

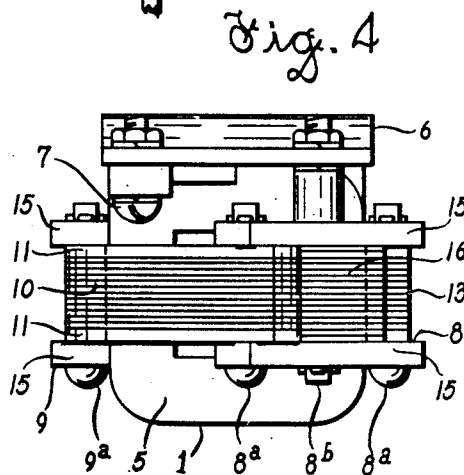
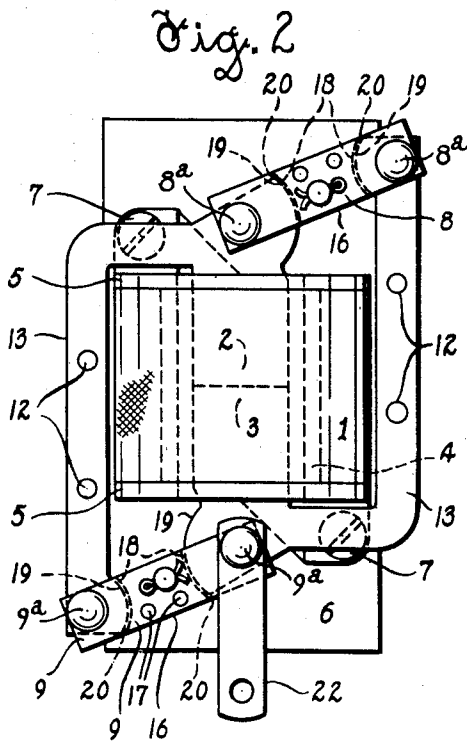
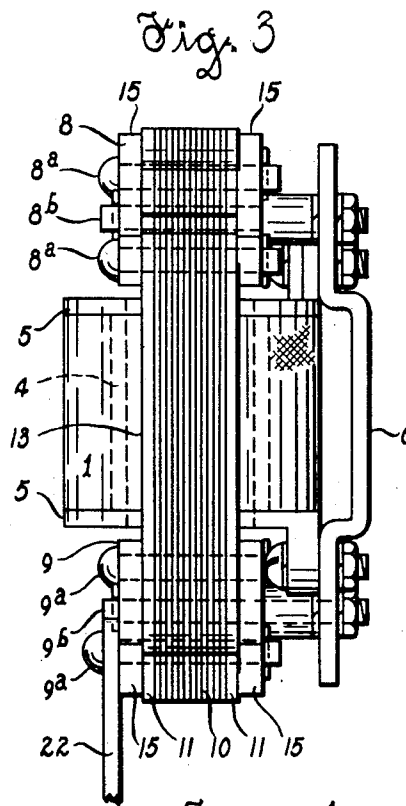
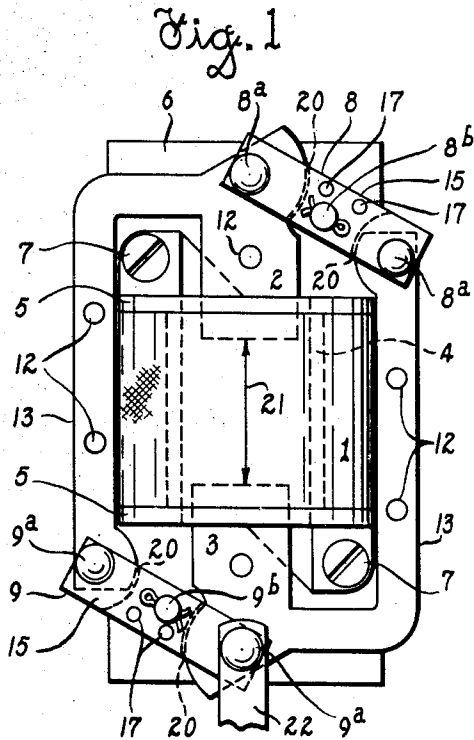
Feb. 22, 1949.

C. T. EVANS

2,462,482

ELECTROMAGNET WITH PLUNGER

Filed April 23, 1946



Inventor
Clarence T. Evans
By Frank H. Hubbard
Attorney

UNITED STATES PATENT OFFICE

2,462,482

ELECTROMAGNET WITH PLUNGER

Clarence T. Evans, Wauwatosa, Wis., assignor to
Cutler-Hammer, Inc., Milwaukee, Wis., a cor-
poration of Delaware

Application April 23, 1946, Serial No. 664,167

2 Claims. (Cl. 175—341)

1

This invention relates to electromagnets, and more particularly to electromagnets of the type including a stationary magnet coil having a pair of opposed operating plungers associated with opposite ends thereof.

The invention has among its objects to provide an improved unitary electromagnet of the double plunger type which is exceedingly compact and rugged in construction, efficient and reliable in operation and which consists of a relatively small number of parts which can be readily manufactured and assembled at low cost.

Another object is to provide a unitary electromagnet of the aforesaid type in which the operating plungers are pivotally supported and operatively connected to each other by linkages to enable push or pull operation of an associated load from either end of the magnet by joint action of the plungers.

Another object is to provide an electromagnet of the aforesaid type in which the plungers and their associated linkages are constructed and arranged to reduce the weight and overall size of the magnet.

Another object is to provide an electromagnet in which the plungers and their associated linkages are constructed and arranged to provide a statically balanced structure for preventing relative movement of the plungers under the action of accelerating forces caused by shock.

Various other objects and advantages of the invention will hereinafter appear.

