April 8, 1930. P. P. SOSINSKI 1,753,726

ELECTRICAL RELAY

Filed Nov. 28, 1928

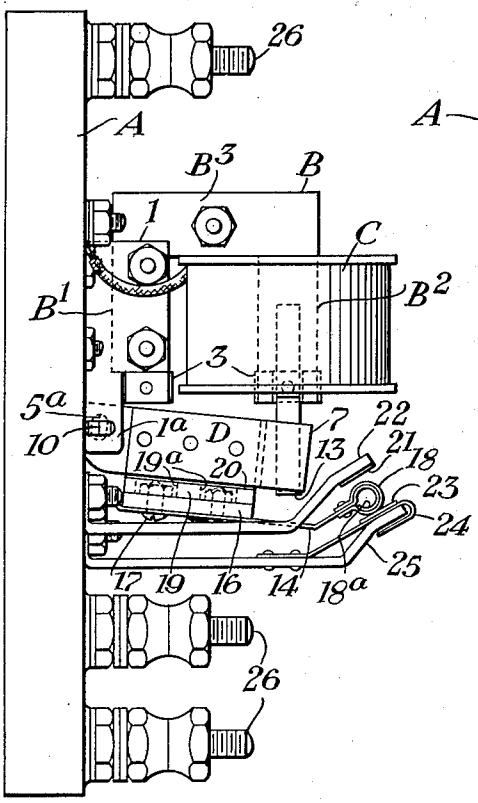


Fig. 1.

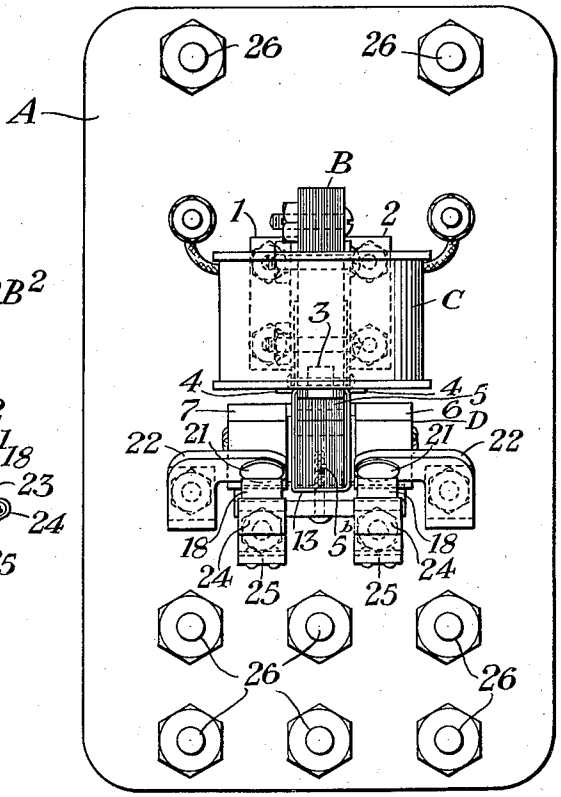


Fig. 2.

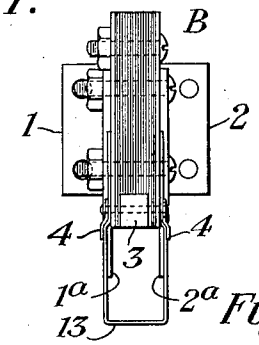


Fig. 4.

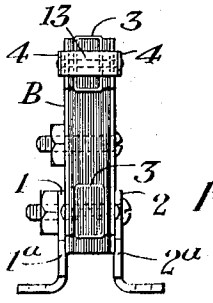


Fig. 3.

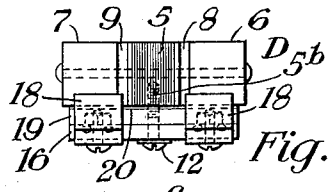


Fig. 6.

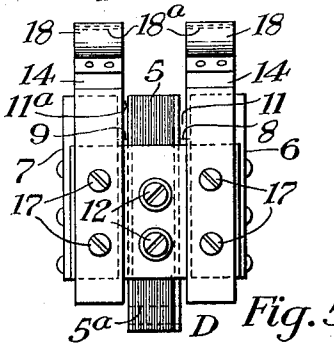


Fig. 5.

INVENTOR:
P. P. Sosinski,
BY A. R. Verrill
ATTORNEY

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UNITED STATES PATENT OFFICE

PAUL P. SOSINSKI, OF SWISSVALE, PENNSYLVANIA, ASSIGNOR TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

ELECTRICAL RELAY

Application filed November 28, 1928. Serial No. 322,543.

My invention relates to electrical relays.

I will describe one form of electrical relay embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a view, showing in side elevation, one form of relay embodying my invention. Fig. 2 is a front view of the relay shown in Fig. 1. Figs. 3 and 4 are bottom and front views, respectively, of the laminated core B shown in Figs. 1 and 2. Figs. 5 and 6 are bottom and front views, respectively, of the armature assembly shown in Figs. 1 and 2.

