O. S. FIELD.

ALTERNATING CURRENT RELAY.

APPLICATION FILED SEPT. 30, 1916.

1,333,070.

Patented Mar. 9, 1920.

4 SHEETS—SHEET 1.

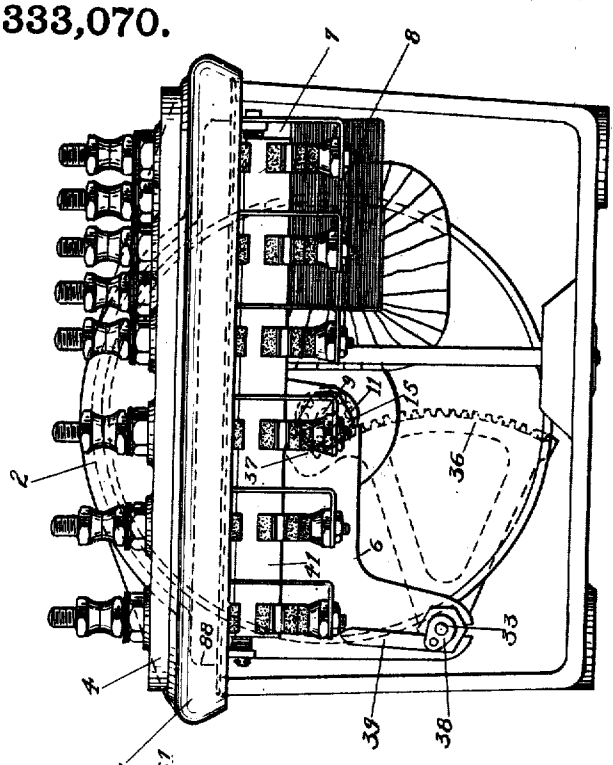


Fig. 2.

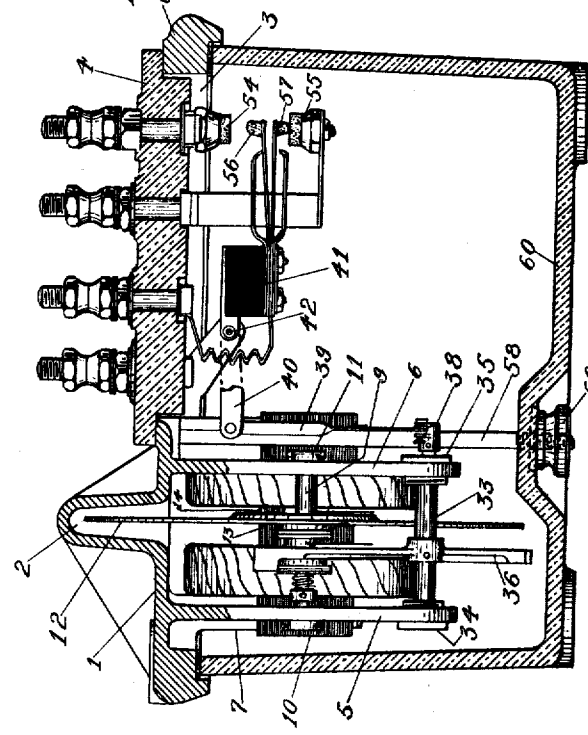


Fig. 1.

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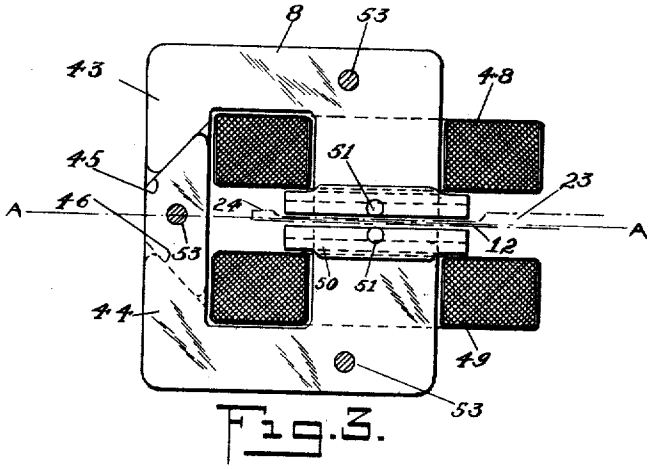


Fig. 3.

