

March 25, 1924.

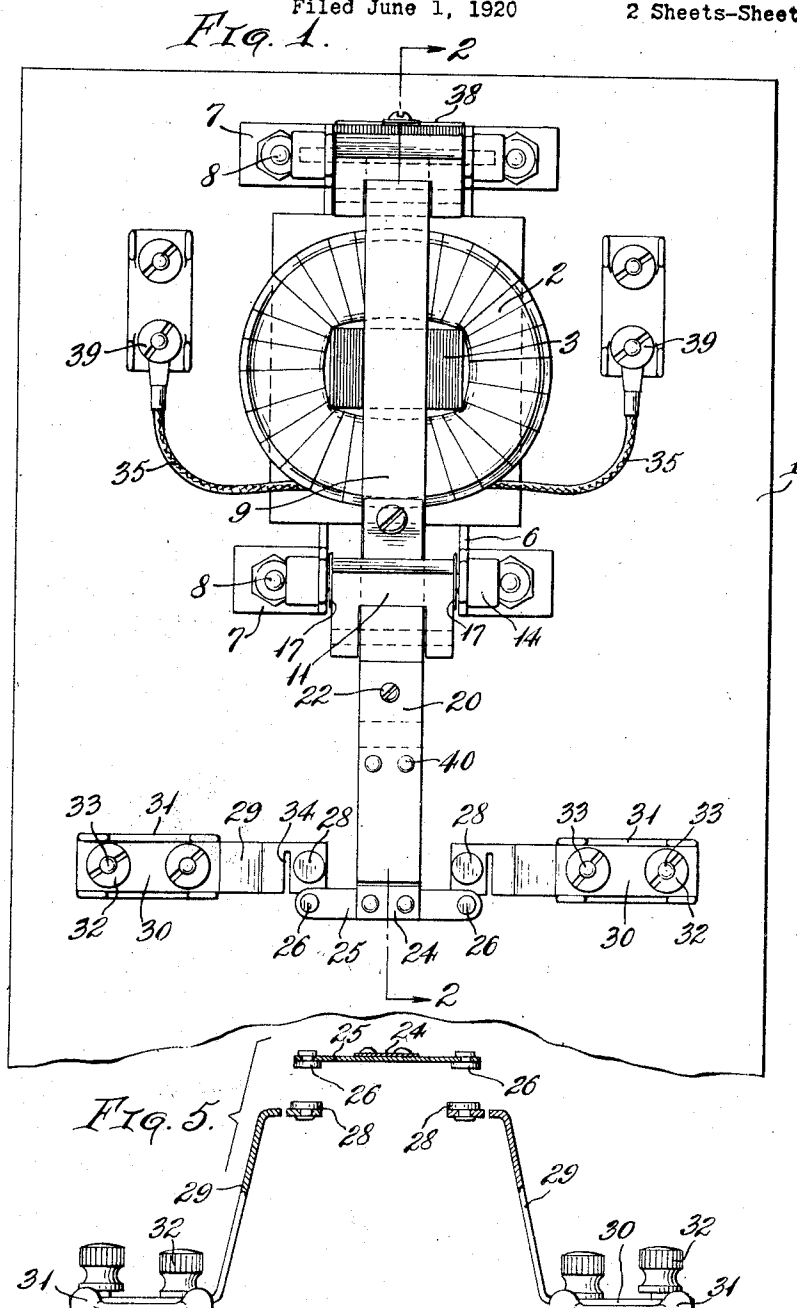
L. E. RICHMOND

1,488,134

RELAY

Filed June 1, 1920

2 Sheets-Sheet 1



Inventor.
Louis E. Richmond
By Brockett & Hyde
Attys.

March 25, 1924.

