N. O. LINDSTROM.

ALTERNATING CURRENT MAGNET.

APPLICATION FILED OCT. 27, 1910.

989,018. Patented Apr. 11, 1911.

2 SHEETS—SHEET 1.

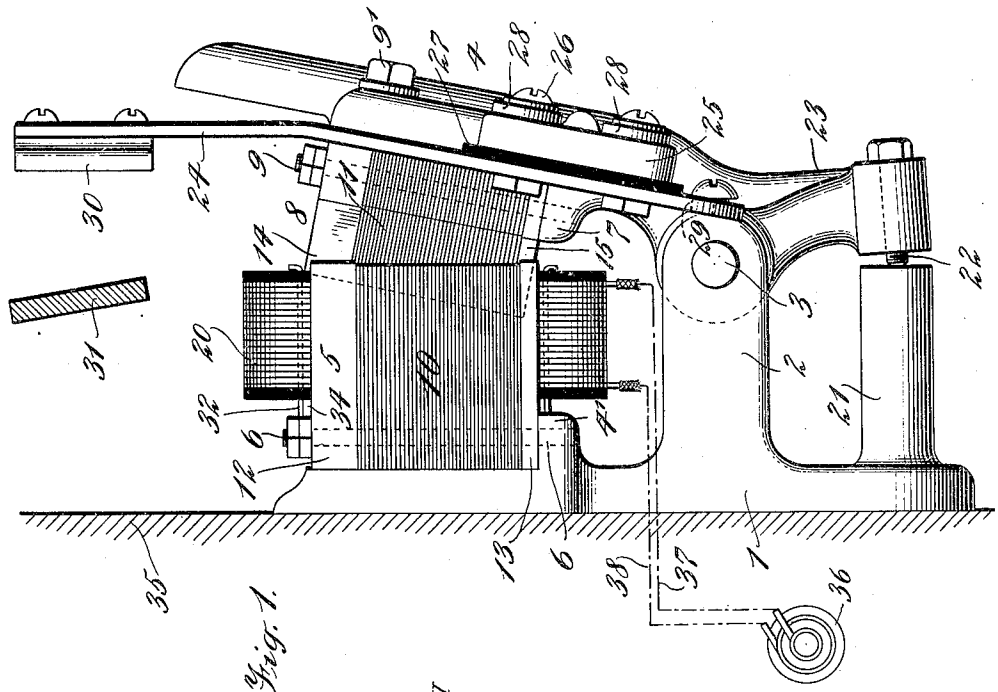

Fig. 1.

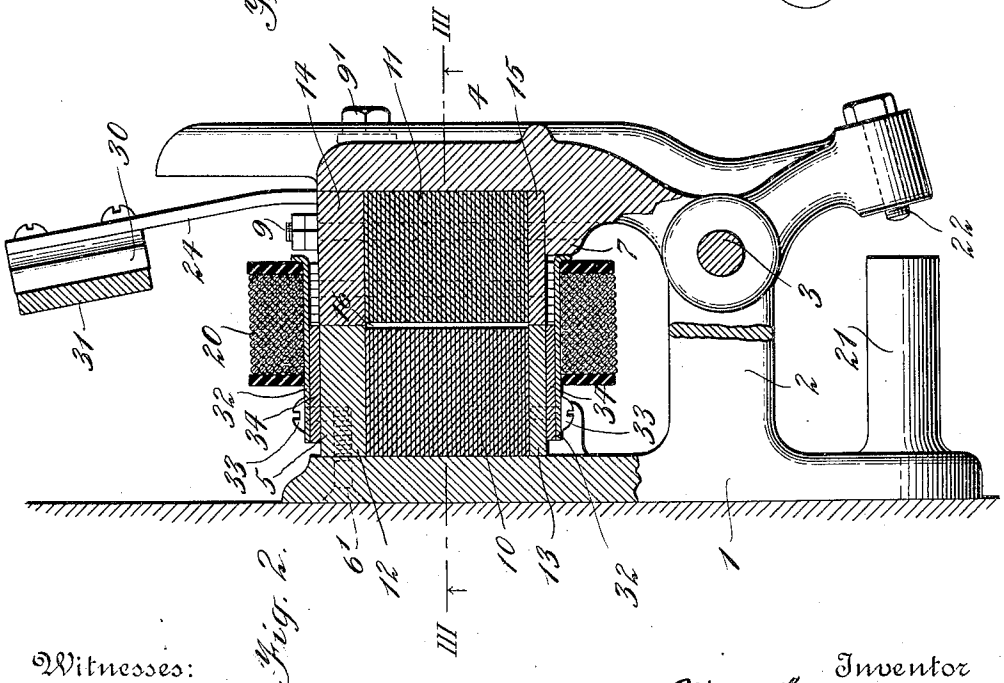

Fig. 2.

