

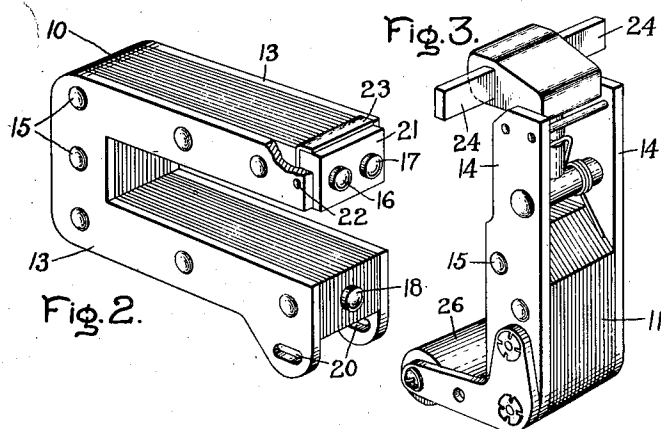
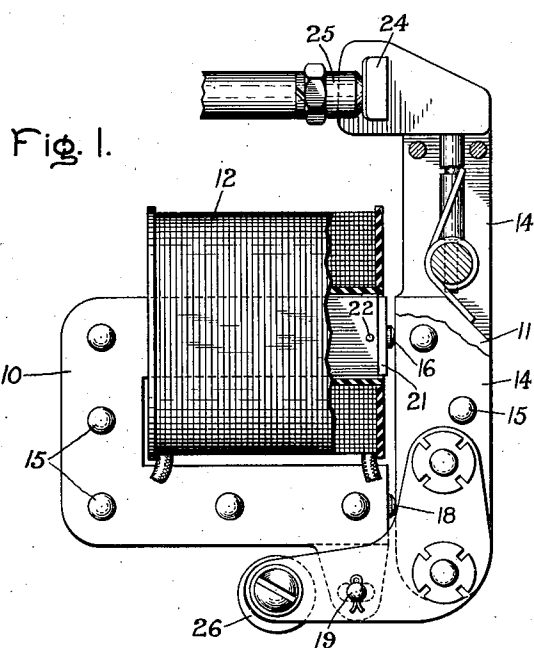
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H. M. STEVENS

ELECTROMAGNET

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Inventor:
Harry M. Stevens,
by *W. S. Hunt*
His Attorney.

UNITED STATES PATENT OFFICE.

HARRY M. STEVENS, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

ELECTROMAGNET.

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To all whom it may concern:

Be it known that I, HARRY M. STEVENS, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Electromagnets, of which the following is a specification.

My invention relates to improvements in electromagnets, and more particularly to improvements in electromagnets for alternating current circuits, and the object of my invention is to provide an electromagnet having improved characteristics in both construction and operation.

Electromagnets when operated on alternating current circuits tend to hum or chatter because the voltage in passing through zero allows the armature to recede from the magnet. The resultant back and forth movement of the armature with the periodic variation in voltage is objectionable not only because of the noise produced but also because of a tendency to wear the parts such as to batter the pole faces and armature, wear the pivots, etc. To avoid these difficulties, various devices have been arranged to provide a secondary or holding flux out of phase with the primary or main flux. The commonest of these devices is the well-known shading coil which, in general, comprises a short-circuited winding or ring of electric current conducting material enclosing a portion of the pole face. The effectiveness of a shading device of this type depends largely upon the nicety of bearing between the armature and pole faces. Consequently, there must be not only nicety of alinement of the parts but also the pole faces and armature must be finished to precisely plane surfaces if good operating results are to be obtained. Inasmuch, however, as alternating current magnet structures are preferably laminated or built up of relatively thin pieces, which are usually punched out as an economic expedient, it is not only difficult but also not feasible as an economic manufacturing proposition to produce the requisite plane surfaces and nicety of alinement such that all parts come to a precisely even bearing when the armature is in the attracted position. Moreover, in certain ap-

plications of electromagnets, it is essential that residual magnetism be not effective to hold the armature so that a definite drop out or movement thereof to the unattracted position is assured.

An object of my invention is, therefore, to provide an improved alternating current electromagnet in the construction of which undue and costly refinements are unnecessary, which does not hum or chatter with the periodic variation voltage and in which sticking of the armature due to residual magnetism is eliminated. To this end, I make use of the fact that three points not in the same straight line determine a plane and therefore a solid body even though more or less irregular in shape will come to an even and stable bearing on three triangularly spaced points of support, and I combine with the three point bearing an improved flux displacing or shading device.

My invention will be better understood from the following description taken in connection with the accompanying drawing and its scope will be pointed out in the appended claims.

In the accompanying drawing, Fig. 1 illustrates in elevation an electromagnet embodying my invention, and Figs. 2 and 3 illustrate in perspective the stationary and movable parts respectively of the electromagnet shown in Fig. 1.

The several figures of the accompanying drawing illustrate an alternating current electromagnet embodying my invention and comprising relatively movable magnetic members such as a U-shaped magnet 10 and an armature 11 therefor and an energizing winding 12. The magnetic members 10 and 11 are preferably built up or laminated and are held together in any suitable manner such as by side pieces or magnetic frame members 13 and 14 and rivets 15.

