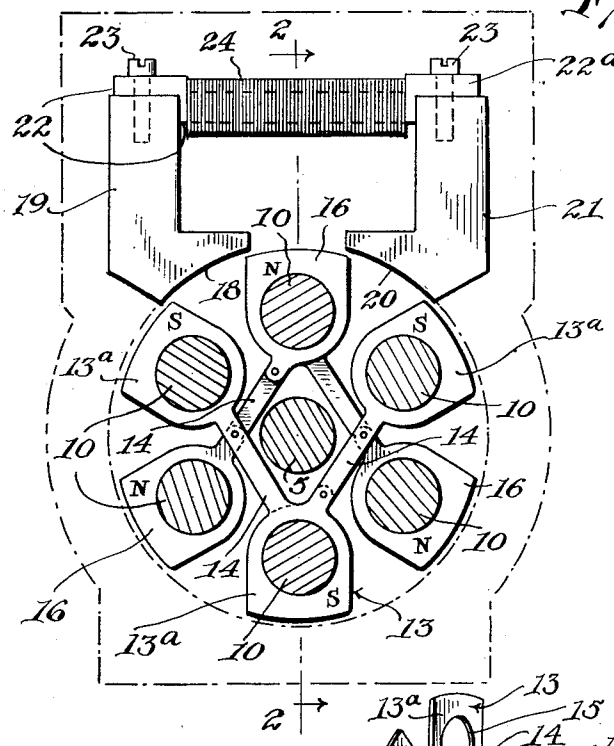


Fig. 3.

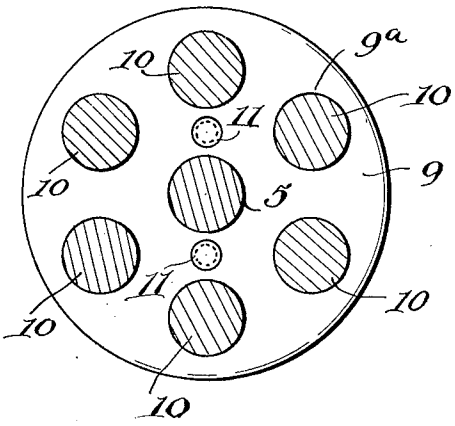


Fig. 4.

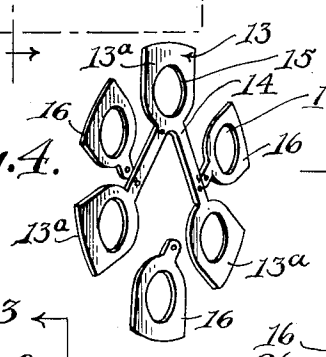


Fig. 2.

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UNITED STATES PATENT OFFICE

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ROTOR FOR MAGNETOS

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My invention relates to rotors for magnetos and particularly of the permanent magnet type which are adapted to cooperate with a fixed generating winding.

In magnetos of the prior art it has usually been the practice to employ a rotor having two or four poles. When magnetos of this type are used in connection with engines having a large number of cylinders it is necessary to run them at excessive speed in order to produce the necessary number of sparks per revolution. For example when using a two-pole rotor in conjunction with a twelve cylinder motor, it is necessary to run the magneto at three times cam-shaft speed.

It is impractical to do this because the parts of the rotor are subjected to very heavy strains causing them to be short-lived and to require frequent repairing or replacement. Such speeds also tend to cause a slight bending of the rotor shaft by centrifugal force so that it becomes necessary to increase the rotor air-gap in order to prevent the rotor from striking the stator. At high speeds the effects of slight unbalance in the rotors are also accentuated and tend to cause breakage of parts.

One of the objects of my invention is to produce a rotor which can generate any desired number of sparks per revolution, while running at engine cam-shaft speed.

Another object is to produce a construction capable of replacing the battery ignition of automobiles without material modification of the ignition system.

A further object is to produce a simple, efficient and durable magneto capable of generating a hot fat spark, even at low speeds.