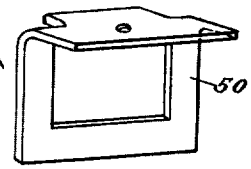


Fig. 6.

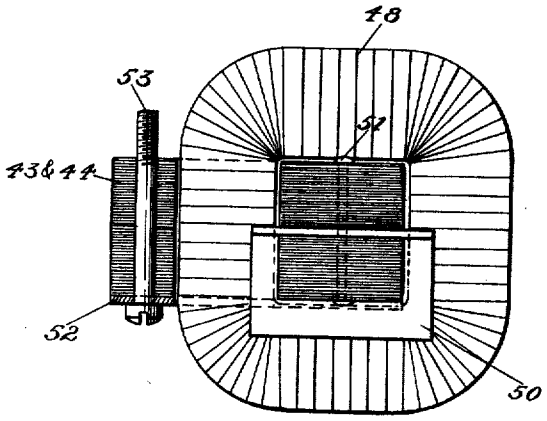


Fig. 4.

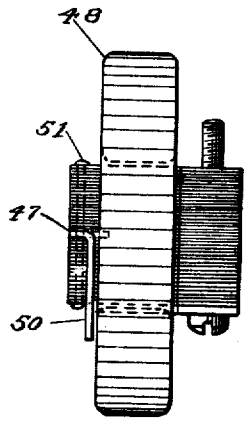


Fig. 5.

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4 SHEETS—SHEET 3.

Fig. 7.

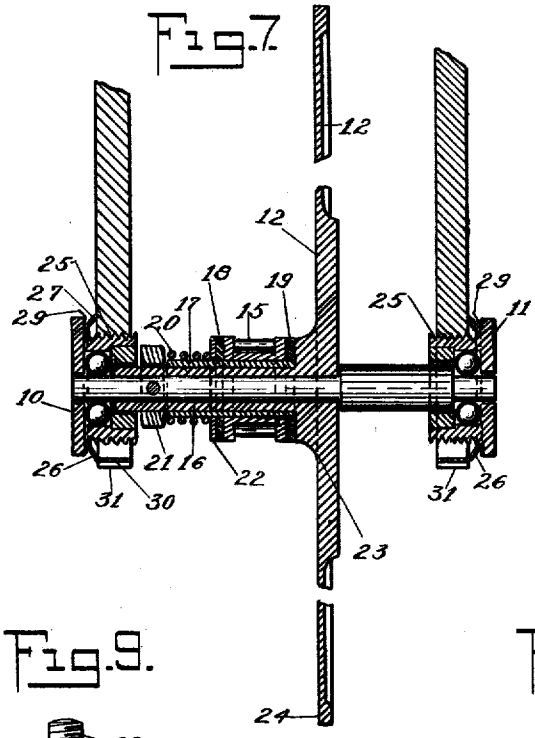


Fig. 8.

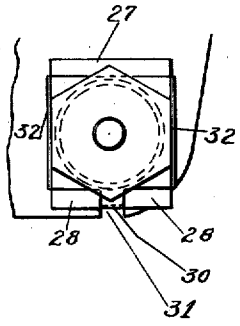


Fig. 9.

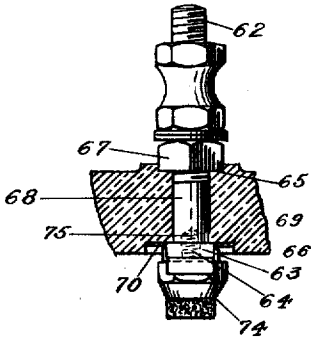
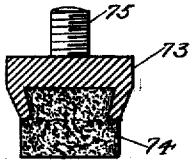


Fig. 10.