Witnesses:

Inventor

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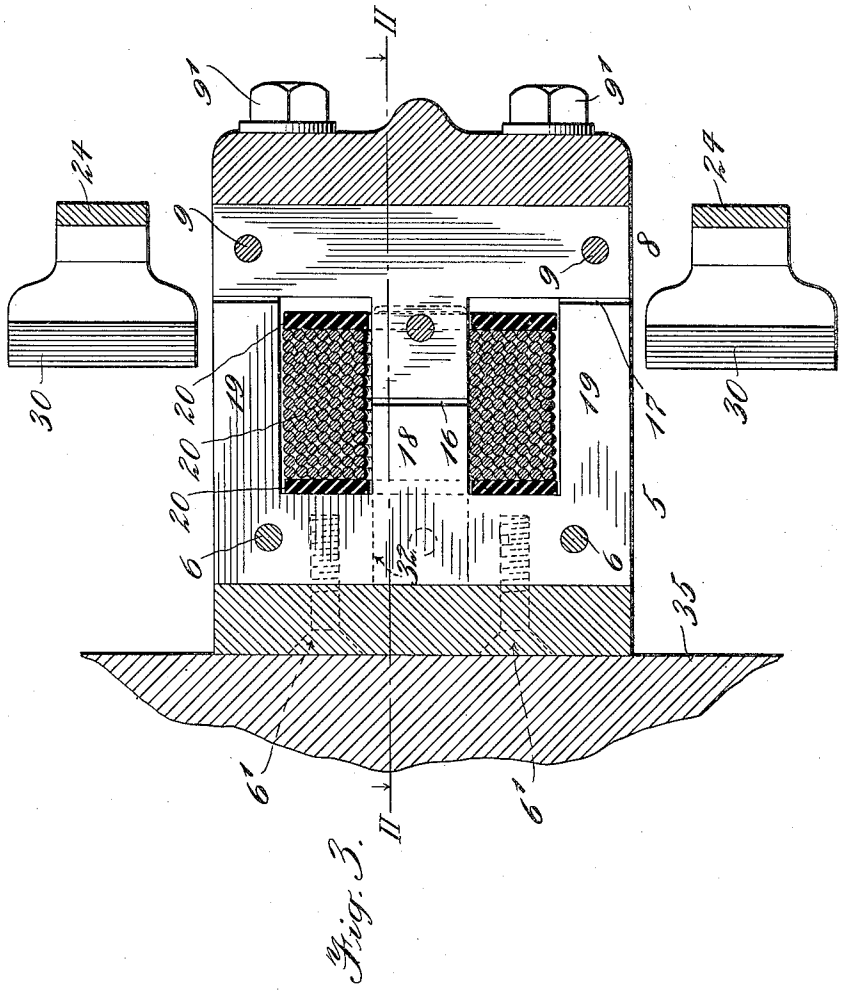

Fig. 3.

Witnesses:

Inventor

Nils O. Lindstrom

By his Attorneys

UNITED STATES PATENT OFFICE.

NILS O. LINDSTROM, OF NUTLEY, NEW JERSEY, ASSIGNOR TO ALONZO B. SEE, OF NEW YORK, N. Y.

ALTERNATING-CURRENT MAGNET.

989,018. Specification of Letters Patent. Patented Apr. 11, 1911.

Application filed October 27, 1910. Serial No. 589,314.

To all whom it may concern:

Be it known that I, NILS O. LINDSTROM, a citizen of the United States, residing at Nutley, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Alternating-Current Magnets, of which the following is a full, clear, and exact description.

This invention relates to alternating current magnets and more particularly to single phase alternating current magnets, and has for its object the provision of means whereby the chattering, which has heretofore been much in evidence in the use of such devices, may be overcome and eliminated. This objectionable action of electro-magnets as heretofore constructed and designed for use in an alternating current circuit has been due to the fact that the magnetic field was periodically weakened by the pulsations in the current, to such an extent that the armature of the magnet was released therefrom, slightly in some forms of apparatus it is true, but enough to cause an incessant noise or chatter which rendered its use objectionable in many cases.

The device herein described is primarily intended for service in connection with electric elevator controls, brakes, and the like; and I have illustrated in the accompanying drawings an embodiment of my invention which is especially well adapted for use in elevator controlling appliances, serving to make and break a partial circuit therein.

