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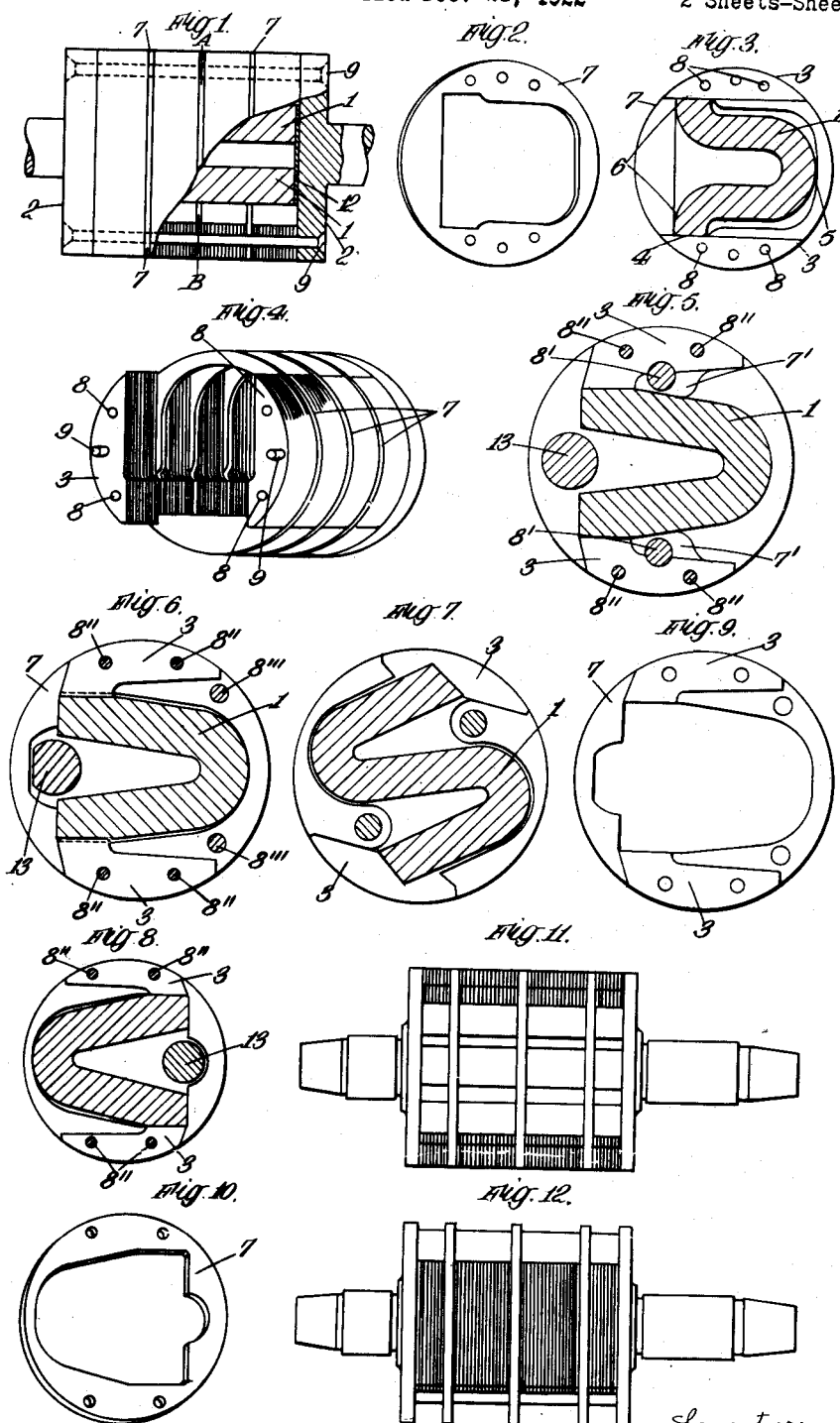
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IGNITION MAGNETO

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UNITED STATES PATENT OFFICE.

ERNEST O. TURNER AND EDWARD B. TUPPEN, OF BIRMINGHAM, ENGLAND, ASSIGNORS TO THE BRITISH LIGHTING AND IGNITION COMPANY, LIMITED, OF BIRMINGHAM, ENGLAND, A BRITISH COMPANY.

IGNITION MAGNETO.

Application filed December 21, 1922. Serial No. 608,180.

To all whom it may concern:

Be it known that we, ERNEST OWEN TURNER and EDWARD BROWNE TUPPEN, both subjects of the King of Great Britain, residing, respectively, at 35 Mayfield Road, Moseley, Birmingham, in the county of Warwick, England, and 96 Court Lane, Erdington, Birmingham, in the county of Warwick, England, have invented certain new and useful Improvements in or Relating to Ignition Magnetos, of which the following is a specification.