Further objects of the invention will appear in the following description, when read in conjunction with the accompanying drawings, in which

Figure 1 is a sectional view, partly diagrammatic, taken on line 1—1 of Figure 2, of one form of rotor embodying my invention, the rotor being shown in connection with a conventional stator structure.

Figure 2 is a section on line 2—2 of Figure 1.

Figure 3 is a section on line 3—3 of Figure 2; and

Figure 4 is a detailed perspective view illustrating the arrangement of the rotor laminations.

Referring first to Figure 2 the reference character 5 designates a rotor shaft having fixedly secured to it, as by welding, an end plate 6 of non-magnetic material and a magnet supporting plate 7 which contains openings 7*a* for supporting the magnets. Spaced from plate 6 is a second end plate 8 of magnetic material having in close contact with it a magnet supporting plate 9 containing openings 9*a*. Plates 6 and 7 as well as plates 8 and 9 are secured together rigidly in any suitable manner such as riveting, the rivets being here designated by the reference character 11.

Connecting the two end plates 6 and 8 and mounted in the openings 7*a* and 9*a* in plates 7 and 9 respectively, are a series of cylindrical bar magnets 10 which, when in position form a cage-like construction closed at each end by the end plates 6 and 8. The magnets and end plates are here shown as being held in assembled relation by means of a nut 12 threaded on to the rotary shaft 5 and contacting with the outer face of end plate 8.

The active ends of magnets 10 are in contact with the plates 6 and 7 and it is for this reason that I make these plates of non-magnetic material in order to prevent the magnets from being short circuited. The opposite ends of these magnets contact with the magnetic plates 8 and 9 which act as keepers, so that magnetic flux passes from the north pole of one magnet to the south pole of the adjacent magnet and so on. An inspection of Figure 1 will indicate clearly that these magnets are arranged in the usual manner so that unlike poles are adjacent one another in each instance.

It is necessary to provide pole pieces for these magnets in order to concentrate and convey the flux to the generating winding of the stator with which this rotor is to be used. I preferably form these pole pieces in the shape of thin laminations of high permeability and low coercive force, and composed of soft iron,

silicon steel, or any other suitable material. These laminations are of two forms, each clearly shown in Figure 4. The laminations 13 are substantially V-shaped and consist of three branches 13*a* connected together by straight portions 14, and each having an aperture 15 adapted to receive the body of one of the magnets 10. As here shown the branches 13*a* are spaced from one another by an angle of 120 degrees so that when placed in position over the bar magnets 10 they embrace three magnet ends of the same polarity, as shown in Figure 1. The laminations 16, on the other hand, consist solely of parts similar to branches 13*a* and each having an opening 17 adapted to receive one of the bar magnets 10.

The manner of assembling the laminations to form the pole pieces is indicated in Figure 2. By reference to this figure it will be noted that the section of laminations designated A consists of a series of the laminations 16 which are threaded over all six of the magnet ends adjacent to the non-magnetic plate 7; this series of laminations preferably extending for approximately one fourth of an inch. The next series designated B consists of both laminations 13 and laminations 16, the laminations 13 embracing the north poles and laminations 16 embracing the south poles, the arrangement being made up as shown in Figure 4, but consisting of a number of layers capable of extending over a distance of about half an inch. The next section designated A′ consists of laminations 16 only, similar to section A, and these are placed on both the north and south poles. Following the section A′ is a fourth and last section designated C and made up of a series of laminations 13 embracing the south poles, and a series of laminations 16 embracing the north poles; this section likewise extending for approximately half an inch. The pole pieces then consist of two axially spaced sets of laminations, B and C, of different polarities.

After these sections are placed in position over the magnets they are secured there by the means of split rings 26 in grooves 25 in the outer surface of each of the magnets 10. These rings 26 may possess sufficient tension to securely fasten the laminations permanently in place and to prevent them from loosening when the rotor is driven at high speeds.

It will be understood that the construction herein shown and described relates specifically to a six pole rotor, the poles being spaced by 60 degree intervals. This construction is shown merely by way of example, since it will be obvious that a similar construction may be applied to rotors having different numbers of poles.

