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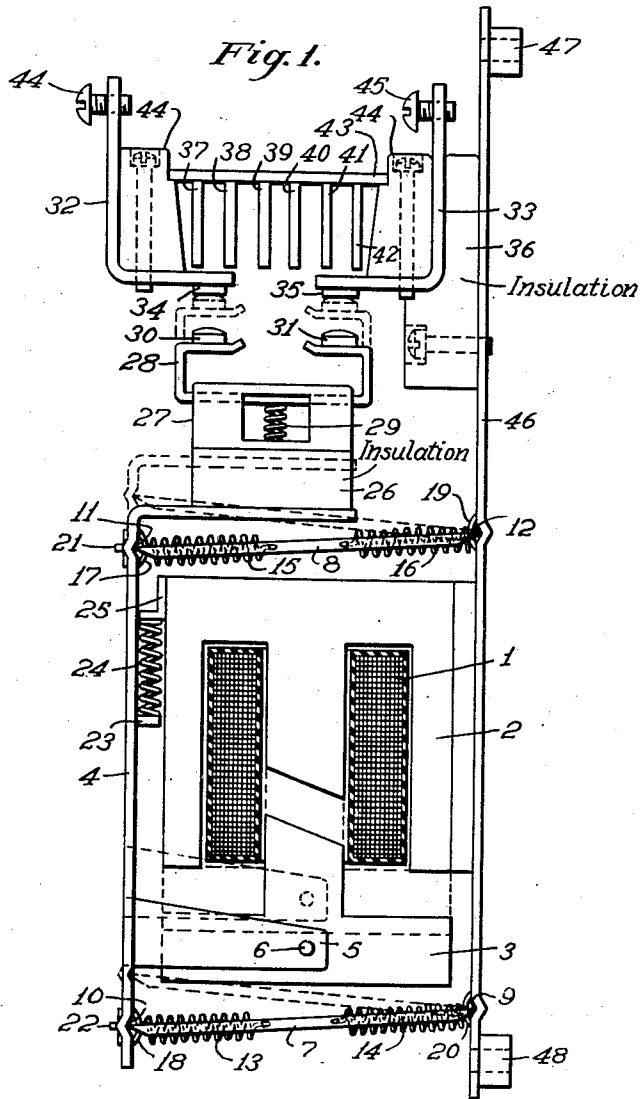
W. I. BENDZ

2,310,056

MAGNETIC CONTACTOR

Filed Dec. 4, 1940

2 Sheets-Sheet 1



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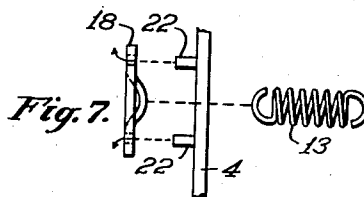
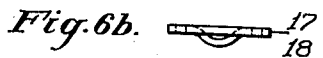
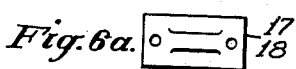
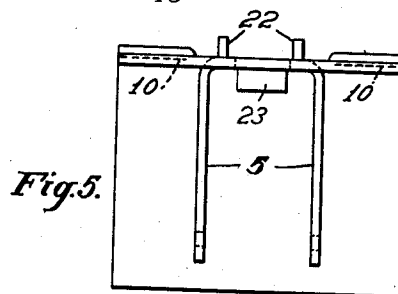
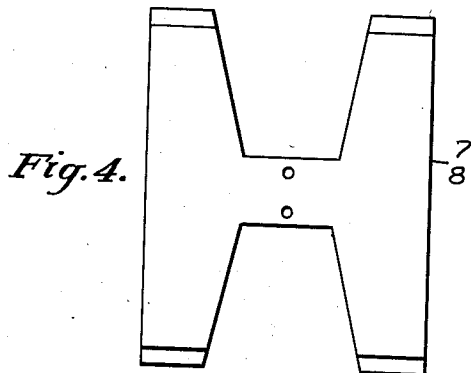
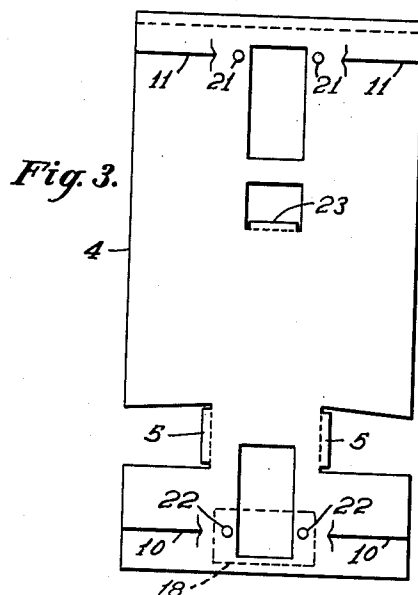
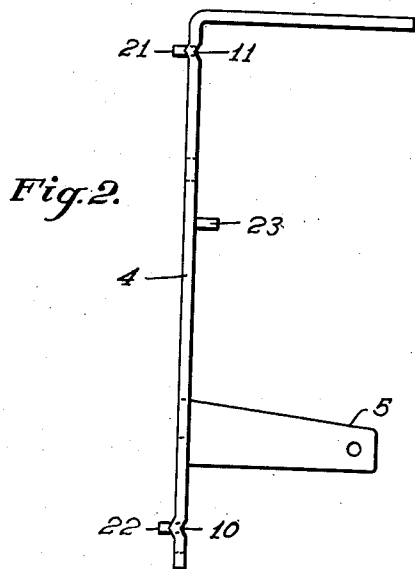
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,310,056

