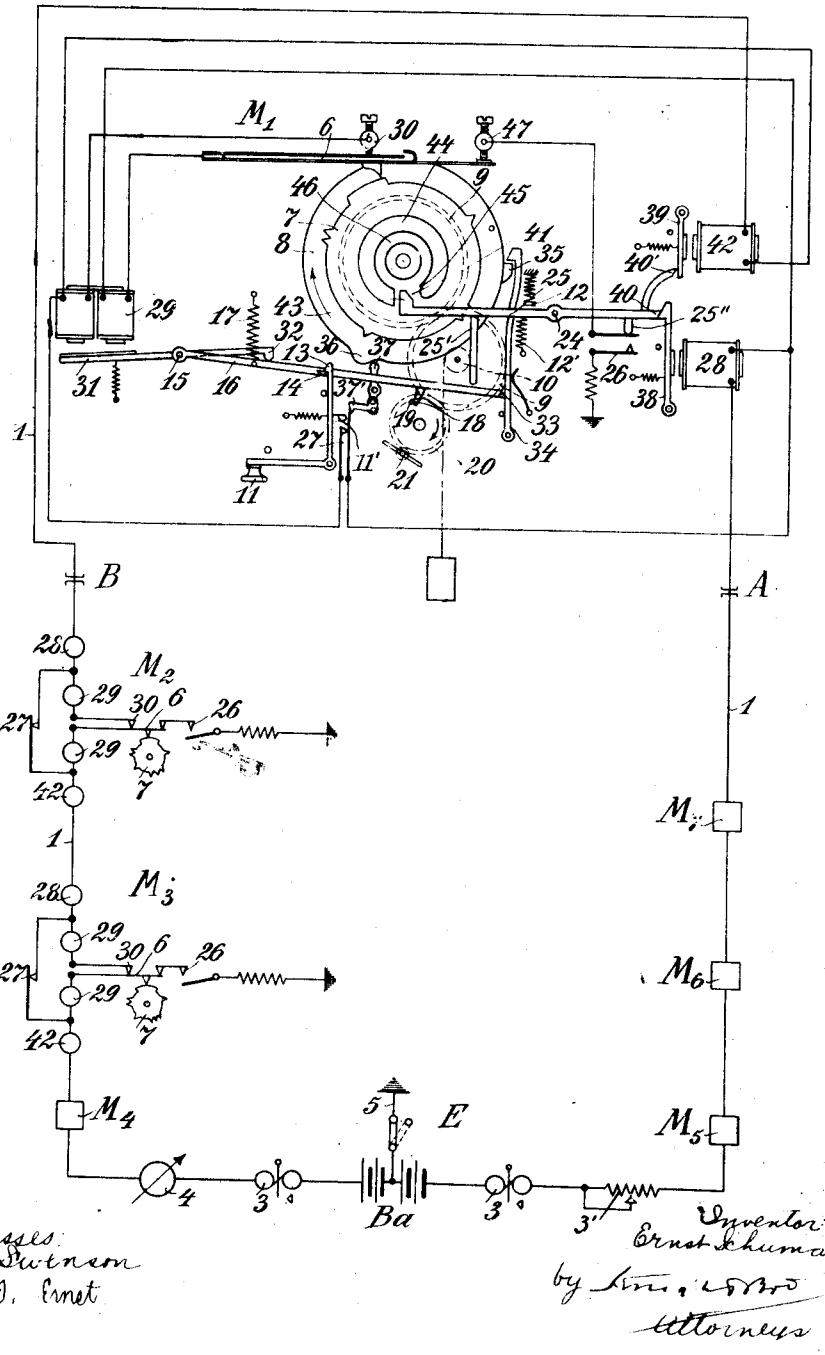
E. SCHUMANN.

FIRE ALARM SYSTEM.

APPLICATION FILED JUNE 28, 1913.

1,105,044. Patented July 28, 1914.



UNITED STATES PATENT OFFICE.

