Dec. 1, 1931. L. FLANDRIN ET AL 1,834,832

RESISTANCE CONTROLLING DEVICE

Filed July 18, 1930

Fig. 1

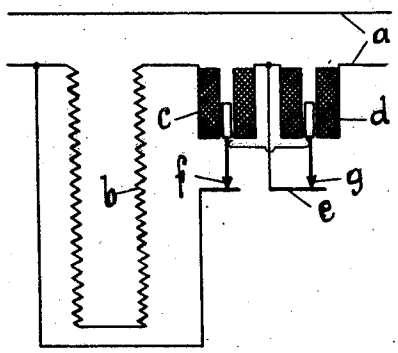


Fig. 2.

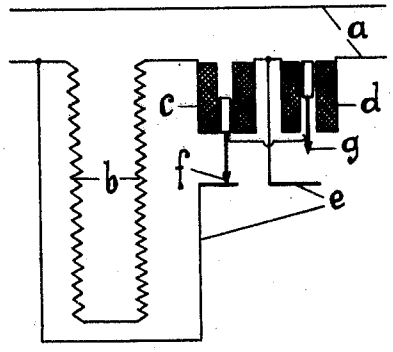


Fig. 3.

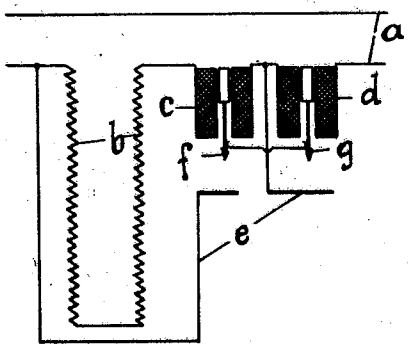


Fig. 4

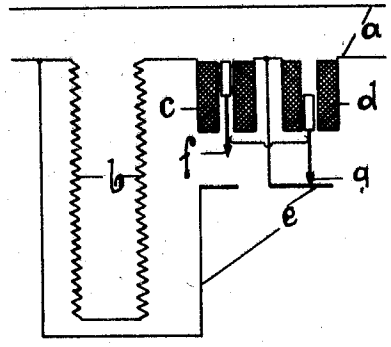


Fig. 5.

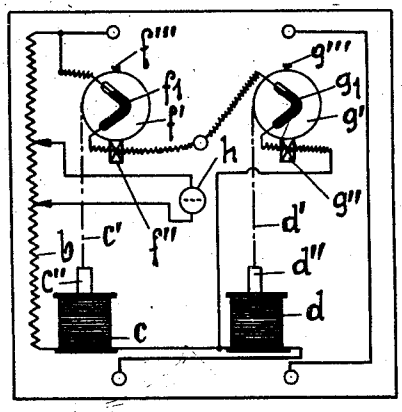
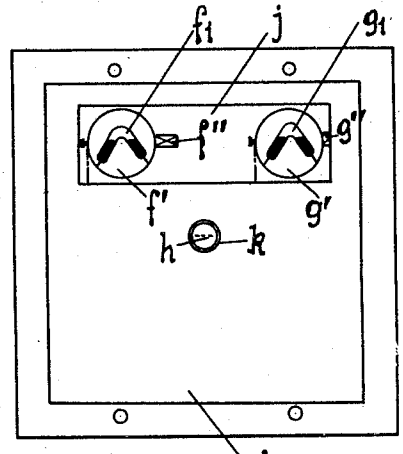


Fig 6



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UNITED STATES PATENT OFFICE

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RESISTANCE CONTROLLING DEVICE

Application filed July 18, 1930, Serial No. 468,930, and in France July 20, 1929.

Our invention has for its object a controlling device which serves to insert an additional resistance in a circuit or to remove it therefrom according to the value of the resistance in the circuit itself.

This device may more particularly be used for limiting the current in a shunt which it automatically puts back into its original state when the rate of flow is again normal, after a short-circuit or a rise of intensity above the maximum intensity that has been provided for.

Our invention consists in mounting in series in the circuit two electro-magnets and the additional resistance and in shunting this resistance, together with the electro-magnet which is adjacent to it, by means of a connection comprising two contacts in series, each of these contacts being operated through the movable core of each of the electro-magnets respectively.

The electro-magnet which is not shunted is so chosen as to draw its movable core and thus open the corresponding contact when the current rises above a certain value, as a result of an exaggerated demand or of a short-circuit. This breaks the shunt so that the other electro-magnet and the additional resistance are inserted in the main circuit. It results therefrom first that the second electro-magnet draws its core, thereby opening the corresponding contact, and also that, the current decreasing in the circuit, the first electro-magnet lets its contact close again. The second electro-magnet is so chosen as to release its core only when the resistance in the circuit falls back to a value that corresponds to the maximum current that must pass in the circuit, or to any other value below that one.

When this condition is fulfilled, the closing of the above mentioned contact produces the make of the shunt, which had been prepared by the closing of the contact of the first electro-magnet, which immediately follows the opening of the contact of the second electro-magnet.

Our invention will be described with reference to the appended drawings in which:

Figs. 1 to 4 are diagrammatic views of our device taken at different times during the operation.

Figs. 5 and 6 show a preferred embodiment of our invention.

The additional resistance b is inserted in series with the electro-magnet c and d in one of the conductors of the circuit a which is to be controlled. The whole of resistance b and electro-magnet c is shunted by a connection e comprising two contacts f g in series. Contacts f and g are operated by the movable cores of electro-magnets c and d respectively. They are so disposed as to be opened whenever the corresponding core is drawn by its magnet.

This device is placed for instance on a service-lead. Normally none of the cores is drawn by its electro-magnet.

