June 10, 1941. B. E. SHAW 2,245,230

RELAY

Original Filed Sept. 11, 1939

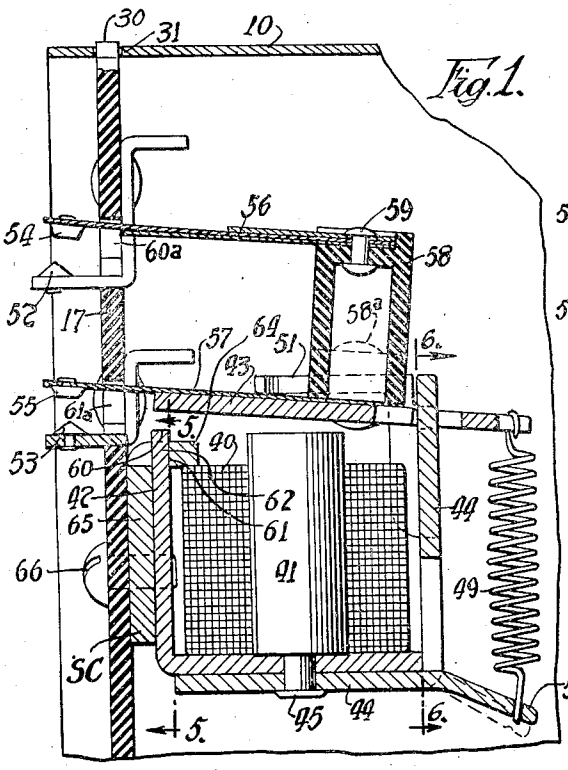


Fig. 1.

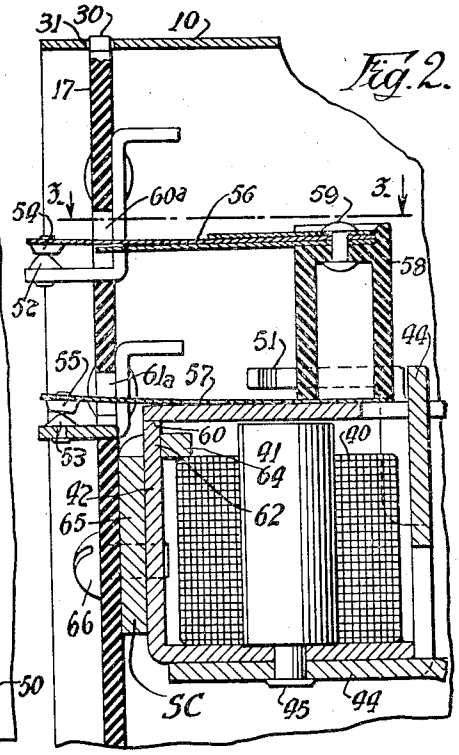


Fig. 2.

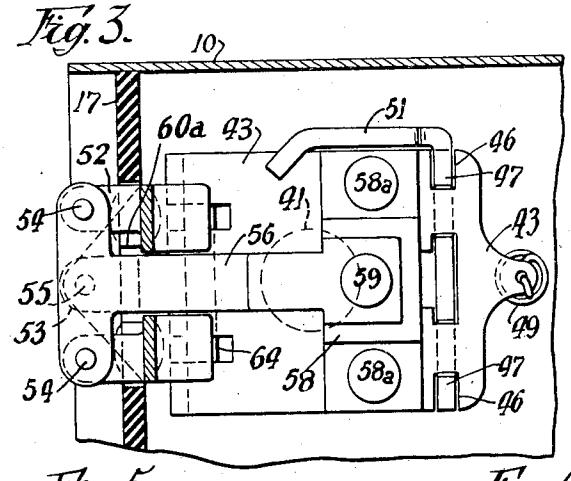


Fig. 3.

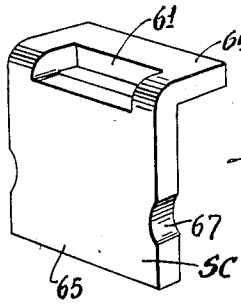


Fig. 4.

