

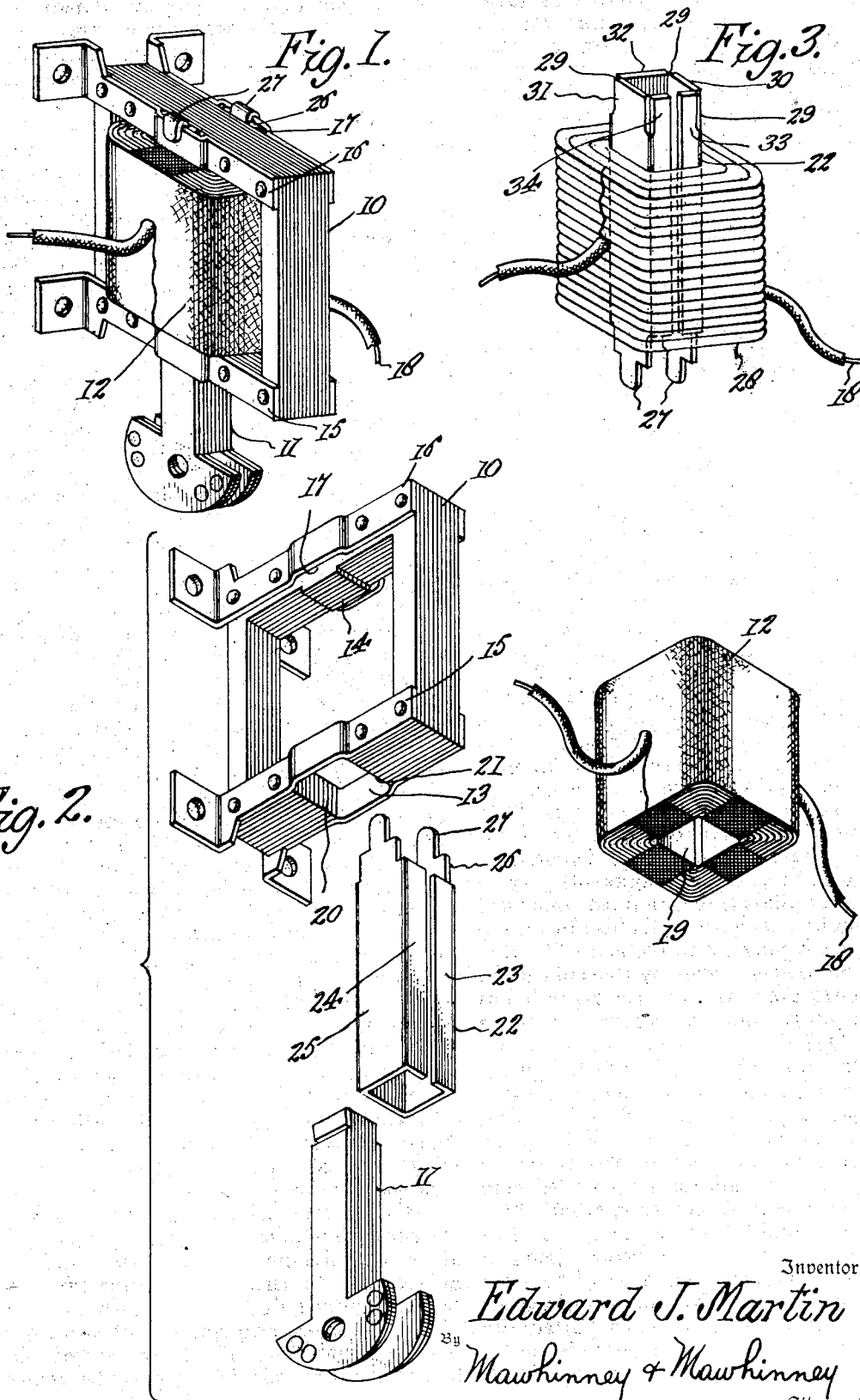
Jan. 11, 1944.

