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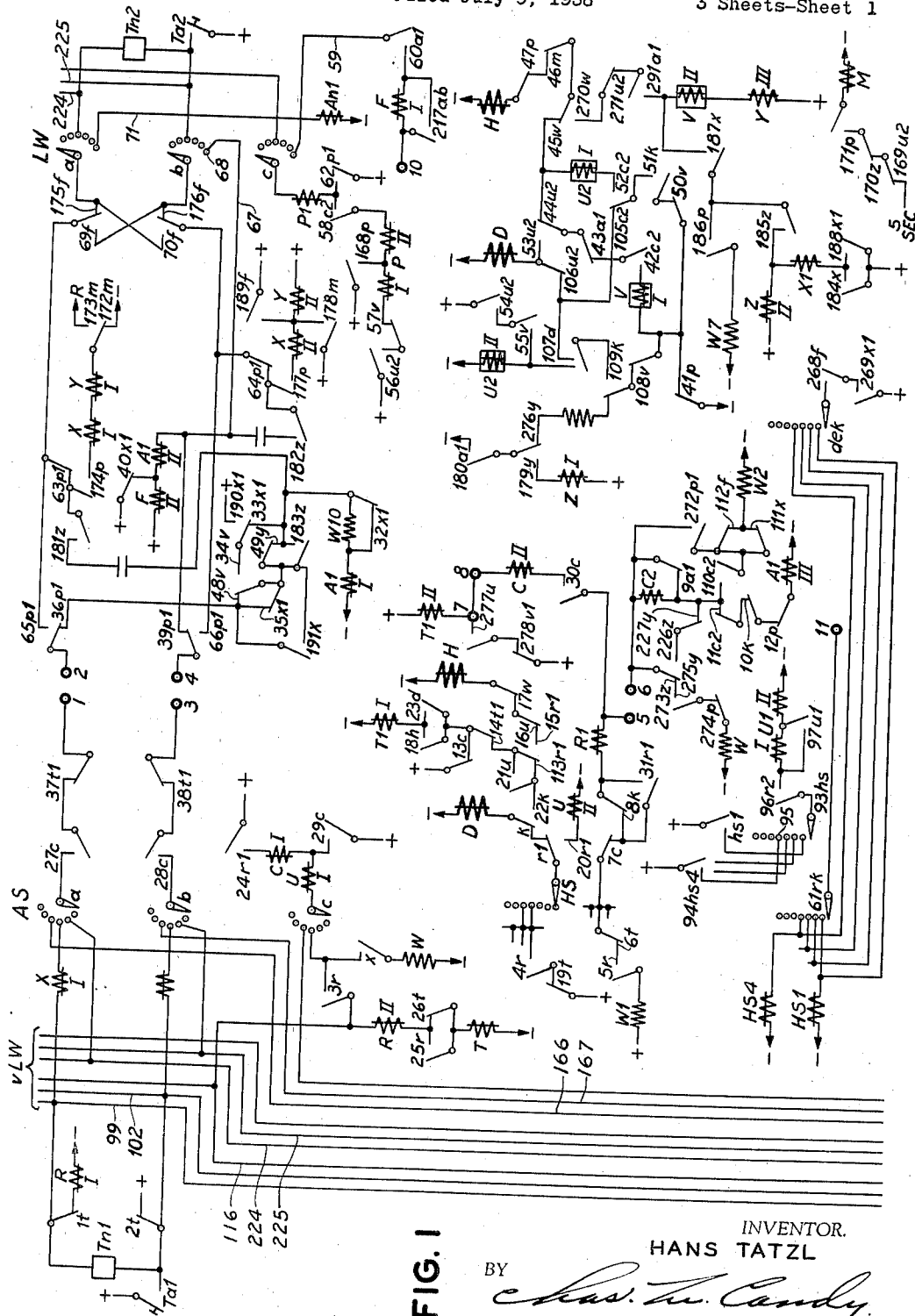
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2,238,235

AUTOMATIC TELEPHONE SYSTEM

Filed July 9, 1938

3 Sheets-Sheet 1



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**April 15, 1941.**

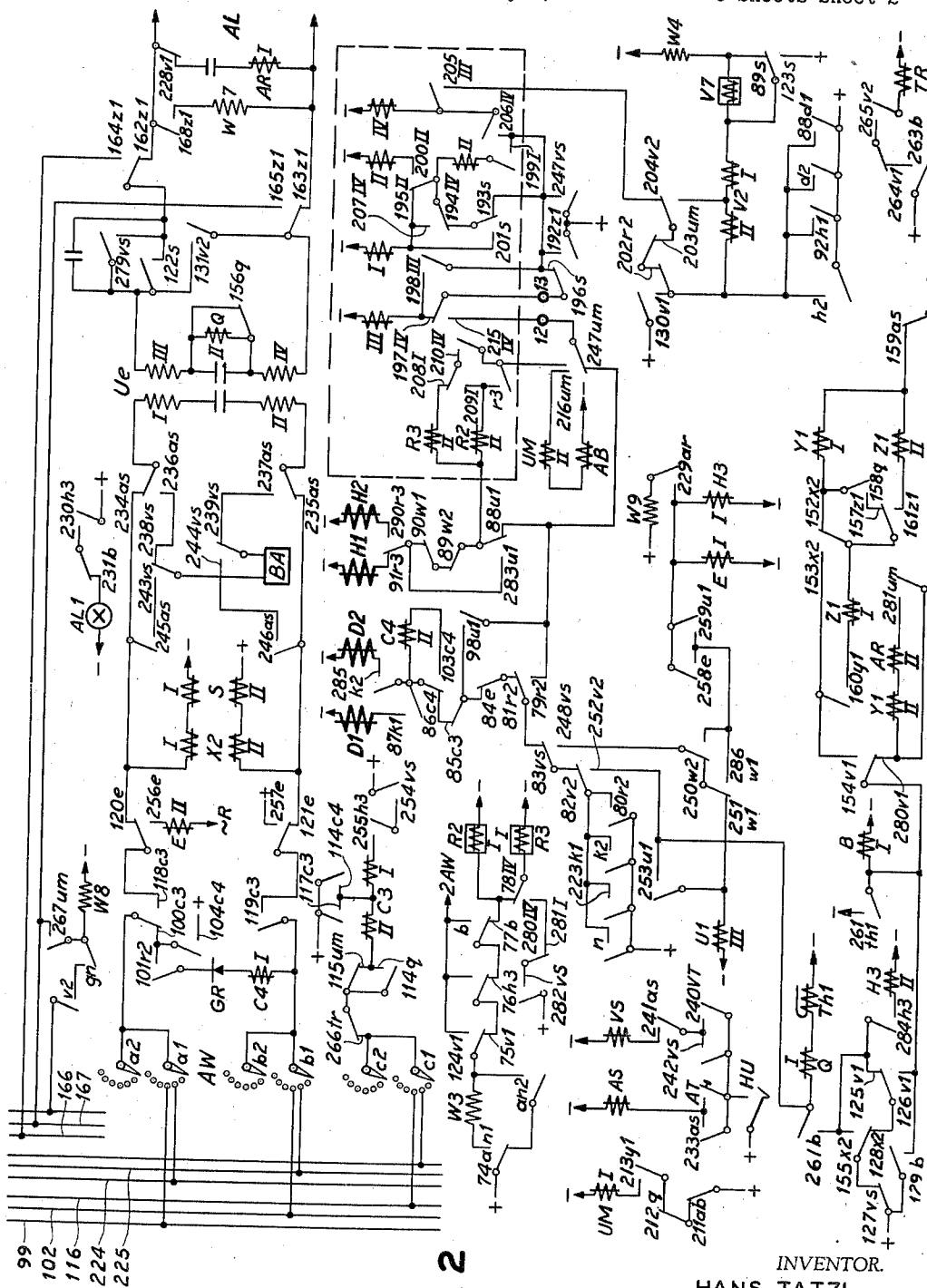
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3 Sheets-Sheet 2