This invention relates to ignition magnetos for internal combustion engines, said magnetos being of the type in which a rotary magnet is employed in conjunction with a fixed armature, and has special reference to the mechanical construction of the magnet rotors for ignition magnetos of the type described in the specification of our co-pending patent application Serial No. 562725 filed 22nd May 1922 and in particular to rotors of the type in which solid magnets with pole shoes of laminated soft iron are employed.

According to the present invention a magnet rotor for ignition magnetos of the type referred to and having pole shoes of laminated construction is provided with one or more plates interleaved at suitable intervals with the iron laminations constituting the said pole shoes, the said interleaving plates being made of such material or constructed in such manner as to prevent passage of the flux in an undesirable direction. Preferably the interleaving plates are made of non-magnetic material such as brass or other non-magnetic substance, but if desired the said plates may be made of iron or steel in which latter case they are provided with slots or holes suitably disposed so as to avoid the contingency of any undue leakage between neighbouring portions of the magnet pole shoes or between two portions of the magnet between which there may be a difference of magneto-motive-force. By means of this construction the pole shoes may be rigidly fastened in position with but little or no reduction of their effective cross sectional area by the space usually occupied by rivets or like fastenings.

The magnet may if desired be made up of a number of magnets of correspondingly re-

duced axial length, a small space being left between each individual magnet for a non-magnetic partition, which in this case may be made stronger if required, as the portion of the area that otherwise would be taken up by the magnet is set free, and advantage of this may be taken by stiffening up the partition very considerably if it is so desired. The advantage of the use of the interleaving partitions in the manner described is that the pole shoes are thereby made much more rigid and less of their cross-sectional area need be taken up by rivets or screws.

While in the case of ignition magnets of the type that spark symmetrically twice per revolution the pole shoes are usually so designed that the pole shoe arcs subtend an angle in the neighbourhood of 90° at the point constituting the centre round which the said arcs are described, in the case of the present invention the pole shoes may be designed so that they subtend any desired angle, and in particular an angle substantially less than 90°, for example 75° and in this latter case the length of the pole arc of the stator shoes is increased by an amount dependent on the extent to which the aforesaid angle has been decreased from the normal angle of 90°. By means of this construction the magnetic leakage between the shoe tips and the neighbouring portions of the magnet can be considerably reduced.

The present invention is applicable to devices having various forms of magnet, either straight or curved in such shapes as those of an S or U, and in which the pole shoes, while comprising a number of portions to admit of interleaving with plates of non-magnetic material or with suitably constructed iron or steel plates as referred to above have the said portions either of solid or laminated construction.

In order that the invention may be clearly understood and readily carried into effect, the same will now be more fully described with reference to the accompanying drawings, in which:—

Figure 1 shows in elevation and part section a rotor with the pole shoes and interleaving plates.

Figure 2 shows in perspective one form of the non-magnetic discs or laminations.

Figure 3 is a section on the line A B of

Figure 1 at right angles to the axis of rotation.

Figure 4 is a perspective view of the laminated pole shoe extensions and the non-magnetic discs or laminations shown in Figure 2, the spindles and magnet being removed.

Figures 5, 6, 7 and 8 illustrate respectively various other cross sectional shapes for the rotary magnet with pole shoes and means of attaching the two rigidly together.

Figure 9 shows in elevation a pole shoe superimposed on a non-magnetic interleaving plate.

Figure 10 shows a separate interleaving plate of another type.

Figures 11 and 12 illustrate two elevations of complete magnet rotors with the spindles attached.

Figure 13 shows an interleaving plate made of magnetic material.

Figure 14 is a cross sectional view showing the same interleaving plate as in Figure 13 and in addition the magnet and pole shoes.

Figure 15 shows in elevation and part section a rotor with the pole shoes and interleaving plates but with the magnet made up of a number of individual magnets.

Figure 16 shows in perspective one of the partitions between the individual magnets shown in Figure 15 and

Figure 17 shows in perspective one of the non-magnetic interleaving plates inserted between the iron laminations of the magnet pole shoes.

