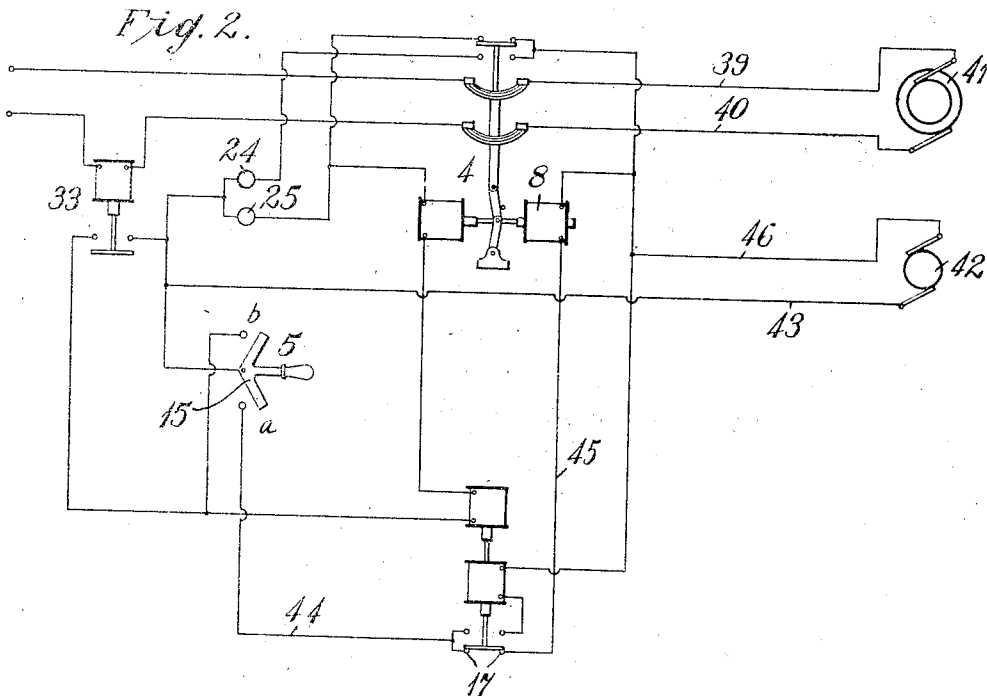
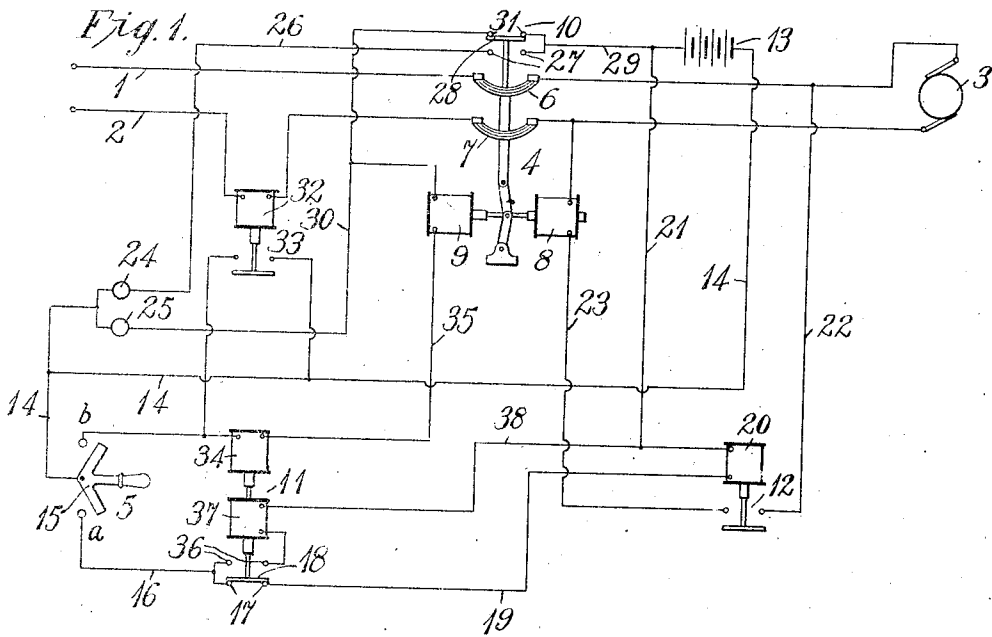


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SYSTEM OF ELECTRIC-CURRENT DISTRIBUTION.