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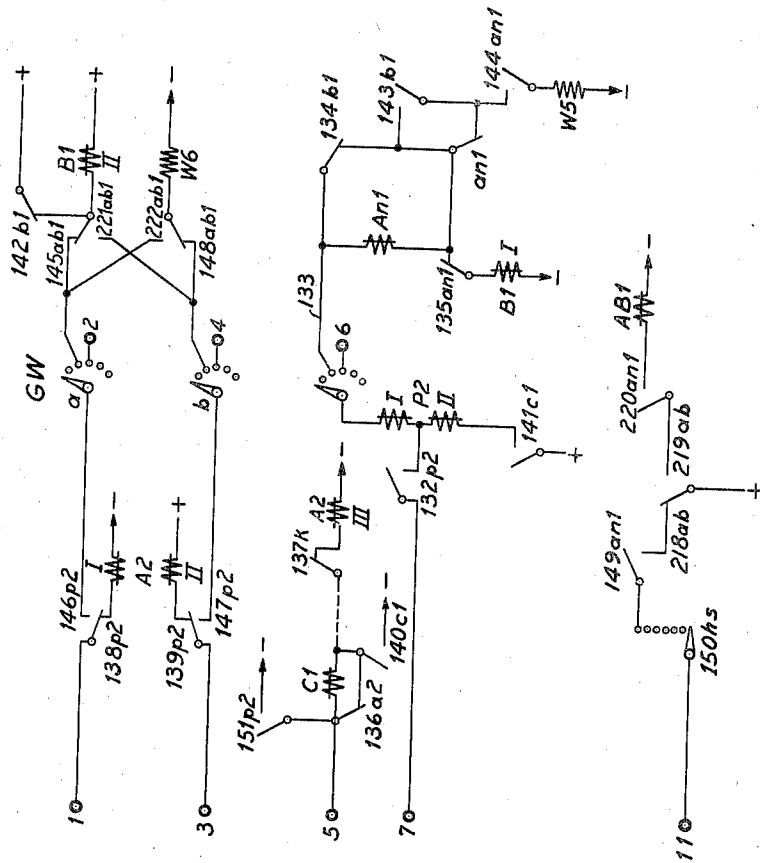
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# AUTOMATIC TELEPHONE SYSTEM

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3 Sheets-Sheet 3



**FIG. 3**

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## UNITED STATES PATENT OFFICE

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## AUTOMATIC TELEPHONE SYSTEM

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The invention relates to a circuit arrangement for selectors in telephone systems which sets itself by free hunting on characterised speaking sets. In such arrangements it is known to carry out the stopping of the selector in free hunting over special wipers undertaking the characterisation by relays controlled over these wipers. Further it is also known to carry out the stopping on the characterised speaking set by relays controlled over a particular wiper of the selector the speaking leads of the calling subscriber's set. These known arrangements require a special wiper on the selector with free hunting for the stopping of the selector over which wiper the switch means for stopping the selector is controlled and furthermore in known arrangements with the use of speaking leads disturbing noises are produced by the extension over engaged sets. The present invention concerns a special wiper for stopping the selector in free selection on a characterised set and avoiding disturbances by the passage of the lines of a subscriber over an engaged connection which is attained according to the invention in that for the set on which the selector is to set itself in free hunting a flow of current is produced over the speaking leads by which the direction of the feeding current of an engaged set is reversed and in this way a relay situated between the speaking leads in the exchange which relay only energises in this definite direction, is excited on obtaining the set characterised by the current reversal and carries out the stopping of the selector.

Of particular importance is the arrangement according to the invention in office systems with local and exchange traffic in which after the characterising of the exchange selection a selector of the exchange line is set on the calling set and this selector is also set as line selector by the incoming exchange connections on the set desired by the exchange. In such systems a large number of conditions are to be fulfilled which make necessary a control of the switch operations over the wipers of the selectors. In the arrangement according to the invention it is possible to fulfill the particular conditions as for example enquiry, reversal, etc., also in systems in which the selector is equipped for internal connections and the exchange selector as up-and-around selector with three wipers stepping over the contacts of the contact bank.

In Figs. 1 and 2 an embodiment of the invention is shown, illustrating an office system with call-finder and line selector for making internal connections on the exchange selector for making incoming and outgoing selections. The call finder, line selector and the exchange selector are considered as up-and-around selectors.

In Fig. 3 a group selector is also shown which is connected between the intermediate call finder

and line selector in Fig. 1 when a larger office system is concerned. If group selectors are present and if the number of neighbouring set subscribers which are authorised for exchange connections is greater than the capacity of an exchange selector a second exchange selector is connected parallel to the previous one.