ERNST SCHUMANN, OF CHARLOTTENBURG, GERMANY, ASSIGNOR TO SIEMENS & HALSKE, A. G., OF BERLIN, GERMANY, A CORPORATION OF GERMANY.

FIRE-ALARM SYSTEM.

1,105,044. Specification of Letters Patent. Patented July 28, 1914.

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To all whom it may concern:

Be it known that I, ERNST SCHUMANN, a citizen of the German Empire, and residing at Charlottenburg, Germany, have invented certain new and useful Improvements in Fire-Alarm Systems, of which the following is a specification.

My invention relates to fire-alarm systems in which a ground connection is provided for working when the line is broken.

In fire-alarm systems wherein the various alarms are connected in series in each circuit, apparatus has been devised both for grounding the alarm when the alarm-signal is given and also for establishing a ground connection at the receiving station when a breakage occurs in the line forming the circuit, so that in the event of a wire being broken the currents flowing in the portions of the circuit on both sides of the breakage find a path through ground and in this manner enable the alarm to be given. In such systems difficulties are met with in employing those known devices for non-grounded circuits which are intended to prevent confusion in the signals when several alarms are simultaneously set into operation. The reason for this is that when employing the known devices in such a case, the alarms which are pulled would be simultaneously put to ground and consequently the remaining portion of the circuits which is beyond these alarms would become short-circuited.

A primary object of my invention is to obviate this defect. To this end I make the connection to ground dependent on a contact member which when the alarm is given makes contact to ground only as the result of the principal magnet not attracting its armature owing to a breakage of the wire or the like, but at other times keeps the ground circuit open. In addition, I associate with each alarm a magnet having several windings or several magnets which, when once the ground connection is made at an alarm, maintains this connection until the broken wire is repaired, or until another part of the circuit is grounded, in which case the alarm in question is located in a closed circuit.

One embodiment of my invention is diagrammatically illustrated by way of example in the accompanying drawing showing a circuit containing a number of alarms of which one is shown in detail in elevation.

Referring to the drawing the various alarms M_1 to M_7 are located in the circuit 1. At the receiving station E the usual relays 3, resistances 3', measuring instruments 4 and the like are provided, and also the battery B_a whose middle point is connected to ground by a lead 5 in the event of a breakage of wire. In each of the alarms the circuit-wheel 7, which influences a contact-spring 6, is rigidly connected with a controlling disk 8 and is driven by means of intermediate gears 9 by driving mechanism 10, which is released upon depressing a key 11. When this key is depressed a spring-pulled lever 16 fulcrumed on the axle 15 is released owing to a stop 14 provided thereon being released by the catch 13, on the key-lever 11 and consequently moves upward under the influence of its spring 17. A stop 18 on the lever 16 has a right angled extension, the said extension lying in a plane parallel to the plane of the pin 19 and engaging said pin. Consequently a downward movement of the lever 16 releases the said pin 19 which is mounted on the wheel 20 driving the fly 21. This serves as the lock for the mechanism 10. The circuit-wheel 7 thereupon begins to rotate in the direction indicated by the arrow. At the same time the lever 16 being in engagement with a lever 25 fulcrumed on the axle 24 by means of a lug 25' provided thereon drives upward the one end of said second lever 25, without however making the ground contact 26 which is influenced by the other end of this lever, because a resilient stop 12 first of all checks further movement.

When the circuit 1 is unbroken throughout owing to the depression of the key 11 the contact 27 bridging the alarm is opened by a projecting lug 11' on the key-lever 11 and held open by a catch 37' fulcrumed on a two-armed lever 37 and the following circuit is formed: battery B_a at the receiving station E, right half of loop 1, magnet 28 in alarm M_1, right-hand winding of another magnet 29, interrupter contact-piece 30 of the contact-spring 6 set into motion by the rotation of the circuit-wheel 7, left-hand winding of the magnet 29, another magnet 42, and back over the left half of the circuit to the battery B_a. The magnet 29 attracts