E. J. MARTIN

2,338,775

ELECTROMAGNET

Filed May 31, 1941



Inventor

*Edward J. Martin*

*Mawhinney & Mawhinney*

Attorneys

## UNITED STATES PATENT OFFICE

2,338,775

## ELECTROMAGNET

Edward J. Martin, New Orleans, La.

Application May 31, 1941, Serial No. 396,124

3 Claims. (Cl. 175—341)

The present invention relates to electromagnets and more particularly to electromagnets for use in the solenoid type of control switches such as disclosed in the Welch Patent No. 1,916,593.

An object of the present invention is to provide an electromagnet having improved means for mounting, holding and aligning the operating coil within the magnetic frame.

A further object of the invention is to provide an electromagnet which eliminates the chattering or humming noise usually attendant in the operation thereof.

A still further object of the invention is to provide an electromagnet having improved means for guiding and steadying the operation of the moving armature within the coil.

With the foregoing and other objects in view, the invention will be more fully described hereinafter, and will be more particularly pointed out in the claims appended hereto.

In the drawing, where like symbols refer to like or corresponding parts throughout the several views

Figure 1 is a perspective view of an electromagnet embodying the present invention.

Figure 2 is an exploded perspective view of the electromagnet shown in Figure 1, and

Figure 3 is a modified form of the invention.

Referring more particularly to the drawing and to Figures 1 and 2, one form of the invention is shown as applied to an electromagnet which comprises essentially a magnetic frame 10, a movable armature 11 and an operating coil 12. In order to permit the efficient operation with alternating current, the frame 10 and armature 11 are built up of a multiplicity of thin laminations of magnetic material as indicated in the drawing. Each of the superimposed laminations constituting the frame 10 is of C-shape in order to provide an opening 13 through which the armature 11 operates within the coil 12. The closed end of the C-frame is provided with a projecting portion 14 in alignment with the opening 13.

The laminations are clamped by opposing pairs of supporting members 15 and 16 and held together by rivets or the like. The two opposing supports 15 at the end of the frame 10 having the opening 13 therein bridge the sides of this opening to maintain the frame laminations on the opposite sides of the opening in alignment. These supports also serve as guides to confine the armature 11 in proper operating relation in the opening 13. The other pair of supporting members 16 at the opposite or rear end of the frame

are spaced apart from the frame 10 to form guideways 17 for a purpose to be described later.

The coil 12 is conventional, the same comprising an insulated conductor 18 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 with an opening 19 through the center.

The coil is placed between ends of the frame 10 so that the opening 19 in the coil is in alignment with the projection 14 and with the opening 13 provided between the inwardly extending ends 20 and 21 of the magnetic frame.

The operation of the armature 11 back and forth through the coil and frame sometimes injures both the frame and coil while emitting a chattering or humming noise. In order to rigidly secure the coil in position and eliminate the noises referred to, the present invention contemplates provision of a guide for the movement of the armature through the coil.

Generally such guide means comprises a single sheet of brass material bent to form a square tube and fitting in the coil opening and secured to the magnetic frame.

As illustrated in Figure 2, the guide as indicated by the numeral 22 is substantially square in cross-section although any suitable shape may be given to same. Such guide 22 is preferably formed from a single sheet of brass material bent to provide a one piece square tube with inwardly extending legs 23 and 24 spaced from each other. This spacing will permit a slight contraction before insertion and a corresponding expansion after insertion of the guide 22 in coil 12 to provide a snug assembly of coil and guide.

As thus constructed, the guide 22 provides ample bearing surfaces for movement of the armature 11 in its movement through the guide. At the same time, the guide 22 snugly encompasses the armature 11 to prevent the chattering or humming noise referred to and which is objectionable.

It will be noted that the guide 22 provides a continuous bearing surface for the armature except for the slight clearance between legs 23 and 24. The opposed sides 25 of the guide 22 have reduced portions 26 and 27 at the rear thereof

or in the portions which engage in the guideways 17. The reduced portions 27 form tabs to be utilized in the assembly of the guide to the frame 10.

