Aug. 14, 1923. 1,465,081

F. HOLDEN

ELECTRIC MACHINE

Filed June 24, 1920

FIG. 1.

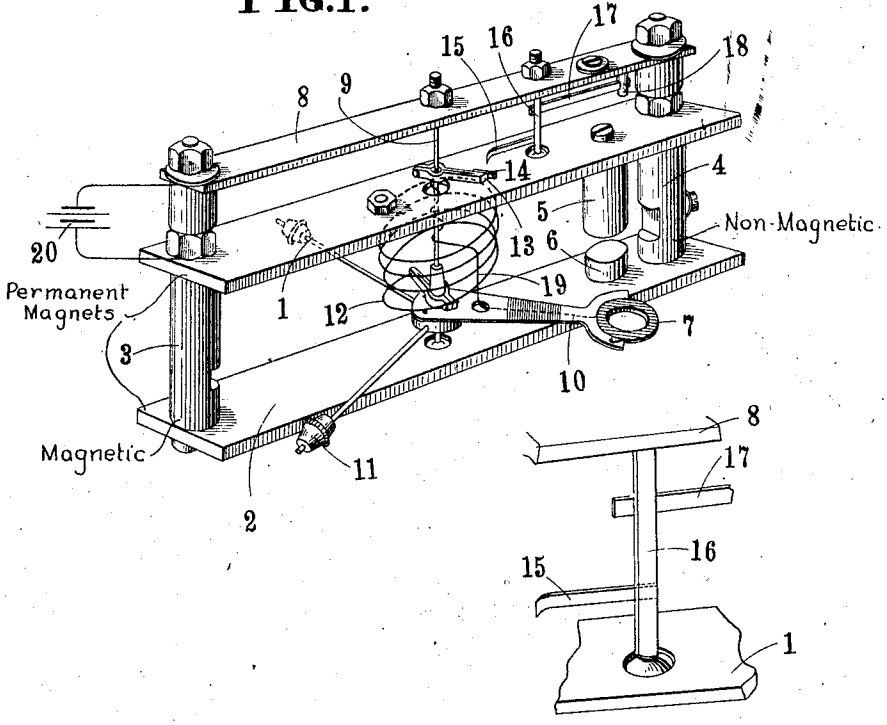


FIG. 2.

Frank Holden.
INVENTOR:
by Edward Williams
His Attorney.

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UNITED STATES PATENT OFFICE.

FRANK HOLDEN, OF LONDON, ENGLAND.

ELECTRIC MACHINE.

Application filed June 24, 1920. Serial No. 391,472.

To all whom it may concern:

Be it known that I, FRANK HOLDEN, a citizen of the United States of America, residing at 190ª Adelaide Road, London, N. W., England, have invented certain new and useful Improvements in Electric Machines, of which the following is a specification.

This invention relates to electro-magnetic mechanism suitable for driving a train of wheels such as a clockwork train and has for its object to provide an efficient mechanism of this type which is inexpensive to manufacture and can be operated by a small amount of current.

This invention consists in providing a flat coil operating between permanent magnet pole pieces and also in an improved construction of contact device which ensures a good engagement of the contacts while the coil is in the magnetic field and a quick return of the contacts to their normal positions on breaking of the connection.

The accompanying drawings illustrate this invention Fig. 1 being a perspective view of the machine and Fig. 2 an enlarged detail view of the contact device.

