

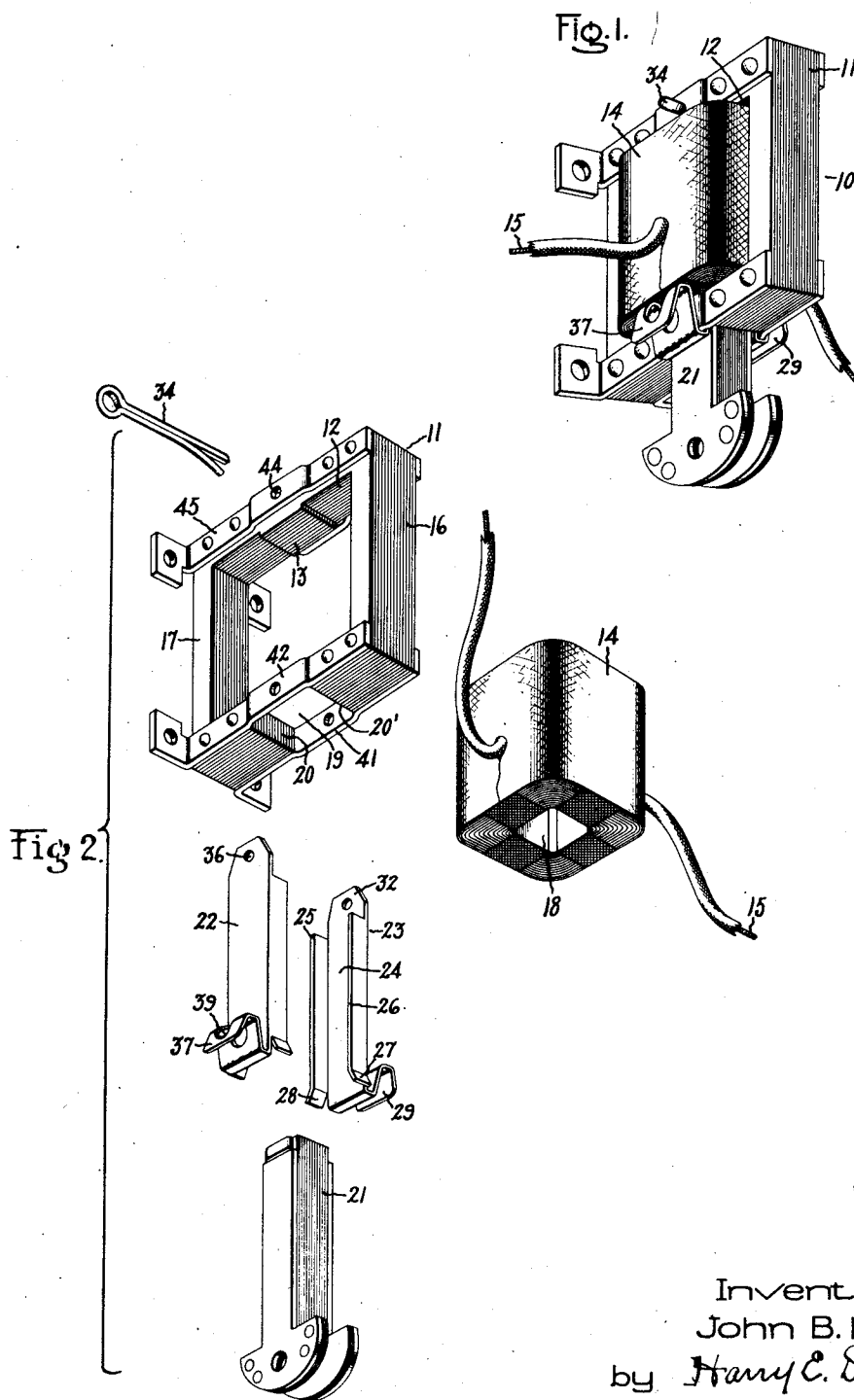
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ELECTROMAGNET

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## UNITED STATES PATENT OFFICE

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## ELECTROMAGNET

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6 Claims. (Cl. 175-341)

My invention relates to electromagnets and has for an object the provision of a reliable, inexpensive and rugged means for mounting, holding and alining the operating coil within a magnetic frame.

Heretofore it has been common practice, as shown by Trombetta Patent 1,696,615, to wind the coils on insulating spools, the spools being provided with an opening through the centers into which the armature of the magnet was slidably mounted. Much is yet to be desired, however, in improving the mounting of the coil. For example, where an insulating spool is employed an overheated coil may sometimes cause the spool to warp out of shape sufficiently to prevent the free movement of the armature within the spool. If the armature actually jams within the spool the switch cannot be operated properly and the coil, therefore, is subjected to additional heating. Furthermore, a spool wound coil requires more space than a form wound coil, i. e. a coil wound on a form, dipped in insulating material and not including the spool, because of the space taken by the spool. Consequently, a larger magnetic frame is required for the spool wound coil, the efficiency of the magnet being correspondingly decreased.

In carrying out my invention in one form thereof, I provide a magnetic frame within which the coil is securely mounted by means of a pair of metallic supports which act as guides for the armature of the magnet as well as for the sides of the coil. The insulated ends of the guides are so constructed as to come into contact with one end of the coil and thereby hold it firmly in place against the magnetic frame.

