No. 885,688. PATENTED APR. 21, 1908.

A. S. CUBITT.

RELAY.

APPLICATION FILED AUG. 24, 1907.

Fig. 1.

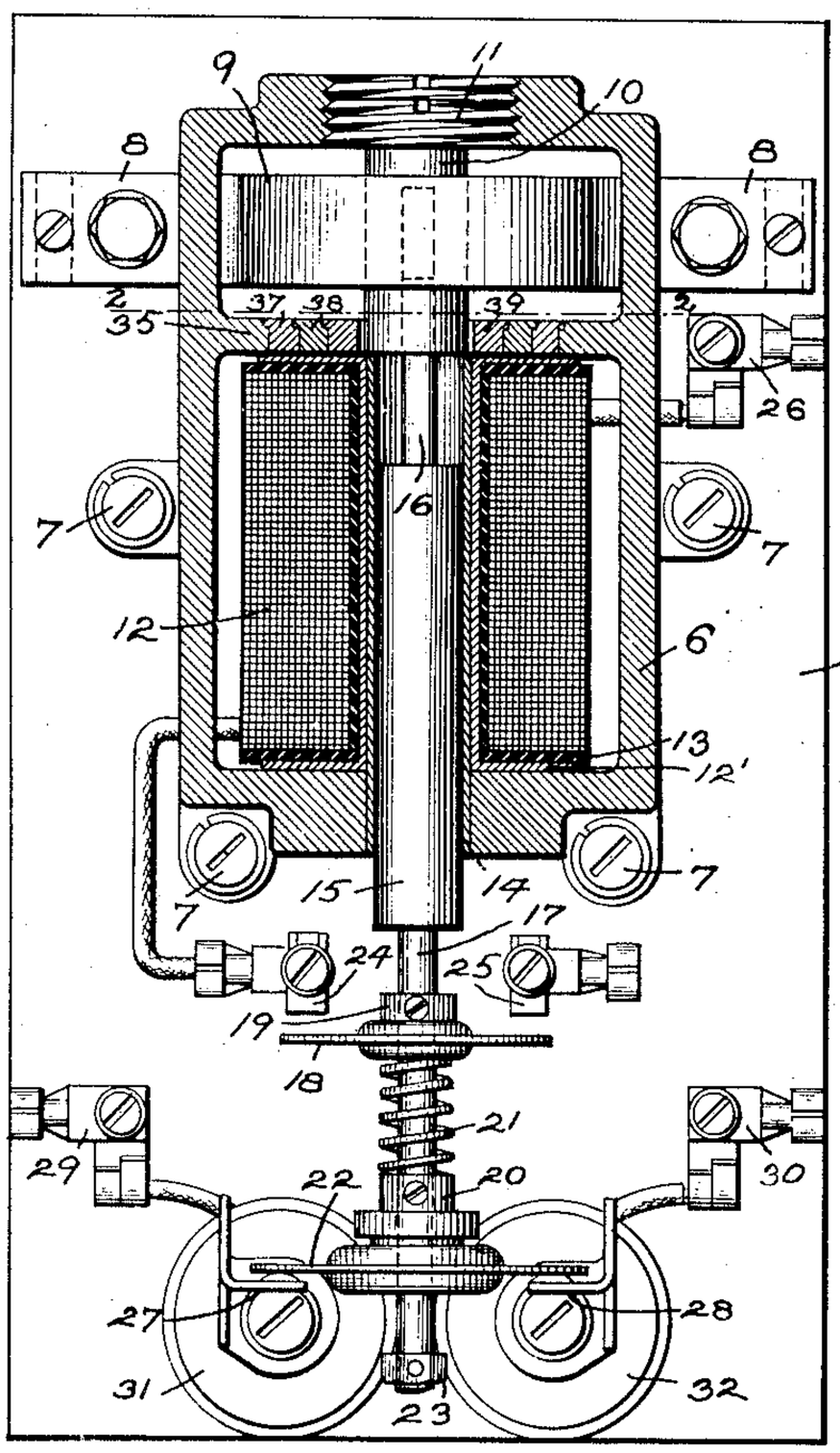
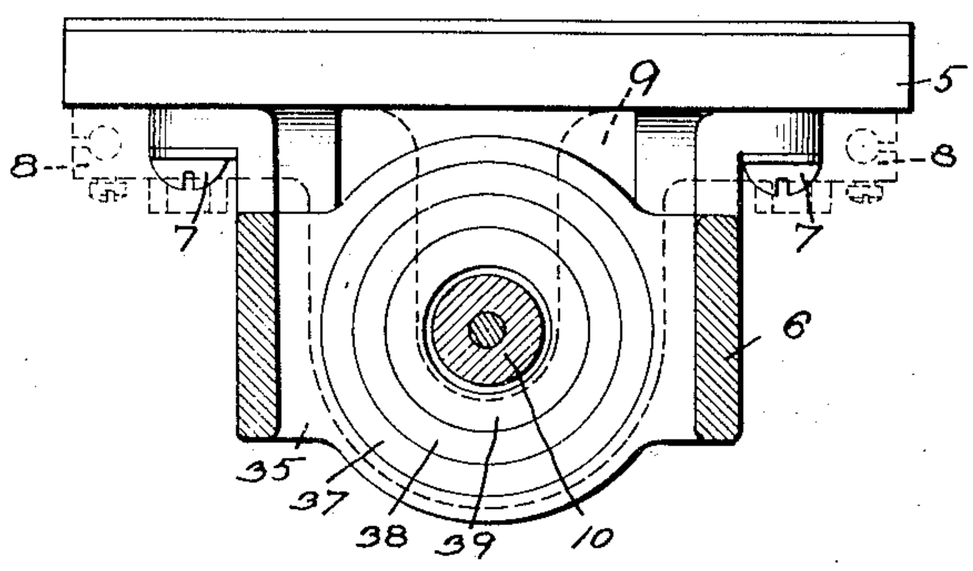


