

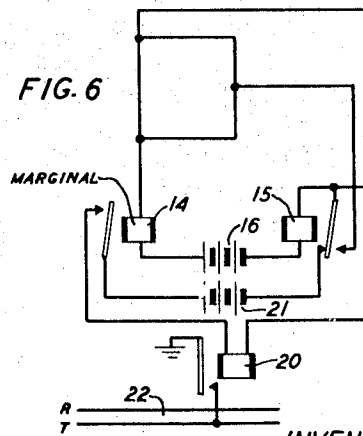
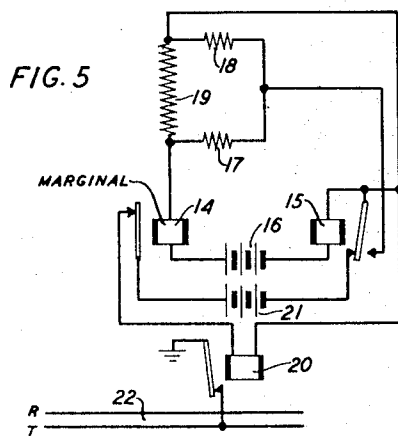
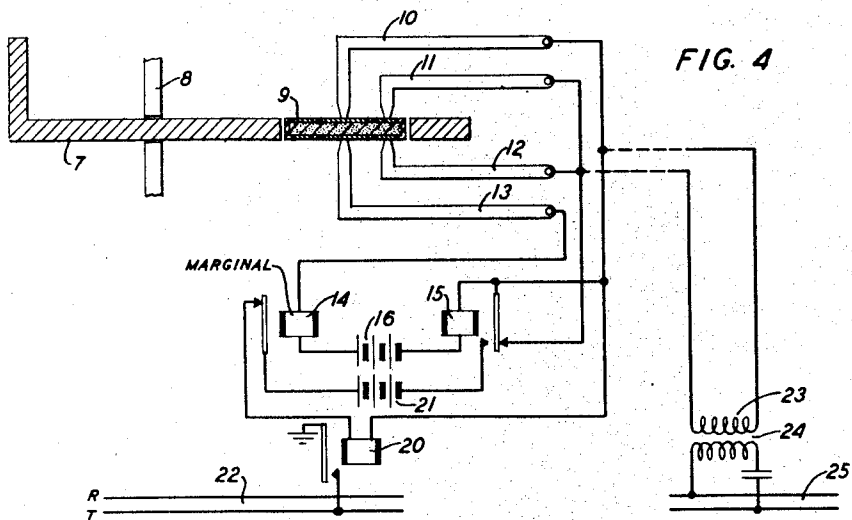
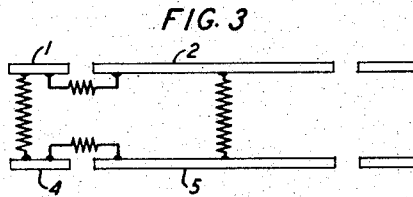
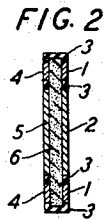
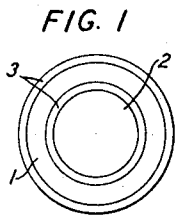
Oct. 12, 1948.

O. A. SHANN
SIGNALING SYSTEM

2,450,997

Filed May 23, 1945

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG. 7

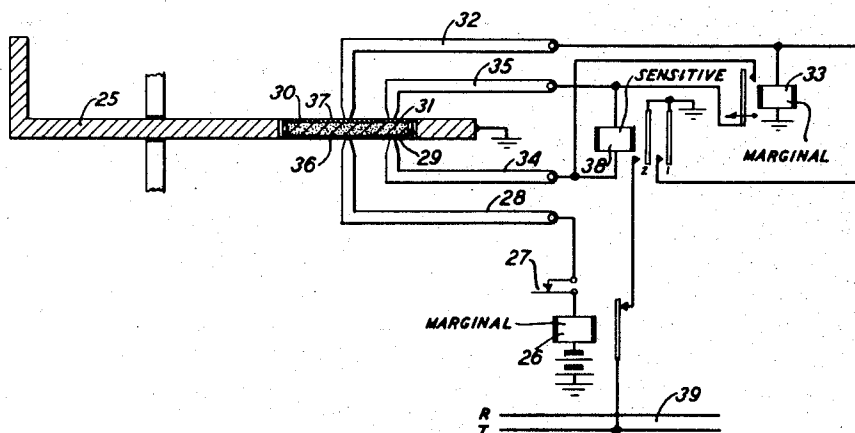
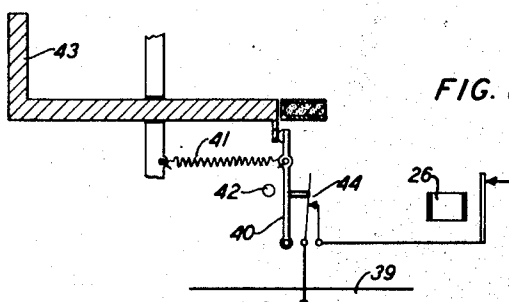


