

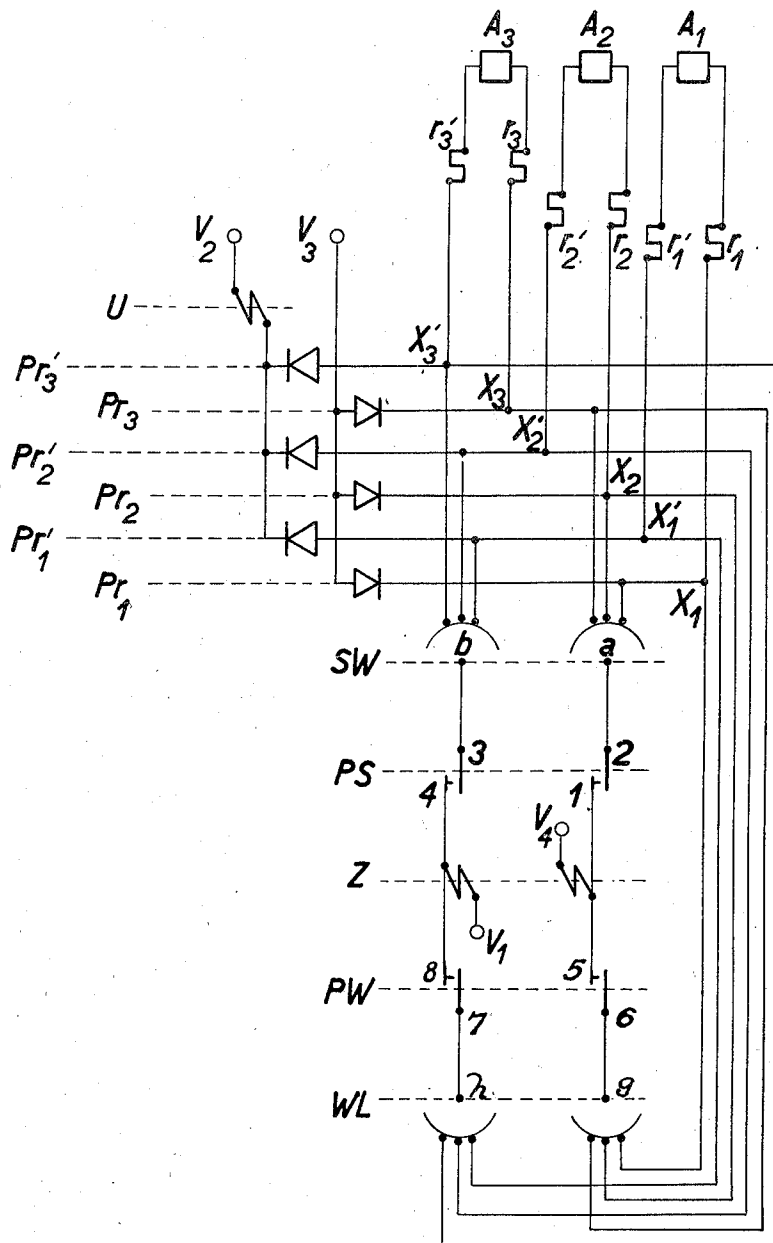
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to automatic or semi-automatic telephone and like telecommunicating or signalling systems with line finders.

Exchanges with line finders are known, in which the subscribers' lines are fitted with two individual relays: a line relay and a cut-off relay. The line relay is used for marking the calling line in line finder banks and for creating the start circuit. The cut-off relay serves for disconnecting the line relay when the calling line has been found, and for interruption in this way the start circuit.

There are also known exchanges, in which the two above-named relays are replaced by one two-step relay. But the working of such two-step relays is less sure than that of normal relays, and the two-step relays require a more frequent and difficult periodical regulation.

The object of this invention is to provide an automatic or semi-automatic exchange with line finders for the purpose of tele-communication, in which the creating of the start circuit, and the interrupting of it after finding the calling line by the line finder, is effected without any individual relay. In this way the calling lines in an exchange according to the invention must be fitted—apart from the arrangements explained in the following specification—with a normal one-step relay, only marking the calling line in the line finder banks in the case where such a marking is necessary in the supposed system of exchange.

In an exchange according to the invention, the calling lines are fitted with two individual rectifiers. The corresponding electrodes of these rectifiers are connected parallelly to each other for a group of the subscribers' lines, and annexed to the common branch containing the start relay in such a way, that when a subscriber's call is made, a current flows in the common branch, in the rectifiers appertaining to the calling subscriber, and in the line appertaining to him. In this way the common start relay is excited and it mobilizes the line finder.