Other objects of my invention will be hereinafter set forth and more particularly pointed out in the appended claims.

In the drawings which form a part hereof: Figure 1 is a side elevation of one form of my alternating current magnet. Fig. 2 is a partial longitudinal section of said magnet taken substantially on the line II—II of Fig. 3. Fig. 3 is a transverse section of the apparatus, said section being taken on the line III—III of Fig. 2.

Like reference characters designate like parts throughout the several views.

Referring to Fig. 1, a base 1 is provided with two up-standing ears 2, through which extends a pin 3 on which is pivoted the armature 4 of the magnet. The base is also provided with a lug 4′, which together with the forward end of the base forms a seat for a W-shaped pole piece broadly designated 5. This pole piece is secured to the base in any suitable manner as by the bolts 6 and screws 6′. The armature is correspondingly provided with a lug 7 and is formed to provide a seat for a T-shaped armature pole piece, broadly designated 8, which may be secured to the armature body by the bolts 9 and 9′. The peculiarity of both the armature and magnet pole pieces is that they are formed of layers of magnetizable material, such as iron, said layers being of different thickness; portions designated 10 in the base pole piece and 11 in the armature pole piece, being formed of very soft magnetizable material, such for example, as soft Swedish iron, and being laminated as shown; while other portions of each of said pole pieces are preferably formed of a relatively hard magnetizable material, to wit, a fairly hard iron, such pieces being relatively much thicker than those aforesaid; and each of the pole pieces being provided with two such relatively thick elements respectively designated 12 and 13 in the base pole piece, and 14 and 15 in the armature pole piece.

When the respective pole pieces are in engagement as shown in Figs. 2 and 3, the elements 12 and 14, and 13 and 15, are respectively directly in contact, whereas preferably at no time are the opposed edges of the laminations of the soft or thin iron parts so adapted to contact with each other; air gaps 16 and 17 being provided therebetween. The interior legs 18 of the W-shaped parts are not as long as the external legs 19, but are substantially only half the length thereof, so that the stems of the T-shaped parts project inwardly there-toward to such an extent that the air gap 16 is of substantially the same width as the air gaps 17. The respective layers of thin and thick iron are preferably held rigidly together by bolts in the manner shown.

Referring to Fig. 3, it will be seen that two pockets are formed which extend through and between the respective pole pieces, which pockets are adapted for the reception of the sides of a coil 20 to which the single phase alternating current is supplied.

To the rear of the ears 2 and preferably intermediate thereof is a pedestal 21, which is adapted for engagement with an adjustment screw 22 disposed in a rearwardly projecting extension 23 of the armature. By means of screw 22, it is possible to adjust to

a nicety the amount of play or movement of the armature. In the form of device shown the armature is further provided with contact making parts; such parts comprising flat springs 24 which are carried on laterally extending lugs 25 of the armature, being secured thereto by means of bolts 26 and insulated therefrom by means of the fiber plates 27. Bolts 26 are preferably insulated from lugs 25 in any suitable manner, as by washers 28. Electrical connection can be made directly to the rear extremity of each of the respective springs by means of the bolt holes 29 in such extremities. The forward ends of these springs carry contact making shoes 30, and such shoes are adapted to make contact with a suitably supported cross-bar 31 indicated in section in Figs. 1 and 2. It will be observed that the line of separation between the respective pole pieces at or adjacent to the air gap 16 is disposed in a plane which passes substantially through the center of the coil 19. This coil is supported upon the magnet base by means of brass strips 32 which are suitably secured to the base or magnet pole piece, as by screws 33. These strips are spaced from the respective front and rear walls of the base pole piece by means of spacers 34; and the coil may readily be detached by merely withdrawing screws 33.

