Nov. 15, 1932. J. P. MEDLIN 1,887,695

ELECTRICAL DISTRIBUTING SYSTEM

Original Filed June 13, 1929

Fig. 1.

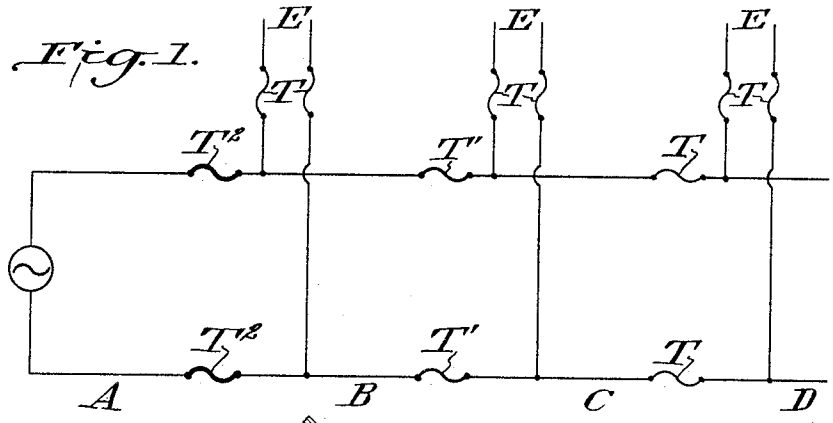
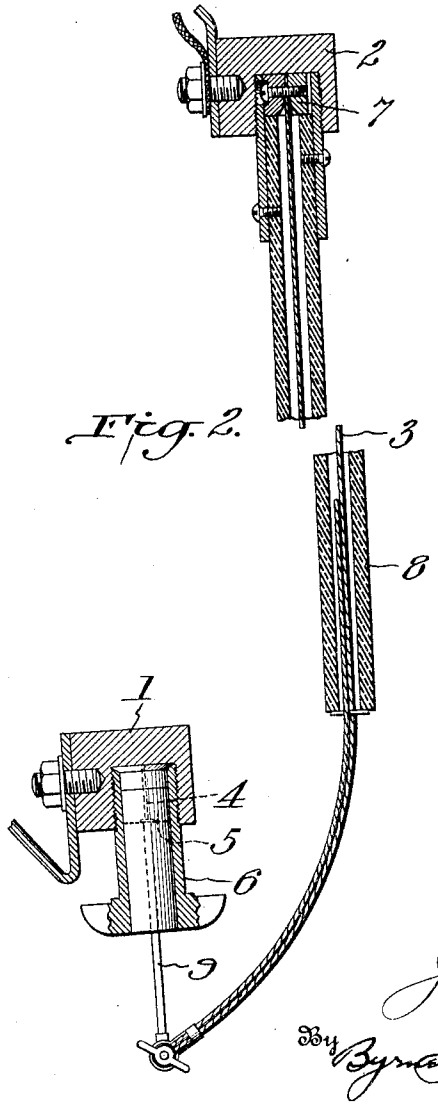


Fig. 2.



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UNITED STATES PATENT OFFICE

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ELECTRICAL DISTRIBUTING SYSTEM

Original application filed June 13, 1929, Serial No. 370,709, and in Canada August 5, 1929. Divided and this application filed August 9, 1930. Serial No. 474,203.

This invention relates to distributing systems and more particularly to distributing systems including thermostatically controlled circuit breaking devices, having predetermined time response characteristics.

This application is a division of my copending application, Serial No. 370,709, filed June 13, 1929.

An object of the invention is to provide an electrical distributing system in which several portions of the line may be protected by circuit breakers operable at the same relative overload conditions but calibrated for operation at different intervals.

This and other objects of the invention will be apparent from the following description when taken with the accompanying drawing in which:

Fig. 1 is a circuit diagram of a distribution system equipped with circuit breakers embodying the invention, and

Fig. 2 is a fragmentary vertical longitudinal section through the circuit breaker.