The line finder having found the calling subscriber, its brushes *a* and *b* are connected to the source of current feeding the connecting circuits of the exchange. According to the invention, the plus pole of the source feeding the subscriber station, when the call is made, has a potential lower than the potential of the plus pole in the source feeding the subscriber lines during speaking, and the minus pole of the source feeding the lines, when the call is made, has a potential higher than the potential of the minus pole of the source

feeding the subscribers' lines during speaking, the direction of the current flowing through the subscribers' lines during speaking being the same as it was at the moment when the subscriber's call was made.

At the moment when the line finder stops in the calling line, there arises—due to the explained system of potentials—in the rectifiers a difference of potentials opposite to that which causes the flowing of the current, and the rectifiers, appertaining to this line, cease to conduct the current and the start relay becomes demagnetized and interrupts the start circuit (when no other call has been made at the same time).

The invention is characterized by the feature that the line is insulated during speaking against the influence of the common branch, containing the start relay, by a suitable polarization of the rectifiers.

In this way the line is secured during speaking against cross-talks from other circuits.

In exchanges which are not exchanges for the purpose of telephony, the words "subscribers" and "subscribers' lines" means any other analogous suitable individual arrangements.

The telephone exchange described below with reference to the accompanying drawing, serves as an example of one of the possible applications of this invention. The invention may, however, also be applied to any other signalling exchanges.

The single figure represents a scheme of a part of an automatic telephone exchange necessary for understanding the invention. A_1 , A_2 and A_3 are subscribers' apparatus, r_1 , r_1' , r_2 , r_2' , r_3 and r_3' —the resistances connected in series to the lines from the apparatus to the exchange, Pr_1 , Pr_1' , Pr_2 , Pr_2' , Pr_3 and Pr_3' —the rectifying elements connected between the individual subscribers' lines and the common points V_3 and V_2 in series with the winding of the relay U . The means for marking the calling line in the field of the contacts of the line finder being generally known, this detail has been omitted in the drawing.

The manner of drawing the rectifiers is such that the current flows from the higher potential on the side of the blade to the lower one on the side of the plate, but at the lower potential on the side of the blade, and the higher one on the side of the plate, the rectifier has a very high resistance and the current practically does not flow.

In the example given the following inequalities are forthcoming between the potentials V_1 , V_2 , V_3 and V_4 : potential of the point V_2 is higher than potential of the point V_1 , that of V_3 is

higher than that of V_2 and that of V_4 is higher than that of V_3 ; the following values are accepted for the above potentials: potential of the point $V_2=8$ volts, potential of the point $V_3=16$ volts, potential of the point $V_4=24$ volts, and the potential of the point V_1 is zero.

At the moment when one of the subscribers, e. g. A_1 lifts the hand set, the following circuit is closed: the point V_3 , rectifier Pr_1 , resistance r_1 , subscriber's apparatus A_1 , resistance r_1' , rectifier Pr_1' , winding of the relay U , the point V_2 . Between the points V_3 and V_2 there is the tension $=8$ volts (equal to the difference of potentials of the points V_3 and V_1).

Both rectifiers are connected on this circuit in the conducting direction and, therefore, the current flows and the relay U operates. The relay U closes the circuit for the line finder SW which finds by means of the wipers a and b the called subscriber and stops there. The circuits of the operation and stopping of the line finder are omitted in this description as they are known, and as these circuits perform the auxiliary functions only and do not form a part of this invention.

At the moment when the line finder stops at the called subscriber, the right and left windings of the feeding relay Z are connected parallelly with the points X_1 and X_1' through the already coupled contacts of the test relay PS of the line finder. The relay Z is connected to the battery having a tension $V_4=24$ volts (equal to the difference of potentials of the points V_4 and V_1).

Parallelly to the last mentioned circuit, the following circuit is formed: Point V_4 , right winding of the relay Z , contacts 1—2 of the relay PS , wiper and contact a of the finder SW , resistance r_1 , subscribers' apparatus A_1 , resistance r_1' , contact and wiper b of the finder SW , contacts 3—4 of the relay PS , left winding of the relay Z , and point V_1 .

The values of the resistances r_1 and r_1' are selected in such a manner that the potential at the point X_1 is higher than the potential at the point $V_3=16$ volts, and the potential at the point X_1' is lower than the potential of the point $V_2=8$ volts.

In view of this, there are such potentials at the rectifying elements at which no current can flow through these elements, and, therefore, the last described circuit may be regarded as disconnected from the common points and will not react to any influences resulting from the mechanical connection with these points.

At the moment, when, after selecting a demanded set, e. g. A_3 , the test relay PW of the line selector will operate, the called subscriber will lift the handset and a speech circuit will be closed, the potentials at the points X_1 and X_1' will be changed, because of the connection to the windings of the relay Z of a following parallel circuit: the point V_4 , right winding of the relay Z , contacts 5—6 of the relay PW , wiper and contact g of the selector WL , resistance r_3 , subscriber's apparatus A_3 , resistance r_3' , contact and wiper h of the selector WL , contacts 7—8 of the relay PW , left winding of the relay Z , and point V_1 .

