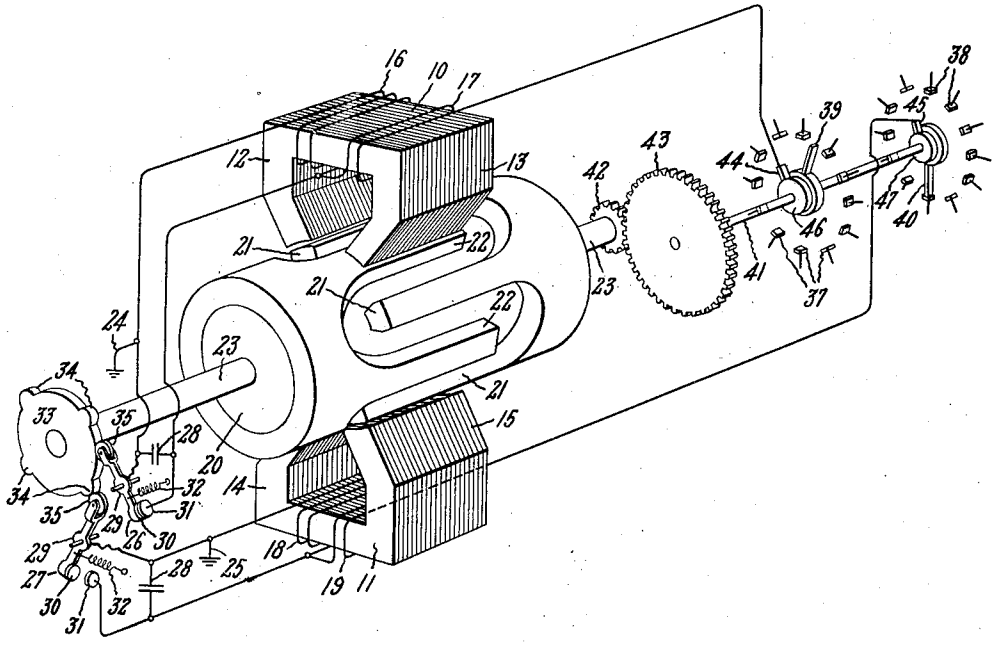
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DYNAMO-ELECTRIC MACHINE

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DYNAMO-ELECTRIC MACHINE

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Our invention relates to dynamo-electric machines.

In constructing dynamo-electric machines, such as magnetos adapted to be utilized for the generation of a voltage for ignition purposes in internal combustion engines having a large number of cylinders, difficulty is encountered in obtaining the proper functioning of ordinary contact breakers if a single set of coils is used, and magnetic and electrical interference occurs between different sets of coils when more than one set of coils is used.

An object of our invention is to provide an improved dynamo-electric machine adapted to be used for ignition purposes in high speed multi-cylinder internal combustion engines, constructed to provide improved contact breaker operation and to eliminate magnetic and electrical interference between different sets of coils.

We accomplish this by providing a stator having magnetically and electrically independent sets of primary and secondary coils, each associated with a pair of pole-pieces mechanically spaced 180° of arc apart from the pole-pieces associated with the other set of coils, and controlled by separate contact breakers operating alternately. The contact breakers preferably are actuated by separate pivoted levers, which are operated alternately by a single cam having projecting cam surfaces angularly displaced from each other to produce the desired timing of the machines. The rotor consists of a magnet or magnets providing two or more pairs of pole-pieces of opposite polarity, circumferentially spaced, so that one of the pairs of rotatable pole-pieces cooperates magnetically with one of the pairs of stationary pole-pieces, at the same time that a diametrically opposite pair of rotatable pole-pieces cooperates magnetically with the other pairs of stationary pole-pieces. Each secondary coil preferably is connected to a separate distributor arm. These arms are driven at the same speed and in a predetermined speed relation to the speed of the magneto.

Our invention will be more fully set forth in the following description referring to the accompanying drawing, and the features of novelty which characterize our invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

For a better understanding of our invention, reference is made to the accompanying drawing wherein the single figure is a diagrammatic illustration of a magneto electric machine embodying our invention.

Referring to the drawing, we have shown our invention as applied to a magneto electric machine adapted to be used in the ignition system of a twenty-four cylinder engine of the four-cycle type. The stationary magnetic circuit comprises two U-shaped cores 10 and 11 having pairs of pole-pieces 12 and 13, and 14 and 15, respectively, spaced 180° apart and magnetically independent of each other, which may be supported in any suitable manner to provide this arrangement, as in a non-magnetic frame. The electrical circuit of the magneto comprises two sets of primary and secondary coils 16 and 17, and 18 and 19. One set of these coils is mounted on each of the pairs of stationary U-shaped cores. In this manner, each set of coils is electrically and magnetically independent of the other set and interference therebetween is effectively prevented.

