M. P. RYDER.

CIRCUIT BREAKER.

APPLICATION FILED APR. 9, 1904.

998,990. Patented July 25, 1911.

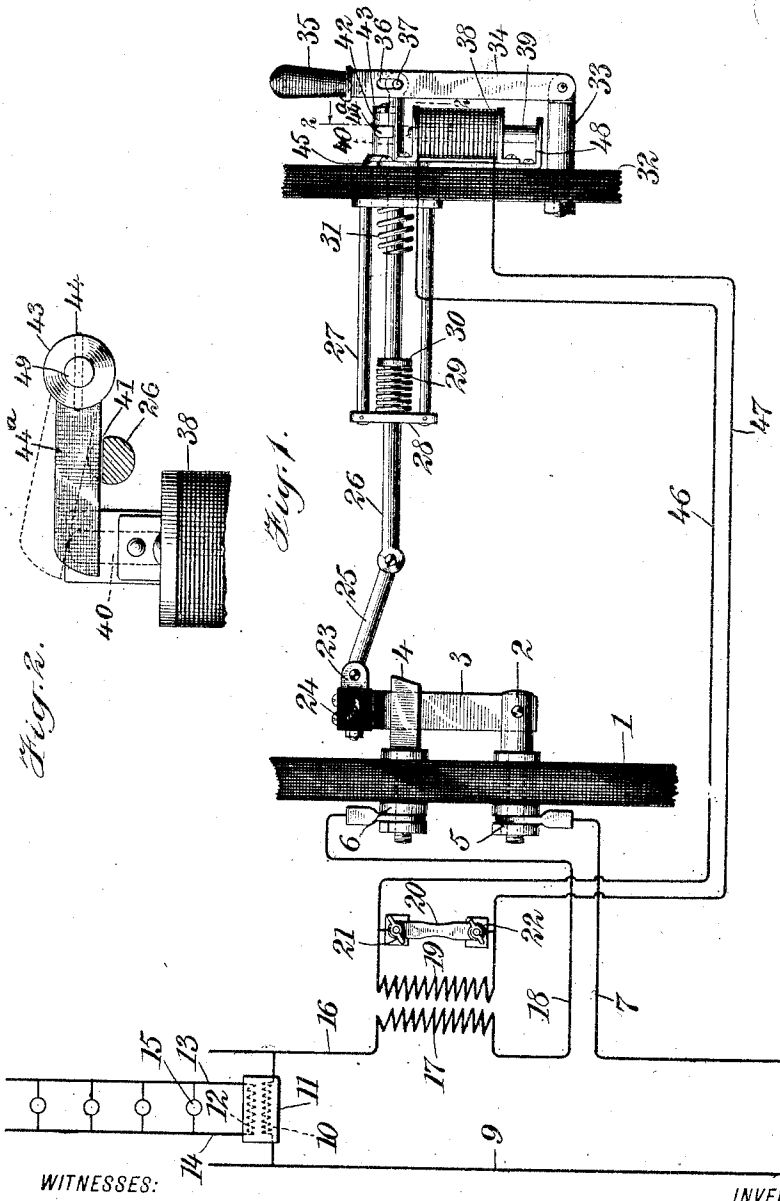

Fig. 1.

Fig. 2.

WITNESSES:

Geo. H. Maylor.

Walton Harrison

INVENTOR

Malcolm P. Ryder.

BY

Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

MALCOLM P. RYDER, OF WHITE PLAINS, NEW YORK.

CIRCUIT-BREAKER.

998,990. Specification of Letters Patent. Patented July 25, 1911.

Application filed April 9, 1904. Serial No. 202,287.

To all whom it may concern:

Be it known that I, MALCOLM P. RYDER, a citizen of the United States, and a resident of White Plains, in the county of Westchester and State of New York, have invented a new and Improved Circuit-Breaker, of which the following is a full, clear, and exact description.