In assembling the device, the coil 12 is placed within the frame 10 whereby the opening 19 of the coil is in registry with the projection 14 and opening 13 of the frame. Then the guide 22 is inserted through the opening 13 and opening 19, the reduced portions 26 and 27 sliding in the guideways 17 with the reduced portions 27 projecting therefrom. The tabs 27 are subsequently turned back over the guideways 17.

Thus by means of this construction it will be observed that the guide 22 not only secures the coil 12 firmly in place and in alinement with the frame 10 but it also protects the coil from injury by the armature 11 and at the same time affords suitable bearing surfaces for the armature to prevent the objectionable noise referred to. Furthermore, the coil is readily assembled within the frame and replacements can be made with a minimum of effort.

Referring now to the modified form of the invention illustrated in Figure 3, this form is to be used with the same frame and armature illustrated in Figures 1 and 2. In this form of the invention, however, the coil 28 is wound or formed directly on the guide 22 instead of being inserted separately therein as in Figures 1 and 2. Thus the coil 28 and guide 22 are handled as a single unit to facilitate assembly and replacement to and from the frame 10.

This form of the invention has tabs 27 which are similar to those illustrated in Figures 1 and 2 and are adapted to enter the guideways 17 and be turned back as in those figures. However the forward portion of the sleeve 22 is provided with slits 29 which form additional tab members 30, 31, 32, 33 and 34. As such, when the coil and sleeve are assembled in the frame, the tabs 30, 31, 32, 33 and 34 are bent back against the frame 10 to furnish additional support and to keep the coil in position.

In either form of the invention, the guide member 22 serves not only to rigidly secure the coil in position and protect it from damage by movement of the armature 11 but by providing a guide for the armature prevents undesired vibration or oscillation of the armature. The square tube type of guide means not only simplifies construction of the guide but also provides a great deal of bearing surface for the armature. The tabs on the guide member permit an easy assembly and replacement in the frame 10.

It is obvious that various changes and modifications may be made in the details of construction and design of the above specifically described embodiment of this invention without departing from the spirit thereof, such changes and modifications being restricted only by the scope of the following claims:

#### What is claimed is:

1. In an electromagnet comprising a magnetic frame, an operating coil provided with a bore extending axially therethrough, a guide member having greater length than said bore, said guide being of tubular form and constructed of an integral piece of material the side edges of which are disposed in spaced parallel relation to define a longitudinal slot extending from end to end of the guide member and permitting contraction and expansion of the guide member, said guide member being of a cross-sectional size requiring a slight contraction to enable it to be passed through the bore of the coil whereby when placed in position within the bore of the coil and released it will expand and grip the walls of the coil bore, an armature adapted for slidable movement in said guide, and means to removably connect said guide member to the magnetic frame.

2. In an electromagnet comprising a magnetic frame, an operating coil provided with a bore extending axially therethrough, a guide member having greater length than said bore, said guide being of tubular form and constructed of an integral piece of material the side edges of which are disposed in spaced parallel relation to define a longitudinal slot extending from end to end of the guide member and permitting contraction and expansion of the guide member, said guide member being of a cross-sectional size requiring a slight contraction to enable it to be passed through the bore of the coil whereby when placed in position within the bore of the coil and released it will expand and grip the walls of the coil bore, an armature adapted for slidable movement in said guide, means to removably connect said guide member to the magnetic frame, said magnetic frame having supports secured thereto and shaped to provide guideways between the frame and the supports in line with the side walls of the guide member, and said removable connecting means comprising extensions carried by opposite sides of said guide member at one end thereof, said extensions being inserted into said guideways adjacent to the magnetic frame, and tabs carried by the ends of the extensions and bent over said supports to secure the guide member and coil to the frame.

3. A tubular guide member for an electromagnet comprising an integral piece of material slotted longitudinally to permit contraction and expansion thereof, one end of said guide member having a pair of tabs extending therebeyond and adapted to be bent over to secure said guide member to one end of a frame, the other end of said guide member being slotted to provide tabs in excess of the first mentioned pair of tabs for securing the guide to the other end of a frame, and an operating coil wound upon and permanently secured to said guide member between the end portions.

EDWARD J. MARTIN.