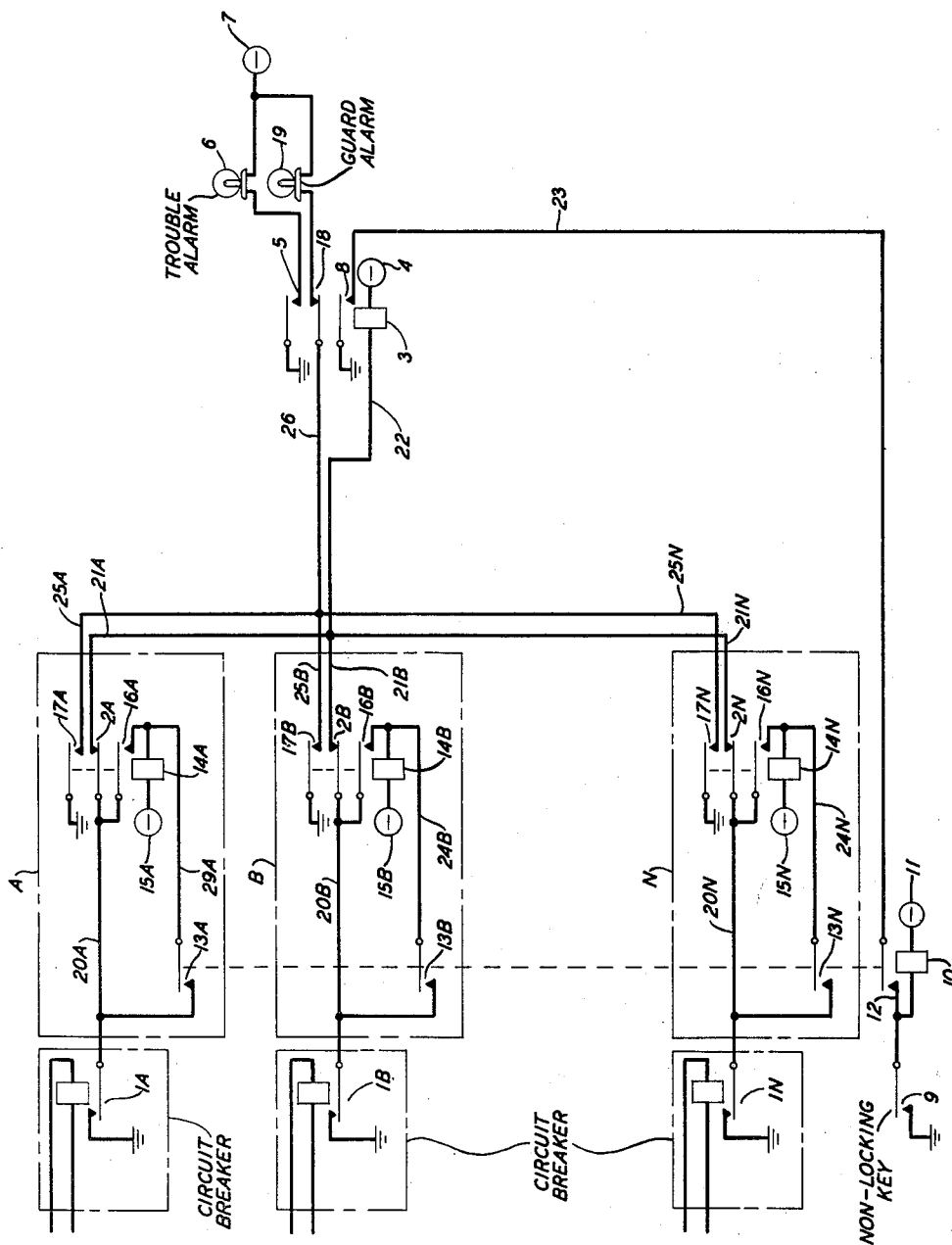


3,151,320

Filed Aug. 17, 1960



INVENTOR
J.F. MORRONGIELLO
BY *Kenneth B Hamlin*
ATTORNEY

1

2

3,151,320

ALARM SYSTEM WITH TRANSFERABLE INDICATION

Joseph F. Morrongiello, Long Island City, N.Y., assignor to Bell Telephone Laboratories, Incorporated, New York, N.Y., a corporation of New York
Filed Aug. 17, 1960, Ser. No. 50,290
5 Claims. (Cl. 340-213.1)

This invention relates to alarm systems and more particularly to such systems having a common signal alarm to indicate the tripping of any of a plurality of circuit breakers.