My invention relates to circuit breakers, and admits of general use, but is peculiarly applicable in cases where it may be desirable to break the circuit only when there is a long continued excess of current flowing through it. In other words, I seek to produce a type of circuit breaker which is sensitive to long continued excesses of current, but which is not affected by momentary increases or decreases of the same.

My invention consists in the novel disposition or relative arrangement of a transformer, a fuse and coils for a magnetic circuit breaker which controls the circuit of the primary of the transformer, such novel disposition or arrangement comprising magnetic circuit breaker coils and the fuse in shunt relation to one another upon the secondary circuit of the transformer, as is hereinafter described and then specified in the claims.

By my invention, as will be hereinafter more apparent, I secure not only reliability of action, but provide a wide margin of adjustment and operation for the circuit breaker and further simplify and reduce the size of the device and secure freedom from danger in operation of the apparatus.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation, partly diagrammatic, showing my invention in use; and Fig. 2 is a section upon the line 2—2 of Fig. 1, looking in the direction indicated by the arrow.

Upon the board 1 is mounted a post 2, pivoted upon which is a knife 3, engaging a bifurcated contact 4, the post 2 and the contact 4 being provided respectively with terminals 5, 6, all of these parts constituting a so-called knife switch. From the terminal 5 a wire 7 leads to the dynamo 8, and from this dynamo a wire 9 leads to the primary winding 10 of a transformer 11. The secondary winding of this transformer is connected with the wires 13, 14, for energizing the lamps 15, which are connected in the usual or any desired manner. From the primary winding 10 a wire 16 leads to a primary winding 17, from which a wire 18 leads to the terminal 6. The secondary winding 19 is disposed adjacent to the primary winding 17, these two windings constituting a second transformer. A fuse 20 provided with terminals 21, 22, is connected to a circuit 46, 47 and in shunt relation to a magnet coil 38 on said circuit as shown. The upper end of the knife 3 is provided with a head 23, connected thereto by the insulation 24. Journaled upon this head is a link 25, which is pivotally connected with a sliding rod 26, passing through a cap 27, this cap being rigidly mounted upon a board 32. One end of this cap 27 is provided with a plate 28, and resting against this plate is a spiral spring 29, which also engages an annular boss 30, mounted rigidly upon the sliding rod 26. Another spiral spring 31 is mounted upon the opposite side of the annular boss 30, and serves as a buffer to cushion the movements of the sliding rod 26 in one of its longitudinal directions, as will be seen from Fig. 1. A post 33 is rigidly mounted upon the board 32, and journaled upon this post is a knife 34, provided with a handle 35 and with a slot 36, this slot being loosely engaged by a sliding pivot 37, rigidly mounted within the sliding rod 26. A solenoid 38 is provided with a movable core 39, the upper portion 40 of which is comparatively small and is rounded upon its upper end as shown. The sliding rod 26 is provided with a notch 41, as shown more particularly in Fig. 2. A sleeve 42 is loosely mounted upon a stationary boss 49, being held in position by the disk 43, this disk being secured by a pin 44 passing diametrically through the boss 49, as indicated in dotted lines in Fig. 2. The boss 49 is rigidly mounted upon a base or bracket 45, which is in turn rigidly connected with the board 32, said boss carrying an arm 44^a, normally engaging a notch 41 as shown in Fig. 2. Wires 46, 47, connect the transformer 19 and the fuse 20 with the solenoid 38, the arrangement of these mem-

bers being preferably such that the fuse 20 and solenoid 38, or equivalent magnetic member of the circuit breaker, are connected in parallel with each other across the secondary circuit. Owing to the impedance of the coil in shunt relation to the fuse but little current flows in the shunt around the fuse while same is intact, but when the fuse blows opening the short circuit path, the current is forced to act on the magnetic member of the circuit breaker. A bracket 48 normally supports the core 39 in its lowermost position.