FIG. 8



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2,450,997

SIGNALING SYSTEM

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Application May 23, 1945, Serial No. 595,302

3 Claims. (Cl. 177—353)

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This invention relates to communication systems and particularly to station arrangement to permit emergency operation.

The object of the invention is to provide a special device by which a subscriber may dispense with the requirement to deposit a coin in order to make a call. The said special device may be in the form of a reclaimable token in the possession of a particular subscriber which has certain peculiar properties by virtue of which the substation circuit of a coin box station may be operated.

In accordance with the present invention a token is provided having on the surfaces thereof a number of electrical contact surfaces and within the body thereof a plurality of changeable electrical circuits between such surfaces. The token, described in another manner, may consist of a disc of thermistor material provided with a plurality of electrodes whereby a plurality of electrical paths through said material are provided, which paths due to the nature of the material are changeably responsive in their resistances to the current flowing therethrough.

The invention comprises the use of such a token in a responsive circuit whereby a new and desirable result may be obtained.

The combination of this new token and the responsive circuit may be used, by way of example, to make emergency calls over coin box telephone stations. The token may be in the possession of an authorized person and may be reclaimable, that is, it may be arranged for temporary use in the coin box apparatus and not subject to deposit in the manner of an ordinary coin.

A feature of the invention is a token shaped like an ordinary coin having changeable electrical circuits therein between different points on its surface.

Another feature of the invention is the combination of a token having changeable electrical circuits between different points on its surface and a circuit responsive to the insertion of said token therein for producing a result differing from the insertion of any other material either conducting or insulating therein.

Another feature of the invention is the arrangement in substation apparatus for operating a calling circuit either by the deposit of a coin or the reclaimable insertion in the coin slot of a special token.

In accordance with another feature the special token by virtue of its internal resistance may be

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made to produce a vibration whose frequency depends on the value of said internal resistance. In accordance with this feature different tokens may thus be provided to produce different tones which may be used as identification signals.

Another feature of the invention is a circuit arrangement for operating a coin box telephone circuit responsive to the change in resistance of a special token inserted therein and unresponsive to any other condition established by the use of a token of unchangeable resistance.

Other features will appear hereinafter.

The drawings consist of eight figures as follows:

Fig. 1 is a plan view of the special token;

Fig. 2 is a cross-sectional view of the same;

Fig. 3 is a schematic circuit diagram showing the equivalent resistance paths within the token;

Fig. 4 is a circuit diagram with a schematic representation of the mechanical arrangement of the slider apparatus in which the special token may be used;

Fig. 5 is an equivalent circuit diagram of the arrangement shown in Fig. 4 where the special token is in circuit;

Fig. 6 is a similar equivalent circuit diagram showing the connections which would be established were a coin or metal slug put in the slider;

Fig. 7 is a figure like Fig. 4 showing an alternative arrangement in which the changing resistance of the special token is used to cause the proper response; and

Fig. 8 is a fragmentary drawing showing a safety device which might be used.

This invention is embodied in the construction and the use of a specially constructed token, the size of the usual coin used in the coin slot of a telephone substation instrument. The token is shown in Figs. 1 and 2, where Fig. 1 is a plan view showing a conducting ring 1 and a conducting disc 2 embedded in and flush with the remainder of the surface 3. The conducting parts may be of brass, copper, silver or any other appropriate metal of comparatively low electrical resistance. In Fig. 2 where the token is shown in cross-section it is seen that a similar ring 4 and disc 5 is embedded in the opposite surface and that the interior of the token is filled with a thermistor compound, a material having the property of presenting a high resistance electrical path therethrough when cold and a low resistance path when heated, as by the flow of current therethrough.