Referring to Figures 1, 2, 3 and 4, the two pole faces of the permanent magnet 1 are arranged to fit closely against the corresponding pole shoes or extensions 3, 3, at the surfaces 4, 4, so that good magnetic contact is made. These faces also serve as a location for the magnet in a direction at right angles to the axis of rotation. Movement of the magnet in the plane of these faces and at right angles to the axis is prevented by contact which is made with the inside of the non-magnetic laminations 7 at the points 5 and 6. Movement of the magnet 1 in an axial direction is prevented by the spindle and flanges 2, 2. In order however to prevent the magnet being positively pressed between the flanges 2, 2, as it is better that all available pressure due to the rivets 9 which hold the end flanges 2, 2 should be concentrated on the iron laminations 3 and brass interleaving plates 7, a piece of material 12 which will yield slightly under pressure is interposed between the magnet 1 and the flange 2 at one or both ends.

In assembling the form of device under consideration, the pole shoes or extensions 3 and the non-magnetic laminations 7 are first assembled as shown in Figure 4; there may

of course be any desired number of laminations 3 and also of the laminations 7. The desired number of laminations 3 and 7 are assembled on the four rivets 8, tightly pressed together, and then the rivets riveted over. In order to ensure that the assembled unit is not distorted during the riveting operation a suitable jig may be provided. The number of rivets 8 may be increased or decreased as desired. In order to obtain the best possible contact at the surfaces 4, 4, a machining operation such as broaching may be employed before the magnet is inserted. This operation may also serve to true up the surfaces 5 and 6. The corresponding portions of the magnet are ground to the desired size, and the magnet 1 is then inserted together with some yielding material 12, the end flanges 2 then being placed in position. Rivets 9 are then inserted, and while pressure is exerted on the end flanges these rivets are riveted over. The result is a compact and substantially constructed unit, in which the shoes for the north and south poles of the magnet are held together in a kind of cage. The number of rivets 9 may be increased or decreased as desired, or in lieu thereof screws may be used. In this way the pole shoes or extensions are securely held in the desired position and in close contact with the pole faces of the magnet.

After the rotor is assembled, as shown in Figure 1, the usual finishing operations may be applied to the spindles and the external surface of the rotor to bring it to the desired diameter. The pole shoes or extensions 3 may be designed to give any desired angle between the tips, and, if greater accuracy is required than is obtained by the ordinary process of punching, the tips may be conveniently machined after the rotor has been assembled.

In the modification shown in Figure 5 the magnet 1 is shown in section, and the separate laminated pole shoes are shown at 3, 3, the intermediate non-magnetic plates being shown at 7'. The main rivets by which the structure is held together are shown at 8', these rivets occupying but little space of the pole shoes themselves, whilst additional light rivets 8'' are also added. A balance weight held in position by the flanges carrying the spindles at either end of the rotor is shown at 13.

In the alternative forms of construction illustrated by succeeding figures the interleaving plates are formed, similarly to the construction illustrated in Figures 1 to 4, as a kind of cage limiting the motion of the magnet and holding together the north and south pole shoes independently of the flanges at either end.

In the modification shown in Figure 7 the pole shoes 3 are formed with a wedge shaped

slot into which the ends of the S-shaped magnet fit, thus preventing sideways displacement of the magnet 1 without the necessity of specially shaping the interleaving plates for this purpose, and in addition permitting the mechanical balance of the device to be more readily attained, so that the addition of an extra pair of rivets or weights for balancing purposes is rendered unnecessary.

Figure 9 shows the interleaving partition 7 in end elevation with pole shoes 3, 3, in front, whilst in the modification shown in Figure 6 a balance weight 13 is inserted in the cage, and further rivets 8¹¹¹ are also added; these latter rivets 8¹¹¹ may be used or omitted as desired. Figure 8 shows a construction in which all rivets except very light ones 8¹¹ through the pole shoes themselves are dispensed with, the structure being made sufficiently rigid to enable this to be done. The completed magnet rotor embodying the construction referred to in connection with Figure 8 and employing a number of interleaving non-magnetic plates, one of which is illustrated in Figure 10, is shown in elevation in Figures 11 and 12, in the case of the latter however the rotor being turned through an angle of 90° from the position shown in Figure 11.

In the case when the interleaving plates are made of magnetic material as illustrated in Figures 13 and 14, the said plates 7 are made with suitably disposed holes 14, or slots 15 so as to provide an iron path of small cross section, the object of the holes or slots being to reduce the cross section of iron path providing a leakage path for magnetic flux, so that this path becomes readily saturated and undue leakage is hereby prevented from taking place between, for example, the north and south poles of the magnet (as on the left-hand side of Figure 14) or between the pole shoes 3 and the arch of the magnet (as on the right-hand side of Figure 14).