For a more complete understanding of my invention, reference should now be had to the accompanying drawing wherein I have shown in Fig. 1 a perspective view of an electromagnet embodying my invention, while Fig. 2 is an exploded, perspective view of the electromagnet shown in Fig. 1.

Referring to the drawing, I have shown my invention in one form as applied to an electromagnet 10 provided with a laminated C-shaped magnetic frame 11, the closed end 12 of the frame being provided with a projecting portion 13. An operating coil 14 is form wound. That is to say, an insulated conductor 15 is wound onto a form, suitable insulation being provided between adjacent layers of turns, and dipped into insulating material, which material serves to bind the turns together and also serves to bind the adjacent layers of turns to the insulation provided

between them. The coil is then taped with insulating material, a rigid construction being obtained thereby without the use of an insulating spool.

The completed coil 14 is placed between the legs 16 and 17 of the frame 11 so that the opening 18 in the coil 14 is in alinement with the projection 13 and with the opening 19, provided between the inwardly extending ends 20 and 20' of the magnetic frame. In order to secure rigidly the coil in position and to protect it from damage by movement of the armature 21, a pair of metallic guides 22 and 23 are provided. The guide 23 is provided with a U-shaped portion 24, the inwardly extending legs 25 and 26 forming bearing surfaces for the armature 21. In order to center the guides 23 within the opening 19 of the magnet, the outer ends 27 and 28 of the legs 25 and 26 are bent outwardly so as to engage the inner ends 20 and 20' of the frame 11. The guide 23 is provided with a resilient end 29 formed by bending one end of the guide so that it can come into engagement with the coil. The opposite end 32 of the guide 23 is provided with a hole arranged to receive a fastening pin 34. The guide 22 is identical in construction with the guide 23, the hole 36 being arranged to receive the fastening pin 34, while the resilient end 37 is arranged to bear against one end of the coil. In order to increase the resiliency of the end portions a fraction of the metal is removed as indicated by the reference numeral 39.

Continuing with the assembly of the electromagnet, it will be observed that the guides 22 and 23 are placed within the coil, the resilient ends 29 and 37 engaging respectively the supporting members 41 and 42. The distance between the hole 36 and the resilient end 37 of the guide is selected so that the fastening pin 34 cannot be inserted through a hole 44 provided in a supporting member 45 and into the hole 36 until after the resilient end 37 has been pressed against one end of coil 14 a predetermined amount. The guide 23 is similarly proportioned. By means of this arrangement, it will be observed that the coil 14 is securely held in place by the bias exerted on it by the resilient ends 29 and 37.

By means of this construction it will be observed that the guides 22 and 23 not only secure the coil 14 firmly in place and in alinement with the frame 11 but they also protect the coil from injury by the armature 21 and at the same time afford free bearing surfaces for the armature. Furthermore, the coil is readily assembled within the frame and replacements can be made with

a minimum of effort. Also, any inaccuracies of manufacture are automatically compensated for inasmuch as the guides are always automatically centered in the frame by reason of the pin 34 and by the outwardly extending ends of the legs 25 and 26.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as 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 electromagnet comprising a magnetic frame, an operating coil provided with an opening through its center, means for securing said coil to said frame comprising a guide extending through said coil opening and provided with a resilient end, and means for securing said guide to said frame after said resilient end has been forced against said coil a predetermined amount.

2. The combination with an electromagnet provided with a magnetic frame and an operating coil, having an opening through its center, of means for securing said coil to said frame comprising a pair of guides of U-shaped cross-section over a portion of their length, one of said guides being provided with a resilient end, and means for securing said guides to said frame with said U-shaped portions extending through the opening in said coil and on opposite sides thereof, and with said resilient end exerting a predetermined force against one end of said coil.

3. The combination with an electromagnet provided with a C-shaped magnetic frame and an operating coil having an opening through its center, of means for securing said coil within said frame comprising a pair of guides of U-shaped cross-section over a portion of their

length, the common ends of said guides being provided with resilient ends, means for centering said guides within the opening of said C-shaped frame, and means for securing said guides to said frame so that said resilient ends exert a predetermined force against one end of said coil.

4. In combination with an electromagnet provided with a magnetic frame, an armature and an operating coil having an opening through its center, of means for securing said coil within said frame comprising a pair of guides of U-shaped cross-section over a portion of the length, the common ends of said guides being provided with resilient ends, means for aligning said U-shaped portions of said guides so as to form free bearing surfaces for said armature, and means for securing said guides to said frame after said resilient ends have been pressed against said coil with a predetermined pressure.

5. The combination with an electromagnet provided with a C-shaped magnetic frame, an armature and an operating coil having a rectangular opening through its center, of means for securing said coil within said frame comprising a pair of guides provided with inwardly extending legs over a portion of their length, the common ends of said guides being resilient.

6. An electromagnet comprising a magnetic frame, a form wound coil provided with a rectangular opening through its center, a pair of U-shaped guides for said coil each of said guides being provided with a resilient end for engagement with one end of said coil, the other ends of said guides being provided with holes, supporting members provided with holes and rigidly secured to said frame, and a pin insertable into said holes for securing said guides against said coil after said resilient ends have been compressed a predetermined amount against one end of said coil.

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