The dimensions of the token are such that the resistances between the various conducting rings

and discs may be shown in Fig. 3. The resistance between the ring 1 and disc 2 is comparatively low, between ring 4 and disc 5 is comparatively low and the other paths, such as that between rings 1 and 4 or between discs 2 and 5, are comparatively high. When the token is placed in circuit, the current flow will cause the comparatively low resistance paths to heat and thus become very much lower while the comparatively high resistance paths will remain substantially unaffected.

Fig. 4 shows an arrangement in which the token above described may be usefully employed for the special purpose of making a call over a telephone line from a substation which ordinarily requires the deposit of a coin. The apparatus here shown is in addition to the conventional apparatus present at such a station.

The arrangements include a slider type coin slot here used only in connection with the special token above described. The slider 7 may be pulled out until a recess in such slider is outside the wall 8 of the device so that the special token 9 may be inserted therein. The slider is then pushed back into the position shown so that the fingers 10, 11, 12 and 13 come into contact with the contact surfaces of the token.

Two detecting relays 14 and 15 are employed of which 14 is marginal so that it will fail to respond to anything less than a direct connection between the fingers 10 and 13. When the special token is first inserted in the slot, the connections shown in Fig. 4 will be established and the two relays 14 and 15 will be included in a circuit the equivalent of which is shown in Fig. 5. A circuit may be traced from the battery 16, through the winding of the marginal relay 14, contact finger 13, the thermistor material of the token to finger 12, the connection to finger 11, the thermistor material of the token to the contact finger 10, the winding of sensitive relay 15 to the battery 16. At first the resistance of the thermistor material is so high that neither of these relays respond, but as the current flows through the circuit described, such resistance changes and in a short time the condition pictured in Fig. 5 is established. Here the resistance between the fingers 13 and 12 is shown as a low resistance 17, the resistance between the fingers 11 and 10 is shown as a low resistance 18 and the resistance between the fingers 13 and 10 is shown as a high resistance 19 which does not change to any appreciable degree. As these resistances 17 and 18 become low the current in the circuit described increases until relay 15 operates but the marginal relay 14 does not respond. Therefore a circuit for relay 20 is closed from battery 21, armature and back contact of relay 14, winding of relay 20, armature and front contact of relay 15 to battery 21. Relay 20 responds and grounds the tip of the telephone line 22, thus calling in the operator or otherwise rendering the line active in conventional manner.

As an alternative or additional means, the primary 23 of an induction coil or transformer 24 may be connected to the fingers 10 and 11 and a back contact for the armature of relay 15 may be provided. In this case the winding of the relay 15 is so designed that it will respond to the low resistance 17 but will not respond to the resistances 17 and 18 when in series. Therefore as the resistances 17 and 18 reach their low values, the armature 15 will vibrate and thus produce a tone in the coil 24 which may be transmitted over a telephone line 25 to notify an operator

that a call is being made by one specially privileged to do so by possession of such a special token.

Should an unauthorized person attempt to use this special service by inserting a coin or a metal disc in the slot of the slider, the circuit condition shown in Fig. 6 will be established. Here the relays 14 and 15 are included in a direct connection, and the marginal relay as well as the sensitive relay 15 will respond so that the circuit for relay 20 closed by relay 15 is opened at another point by relay 14 with the result that relay 20 fails to operate. Thus an unauthorized person cannot make a call by inserting a coin in the slider 7 from which it may be recovered but must perforce make the call in the conventional manner by inserting the coin in the regular apparatus from which it cannot be recovered except of course by an action of the operator.

In Fig. 7 an alternative arrangement is shown in which two tests are sequentially made to determine first that the token inserted is of high resistance and second that it has later changed its resistance to a lower value whereby the changing characteristic of this token is recognized. In Fig. 7, the slider 25 is shown by the connection at its right-hand end to be grounded (being of metal and being electrically in contact with the frame of the apparatus). Here the slider is only partially pushed home to illustrate the action which takes place during the operation. At this stage a connection will be established from a grounded battery, through marginal relay 26 which will respond to nothing less than a direct connection to ground, through contacts 27 which may be operated by the conventional switchhook, the finger 28, the ring 29 of the token 30, the thermistor material therein, the ring 31, the finger 32 and the marginal relay 33 to ground. Neither the relay 26 nor the relay 33 will respond in this circuit if the resistance of the thermistor material between the rings 29 and 31 is high, as it should be at this stage of the operation, nor will either of these relays respond when the slider has been pushed all the way home until fingers 34 and 35 come in contact with the rings 29 and 31 respectively and the fingers 28 and 32 come in contact with the discs 36 and 37 respectively, in the somewhat lower resistance circuit provided by the token (as indicated in Fig. 3), until the thermistor material has become heated. At this stage, however, a relay 38 has been placed in series and which will respond as soon as the thermistor material lowers its resistance through heating. The circuit for relay 38 may be traced from grounded battery relay 26, contacts 27, finger 28, disc 36 and comparatively lower resistance between disc 36 and ring 29, finger 34, winding of relay 38, finger 35, ring 31, the comparatively lower resistance between ring 31 and disc 37, finger 32, winding of relay 33 to ground. With the slider in its home position the added resistance of the relay 38 in series with the winding of relay 33 will prevent the operation of relay 33 even when the thermistor material changes to a low resistance value. Relay 38, which is the most sensitive of the three relays, will not respond at first, but as the thermistor material becomes heated, will at length operate and through its armature 1 will short-circuit the marginal relay 33 to prevent its operation. Relay 38 also closes a circuit from ground, its armature 2 and front contact the back contact and armature of relay 26, the tip of the telephone line 39 to signal the central office. It should be noted that even