1,017,060.

Specification of Letters Patent.

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Application filed May 13, 1909. Serial No. 495,781.

To all whom it may concern:

Be it known that we, CHARLES M. MOSS and STEPHEN Q. HAYES, both citizens of the United States, and residents of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Systems of Electric-Current Distribution, of which the following is a specification.

Our invention relates to systems of electric-current distribution and circuit control, and it has for its object to provide an improved system, of the class above indicated, that shall embody an electrically-operated circuit interrupter and remote means for controlling the same.

Circuit interrupters which are adapted for use with relatively high-voltage circuits are usually arranged for electric operation and remote control, on account of their size and the relatively large amount of power required for their operation.

According to our present invention, we have materially improved the arrangement of the control circuits for circuit interrupters and switching devices, of the class referred to above, by providing automatic means for preventing an attendant at a remote point from holding the circuit interrupter closed, under predetermined abnormal conditions, such as an overload or over-voltage in the main circuit. In our preferred arrangement, as hereinafter pointed out, the closing circuit is not governed directly by the master controller and the control circuits which extend to a remote point are, consequently, only called upon to transmit very small currents, so that relatively inexpensive high-resistance conductors may be used.

Our invention is illustrated in the accompanying drawings, in which—

Figures 1 and 2 are diagrammatic views of systems arranged in accordance therewith, the control circuits being partially supplied from the main circuit, in one arrangement, and entirely independent of the main circuit, in the other.

Referring to Fig. 1 of the drawings, direct current energy is supplied to a main distributing circuit 1—2 from a generator 3, through a circuit interrupter 4, which is controlled from a distant point by means of

a master switch or controller 5. The circuit interrupter comprises bridging contact members 6 and 7 which are, respectively, included in the line circuits 1 and 2 when the interrupter is closed; a closing coil 8, a tripping coil 9, and an auxiliary switch 10 comprising a movable contact member 28 which is operatively connected to the bridging contact members 6 and 7. It will, of course, be understood that a relatively large amount of energy is required to close the circuit breaker, while small amounts of energy are required to operate the tripping coil and the relay switches 11 and 12.

The operation of the system is as follows: Assuming that the circuit interrupter is open and that the master switch 5 occupies its mid-position, as shown in the diagram; if the master switch is thrown into position *a*, a circuit is established from any suitable source of energy, such as a battery 13, through conductor 14, contact member 15 of the switch 5, conductor 16, contact members 17 of the relay switch 11 (which are engaged by a contact member 18 when the operating magnet of the relay switch 11 is deenergized), conductor 19, magnet winding 20 of the relay switch 12, and conductor 21, to the opposite terminal of the battery. When the magnet 20 is energized, the relay switch 12 is closed and a circuit is established from the generator 3, through conductors 1 and 22, switch 12, conductor 23, magnet winding 8, and conductor 2, to the opposite terminal of the generator. Energy is thus supplied from the main circuit to the coil 8, which closes the interrupter 4.

The position of the circuit interrupter is indicated by means of lamps or other visual indicators 24 and 25, the circuit being established from the conductor 14, through the lamp 24, conductor 26, and contact members 27 (which are bridged by a contact member 28 of the control switch 10 when the circuit interrupter is opened) and a conductor 29 to the opposite terminal of the battery. A similar circuit is established from the conductor 14, through the lamp 25, conductor 30, and contact members 31 (which are bridged by the contact member 28 when the circuit interrupter is closed).