MAGNETIC CONTACTOR

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pany, East Pittsburgh, Pa., a corporation of
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Application December 4, 1940, Serial No. 368,493

5 Claims. (Cl. 200—111)

My invention relates to an electrical switch construction and more specifically to an alternating-current magnetic contactor.

In the past, magnetic contactors have possessed one outstanding disadvantage fundamentally due to the fact that the vertical plunger was not closely guided, and to the fact that the armature movement was not guided independently of the solenoid. The solenoid plungers in such structures would often stick in their guides which provided a loose fitting, thereby preventing either opening or closing of the contactor when its operating coil was energized or deenergized.

An object of my invention is to provide a magnetically operated contactor with a novel design so that the moving armature is guided with a close fit and guided independently of the solenoid, thereby eliminating the possibility of the solenoid plunger rubbing or sticking against its guide.

Another object of my invention is to provide a magnetic contactor with knife-edge pivots on its armature assembly so as to minimize the effects of friction and to avoid sluggish operation.

Another object of my invention is to provide a magnetic contactor which has readily dismountable pivots by virtue of which the armature assembly can be readily removed and replaced.

Another object of my invention is to provide a magnetic contactor which is relatively simple in construction, inexpensive to manufacture, and yet highly reliable in operation.

Other objects and advantages will become more apparent from a study of the following specification when considered in conjunction with the accompanying drawings, in which:

Figure 1 is a side view partly in cross section of a magnetic contactor embodying the principles of my invention;

Fig. 2 is a side view of the armature shown in Fig. 1;

Fig. 3 is a rear view of the armature shown in Fig. 2;

Fig. 4 is a bottom view of the armature shown in Fig. 2;

Fig. 5 is a top view of the supports shown in Fig. 1;

Figs. 6a and 6b are top and side views, respectively, of the spring retainer, shown in Figs. 1 and 3;

Fig. 7 is an exploded view showing the assembly of the spring retainer, a portion of armature, and spring.

The contactor design, in accordance with my invention, embodies a relatively simple construc-

tion substituting knife edge bearings for the conventional pivot bearings or slides. Such a construction will stand frequent operation better than other types of bearings and in addition provides an assembly such that the moving contacts and operating coil are readily removed for replacement.

Referring to Fig. 1, an operating coil 1 is assembled in a stationary magnet frame 2 and attracts a moving armature. It is understood that the physical design of these items is intended to serve the purpose of a description only and the ultimate design of such an equipment may require an entirely different shape of these particular items.

A vertical armature support 4 is attached to the moving armature 3 by means of ears 5 and pivot pin 6. The vertically moving armature 3 is supported from the contactor stationary frame 46 by means of the lower support 7 designed with knife edges and the upper support 8 which is a duplicate of the lower support. The upper and lower supports rest in V's stamped into the vertical armature support 4 and the stationary frame 46. The V's in the vertical armature support 4 are shown in side view as 10 and 11 and in the stationary frame 46 as 9 and 12.

The knife edges of the supports 7 and 8 are held in position in the V's by means of tension springs 13, 14, 15 and 16. As can be seen in Figure 1, springs 14 and 16 hold the supports against the stationary frame 46 while springs 13 and 15 attach the supports to the vertical support 4.

