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3,268,841

ELECTROMAGNET DEVICE HAVING A MULTI-MEMBER CORE ASSEMBLY

Filed July 27, 1964

2 Sheets-Sheet 1

FIG. 1

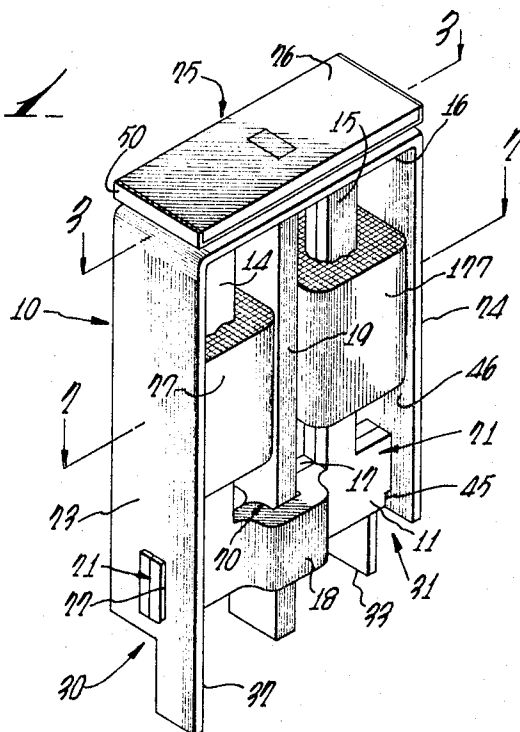


FIG. 2

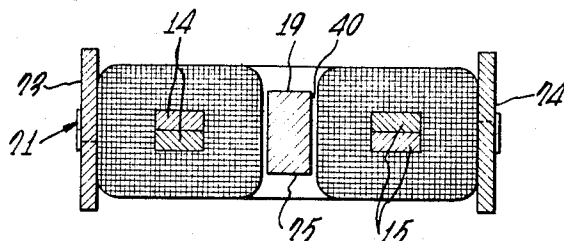
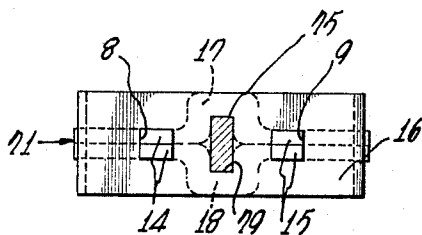


FIG. 3

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FIG 4

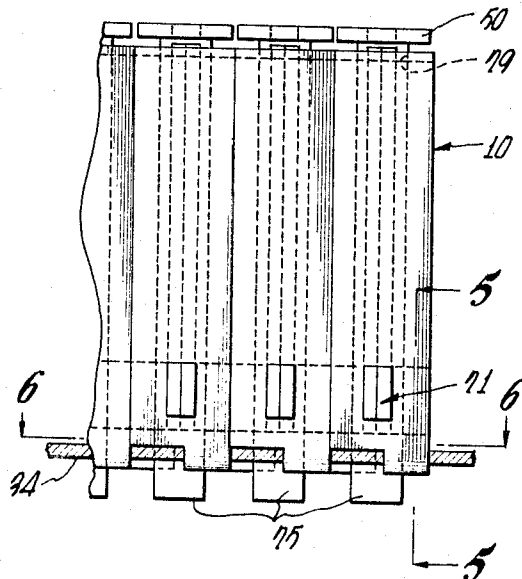


FIG 5

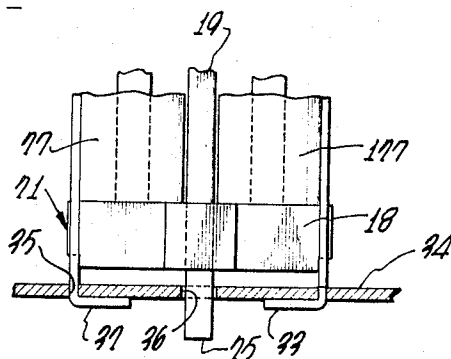
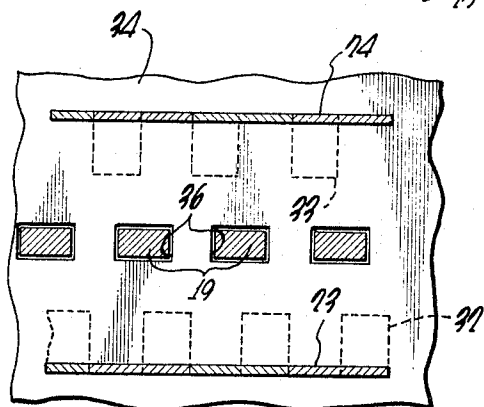


FIG 6

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ELECTROMAGNET DEVICE HAVING A MULTI-MEMBER CORE ASSEMBLY

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5 Claims. (Cl. 335-266)

This invention relates to electromagnets and has particular reference to electromagnets capable of being manufactured in extremely small sizes.