Besides, the speech currents are flowing in the following circuit: subscriber's apparatus A_1 , resistance r_1 , contact and wiper a of the finder SW , contacts 2—1 of relay PS , contacts 5—6 of the relay PW , wiper and contact g of the selector WL , resistance r_3 , subscriber's apparatus A_3 , resistance r_3' , contact and wiper h of the selector WL , contacts 7—8 of the relay PW , contacts 4—3

of the relay PS , wiper and contact b of the finder SW , resistance r_1' , apparatus A_1 .

The values of the resistances r_1 , r_1' , r_3 and r_3' are selected in such a manner that at very short subscribers' lines and the highest possible intensity of the voice on the microphones, the potentials at points X_1 , X_1' , X_3 and X_3' should not be equalized with the potentials on the other side of the rectifying elements.

In the example given, as above noted, the tension of the feeding storage battery was assumed to be equal to 24 volts at the battery terminals and 8 volts and 16 volts at the points or terminals V_2 and V_3 .

It is clear that depending on varying conditions, these values may be changed in a manner which is the most suitable for each separate case.

I claim:

1. In an automatic telephone and signalling exchange having line finders, the sub-combination of: subscriber lines; rectifiers through which said subscriber lines are connected in parallel with one another; a common relay to which said subscriber lines are connected; a current source feeding current to said relay; a current source feeding current to said subscriber lines individually during suitable working periods, the plus pole of the first mentioned current source having a lower potential than the potential of the plus pole of the second mentioned current source, whilst the minus pole of the first mentioned current source has a higher potential than the minus pole of the second mentioned current source, the rectifiers being so connected that the current flows from the plus pole of the first-mentioned current source to the minus pole of said source.

2. In a semi-automatic telephone and signalling exchange having line finders, the sub-combination of: subscriber lines; rectifiers through which said subscriber lines are connected in parallel with one another; a common relay to which said subscriber lines are connected; a current source feeding current to said relay; a current source feeding current to said subscriber lines individually during suitable working periods, the plus pole of the first mentioned current source having a lower potential than the potential of the plus pole of the second mentioned current source, whilst the minus pole of the first mentioned current source has a higher potential than the minus pole of the second mentioned current source, the rectifiers being so connected that the current flows from the plus pole of the first mentioned current source to the minus pole of said source.

3. In an automatic telephone and signalling exchange having line finders, the sub-combination of: subscriber lines; rectifiers through which said subscriber lines are connected in parallel with one another; a common relay to which said subscriber lines are connected; a current source feeding current to said relay; a current source feeding current to said subscriber lines individually during suitable working periods, this first mentioned current source being a part of the second mentioned current source, the plus pole of the first mentioned current source having a lower potential than the potential of the plus pole of the second mentioned current source, whilst the minus pole of the first mentioned current source has a higher potential than the minus pole of the second mentioned current source, the rectifiers being so connected that the current flows from the plus pole of the first mentioned current source to the minus pole of the said source.

4. In a semi-automatic telephone and signalling exchange having line finders, the sub-combination of: subscriber lines; rectifiers through which said subscriber lines are connected in parallel with one another; a common relay to which said subscriber lines are connected; a current source feeding current to said relay; a current source feeding current to said subscriber lines individually during suitable working periods, this first mentioned current source being a part of the second mentioned current source, the plus pole of the first mentioned current source having a lower potential than the potential of the plus pole of the second mentioned current source, whilst the minus pole of the first mentioned current source has a higher potential than the minus pole of the second mentioned current source, the rectifiers being so connected that the current flows from the plus pole of the first mentioned current source to the minus pole of said source.

5. An automatic telephone and signalling exchange arrangement having line finders as specified in claim 1, wherein feeding relays for the individual devices are provided, each winding of the relays being connected during suitable working periods, in series with individual devices, to the current source feeding current to the subscribers' lines individually during those periods, and said devices are connected with said recti-

fiers through resistances of such magnitude that when the current is at its maximum value in said independent circuits the voltage drop in each winding of said relays is smaller than the difference between the potential of the poles of said feeding device feeding current to said independent circuits, and the potential of the respective poles of said feeding device feeding said common part.

6. A semi-automatic telephone and signalling exchange arrangement having line finders as specified in claim 2 wherein feeding relays for the individual devices are provided, each winding of the relays being connected during suitable working periods, in series with individual devices, to the current source feeding current to the subscribers' lines individually during those periods, and said devices are connected with said rectifiers through resistances of such magnitude that when the current is at its maximum value in said independent circuits the voltage drop in each winding of said relays is smaller than the difference between the potential of the poles of said feeding device feeding current to said independent circuits, and the potential of the respective poles of said feeding device feeding said common part.

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