its armature 31, which is likewise pivoted on the axle 15, and by means of a laterally projecting lug 32 drives the lever 16 so far downward that its free end snaps behind the detent 33 of a pivotally mounted spring-pressed lever 34. When this movement occurs the previously raised grounding lever 25 is lowered under the influence of the spring 12'. The type-wheel and the mechanism geared thereto can now continue to rotate without hindrance until finally a cam-like projection 35 on the controlling disk 8, after making one revolution, drives the lever 34 aside and consequently releases the lever 16 from the detent 33. The latter lever then returns into its normal position where it is held by the catch 13 provided on the key-lever 11, and consequently its stop 18 arrests the driving mechanism 10 by stopping the pin 19. Just before this occurs, a cam-like projection 36 also on the controlling disk 8 has rocked over the two-armed lever 37 and disengaged the catch 37' connected to this lever from one of the contact members 27, so that the bridging contact 27 can return into its normal position and the alarm is again short-circuited.

During the continuance both of the closed-circuit current as well as of the alarm current the magnets 28 and 42 remain energized, so that their armatures 38 and 39 are attracted and cannot hold the grounding lever 25 at its ends 40, 40' adapted to coact with these armatures. On the other hand, the conditions are different when a breakage occurs in the line. Assuming, for example, that such a breakage occurs in the right half of the circuit, say at a point A, and that the alarm M_1 is subsequently operated by depressing the key 11, the bridging contact 27 would again be opened, but the armature 31 of the magnet 29 would not be attracted, so that the lever 16 under the influence of the spring 17 and, consequently, the grounding lever 25 would remain in their raised positions. In this position a pin 43 extending backward in a direction normal to the plane of the drawing projects into a notch 41 in a circular collar 44 on the circuit-wheel or the controlling disk. As soon however as the alarm has moved a short distance a slanting face 45 on the circular collar bears against the pin 43 and compels the latter to overcome the pressure of the resilient stop 12 and to enter the track or way 46, the lever 25 being thus rocked still further and making the ground-contact 26 by means of its lug 25'', so that the alarm is grounded for the continuance of the rotation of the circuit-wheel. The circuit now closed is as follows: battery B_4, conductor 5, ground, contact 26, binding post 47 of the contact-spring 6 moved by the circuit-wheel, contact-piece 30, left-hand winding of magnet 29, magnet 42, left half of the circuit, and back to battery B_4. The magnet 42 is thus energized and keeps its armature 39 attracted, but the magnet 28 remains currentless, so that the detent on its armature 38 engages over the end of the grounding lever 25 and consequently holds the latter continuously in the position wherein it closes the contact 26. Since the magnet 29 has by this time been energized, its armature 31 is attracted and the lever 16 is consequently detained by the lever 34, whereby the alarm signal is delivered in the normal manner.

Owing to the magnet 28 being currentless the ground connection is maintained after the driving mechanism has run down, so that each new alarm is effected without difficulty by passing over ground. The said ground connection is disconnected only when the magnet 28 again receives current, thereby attracting its armature 38 and releasing the grounding lever 25. This occurs either when the broken wire is repaired, or when an alarm in series with the alarm in question is required to deliver an alarm signal and is grounded in a manner corresponding to that described. For example, if the key of the alarm M_4 were depressed and this alarm M_4 were grounded owing to the breakage at A, its magnet 28 would first of all be currentless. As soon as the key of an alarm M_2 located beyond is depressed, however, the magnet just referred to obtains over the ground contact of this alarm a current, and so automatically disconnects its own ground connection. The same occurs if, for example, the line is grounded at the broken place. If the breakage is located in the left half of the circuit, *e. g.* at the point B, the circuit of the battery B_4 is closed over ground, contact 26, binding post 47, contact-spring 6, right-hand winding of magnet 29, and magnet 28. The magnet 42 therefore remains unenergized and now in turn holds down the grounding lever 25 owing to its armature 39 keeping down the stop 40'. The two magnets 28 and 42 may be united to form one magnet having two windings, its armature for influencing the grounding lever being attracted only when current flows through both windings. In a similar way this magnet may be united with the magnet 29.