In certain applications, such as remotely controlled data printing machines and the like, it is desirable to stack a plurality of electromagnets together at a relatively small center to center distance, i.e., on the order of .20 inch apart. When so restricted in size, the usual form of solenoid or electromagnet becomes inefficient and often too weak to operate properly.

It therefore becomes a principal object of the present invention to provide an electromagnet having a minimum dimension in at least one direction.

Another object is to provide an electromagnet of the above type which is inexpensive to manufacture and assemble.

Another object is to provide an electromagnet of the above type which is highly efficient in operation.

Another object is to provide an electromagnet of the above type in which the electromagnetic coils may be wound independently and thereafter assembled into the frame.

Another object is to provide electromagnets of the above type which may be located in side by side relation without interfering with the action of each other.

The manner in which the above and other objects of the invention are accomplished will be readily understood on reference to the following specification when read in conjunction with the accompanying drawing, wherein:

FIG. 1 is a perspective view of a preferred form of the present invention.

FIG. 2 is an enlarged sectional plan view of the electromagnet and is taken along the line 2-2 of FIG. 1.

FIG. 3 is a sectional plan view of the electromagnet and is taken substantially along the line 3-3 of FIG. 1.

FIG. 4 is an elevational view showing an assembly of electromagnets according to the preferred form of the invention.

FIG. 5 is a fragmentary elevational view of part of the electromagnet and is taken substantially along the line 5-5 of FIG. 4.

FIG. 6 is a sectional plan view taken substantially along the line 6-6 of FIG. 4.

With reference to the drawings, the invention comprises, in general, a U-shaped frame 10 of non-magnetic material. A pair of core pieces 11 and 12 of soft magnetic material, such as soft iron, are mounted in side by side relation to one another within the frame 10. Each core piece comprises a pair of spaced parallel pole legs 14 and 15 which are fitted at their upper ends into holes 8 and 9 formed in a horizontal cross piece or leg 16 of the frame 10. The core pieces also have connecting webs or crosspieces 17 and 18, respectively, adjacent their lower extremities. The crosspieces are formed outwardly from each other at their centers to conjointly form a bearing or guideway 20 and also have projecting ends 21 extending through openings 22 in downwardly extending legs 23 and 24 of the U-shaped frame 10. The ends of the core pieces fit snugly together in the various openings 8, 9 and 21 in the frame 10 and are thus securely locked in place in the frame.

An armature 25 is shown in the form of a stem 19 of non-magnetic material to which is suitably attached a head 26 of soft magnetic material. The stem is of rec-

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tangular cross section and is slideably mounted at its lower end in the bearing 20 and at its upper end in a bearing slot 29 formed in the upper leg 16 of frame 10. The head 26 cooperates with the core pieces 11 and 12 to form a magnetic circuit which is broken only by the gaps formed between the upper ends of the pole legs and the head 26. A pair of electromagnetic coils 27 and 127 are fitted around the pole legs of the two core pieces and extend the length thereof. The coils terminate at their upper ends against the frame leg 16 and at their lower ends against the crosspieces 17 and 18.

The U-shaped frame 10 is of a sufficient thickness to give a durable and rigid support to the core pieces 11 and 12 held therein. The downwardly extending legs 23 and 24 of the frame can be seen to be notched away at 30 and 31, resulting in a pair of tongues 32 and 33 respectively. As clearly illustrated in FIG. 5, the frame is shown mounted into a wall 34 and the tongues can be seen to extend through openings 35 in the wall and are bent upwardly against the bottom surface of the wall, thereby holding the frame rigidly in place. The wall also has an aperture 36 (FIG. 6) therein through which the armature stem 19 projects so that it may mechanically actuate any suitable device, such as an electric switch.

It will be noted in FIGS. 4 and 6 that the tongues 32 and 33 are disposed laterally from each other to insure rigid lateral support of the frame and to permit additional frames to be located side by side without requiring continuous openings 35 in the wall.