Prior alarm systems employing a common signal alarm actuated by a plurality of circuit breakers have one or more disadvantages. In some prior systems provision is made for disabling the common signal alarm while the maintenance man is correcting the trouble and resetting the tripped circuit breaker. However, no provision is made for detecting the subsequent tripping of others of the circuit breakers while the common alarm is in its disabled condition. In others of the prior systems the common alarm is actuated in response to the tripping of one of the plurality of circuit breakers and remains actuated until the tripped circuit breaker is reset. In these systems no provision is made to operate an alarm in the event of a subsequent tripping of an additional circuit breaker while the common alarm is actuated. Thus, if one of the circuit breakers is tripped and the signal alarm is actuated and/or disabled, the tripping of a subsequent circuit breaker in the known alarm systems will not be detected until the first circuit breaker is reset and the common alarm enabled. The above disadvantages are particularly serious where the alarm station is located remote from the circuit breakers because the maintenance man will not be informed of a subsequent tripped circuit breaker until he has reset the first tripped circuit breaker and returned to the alarm station to enable the common alarm. Thus, it is possible in the prior alarm systems for one circuit breaker to trip, which of itself may not be critical, and subsequently for a large number of the circuit breakers to trip, which might be disastrous, and the maintenance man will receive no signal of this condition.

It is an object of this invention to provide an improved alarm system. More particularly, it is an object of this invention to provide an alarm system which will signal the tripping of a first circuit breaker and the subsequent tripping of other circuit breakers before the first circuit breaker is reset.

Other objects of this invention are to provide an improved alarm system which is characterized by simplicity, economy and reliability.

It is a further object of this invention to decrease the number of signal alarms required to signal the tripping of any of a plurality of circuit breakers.

The foregoing and other objects of this invention are attained in an illustrative embodiment thereof which comprises an alarm circuit common to a plurality of circuit breakers. When one or more of the circuit breakers are tripped, the common alarm circuit is actuated to operate a trouble alarm. The trouble alarm may be disabled by the momentary operation of an alarm cut-off key which when operated actuates a guard alarm to indicate that a circuit breaker has been tripped and that the trouble alarm has been disabled. In the event of the subsequent tripping of an additional circuit breaker during the time the guard alarm is actuated, the common alarm circuit in response to this subsequent tripping disables the guard alarm and reoperates the trouble alarm.

It is a feature of this invention that an alarm circuit be connected in common to a plurality of circuit breakers,

and that the alarm indicate the tripping of a first circuit breaker and the subsequent tripping of other circuit breakers after the detection but before the restoration of the first tripped circuit breaker.

It is also a feature of this invention that the tripping of one or more of a plurality of circuit breakers operates a first signal alarm means, that the momentary operation of an alarm cut-off key disables the first alarm means and energizes a second signal alarm means, and that the subsequent tripping of a second circuit breaker prior to the resetting of the first circuit breaker reoperates the first signal alarm means and disables the second signal alarm means.

It is a further feature of this invention that the first and second signal alarm means be returned to normal in response to the resetting of all of the tripped circuit breakers of the group controlled thereby.

A complete understanding of these and other objects and features of this invention may be gained from a consideration of the following detailed description of an illustrative embodiment thereof when read with reference to the accompanying drawing, the single figure of which discloses a schematic diagram of one embodiment of the invention.

Referring to the drawing, a plurality of circuit breakers which are connected to the alarm system of the present invention are shown symbolically and are designated 1A, 1B . . . 1N. It is to be understood that the alarm system of the present invention is not limited to use with circuit breakers but may advantageously be utilized with alarm type fuses or any circuit element which in response to a fault condition closes an electrical circuit. The alarm system of the present invention comprises a plurality of alarm control circuits designated A, B . . . N, each operatively connected to an associated one of the circuit breakers, 1A, 1B . . . 1N, a common alarm relay 3, a trouble alarm lamp 6, a guard alarm lamp 19, an alarm cut-off relay 10, and a non-locking alarm cut-off key 9. Trouble alarm lamp 6 and guard alarm lamp 19 are representative of common alarms which may be actuated in accordance with the present invention. It is to be understood that other types of alarms such as audible alarms may be advantageously utilized in conjunction with the trouble alarm lamp 6 and guard alarm lamp 19.

Each of the alarm control circuits A, B . . . N associated with the respective circuit breakers 1A, 1B . . . 1N comprises an alarm control relay such as alarm control relay 14A in alarm control circuit A associated with circuit breaker 1A and an armature and front contact of alarm cut-off relay 10 such as armature and front contact 13A of alarm cut-off relay 10 in alarm control circuit A. The individual alarm control circuits A, B . . . N are connected to two common leads which extend to alarm relay 3. These leads are designated 26 and 22 and are utilized to control the operation of trouble alarm lamp 6 and guard alarm lamp 19 in the manner to be described.