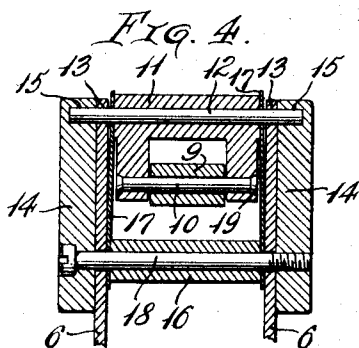
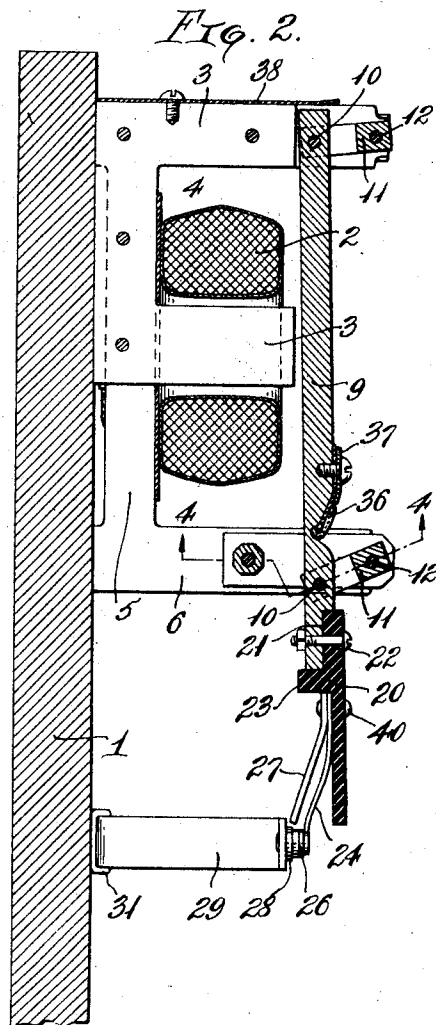
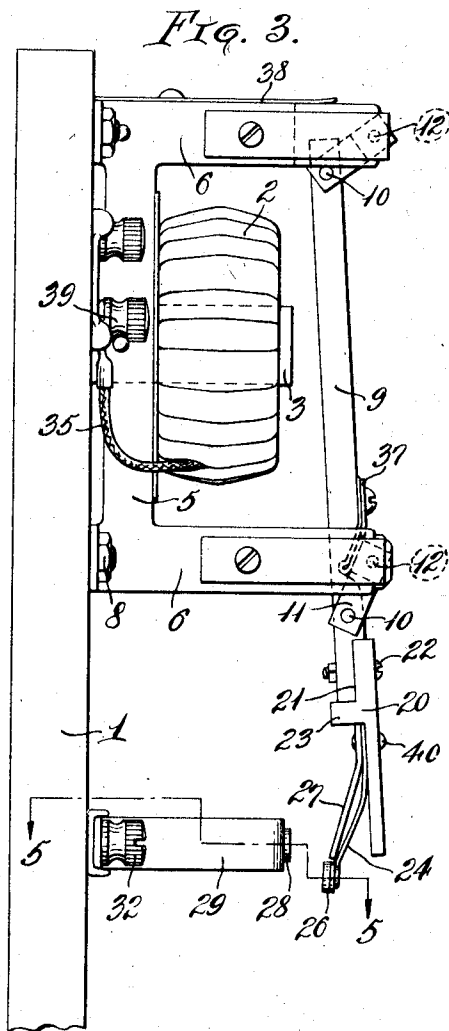
L. E. RICHMOND

1,488,134

RELAY

Filed June 1, 1920

2 Sheets-Sheet 2



Inventor.
Louis E. Richmond
By Brockett & Hyde
Attys.

UNITED STATES PATENT OFFICE.

LOUIS E. RICHMOND, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
THE AUTOCALL COMPANY, OF SHELBY, OHIO, A CORPORATION OF OHIO.

RELAY.

Application filed June 1, 1920. Serial No. 385,677.

To all whom it may concern:

Be it known that I, LOUIS E. RICHMOND, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Relays, of which the following is a specification.

This invention relates to relays, such as are used for transmitting impulses or electrical effects from one electric circuit to another. The object of the invention is to provide a very simple relay that can be made at low cost and which includes a relatively small number of parts so that it is not liable to get out of order in service, and also a relay in which the contact operating member travels in a curved path so that the contacts can be made to engage with a wiping movement to not only cause them to settle or adjust themselves into the proper contacting relation, but also cause said contacts to be self-cleaning and avoid the collection of oxides or the effects of corrosion.

A further object of the invention is to provide a relay embodying an electromagnet and an armature having swinging movement opposite the magnet pole and in the same plane as the axis of said pole, the contact effecting member being connected directly to the armature to simplify the construction.

Further objects of the invention are in part obvious and in part will appear more in detail hereinafter.

In the drawings, Fig. 1 represents a front elevation of one form of relay embodying the invention; Fig. 2 is a sectional elevation on the line 2—2, Fig. 1, looking in the direction of the arrows, the contacts being closed; Fig. 3 is a side elevation showing the relay in open position; Fig. 4 is a sectional detail view on the line 4—4, Fig. 2; and Fig. 5 is a cross section on the line 5—5, Fig. 2.

The relay shown in the drawings comprises a base plate or body 1 made of suitable insulating material, such as slate or the like. On said base is mounted an electromagnet of suitable form for actuating the switch member. Said magnet comprises a coil 2 surrounding one leg or pole 3 of a U-shaped core, the two poles being connected by the base member 4. The core is preferably of laminated form to concentrate the magnetic flux. The laminations of

the core are preferably held between side members 5 of a U-shaped form, said members having legs or posts 6 extending outwardly from the base beyond the ends of the magnet poles, said posts forming supports for the armature carrying members, as will appear. The side frame members are suitably connected to the base 1, such as by being provided with ears 7 through which the clamping screws 8 are passed.