If a short-circuit exists at the time the circuit interrupter is closed or if an ab-

normal current is drawn from the generator, the magnet winding 32 of the series relay switch 33 will be energized sufficiently to close the switch, and, when this is closed, a circuit is established from the conductor 14, through said relay switch 33 and the magnet winding 34 of the relay switch 11, conductor 35, trip coil 9 of interrupter 4, conductor 30, contact members 31, and conductor 29, to the opposite terminal of the battery. The relay switch 11 will consequently be raised, contact member 18 being separated from contacts 17 and moved into engagement with contacts 36, and the magnet winding 20 of the relay switch 12 will be deenergized, thus permitting the latter switch to open and to interrupt the circuit established through the closing coil 8 of the circuit interrupter 4. A holding circuit is now established from the conductor 14, through the master switch 5 (which is assumed to be held in position *a* by an attendant), conductor 16, contact members 36, holding coil 37, conductor 38, and conductor 21, to the opposite terminal of the battery. The trip coil 9, when energized as above indicated, will open the circuit interrupter and bring the contact member 28 of the auxiliary switch 10, through which the trip coil circuit was completed, into engagement with the contact members 27. In this way, the trip coil is only temporarily energized but the relay switch 11 is held in a raised position, so that it is impossible for the interrupter to be again closed until the attendant has first moved the master switch to its off position, irrespective of the deenergizing of the relay closing coil 34.

The series relay switch 33 may, of course, be replaced by a shunt relay switch which will operate to open the circuit-breaker, in case the voltage exceeded a predetermined amount, or a relay switch, actuated both by series and shunt currents, may be so arranged as to operate upon a current reversal in the main circuit 1—2.

When the circuit interrupter is closed, it may be interrupted at the will of an attendant, by moving the master switch into position *b*, which establishes a circuit from conductor 14, through magnet winding 34, conductor 35, tripping coil 9, conductor 30, contact members 31, and conductor 29, to the opposite terminal of the battery, the tripping coil, when thus energized, serving to open the circuit interrupter. The circuit interrupter is so arranged that it will remain either closed or open, when brought into these positions, and it will be observed that the closing coils and the tripping coils are only temporarily energized.

Referring to Fig. 2, in which a slightly modified arrangement is illustrated, energy is supplied to a distributing circuit 39—40 from an alternating current generator 41; the circuit interrupter 4, the relay switch

33, the indicating lamps 24 and 25, and the master controller 5 being arranged substantially in the same manner as in the diagram of Fig. 1. The control circuits are energized from a direct current generator 42, a circuit being established when the master switch occupies position *a*, through a conductor 43, contact member 15, conductor 44, contact members 17, conductor 45, closing coil 8 of the interrupter, and conductor 46 to the opposite terminal of the generator 42.

It will be observed that the circuit for the closing coil is governed by the controller, while, in the diagram of Fig. 1, the circuit for the closing coil is governed by the relay switch 12. The arrangement of Fig. 1 is preferable, when a considerable amount of energy is required for the closing coil of the interrupter, and particularly when the master switch 5 is located at a great distance from the interrupter, since the control circuits may then comprise relatively inexpensive high-resistance conductors. In other respects, the operation of the system is identical with that of Fig. 1, and, consequently, we deem it unnecessary to describe it in detail.

The battery 13 of Fig. 1 is intended to represent any low-voltage source of supply, and the main circuit may, of course, be used directly as the source, or a circuit derived from the main circuit may be employed.

In the diagram of Fig. 2, alternating current energy may be utilized for the control circuits in place of the direct current generator 42, in which case, a transformer will usually be employed for reducing the voltage of the main line circuit.

It will be understood that modifications may be effected in the circuit connections within the scope of our invention, and we desire that only such limitations shall be imposed as are indicated in the appended claims.

We claim as our invention:

1. The combination with a distributing circuit, a circuit interrupter therefor having actuating and release electro-magnets, control circuits and a master switch for selectively energizing the electro-magnets, of means dependent upon predetermined conditions in the distributing circuit for energizing the release magnet, interrupting the circuit of the actuating electro-magnet and preventing the closure of the interrupted control circuit until the master switch has been returned to its off position.
2. The combination with a distributing circuit, a circuit interrupter having a closing magnet and a tripping magnet, control circuits, and a master switch for selectively energizing the electro-magnets, of a series relay switch dependent upon predetermined current in the distributing circuit for ener-

gizing the tripping magnet independently of the master switch, interrupting the control circuit of the closing magnet and preventing the completion of said control circuit until the master switch is returned to its off position.

5 In testimony whereof, we have hereunto

subscribed our names this 4th day of May, 1909.

CHARLES M. MOSS.
STEPHEN Q. HAYES.

Witnesses:

CLARENCE P. LOWLED,
B. B. HINES.