*Making of an exchange connection*

Should the subscriber Tn1 in Fig. 1 wish to make an exchange connection the subscriber has first of all to lift the receiver, in this way the relay R is energised over: negative, winding I of relay R, contact 1t, loop of the set Tn1, contact 2t, positive. The relay R operates its contacts over contact 3r. The calling subscriber is characterised at the wiper c of the call finder AS. Over contact 4r the contact-row of the call finder AS is characterised in which the calling set is included. Over contact 5r the following circuit is made: positive, resistance W1, contacts 5r, 6t, 7c, principal contact 8k, of the call finder AS, relay R1, connecting point 5/6 contacts 9a1, 11c2, principal contact 10k of the line selector LW, contact 12p, winding III of the relay A1, negative. In the previous circuit the relays R1 and A1 energise. The relay R1 holds independently of contact 8k over contact 31r1. Through relay R1 the vertical magnet H of the call finder AS receives current over: positive, contact 13c, 14t1, 15r1, 16u, shaft contact 17w of the call finder AS, vertical magnet H, negative. The vertical magnet H lifts the call finder AS by one step. Through the vertical magnet H the contact 18h is also closed and with it relay T1 over: positive, contacts 13c, 18h, winding I of relay T1, negative. The relay T1 opens the contact 14t1 so that the circuit of the vertical magnet H is interrupted again. The vertical magnet H opens the contact 18h. Relay T1 releases and over contact 14t1 the circuit for the vertical magnet H and relay T1 continues until the following circuit is closed again. The interplay between vertical magnet H and relay T1 continues until the following circuit is over the contact level HS of the call finder AS: positive, contacts 19t, 4r, topmost contact HS, contact 20r1, winding II of relay U, negative. The relay U energises, opens the contact 16u and stops the call finder AS thereby on the contact row reached. By means of relay U the contact 21u is closed. There is now made the following circuit for the rotary magnet D of the call finder AS: positive, contacts 13c, 14c1, 21u, principal contact 22k of the call finder AS, rotary magnet D, negative. The rotary magnet D is energised and turns the call finder AS by one step in the contact bank which has been reached. Through the rotary magnet D the contact 23d is closed so the relay T1 is energised over: positive, contacts 13c, 23d, wind-

ing I of relay T1, negative. Relay T1 opens at contact 14t1 the circuit for the rotary magnet D. The rotary magnet D and the relay T1 act now as reciprocal interrupters until the following test circuit is made over the wiper c of the call finder AS: positive, contact 24r1, winding I of relay C, winding I of relay U, wiper c of call finder AS, contacts 3r, winding II of relay R, contact 25r and 26t, relay T, negative. In the previous circuit the relay R holds, furthermore the relays C and T are energised and through the opposite winding I of relays U the relay U is brought to release. By means of relay C the contact 13c is opened and the circuit of the rotary magnet D and the relay T1 opens. The call finder AS is stopped. Through relay C there follows the switching through at the contact 27c and 28c. Relay C interrupts the circuit for the relay R1 at the contact 7c. Relay R1 releases. By the closing of contact 29c the calling subscriber is locked in known manner. In the circuit of the relay R the relay A1 was energised. At the contact 9a1, the short-circuit for the relay C2 is opened. Relay C2 energises.

For the relay C2 the following holding circuit is made: positive, winding II of relay T1, connecting points 7/8, winding II of relay C, contact 30c, connecting points 5/6, relay C2, contacts 110c2, 111x and 112f, resistance W2, negative. In the previous circuit the relay T1 is not energised.

There exists now the following feeding circuit for the calling set Tn1: negative, winding I of relay A1, contacts 32x1, 49y, 35x1, 36p1, connecting points 2/1, contacts 37t1, 27c, wiper a of the call finder AS, winding I of relay X, subscriber's loops of the speaking set Tn1, winding II, of relay X, wiper b of the call finder AS, contacts 28c, 38t1, connecting points 3/4 contact 39p1, winding II of relay A1, contact 49x1, positive.

When the subscriber now sends the first impulse series out the interruptions by means of the dial are transferred to the set on the feeding bridge relay A1. Relay A1 of itself transfers the impulses to the vertical magnet H of the line selector LW. The circuit for the vertical magnet H of the line selector excites over: positive, contact 41p, winding I of relay V, contact 42c2, 43a1, 44u2, shaft contact 45w, contact 46m, 47p, vertical magnet H, negative. Through the impulse series the relay V is energised. At the end of the first impulse series the relay V releases so relay U2 is energised over: positive, contacts 41p, 50p, principal contact 51k, of the line selector LW, contact 52c2, winding I of relay U2, shift contact 45w, contact 47m, 47p, vertical magnet H, negative. In the above circuit the vertical magnet H is not operated. Through relay U2 the contacts 44u2 is opened and the contact 53u2 closed. The subscriber now sends out the second impulse series for setting the line selector LW on a definite contact on the row of contacts that has been reached. The impulses are again undertaken by the relay A1 and now transferred through the contact 43a1 on to the rotary magnet D of the line selector LW. The circuit for the rotary magnet D is as follows: positive, contact 41p, winding I of relay V, contacts 42c2, 43a1, 53u2, rotary magnet D, negative. After the first rotary step of the line selector LW the contact 45w is opened and so the circuit over the winding I of relay U2 is interrupted. The relay U2 holds over: positive, contact 54u2, 55v, winding II of relay U2 negative. At the end of the impulse the relay V first releases and puts back

its contacts to their rest position. The contact 55v is opened, the relay U2 holds for a short time as a result of its release delay and the following circuit is thereby made: positive, contact 55u2, 57v, windings I and II of relay P, contact 58c2, relay P1, wiper c of line selector LW, conductor 59, contact 60a1, winding I of relay F, connecting points 10/11, top contact 61rk, relay HS4, negative. Line 59 is not multiplied. Over the line 59 a relay F arranged on the line selector LW alone is energised. According to the previous description the subscriber of the calling set Tn1 selects digits for setting the line selector LW. The arrangement can also be so constituted that after lifting the line selector LW to a definite row of contacts the contact, on which the line selector 59 is connected, is automatically selected.

In the circuit of the wiper c of the line selector LW the relays P1, F and HS4 are energised. The relay P1 closes the contact 62p1 so that the circuit over wiper c of the line selector LW is maintained independent of the contacts 55u2, 57v and 58c2. The relay U2 restores. The relay P1 opens the contacts 63p1, 64p1, 36p1, 39p1 and closes the contacts 65p1, 66p1. In the circuit over the wiper c, the relay is also energised so that now the following circuit is made: positive, contact 49x1, winding II of relays A1, line 67, contact 68, wiper b of line selector LW, contacts 69f, 65p1, 37t1, 27c, wiper a of the call finder AS, winding I of relay X, subscriber's loop of subscriber's line Tn1, winding II of relay X, wiper b of the call finder AS, contacts 38t1, 66p1, 70f, wiper a of the line selector LW, line 71, relay An1, negative. By means of the relay F the current direction over the speaking leads of the calling set Tn1 is thus reversed.

