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M. G. NELSEN

2,360,008

ELECTROMAGNET

Filed April 16, 1942

Fig. 1.

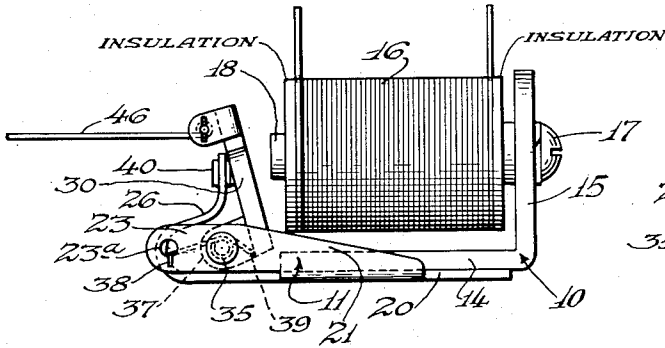


Fig. 2.

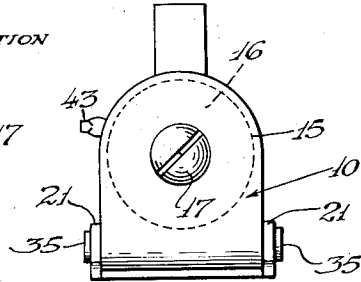


Fig. 3.

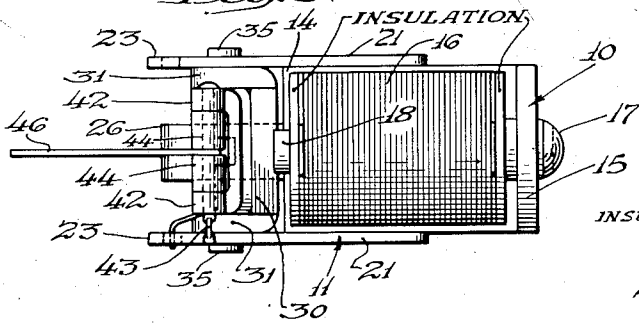


Fig. 4.

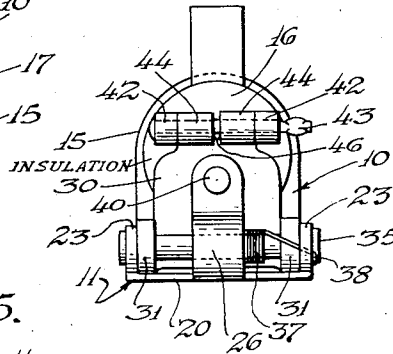
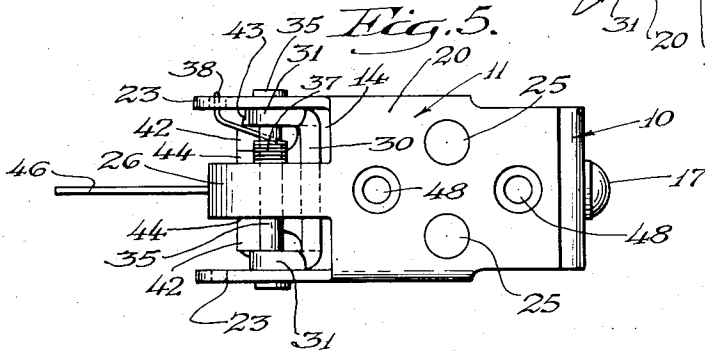


Fig. 5.



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UNITED STATES PATENT OFFICE

2,360,008

ELECTROMAGNET

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1 Claim. (Cl. 175—336)

This invention relates to electromagnets, and more particularly to electromagnets of relatively small size, sometimes termed "miniature" or "midget," and which are especially suitable for use in operating various types of devices, apparatus, or mechanisms, by the movement of the armature.