The operation of the device, when suitably mounted upon a wall 35, is as follows: In such position the center of gravity of the armature being beyond the pivotal point, gravity will tend to keep said armature away from the magnet pole piece, but when current from a single phase alternating current generator 36 is passed, via the leads 37, 38, through the coil 19, lines of force are thereby induced in the respective magnetizable parts, and the armature is drawn in toward the base; contacts 30 being thereby impinged against the conductive bar 31, closing the partial circuit; said partial circuit including, of course, the springs 24, shoes 30 and bar 31. The current being a pulsatory one, induces corresponding pulsations in the fields of force. Now, if the pole piece laminations had been made, as heretofore, of a single or uniform thickness and grade or quality of iron, whenever the field of force became weakened, there would be a tendency for the armature to swing outwardly. Here, however, the novel provision of a plurality of grades and thicknesses of iron comes into play and while the magnetic field in the thin iron parts 10 and 11 dies out almost in synchronism with the subsidence of the current impulse, the magnetic field established in the thick iron parts 12 and 14, and 13 and 15, respectively, tends to continue for a certain length of time, lagging behind the field in the parts 10 and 11. This action is due principally to the eddy currents formed in the thick iron elements, which tend to prolong the existence of the lines of force therein. The eddy currents in the thin sheets are obviously not nearly so strong and hence do not exercise the same tendency to induce a magnetic lag. The lag is further due in part to the difference in the magnetic permeability of the respective grades or kinds of material employed. This lag suffices to hold the armature firmly in its closed position for a sufficient length of time to enable the next pulsation of current to build up or reëstablish the magnetic field in the thin iron parts; so that the armature will normally always remain in its closed position while the pulsatory current is flowing through the coil. Further the lag is materially increased by providing the air gaps between the thin iron parts of the pole pieces while adapting the respective thick iron portions for substantial contact, and the tendency for the magnetic field in the thick iron parts to lag behind the field in the thin iron elements is, in such an arrangement, decidedly pronounced.

A magnet pole piece formed in accordance with the principles of my invention, embodying the provision of a plurality of layers of magnetizable material of varying thickness, even where the material used is of uniform softness or permeability, results in a pole piece structure portions of which are more readily magnetizable and demagnetizable than other portions thereof, by reason of the comparative lack of resistance or opposition to the magnetization and demagnetization in some portions only of such structure, while other portions offer relatively considerable resistance or opposition. It is obvious of course that a section taken at right angles to the lines of force in such a pole piece, will intersect both the more and the less readily magnetizable and demagnetizable material.

In consequence and by reason of the magnetic and electrical actions just described, all chattering is eliminated and the action of the armature is rendered positive and reliable.

I desire to call particular attention to the disposition of the line of separation between the legs 18 and 19 of the magnet pole piece elements and the stems of the armature pole piece elements. By reason of the particular disposition of this line, the variable air gap 16 and the separation of hard iron parts at this point introduce a gap in the magnetic field where such gap may produce the greatest effect on such field; substantially all lines of force passing through said gap. Finally, while the magnet in question is particularly well adapted to single phase alternating currents, I do not wish to be limited to such currents, since the principles of my invention are obviously applicable to magnets intended

for use in connection with multi-phase alternating currents.

Having thus described my invention, what I claim is:

1. In an alternating current magnet, a magnet proper and an armature therefor, each of said parts being provided with a pole piece, and each of said pole pieces comprising elements of magnetizable material of varying thicknesses, elements of greater thickness in one pole piece being substantially in contact with substantially similar elements in another pole piece, when the armature is in closed position, and elements of less thickness in one of said pole pieces being spaced from substantially similar elements in another of said pole pieces when the armature is in said position.

2. In an alternating current magnet, a magnet proper and an armature pivoted thereto, operative parts carried by said armature, and pole pieces carried by said magnet and said armature respectively comprising iron disposed in the form of thin laminated sheets, and relatively thick blocks of iron disposed substantially in parallelism with the thin iron sheets, the respective blocks of the armature and magnet proper being adapted to contact with each other when the armature is in closed position, and the said thin laminated sheets of the respective pole pieces being spaced apart when the armature is in said position.

3. In an alternating current magnet, an electromagnet proper having an energizing coil, and an armature for said magnet, said magnet and armature having pole pieces formed of magnetizable material of differing thicknesses, said pole pieces having tongues projecting into the interior of said coil, the line of separation between said tongues being located within said coil.

4. In an alternating current magnet, an electromagnet proper having an energizing coil, and an armature for said magnet, said magnet and armature having pole pieces formed of magnetizable material of differing grades of magnetic permeability, said pole pieces having tongues projecting into the interior of said coil, material of one of the grades aforesaid in each of said tongues being spaced at all times from a like grade of material in the other tongue to provide an air gap therebetween.

5. In an alternating current magnet, a plurality of opposed pole pieces, said pole pieces respectively comprising iron disposed in the form of thin sheets and blocks, the edges of the thin sheets in the respective opposed pole pieces being spaced apart at all times, and the opposed blocks being substantially in contact when the armature is in closed position.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

NILS O. LINDSTROM.

Witnesses:
WALDO M. CHAPIN,
JAMES D'ANTONIO.