The relay An1 is, therefore, energised by sending out of the exchange characterising digit. The relay An1 closes the contact 74an1 so that the following circuit is made: positive, contact 74an1, resistance W3, contacts 75v1, 76h3, 77b, winding I of relay R2, negative. The relay R3, situated over the contact 78IV parallel to relay R2, is not energised in view of the previously connected resistance W3. By means of relay R2 the contact 81r2 is opened and the contacts 80r2 and 79r2 are closed. By means of relay R2 the vertical magnet H1 of the exchange selector AW is energised, and actually over: positive, contacts 80r2, 82v2, 83vs, 79r2, 88u1, shaft contact 89w2, shaft contact 90w1, contact 91r3, vertical magnet H1, negative. The vertical magnet H1 causes the lifting of the selector AW on to the first contact row. By means of the vertical magnet H1, the contact 92h1 is closed so that the relay V2 is energised: positive, contact 92h1, windings II and I of relay V2, contact 89s, resistance W4, negative. Relay V2 opens the contact 82v2 and interrupts thereby the circuit for the vertical magnet H1. The vertical magnet H1 sets back the contact 92h1 into its rest position again so that the circuit for the relay V2 is interrupted. The relay V2 closes the contact 82v2 so that the circuit for the vertical magnet H1 is made again. The interplay between the vertical magnet H1 and the relay V2 acting as mutual interrupters continues until over the contact level 93hs of the exchange selector AW the contact characterised by contact 94hs4 of the relay HS4 is energised and the relay U1 is operated. The circuit for the relay U1 extends over: positive contact 94hs4, contact 95, bank contact 93hs, contact 96r2, windings I and II of relay U1, negative. The relay U1 short-

circuits at contact 97u1 the winding I of relay U1 so that the relay U1 has a delayed release. Relay U1 interrupts at the contact 88u1 the circuit of the vertical magnet H1. Over the contact 98u1, the following circuit over rotary magnet D1 is made: positive, contacts 80r2, 82v2, 83vs, 79r2, 98u1, 85c3, 86c4, rest contact 87k1 of the wiper set over a1/b1/c1 of the exchange selector AW, rotary magnet D1 of the exchange selector AW, negative. The rotary magnet D1 only connected to the wipers a1, b1 and c1 from contact to contact. By means of the rotary magnet D1 the contact 88d1 is closed so that the relay V2 is energised over: positive, contact 88d1, winding II and I of relay V2, contact 89s, resistance W4, negative. The relay V2 energises and opens at the contact 82v2 the circuit of the rotary magnet D1. The rotary magnet D1 sets back the contact 88d1 to its rest position. The relay V2 restores and there is closed again over contact 82v2 the circuit for the rotary magnet D1. The interplay between rotary magnet D1 and relay V2 continues until the following test circuit is made, positive, contact 40x1, winding II of relay A1, contact 68, wiper b of line selector LW, contact 69f, 65p1, connecting points 2/1, contacts 37t1, 27c, winding I of relay X, line 99, wiper a1 of the exchange selector AW, contacts 100c3, 101r2, rectifier GR, winding I of relay C4 wiper b1 of the exchange selector AW, line 102, winding II of relay X, wiper b of the call finder AS, contacts 28c, 38t1, connecting points 3/4, contact 66p1, 70f, wiper a of the line selector LW, line 71, relay An1, negative. The relay C4 of the exchange selector energises in the previous circuit as a result of the current reversal after the carrying out of the digit selection for outgoing exchange connections. The exchange selector AW is not stopped on an existing connection since at the existing connection an oppositely directed current flows over the speaking lead by which the relay C4 cannot be energised through the rectifier GR. No potential is situated on the moving wiper of the exchange selector AW so that a disturbing noise due to running over an engaged set is avoided.

The relay C4 of the exchange selector AW energises and opens the contact 86c4 and closes contact 103c4. In this way the exchange selector AW is stopped and the winding II of relay C4 is short-circuited so that the relay C4 is made into a delay relay. Over positive, contact 104c4, 103c3, wiper a1 of the exchange selector AW, line 99, winding I of relay X wiper a of the call finder AS, contacts 27c, 37t1, connecting points 1/2 contacts 65p1, 69t, wiper b of the line selector LW, contact 68, line 67, the winding II of the relay A1 is short-circuited. The relay A1 restores so that relay C2 is short-circuited over contact 9a1. The relay C2 sets back its contact into its rest position. Following circuit for the rotary magnet D of the line selector LW is made: positive, contacts 41p, 50v, principal contact 51k, contacts 105c2, 106u2, rotary magnet D, negative. The rotary magnet D closes the contact 107, so that relay U2 is energised over: positive, 41p, 108v, rest contact 109k, contact 107d, winding II of relay U2. Relay U2 opens the contact 106u2 so that the circuit of the rotary magnet D is interrupted. Relay D opens the contact 107d, so relay U2 is released. Over contact 106u2 the circuit of the rotary magnet D is closed again. The interplay between the rotary magnet D and relay U2 continues until the rest contacts 51k and 109k are opened in the rest position of the line selector

LW. By short-circuiting of the relay C2 over contact 9a1 the relay C2 releases, opens the holding circuit for the relay C over contact 110c2. In this way it releases the relay C. The rotary magnet D of the call finder AS receives current over: positive, contacts 13c, 14t1, 113r1, raised contact 22k, rotary magnet D, negative. By means of the rotary magnet D the contact 23d is closed and thereupon relay T1 energises. Relay T1 opens at contact 14t1 the circuit of the rotary magnet D. The rotary magnet D causes the release of the relay T1 by opening the contact 23d. The interplay between relay T and rotary magnet D continues until the principal contact 22k is opened in the rest position of the call finder AS.

By the release of the line selector LW the circuit over wiper c of the line selector LW is also interrupted so that the relays P1, F and HS4 travel back to their rest position. By the release of the line selector LW the circuit for the relay C4 and An1 is also interrupted. The switch means included in the local aggregate are thus set back again to their rest positions. By the release of the relay An1 the circuit of the relay R2 is interrupted at the contact 74an1. The contact 96n2 the circuit for the relay U1 is opened. The relays R2 and U1 set back the contacts to the rest position. If the locking of the calling set by the opening of the contact 29c is removed the relay C3 of the selector AW energizes before the release of the relay C4 over positive, contact 114c4, winding II of relay C3, contact 115um, 266tr, wiper c1 of the exchange selector AW, line 116, winding II of the relay R, contact 25r, relay T, negative. Relay C3 holds the previous circuit independently of contact 114c4 over contact 117c3, the relay C3 opens the contact 110c3 and closes the contacts 118c3 and 119c3 so that the lines of the exchange selector AW are switched through. The following feeding circuit for the calling station Tn1 now exists over: negative, winding I of relay S, winding I of relay X2, contacts 120e, 118c3, wiper a1 of the exchange selector AW, line 99, loop of the set Tn1, line 102, wiper b1 of the selector AW, contact 119c3, 121e, winding II of relay X2, winding II of the relay S, positive. The relay S is energized. The relay X2 is considered as differential relay. By means of relay S the switching through of the exchange line over contact 122s results. The relay S opens 89s and closes 123s. The relay V1 is energized over: positive, contact 123s relay V1, resistance W4, negative. By the energizing of the relay V1 the contact 75v1 is opened and the contact 124v1 is closed. A further calling impulse for making an outgoing exchange connection is transferred thereby onto the impulse relays R2 and R3 of another exchange line. By means of relay V1 the contact 125v1 is opened and the contact 126v1 is closed. Relay B is energized over: positive, contacts 127vs, 128x2, 126v1, relay B, negative. The relay B holds independently of the contacts 127vs, 128x2, and 126v1, over contact 129b.