The circuit breakers diagrammatically shown by the wires T, T′ and T^2 in Figure 1, may be of the type disclosed in my above mentioned copending application. In this type of circuit breaker, a wire of predetermined size (indicated by T, T′ and T^2 in Figure 1) carries the line current and upon the occurrence of an overload, it is heated to set off a charge of gun powder, which in turn causes the circuit to be quickly broken.

One specific form of the circuit breaker is shown in Figure 2, in which 1 and 2 are supports which are mounted on insulator columns in the usual manner. The current carrying wire 3 is attached to the ignition wire 4, located within the explosion chamber 5 which is in a cartridge 6, secured to the support 1. The other end of the wire is gripped in a clamp 7 held in the support 2. An insulating sleeve 8 surrounds the wire 3 adjacent the support 2. When the ignition wire 4 is heated by an overload current, the gun powder in the explosion chamber 5 will quickly eject the fixture 9 joining the wire 3 and ignition wire 4 and pull the wire 3 from the clamp 7. In this manner, the circuit is broken at two places, viz. at the clamp 7 and the ignition wire 4.

The composition, length and diameter of the ignition wires T, T′ and T^2 are so fixed that upon an overload of a predetermined value, they will be raised to red heat, cause the gun powder to explode and thereby break the circuit.

The explosion of the charge is not the immediate result of an overload, since the ignition wire must be raised to the ignition temperature of the gun powder to initiate the action. In a given increase in current flow the rate at which the temperature increases is a function of the mass of the wire. It is therefore, possible to determine the time response characteristic of a single circuit breaker or of a plurality of breakers, by an appropriate choice of material constituting the ignition wire.

For a given current, the relative masses of ignition wires of different compositions will vary inversely as their relative conductivities. For example, a copper wire will be of smaller size and mass than a German silver wire, and a German silver wire will be of smaller size and mass than a nickel wire.

This variation in the time response characteristics of different metals may be employed to advantage in protecting the several branches of a distribution system. As shown diagrammatically in Fig. 1, the system includes a plurality of branch lines E, and which are separated from each other by circuit breakers of the type herein described. In the diagram, no attempt has been made to illustrate the mechanical construction of the circuit breakers, and the relative masses of the several ignition wires are graphically indicated by the relative widths of the lines. The ignition wires T, of the circuit breakers protecting the several branches E and the terminal section D are of relatively fine wire of high conductivity, for example, copper; the ignition wires T′ which form parts of the circuit breakers between sections B and C are formed of wire of somewhat lower conductivity, for example, German silver; and the wires T^2 are of still lower conductivity, for example, nickel.

For simplicity of explanation, it is assumed that the several circuit breakers are not designed for actuation at a definite increase over the normal current flow in a particular section of the line, but that they are all designed for actuation at the same abnormal current flow.

Regardless of the actual rating in amperes of the ignition wires, the relative time response characteristics may be given any desired value. However, the advantages of this invention may be more readily understood when described in connection with a system in which all of the circuit breakers will be actuated at the same value of abnormal current flow.

Assuming that one of the branch lines E or terminal section D is overloaded, the abnormal flow of current will raise the temperature of the particular ignition wires T at a more rapid rate than the temperatures of the heavier wires T′ and T^2. The branch and/or terminal circuit breakers will therefore be actuated to isolate the overloaded circuit before the circuit breakers which protect sections B and C are actuated. It is to be understood, however, that in determining the ampere rating of the ignition wires, the cumulative effect of the current in the main line due to the branch lines will be taken into account.

It will be apparent from the foregoing description, that the invention is applicable to other circuits than the conventional one disclosed in connection with the description. Also various changes may be made in the relation of the parts without departure from the spirit of my invention as set forth in the following claim.

I claim:

A plurality of overload circuit breakers serially arranged along a transmission line, each of said breakers including an explosive device for actuating the breaker and an ignition wire for firing said explosive device, all of said ignition wires having such resistance that the continued passage of an abnormal current would actuate all of said breakers, and certain of said wires having a greater mass than another of said wires, whereby the circuit breaker in which said wire of lighter mass is incorporated will be actuated in advance of the other breakers.

In testimony whereof, I affix my signature.

JOHN P. MEDLIN.