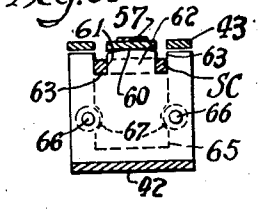


Fig. 5.

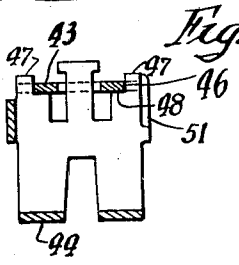


Fig. 6.

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UNITED STATES PATENT OFFICE

2,245,230

RELAY

Burton E. Shaw, Bristol, Ind., assignor to Penn Electric Switch Co., Goshen, Ind., a corporation of Iowa

Original application September 11, 1939, Serial No. 294,408. Divided and this application April 8, 1940, Serial No. 328,529

13 Claims. (Cl. 200—91)

My invention relates to a relay of simple construction and of such design that it can be made comparatively small and inexpensive from a manufacturing standpoint.

The present application is a division of my copending application Serial No. 294,408, filed September 11, 1939.

One object of the invention is to provide a relay which can be made sufficiently powerful, yet relatively small to minimize current consumption and to minimize jarring of a casing in which it is mounted, and in which quite often other apparatus is mounted, such as a stack switch shown in my parent application. The desirability of minimizing jarring is to prevent undesirable chattering of the other devices in the casing, such as stack switch contacts, when the relay operates.

More particularly it is one of my objects to provide a relay which has a solid core and a shading coil serving, in addition to its shading capacity, as a spacer between the relay and a panel on which the relay is mounted.

Among other objects of the invention I provide a relay mounted on a panel so that the major portion of the relay is back of the panel and likewise all wiring is behind the panel, the contacts controlled by the relay being mounted in front of the panel where they are accessible for cleaning or inspection, the panel being slotted to receive the contact blades of the armature which extend from the back to the front of the panel.

A further object is to provide a relay which has a hard silicon steel core and therefore loses all residual magnetism when current is discontinued, thus making it possible, by using hard silicon steel for a magnetic frame of the relay and an armature thereof, to permit the armature to touch the frame in closed position so that there is a maximum of holding power to guard against undesired opening of the relay as a result of voltage drop.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawing. Although the invention is susceptible of a variety of embodiments, it is unnecessary to fully describe and illustrate more than one in order to give a full understanding of the invention both from its structural and functional standpoints. Accordingly, I have illustrated a preferred and desirable embodiment of the invention in the accompanying drawing, in which:

Figure 1 is an enlarged sectional view showing my relay mechanism mounted on a panel within a casing and the relay in open position;

Figure 2 is a similar sectional view showing the relay in closed position;

Figure 3 is a sectional view on the line 3—3 of Figure 2;

Figure 4 is a perspective view of a combined spacer and shading coil; and

Figures 5 and 6 are sectional views on a reduced scale on the lines 5—5 and 6—6, respectively, of Figure 1.

On the accompanying drawing I have used the reference numeral 10 to indicate a casing, a portion only of which is shown on the drawing. A panel 17 is supported in the casing 10 and has a projection 30 extending through a perforation 31 of the casing 10 to assist in retaining the panel in position in the casing.

On the back of the panel 17 I mount a relay consisting of a coil 40, a core 41, a magnetic frame member 42 and an armature 43. A non-magnetic frame member 44 of brass or the like is secured to the core 41 by riveting the core as indicated at 45. The riveting at 45 also retains the magnetic frame member 42 assembled on the core 41.

The armature 43 is provided with a pair of notches 46 receiving a pair of projections 47 of the frame member 44. Adjacent the projections 47 the frame member 44 is provided with shoulders 48, see Figure 6, against which the armature is retained by a relatively stiff spring 49. The lower end of the spring 49 is connected with an extension or tongue 50 of the frame member 44. This extension may be bent downwardly as shown in dotted lines in Figure 4 to increase the tension of the spring 49 without the necessity of having to provide an adjusting screw for this purpose.

