June 8, 1926. 1,587,958

J. C. HUTTON ET AL

IGNITION MAGNETO

Filed Nov. 25, 1924

Fig. 1

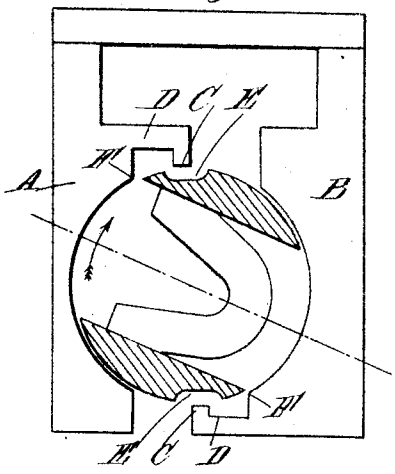


Fig. 2.

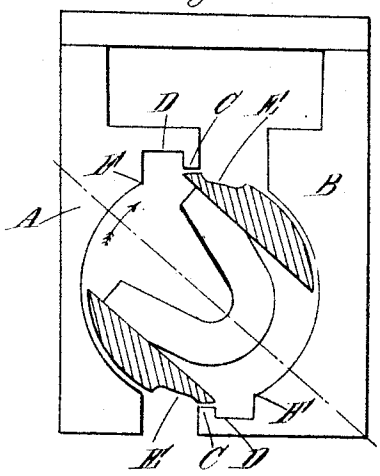


Fig. 3.

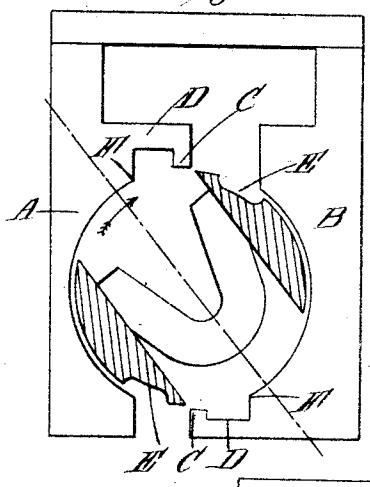


Fig. 4.

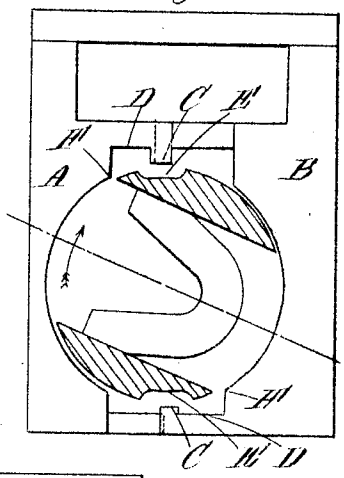
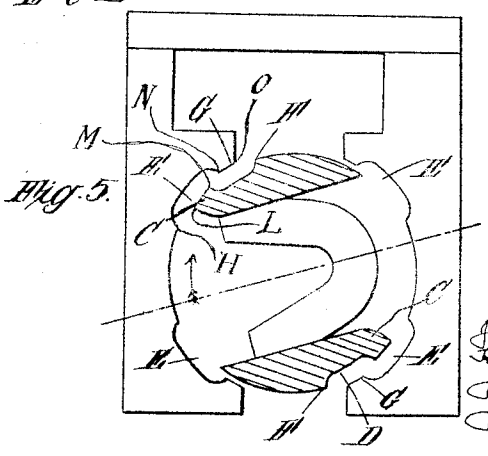


Fig. 5.



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UNITED STATES PATENT OFFICE.

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IGNITION MAGNETO.

Application filed November 25, 1924, Serial No. 752,151, and in Great Britain February 15, 1924.

This invention relates to ignition magnetos for internal combustion engines, said magnetos being of the type in which either the armature is fixed and there is employed in conjunction therewith either a rotary magnet or rotating inductors and stationary magnets, or the armature is rotatable and the magnets are stationary.

With magnetos as hereinbefore constructed their sparking characteristics at slow speeds are much worse in the retarded position of the timing than in the advanced position; this is due to the fact that at the moment when the contacts open the length of the air gap between the rotor and stator pole tips is much greater in the retarded position than in the advanced position, with the result that a large proportion of the flux has already reversed its direction in the coil core.

In order to improve the performance of magnetos for the retarded sparking position various means have been proposed, one of the most effective being a steel sleeve positioned between the stator and rotor shoes, said sleeve being arranged to rotate with the timing lever so as to maintain an air gap of unvarying size between the edges of the rotor and stator poles with either an advanced or retarded position of timing; this method however has the disadvantage that an extra air gap is introduced between the rotor and stator and moreover the construction of magnetos with this arrangement is expensive.