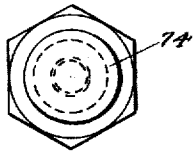


Fig. 11.

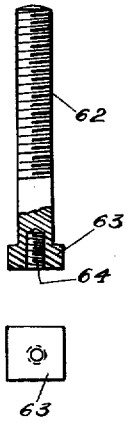


Fig. 12.

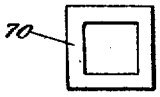


Fig. 13.

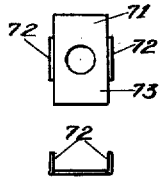
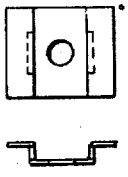


Fig. 14.



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4 SHEETS—SHEET 4.

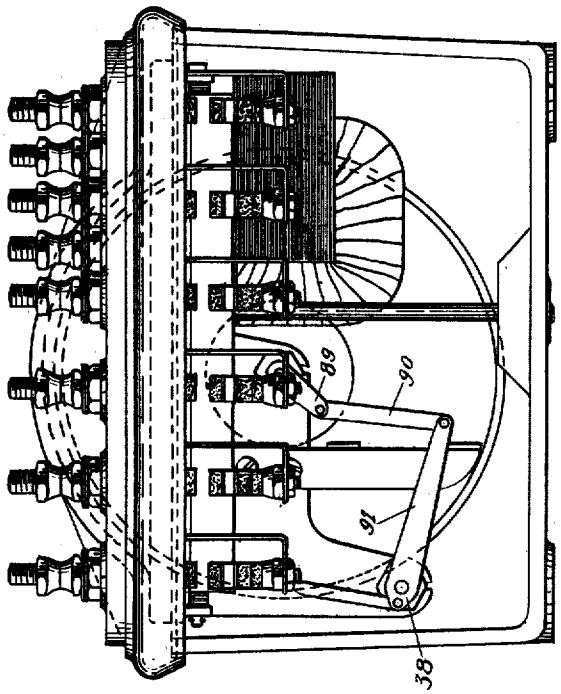


Fig. 15.

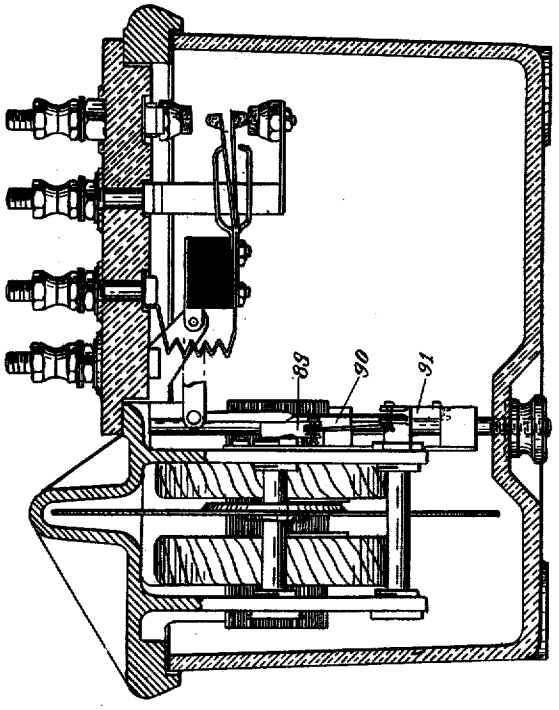


Fig. 16.

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UNITED STATES PATENT OFFICE.

OSCAR S. FIELD, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO HALL SWITCH & SIGNAL CO., A CORPORATION OF MAINE.

ALTERNATING-CURRENT RELAY.

