May 3, 1938. W. FONDILLER 2,115,804

ELECTROMAGNETIC SWITCH

Filed Sept. 18, 1935

FIG. 1

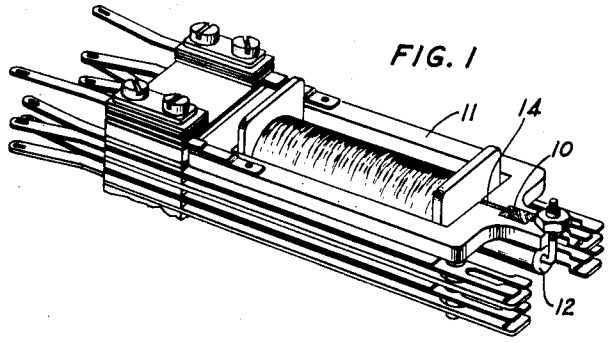


FIG. 2

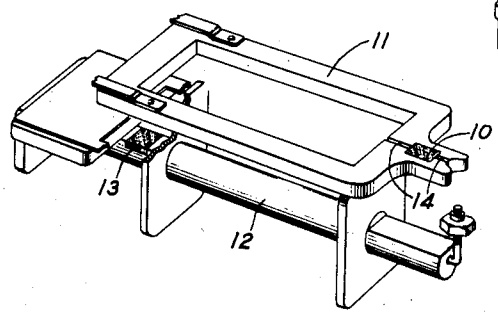


FIG. 3

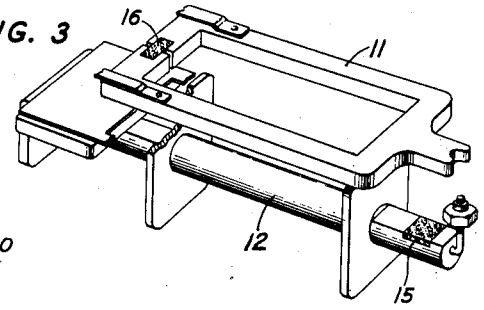


FIG. 5

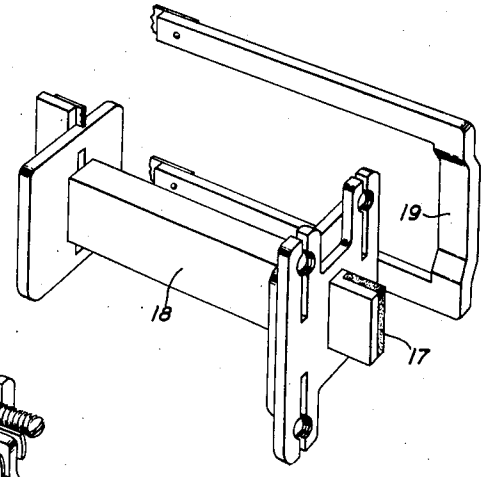
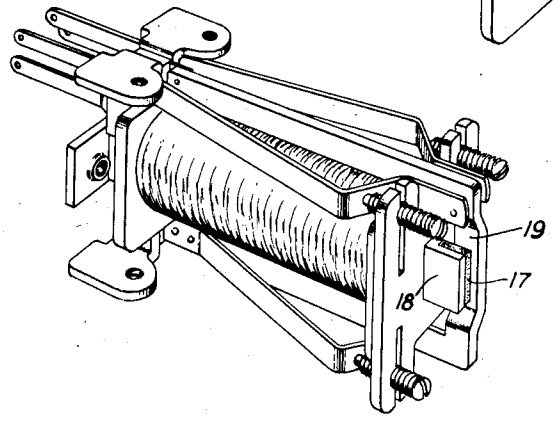


FIG. 4



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2,115,804

ELECTROMAGNETIC SWITCH

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4 Claims. (Cl. 175—336)

This invention relates to electrical switching devices, and more particularly to electromagnets.

In numerous cases where electromagnets are used to open and close circuits, it is very important to have the electromagnet as fast in its release as possible. This is particularly true in the case of electromagnets used in automatic telephone exchange systems to effect the interconnection of telephone lines; for example, in the so-called cross-bar type system.

