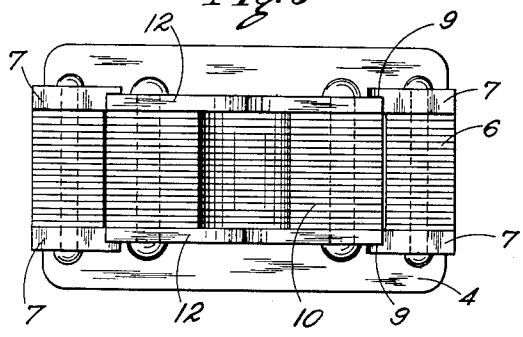
April 22, 1941. M. L. JEFFREY 2,239,267

ELECTROMAGNET

Filed March 13, 1939

Fig. 3



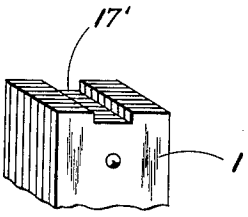


Fig. 4

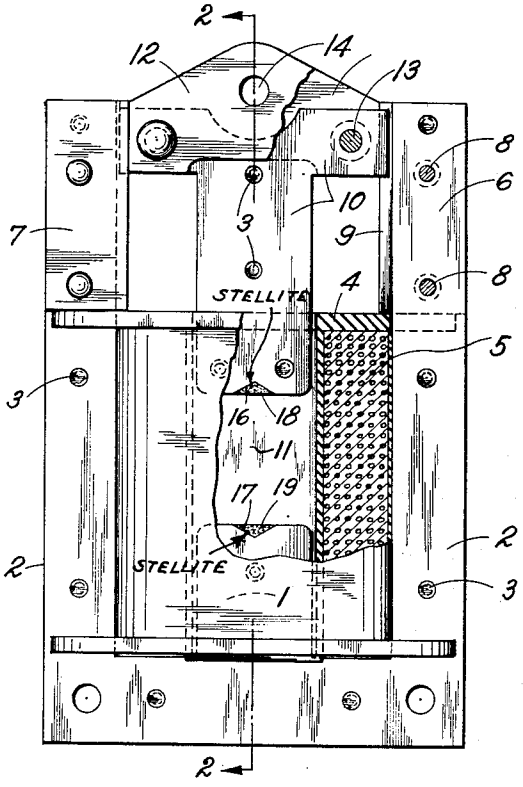


Fig. 1

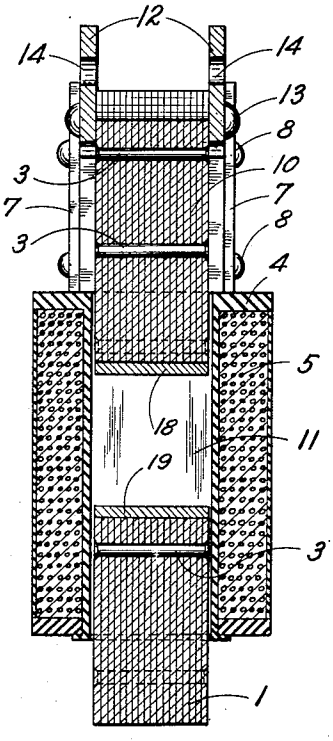


Fig. 2

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UNITED STATES PATENT OFFICE

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ELECTROMAGNET

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Application March 13, 1939, Serial No. 261,412

1 Claim. (Cl. 175—341)

My invention relates to an improvement in electromagnets, and more particularly to electromagnets of the type shown in Patent No. 1,838,836 of December 29th, 1931, to Mr. M. L. Jeffrey et al.

As is well known, magnets of the character herein involved are fabricated with a laminated core and pole pieces of very soft silica iron. The reason for the laminations and the softness of the iron are well known to those versed in the art, and include that of eliminating so-called iron losses due to eddy currents and the like. Under conditions of ordinary use the armatures and pole magnets of this type gradually become deformed because of the continuous impact to which the parts are subjected; the deformation is usually characterized by mushrooming of the parts which impact and eventually renders the device inoperative.

By the present invention I have provided an impact surface for the contacting parts made of material different from the soft iron and which will not mushroom upon impact, thus increasing the useful life of the device manyfold over the prior art. Still other advantages reside in the fact that the material which is used for protecting the contacting surfaces has little or no effect such as would cause a decrease in efficiency.