In the case of the rotor illustrated in Figure 15 a number of separate magnets 1' are used instead of the single permanent magnet 1, shown in Figure 1; between the separate magnets 1' there are interposed support plates 7'' made of nonmagnetic material (shown in perspective in Figure 16), whilst at suitable intervals between the iron laminations of the pole shoes there are inserted non-magnetic interleaving plates 7 (shown in perspective in Figure 17).

In all the various constructions of rotor in accordance with the present invention the magnet and other components may be so designed and located that the rotor when completely assembled is balanced about its axis of rotation regardless of the actual centre of gravity of the magnet. On the

other hand the magnet may be so designed or placed in relation to the other parts that its centre of gravity coincides with the centre of axis of rotation of the rotor.

What we claim and desire to secure by Letters Patent of the United States is:—

1. A magnet rotor for an ignition magneto, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, and interleaving plates inserted at suitable intervals between the said iron laminations.

2. A magnet rotor for an ignition magneto, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, and interleaving plates made of non-magnetic material inserted at suitable intervals between the said iron laminations.

3. A magnet rotor for an ignition magneto, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, interleaving plates inserted at suitable intervals between the said iron laminations, and fastening devices to secure the iron laminations and interleaving plates rigidly in position with a minimum reduction of the effective cross-sectional area of said pole shoes.

4. A magnet rotor for an ignition magneto, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, interleaving plates made of non-magnetic material inserted at suitable intervals between the said iron laminations, and fastening devices to secure the iron laminations and interleaving plates rigidly in position with a minimum reduction of the effective cross-sectional area of said pole shoes.

5. A magnet rotor for an ignition magneto, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, and interleaving plates inserted at suitable intervals between the said iron laminations, said interleaving plates each having a continuous periphery forming a bridge between the pole shoes and having a suitably shaped aperture to permit insertion of the magnet.

6. A magnet rotor for an ignition magneto, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, interleaving plates inserted at suitable intervals between the said iron laminations, the said interleaving plates each having a continuous periphery forming a bridge between the pole shoes

and having a suitably shaped aperture to permit insertion of the magnet, and fastening devices to secure the iron laminations and interleaving plates rigidly in position
5 with a minimum reduction of the effective cross-sectional area of said pole shoes.

7. A magnet rotor for an ignition magnet, said rotor comprising a rotary magnet, separate pole shoes for said magnet,
10 said pole shoes comprising a plurality of iron laminations, and interleaving plates inserted at suitable intervals between the said iron laminations, said interleaving plates each having a continuous periphery forming
15 a bridge between the pole shoes and having an aperture for the insertion of the magnet suitably shaped to prevent the occurrence of lateral movement between the magnet and the pole shoes.

20 8. A magnet rotor for an ignition magnet, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, and interleaving plates
25 made of non-magnetic material inserted at suitable intervals between the said iron laminations, said interleaving plates each having a continuous periphery forming a bridge between the pole shoes and having an aper-
30 ture for the insertion of the magnet suitably shaped to prevent the occurrence of lateral movement between the magnet and the pole shoes.

9. A magnet rotor for an ignition magnet, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, and interleaving plates inserted at suitable intervals between the said
40 iron laminations, said pole shoes having slots therein and said magnet having its ends shaped to fit into said slots in the pole shoes to prevent the occurrence of lateral movement between the magnet and the pole
45 shoes.

10. A magnet rotor for an ignition magnet, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, and interleaving plates made of non-magnetic material inserted at

suitable intervals between the said iron laminations, said pole shoes having wedged shaped slots therein and said magnet having its ends shaped to fit into said slots in the pole shoes to prevent the occurrence of lateral movement between the magnet and the pole shoes. 55

11. A magnet rotor for an ignition magnet, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, interleaving plates inserted at suitable intervals between the said iron laminations, and at least one balance weight to secure balance of the rotor about its axis of rotation. 60

12. A magnet rotor for an ignition magnet, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations, interleaving plates made of non-magnetic material inserted at suitable intervals between the said iron laminations, and at least one balance weight to secure balance of the rotor about its axis of rotation. 65

13. A magnet rotor for an ignition magnet, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations of segmental shape, the arcs of said segmental shaped pole shoes subtending an angle of substantially less than 90° at the point constituting the centre round which the said arcs are described, and interleaving plates inserted at suitable intervals between the said iron laminations. 70

14. A magnet rotor for an ignition magnet, said rotor comprising a rotary magnet, separate pole shoes for said magnet, said pole shoes comprising a plurality of iron laminations of segmental shape, the arcs of said segmental shaped pole shoes subtending an angle of substantially less than 90° at the point constituting the center round which the said arcs are described, and interleaving plates made of non-magnetic material inserted at suitable intervals between the said iron laminations. 75

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