The frame member 44 has a finger-like extension 51 bent to a position above the armature 43 to act as a stop therefor, as shown in Figures 1 and 3.

On the front of the panel 17 are a pair of stationary power contacts 52 and a stationary low voltage contact 53. Cooperating therewith are a pair of movable contacts 54 and a single movable contact 55. The contacts 54 and 55 are carried by contact leaf springs 56 and 57, respectively. The spring 57 is secured to the armature 43 under a block of insulation 58, while the spring 56 is riveted to the upper end of the block as at 59. The block 58 is secured to the armature 43 by a pair of rivets 58a.

The springs 56 and 57 extend through openings 60a and 61a of the panel 17 so as to expose the

contacts 54 and 55 on the front thereof where they are readily accessible for inspection and cleaning. The leaves 56 and 57 are substantially straight, thus eliminating the necessity for providing bending dies for forming them. The spring 56 is T-shaped as shown in Figure 3 so as to provide a bridging contact for the contacts 52. The T-head arrangement of the spring 56 provides substantially equal contact pressure on both contacts 52 when the relay is in closed circuit position.

The contacts 54 are mounted substantially above the armature 53 on the shoulder 48 which give a good wipe to these contacts relative to the contact 52 to keep them clean.

The core 41 is made of hard silicon steel which requires no machining and loses all residual magnetism upon de-energization. This makes it possible to have the armature contact with the frame 42 at the point 60 illustrated in Figure 5 when the relay is in closed position. Since contact of the parts gives maximum attraction, this arrangement requires a considerable reduction in line voltage before the relay drops out. Hard silicon steel also has the characteristic of requiring less current for operation and therefore the coil 40 may be relatively small.

To minimize eddy currents, a shading coil SC is provided consisting of a piece of copper as illustrated in Figure 4. A slot 61 therein receives a central pole piece 62 of the frame member 42 (see Figure 5). The frame member is slotted as at 63 to provide for the shading coil SC.

The slot 61 of the shading coil is formed in a leg 64 thereof while another leg 65 at substantially right angles to the leg 64 serves as a spacer between the frame member 42 and the panel 17. Screws 66 extend through the panel and are threaded in the frame member 42, the leg 65 of the shading coil being notched as at 67 to provide clearance for the screws.

My invention has been described in the foregoing specification and illustrated in the drawing more or less precisely as to details. It is to be understood, however, that changes may be made in the arrangement and proportions of parts and equivalents may be substituted without departing from the spirit and scope of the invention as set forth in the appended claims.

What I claim as my invention and desire to secure by Letters Patent of the United States is:

1. In a relay structure, a panel, an electromagnetic coil mounted on the back of said panel, said panel having openings therein, contact springs of said relay extending forwardly through said openings to the front of said panel, cooperating stationary contacts mounted on said front of said panel, a magnetic frame for said coil, an armature, for attraction by said coil, a shading coil for said magnetic frame, said shading coil being interposed between said frame and said panel and thereby constituting means to space the frame from the panel and common means for securing said shading coil, frame and panel assembled.

2. In a device of the character described, a panel, a coil mounted on said panel, contact springs, cooperating stationary contacts mounted on said panel, a solid core for said coil of hard silicon steel, a magnetic frame for said coil of hard silicon steel and an armature for said contact springs of hard silicon steel, said magnetic frame having a pair of slots therein adjacent said armature and a shading coil in said slots.

3. In a relay device of the character described, a panel, a coil mounted on said panel, contact springs, cooperating stationary contacts mounted on said panel, a magnetic frame for said coil and an armature for said contact springs, and an angle shaped shading coil for said frame, said shading coil having one flange to space said magnetic frame from said panel and its other flange perforated to receive said frame.

4. In a switch structure, a casing, a panel therein, a coil mounted on the back of said panel, a core and a magnetic frame member for said coil, an armature, a non-magnetic frame member to which said armature is pivoted, said non-magnetic frame member having a bendable extension, a spring connecting said extension with said armature to bias the armature toward open circuit position, contact springs mounted on said armature, said panel having openings through which said contact springs extend to the front of said panel and cooperating contacts mounted on said front of said panel.