1,333,070. Specification of Letters Patent. Patented Mar. 9, 1920.

Application filed September 30, 1916. Serial No. 123,012.

To all whom it may concern:

Be it known that I, OSCAR S. FIELD, a subject of the King of Great Britain, and a resident of the city of Elizabeth, county of Union, and State of New Jersey, have invented certain new and useful Improvements in Alternating-Current Relays, of which the following is a specification.

This invention relates to certain new and useful improvements in alternating current relays of the split phased type and comprises more specifically improved means of construction and arrangement of parts.

One object of my invention is to provide a relay with the contacts arranged in the forepart of the relay in order to allow the same to be readily inspected; the mechanism being located to the rear of the relay and out of the way of the contacts.

Another object of my invention is to provide a novel means of construction of the split phase magnet.

A further object of my invention is to provide means comprising suitable reduction gearing and links for increasing the pressure at the contact fingers.

Other and further objects of my invention will appear in the attached description, and will be more specifically claimed in the attached claims.

In Figure 1, I show a section through a relay embodying my invention.

In Fig. 2, I show a front elevation of said relay.

In Fig. 3, I show a sectional plan view of the split phase magnet.

In Fig. 4, I show a section through A—A of Fig. 3.

In Fig. 5, I show an end elevation of one of the poles of the split phase magnet.

In Fig. 6, I show a perspective view of the shading coil used on the split phased magnet.

In Fig. 7, I show a section through the rotary disk and slip pinion used in the relay.

In Fig. 8, I show an end elevation of one of the bearings.

In Fig. 9, I show a detail view of one of the front contact posts.

In Fig. 10, I show the detail construction of one of the contacts.

In Fig. 11, I show the details of the front binding post screw.

In Fig. 12, I show details of a lock washer.

In Fig. 13, I show a detail of the lock washer employed to hold the lock washer shown in Fig. 12, in place, and also to lock the contact, shown in Fig. 10, from rotation.

In Fig. 14, I show a modified lock washer used in place of Figs. 12 and 13.

In Figs. 16 and 15, I show sectional and front views of a modified form of relay, to be used where the quick action of the relay is necessary.

Referring to Figs. 1 and 2, the relay consists of a metal base 1, provided with an arched recess 2, and an opening 3, in which is inserted an insulating panel 4. The base 1, is also provided with downwardly projecting bearing carrying members 5 and 6, and with a downwardly projecting part 7 which is employed for carrying a split phase magnet 8. A shaft 9 is journaled in the bearings 10 and 11, shaft 9 carrying a non-magnetic disk 12 rigidly mounted thereon in such a manner that the disk will be free to rotate between the poles 13 and 14 of the split phase magnet 8 as shown. A pinion 15 is loosely mounted so as to be free to rotate about the sleeve extension 16 of disk 12—the extension 16 being provided with a wearing sleeve 17 to take the wear of the pinion 15. On each side of the pinion 15 are provided friction washers 18 and 19, and the pinion 15 is held pressed between these friction washers by means of spring 20 acting between stop ring 21 and washer 22. The disk 12 is provided with a thickened hub 23 and a rim 24, in such a manner as to just clear the poles 13 and 14 of the split phase magnet 8, and yet maintain the disk 12 rigid and free from buckling.

The bearings 10 and 11 are threaded at 25 and provided with lock washers 26. These lock washers have spring extensions 27 and 28 which keep them forced out under the shoulders 29 of the bearings. An extension 30 is provided and is turned under into a slot 31 in the bearing carrying member, in such a manner as to prevent rotation of the lock washers. The bearings are free to be screwed in and out of the bearing carrying members 5 and 6 in order to give lateral adjustment of the disk 12 between the poles 13 and 14 of the split phase magnet.

