

Oct. 26, 1943.

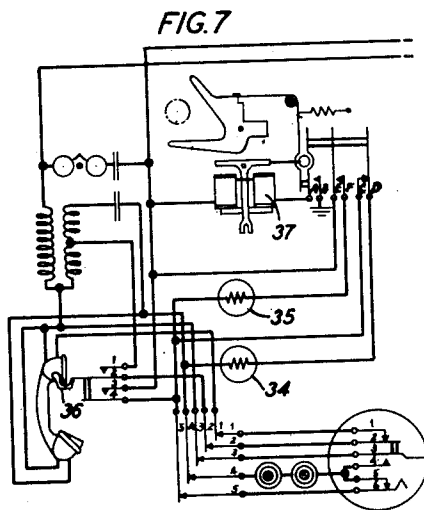
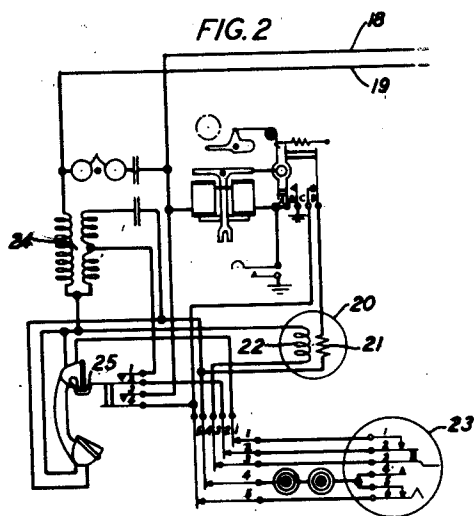
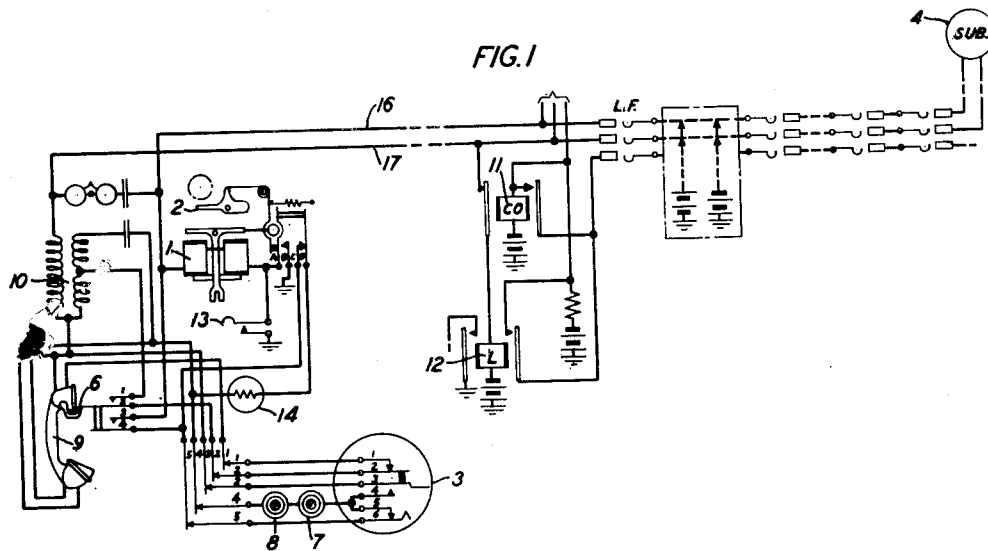
O. A. SHANN

2,332,872

STATION CIRCUIT

Filed July 29, 1942

2 Sheets-Sheet 1



INVENTOR
O. A. SHANN

BY

John A. Hall

ATTORNEY

Oct. 26, 1943.