Another object of the invention is to provide a magnet of the class described having a reciprocable armature, the contacting parts of which are protected against wear by materials which do not affect the efficiency of the magnet per se.

Still other objects of the invention, and the invention itself, will become more apparent from the following description of an embodiment thereof, which description is illustrated by the accompanying drawing, and forms a part of this specification.

In the drawing:

Fig. 1 is an elevational view of a magnet embodying my invention, certain parts being broken away and shown in section;

Fig. 2 is a section taken on the line 2—2 of Fig. 1 and looking in the direction of the arrows;

Fig. 3 is a plan view;

Fig. 4 is a fragmentary perspective representing either the end of the armature or pole piece and showing the same prepared for treatment according to my invention.

Referring to the drawing throughout which like parts are designated by like reference characters, the magnet comprises a laminated core fabricated of E-shaped sheets of soft iron which provides a center or end pole 1 and outer poles 2, the laminations being held together by rivets 3. A solenoid winding is provided and comprises a spool 4 of non-magnetic and non-conducting material upon which the winding 5 is disposed. The end pieces of the spool are notched and straddle the poles 2. The poles extend upwardly as at 6 above the winding and spool and are provided with a pair of guide-plates 7 on opposite sides of the poles secured to the laminations by rivets 8. The inner faces of the guide-plates are provided with ways 9. The plunger is made up of a plurality of laminations 10 of T-shape to provide a downwardly extending portion reciprocable in the core space 11 through the center of the winding. The head of the T is adapted to slide in the guideway 9, the sides of the plunger being provided with a pair of connecting plates 12 held thereto by rivets 13. These plates are apertured as at 14 for external mechanical connection to the device to be operated.

The operation of the device is well known; that is, when the winding is energized the plunger 10, upon energization of the winding 5, is pulled downward in the winding toward the center pole 1 until it contacts therewith. Upon breaking the current, the plunger may be pulled into position as shown in Fig. 1 by a suitable spring, not shown. As previously stated, the downward pull and the resultant impact of the armature 10 and pole piece 1, ordinarily causes considerable mushrooming of the soft iron laminations, which eventually are deformed to such an extent, that the plunger 10 no longer travels freely in the space 11.

I have found that this wear may be substantially eliminated by cutting a transverse groove across the laminations in the plunger 10 and pole piece 1, as shown at 16 and 17 respectively, which groove is filled as at 18 and 19 with Stellite. The Stellite is secured in place by welding and presents a hard non-magnetic impact surface, which materially increases the life. The notches 16 and 17 may be of any conventional shape, those shown in Fig. 1 being V-shape, and those of Fig. 4, rectangular as at 17'. I also contemplate covering the entire surface with a layer of Stellite, but the preferred forms are those particularly illustrated, since it allows ultimately more intimate contact between the magnetic materials with no gap which might otherwise be provided if the entire face was covered. Welding the material in the groove introduces substantially no inefficiencies in the operation and

does not have the effect of making a solid core with its concomitant hysteresis losses.

I have also found that the surfaces where the guide-plates of the plunger reciprocate in the guide-ways 9 are subject to wear, which wear may be eliminated by either chrome plating, or the deposition of Stellite as described.

Although other materials than Stellite may be used, I have found that Stellite is particularly adapted to the present application.

Having thus described my invention in an embodiment thereof, I am aware that numerous and extensive departures will be apparent to those versed in the art, but without departing from the spirit or scope of the appended claim.

I claim:

An electromagnet having a hollow core, a pole piece in one end of said core, a plunger reciprocable in the core toward the pole piece, said pole piece and plunger being fabricated of soft iron laminations, and formed to provide grooves across the laminations of considerable depth and occupying a minor proportion of each of the meeting faces of the pole piece and plunger elements, and zones of hard non-distortionable material comprising Stellite deposited in the grooves by welding therein to bond the laminations together and providing impact surfaces for the pole piece and plunger, the surfaces of said material and of the ends of the iron laminations in each of the pole piece and plunger elements being in substantially the same plane, whereby the pole piece and the plunger elements are prevented from mushrooming while retaining their maximum magnetic efficiency.

MAX L. JEFFREY.