A voltage is induced in the primary coils 16 and 18 by a rotating member comprising a permanent magnet having an axially extending permanent magnet core 20 and polar projections 21 and 22 extending axially back over the core 20 from both ends. All of the polar projections 21 are permanent magnets of one polarity, and all of the polar projections 22 are permanent magnets of another polarity and they are arranged in alternate intermeshing circumferentially spaced relation and provide pairs of rotatable poles of alternate magnetic polarity. These rotatable permanent magnet pole-pieces 21 and 22 are arranged, so that one pair of rotating poles cooperates magnetically with the pair of stationary pole-pieces 12 and 13 simultaneously when a diametrically opposite pair of rotating poles cooperates magnetically with the other pair of stationary pole-pieces 14 and 15. This rotatable magnetic structure is mounted on a shaft 23, which may be driven in any desired manner in a predetermined speed relation to the speed of the engine.

The primary coils 16 and 18 and the secondary coils 17 and 19 are connected, respectively, to ground at 24 and 25 through contact breakers 26 and 27 with condensers 28 connected across the breakers 26 and 27. The contact breakers 26 and 27 are provided with pivoted levers 29 on which are mounted contact points 30 which cooperate with stationary contacts 31. These contact breakers are normally biased into closed position by springs 32. A cam 33 is mounted on the magneto shaft 23 and is provided with four projecting cam surfaces 34 arranged to actuate the contact breakers 26 and 27 through

the rollers 35, so as to interrupt the electrical circuit of the primary coils 16 and 18 when the corresponding distributor arm is adjacent a stationary contact.

The voltage impulses produced by the interruption of the primary circuit are distributed to the engine ignition system by a distributor provided with two sets of twelve contacts 37 and 38 to which the voltage impulses are transmitted by contact arms 39 and 40, respectively. These distributor contact arms are insulated from each other and are mounted on a shaft 41 so that they are driven both at the same speed. With such an arrangement, it is necessary that the distributor arms rotate in a predetermined speed relation to the speed of the magneto and this is readily obtained by driving the shaft 41 through gears 42 and 43 from the magneto shaft 23. In the construction illustrated the shaft 41 is driven one-third of the speed of the magneto shaft 23. Brushes 44 and 45, respectively, connected to the secondary coils 17 and 19 transmit the voltage impulses to insulated slip rings 46 and 47, which are electrically connected to the contact arms 39 and 40.

In the operation of the magneto, the contact breaker 27 interrupts the electrical circuit of the primary coil 18 and produces a voltage impulse in the secondary coil 19 which is transmitted to the distributor arm 40, as illustrated in the drawing. At the same time that the voltage impulse is induced in the secondary coil 19 by the interruption of the current flowing in the electrical circuit of the primary coil 18, due to a voltage induced therein by the rotation of a pair of pole-pieces 21 and 22 across the pole faces of the poles 14 and 15, a pair of pole-pieces 21 and 22 also rotates past the faces of the pole-pieces 12 and 13 but, since the contact breaker 26 is not at that time actuated, no voltage impulse is induced in the secondary coil 17. As the rotating magnet moves through 45° from the position shown, the contact breaker 26 breaks the electrical circuit of the primary coil 16 and induces a voltage impulse in the secondary coil 17. During this operation, a pair of poles 21 and 22 rotates past the pole faces of the stationary pole-pieces 14 and 15 but, since the contact breaker 27 is at that time closed, no voltage impulse is induced in the secondary coil 19. Thus, the voltage impulses are induced alternatively in one secondary coil and then the other upon successive displacement of 45° of the rotatable member and, consequently, eight impulses are produced from the two coils for one revolution of the rotatable member of the magneto.

The distributor brush arms 39 and 40 are displaced so that, as the impulse is induced in the secondary coil 17, the brush arm 39 makes contact with one of the segments 37 and when the rotating magnet of the magneto has moved through 45°, the shaft 41 is moved through 15°, thus bringing the distributor brush arm 40 in contact with one of the distributor segments 38. In this manner, 24 impulses are distributed to the engine with the magneto running at one and one-half times engine speed, and the distributor at half engine speed; that is, at one-third magneto speed. With this type of construction, as many as sixty-four thousand impulses per minute have been produced.

While we have illustrated and described one embodiment of our invention, modifications thereof will occur to those skilled in the art. We desire it to be understood, therefore, that our invention is not to be limited to the particular arrangement disclosed and we intend in the appended claims to cover all modifications which do not depart from the spirit and scope of our invention.