5. In a switch structure, a panel, a coil mounted on the back of said panel, an armature for attraction by said coil, a contact spring mounted on said armature, said panel having an opening through which said contact spring extends to the front of said panel, cooperating contacts mounted on said front of said panel, said contact spring being T shaped to provide a bridging contact for said contacts on the front of said panel.

6. In a switch structure, a casing, a panel therein, a coil mounted on said panel, a core and a magnetic frame member for said coil, an armature, a non-magnetic frame member to which said armature is pivoted, said non-magnetic frame member having a bendable extension, a spring connecting said extension with said armature to bias the armature toward open circuit position, contact springs mounted on said armature, cooperating contacts mounted on said panel, one of said contact springs being T shaped to provide a bridging contact for two of said contacts on said panel, said magnetic frame member having a pair of slots therein adjacent said armature, a shading coil in said slots comprising a plate having an opening therein to surround the portion of said magnetic frame member between the slots thereof, said opening being adjacent one end of said shading coil and the other end thereof extending between said magnetic frame member and said panel to serve as a spacer.

7. In a switch structure, a casing, a panel therein, a coil mounted on said panel, a core and a magnetic frame member for said coil, an armature, contact springs mounted on said armature, cooperating contacts mounted on the front of said panel, said magnetic frame member having a pair of slots therein adjacent said armature, a shading coil in said slots comprising a plate having an opening therein to surround the portion of said magnetic frame member between the slots thereof, said opening being adjacent one end of said shading coil and the other end thereof extending between said magnetic frame member and said panel to serve as a spacer.

8. In a switch structure, a panel, a coil mounted thereon, a solid core and a magnetic frame member for said coil, an armature of hard silicon steel, a contact spring mounted on said armature, a cooperating contact mounted on said panel, and a shading coil for said magnetic frame member comprising a plate having an opening therein to surround a portion of said magnetic frame member, said opening being adjacent one end of said shading coil and the other end thereof extending

between said magnetic frame member and said panel to serve as a spacer.

9. In a switch structure, a panel, a coil mounted thereon, a core for said coil, a magnetic frame member for said coil an armature for said core of hard silicon steel, contact springs mounted on said armature, cooperating contacts mounted on said panel, and a shading coil for said magnetic frame member comprising an L-shaped plate having an opening therein to surround a portion of said magnetic frame member, said opening being adjacent the bend in said plate and one leg of said plate constituting a spacer between said magnetic frame member and said panel.

10. In a switch structure, a panel, a coil mounted on the back of said panel, said panel having openings therein, contact springs extending forwardly through said openings to the front of said panel, cooperating stationary contacts mounted on said front of said panel, a core and a magnetic frame for said coil, an armature, said magnetic frame having a pair of slots therein adjacent said armature and a shading coil in said slots.

11. In a relay structure, a panel, a coil mounted on the back of said panel, said panel having openings therein, contact springs extending forwardly through said openings to the front of said panel, cooperating stationary contacts mounted on said front of said panel, a core for said coil, a magnetic frame for said coil, an armature, and a shading coil on said core, said shading coil being L-shaped with one leg thereof perforated to receive a portion of said core and the other leg thereof constituting means to space said magnetic frame from said panel.

12. In a relay of the character described, a panel, a coil mounted on said panel, contact springs, cooperating stationary contacts mounted on said panel, a solid core for said coil, said core being formed of hard silicon steel, a magnetic frame of hard silicon steel, an armature of hard silicon steel, and a shading coil on said frame.

13. In a relay switch structure, a casing, a panel therein, a coil mounted on said panel, a core for said coil, a magnetic frame member for said coil, an armature, a non-magnetic frame member to which said armature is pivoted, said frame having a perforation, said core having a shouldered portion extending through said perforation in said magnetic frame member and riveted to retain the frame member and the core assembled as a unit, contacts controlled by said armature and a shading coil on said frame member, said frame member being secured to said panel for supporting said relay thereon.

BURTON E. SHAW.