O. A. SHANN

2,332,872

STATION CIRCUIT

Filed July 29, 1942

2 Sheets-Sheet 2

FIG. 3

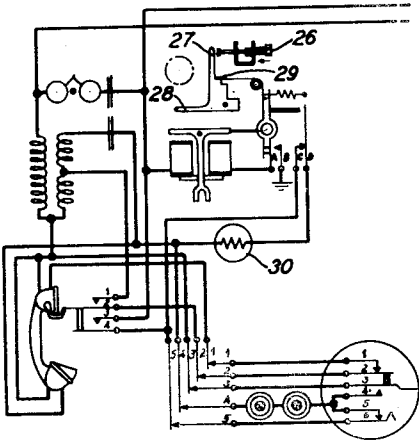


FIG. 4

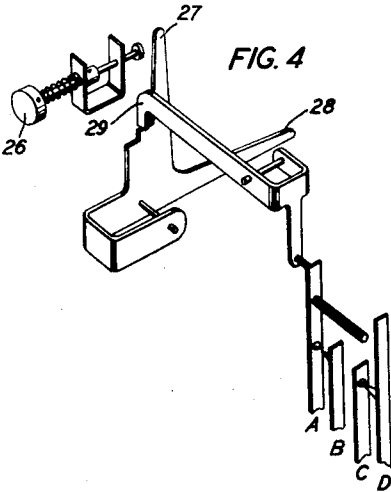


FIG. 5

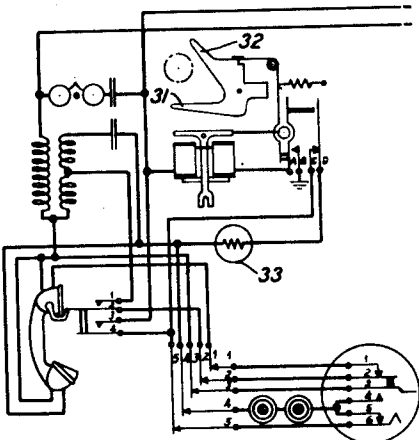
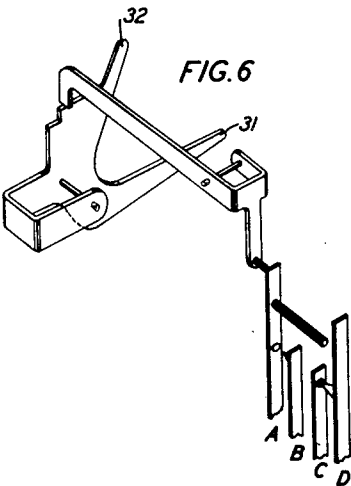


FIG. 6



INVENTOR
O. A. SHANN

BY

Shannon

ATTORNEY

UNITED STATES PATENT OFFICE

2,332,872

STATION CIRCUIT

Oscar A. Shann, Short Hills, N. J., assignor to
Bell Telephone Laboratories, Incorporated, New
York, N. Y., a corporation of New York

Application July 29, 1942, Serial No. 452,732

5 Claims. (Cl. 179-6.3)

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

The object of the invention is to provide means whereby a subscriber under normal conditions is required to perform a certain operation such as to deposit a coin, may dispense with this requirement in order to make an emergency call.

The invention is based on the use of a thermistor, a device whose resistance changes rapidly due to the thermal effect of current flowing therethrough. It is possible to construct a thermistor having an initial resistance so high that bridged across a telephone line it will not interfere with the normal dialing operation. However, with current flowing through this device it quickly changes its resistance to a value low enough to void the effect of the dialing at the distant receiving end. With such a device bridged across the dialing contacts it can be arranged so that but a single digit may be transmitted, but since this is all that is necessary for an emergency call an arrangement of this nature will be useful.

In accordance with the present invention a circuit arrangement is provided in which a thermistor is normally bridged across the dialing contacts of a telephone to prevent the unauthorized use of the telephone. When a coin is inserted in the proper receptacle then this connection will be broken so that full normal use may be made of the telephone. In addition a similar thermistor may be bridged across the switchhook contacts to prevent simulated dialing by the rapid manipulation of the switchhook.

In accordance with a variation of the invention the thermistor may be provided with a separate heating unit controlled by other circuit operations to prevent the avoidance of the effect produced by the simple form by the use of unduly long interdigit pauses in an effort to allow the simple form of thermistor to cool off between trains of transmitted impulses.

A feature of the invention is a means responsive to a limited use of a dial to render further use thereof ineffective.

Another feature of the invention is the use of a negative resistance at one end of a line to render a relay at the other end thereof unresponsive to more than a limited number of interruptions of the line circuit.

Other features will appear hereinafter.