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

1. A dynamo-electric machine including a stationary member having pairs of pole-pieces, a primary coil and a secondary coil associated with one of said pairs of stationary pole-pieces, a second primary coil and a second secondary coil electrically and magnetically independent of said first mentioned primary and secondary coils associated with another of said stationary pole-pieces, a rotatable member comprising a permanent magnet having an axially extending core and polar projections extending axially back over said core from both ends thereof in alternate intermeshing circumferentially spaced arrangement providing pairs of rotatable poles of alternate polarity arranged to cooperate magnetically with said stationary pole-pieces, a contact breaker in circuit with said first mentioned primary coil, a second contact breaker in circuit with said second primary coil, and means for alternately actuating said contact breakers as successive pairs of said rotatable polar projections cooperate magnetically with said stationary pole-pieces.

2. A dynamo-electric machine including a stationary member having pairs of pole-pieces, a primary coil and a secondary coil associated with one of said pairs of stationary pole-pieces, a second primary coil and a second secondary coil electrically and magnetically independent of said first mentioned primary and secondary coils associated with another of said stationary pole-pieces, a rotatable member comprising a permanent magnet having an axially extending core and pairs of axially extending circumferentially spaced polar projections of alternate polarity arranged to cooperate magnetically with said stationary pole-pieces, a contact breaker in circuit with said first mentioned primary coil, a second contact breaker in circuit with said second primary coil, and means for alternately actuating said contact breakers as successive pairs of said rotatable polar projections are in position to cooperate magnetically with said stationary pole-pieces.

3. A dynamo-electric machine including a stationary member having two pairs of pole-pieces, said pole-pieces being spaced 180° apart, a primary coil and a secondary coil associated with one of said pairs of stationary pole-pieces, a second primary coil and a second secondary coil electrically and magnetically independent of said first mentioned primary and secondary coils associated with the other of said pairs of stationary pole-pieces, a rotatable member comprising a permanent magnet having an axially extending core and pairs of circumferentially spaced polar projections of alternate polarity extending axially about said core and arranged to cooperate with said stationary pole-pieces, means including a contact breaker for controlling said first mentioned primary coil, means including a second contact breaker for controlling said second primary coil, and means including a cam for alternately actuating said contact breakers as successive pairs of said rotatable polar projections cooperate magnetically with said stationary pole-pieces.

4. A dynamo-electric machine including a sta-

tionary member having pairs of pole-pieces, a primary coil and a secondary coil associated with one of said pairs of stationary pole-pieces, a second primary coil and a second secondary coil electrically and magnetically independent of said first mentioned primary and secondary coils associated with another of said pairs of stationary pole-pieces, a rotatable member comprising a permanent magnet having an axially extending core and circumferentially spaced polar projections extending axially about said core from both ends thereof arranged alternately to provide pairs of rotatable poles of alternate polarity, said pairs of rotatable poles being arranged so that one of said pairs of rotatable poles cooperates magnetically with one of said pairs of stationary pole-pieces simultaneously when a diametrically opposite pair of rotatable poles cooperates magnetically with the other pair of said stationary pole-pieces, means including a contact breaker for controlling said first mentioned primary coil, means including a second contact breaker for controlling said second primary coil, means including a cam for alternately actuating said contact breakers as successive pairs of said rotatable pole-pieces cooperate magnetically with said stationary pole-pieces, a distributor having two sets of contacts and two contact arms, one of said contact arms being associated with one of said sets of contacts, the other of said contact arms being associated with the other of said sets of contacts, means for electrically connecting said first mentioned contact arm to said first mentioned secondary coil, and means for electrically connecting said second mentioned contact arm to said second secondary coil.

5. A dynamo-electric machine including a stationary member having two pairs of pole-pieces, said pole-pieces being spaced 180° apart, a primary coil and a secondary coil associated with one of said pairs of stationary pole-pieces, a second primary coil and a second secondary coil electrically and magnetically independent of said first mentioned primary and secondary coils associated with the other of said pairs of stationary pole-pieces, a rotatable member comprising a permanent magnet having an axially extending core and polar projections extending axially back over said core from both ends thereof in alternate intermeshing circumferentially spaced arrangement providing pairs of rotatable poles of alternate polarity, said polar projections being arranged so that one of said pairs of rotatable poles cooperates magnetically with one of said pairs of stationary pole-pieces simultaneously when a diametrically opposite pair of rotatable poles cooperates magnetically with the other pair of said stationary pole-pieces, means including a contact breaker for controlling said first mentioned primary coil, means including a second contact breaker for controlling said second primary coil, means including a cam for alternately actuating said contact breakers as successive pairs of said rotatable poles cooperate magnetically with said stationary pole-pieces, a distributor having two sets of contacts and two contact arms, one of said contact arms being arranged to contact one of said sets of contacts, the other of said contact arms being arranged to contact the other of said sets of contacts, means for electrically connecting said first mentioned contact arm to said first mentioned secondary coil, means for electrically connecting said second mentioned contact arm to said second secondary coil, and means for driving said distributor arms at the same speed and in a predetermined speed relation to the speed of said magneto rotatable member.

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