Similar reference characters refer to similar parts in each of the several views.

Referring first to Figs. 1 and 2, the relay comprises an inverted U-shaped laminated core B having two downwardly extending legs B^1 and B^2 and a back strap B^3. The core B is attached to a supporting plate A of suitable insulating material by means of two laterally projecting brackets 1 and 2, and is provided with an energizing winding C which fits over the leg B^2 of the core B. For the purpose of holding the winding C in place on the leg B^2, I have provided two malleable strips 4 which, as best seen in Fig. 4, are riveted to opposite sides of the core B. After the winding C has been placed on the core, the ends of the strips 4 are bent upwardly to engage the lower side of the winding, thereby preventing the winding from sliding off of the core. (See Fig. 2.) This method of supporting the winding C on the core B permits the utilization of the maximum possible space for the winding.

Associated with the core B is an armature assembly, designated in general by the reference character D, and comprising a laminated armature 5 riveted between two counter-weights 6 and 7. The armature assembly D is pivotally supported at one end (see Fig. 1) on a pin 10 which passes through an elongated hole 5^a in the armature 5 with considerable clearance, and which is carried by two lugs 1^a and 2^a projecting downwardly from the brackets 1 and 2, respectively. The counter-weights 6 and 7 are spaced from the armature 5 by means of two spacing blocks 8 and 9. As best seen in Fig. 5, the spacing blocks 8 and 9 are shorter than the armature and the counter-weights, so that two slots 11 and 11^a are formed at the upper end of the armature between the armature and the counter-weights. Fitting within these slots are the sides of a stirrup 13, the ends of which are attached to the core B by means of the same rivet which fastens the strips 4 to the core. (See Figs. 1, 2 and 4.) The stirrup 13 acts as a guide for the armature assembly, and limits its lateral and downward movements.

The armature assembly D also comprises two contact fingers 14 which are attached to an insulating strip 16 by means of four bolts 17, two of which pass through each finger. Each contact finger 14 comprises a flexible strip of electrical conducting material, such as phosphor bronze, having holes to receive the bolts 17, and having one end inclined at an angle with the plane of the strip and bent into a cylindrical shape. The cylindrical end of each finger is covered by a piece 18 of silver or other low resistance electrical conducting material bent around the end and riveted to the strip to form a low resistance contact tip 18^a. The insulating strip 16 carrying the contact fingers 14 is attached to the underside of the armature 5 by means of two screws 12 screwed into threaded holes 5^b in the armature 5. Interposed between the insulating strip 16 and the armature 5 are a spacer washer 19 of insulating material and an insulating washer 20. The spacer washer 19 is provided with two holes which receive the screws 12, and with four holes 19^a (see Fig. 1) which receive the ends of the bolts 17. One advantage of fastening the contact fingers to the armature in the manner described is that an economical assembly is attained without the use of moulded insulation.

Each of the contact fingers 14 co-acts with a front contact 21 of low resistance electrical conducting material, such as silver, and with a similar back contact 23. Each front contact 21 is attached to the under side of the end of a front contact post 22 which, in turn, is fastened to the supporting plate A by means of suitable bolts and nuts. Each back contact 23 is attached to a contact spring

24 riveted at one end to a back contact post 25, which is also attached to the supporting plate A by means of suitable bolts and nuts. It will be noted that the ends of both the front and back contact posts are bent upwardly so that the planes of the front and back contacts are substantially parallel to the plane of the inclined ends of the contact fingers 14.

The relay is intended to be operated by alternating current which is at times supplied to the winding C. When winding C is energized, the armature assembly D is drawn upwardly against the core B by the pull on the armature 5 of the magnetic field set up in the core B, and the contact tips 18[a] of the contact fingers 14 then engage the front contacts 21. The location of the contact posts 22 carrying the front contacts 21 is such that the contact tips 18[a] of the contact fingers engage the front contacts 21 before the armature has completed its upward stroke. As a result, during the remainder of the upward stroke of the armature, the contact fingers are flexed in a manner which produces a wiping action between the low resistance contact tips 18[a] of the contact fingers 14 and the associated front contacts 21. This wiping action tends to dislodge any foreign matter which might become lodged on the front contacts or on the engaging portion of the contact tips, and therefore insures a clean contact surface and a low resistance contact. When winding C is de-energized, the armature assembly D drops down due to the pull of gravity on the armature and the counterweights, and the contact tips 18[a] of the contact fingers 14 then engage the back contacts 23. The contact fingers 24 carrying the back contacts 23 are given an initial set which causes the contact springs to stand away from the contact posts when the contacts are not engaged by the contact tips. When the armature assembly drops down, therefore, the contact fingers are bent downwardly until they engage the back contact posts, thereby producing a wiping action between the low resistance contact tips 18[a] and the back contacts. This wiping action cleans the back contacts to produce a low resistance contact in the same manner as explained above in connection with the front contacts.