Opposite the electromagnet is mounted an armature 9 which may be of laminated form but is shown as formed of a solid piece of magnetizable material. This armature extends vertically across the space between the two poles 3 so as to bridge the gap in the magnetic circuit and also extends below the lower pole 3 and through the space between the two lower posts 6 of the side frame members. It is mounted to swing in a vertical plane through the two pole members, for which purpose it is pivotally connected at the points 10 to two U-shaped blocks 11 mounted to turn upon pins 12 extending across between the pairs of frame posts 6. The two blocks 11 are of similar form. In other words, the distance between the pins 10 and 12 of each block is the same, but the two blocks are not parallel, pivots 10 being farther apart than the pivots 12. The purpose of this arrangement will appear hereinafter.

Fig. 4 shows in detail the mounting for the blocks 11. As illustrated, each of the side frame posts 6 is pierced to provide a pair of apertures 13, and outside of said frame posts are located blocks 14 provided at their upper ends with cavities 15 to receive the ends of pins 12. Between the posts 6 is a spacing tube or sleeve 16, which, at its opposite ends, abuts leaf spring members 17 extending outwardly along the inner faces of the frame posts 6. By screwing up the clamping bolt 18 the two blocks 14 are drawn together until they exert a clamping effect upon the ends of pins 12 and therefore confine said pins without permitting them to turn. The parts are so proportioned that the outer ends of springs 17 have slight play between the frame posts 6 and the ends of the blocks 11, and as their tendency is to spring forwardly toward each other, they exert a slight retarding effect upon the turning or swinging motion of the blocks 11; and as the result of pressure of blocks 14 on the

pins 12 the blocks 11 turn on the pins with a resultant drag. Pins 10 are passed through openings in the legs of the blocks 11 and armature 9 and are headed over at their ends, as at 19, Fig. 4.

To the lower end of the armature is secured an insulating member 20, the upper end of which fits a seat 21 in the armature and is secured thereto by a screw 22. Said insulating member is also provided with a shoulder 23 abutting the lower end of member 9. To the rear face of member 20 is secured a spring arm 24 having a cross bridge 25 at its outer end made of conductive material, such as brass, and carrying two contact points 26. Behind said spring member is a stiff protecting plate 27. The two contacts 26 co-operate with relatively stationary contact points 28 carried by posts 29 suitably secured to the base. As illustrated, these posts are formed as sheet metal strips provided with flat bases or feet 30 held between the walls of channel shaped members 31 clamped to the base by screws 32 threaded upon the bolts 33. These posts may be slotted, as at 34, to enable the contact bearing end portions thereof to be bent to provide parallel contacting relation between the points. The outer screws 33 with their nuts 32 serve as binding posts for the wires of the controlled circuit. The wires of the controlling circuit are led to similar binding posts 39 on the base, from which electric connection is made to the coil by the lead wires 35.

Fig. 3 shows the normal position of the parts. The armature 9 has dropped by gravity to its lower position, in which a cushion 36 of felt or other soft material held beneath the clamp 27 is in contact with a face of the lower block 11. This cushion serves to avoid any noise of impact when the parts drop to normal position. When the coil is energized the attraction of the electromagnetic field moves the armature 9 to the left and upwardly in Fig. 3 to the position shown in Fig. 2. The parts move by a sort of parallel ruler motion. Indeed, as in a parallel ruler, by making the two blocks 11 parallel with each other, or by equally spacing the pins 10 and 12, a true parallel motion can be secured. I prefer, however, in the present relay, to unequally space the pins 10 and 12, as a result of which the lower end of the armature and the contacts carried thereby have a pronounced horizontal movement toward and from the stationary contacts. The effect is to quickly move the contacts 26 horizontally and slightly upwardly until they engage the stationary contacts 28. Continued motion of the armature causes the contacts to wipe over each other with some flexing of the spring 24, the movable contacts adapting themselves to the stationary contacts until full

seating relation is reached. Momentum of the parts tends to carry the armature beyond its normal position of rest opposite the magnetic poles when energized, but such over swing may be limited by a light spring 38 secured to the upper magnet pole and having its free end portion lying opposite the upper end of the armature 9.

The unequal spacing of pins 10 and 12 avoids what might be termed a dead center. In other words, when the relay is closed, as in Fig. 2, the spring 24 is flexed, the pressure of said spring tending to move the armature 9 bodily to the right. If in this position the lower block 11 lay exactly horizontal, the pressure of the spring 24 would be directed in a straight line toward the lower pivot 12 and when the electromagnet was de-energized the pressure of the spring 24 might prevent the armature from dropping. With the arrangement described, however, the pressure of the spring 24 is exerted at one side and specifically below the pivot 12 so that when the magnet is de-energized the spring 24 tends to immediately start the retraction of the armature to its normal position shown in Fig. 3.