Another method that has been proposed is to provide the stator pole shoes with ordinary extended or over-hanging tips extending along either a portion or the whole length of the pole shoe; with this arrangement when the machine is working at low speeds the performance for the retarded sparking position is improved, but the performance in the advanced sparking position is made worse owing to the overlapping tips preventing a sudden complete reversal of the flux in the coil core when the contacts are opened.

A modification of this method which has been suggested is to provide extended tips which however were separated from the main stator pole shoes by a short air gap, but this construction though effective involves certain mechanical difficulties.

Lastly it has also been proposed to separate the ordinary extended tips from the main portions of the stator pole shoes by a narrow bridge of relatively high magnetic reluctance; this method while producing some improvement is not so effective as the last mentioned method, since on account of mechanical considerations the bridge cannot be made as small as is desirable to obtain the best electrical working of the magneto.

The magnetos to which alone the present invention has reference are of the type wherein the faces of the two stator pole shoes, as also the faces of the two rotor pole shoes, are symmetrical, and in which the fully advanced timing position of the rotor corresponds to the maximum sparking position and the fully retarded timing position of the rotor corresponds to the minimum sparking position, there being a gradual decline in the performance of the magneto between the maximum and minimum sparking positions, and the object of the present invention is to overcome the difficulties above mentioned with magnetos functioning in this manner and to improve the slow speed performance of the magneto when the sparking position is retarded without detrimentally affecting its performance when the timing is in the advance position so as to obtain such an improved performance in the retarded position that efficient working of the magneto can be obtained with a large angle of retard, whereby good sparking characteristics of the magneto can be secured with very slow engine speeds. For this purpose, according to the present invention each of the pole shoes of either the rotary member or the stationary member of an ignition magneto of the kind hereinbefore referred to is provided with an extension piece or tip connected therewith by a bridge member of low magnetic reluctance so that the said extension piece is separated from the main body of the pole shoe by a recess, whilst each of the corresponding pole shoes of the other member is formed with a recess or slot therein separating the main body of the pole shoe from the end or tiplike portion thereof, the total circumferential length (that is measured in the plane of rotation) of the extension piece and recess of each pole shoe of one member

being substantially equal to that of the tip and recess of each pole shoe of the corresponding member, and the arrangement being such that for the advanced timing position of the rotor the extension pieces of the pole shoes of one member lie opposite the recesses or slots of the pole shoes of the other member and are separated therefrom in a radial direction by a comparatively large air gap when the flux break occurs, there being two points of flux break on each side of the rotor in the said advanced timing position, whilst for the retarded timing position of the rotor there is only one point of flux break on each side of the rotor, the said flux break then taking place between the extension pieces of the pole shoes of one member and the opposite end portions or tips on the pole shoes of the other member. The extension pieces or tips therefore exercise the desired effect by bridging across the air gap between the stator and rotor pole shoes in the retarded timing position of the rotor, the said extension piece or tips automatically coming into operation as hereinafter described when the timing of the magneto is retarded. The arrangement according to the present invention has the advantages of lending itself to a robust mechanical construction while avoiding the use of any extra moving parts of the magneto beyond those ordinarily involved.

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

Figure 1 illustrates in end elevation one construction of magneto with extension pieces or tips attached to the stator pole shoes, while the rotor pole shoes are formed with slots, the rotor being shown in the fully advanced timing position.

Figure 2 is an illustration of the same magneto as in Figure 1, but with the rotor in a partly retarded timing position when the contact breaker points open.

Figure 3 also illustrates a similar magneto to that of Figure 1 but with the rotor in the fully retarded timing position when the contact breaker points open.

Figure 4 illustrates a modification of the devices shown in Figures 1, 2 and 3 in which extension pieces or tips extending less than half the length of the stator pole shoes are provided both at the bottom and top of each of the said pole shoes, and Figure 5 is an end elevation of another modification in which the extension pieces or tips are attached to the rotor pole shoes and the slots are provided in the stator pole shoes.

Referring to Figures 1 to 3, the stator pole shoes A and B are each provided on their leaving edges with an extension piece or tip C connected to the main tip of the pole shoe by a bridge member D of low magnetic reluctance, while the rotor pole shoes are formed with longitudinal slots E. The tips C may extend the whole length of the stator pole shoes, (measured in an axial direction) or they may be shorter than the said length; in the former case the slots E extend the full length of the rotor pole shoes (measured in an axial direction) while in the latter case it is preferred to make the slots slightly longer than the tips C in order to reduce leakage at the end of the tips. The slots E are of such width and so positioned that they lie under the main portion of the tips C when the rotor is in the correct position for the contact breaker points to open with the timing fully advanced, this position being shown in Figure 1, where it will be seen that there is a comparatively large air gap between the tips C and the rotor pole shoes in a radial direction, so that the tips C exercise practically no detrimental effect, the breaking edge being then between the tips on the rotor pole shoes and the stator pole shoes at F and also between the trailing edge of the main portion of the rotor pole shoe and the trailing edge of the stator extended tip at C. On partly retarding the timing, the rotor will have moved further round at the moment when the contacts open, as shown in Figure 2, so that the unslotted portions of the rotor now lie under the tips C, which latter have the effect of bridging across the air spaces at top and bottom between the main pole shoes of the stator and the rotor pole shoes.