The free end of each contact spring 24 is bent completely around the inclined end of the associated back contact post to limit the movement of the contact spring away from the contact post. With the contact springs arranged in this manner, if the contact tips and the back contacts should fuse together for any reason, and if winding C should then become energized so that an upward pull is exerted on the armature assembly, the ends of the contact springs would engage the underside of the contact posts 25 and limit the upward movement of the armature assembly. It will be apparent, therefore, that with the contact fingers constructed in this manner, it is impossible for the relay to close its back and front contacts simultaneously.

The clearances between the pin 10 and the hole 5[a] in the armature 5, and between the stirrup 13 and the armature 5, are such that the armature assembly D has sufficient freedom of movement in all directions to permit proper alignment of the contacts when the armature is energized or de-energized. Furthermore, this clearance permits proper seating of the armature against the core B when the armature is energized, and therefore greatly reduces vibration and chatter. To further reduce vibration and chatter, I have provided each of the legs B^1 and B^2 of the core B with a ferrule or shading band 3 of copper or other suitable electrical conducting material. As best seen in Figs. 3 and 4, the shading band 3 for each leg is located in slots formed in the ends of the leg by cutting back a few of the laminations, and the shading band is held in place by a rivet passing through the laminations and the shading band. Each shading band surrounds a portion of the associated leg, and when winding C is supplied with alternating current, a shifting magnetic field is produced which exerts a more uniform pull on the armature than would be exerted if the shading bands were not provided.

One advantage of a relay constructed in accordance with my invention is that if winding C becomes energized when the armature assembly occupies its lower position, the armature assembly will swing upwardly through its full stroke in a single uninterrupted movement. Similarly, if winding C is energized so that the armature engages the core B, and winding C is then de-energized, the armature assembly will drop to its lower position in a single movement.

Since the contact tips of the contact fingers are cylindrical, the tips engage the front and back contacts along a single line forming an element of the cylindrical tip. This produces a high unit pressure, and insures a low resistance contact. Furthermore, a contact finger having a cylindrical tip of the type described is economical to manufacture, and the ventilating air space within the tip permits a high current carrying capacity without excessive heating of the tip.

It should be pointed out that since the winding C is placed on leg B^2 of the core B, leakage flux is not wasted, but is effective in supplying power to keep the contacts closed. As a result, the efficiency of the relay is comparatively high.

Electrical connections to exterior circuits are facilitated by means of contact posts 26 which are supported by the plate A and which are connected with the contacts and operating winding of the relay by means of

suitable conductors not shown in the drawing.

Although I have herein shown and described only one form of relay embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. A relay comprising an inverted U-shaped core having one leg provided with an energizing winding, two brackets one attached to each side of the other leg of said core and each provided with a downwardly projecting lug, a pin passing through said lugs, an armature provided with an elongated hole and loosely pivoted on said pin at said hole, a stirrup riveted to said one leg of the core and passing freely around the free end of said armature to limit the motion of said armature laterally and away from said core, a contact finger attached to said armature but insulated therefrom, and a fixed contact co-acting with said contact finger.

2. A relay comprising a core having substantially the shape of an inverted U, a winding on one leg of said core, and two malleable strips one riveted to each side of said leg of said core and each having its end bent upwardly into engagement with the lower side of said winding for holding said winding on said core.

3. An armature assembly for a relay, comprising an armature having an elongated hole at one end, two counterweights one riveted to each side of said armature, two spacing blocks one interposed between each of said counterweights and said armature, an insulating strip attached to said armature, a contact finger attached to said strip, a spacing washer of insulating material interposed between said strip and said armature, and an insulating washer interposed between said spacing washer and said armature.

4. A relay comprising a laminated core having substantially the shape of an inverted U and provided with an energizing winding, two shading bands one surrounding a portion of the end of each leg of said core, two brackets attached to said core and each provided with a downwardly extending lug, a pin carried by said lugs, a laminated armature provided at one end with an elongated hole receiving said pin, two counterweights one riveted to each side of said armature, two spacing blocks one interposed between each counterweight and said armature, a stirrup riveted to said core and surrounding the free end of said armature with considerable clearance to limit the lateral and downward movement of said armature, an insulating strip attached to said armature, a plurality of contact fingers each having one end bent into a cylindrical shape, a plurality of pieces of low resistance electrical conducting material one fastened around the cylindrical end of each contact finger to form a low resistance contact tip, a plurality of bolts two passing through each finger and said strip for fastening said fingers to said strip, a spacing washer of insulating material interposed between said strip and said armature and provided with a plurality of holes to receive the ends of said bolts, an insulating washer interposed between said spacing washer and said armature, and a plurality of fixed contacts one co-acting with the low resistance contact tip of each contact finger.

In testimony whereof I affix my signature.

PAUL P. SOSINSKI.