In Fig. 1 plates 1 and 2 are bar magnets and are connected at one end by means of a support 3, of magnetic material such as soft iron and at the other end by a support 4 of brass or other non-magnetic material. The bar magnets 1 and 2 are arranged with like poles transposed so that with the support 3 of magnetic material they constitute a permanently magnetized system which has its effective poles separated by the non-magnetic support 4. In proximity to the support 4, secured to the plates 1 and 2 are soft iron pole-pieces 5 and 6 between which a flat circular coil 7 oscillates. Secured to but insulated from the upper plate 1 is a plate 8 of brass or other non-magnetic material. The spindle 9 of an oscillating member is supported in pivot bearings, preferably jewels, secured in the plates 8 and 2. This spindle carries an arm 10 on the end of which the coil 7 is mounted and is also provided with two arms arranged at 120° on either side of arm 10 carrying counterweights 11. The oscillation of the spindle 9 is controlled by the helical spring 12 secured at one end by means of a clamp to the spindle 9, and at the other end to the plate 1. The spindle carries near its upper end a contact arm 13 which is preferably provided at its outer end with an engaging surface 14 of silver or other good conducting material. A second contact 15 is secured to a member 16 in such a position that it projects into the path of the contact 13. The member 16 is pivotally mounted at its ends in jewel or other suitable bearings carried by the plates 8 and 1 and is provided with a flattened portion on one side as clearly shown in Fig. 2 against which a leaf spring 17 bears. This spring tends to hold the contact 15 in its zero position and is so arranged that the contacts 13 and 15 engage when the coil 7 enters the magnetic field between the pole pieces 5 and 6 and engagement is maintained by the pressure of the spring until the coil is practically concentric with the pole-pieces at which point the contacts disengage and contact 15 is quickly returned to its zero position. During the return movement, owing to the shape of the contact 15, the duration of the engagement between the two contacts is very short being only a small fraction of the time they are in engagement when the spindle is moving in the opposite direction.

The leaf spring 17 is electrically connected to the plate 8 through its support 18 while the contact 13 is insulated from the spindle 9 and arm 10 but is electrically connected by a conductor 19 to one end of the coil 7 the other end of which is electrically connected to the arm 10. The spring 12 is electrically connected to the arm 10 at one end and to the plate 1 at its upper end so that by connecting a source of current such as a battery 20 between the plates 8 and 1 a circuit will be completed through the coil 7 when the contacts 13 and 15 are in engagement which occurs as described above when the coil is entering the magnetic field, the path of the current being from battery 20 through plate 1, spring 12, arm 10 coil 7, conductor 19, contact arm 13, contacts 14 and 15, support 16, leaf spring 17, support 18, plate 8 and back to the battery 20. The effect of this is that the coil is repelled or forced out of the magnetic field and the spindle caused to rotate until the tension of the spring 12 arrests its movement and causes it to return. The kinetic energy of the coil arm and the counter weights 11 causes the spindle to oscillate and when it again enters the magnetic field between the pole pieces 5 and 6 it again receives an impulse and the spindle is kept oscillating so long as current is supplied from the source. The oscillation of

the spindle can be utilized to operate a train of wheels or other mechanism.

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

1. In electromagnetic mechanism, the combination of a pair of bar magnets spaced apart in parallel relation and with like poles transposed, a support of magnetic material and a support of non-magnetic material connecting opposite ends of said magnets, a pair of pole pieces secured to the magnets adjacent said non-magnetic support, a coil adapted to oscillate between said pole pieces and means for completing an electric circuit through said coil during a part of each oscillation.

2. In electromagnetic mechanism, the combination of a permanent magnet, a coil mounted on a pivoted arm and adapted to oscillate between the poles of said magnet, a contact arm having a fixed mechanical and electrical connection to said coil and oscillating therewith, a co-operating contact arm mounted on a pivoted spindle, a flattened portion on said pivotal mounting, a spring engaging said flattened portion whereby the co-operating contact arm is biased to a normal position in the path of the first mentioned contact arm but is adapted to be oscillated out of said path on either side of said normal position, a source of current and means for completing a circuit through said coil when the co-operating contacts engage.

3. In electromagnetic mechanism, the combination of a permanent magnet and a pivotally mounted coil adapted to oscillate between the poles of said magnet, a contact arm mechanically and electrically connected to said coil and oscillating therewith, a co-operating pivotally mounted contact arm disposed in the path of and having its axis in a plane with that of said first mentioned oscillating contact arm, a flattened portion on said pivotal mounting, a spring engaging said flattened portion, whereby the co-operating contact arm is biased to a normal position angularly offset from said plane but is adapted to be oscillated out of said path on either side of said normal position, a source of current and means for completing a circuit through said coil when the contacts engage.

In witness whereof I have hereunto set my hand this 9th day of June 1920.

FRANK HOLDEN.