After the bearings have been adjusted

projections 32 are turned up about the hexagonal face of the bearing, thereby locking the same from rotation. A shaft 33 is mounted in bearings 34 and 35 and carries a sector 36 which engages with the teeth of the pinion 15. On sector 36 a projection 37 is provided and normally rests on the pinion 15 thereby supporting the weight of the sector 36. On the outer end of the shaft 33 a crank 38 is provided which is so arranged, that upon the movement of the sector 36 in an upward direction, it will draw the link 39 down, thereby drawing lever arm 40 down and rotating contact carrying bar 41 about the pivot 42.

The split phase magnet 8 is built of a series of laminations 43 and 44 stacked together in such a manner as to alternate the joints as shown at 45 and 46. At the end of the poles a groove 47 is provided. After the coils 48 and 49 have been pushed over the poles a shading coil 50, shaped as shown in Fig. 6, is slid into the groove 47 in such a manner that it surrounds the lower half of the pole and is riveted in place by means of rivets 51, thereby holding the coils 48 and 49 in place. This split phase magnet is clamped to downward projecting part 7 by means of clamp plate 52 and screws 53.

The insulating panel 4 is provided with a series of front contacts 54 and back contacts 55, so arranged that the contact fingers 56 and 57 will engage therewith upon a vertical movement of the contact finger carrying bar 41. A clamping rod 58 provided with a knurled nut 59 is arranged in such a manner that it will clamp a glass cover 60 over the whole mechanism, drawing the cover up against a gasket 61. The front contact 54 is composed of a contact binding post 62 which is provided with a square head 63 and is tapped at 64. The insulating panel 4 is provided with a hexagonal recess 65 on the upper side thereof and a square recess 66 on the lower side.

In placing the binding posts 62 in position the hexagonal nut 67 is first inserted in the recess 65. The binding post 62 is then passed through the opening 68 and screwed through the nut 67 until the square head 63 is tight against the face 69 of recess 66. The square washer 70 is then inserted in the recess 66, thereby preventing the binding post 62 from turning. The lock washer 71 is now placed over the square head 63 in such a manner that the ears 72 project upwardly and hold the washer 70 in place.

The contact carrying member 73 which carries graphite contact 74 is provided with a screw extension 75. This extension 75 is now screwed into the tapped portion 64 of the binding post 62, thereby holding the lock washers 71 and 70 rigidly in place. The ears 73 of lock washers 71 are now turned down about the hexagonal face 74 of contact carrying piece 73, thereby locking the same from rotation.

In Fig. 14, I show a modified form of washer which, obviously, may be used to replace the lock washers 70 and 71.

The operation of the relay as described is as follows:

As shown in Figs. 1 and 2 the relay is in the deënergized position, the back contacts 55 and 57 being held closed by gravity. To operate the relay alternating current is applied to the coils 48 and 49 from any suitable source. On account of the magnet 8 being provided with shading coils 50 on the lower halves of the laminated pole structures 13 and 14, it will be seen that a downwardly moving flux will be created between the poles 13 and 14 which will cause the disk 12 to rotate in a clock-wise direction. This will rotate pinion 15 and move sector 36 upwardly until the projection 37 engages with the lip 88 of the relay top 1, the pinion 15 being so arranged that it will slip when sector 36 is brought to a stop in order to absorb the momentum of disk 12. This will cause crank 38 to move downwardly, drawing arm 40 down by means of link 39 and rotating the contact finger bar 41 about the pivot 42 in such a manner as to raise the contact fingers 56 and 57, and thereby break the back contacts 57 and 55 and make the front contacts 54 and 56.

It will be seen that upon the deënergization of the relay that both the weight of the contact finger bar 41 with its contact fingers 56 and 57, and also the weight of the sector 36, tend to open the relay to its deenergized position.

I have shown in Figs. 15 and 16, a modified construction of the relay in which I have replaced pinion 15 by means of crank 89, and sector 36 by means of link 90 and extension lever 91 of crank 38.