The usual method of obtaining fast release characteristics in electromagnets is to increase the self-demagnetization factor of the magnetic circuit by means of air-gaps maintained between the core and armature in the operated position. This has the undesirable effect, however, of reducing materially the magnetic circuit efficiency with resultant increase in the required number of ampere turns for operation.

It is the object of this invention to speed up the release of electromagnets without materially affecting their operating efficiency, and this object I accomplish by introducing an auxiliary magnetic material, such as compressed powdered magnetic material at a critical point or points in the magnetic circuit, such as on the contacting area of either the armature or the core. This compressed powdered magnetic material possesses a high degree of self-demagnetization though its permeability is inferior to that of iron. The term "iron" is here used in a generic sense and includes the high permeability alloys commonly used in electromagnets, such as silicon steel, permalloy, etc. The presence in the magnetic circuit of the auxiliary magnetic material will not materially increase the reluctance of the magnetic circuit, but will be very effective in reducing its retentivity.

In the illustrations, compressed powdered magnetic material is shown as the auxiliary material. It should be understood, however, that other alloys having lower permeability than iron can be used and will approximate the improvement in release characteristics obtained with the powdered material.

Referring to the drawing,

Fig. 1 is a perspective view of an assembled relay in which this invention is embodied;

Fig. 2 is a perspective view of the armature and core with the powdered magnetic material located on the front end of the armature and the rear portion of the core;

Fig. 3 is a perspective view of the armature and core with the powdered magnetic material located on the front portion of the core and the rear of the armature;

Fig. 4 is a perspective view of another type of relay in which my invention is embodied; and

Fig. 5 is a perspective view of the armature and core thereof.

The relay shown in Figs. 1, 2, and 3 of the drawing has the same mechanical arrangement as that shown in Patent 1,973,090 to D. D. Miller, issued September 11, 1934, and reference is made to that patent for a description of these details.

One embodiment of the invention is illustrated in detail in Figs. 1 and 2. As shown in these figures, the self-demagnetizing compressed powdered magnetic material takes the form of an insert 10 in the armature 11 where the armature is to make contact with the core 12 when the armature is attracted. The rear of the core where the armature rests on the same is also provided with a similar insert 13. This insert 13 is provided in the rear of the core due to the character of the magnetic circuit of this relay; that is, this relay is provided with a closed magnetic circuit at its rear end and the insert is located at this point to afford quick release of the armature. Since the compressed powdered magnetic material is brittle, I prefer to so locate it that a strip of the armature metal surrounds the material. This I accomplish by compressing magnetic material and locating it in an aperture in the armature. In order to effect quicker release of the armature, I preferably break the magnetic circuit at this point by saw cuts 14.

Referring now to Fig. 3, in the construction there shown, I have reversed the position of the inserts, the core insert 15 being near the front end of the core and the armature insert 16 at the rear of the armature, the magnetic circuit being broken adjacent the insert 16.

Referring now to Figs. 4 and 5, the relay shown in these figures has the same mechanical arrangement as that shown in the patent to E. B. Craft, No. 1,121,897, of December 22, 1914, and reference is made to that patent for a description of these details. In this embodiment of the invention, the compressed powdered magnetic insert 17 is located on the core 18 at the point where armature 19 makes contact therewith.

What is claimed is:

1. In an electromagnet, a core, a winding thereon, a perforated armature, compressed powdered magnetic material in the perforation in said armature and said armature being slit adjacent opposite sides of the powdered magnetic material to interpose a break in the magnetic circuit.

2. In an electromagnet, a core, a winding thereon, an armature, said core being provided with an indentation filled with compressed powdered magnetic material where said core engages the armature.

3. In an electromagnet, a core, a winding thereon, an armature, a mounting plate, said armature being hinged thereto at its rear and resting thereat on said core and having an aperture adjacent its rear portion in which is located compressed powdered magnetic material, said armature having a free end spaced from a forward end of said core and to be attracted thereto, said core at its forward end being provided with compressed powdered magnetic material where it is engaged by the armature when said armature is attracted.

4. In an electromagnet, a core, a winding thereon, an armature having one end resting on an end portion of said core and a free end spaced from and to be brought into engagement with an opposite end portion of said core, said armature being provided at its free end where it is to engage the core with compressed powdered magnetic material, slight air-gaps being provided on both sides of said material, and said core being provided at the point upon which said armature rests with an insert of compressed powdered magnetic material.

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