When any of the circuit breakers 1A, 1B . . . 1N is tripped in response to a fault condition, its contact closes and applies a ground to its associated alarm control circuit. For example, if circuit breaker 1A is tripped, it applies a ground to its associated alarm control circuit A which ground is extended through back contact and armature 2A of relay 14A over conductor 22 through the winding of alarm relay 3 to battery 4, causing the alarm relay 3 to operate.

The operation of alarm relay 3 completes an electrical circuit for the operation of trouble alarm lamp 6 through armature and front contact 5 of alarm relay 3 and through trouble alarm lamp 6 to battery 7. The operation of alarm relay 3 also partially opens the operating path for guard lamp 19 at armature and back contact 18 and par-

3

tially closes the holding path for alarm cut-off relay 10 at armature and front contact 8 of alarm relay 3.

If the tripped circuit breaker can be resorted to normal, that is reset, the alarm relay 3 releases and extinguishes trouble alarm lamp 6. However, if the tripped circuit breaker cannot be restored to normal due to a permanent fault condition in its circuit, the maintenance man may momentarily operate the non-locking alarm cut-off key 9 which completes an operating path from ground through the winding of alarm cut-off relay 10 to battery 11. Alarm cut-off relay 10 in operating locks through a circuit including its own armature and front contact 12, conductor 23 armature and front contact 8 of alarm relay 3 to ground. The operation of alarm cut-off relay 10 closes the operating path for the alarm control relay 14 in each of the alarm control circuits A, B . . . N so that the tripped circuit breaker may control the operation of its associated alarm control relay. For example, if circuit breaker 1A is tripped, relay 14A will be operated after the operation of alarm cut-off relay 10 over a path from ground supplied by the tripped circuit breaker 1A through armature and front contact 13A of alarm cut-off relay 10 through the winding of alarm control relay 14A to battery 15A. Alarm control relay 14A locks operated over a path including its own armature and front contact 16A to ground supplied by the tripped circuit breaker 1A. The operation of relay 14A removes the operating ground from conductor 22 when armature and back contact 2A of relay 14A opens and applies a ground through armature and front contact 17A to conductor 26. The removal of ground from conductor 22 permits alarm relay 3 to release. Contacts 2A and 16A of relay 14A and the corresponding contacts of relays 14B . . . 14N, are continuity contacts, i.e. the armature and front contact 16A makes before the armature and back contact 2A breaks, to insure that a locking path is available for relay 14A before the operating ground is removed from conductor 22 to permit alarm relay 3 to release.

When alarm relay 3 releases the trouble alarm lamp 6 is extinguished and the guard alarm lamp 19 is actuated over a circuit traced from ground through armature and front contact 17A of alarm control relay 14A of alarm over conductor 26 through armature and back contact 18 of alarm relay 3 through guard alarm lamp 19 to battery 7. The release of alarm relay 3 opens a holding path for alarm cut-off relay 10 which releases.

The release of alarm cut-off relay 10 opens the operating path for all of the alarm control relays associated with the circuit breakers such that the only alarm control relay held operated is the one associated with the tripped circuit breaker. Thus, guard alarm lamp 19 is held actuated under control of the alarm control relay 14A associated with tripped circuit breaker 1A. Alarm control relay 14A is in turn unlocked operated to ground supplied by the tripped circuit breaker 1A. When the tripped circuit breaker 1A is reset and the holding ground is removed from alarm control relay 14A, alarm control relay 14A releases and guard alarm lamp 19 will be extinguished.

During the time that guard alarm lamp 19 is actuated in the manner described above, it provides a signal indication to the maintenance personnel that a circuit breaker has been tripped, that the original trouble alarm lamp 6 has been disabled, and that the fault condition persists. During the interval that the maintenance personnel are correcting the fault condition in order to restore the tripped circuit breaker to normal, if an additional circuit breaker trips in response to a fault condition the guard alarm lamp 19 will be extinguished and the trouble alarm lamp 6 will be reactivated. Thus, for example, if a fault occurs in the circuit which includes circuit breaker 1B, ground is applied from the tripped circuit breaker 1B to the alarm control circuit B associated therewith. This ground is extended through armature and back contact 2B of alarm control relay 14B over lead 22 through the wind-