A compression spring 24 is anchored to the contactor stationary assembly by means of a support 25 and its resulting force transmitted to the vertical support 4 by means of ear 23. Compression spring 24 forces the vertical armature support 4 downwardly when operating coil 1 is deenergized.

A block of insulating material 26 is attached to the top of the vertical armature support 4. The moving contact assembly consists of contact tips 30 and 31 welded to a cross bar 22, backed up by a compression spring 29 and held in a stationary guide 27 attached to the insulating block 26.

When operating coil 1 is energized, the moving assembly assumes the position indicated by the dotted lines and the moving contact tips 30 and 31 make contact with the stationary contact tips 34 and 35.

Stationary contacts 32 and 33 are attached to a block of ceramic material 36 serving as a sup-

port for the stationary contacts and arc box. De-ion grids 37 to 42 are assembled in slots in the arc box 44 and covered by a top plate 43.

The stationary contactor frame 46 is mounted to the required framework by means of rubber vibration dampening supports 47 and 48.

Figs. 2, 3 and 4 illustrate the design of the vertical armature support 4 in more complete detail. Fig. 2 is a side view of the armature and indicates the ears 5 for connecting the armature with the vertical armature support 4. The V's in which the knife edges rest, are shown punched as 10 and 11.

Fig. 5 shows a plan view of the supports 7 and 8 and it is obvious that the knife edges of these two supports rest in the V's, the assembly of which is indicated in Fig. 1.

Fig. 3 shows that two rectangular holes are cut into the vertical armature support 4. Each side of the rectangular holes are two pin studs 21 and 22. Fig. 6 shows a spring retainer 17 or 18 which has two holes and is punched to have a loop which shows in side view. The holes in spring retainer 18 coincide with the spacing of pin studs 22 and Fig. 3 shows the outline of the spring retainer 18 in dotted lines, covering the bottom rectangular holes.

With the spring retainer 18 in place over the studs 22, the loop extends through the opening in the vertical armature support 4 so that spring 13 can be attached to the loop of the spring retainer 18. The method of this assembly is shown by the exploded view of Fig. 7.

The purpose of this assembly is to make the vertical armature support 4 readily removable. All that is required to remove the vertical armature support which carries the entire moving contact assembly, is to pull out on the two spring retainers 17 and 18 so as to remove these retainers from their pin studs 21 and 22, then allowing the spring retainers 17 or 18 to be turned one quarter turn in which position the retainer will pass through the rectangular hole cut in the vertical armature support 4. The entire armature assembly can then be removed from the knife edge supports 7 and 8. Once the moving armature assembly has been removed, the contacts can be readily inspected or replaced, or it is then possible to easily replace the operating coil 1.

The assembly does not include any part for retaining the operating coil 1 in position in its place in the stationary magnet frame 2. This design detail can be readily incorporated in the general assembly and any of the known methods of retaining the operating coil in position should be entirely satisfactory.

Fig. 1 shows that spring retainers 19 and 20 must be provided in the stationary frame 46. However, it is not necessary to make these retainers removable, since there would be no logical occasion to completely remove the knife edge supports 7 and 8.

It will be noted that the movement of pin 6 is guided substantially vertically by virtue of its mounting on the movable part of the parallelogram structure including elements 4, 7, 8, 46. Since the upward movement of solenoid armature 3 is confined to substantially a vertical path by the parallelogram structure throughout its pivotal movement at its corners and since no lateral movement of solenoid armature 3 is possible, the latter armature may be closely guided without the danger of excessive tilting or sticking in its guide.

I am, of course, aware that others, particularly 75

after having had the benefit of the teachings of my invention, may devise other devices embodying my invention, and I, therefore, do not wish to be limited to the specific showings made in the drawings and the descriptive disclosure hereinbefore made, but wish to be limited only by the scope of the appended claims and such prior art that may be pertinent.