In order that the magnetic members 10 and 11 may have an even or stable bearing relatively to each other when the armature 11 is in the attracted position, I provide three bearing portions such as pins 16, 17 and 18 inserted, for example, in the pole faces of the magnet 10 and projecting outwardly therefrom into the path of movement of the armature. These three project-

ing portions are preferably of magnetic material and are positioned so as not to be in the same straight line, that is to say, triangularly spaced. Also, they are preferably substantially pointed and therefore provide a three point bearing so that the armature 11 when in the attracted position will be stable. In order to obtain the pointed effect, the projecting portions 16, 17 and 18 may be convexly faced towards the armature. While I have shown the three pins inserted in the pole faces of the magnet 10, it is obvious that they may be inserted in the armature 11 or that two may be inserted in the magnet and one in the armature or vice versa. In order that the armature 11 may be free to seat itself evenly on the projecting portions or pins 16, 17 and 18, it is loosely mounted. For this purpose, it may be carried on a pivot 19 which is yieldingly or loosely supported as, for example, in slots 20 in the magnetic frame members 13.

For holding the armature 11 quietly in the attracted position in stable bearing on the three projecting portions or pins 16, 17 and 18 so as to prevent chatter, I provide means for producing a secondary or holding flux displaced in phase relatively to the main flux. To this end, I combine with two preferably of the magnetic projecting portions such as 16 and 17 a section 21 of non-magnetic electric current conducting material such as copper in which the projecting portions 16 and 17 are inserted at spaced points. This non-magnetic section 21 is incorporated in one end of the magnetic circuit of the magnet 10. The section 21 may be held in position between the frame members 13 in any suitable manner such as by a pin 22 and the section is arranged to project somewhat beyond the ends of the frame members 13 so as to provide an air gap in the flux paths of the secondary or local holding flux and also in the main flux. Between the end of the magnet 10 and the copper section 21, I insert a section 23 of non-magnetic material such as brass in order that there may not be a continuous magnetic circuit of low reluctance through the magnet 10 and the projecting portions 16 and 17.

It will then be clear that when the magnet 10 is energized and the armature 11 drawn to the attracted position, that the main flux will induce currents in the copper section 21. These currents will in turn set up a flux, displaced in phase relatively to the main flux, in each of the projecting portions 16 and 17. The paths for this local holding flux are the projecting portions or pins 16 and 17, the armature 11, the magnetic frame members 14, the air gap between these frame members and the frame members 13, the frame members 13 and the copper section 21. Inasmuch as there is an appreciable air gap in these

flux paths, there is no tendency for the armature to stick because of residual magnetism.

In the illustrated embodiment of my invention the armature 11 is shown as provided with a yieldingly mounted contact controlling member 24 arranged to bridge contacts 25, only one of which is shown. For controlling the amount of movement of the armature 11, that is, the gap between the contact member 24 and contacts 25 when the armature is in the unattracted position, I provide an adjustable stop such as an eccentrically mounted cylindrical member 26 which is secured to the armature 11 so as to be movable therewith and is arranged to abut the magnet 10. By changing the angular position of the member 26, the distance between it and the magnet 10 when the armature 11 is in the attracted position may be varied so as to change the extent of movement of the armature.

While I have shown and described only one embodiment of my invention, I do not desire to be limited to the exact arrangement shown and described but seek to cover in the appended claims all those modifications that fall within the true 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 alternating current electromagnet comprising relatively fixed and movable cooperating magnetic members, characterized by the fact that said electromagnet is provided with three triangularly spaced portions projecting from the cooperating pole faces of said members whereby to provide a three point bearing between said members when the electromagnet is energized.

2. An alternating current electromagnet comprising relatively fixed and movable cooperating magnetic members characterized by the fact that one of said members is provided with three triangularly spaced portions projecting from the pole faces of the member, at least one of said portions being of magnetic material.

3. An alternating current electromagnet having two magnetic portions projecting from one of the pole faces and a third portion projecting from another pole face, said portions being triangularly spaced and a loosely pivoted armature whereby upon energization of said magnet said armature assumes a position of stable bearing on said projecting portions.

4. An alternating current electromagnet, a loosely pivoted armature therefor, and three triangularly spaced magnetic members projecting from the pole faces of said magnet and forming a three point bearing for said armature whereby upon energization of said magnet the armature thereof assumes a position of stable bearing.

5. An alternating current electromagnet comprising relatively movable cooperating magnetic members characterized by the facts that one of said members is loosely pivoted and that another of said members is provided with three convexly faced magnetic portions projecting from the pole faces of the member, said portions being triangularly spaced, whereby upon energization of the electromagnet said members assume a position of stable bearing relatively to each other.

6. An alternating current electromagnet, a loosely pivoted armature therefor, and means adapted upon energization of said magnet to hold said armature quietly in a position of stable bearing against said magnet comprising a section of non-magnetic electric current conducting material in the magnetic circuit of said magnet at one end thereof, two spaced magnetic members inserted in said section and projecting outwardly therefrom, said members being arranged to cooperate with said section to provide a magnetic flux displaced in phase relatively to the main flux of the magnet, and another member projecting outwardly from

the other end of said magnet and forming with said two magnetic members a three point bearing for said armature.

7. An alternating current electromagnet, a loosely pivoted armature therefor, and means adapted upon energization of said magnet to hold said armature quietly in a position of stable bearing against said magnet comprising a section of non-magnetic electric current conducting material in the magnetic circuit of said magnet at one end thereof, two convexly faced spaced magnetic members inserted in said section and projecting outwardly therefrom in the path of movement of said armature, said members being arranged to cooperate with said section to provide a magnetic flux displaced in phase relatively to the main flux of the magnet, and a third convexly faced magnetic member projecting outwardly from the other end of said magnetic members in the path of movement of said armature and forming with said two magnetic members a three point bearing for said armature.

In witness whereof, I have hereunto set my hand this 23rd day of May, 1924.

HARRY M. STEVENS.