The calling subscriber can now operate his dial for the purpose of setting the selectors which are reached over the exchange line AL and in this way causes the feeding bridge relay S to release impulsively. The impulses are transferred through contact 122s on to the exchange line AL. By relay V1 over contact 130v1 the circuit for the relay V2 is prepared. When therefore the impulses are sent out, by the first release of the relay S the short-circuit for the relay V2 is removed over contact 123s and the relay

V2 is energized. The relay V2 remains energized during the impulse series and short-circuits the windings III and IV of the transformer Ue over contact 131c2.

If a larger system is concerned a group selector GW is inserted between the call finder and the line selector LW in Fig. 1 according to Fig. 3. The connections result in that the connecting point 1 in Fig. 1 is connected to the connecting point 1 in Fig. 3, the connecting point 2 in Fig. 1 to connecting point 2 in Fig. 3, the connecting point 3 in Fig. 1 to connecting point 3 in Fig. 3, the connecting point 4 in Fig. 1 to connecting point 4 in Fig. 3, the connecting point 5 in Fig. 1 to connecting point 5 in Fig. 3, the connecting point 6 in Fig. 1 to connecting point 6 in Fig. 3, the connecting point 7 in Fig. 1 to connecting point 7 in Fig. 3, the connecting point 11 in Fig. 1 to connecting point 11 in Fig. 3. The connection between 10 and 11 in Fig. 1 is interrupted. The relay A<sub>n1</sub> which is connected to the line selector LW is connected to the group selector GW in Fig. 3.

When in a system with group selectors the calling subscriber wishes to make a connection with an exchange line then after lifting the receiver and switching the call finder AS of the group selector GW on a desired contact row the group selector GW can be reached from a definite group of subscribers and the dividing of the subscribers results in the first place in a group of subscribers which are connected at the wiper a1/b1/c1 of the exchange selector AW (Fig. 2) and are reached over the contact series 1, 3, 5, etc., of the group selector, while the other groups of subscribers are connected to the wipers a2/b2/c2 of the exchange selector AW and are reached over the directed contact row 2, 4, 6, etc., of the group selector. When the subscriber who is connected over the wipers a1/b1/c1 of the exchange selector AW wishes to make an exchange connection then after the setting of the calling and operating of the relay C in Fig. 1, the following circuit is made: positive, winding II of relay T1, connecting point 7, winding II of relay C, contact 30c, connecting point 5, in Figs. 1 and 2, contact 136a2, off normal contact 137k of the group selector GW, winding III of relay A2, negative. In the previously mentioned circuit the relay C in Fig. 1 holds, furthermore the relays C1 and A1 in Fig. 3 are energized. The relay T1 does not operate. The calling subscriber receives current over: rest contact 138p2, 139p2, and windings I and II of relay A2. The relay A2 opens the short-circuit for relay C2 at the contact 136a2. The exchange characterizing is done by means of the relay A2 and transferred to the vertical magnet of the group selector GW which is not shown. After the first stepping the off-normal contact 137k is opened, relay C in Fig. 1 and relay C1 in Fig. 3 are energized over contact 140c1. After the lifting of the group selector GW onto a definite contact row the group selector GW rotates in known manner. When the contact is reached on which the relay A<sub>n1</sub> is connected relays P2 and B1 in Fig. 3 are energized over: positive, contacts 141c1, windings II and I of relay P2, wiper c of the group selector GW, line 133, contacts 144b1, 135an1, winding I of relay B1, negative. Relay P2 operates. Over the wiper c of the group selector GW in Fig. 3 the following circuit is now made: positive, winding II of relay T1, connecting point 7 in Figs. 1 and 3, contact 132p2, winding I of relay P2, wiper c

of group selector GW, line 133, relay A<sub>n1</sub>, contact 143b1, 144an1, resistance W5, negative. Relay A<sub>n1</sub> actually has the contact 135an1 opened and thus disconnects the winding I of the relay B1, the relay B1 holds over: positive, winding II of relay B1, contact 145ab1, wiper a of the group selector GW, contact 146p2, connecting point 1 in Figs. 3 and 1, contact 37t1, 27c, wiper a of the call finder AS, winding I of relay X, loop of the set Tn1, winding I of relay X, wiper b of call finder AS, contact 28c, 30t1, connecting point 3 in Figs. 1 and 3, contact 147p2, wiper b of group selector GW, contact 148ab1, resistance W6, negative. The current passes over the previously mentioned circuit over the speaking leads in a reverse direction to the feeding current of the existing connection. By means of this current reversal over the speaking leads the calling subscriber who has selected the exchange characterizing digit is repeatedly characterized. The contact 149an1, is closed by means of the relay A<sub>n1</sub>. Over the bank contact 150hs of the group selector GW, positive potential is applied to the connecting point 11 in Figs. 3 and 1 so that over the direction contact 61rk of the call finder AS the contact level relay HS4 is energized by means of which it is characterized that the calling subscriber is connected in the fourth contact row of the call finder AS and of the selector AW wipers a1/b1/c1.

By means of relay A<sub>n1</sub> in Fig. 3 the contact 74an1 in Fig. 2 is closed, thus relay R2 energizes. Relay R2 brings about in the previously described manner first of all the operation of the vertical magnet H1 of the exchange selector (wiper set a1 to c1). Next the rotary magnet D1 is operated for setting on the contact of the contact row which has been reached. When the exchange selector AW reaches the contact of the calling set relay C4 is energized by the current reversal over the speaking leads. There follows in the same way as has already been described the stopping of the selector AW, switching through etc. By transitory earthing of the line 99 after the operation by the relay C4 of the contact 104c4, relay B1 in Fig. 3 is short-circuited, the relay B1 releases and opens the circuit for the relay P2 at contact 143b1. The relay P2 restores and opens the contact 151p2 the holding circuit for the relay C in Fig. 1. Relay C restores and effects the release of the call finder AS and over the wiper c1 of the exchange selector AW the locking circuit becomes effective.

By the release of relay P2 in Fig. 3 the group selector is set back into its rest position in known manner.

The stopping of the exchange selector AW on a calling subscriber who wishes to make an exchange connection results therefore, as follows from the above, by the current reversal over the speaking leads. However, by the reversal of the exchange selector AW after the making of a homing enquiry connection from the calling subscriber to the called subscriber the characterization of the called subscriber also results by the current reversal over the speaking leads.

