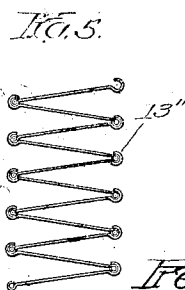
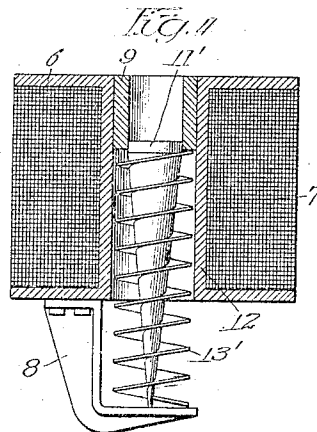
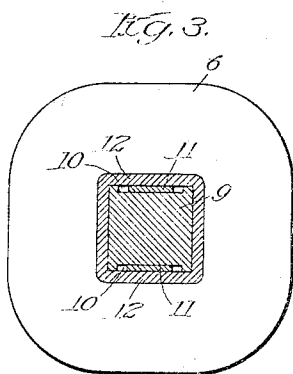
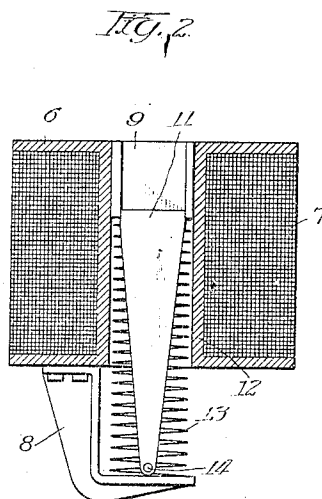
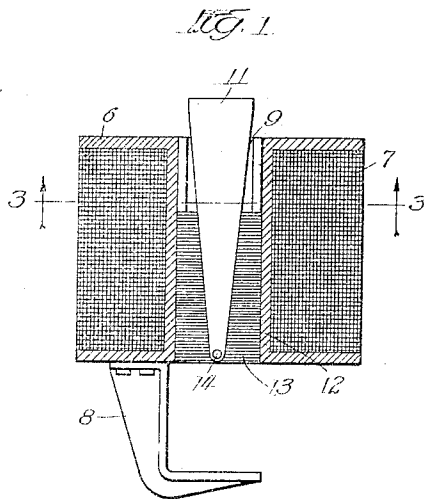


F. W. MARTINI.
ELECTROMAGNET.
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1,064,512.

Patented June 10, 1913.



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UNITED STATES PATENT OFFICE.

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ELECTROMAGNET.

1,064,512.

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To all whom it may concern:

Be it known that I, FREDERICK W. MARTINI, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electromagnets, of which the following is a specification.

My invention relates to improvements in 10 electromagnets.

One of the salient objects of my invention is to provide an unusually sensitive electromagnet having a long, strong, uniform pull, with a relatively light consumption of electric current energy thereby providing a magnet of very high efficiency.

Other and further objects of my invention will become readily apparent to persons skilled in the art from a consideration 20 of the following description when taken in conjunction with the drawing forming a part hereof, wherein—

Figure 1 is a central vertical section of a preferred form, when the electromagnet is 25 to be used for light work, showing the position of the parts when the magnet is energized; Fig. 2 is a similar view showing the magnet deenergized; Fig. 3 is a transverse section taken on lines 3—3 of Fig. 1; 30 Figs. 4 and 5 are modifications.

In carrying my invention into effect, I provide an extensible part of the electromagnet core which, in effect, is the armature and which is at all times in contact 35 with the fixed portion of the magnet core. The solid, fixed portion of the core, occupies only part of the interior of the coil and the armature, or extensible part of the core, consists of a magnetically susceptible plicatile material capable of a relatively great 40 degree of longitudinal expansion when not potentiated by the effect of the current flowing through the coil and of an equal contraction when the electromagnet becomes energized. The movable, responsive portion of 45 the core, consists of a relatively long, magnetically continuous, responsive member plicated, or folded upon itself, so that each lamina of the fold shall occupy an angular position with respect to adjacent folds when 50 deenergized, and when energized each fold thereof shall be drawn into contact with its neighboring fold whereby a compact, substantial continuation of the fixed solid portion of the core is effected.