I claim as my invention:

10 1. An electromagnetically operable contactor operating device comprising, in combination, a support, an electromagnet mounted on said support and including a coil and reciprocable plunger type armature which is movable into said coil, a
15 hinged framework having the outline of a parallelepiped comprising two parallelogram frameworks each including two parallel sides, substantially perpendicular to said support and a side parallel to said support, said last mentioned side comprising an element common to both parallelo-
20 gram frameworks, separate pivots at all eight corners of said parallelepiped framework for allowing movement of all of the sides of the parallelepiped except that formed by said support, said plunger type armature being secured to said
25 element common to both frameworks, said common element of the parallelepiped framework which is parallel to said support having a pair of springs for each parallelogram framework and clips for supporting the respective springs at the
30 pivots, window portions on said common element which has contours substantially the same as that of the respective spring clips except that such contours are arranged at right angles to the normal
35 mounted position of the spring clips thereby making it possible, upon rotation of the spring clips about 90° to pass such clips through said windows and allow disassembly of said parallelo-
40 gram framework.

2. An electromagnetically operable contactor comprising, in combination, a support, an electro-
45 magnet mounted on said support and including a coil and reciprocable plunger type armature which is movable into said coil, two pairs of V-shaped longitudinally spaced grooves on said support, a contact carrying element arranged substantially parallel to said support and also having
50 two pairs of V-shaped, longitudinally spaced grooves which are opposite to the aforementioned pairs of grooves, a pair of link members each having two pairs of knife edges which are adapted to fit into said oppositely disposed V-shaped
55 grooves thereby forming a parallelepiped framework having the contour of a parallelepiped, spring means at each of eight separate pivots for holding the adjoining arms of the parallelogram framework together at substantially right angles, said plunger type armature being secured to one
60 of the movable sides of said parallelogram framework, a movable contact member also carried by said contact carrying member, a stationary contact member mounted on said support for coop-
65 eration with said movable contact member, each of said springs being normally under tension and having one end rigidly secured to its corresponding link member, a spring clip at each of the pivots on the contact carrying member, said spring clip being supported against the outer surface of said contact carrying member, each of
70 said springs having its other end connected to one of said spring clips, and window portions on said contact carrying member which have contours substantially the same as that of the respective spring clips except that such contours are arranged at right angles to the normal mounted po-

sition of the spring clips thereby making it possible, upon rotation of the spring clips about 90°, to pass such clips through said windows and allow disassembly of said parallelogram framework.

3. An electromagnetically operable contactor comprising, in combination, a support, an electromagnet mounted on said support and including a coil and reciprocable plunger type armature which is movable into said coil, two pairs of V-shaped longitudinally spaced grooves on said support, a contact carrying element arranged substantially parallel to said support and also having two pairs of V-shaped, longitudinally spaced grooves which are opposite to the aforementioned pairs of grooves, a pair of link members each having two pairs of knife edges which are adapted to fit into said oppositely disposed V-shaped grooves thereby forming a parallelepiped framework having the contour of a parallelepiped, spring means at each of eight separate pivots for holding the adjoining arms of the parallelogram framework together at substantially right angles, said plunger type armature being secured to one of the movable sides of said parallelogram framework, a movable contact member also carried by said contact carrying member, a stationary contact member mounted on said support for cooperation with said movable contact member, said link members being substantially H-shaped and thereby having said knife edges at the extremities of each leg thereof.

4. An electromagnetically operable contactor operating device comprising, in combination, a stationary support, an electromagnet comprising a magnet frame mounted on said support, an energizing coil carried by said frame, and an armature movable into and out of engagement with

said frame, and means mounting said armature on said support and guiding its movement with respect to said magnet frame comprising a contact carrying movable support spaced from said stationary support, and a pair of spaced parallel link members respectively located at opposite ends of and straddling said electromagnet, each of said link members having one of its ends pivotally connected to said stationary support and its other end pivotally connected to said movable member, said electromagnet being positioned within and substantially filling the space defined by said link members and said stationary and movable supports.

5. An electromagnetically operable contactor operating device comprising, in combination, a stationary support, an electromagnet comprising a magnet frame mounted on said support, an energizing coil carried by said frame, and an armature movable into and out of engagement with said frame, and means mounting said armature on said support and guiding its movement with respect to said magnet frame comprising a contact carrying movable support spaced from said stationary support, a pair of spaced parallel link members respectively located at opposite ends of and straddling said electromagnet, each of said link members having a knife-edge at one of its ends for pivotal engagement with said stationary support and a knife-edge at its other end for pivotal engagement with said movable support, and a spring at each end of said link members for maintaining the knife-edge at such end in engagement with its respective support, said electromagnet being positioned within and substantially filling the space defined by said link members and said stationary and movable supports.

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