after the finger 32 is directly grounded by the operation of relay 38 the resistance of relay 38 will prevent that direct connection needed by the marginal relay 26 for its operation.

If a coin or metal slug is placed in the slot, then through its contact with the slider material it will provide a direct path to ground for relay 26 and cause this relay to operate so that the connection to the tip of the line 39 cannot be completed. At the same time both relays 33 and 38 will be short-circuited and cannot operate.

If a plastic or other non-conducting token is placed in the slot, then none of the relays will operate.

If some ingenious person should attempt to place in the device a coin-shaped piece of material, such as a carbon disc, which might have the heated resistance characteristic of the special token, then the relay 33 would operate as the slider comes into the position shown in Fig. 7. In this case relay 33 would not have the resistance of relay 38 in series with it and would respond to the circuit established with a comparatively low resistance between fingers 28 and 32. Relay 33 in responding will short-circuit relay 38 and thus prevent its operation. Relay 33 is shown as slow releasing, though it is not necessary to make this relay able to hold over any more than a very few milliseconds as the time taken for a person to push the slider from the position shown in Fig. 7 to its final position will never be long or more than the said few milliseconds. Therefore the relay 33 tends to lock itself in operated position for by short-circuiting the relay 38 it assures itself of sufficient operating current to maintain itself in operation. Thus an attempt to simulate the action of a special token with an unchangeable resistance disc will be defeated.

Fig. 8 shows an additional device which may be introduced for safety purposes though it will be understood that such safety devices will ordinarily be included when practical considerations call for them. In this case an arm 40 is normally stressed toward the left by a spring 41 against a stop pin 42. When a call is to be made, the person using this special token will push the slider 43 all the way home thus moving the arm 40 toward the right and closing the contacts 44 and thus completing a normal open connection between the tip of the line 39 and the armature of relay 26. When the central office operator responds, the pressure on the slider 43 may be relieved whereupon the spring 41 will move the slider back a small amount and open the circuit through contacts 44, since this calling connection is not needed after the operator answers.

What is claimed is:

1. In a check-controlled signaling system, a check having a changeable internal resistance, a circuit into which said check may be inserted, means responsive to the insertion of said check in said circuit for causing a change in the internal resistance of said check, and means responsive to the sequential values of the resistance of said check for transmitting a signal.

2. In a signaling system, a normally open circuit including a source of battery and a pair of marginal relays in series, one of said relays being responsive to a current of lesser strength than the other, both said relays being responsive to a closure of said circuit through a path of substantially zero resistance, a coin slot for holding a coin-shaped check, means responsive to the operation of said coin slot for inserting a coin or a coin-shaped check into the circuit of said relays, a special coin-shaped check having a plurality of electrical paths therethrough each having an appreciable resistance, said special coin-shaped check when introduced into the circuit of said relays constituting a current-limiting network for operating one only of said relays, and signaling means responsive jointly to said relays only when a particular one of said relays operates.

3. In a check controlled signaling system, a portable check having a changeable internal resistance, a circuit into which said check may be inserted, a battery responsive to the insertion of said check in said circuit for causing a change in the internal resistance of said check, a first relay unresponsive to the unchanged resistance of said check and responsive to the changed resistance thereof, a second relay likewise unresponsive to the unchanged resistance of said check and responsive to the changed resistance thereof, each of said relays when operated having means for rendering the other of said relays inoperative, and means controlled by said relays responsive to the sequential values of the resistance of said check for transmitting a signal.

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