In the operation of the device, the fold or

lamina which is nearest to and contacts with the fixed portion of the core is attracted first, and as shown in Fig. 1, its entire superficial area or extent, which confronts the face of the solid portion of the core, is brought into contact therewith; this operation in effect thereby extends the fixed or solid portion of the core to the extent of the thickness of the contacting lamina, and so on, when the next lamina is brought into contact with the first, the same effect is produced until when the entire extensible part of the core or armature is completely drawn within the coil of the magnet, the solid portion of the core is in effect by this means substantially extended throughout the entire extent of the coil. By this means, the armature produces a series of power impulses by the successive attraction of one lamina for another in consecutive order until the entire plicatile armature, or extensible portion of the core has been completely contacted, whereby the successive, rapidly occurring, small impulses have been aggregated into a relatively long and effective pull.

In the exemplification which I have illustrated, 6 is the spool of an electromagnet provided with a winding 7, suitable for the purpose for which the magnet is intended, and having a central opening for accommodation of the core and the responsive part thereof, or armature.

8 is a rest of any suitable form for supporting the retracted armature as when the device is in an unenergized condition.

9 is the fixed, solid portion of the core of the electromagnet, shown in this case to extend only a slight distance into the interior thereof. It is provided with grooves at each side, as at 10—10, for inclusion of the guide pieces 11—11 which are necessarily made of a diamagnetic material such as brass or the like. The guide pieces 11 are intended for sliding movement in the grooves provided in the solid portion of the core 9, between the core and the inner walls of the spool 6, as at 12.

The extensible armature 13 may be composed of a relatively long strip of thin magnetically susceptible inductive material, such as a thin strip of iron or soft steel folded upon itself, as shown in the drawing in Figs. 1 and 2, whereby it may be compressed or contracted, so that each of the laminae will lie in substantially parallel planes with

its adjacent attracted lamina, as shown in Fig. 1, and when the entire extensible portion is contracted they will all be in parallel planes. Each of the laminae will occupy a position, at slight angles from its neighbor, as shown in Fig. 2, when the magnet is deenergized and the armature is extended to its fullest extent. The armature may, however, take the form shown in Fig. 4 where the successive convolutions are extended in spiral direction, the entire extent of the armature being vertically perforated by a tapering orifice for the accommodation of the conical guide 11'. Notches, or slots, equal in thickness to the slots 10, are cut into the sides of the folded portions composing the armature 13, to correspond with the taper of the guides 11, substantially as shown in Fig. 2, wherein the upper lamina has a very much wider notch than the lower one, and the width of the notches in each succeeding lamina are proportional to the taper of the guides. Perforations 14 may be made in the small ends of the guides 11-11 for connection to the object to be moved by the operation of the electromagnet, or the upper ends of the guides may be associated with the parts to be moved, as desired.

In Fig. 5 I have shown another means of folding the armature structure upon itself so that the ends of the succeeding laminae will not be so rigid or unyielding when the armature is to be made of relatively thicker material as when it is to be used for doing heavier work than the forms shown in Figs. 1, 2 and 4. When the armature, made in accordance with this modification, is to be employed the inner end is to be connected to the fixed or solid core, as in the other instances and the entire magnetic path is preserved through the succeeding members of the structure and while the molecular structure is interrupted the magnetic continuity is maintained.