Member 20 has its lower end portion depending from the rivets 40 which connect the spring 24 and the plate 27 thereto, and this depending portion serves as an apron to protect the spring and contacts from accidental disturbance. The plate 27 lying behind the spring serves similarly to protect the spring from being bent downwardly with the fingers or by any articles striking it.

By making the armature 9 of a solid bar of metal, said armature acts more sluggishly than when made of laminated form. The sluggishness of the movement is increased by the effect of the springs 17. While the movement is termed sluggish, this is a comparative term as the actual movement is quite rapid. 60 cycle hum is also avoided.

What I claim is:

1. In a relay, the combination of relatively stationary contacts, an electromagnet, and a contact carrying armature member lying approximately normal to the axis of said electromagnet and mounted to swing at two points so as to be bodily movable at both points to carry its contacts into and out of operative engagement with said stationary contacts.

2. In a relay, the combination of relatively stationary contacts, an electromagnet, a pivotally mounted block, an armature member lying approximately normal to the axis of said electromagnet and having pivotal connection at one point with said block, and means for supporting said armature member at another point so that it can be swung bodily relative to said stationary contacts.

3. In a relay, the combination of relatively

stationary contacts, an electromagnet, a plurality of pivotally mounted blocks, and an armature member lying approximately normal to the axis of said electromagnet and having pivotal connection with said blocks so that it can be swung bodily with relation to said stationary contacts.

4. In a relay, the combination of relatively stationary contacts, an electromagnet, a plurality of pivotally mounted blocks, an armature member carrying contacts and having pivotal connection with said blocks so that it can be swung bodily relative to said stationary contacts, said blocks being out of parallel so that said armature contacts will first engage said stationary contacts at an angle and then wipe over the same.

5. In a relay, the combination of relatively stationary contacts, an electromagnet, a block pivotally mounted upon a horizontal axis, an armature member having pivotal connection at one point with said block and adapted to swing in a vertical plane, and means for freely supporting said armature at another point so that it will swing bodily relative to said contacts, said block occupying a position off of dead center when said electromagnet is energized.

6. In a relay, the combination of relatively stationary contacts, an electromagnet, a plurality of blocks pivotally mounted upon horizontal axes, and an armature member having pivotal connection with said blocks so that it can be swung bodily in a vertical plane toward and from said contacts, said blocks being out of parallel with each other.

7. In a relay, the combination of relatively stationary contacts, an electromagnet, a block pivotally mounted upon a horizontal axis, an armature member having pivotal connection at one point with said block and adapted to swing in a vertical plane, means for freely supporting said armature at another point so that it will swing bodily relative to said contacts, said block occupying a position off of dead center when said electromagnet is energized, and means tending to retract said armature from said magnet, whereby said armature will automatically drop to inactive position when the magnet is de-energized.

8. In a relay, the combination of relatively stationary contacts, a vertically disposed U-shaped frame, an electromagnet in

said frame, and an armature member having swinging connection with the arms of said frame and adapted to swing in a vertical plane relative to said contacts.

9. In a relay, the combination of relatively stationary contacts, a vertically disposed U-shaped frame, an electromagnet in said frame, an armature member having swinging connection with the arms of said frame and adapted to swing in a vertical plane relative to said contacts, and cushioning means between said armature and its support.

10. In a relay, the combination of relatively stationary contacts, a vertically disposed U-shaped frame, an electromagnet in said frame, an armature carrying a contact member for co-operation with said stationary contacts, and a spring connection between said armature and its contact member, said armature having swinging connection with the arms of said frame and adapted to swing in a vertical plane toward and from said electromagnet, said spring tending to normally retract said armature from said electromagnet.

11. In a relay, the combination of relatively stationary contacts, a vertically disposed U-shaped frame, an electromagnet in said frame, an armature carrying a contact member for co-operation with said stationary contacts, a spring connection between said armature and its contact member, said armature having swinging connection with the arms of said frame and adapted to swing in a vertical plane toward and from said electromagnet, said spring tending to normally retract said armature away from said electromagnet, and means for protecting said spring member.

12. In a relay, the combination of relatively stationary contacts, a vertically disposed U-shaped frame, an electromagnet in said frame, an armature member having swinging connection with the arms of said frame and adapted to swing in a vertical plane into and out of engagement with said contacts, and frictional means effective upon said armature to retard its motion toward and away from said electromagnet.

In testimony whereof I affix my signature.

LOUIS E. RICHMOND.