Dec. 15, 1942. A. C. WALL 2,304,866

MAGNETO

Filed Dec. 30, 1939

Fig. 1.

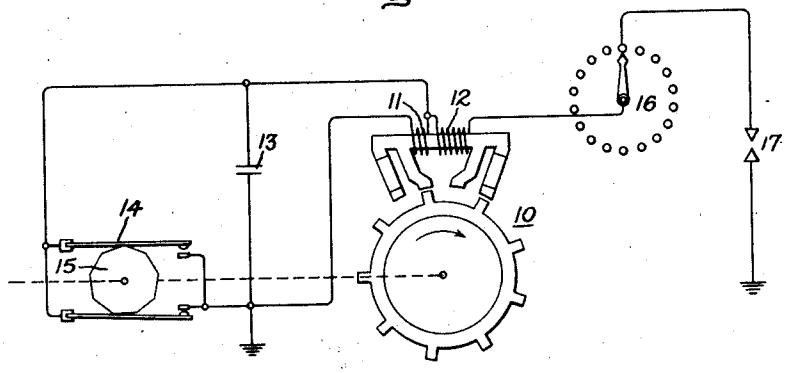
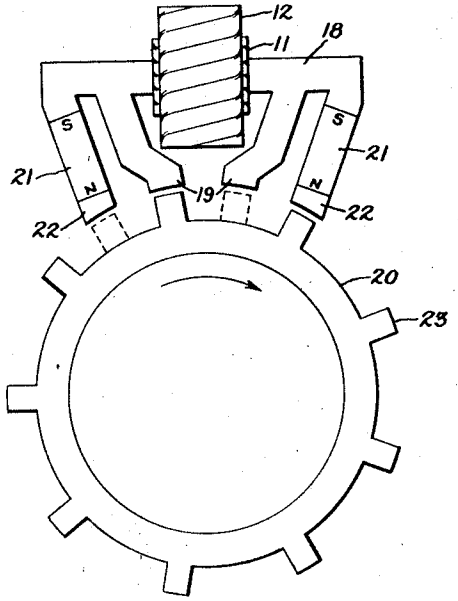


Fig. 2.



Inventor:
Alexander C. Wall,
by Harry C. Dunham
His Attorney.

Patented Dec. 15, 1942

2,304,866

UNITED STATES PATENT OFFICE

2,304,866

MAGNETO

Alexander C. Wall, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

Application December 30, 1939, Serial No. 311,797

4 Claims. (Cl. 171—209)

My invention relates to an electric ignition system for internal combustion engines, and more particularly to magnetos of the inductor type.

Heretofore magnetos of the above mentioned type have been operated with permanent magnets and generating coils on the stationary member thereof and with a rotatable member so arranged as to produce the build up of flux first in one and then in the opposite direction through generating coils. In magnetos of this type which have used this flux reversal in the generating coils, the permanent magnet which is not producing the useful flux at the particular moment is so arranged as to be short circuited by the rotatable member. In accordance with my invention, however, the idle permanent magnet is open circuited.

Further objects and advantages of my invention will become apparent from the following description referring to the accompanying drawing, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

In the drawing Fig. 1 diagrammatically illustrates a conventional ignition circuit provided with my improved magneto, and Fig. 2 illustrates the magneto shown in Fig. 1.

Referring to the drawing, in Fig. 1 I have illustrated an ignition system for an internal combustion engine including a magneto 10 with a coil member having a primary winding 11 and a secondary winding 12. The primary winding 11 has in circuit with it a conventional capacitor 13 and a conventional breaker 14 which periodically interrupts the primary winding circuit. This breaker 14 is actuated by a cam member 15 which may in turn be rotated by the camshaft directly, or by the crankshaft through suitable gears. I have shown two breakers which are operated by the same cam and they are so constructed that the primary winding circuit is broken each time the current in the primary winding reaches its maximum value. Of course, only one, or any number of breakers may be used to effect this operation. The secondary winding 12 is in circuit with a conventional distributor 16. This distributor includes a rotating electrode and a series of stationary contacts each of which is connected to a spark plug 17. Only one such connection is shown in Fig. 1.