The accompanying drawing illustrates an embodiment of the invention which will now be described, it being understood that various modifications may be made in the embodiment illustrated without departing from the spirit and scope of the appended claims.

In the drawing,

Figure 1 is a front elevational view of an electromagnet embodying the invention with the operating parts of the magnet shown in normal position;

Fig. 2 is a similar view illustrating the operating parts of the magnet in attracted position;

Fig. 3 is a side elevational view of the magnet illustrated in Fig. 1, and

Fig. 4 is a top view thereof.

Referring to the drawing, the same illustrates an alternating current magnet including a stationary magnet coil 1 having a pair of operating plungers 2 and 3 associated with opposite ends thereof. Magnet coil 1 is wound upon an insulating spool 4 having end flanges 5 which are secured to a rear base plate 6 by bolts 7. Plungers

2

2 and 3 are pivotally supported and operatively connected to each other by a pair of levers 8 and 9 which provide for movement of said plungers in unison between the extreme positions illustrated in Figs. 1 and 2 upon energization and deenergization of coil 1.

More specifically, plungers 2 and 3 are of like construction, each being formed of laminations 10 which are clamped between side plates 11 by rivets 12. Each of the plungers 2 and 3 has an integral extension formed on one side thereof which is L-shaped to provide an elongated vertically disposed arm 13, and said plungers are arranged in opposed relation within opposite ends of coil 1 with the arms 13 thereof disposed on opposite sides of said coil.

Lever 8 is pivotally connected at opposite ends to plunger 2 and to the upper end of arm 13 of plunger 3 by pins 8^a, and lever 9 is pivotally connected at opposite ends to plunger 3 and to the lower end of arm 13 of plunger 2 by pins 9^a. Levers 8 and 9 are pivotally supported at points midway between the ends thereof upon pivot pins 8^b and 9^b, respectively, which are fixed to base 6.

Levers 8 and 9 are of like construction, and as shown in Fig. 4 each of the same comprises a pair of spaced side arms 15—15 having a magnetic laminated section 16 clamped therebetween by rivets 17. The side arms 15 of levers 8 and 9 are preferably non-magnetic and are spaced to engage plungers 2 and 3 on opposite sides thereof. As shown in dotted lines in Fig. 2 the laminated section 16 of lever 8 extends between plunger 2 and the upper end of arm 13 of plunger 3, while the laminated section 16 of lever 9 extends between plunger 3 and the lower end of arm 13 of plunger 2. Also as illustrated in dotted lines in Fig. 2 the laminated section 16 of levers 8 and 9 are provided with circular end faces 18 which cooperate with circular faces 19 on plungers 2 and 3 and their associated arms 13 to provide narrow circular air gaps 20 which are concentrically disposed with respect to the axes of the pivot pins 8^a and 9^a.

Plungers 2 and 3 are normally positioned as shown in Fig. 1 with an air gap 21 between the opposing pole faces thereof, and as is apparent levers 8 and 9 provide for equal movements of said plungers in unison into the attracted position shown in Fig. 2 upon energization of coil 1 and for return thereof in unison to the position shown in Fig. 1 upon deenergization of said coil. Also as is apparent, during movement of plungers 2 and 3 in opposite directions between the positions shown in Figs. 1 and 2 the arms 13 thereof

are maintained in parallel relation by levers 8 and 9 for vertical positioning of said plungers within coil 1.

The above described magnet construction is advantageous in that levers 8 and 9 and the arms 13 provide two magnetic circuits between plungers 2 and 3 having fixed air gaps 20. Thus the air gap 21 between plungers 2 and 3 is the only air gap in the magnet circuit which changes in length during movement of said plungers into the attracted position shown in Fig. 2. Also it should be noted that plungers 2 and 3 are pivotally supported by levers 8 and 9 to provide for free movement thereof and are also statically balanced by said levers to insure against relative movement thereof under the action of accelerating forces caused by shock.

The above described magnet structure is also advantageous in that the same can be connected at either end to an associated device such as a brake or a switch to provide for either push or pull operation of the device by joint action of the plungers 2 and 3 during movement thereof into the attracted position shown in Fig. 2. As shown in Fig. 1, pull operation of a device can be effected by means of a link 22 which is connected to plunger 3 by means of its associated pivot pin 9^a. On the other hand, for push operation of a device the link 22 can be connected to the pivot pin 9^a associated with the arm 13 of plunger 2.

What I claim as new and desire to secure by Letters Patent is:

1. The combination with a stationary magnet coil, of a pair of opposed operating plungers extending into opposite ends of said coil and normally spaced apart to provide an air gap therebetween, each of said plungers having an arm on one side thereof and said arms being disposed in parallel relation on opposite sides of said coil,

and a pair of levers disposed adjacent opposite ends of said coil and each having one end pivotally connected to one of said plungers and its opposite end pivotally connected to the arm on the other of said plungers, said levers being pivotally supported upon stationary pivot pins located midway between the ends thereof and providing for equal movements of said plungers in unison toward and away from each other to close and open said air gap upon energization and deenergization of said coil.

2. The combination with a stationary magnet coil, of a pair of opposed operating plungers extending into opposite ends of said coil and normally spaced apart to provide an air gap therebetween, said plungers each having an arm on one side thereof and said arms being disposed in parallel relation on opposite sides of said coil, and a pair of pivoted levers disposed adjacent opposite ends of said coil and each having one end connected to one of said plungers and its opposite end connected to the arm on the other of said plungers, said levers providing for equal movements of said plungers in unison toward and away from each other to close and open said air gap upon energization and deenergization of said coil and said levers and said arms constituting return magnetic circuits between said plungers around opposite sides of said coil.

CLARENCE T. EVANS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,155,157	Lewis	Sept. 28, 1915