Figure 3 shows the position of the same rotor when the contacts open with the timing fully retarded, the flux break taking place in this position between the ends of the tips C and the ends of the unslotted edges of the rotor pole shoes, the effect of the tips being again to bridge across the air space and so to reduce its reluctance.

In the modification shown in Figure 4 both the top and bottom of each stator pole shoe are provided with extension pieces or tips C, these being constructed of less than half the length (measured in an axial direction) of the main stator pole shoes and being staggered so that the tips attached to opposite poles do not lie too close to one another. This construction allows the body of the magneto to be used both for clockwise and counter-clockwise machines.

Lastly in the construction shown in Figure 5 the extension pieces or tips C are attached to the rotor pole shoes by the bridges D and the slots E are then formed in the requisite positions in the stator pole shoes, instead of in the rotor pole shoes as in the case of the arrangements previously described. With this construction when the

rotor is in the advanced timing position the break takes place between the stator and rotor pole shoes at F and also between the trailing tip of the rotor at C and the edge of the stator shoe at H, the rotor tips C being separated from the stator pole shoes in a radial direction by a comparatively large air gap, this being the position illustrated in Figure 5. As the timing is retarded the air gap between the rotor tips C and the stator pole shoes is reduced, until finally the break occurs between the edges G of the stator pole shoes and the rotor tips C. By forming each of the stator pole shoes with two slots therein as illustrated, one above the horizontal axis of the rotor and one below the said axis, the same body may be used for both clockwise and counter-clockwise machines.

It is preferred to construct the rotor pole shoes so that the dimension measured from the axis of the rotor to the extended trailing tip C of the rotor pole shoe is less than the dimension to the main body of the rotor pole shoe at F so as to avoid any risk of a maximum sparking position occurring when the rotor is in the mid-position as indicated in Figure 2.

The machines illustrated in the drawings are of the rotary magnet and stationary armature type, but it is to be understood that the invention may be applied to any type of magneto which is provided with variable ignition. Devices constructed in accordance with the present invention are of special applicability where it is desired to provide a large range for the ignition timing and give a greatly improved performance in the retarded timing position without any detrimental effects to the sparking characteristics in the advanced timing position being experienced.

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

1. An ignition magneto of the type hereinbefore referred to comprising a rotary member and a stationary member, each of the pole shoes of one of the aforesaid members being provided with an extension piece or tip connected therewith by a bridge member of low magnetic reluctance so that the said extension piece is separated from the main body of the pole shoe by a recess, and each of the corresponding pole shoes of the other member having a recess or slot therein separating the main body of the pole shoe from the end of the tip-like portion thereof, the total circumferential length (measured in the plane of rotation) of the extension piece and recess of each pole shoe of one member being substantially equal to that of the recess and tip of each pole shoe of the corresponding member, and the extension piece and recess of each pole shoe of one member being so located with regard to the recess and tip of each pole shoe of the corresponding member that for the advanced timing position of the rotor the extension pieces of the pole shoes of one member lie opposite the recesses or slots of the pole shoes of the other member and are separated therefrom in a radial direction by a comparatively large air gap when the flux break occurs, there being two points of flux break on each side of the rotor in the said advanced timing position, whilst for the retarded timing position of the rotor there is only one point of flux break on each side of the rotor, the said flux break then taking place between the extension pieces of the pole shoes of one member and the opposite end portions or tips of the pole shoes of the other member.

2. An ignition magneto as claimed in claim 1, in which the distance from the axis of rotation of the rotor to the face of the trailing tip on each rotor pole shoe is appreciably less than the distance from the said axis to the face of the main body of the said pole shoes.

3. An ignition magneto as claimed in claim 1, in which each stator pole shoe is provided on its leaving edge with an extension piece or tip connected to the main body of the pole shoe in question by a bridge member of low magnetic reluctance, said extension piece or tip being of shorter length (measured in an axial direction) than that of the stator pole shoes, and each rotor pole shoe is formed with a recess or slot therein, said recess or slot being slightly longer than the said tips so as to reduce leakage at the end of the tips.

4. An ignition magneto as claimed in claim 1, in which the rotor pole shoes are formed with recesses or slots therein and the stator pole shoes are provided both at the top and bottom thereof with extension pieces or tips, the said tips being less than half the axial length of the main stator pole shoes and staggered with regard to one another for the purpose specified.

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