The drawings consist of two sheets having figures, as follows:

Fig. 1 is a circuit diagram showing a substa-

tion circuit embodying the present invention and a schematic showing of the cooperating central office circuits;

Fig. 2 is a variation of the substation circuit of Fig. 1 showing the use of an indirectly heated thermistor;

Fig. 3 is a circuit diagram practically the same as that of Fig. 1 except that a different arrangement is employed to originate a call. This is illustrated in

Fig. 4 which shows a skeletonized perspective view of a button, the coin trigger and the contacts operated thereby;

Fig. 5 is another circuit diagram similar to that of Fig. 1, in which a two step coin trigger is employed;

Fig. 6 is a skeletonized perspective view of the two step coin trigger; and

Fig. 7 is a circuit diagram showing the use of a thermistor to prevent the simulation of dialing by the manipulation of the switchhook.

Reference is made to Patent 2,235,648 granted to Shann et al., March 18, 1941 which shows a coin collector upper housing which carries a dial and the transmitters used for detecting the passage of a coin. This apparatus is then connected with the rest of the substation apparatus and circuits by a set of contacts which cooperate with a corresponding set when the coin collector housing is placed in proper position. Patent 2,251,073, granted to O. A. Shann, July 29, 1941 is referred to as showing in detail the coin trigger arrangement usually employed. Patent 2,132,241, granted to H. Hovland, October 4, 1938 is referred to as showing dial central office circuits operable from a coin box station such as that herein disclosed.

In Fig. 1 a coin disposal magnet 1 is shown. Above this is a coin trigger 2, which on operation will operate the contacts to close a circuit between the contacts A and B and to open a circuit between contacts C and D. Upon the deposit of a coin these contacts will be operated as stated and the substation will then be enabled for regular service. Thereafter, by the use of the dial 3, the various switches at the central office may be set and a connection established to substation A. Through the connection established from ground contact B, contact A, coin magnet 1, contacts 3 and 4 of switchhook 6, contacts 5 of the housing contact set, contacts 6 and 5 of the dial 3, transmitters 7 and 8, contacts 5 of the housing contact set, transmitter of the handset 9, left-hand winding of the induction coil 10, ring of the line, left-hand armature of cut-off relay

11, winding of line relay 12 to battery, the central office apparatus is set in motion so that in due time a dial tone will be returned in accordance with well-known practice. Thereafter the central office apparatus may be set under dial control in the usual manner.

In case an emergency call is to be made, one involving usually the dialing of but a single digit, without the deposit of a coin, then the subscriber may depress key 13, which will perform the same function as the establishment of contact between the springs A and B. However, since no coin has been deposited, the thermistor 14 is in shunt of the pulsing contacts 5 and 6 of the dial 3. The thermistor is a device which has a resistance at ordinary room temperature in the order of one hundred thousand ohms. However, with a small amount of current flowing therethrough, it becomes heated and its resistance falls to something in the order of one to two hundred ohms. If an attempt is now made to dial, on each opening of the dial pulsing contacts, current will flow through the thermistor 14. The circuit conditions may be such that a single digit of ten pulses may be dialed without interference, but if much more than this is attempted, the resistance of the thermistor becomes so low that the pulse relay in the central office will fail to respond. Hence an emergency call requiring the dialing of one digit may be made but a regular call of four or six or seven digits cannot be made without the deposit of a coin to break the connection between the springs C and D.

Fig. 2 shows a substitution circuit similar in detail to that of Fig. 1 with the exception of the wiring of the thermistor. The line conductors 18 and 19 may be connected in a manner similar to the line conductors 16 and 17, respectively, of Fig. 1 to the central office apparatus shown to the right in Fig. 1. The thermistor 20 has a resistance element 21 which is heated by a heating element 22. When the dial 23 is moved off normal, a circuit may be traced from the line conductor 19, through the left-hand winding of induction coil 24, heating coil 22, springs 3 of the housing contacts, dial springs 3, 4, 5 and 6, springs 5 of the housing contacts, springs 4 and 3 of the switchhook 25 to line conductor 18. Thus during the off-normal periods of the dial, the thermistor 20 is heated to lower its resistance and thus frustrate any attempt to dial a sufficient number of digits to establish anything more than an emergency connection without the deposit of a coin.