Fig. 2.



WITNESSES
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RELAY.

No. 885,688. Specification of Letters Patent. Patented April 21, 1908.

Application filed August 24, 1907. Serial No. 390,031.

To all whom it may concern:

Be it known that I, ARCHIBALD S. CUBITT, a subject of the King of Great Britain, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Relays, of which the following is a specification.

My invention relates to relays, and particularly to that form of relay in which two coils are employed, one being an actuating coil of few turns of a heavy conductor, and the other a coil of many turns of finer wire.

Relays of this kind are often used in connection with motor control apparatus of the separately actuated contact type and serve to protect the apparatus against overload. In such service the heavy conductor of few turns generally carries the main motor current, while the other coil of smaller wire receives current, after the relay has pulled up, through contacts closed by the relay, and through contacts closed when the master-switch is in any but its off or first position. The main contacts of the relay may be connected in the main control circuit, or may be simply in the control circuit going to those contactors which regulate the amount of resistance in the motor circuit. In the first case, pulling up of the relay allows all the contactors of the controller to drop, thereby opening the motor circuit, and in the second case, operation of the relay allows only the resistance controlling contactors to drop, thereby throwing all the resistance into the motor circuit but not breaking the connection of the motors with the source of current. Such a relay, if the current in the motor circuit exceeds a certain value, is pulled up by the field produced by the coil of heavy conductor and few turns, and is then held in its raised position by the other coil until the master-switch is thrown to its off or first position.

In relays of this type where the current in the actuating coil is large, the field produced by it may be sufficiently strong if it is given but a single turn. When still higher currents are to be handled, even one turn in this coil may produce too strong a field and it becomes necessary to weaken it in some way. It is at once obvious that when this coil has been reduced to a single turn it is difficult to arrange the conductor so that the magnetic field produced by it will be materially weaker than that produced by a single turn.

It is an object of my invention to provide means whereby the effective magnetic field, produced by the actuating coil, may be easily regulated when the current in this coil is so high that the field normally produced by a single turn would be stronger than is desirable for the purposes of operation.

In carrying out my invention, I provide a shunt path for the magnetic flux, preferably using a portion of the frame of the relay for this purpose. I also provide means whereby the reluctance of the shunt path may be varied and the effective field strength thereby maintained more or less constant with different exciting currents.

In the accompanying drawing I have shown one construction in which my invention may be embodied.

In this drawing Figure 1 is an elevation, partly in section, of a relay provided with my invention; and Fig. 2 is a sectional plan view on line 2 2 of Fig. 1, the lower part of the relay being omitted and the operating coil being shown in dotted lines.