4

ing of alarm relay 3 to battery 4. The operation of alarm relay 3 in the manner described above closes the electrical circuit at its armature and front contact 5 for the operation of trouble alarm lamp 6 and opens the operating circuit for guard alarm lamp 19 at its armature and back contact 18. Thus, the maintenance man who may be occupied in correcting the trouble condition in the circuit which caused the tripping of circuit breaker 1A will be notified immediately that another circuit breaker in this group of circuit breakers has tripped. The maintenance man may advantageously reoperate alarm cut-off key 9 which in turn will extinguish trouble alarm lamp 6 and re-actuate guard alarm lamp 19 in the manner described above. Under these conditions guard alarm lamp 19 will remain actuated until both circuit breakers 1A and 1B have been returned to normal. With the return of all of the circuit breakers to normal and the release of the associated alarm control relays, guard alarm lamp 19 will be extinguished and the alarm system of the present invention will be returned to normal conditions. Thus, the alarm system of the present invention provides an indication of a tripping of the first circuit breaker and any further circuit breakers which may subsequently trip during the interval that the maintenance man is correcting the first trouble condition.

It is to be understood that the above-described arrangements are illustrative of the principles of the invention. Numerous other arrangements may be devised by those skilled in the art without departing from the spirit and scope of the invention.

What is claimed is:

1. An alarm system for indicating the actuation of any of a plurality of circuit breakers comprising a first alarm device common to all of said plurality of circuit breakers, a second alarm device common to all of said plurality of circuit breakers, means for energizing said second alarm device in response to the de-energization of said first alarm device including a first relay, a second relay, a plurality of third relays each operatively associated with a respective one of said plurality of circuit breakers, means responsive to the actuation of any of said plurality of circuit breakers for operating said first relay and said first alarm device, an alarm cut-off key, means including said second relay responsive to the actuation of said key for operating particular ones of said plurality of third relays associated with actuated ones of said plurality of circuit breakers, means responsive to said operated third relays for releasing said first relay, said second relay, said first alarm device and operating said second alarm device, means responsive to the subsequent actuation of any additional ones of said plurality of circuit breakers for re-operating said first relay to release said second alarm device and re-operate said first alarm device, a first conducting path means to couple said first alarm device in common to all of said circuit breakers and a second independent conducting path means to couple said second alarm device in common to all of said circuit breakers.

2. In an alarm system for indicating the successive tripping of a plurality of circuit breakers the combination comprising a first alarm means common to all of said plurality of circuit breakers, a first means responsive to the tripping of one of said plurality of circuit breakers for operating the said first alarm means, a second alarm means common to all of said plurality of circuit breakers, a nonlocking key, a second means jointly responsive to the operation of said first means and said key for releasing said first alarm means and operating said second alarm means, and a third means including said first means for releasing said second alarm means and re-operating said first alarm means in response to a subsequent tripping of others of said plurality of circuit breakers, wherein said first, second and third responsive means include a first conducting means to couple said first alarm means in common to all of said circuit breakers and a second

5

independent conducting means to couple said second alarm means in common to all of said circuit breakers.

3. In an alarm system for indicating the successive tripping of a plurality of circuit breakers, the combination in accordance with claim 2 wherein said first means comprises a first relay operable in response to the tripping of one of the said plurality of circuit breakers to operate said first alarm means and wherein said third means further includes part of said second means.

4. In an alarm system for indicating the successive tripping of a plurality of circuit breakers the combination in accordance with claim 3 wherein said second means comprises a second relay having a plurality of contacts each associated with respective ones of said plurality of circuit breakers, wherein said third means includes a third relay operatively associated with a tripped one of said plurality of circuit breakers, and wherein said plurality of contacts on said second relay is effective for energizing a particular one of said third relays associated with said tripped circuit breaker to disable said first relay and operate said second alarm means.

5. In an alarm system for indicating the successive tripping of a plurality of circuit breakers the combination in accordance with claim 4 wherein said third means further includes a plurality of contacts on each of said plu-

6

ality of third relays, means for connecting in parallel a first contact of each of said third relays and means for connecting in parallel a second contact of each of said third relays, means comprising a first independent path for connecting between said first relay and one of said parallel connections, and additional means comprising a contact on said first relay and a second independent path for connecting between said contact on said first relay and said other parallel connection.

References Cited in the file of this patent

UNITED STATES PATENTS

Re. 24,031	Marmorstone	June 28, 1955
2,000,074	Grant	May 7, 1935
2,278,939	Muehter	Apr. 7, 1942
2,712,129	Marmorstone	June 28, 1955

FOREIGN PATENTS

749,941	France	May 15, 1933
---------	--------	--------------

OTHER REFERENCES

Universal Panalarm "50," publication by Panalarm Products, Inc., Chicago, Ill., copyright 1952, pages 20 and 21 relied on.