As viewed in FIG. 4, a plurality of electromagnets, each similar to the electromagnet shown in FIGS. 1 to 3, are rigidly mounted on the wall 34 in side by side relation with one another. This arrangement is most desirable because a large number of these magnets can thus be so arranged in a minimum amount of space.

The coils 27 may be wound independently of their respective core pieces and thereafter slipped over the pole legs 14 and 15 of the two core pieces.

On reference to FIG. 2, the armature stem is shown in section and can be seen to have a clearance 40 between it and the coils on either side.

The downwardly extending legs 23 and 24 of the frame 10 together have a certain amount of resiliency. During assembly this is used to an advantage in that the legs are spread apart slightly, permitting the projecting ends 21 of the core pieces to be inserted in the openings 22. When the legs are bent to be inserted in the openings 35 they engage shoulders 45 on the core pieces, thus locking the assembly in place.

The magnetic head 26 has a thin copper seat or plate 50 bonded to its lower surface and extending the length thereof. This seat is actually the contacting element between the head 26 and the pole pieces during energization of the coils 27 and 127. It is supplied to help give the head a clean break from the pole pieces as the magnet is de-energized. Otherwise, residual magnetism would hold the two together for a short period of time, creating a delay or lag in operations.

The coils 27 and 127 are preferably connected in circuit with each other and with a source of electric current (not shown) in such a manner as to aid each other in generating a magnetic flux in the core pieces and armature head 26.

Although the invention has been described in detail and certain specific terms and languages have been used, it is to be understood that the present disclosure is illustrative rather than restrictive and that changes and modifications may be made without departing from the spirit or scope of the invention as set forth in the claims appended hereto.

Having thus described the invention, what is desired to be secured by United States Letters Patent is:

1. An electromagnet comprising a pair of core pieces

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of magnetic material arranged in side-by-side relation, said core pieces each having two spaced parallel pole legs and a web extending between said legs adjacent the bottoms of said legs;

portions of said webs intermediate said legs extending 5 outwardly to conjointly form a first bearing, said webs having portions extending beyond said legs, a frame of non-magnetic material, said frame having a first pair of openings fitted over the tops of said legs, 10 said frame having a second pair of openings fitted over said portions of said webs whereby to retain said core pieces in side-by-side relation, said frame having an additional opening forming a second bearing aligned with said first bearing, 15 an armature comprising a stem slideable longitudinally in said bearings and a head of magnetic material at one end of said stem and cooperable with said pole legs; and a pair of electromagnetic coils surrounding said pole legs intermediate said webs and the cross web of said frame whereby to induce a magnetic flux into said core pieces.

2. An electromagnet comprising a pair of core pieces of magnetic material arranged in side-by-side relation, said core pieces each having two spaced parallel pole legs and a web extending between said legs adjacent the bottoms of said legs;

portions of said webs intermediate said legs extending outwardly to conjointly form a first bearing, 25 a U-shaped frame of non-magnetic material, means attaching said core pieces to said frame, said frame having an opening forming a second bearing aligned with said first bearing,

an armature comprising a stem slideable longitudinally 30 in said bearings and a head of magnetic material at one end of said stem cooperable with said pole legs; and a pair of electromagnetic coils surrounding said pole legs intermediate said webs and the cross web

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of said frame whereby to induce a magnetic flux into said core pieces.

3. An electromagnet comprising a pair of core pieces of magnetic material arranged in side-by-side relation, said core pieces each having two spaced parallel pole legs and a web extending between said legs adjacent the bottoms of said legs;

portions of said webs intermediate said legs extending outwardly to conjointly form a first bearing, 5 said webs having portions extending beyond said legs, a U-shaped frame of non-magnetic material, said frame having a cross piece and two spaced frame legs,

said cross piece having two spaced openings fitted over the tops of said pole legs,

said frame legs having openings fitted over said portions of said webs,

said cross piece having an additional opening forming a second bearing aligned with said first bearing, 10 an armature comprising a stem slideable longitudinally in said bearings and a head of magnetic material at one end of said stem and cooperable with said pole legs; and

a pair of electromagnetic coils surrounding said pole legs intermediate said webs and said cross piece.

4. An electromagnet according to claim 3 comprising bendable tongues extending from said frame legs for attaching said frame to a supporting wall.

5. An electromagnet according to claim 3 comprising bendable tongues extending from the ends of said frame legs remote from said cross piece, said tongues being out of alignment with each other and said tongues being effective to attach said frame to a supporting wall.

No references cited.

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