Referring to the drawing, 5 indicates a base, preferably of insulating material, upon which the parts of the relay are mounted. The iron frame 6 of the relay, the form of which is evident from the drawings, may be attached to the base 5 by means of screws 7 passing through lugs which extend from the frame as shown. The coil which carries the motor current consists as shown of two straight terminals 8 and a middle U-shaped portion 9 which partially surrounds a fixed core 10 extending downward from the top of the frame 6. This core 10 has a threaded head 11 which screws into the frame and permits adjustment of the core 10 in a vertical direction. The maintaining coil is shown at 12 mounted in the lower part of the frame and insulated therefrom in any suitable manner. This coil may conveniently be made by winding it on a sheet metal spool 12′ between which and the coil a layer of insulating material 13 is interposed. After the spool is slipped into the frame, a tube 14 of brass or other non-magnetic material forced up through the hole in the bottom of the frame will serve to keep it in place. The movable element of the relay may be of any suitable construction and, as shown, comprises an iron core 15 adapted to slide easily within the tube 14, said core having a guide pin 16 sliding into a hole in the fixed core 10,

as shown in Fig. 1. Mounted loosely on the rod 17, which projects from the bottom of the core 15, is a contact disk 18. Above said disk 18, and secured to the rod 17, is a collar 19, and below the disk is a collar 20 also secured to the rod 17, a spring 21 being interposed between the disk 18 and collar 20.

Another contact disk 22 is loosely mounted on the rod 17 and is only lifted when it is engaged by the nut or collar 23 secured to the lower end of the rod 17. The contact disk 18, when the core is raised, connects fixed contacts 24 and 25. Contact 24 is connected to one end of the coil 12 and the other end of this coil is connected to a terminal 26. The lower contact disk 22, when the relay is in its lower position, bridges fixed contacts 27 and 28 which are connected to terminals 29 and 30 through blow-out coils 31 and 32 in a usual and well known manner. It is at this set of contacts that the control circuit is interrupted.

I now come to the principal feature of my invention which is the shunt by which more or less of the magnetism produced by the coil 9 may be shunted if the current which is to pass through the coil 9 is more than that necessary to produce the field strength required for operation. This shunt is shown in Fig. 1 between the coils 9 and 12. It comprises an iron web 35 preferably integral with the frame 6, and a number of bushings 37, 38 and 39 which are arranged to nest one within the other and are supported by the web 35. These bushings may be easily inserted if the core 10 is raised or removed. The bushings may be secured in any suitable manner, as by frictional engagement with one another.

The operation of my relay is apparent from the drawing. The heavy coil 9 produces a magnetic field, which, when it reaches a certain strength, draws up the movable core 15. The effective strength of the field produced by the coil 9 may be reduced by the insertion of the bushings 37, 38 and 39. These serve to lessen the air gap between the web 35 and the lower end of the core 10. As the air gap is decreased by the insertion of bushings, more flux passes through this shunt path instead of by the path formed by the core 15 and the side members on the frame 6. By removing successively the bushings 39, 38 and 37 the reluctance of the shunt path is increased, and the effective strength of the magnetic field produced by the coil 9 is increased. In this way the relay may be calibrated for high current values.

While I have shown you one form of apparatus in which my invention may be embodied, I wish it understood that I do not intend to limit myself to this construction, but aim to cover all such modifications as will occur to those skilled in this art.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In a relay, a current carrying coil, a core movable in the magnetic field thereof, a frame serving as a path for the magnetic flux, and adjustable means coöperating with said frame for shunting more or less of the flux around said core.

2. In a relay, a current carrying coil, a core movable in the magnetic field thereof, a frame serving as a path for the flux and as a magnetic shunt around said core, and means for varying the reluctance of the shunt path.

3. In a relay, a current carrying coil, a core movable in the magnetic field thereof, a frame serving as a path for the flux and as a magnetic shunt around said core, and bushings for varying the reluctance of the shunt path.

4. In a relay, a current carrying coil, a core movable in the magnetic field thereof, a frame for supporting said core and serving as a path for the flux and as a magnetic shunt around said core, and bushings arranged to nest one within the other for varying the reluctance of the shunt path.

5. In a relay, a current carrying coil of few turns, a current carrying coil of many turns, a core movable in the field produced by both coils, a frame for supporting said core and serving as a path for the flux, and an adjustable extension on said frame for shunting a portion of the flux of the first mentioned coil around said core.

In witness whereof, I have hereunto set my hand this 23rd day of August 1907.

ARCHIBALD S. CUBITT.

Witnesses:
HEWLETT SCUDDER, Jr.,
HELEN ORFORD.