The operation of the device is substantially as follows:—When the coil 7 is energized, by the passage of a suitable electric current, the fixed solid portion 9 of the core becomes highly magnetic and attracts the first lamina, which is connected thereto until the angularly disposed lamina lies in parallel planes with the face of the core, thereby becoming substantially a part of the fixed magnetic core. This lamina then exerts an equal influence upon the next succeeding lamina until all of laminae of the entire structure have been thus drawn into parallel positions, as shown in Fig. 1. The slots, or perforations of the extensible armature are dimensioned suitable for cooperation with the angular sides of the guide plates, as shown in Fig. 2, when the laminae are consecutively attracted, by the fixed solid portion of the core and the in-

crements added thereto they, each in turn, lift the guides 11-11 or 11', as the case may be, a slight distance and the slight lifting produced by each separate lamina, as it in turn becomes energized, in a manner heretofore described, constitutes the pull made up of the impulses that have been imposed upon the guides 11-11 by the successively energized folds composing the extensible part of the device, until the entire armature has been contracted, substantially as shown in Fig. 1, in which case the core is substantially solid throughout the entire extent of the coil. When the magnet has become deenergized, the entire movable and extensible system will fall into the position shown in Fig. 2, by the effect of gravity, or by a spring or by other means, as may be desired ready for instant response to the energization of the magnet.

While I have herein described a single embodiment of my invention with modifications that have readily occurred to me, it is evident that many changes may be made from the specific structure shown and that many other modifications will readily suggest themselves and may be employed without departing from the spirit and scope of my invention as defined by the appended claims.

What I claim is:

1. As an article of manufacture, an electro-magnet having a solid core and a plicatile armature, the first lamina of which has one edge always in contact with the solid core of said electro-magnet.

2. As an article of manufacture an electro-magnet having a fixed core and a plicatile armature extendible therefrom, the first lamina of said armature having its free edge always in contact with said fixed core, the material of said armature extending integrally from lamina to lamina to the other free edge of said plicatile armature.

3. As an article of manufacture an electro-magnet having a solid core and an extendible plicatile armature, the first lamina of which is always in contact with the solid core of said electro-magnet, and a guide for said armature adapted to receive a thrust to move the same upon each successive movement of the laminae of said armature beginning with that lamina which is always in contact with the solid core of the electro-magnet, whereby said guide is movable by the cumulative effects of the individual laminae.

4. As an article of manufacture an electro-magnet having a solid core partly filling the center thereof and an extendible armature comprising a strip of magnetically susceptible material folded upon itself, to form a plurality of alternate laminae disposed in angular planes, with reference to each other when deenergized and adapted to occupy

parallel planes when energized, said armature when so energized and compressed substantially filling that portion of the center of the electro-magnet not occupied by the solid core thereof, and when deenergized extending beyond the electro-magnet, the innermost lamina of said armature having its free edge always in contact with said solid core, for purposes described.

5 10 5. As an article of manufacture an electro-magnet having a solid core and an extensible member comprising a plurality of laminae the innermost of which is always in contact with said solid core, successive laminae, from innermost to outermost, becoming when energized effective magnetically as a part of said solid core, a movable member of diamagnetic material adapted and arranged to receive thrusts from each of said laminae as it moves from inclined position to energized position in which it acts as a part of the solid core.

20 25 6. As an article of manufacture an electro-magnet having a solid core, in combination with an extensible integral member having a plurality of laminae the innermost of which has one edge always in contact with the solid core, a movable tapering member of diamagnetic material, said laminae having

portions thereof cut away to receive said tapering member, said cut-away portions of the successive laminae being of progressively increasing dimensions to correspond to the taper of said movable tapering member, whereby each lamina, in the successive movement of said laminae from the innermost to the outermost thereof, contributes to the movement of said tapering member.

7. As an article of manufacture an electromagnet having a solid core and an extensible member comprising a plurality of laminae, said laminae from innermost to outermost being successively in metallic contact whereby the successive energization of each lamina makes it magnetically effective as a part of said solid core, the next lamina, in magnetic contact therewith, being forcibly drawn thereagainst, and all of said laminae being finally drawn together to form, with said solid core, the core of said electro-magnet.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

FREDERICK W. MARTINI.

In the presence of—
MARY F. ALLEN,
W. LINN ALLEN.