If a connection exists between the set Tn1 and the exchange line AL, the differential relay X2 is energized by the transitory operation of the key Tai. Through contact 155x2, relay Q is energized over: positive, contact 127vs, 155x2, 216b winding I of relay Q, thermal relay Th1, negative. Relay Q opens the short-circuit over the winding II of relay Q by means of its

contact 156g. Over positive contact 129b, 154v1, 153x2, 157z1, 158g, winding I of relay Y1, contact 159as, negative, relay Y1 is energized. Relay Y1 closes the contact 160y1. When the subscriber releases the key the differential relay X2 restores. Relay Q now holds over the winding II. The following circuit is made for the relays Z1 and Y1: positive, contact 129b, 154v1, 160y1, winding I of relay Z1, contacts 157z1, 150g, and 152x2, winding I of relay Y1, contact 159as, negative. Relay Z1 operates, opens the contact 157z1 and closes the contact 161z1. There exists now the following circuit for the relay Z1: positive, contact 129b, 154b1, 160y1, winding I of relay Z1, contact 161z1, winding II of relay Z1, contact 159as, negative. The contact 162z1 and 163z1 are opened by means of relay Z1 and contacts 164z1 and 165z1 are closed. There follows the switching of the exchange line AL onto the enquiry line 166/167. Over contact 168z1 and resistance W7 the exchange connection is held. By switching on to enquiry line 166/167 the loop is made. In this way the call relay, not shown, of the enquiry line 166/167 is energized and thus brings about the setting of the call finder AS of the enquiry line 166/167. After the setting of the call finder the impulse series for setting the selector upon the enquiry path is sent out from the calling subscriber. The impulses are taken up by relay S and transferred over the contact 122s as to the enquiry line 166/167.

If group and two exchange selectors connected in parallel are used in this system the first impulse series by means of which the setting of the group selector results also transfers to the discriminating device consisting of relays I, II, III and IV (Fig. 2). By means of this discriminating device it is characterized whether the connecting set calling in an enquiry is in an even or odd contact row of the group selector and thus is connected at the contacts of the wipers a2/b2/c2 of the A1/b1/c1/ of the exchange selector AW.

The setting of the group selector results in the manner already described.

The series of discriminating relays consisting of relays I to IV is also controlled by the first impulse series for setting the group selector GW of the enquiry path. The first release of the relay S by the impulse series brings up the relay I over: positive, contacts 192z1, 193s, 184IV, 195II, relay I, negative. Furthermore, the relay III is energized over: positive, contacts 192z1, 196s, 197IV, relay II, negative. The relay III operates independently of the contacts 196s and 197IV over contact 198III. By means of relay I the contact 199I is closed so that the relay II is energized over: positive, contacts 192z1, 199I, relay II contact 195II, relay I, negative. The relay II opens contact 195II and closes contact 200II. At this point of time contact 193s is opened again and contact 201s closed. The relays I and II hold over: positive, contact 192z1, 199I, relay II, contact 194IV, 201s, relay I, negative. For the relay II there exists the following circuit: positive, contacts 192z1, relay II, contact 200II, relay II, negative. When the second release of relay S occurs the contact 201s is opened and the contact 193s closed. The circuit for relay I is thus interrupted, relay I restores and opens the contact 199I, so that the relay II also sets back its contacts into the rest position. Only relay III of the series is now energized. At the end of the second interruption the contact 193s is opened and contact 201s

closed, but however, an energizing of relays I or II does not come about since contact 199I is opened. When the third interruption of the relays S comes about by means of the third impulse then by the release of the relay S over contact 193s relay I is energized again and by closing its contact 199I operates the relay II. As follows from the above the relays I, II, III are energized by odd impulses while only relay III is energized by even impulses. If at the end of the first impulse series the relay V2 restores, the relay IV is energized over, positive, contacts 130v1, 202r2, 203um, 204v2, 205III, relay IV, negative. The relay IV holds over: positive, contacts 192z1, 206IV, relay IV, negative. Relay IV opens the contact 194IV and closes contact 207IV so that a further influencing of relays I and II by means of the following impulse is prevented.

If a subscriber is concerned who is connected to an odd contact row of the group selector GW, the relays I and II are energized and characterized so that the subscriber called in enquiry is connected on the wipers a1 to c1 of the exchange selector AW. By operation of the relays I and II contact 208I is opened and contact 209I is closed. Further the contact 210IV is also closed.

Over the closed contact 209I the energizing of the relay R2 is prepared and thus also the setting of the exchange selector AW and the set of wipers a1/b1/c1. If, however, a called subscriber is concerned who is connected in an even contact row, the relays I and II are rested so that over contact 208I the energization of the relay R3 and thus the setting of the selector with its wipers a2/b2/c2 is prepared.

By the setting of the line selector LW on the speaking set over the wiper of the line selector LW only the relay P is energized. The relay P operated by the free set locks the switch by closing the contact 168p. Over the 5-second switch 5sec, contacts 169u, 170z, 171p, relay M, negative, the relay M is energized at 5 second intervals and sets calling current on the speaking lead by opening contact 172m and closing contact 173m. The calling circuit extends from the calling current source R, contact 173m, winding I of relay Y, winding I of relay X, contacts 174p, 63p1, 175f, wiper a of the line selector LW, bell of the set Tn2, wiper b of the line switch LW, contacts 176f, 64p1, 177p, winding II of relay X, contact 173m, positive. If the subscriber on the set Tn2, replies the relay Y is energized in the calling paths. The relay Y closes the circuit for the relay Z over: positive, winding I of relay Z, contacts 179y, 180a1, negative. Relay Z opens at contact 170z the circuit for the relay M. The set Tn2 receives the feeding current circuit over contact 172n1. By means of the relay Z there follows the switching through in the line selector LW 181z and 182z. The switching through of the selector LW is maintained independently of contact 49y over contact 183z.

Should the subscriber of the set Tn2 calling in enquiry wish to take up a conversation with the exchange then the subscriber of the set Tn2 has to press the key Ta2. In this way the differential relay X is energized in the feed circuit, the relay X closes the circuit for the relay X1 over: positive, contact 184x, relay X1, contact 185z, 186p, resistance W7, negative. By means of relay X a holding circuit for the relay Y and energizing circuit for the relay V is made. It



extends over positive, winding III of relay Y, winding II of relay V, contact 167x, 168p, resistance W7, negative. Relay X1 holds independently of contact 184x over contact 138x1. By opening of contact 40x the winding II of relay F is connected. The relay F does not energize. Later, however, should the subscriber's set Tn2 release the key Ta2 the differential relay X restores. At the contact 187x, the circuit for the relay V is interrupted. This delay relay V holds the contact in its working position for an additional short time. During this time the upper speaking lead is interrupted at the contacts 48v, 35x1 and 191x and the relay Q of the exchange line thus releases.