In Fig. 3 the circuit arrangement is like that of Fig. 1 with the exception that the button 13 is eliminated and in its place a button 26 is employed. This is shown in detail in Fig. 4. When the button 26 is pressed, it engages an arm 27 formed on the piece with the coin trigger 28. The button 26 will not move this piece as far as a coin but will allow the latch 29 to drop down the first of two steps far enough to bring the springs A and B together but not far enough to break the contact between springs C and D. In this manner the ground for operating the line relay 12 is provided but the thermistor 30 is left in circuit.

Figs. 5 and 6 show another two step arrangement in which a coin trigger having two trigger arms is employed in much the same manner. In this arrangement it is intended that a coin may be deposited to make an emergency call, which coin may be returned by an operator or the normal functioning of the machine switching ap-

paratus. For making a normal call, the deposit of two coins is required.

The deposit of the first coin will strike the trigger arm 31 and cause a circuit to be established between the springs A and B while leaving the springs C and D still in contact with each other so that the thermistor 33 is left effectively in circuit. Thus by the deposit of a single coin, the apparatus may be conditioned to make an emergency call.

In the normal operation of this apparatus, two coins are required to be deposited. The first causes the operation described and leaves the trigger arm 32 in the coin track so that the second coin strikes this arm 32 and completely operates the contacts, opening the circuit between contacts C and D for normal operation.

In Fig. 7 a substitution circuit is shown in which the thermistor 34 plays the same role as in each of the other previously described figures. Any one of the previously described two step means for starting the call may be used, such as the two coin trigger of Fig. 6. In this case another pair of springs E and F are closed by the first coin so that a thermistor 35 is bridged across the contacts 3 and 4 of the switchhook 36 to prevent an attempt at simulated dialing. Even if the thermistor is heated by such an attempt, it will cool off during the conversational period so that when the handset is hung on the switchhook at the end of the conversation, the line circuit will be effectively opened long enough to cause the central office apparatus to properly work the coin disposal magnet 37 which will in turn release the springs E and F and thus open the circuit of thermistor 35.

What is claimed is:

1. A station circuit for a communication system, including an impulse transmitter having a set of impulse contacts, a thermistor having an initially high resistance bridged across said contacts and subscriber controlled means for effectively excluding said thermistor from said circuit.
2. A station circuit for a communication system, including an impulse transmitter having a set of impulse contacts normally closed, a device bridged across said contacts having a normal high resistance value, said device being responsive to current flowing therethrough during operation of said contacts to change its resistance to a value low enough to render the operation thereof ineffective and subscriber controlled means for opening the circuit of said device.
3. In a telephone system, a line, a station at one end of said line, said station including an impulse transmitter, a source of current and an impulse relay responsive to said transmitter at the other end of said line, a negative resistance device bridged across said transmitter responsive to current from said source to change its resistance from a high to a low value, said relay being responsive to said transmitter while said resistance is at said high value and unresponsive to said transmitter while said resistance is at said low value and means at said station responsive to the deposit of a coin for excluding said negative resistance from said station circuit.
4. In a telephone system, a line, a station at one end of said line, said station including an impulse transmitter, a source of current and an impulse relay responsive to said transmitter at the other end of said line, a negative resistance device bridged across said transmitter, thermal

means responsive to the operation of said transmitter for heating said device to change its resistance from a high to a low value, said relay being responsive to said transmitter while said resistance is at said high value and unresponsive to said transmitter while said resistance is at said low value and coin operated means at said station for excluding said negative resistance from said station circuit.

5. In a telephone system, a line, a station at one end of said line, said station including an impulse transmitter and a set of switchhook contacts, a source of current and an impulse relay responsive to the operation of said transmitter and the operation of said switchhook contacts, a negative resistance device bridged across said

transmitter responsive to current from said source during the open periods of said transmitter to change its resistance from a high to a low value, a similar negative resistance device bridged across said switchhook contacts responsive to current from said source during the open periods thereof to change its resistance from a high to a low value, said relay being responsive to interruptions of said line circuit by said transmitter and said switchhook contacts while said resistances are at said high value and unresponsive to said interruptions while said resistances are at said low value and means for effectively excluding said negative resistance devices from said station circuit.

OSCAR A. SHANN.