In connection with relatively small size electromagnets, it has heretofore been proposed that the field pieces and armatures be formed to relatively exact dimensions by performing milling and drilling operations thereon with a view to obtaining relatively accurate construction and operation of the electromagnet. In electromagnets of this type, it is highly desirable that the parts be so made and assembled as to reduce to a minimum the lateral flexing of the armature with respect to its mounting in the field piece. In producing electromagnets of this small type by performing milling and drilling operations upon the parts, in addition to being relatively expensive, both in fabrication of the parts and in assembling thereof, there frequently resulted misalignment of cooperating apertures formed in the hinge end of the armature, or in the apertures formed in the lugs of the field piece. This results in difficulty in assembling and often results in improper seating of the armature on the end of the core of the coil and may cause inaccurate movement of the armature, and impairment of operation of devices and mechanism actuated by the movement of the armature.

One of the primary objects of this invention is to provide a novel and improved construction of relatively small size electromagnet, wherein the armature and the field piece are formed as sheet metal stampings, and are so constructed as to insure relatively exact alignment of parts for proper and efficient operation of the electromagnet.

Another object is to provide an improved electromagnet of the character indicated, by virtue of which it is possible to dispense with expensive milling and drilling operations on the armature and field piece.

A further object is to provide a novel and improved electromagnet of small size, wherein the field structure is initially formed of two separate sheet metal stampings, rigidly connected together in assembly, for efficient and economical production.

Still another object is to provide a novel and improved construction of relatively small size electromagnet, wherein the mounting of the

armature on the field piece is such as to reduce to a practical minimum the lateral flexing of the armature relatively to the field piece at the hinge connection of these parts.

5 A still further object is to provide an improved, relatively small size electromagnet which is simple in construction, durable in operation, and capable of being economically manufactured.

10 Further objects and advantages of this invention will be apparent from the following description, taken in connection with the accompanying drawing, in which:

15 Figure 1 is a view in side elevation of the electromagnet embodying the present invention;

Figure 2 is a rear end elevational view;

Figure 3 is a top plan view;

Figure 4 is an end elevational view of the armature end of the electromagnet; and

20 Figure 5 is a bottom plan view.

Relatively small size electromagnets of the type embodying the present invention are especially suitable for operating directly, incident to movement of the armature, various types of devices, apparatus and mechanisms. The size electromagnet represented in the drawing is frequently referred to in the trade as a "midget" size, and operates by a relatively small amount of power in a range of, say, two or three 30 watts. To facilitate a clear understanding of the construction embodied in my novel electromagnet, the illustrations in the drawing are approximately three times actual size of the device.

35 Referring now in detail to the drawing, the novel electromagnet includes a field structure including a main field piece member 10, and an auxiliary field piece 11, both of which parts are formed as stampings. The main field piece 10 includes a horizontally extending leg 14 which 40 terminates at one end in an upstanding vertical leg 15. Carried by the main field piece 10 is a horizontally disposed coil 16, one end of which is rigidly attached to the vertical leg 15 of the main field piece by a screw 17. The coil is provided 45 with a core 18, one end of which projects beyond the coil, at the end opposite the mounting thereof to the upright leg 15, as clearly seen in the drawing.

50 The auxiliary field piece 11 includes a body portion 20, with the marginal side edges of the forward portion thereof continuing with upstanding sides or flanges 21, with the terminal ends of said flanges protruding forwardly a substantial distance beyond the free end of the hori-

zontal leg 14 of the main field piece, so as to constitute mounting lugs 23. The auxiliary field piece embraces the horizontal leg 14 of the main field piece, as clearly seen in the drawing, with the flanges 21 snugly fitting against the side edges of said horizontal leg. The parts constituting the field structure and composed of the main field piece 10 and auxiliary field piece 11 are rigidly and permanently connected together in such assembled relation by spot-welding at two places as indicated at 25 on Figure 5.

Protruding forwardly from the body portion 20 of the auxiliary field piece 11, substantially centrally thereof, as may be seen in the drawing, is an elongated member 26 terminating adjacent the outer ends of the side flanges 23 in an upwardly bent arm, as clearly seen in Figure 1 of the drawing, to constitute a stop for limiting outward movement of the armature, as will be presently described.