I claim:—

1. In a fire-alarm system, the combination of a circuit including a circuit-breaker and an electromagnet; a normally open switch for connecting said circuit to ground, a grounding member for closing said switch, automatic mechanism for actuating said circuit-breaker and driving said grounding member and thereby closing said switch, releasing means for releasing said automatic mechanism and driving the said grounding member into an operative position in which it can be driven by the automatic mechanism

and thereby close said switch, and retracting means controlled by said electromagnet for preventing said releasing means driving said grounding member into said operative position.

2. In a fire-alarm system, the combination of a circuit including a circuit-breaker, a main electromagnet and two auxiliary electromagents in series therewith; a normally open switch for connecting said circuit to ground, a grounding member for closing said switch, the unattracted armatures of the auxiliary electromagnets being adapted to hold the grounding member in its switch-closing position, automatic mechanism for actuating said circuit-breaker and driving said grounding member and thereby closing said switch, releasing means for releasing said automatic mechanism and driving the said grounding member into an operative position in which it can be driven by the automatic mechanism and thereby close said switch, and retracting means controlled by said electromagnet for preventing said releasing means driving said grounding member into said operative position.

3. In a fire-alarm system, the combination of a circuit including a main electromagnet comprising two windings, a circuit breaker connected between the two windings to the one end thereof and two auxiliary electromagnets connected in series with the windings to the other ends thereof; a normally open switch for connecting said circuit to ground, a grounding member for closing said switch, the unattracted armatures of the auxiliary electromagnets being adapted to hold the grounding member in its switch-closing position, automatic mechanism for actuating said circuit-breaker and driving said grounding member and thereby closing said switch, releasing means for releasing said automatic mechanism and driving the said grounding member into an operative position in which it can be driven by the automatic mechanism and thereby close said switch, and retracting means controlled by said electromagnet for preventing said releasing means driving said grounding member into said operative position.

4. In a fire-alarm system, the combination of a circuit including a main electromagnet comprising two windings, a circuit-breaker connected between the two windings to the one end thereof and two auxiliary electromagnets connected in series with the windings to the other ends thereof; a normally open switch for connecting said circuit to ground, a grounding member for closing said switch, the unattracted armatures of the auxiliary electromagnets being adapted to hold the grounding member in its switch-closing position, automatic mechanism for actuating said circuit-breaker and driving said grounding member and thereby closing said switch, a short-circuiting switch normally short-circuiting the main electromagnet and circuit-breaker, arresting means for arresting the short-circuiting switch in its open position, releasing means for opening the short-circuiting switch, releasing said automatic mechanism and driving the said grounding member into an operative position in which it can be driven by the automatic mechanism and thereby close said former switch, and retracting means controlled by said electromagnet for preventing said releasing means driving said grounding member into said operative position.

5. In a fire-alarm system, the combination of a circuit including a circuit-breaker, a main electromagnet and two auxiliary electromagnets in series therewith; a normally open grounded switch electrically connected with the circuit-breaker, a spring-influenced grounding lever for closing said switch, each armature of the auxiliary electromagnets being adapted to hold said lever in its switch-closing position; automatic mechanism for actuating said circuit-breaker and driving said lever and thereby closing said switch, a short-circuiting switch normally short-circuiting the main electromagnet and circuit-breaker, a catch adapted to be released by the automatic mechanism for holding the short-circuiting switch in its open position, a spring-influenced releasing lever normally coacting with the grounding lever and tending to drive the same into engagement with the automatic mechanism, a stop on the releasing lever for arresting the automatic mechanism in the rest-position of the releasing lever, a key-lever normally holding the releasing lever in its rest position and adapted to open said short-circuiting switch, and a lever-arm controlled by the armature of the main electromagnet for driving the releasing lever into its lowest position.

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

ERNST SCHUMANN.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.