The current, flowing through electro-magnet d, is sent to the utilization apparatus through shunt e (Fig. 1). If the resistance of the circuit to be controlled decreases, either because too many utilization apparatus are connected to this circuit, or on account of a short-circuit, the current thorugh the electro-magnet d increases. As this electro-magnet is so chosen as to become capable, under these condtions, of drawing its core, the contact g is opened (Fig. 2).

The shunt e being then broken, the current passes through resistance b and electro-magnet c, which is thus energized. The electro-magnet c is so chosen as to be capable, under these circumstances, of drawing its core, which then opens contact f (Fig. 3).

But, on account of the insertion of resistance b in the circuit, the intensity of the current that passes through electro-magnet d has fallen down to the normal value or below it. It results therefrom that this electro-magnet can no longer keep its core in a raised position and must let contact g close again. (Fig. 4).

The device remains in this position until the short-circuit is eliminated or the demand reduced to a normal value. When this is done the intensity decreases in the circuit, so that electro-magnet c lets contact f close again. The device is then again in its original position (Fig. 1) and is ready to operate

once more as above described, without it being necessary to act directly upon it.

Our device could also be used for instance for automatically inserting a resistance in the circuit of a motor in case of overload.

Likewise, being given two motors connected in series a device according to our invention may be inserted in their feed circuit, the additional resistance being chosen equal to the resistance of one of the motors. If a short-circuit occurs in one of said motors, the additional resistance will automatically be substituted for this motor, as far as the question of resistance in the circuit is concerned, which will protect the other motor, thus enabling the latter to keep on running as an emergency motor.

A device of this kind can be used in connection with arc-lamps or other utilization apparatus arranged in series, in order to insert the additional resistance in case of short-circuit in one of them.

As another example of application, our device may very advantageously be used for inserting a resistance in the neutral wire of a three-wire distribution, when this wire tends to become overloaded on account of an inequality in the currents through the two bridges.

Contacts f and g shall preferably be of the type described in our French patent Ser. No. 662,267, filed February 4, 1928, for mercury circuit-breakers. It is particularly advantageous to use the V-shaped circuit breakers described in said patent.

This embodiment has been shown in Figs. 5 and 6. The circuit breakers f^1 and g^1 are each mounted on a disk f' g' respectively, pivotally mounted on an axis passing through its center. Disks f' and g' are provided with counterweights f'' g'' which are preferably adjustable.

At points f''' g''' of the periphery of these disks are fixed flexible wires which are partially wound round the disks and are fastened to the cores c'' d'' of the electro-magnets c d respectively.

One of the electrodes of each circuit-breaker is connected by means of flexible wires to the shunt e while the other electrodes are connected together by similar wires. In Fig. 5, the circuit-breakers are shown as making the shunt, in Fig. 6 as breaking it.

A small lamp at low voltage h is inserted between two points of the additional resistance b, said lamp being lighted when the resistance is in the circuit.

The whole of the device is covered by a casing i (Fig. 6) provided with a large glass window j, through which the circuit-breakers can be seen, and with a peep-hole k behind which is located lamp h.

Of course our invention is not limited to the use of mercury circuit-breakers of any kind, as any other equivalent means could be used.

While we have disclosed what we believe to be the preferred form of our device, we do not wish to be limited thereto as there might be changes made in the construction disposition and shape of the parts without departing from the spirit of our invention as comprehended within the scope of the appended claims. For instance, for relatively small currents, the electro-magnet c could be given a sufficient resistance for making resistance b unnecessary. Furthermore, the applications of our invention are not limited to the examples that have been indicated.

What we claim is:

1. A device for inserting in a circuit or removing therefrom an additional resistance, according to the value of the resistance in the circuit, which comprises two electro-magnets and a resistance inserted in series in the order named in the circuit to be controlled, a shunt extending around the resistance and the electro-magnet adjacent thereto, two switches in series in said shunt, and means, actuated by the two electro-magnets respectively, for operating said switches.

2. Device for inserting in a circuit or removing therefrom an additional resistance, according to the value of the resistance in the circuit, which comprises two electro-magnets and a resistance inserted in series in the order named in the circuit to be controlled, movable cores in said electro-magnets, a shunt extending around the resistance and the electro-magnet adjacent thereto and two switches in series in said shunt adapted to be operated by the movable cores of the electro-magnets.

3. Device for inserting in a circuit or removing therefrom an additional resistance, according to the value of the resistance in the circuit, which comprises an emergency resistance, and electro-magnet in series with said resistance, a movable core adapted to be actuated by said electro-magnet when the current flowing through it exceeds a certain maximum, another electro-magnet in series with the first one, a movable core adapted to be actuated by this electro-magnet when the current flowing through it exceeds a certain value higher than the above mentioned maximum, the resistance and the two magnets being inserted in series in the order named in the circuit to be controlled, a shunt extending around the resistance and the electro-magnet adjacent thereto, and two circuit-breakers, inserted in series in said shunt, adapted to be operated by the movable cores of the electro-magnets respectively.

4. Device for inserting in a circuit or removing therefrom an additional resistance, according to the value of the resistance in the circuit, which comprises an emergency resistance, an electro-magnet in series with said resistance, a movable core adapted to be ac-

tuated by said electro-magnet when the current flowing through it exceeds a certain maximum, another electro-magnet, in series with the first one, a movable core adapted to be actuated by this electro-magnet when the current flowing through it exceeds a certain value higher than the above mentioned maximum, the resistance and the two magnets being inserted in series in the order named in the circuit to be controlled, a shunt extending around the resistance and the electro-magnet adjacent thereto and two rotatable mercury circuit-breakers inserted in series in said shunt, adapted to be rotated by the movable cores of the electro-magnets respectively.

In testimony whereof we have signed our names to this specification.

LUDOVIC FLANDRIN.
GEORGES CLEMENT LEVY.