The sections B and C of rotor laminations make up six poles, the like poles being spaced by 120 degrees circumferentially and the unlike poles being spaced by 60 degrees circumferentially and the latter also by a substantial distance axially of the rotor. The pole pieces formed by these sections are adapted to cooperate with a stator construction employing two pole pieces and a fixed generating winding. As here shown, the stator comprises field members 19 and 21 having polar faces 18 and 20, respectively. These field members are preferably of laminated construction in order to reduce eddy current and hysteresis losses. Supported across and connecting the upper ends of field members 19 and 21, is a bridge 22 having arms 22*a* which contact with and are held across the field members in any suitable manner, as by screws 23. This bridge may be made up of fine wire strands of soft iron, or other suitable material. Wound around the bridge 22 is a generating coil 24 made up of a suitable number of turns of fine wire.

It will be obvious to those skilled in the art that with the parts constructed as shown, the rotation of the rotor will cause magnetic flux to pass from one pole piece of the rotor through one of the field members 19 and 21, magnetic bridge 22, and then return to a pole piece of opposite polarity through the other field member, so as to generate a current within the winding 24 in a manner well understood. The direction of this flux travel will be changed six times for each revolution of the rotor so as to produce six sparks per revolution. The rotor may be driven in any suitable manner and the generating winding 24 may be connected to any type of circuit desired.

It will now be evident that I have produced a simple and effective rotor construction which can be employed in a magneto used in place of the conventional distributor commonly employed in the battery ignition systems of automotive vehicles and aeroplanes. This structure is not only efficient and durable but it may be constructed simply and cheaply and parts can be readily replaced in case of breakage.

Although I have herein shown and described only one form of magneto rotor embodying my invention it will be obvious that various changes and modifications may be made in the details within the scope of the appended claims without departing from the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent is:

1. A magneto rotor comprising a cage made up of a plurality of spaced bar magnets, a pair of separate end plates supporting said magnets and abutting the ends thereof, one of said plates including magnetic connecting means for one end of said magnets, and sets of magnetic laminations connecting the like poles of said magnets at the other end.

2. A magneto rotor comprising a shaft carrying two spaced end plates each having

circumferentially spaced openings on their inner faces, six parallel bar magnets having their ends supported in said openings, the magnet ends contacting with each of said end plates being alternately of north and south polarity and one of said plates forming a magnetic flux path for said magnets, a set of stacked V-shaped laminations having portions embracing the like polar ends of three of said magnets, and another similar set embracing the ends of the remaining three magnets, said two sets of laminations being spaced from each other.

3. In a magneto rotor a plurality of bar magnets, a pair of end plates separate from the magnets for supporting said magnets in evenly spaced parallel relation, one of said supporting plates forming a magnetic path connecting the unlike poles of said magnets, and a plurality of spaced sets of magnetic laminations embracing the magnets, one set connecting the north poles only and the other set connecting the south poles only.

4. A megneto rotor comprising a plurality of bar magnets, means for supporting said magnets in parallel spaced relation to one another, with the magnets at each end having unlike poles in adjacent relation, each bar magnet provided with an annular groove intermediate its ends, a stack of laminations encircling each magnet, and a split ring seated in each of said annular grooves and locking said laminations in place.

5. A magneto rotor comprising two circular end plates, one of magnetic and the other of non-magnetic material, a magnet supporting plate mounted in contact with each of said end plates, said magnet supporting plates containing circumferentially spaced openings, a shaft connecting said end plates, a plurality of bar magnets mounted between said end plates with their ends in the openings in the magnet supporting plates, and means for clamping said end plates against the ends of said plates.

6. A magneto rotor comprising two circular end plates, one of magnetic and the other of non-magnetic material, a magnet supporting plate mounted in contact with each of said end plates, said magnet supporting plates containing circumferentially spaced openings, a shaft connecting said end plates, a plurality of bar magnets mounted between said end plates with their ends supported in the openings in said magnet supporting plates and abutting said end plates, means for securing the end plates against the ends of said magnets, and a laminated pole piece on each of said magnets adjacent one end thereof.

THOMAS J. HARLEY.