An armature 30, also formed as a sheet metal stamping, is disposed in upright position for cooperative engagement with the end of the core 18, upon energizing of the coil 16. The lower end of said armature is formed with a pair of spaced apart forwardly extending lugs 31, which are dimensioned for a relatively close fit between the lugs 23 constituting the terminal extensions of the side flanges 21 of the auxiliary field piece 11. Said lugs 31 of the armature and the lugs 23 of the auxiliary field piece are formed with aligned apertures for accommodating a hinge pin 35, preferably formed of brass.

Mounted on the hinge pin 35, at one end, is a coil spring 37, one end of which, as indicated at 38, is anchored in an aperture 23a formed in the outer end of the adjacent lug 23, while the other end of the coil spring, indicated at 39, abuts against the lower edge of the armature, as seen in Figure 1 of the drawing, so as to normally yieldingly urge the armature away from the core of the coil and against the stop 26, as seen in Figure 1. The upper end of the stop 26 is provided with a brass rivet 40, the purpose of which is to break the magnetic field between the armature and the field piece, in a manner well understood in the art.

The upper end of the armature 30 is formed as a yoke including a pair of spaced apart, forwardly extending lugs 42, having formed therein a pair of aligned apertures for receiving a pivot pin 43. Mounted on the pin 43 intermediate the lugs 42 are spacer members 44, and between which spacer members, as clearly seen in the drawing, is swivelly mounted the looped end of an operating rod or arm, as indicated at 46, the free end of which, it may be understood, is adapted to be connected to any suitable mechanism, device or apparatus adapted to be operated incident to movement of the armature 30.

By virtue of the use of the spacers 44, it is possible to obtain a relatively close fit with respect to the looped end of the rod 46 so as to preclude

appreciable lateral flexing of the rod 46 at its end of connection to the armature.

When the field structure composed of field pieces 10 and 11 has been assembled together, the body 20 of field piece 11 and the horizontal leg 14 of field piece 10, in effect provide a unitary mounting base which is formed with a pair of spaced-apart threaded apertures 48 for convenient anchorage to a suitable mounting.

The construction herein shown and described lends itself to practical and economical assembly of parts, while at the same time insuring relatively accurate alignment of apertures of cooperating parts. By forming the armature and the combined field piece as stampings, it will be apparent that it is possible to accurately produce large quantities of the devices in a practical and economical fashion.

While in the claim I have used the terms "horizontal" and "vertical," in defining the relationship of parts, it is to be understood that the terms have been used merely for convenience, and it is intended that the terminology be given full range of equivalency when considering devices of this type when anchored upon a vertical mounting surface in lieu of a horizontal mounting surface.

Although I have herein shown and described a preferred embodiment of my invention, manifestly it is capable of modification and rearrangement of parts without departing from the spirit and scope thereof. I do not, therefore, wish to be understood as limiting this invention to the precise embodiment herein disclosed, except as I may be so limited in the appended claim.

I claim as my invention:

In an electromagnet of relatively small size, the combination of a main field piece including a horizontal leg and a vertical leg, a horizontally disposed coil connected at one end to said vertical leg, an auxiliary field piece formed as a sheet metal stamping including a body portion rigidly connected to said horizontal leg of the main field piece, the outer end of said body portion, beyond the free end of said coil, being formed with a pair of upstanding lugs, an upright armature formed as a sheet metal stamping and having a pair of spaced apart lugs at its lower end hingedly connected to said lugs of the auxiliary field piece, so as to dispose the armature in a position to cooperate with the end of the core of said coil, the outer end of the auxiliary field piece being formed with an upstanding leg projecting intermediate said lugs at the lower end of the armature and serving as a stop for limiting outward movement of the armature, the upper end of said armature being formed with a pair of spaced-apart outwardly extending lugs to provide a pivotal connection for a member to be operated incident to movement of the armature.

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