As more completely shown in Fig. 2 my improved magneto includes a core member 18 which is magnetically associated with the coil member. The core member also has a plurality of pole pieces 19 which cooperate with a rotatable member 20. Magnetically connected with the core member 18 I also provide permanent field magnets 21 which are relatively short and have high coercive force. Any suitable magnet material may be used, and I have found that the iron-aluminum-nickel alloy described in U. S. Patent No. 1,947,274, Ruder, to be particularly efficient. The permanent magnets may also have on an end thereof pole faces 22 which also cooperate with the rotatable member. The pole faces 22 and the pole pieces 19 are so constructed and arranged that they lie on the arc of a circle. The rotatable member 20 has a plurality of teeth 23, the peripheral faces of which being of slightly less width than the pole faces 22 so as to give a more rapid change of flux and so as to maintain a higher voltage at lower speeds. In the illustrated embodiment of my invention nine such teeth are provided. However, it is to be understood that any suitable number of teeth may be provided on the rotatable member depending on the number of cylinders in the internal combustion engine. The illustrated magneto, therefore, has application with an 18 cylinder internal combustion engine, since 18 sparks will be produced for every complete rotation of the rotatable member. This is effected by providing the distance between similar portions of each of the pole pieces substantially equal to one-half the tooth pitch of the rotatable member. The distance between a pole piece and the adjacent permanent magnet pole face is substantially equal to the distance between the two pole pieces. With the rotatable member shown in the position as shown in Fig. 2, flux will pass from the north pole of the right hand permanent magnet into the adjacent tooth on the rotor and then into the next tooth which lies opposite the left hand pole piece. The flux will then pass to the core member and link the coil member and then pass to the south pole of the permanent magnet. When the rotatable member has moved a distance equal to one-half its tooth pitch, the rotor will assume the position shown in the dotted lines in Fig. 2, and flux will now pass from the north pole of the left hand permanent magnet into the rotor and then into the right hand pole piece. The flux will then pass to the core member and will link the coil member in the opposite direction from the flux linkage caused by the completion of the first magnetic path described above. The flux will then pass to the south pole of the left hand magnet. In the construction illustrated the north pole of each magnet is adjacent the rotatable member, but it is obvious

that the south pole of each magnet may be placed adjacent the rotatable member. It is only necessary that each magnet have like poles pointing toward and away from the rotatable member. It may be seen then that as the magnetic path of each magnet is completed, the magnetic path of the other magnet is open circuited. In constructions used in the past which make use of the inductor type magneto with stationary permanent magnets, the magnetic path for each magnet is always completed when each ignition spark is desired. This was accomplished by either using all the magnets to produce each ignition spark, or by using only one magnet and providing a separate short circuiting path for the other magnet. It was thought necessary to short circuit a magnet which is not in use. I have found, however, that it is not necessary to short circuit the magnet which is not at the moment being used to produce the ignition spark. In order to produce the short circuiting magnetic path in the magnetos heretofore used it was necessary to use large pole faces attached to the ends of the magnets. With my improved magnet arrangement such large pole faces are dispensed with, and in addition the iron necessary on the rotatable element to produce this short circuiting is dispensed with. Therefore, if the short circuiting of the idle magnet were caused by the same rotor tooth that carried the useful flux, it will be seen, that with my improved arrangement, the flux which a single rotor tooth adjacent a pole piece must carry is substantially reduced to one-half, thus allowing a decrease in iron of the tooth to one-half. This results in a substantial saving in weight and space which is desirable and particularly important when the magneto is to be used on aircraft.

Modifications of the particular arrangements which I have disclosed embodying my invention will occur to those skilled in the art, so that I do not desire my invention to be limited to the particular arrangements set forth and I intend in the appended claims to cover all modifications which do not depart from the spirit and scope of my invention.

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

1. An ignition system for an internal combustion engine including a magneto having a coil member, a plurality of permanent magnets, a core member, said magnets having ends connected to said core member to form magnetic paths between said coil member and said magnets, and means including a rotatable member for completing in succession the magnetic path of only one of said magnets at a time through said coil core member and said rotatable member.

2. An ignition system for an internal combustion engine including a magneto having a coil member, a plurality of permanent magnets, a core member, said magnets having ends connected to said core member to form magnetic paths between said coil member and said magnets, a plurality of pole pieces magnetically associated with said core member, and means including a rotatable member arranged to rotate for completing in succession the magnetic path of only one of said magnets at a time by said rotatable member.

3. An ignition system for an internal combustion engine including a magneto having a coil member, a plurality of permanent magnets, a core member, said magnets having ends connected to said core member to form magnetic paths between said coil member and said magnets, a plurality of pole pieces magnetically associated with said core member, and means including a rotatable member arranged to rotate for completing in succession the magnetic path of only one of said magnets at a time by said rotatable member, said magnets being so arranged that the completion of one of said magnetic paths produces a flux in said core member opposite to the flux produced by the path immediately before completed.

4. A magneto including a rotatable inductor having a plurality of teeth, a coil member, a plurality of permanent magnets having high coercive force, a core member threading said coil member, said magnets having ends of like polarity connected to said core member so as to form magnetic paths between said coil member and said magnets and ends of like polarity arranged in the arc of a circle so as to cooperate with said teeth of said rotatable inductor, and a plurality of pole pieces extending from said core member and arranged in the arc of a circle so as to cooperate with said teeth of said rotatable inductor, one of said magnets and one of said pole pieces extending from said core member adjacent each of the opposite sides of said coil member, means including the arrangement of said teeth on said rotatable member relative to said magnets and said pole pieces for completing in succession the magnetic path of only one of said magnets at a time.

ALEXANDER C. WALL.