The relay UM is energized by means of relay Q: positive, contacts 211av, 212q, 213y1, winding I of relay UM, negative. The relay UM operates and closes the contacts 267um. The following circuit is made: negative, resistance W8, contact 267um, line 167, wiper b of the call finder AS, contact 28c, 38f1, connecting point 3 in Figs. 1 and 3, contact 147p2, wiper b of the group selector GW, connecting point 4 in Figs. 3 and 1, contact 39p1, winding II of relay A1, winding II of relay F, positive. In this circuit the relay F energizes. There exists now the following feeding circuit for the set Tn2: negative, contact 172m, winding I of relay Y, winding I of relay X, contact 174p, 63p1, 69f, wiper b of line selector LW loop of the set Tn2, wiper a of the line selector LW, contact 70f, 64p1, 177p, winding II of relay X, contact 189f, positive. Over: positive, contact 265p1, 268f bank contact aek of the line selectors LW, relay HS4, negative, the relay HS4 is energized and characterizes the called set which is connected in the fourth contact row of the line selector LW and also in the fourth contact row of the exchange selector AW.

By the energizing of the relay UM, since contact 214q is open, the circuit for the relay C3 is interrupted at contact 115um. Relay C opens, at contact 118c3 and 119c3, the circuit for the relay S. Relay S restores. The relay UM now holds over: positive, contact 192z1, 196s, 215IV, 216um, winding II of relay Um, common relay AB, negative. Common relay AB is energized and opens contact 211ab the energizing circuit of the windings I of all relays UM.

In this way at no other exchange line can the relay UM be energized and thus no other relay F on another line selector can come to operate by a reversing impulse and undertake the characterizing for the set by current reversals.

The relay AB closes the contact 217ab so that the winding I of the relay F is short-circuited, in this way a current reversal is prevented from occurring in a line selector after the characterizing digit selection so that the controlled exchange selector AW can in no case be set on another subscriber than the one the characterizing digit has selected for the outgoing exchange connections.

If group selectors are used in the system the contact 218ab is opened by the relay AB in Fig. 3 and the contact 219ab is closed. When now another subscriber stops the group selector by the exchange characterizing digits, the relay An1 is operated. Over contact 219ab and 220an1, however, the relay AB1 is energized and in this way the contacts 145ab1 and 148ab1 are opened and contacts 221ab1 and 222ab1 closed. Thus the current reversal is avoided so that the reversing exchange selector AW in Fig. 2 can in no case switch this on a calling subscriber who has se-

lected the characterizing digit for outgoing exchange selections. In the group selector according to Fig. 3, however, the relay B1 is maintained energized in spite of the current reversal. When, therefore, after the reversal of the exchange selector in Fig. 2 the common relay AB1 restores, contact 119ab1 in Fig. 3 is also opened and thus relay AB1 is released. Relay AB1 has put back the contacts in their rest position and there is then made possible a testing of an exchange selector on the subscriber who has selected the characterizing digit for outgoing connections.

By the release of the relay S after the coming into effect of reversing impulses relay VI is short-circuited over contact 139s, relay V1 sets back the contacts in their rest position. By the opening of the contact 154v1 the relays Y1 and Z1 are brought to release.

After the release of the relay C3 the rotary magnet D1 of the exchange selector AW receives current over: positive, off-normal contact 223k1, contacts 82v2, 23vs, 81r2, 84e, 85c3, 84c4, principal contact 87k1, rotary magnet D1, negative. The rotary magnet D1 operates, steps the arms A1/b1/c1 of the exchange selector one step forward and closes contact 88d1. In this way relay V2 is energized. Relay V2 opens the contact 88v2 so that the circuit of the rotary magnet D1 is interrupted. The interplay between rotary magnet D1 and relay V2 which interrupt each other follows until the exchange selector AW has reached its rest position in which the principal contacts 223k1 and 87k1 are opened. If the selector is with its wiper a1/b1/c1 in their rest position then the shaft contacts are also set back to their rest position.

In the following it should be assumed that the subscriber calling in enquiry is a subscriber who is reached over an odd contact row of the group selector GW. In this case the circuit for relay R2 is prepared over contact 209I. When, however, the exchange selector AW has reached the rest position the following circuit for the relay R2 is made: positive, contacts 192z1, 196s, 215IV, 216um, 210IV, winding II of relay R2, shaft contacts 69v2, 90w1, contact 91r3, vertical magnet H1, negative. In the above circuit the relay R2 is energized. The following circuit for the vertical magnet H1 is now made: positive, contact 80r2, 82v2, 63vs, 79r2, 88u1, contact 99w, 90w1, contact 91r3, vertical magnet H1, negative. The vertical magnet H1 works together with relay V2 (over contact 92h1) as an interrupter until the following circuit is made by contact characterizing the relay HS4 associated with the bank contact of the relay U1: positive, contact 94hs4, bank contact 93hs, contact 96r2, windings I and II of relay U1, negative. Relay U1 closes contact 97u1 so that the relay U1 has a delayed release. At contact 88u1 the circuit of the rotary magnet H1 is interrupted. By means of relay U1 the contact 98u1 is closed so that the rotary magnet D1 now works together with the relay V2 as mutual interrupters until the following circuit for the relay C4 of the exchange selector AW is made: positive, contact 139f, winding II of relay X, contact 177p, 64p1, 70f, wiper a of line selector which is set on the called set Tn2, line 224, wiper a1 of the exchange selector AW, contact 100c3, 101r2, rectifier GR, winding I of relay C4, wiper b1 of the exchange selector AW, line 225, wiper b of line selector LW, contact 63f, 63p1, 174p, winding I of relay X, winding I of relay Y, contact 172m, negative. In the preceding circuit the relay C4 operates, so that by the opening of the contact

86c4 the rotary magnet D1 is stopped. The relay C4 effects repeatedly the transitory earthing of the lead 224 so that the relay Y in the line selector is short-circuited and released. Relay Y interrupts the circuit over winding I of the relay Z by opening the contact 179y. Relay Z still holds over winding II. There however follows the short-circuit of the relay C2 over contacts 226z and 227y. Relay C2 restores and brings about in the described manner the release of the line selector LW of the group selector GW and of the call finder AS which has set itself on the enquiring line. After the release of the relay P in the line selector LW the locking circuit over wiper C1 of the exchange selector LW is made, in which the relay C3 is energized. The relay C3 causes the switching through of the exchange lead at the contacts 118c3 and 119c3. The relay S is energized again and over contact 123s the relay V1. At the contact 196s the circuit of the relay UM and the circuit of the common relay AB is brought to release. Thus the selector called in enquiry is connected by the reversal of the exchange selector AW with the exchange lead AL.