The action of my device is as follows:— The dynamo 8 being started up, the primary windings 10 and 17 are energized, and they in turn act inductively upon the secondary windings 12 and 19. The fuse 20 is of such thickness as to be rendered insensitive to momentary increases in current, but is readily melted by an excess of current if the same be long continued. As will be seen, the fuse forms a shunt of low or practically no inductance around the solenoid coils of the magnetic circuit breaker, while, on the other hand, the coils themselves being of comparatively high inductance, there is an extremely effectual shunting of the alternating currents around said coils so long as the fuse remains intact. Hence, so long as the alternating current on the secondary is insufficient to melt the fuse, practically no current will flow in the coils of the magnetic circuit breaker and the current flow on the main circuit and on the secondary may vary within very wide limits without affecting to any appreciable extent the strength of the solenoid. This insures complete freedom from accidental operation of the device under ordinary variations of load on the main circuit of the system and gives, in effect, a wide margin of action or adjustment for the magnetic circuit breaker. When, however, an overload occurs sufficient to melt the fuse, then all the current theretofore diverted from the coils by the coöperation of the low inductance in the fuse branch and the high inductance in the coil branch of the secondary is compelled to flow in said coil, and the circuit breaker will be caused to act as hereinafter more fully set forth. The usual position of the apparatus, while the dynamo 8 is in action, is shown in Fig. 1, the knife switches 3 and 34 being in the position indicated. Alternating currents are sent through the primary winding 17, and these in turn induce alternating currents in the secondary winding 19, thereby throwing more or less current through the fuse 20, which thus serves to short circuit the solenoid 38, so as to render the same inactive. A momentary increase of current through the main circuit of course produces a momentary increase of current through the secondary winding 19, and slightly elevates the temperature of the fuse 20. If the excess of current is only momentary, however, and not of too great magnitude, the fuse 20 is not melted, and therefore continues to serve as a short circuit for the magnetic member 38. If, however, the excess of current be long continued, the fuse 20 melts out and the entire current of the local circuit passes through the wires 46, 47, and solenoid 38, which now operates as a trip coil for the automatic circuit breaker and being abruptly energized lifts the core 39. The upper portion 40 of this core thereupon raises the arm 44ª out of the notch 41, and thereby releases the sliding rod 36. This rod acting under tension of the spiral spring 29 suddenly moves to the right, thereby moving the knife 3 so as to open the switch and stop all flow of current in the main circuit.

I am aware that circuit breakers have heretofore been used in which an excess of current in a main or working circuit caused a fuse in said circuit to blow and thus open the circuit. Such circuit breakers, however, cannot be depended upon to safely and surely open a circuit carrying a large amount of power at high voltage. In my device the fuse is traversed by current of small volume and voltage as compared with that on the main circuit or circuit to be protected and is not depended upon to open said main or other circuit directly but merely brings into action at the proper time the magnetic member of an automatic switch or circuit breaker, which member is in shunt relation to the fuse in a circuit inductively related to the main circuit and operates to release the circuit breaking member of the automatic circuit breaker or switch.

My invention combines the safety and reliability of the automatic switch for opening the circuit and the time limit of the fuse. I do not limit myself, however, to the particular arrangement of the mechanism above described, nor to the electrical connections disclosed, for obviously these details may be varied considerably without departing from the spirit of my invention.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:—

1. The combination, substantially as described, of a transformer, a magnetic circuit breaker for the main circuit of the system, a fuse and magnetic coils for said circuit breaker in shunt or parallel relation to one another on the secondary of the transformer, as and for the purpose set forth.

2. The combination of a main or working circuit, an automatic circuit breaker for interrupting the flow of excess current therein, a transformer connected to said circuit, a fuse and trip coils for said circuit breaker,

said fuse and coils being in shunt or parallel relation to one another on a secondary of the transformer forming, respectively, low inductance and comparatively high inductance branches for the flow of the alternating currents furnished from the secondary.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MALCOLM P. RYDER.

Witnesses:
WALTON HARRISON,
EVERARD BOLTON MARSHALL.