It will be seen that by means of this modified construction a far more rapid action of the relay may be obtained at the sacrifice of either more energy or a reduction in the pressure obtained at the contact finger.

While I have described my invention it is obvious that various modifications may be made in the construction of my apparatus without deviating from the broad principle of the invention; I, therefore, do not wish to be restricted to the specific form of construction as shown and described.

Having described my invention what I claim as new and desire to secure by Letters Patent is:

1. In combination with a relay a source of alternating current supply, a split phase magnet energized from said source comprising a bi-polar magnet having shading coils composed of bent sheet metal about a portion of its poles to create a moving field between said poles, contacts and coacting con-

tact fingers, and a nonmagnetic disk rotor mounted transversely at the back of said contact fingers to operate the same.

2. In a relay the combination of a metal top having an insulating panel carried thereby; contacts carried by said insulating panel, a contact finger carrying bar pivotally mounted on said top, contact fingers carried thereon and adapted to coact with said contacts, and means comprising a split phase magnet, and a nonmagnetic operating element placed transversely behind said contacts and contact finger bar to operate the contact finger bar.

3. In a relay the combination of a metal top having an insulating panel carried thereby; contacts carried by said insulating panel, a contact finger bar pivotally mounted on said top, contact fingers carried thereon and adapted to coact with said contacts; a split phase magnet, a non-magnetic disk rotor placed transversely behind said contacts and contact finger bar and adapted to operate the contact finger bar upon the energization of said split phase magnet.

4. In a relay the combination of a metal top, contacts carried by said top and insulated therefrom, a contact finger bar pivotally mounted on said top, contact fingers carried thereon and adapted to coact with said contacts, and means comprising a split phase magnet and non-magnetic disk rotor having a rim and hub formed thereon to prevent buckling of the same, to operate the contact finger bar.

5. In a relay the combination of a metal top, contacts carried by said top and suitably insulated therefrom, a contact finger carrying bar pivotally mounted on said top, contact fingers carried thereon and adapted to coact the said contacts, a split phase magnet and a non-magnetic disk rotor having a rim and hub formed thereon to prevent buckling of the same; said disk being placed transversely at the back of said contacts and operably connected to said contact fingers to operate the same.

6. In a relay the combination of a metal relay top; contacts and coacting contact fingers insulatively mounted thereon; means for operating said contact fingers comprising a split phase magnet, composed of a laminated structure, having shading coils formed of bent sheet metal about a portion of its poles, and a non-magnetic element transversely disposed behind said contacts and contact fingers and operatively connected to said contact fingers to operate the same upon energization of said split phase magnet.

7. In a relay, the combination of a metal relay top, contacts and coacting contact fingers insulatively mounted thereon, means for operating said contact fingers comprising a split phase magnet composed of a laminated structure having shading coils formed of bent sheet metal about a portion of its poles, and a nonmagnetic disk rotor having a rim and hub formed thereon to prevent buckling of the same, said disk rotor being transversely disposed behind said contacts and contact fingers and operatively connected to said contact fingers to operate the same upon the energization of said split phase magnet.

8. In a relay an operating element comprising a split phase magnet, coils completely surrounding the poles thereof, shading coils formed from flat sheet metal stock partly surrounding the poles thereof and having faces adjacent the outer walls of said coils to retain said coils in place, and a nonmagnetic element acted upon by said split phase magnet whereby the nonmagnetic element is caused to move.

9. In a relay the combination of a metal top having an insulating panel carried thereby, contacts carried by said insulating panel, a contact finger bar pivotally mounted on said top, contact fingers carried thereon and adapted to coact with said contacts, a split phase magnet, a nonmagnetic disk rotor placed transversely behind said contacts and contact finger bar and adapted to operate the contact finger bar upon the energization of said split phase magnet, clamping means and a cover of transparent material adapted to incase the movable elements and form a support for said relay.

In testimony whereof I have signed my name to this specification.

OSCAR S. FIELD.