The series of leads I, II, III and IV is also used to characterize the exchange selector over which the subscriber desired by the exchange is obtained by incoming exchange connections. By incoming exchange calls the relay AR is energized over the rest contact 228v1. Over positive, resistance W9, contact 229ar winding I of relay H3, negative, the relay H3 is energized. Relay H3 holds over: positive, contacts 127vs, 128x2, 125v1, 284h3, winding II of relay H3, negative. At the same time the calling lamp AL1 is lit up over: positive, contacts 230h3, 231b, lamp AL1, negative.

The operator takes up the receiver and operates the exchange key connected with the calling exchange line. The relay AS is energized. The relay AS holds over contact 233as. By the opening of contacts 243as and 235as and the closing of contacts 236as and 237as the apparatus BA is connected over contacts 238v3 and 239vs to the calling exchange line. The operator can discover the desired local subscriber from the calling subscriber. The operator operates the connecting key 240VT. The relay VS is energized over contact 241as. Relay VS holds independently of the key VT over contact 242vs. Relay VS opens contact 238vs and 239vs and closes the contacts 243vs and 244vs. Over the contact 245as and 246as the apparatus BA is connected to the connection side of the exchange line and energizes the relay S. The relay S brings about the energizing of the relay V1 by closing contact 123s. By opening contact 125v1 and closing contact 126v1 the holding circuit of the relay H3 is interrupted and the relay B is energized. Relay B holds over contact 129b. The operator now sends the first impulse series for the desired subscriber. The first impulse series is taken up by the relay S and transferred to the series of relays I, II, III, IV and the relay I is energized by the first interruption over positive, contacts 247vs, 193s, 194IV, 195II, relay I, negative. Relay I closes the contact 199I so that the relay II is also operated. After the release of relays S the holding circuit for relay I is made over: contact 201s so that relay II is maintained energized over contact 199I. If by the second interruption the relay S is brought to release the holding circuit for the relay I and thus for the relay II is removed. The relays I and II remain in their rest position for the even impulse series. At the end of the first impulse series the relays I, II and III are energized by odd impulses while by

even impulse series the relays I and II are in their rest positions.

The next impulse series is now transferred by an odd first impulse series over: positive, contacts 247vs, 196s, 215IV, 247um, 88u1, shaft contact 89w2, 10w1, contact 91r3, vertical magnet H1, negative, to the vertical magnet H1. The wipers a1/b1/c1 of the exchange selector AW are lifted to a definite contact row. If at the end of the second impulse series the relay V2 restores, the relay U1 is energized over: positive, off-normal contact 223k1, contacts 82v1, 248vs, shaft contact 250w2, 251w1, winding II of relay U1, negative. The contact 88u1 is opened and the contact 98u1 is closed. The next impulse series is transferred to the rotary magnet D1. After the first ten steps the circuit for the winding III of the relay U1 is indeed opened at shaft contact 251w1, the relay U1 is maintained energized, however, over: positive, principal contacts 223k1, 252v2, 253u1, winding III of relay U1, negative, during the last impulse series. At the end of the last impulse series the relay V2 first releases and relay E is energized over: positive, principal contact 223k1, contact 82v2, 248vs, 286w1, 259u1, winding I of relay E, negative. Parallel to relay E the relay H3 is energized. The relays E and H3 hold independently of the contact 259u1 over contact 258e. A short while after the release of the relay V2 the relay V1 also releases. Over positive, contact 254vs, 255h3, winding I and II of relay C3, contact 115um, 266tr, wiper c1 of the exchange selector AW, line 116, winding II of relay R, contact 26t, relay R, negative, a test circuit is made in which the relays C3, R and T operate by a free subscriber's set. Relay C3 closes the contacts 118c3, 119c3, relay T interrupts the calling circuit of the speaking set at contacts 1t and 2t. Relays R and T and C3 are maintained energized independently of contact 26t over contact 25r.

By means of relay C3 of the exchange selector AW the call circuit is closed over the calling current source, winding II of the relay E, contact 255e, 118c3, wiper a1 of the exchange selector AW, line 99, bell of the set Tn1, line 102, wiper b1, of the exchange selector AW, contact 119c3, 247e, positive. When the subscriber replies the reverse winding II of relay E becomes effective in the calling circuit. Relay E restores. At the contact 258e the hold circuit for the winding I of the relay E is interrupted, since the relay U1 is already released after the release of the relay V2 and the holding circuit is opened at the contact 259u1. The operator hangs up the receiver, thereby interrupts the holding circuit for the relays AS and VS, the exchange line being switched through at the contacts 234as/235as. By the release of the relay E the feeding circuit for the calling set now extends over the relay S so that relay S remains energized.

The circuit for the relay R3 is closed by even impulse series over: positive, contacts 282vs, 281I, 280IV, winding I of relay R3, negative, when at the end of the first the relay V2 has released and relay IV has been energized. By means of relay R3 the contact 91r3 is opened and the contact 290r3 is closed. The next impulse series is transferred to the vertical magnet H2 and thus lifts the wipers a2/b2/c2 of the exchange selector AW to a definite contact row. Off-normal contacts 285k2 is closed so that the next impulse series effects the rotary magnet D2.

The end of the connection and the hanging up of the receiver of the calling set Tn1 the relay S releases, the relay S short-circuits the relay V1.

over contact 89s so that this relay also sets back its contacts to their rest position. Over positive, contact 128vs, 128x2, 125v1, 260c, 261b, winding I of relay Q, relay Rhl, negative, the relay Th1 is energized after a short interval. The relay Th1 by its operation closes its contact 262th1 so that the relay B is short-circuited and brought to release. By the release of relay S, the relay V2 is transitorily energized over contact 89s before the release of the relay V1 and thus makes the circuit for the relay TR over: positive, contact 263b, 264v1, 265v2, relay TR, negative. The relay TR opens the contact 266tr so that the relay C2 restores. Relay C3 closes the contact 85c3 and the rotary magnet D1 and the relay V2 act as mutual interrupters until the selector AW has reached its rest position in which the off-normal contact 223%1 is open.

The selectors which have been used are thus set back in their rest positions.

What is claimed is:

1. In a switching system, a relay, a plurality of lines each having two conductors, means for connecting a potential across the conductors of any one of said lines, a switch operative responsive to the connection of said potential across said one line to connect said relay across the conductors of said lines successively, said potential effective to operate said relay responsive to the connection of the relay across the conductors of said one line, and means including said relay for terminating the operation of said switch responsive to said operation of the relay.

2. In a switching system, a plurality of lines each having two conductors, means for connecting different potentials across the conductors of different ones of said lines, a switch, a testing device in said switch, means for operating said switch to connect said device across the conductors of said lines successively, said device responsive to only a predetermined one of said different potentials, and means controlled by said device for halting operation of said switch responsive to the operation of the device.

3. In a switching system, a plurality of lines each having two conductors, means for connecting a potential of predetermined polarity across the conductors of different ones of said lines at different times, a plurality of switches, means for operating a switch to hunt for and extend a connection to each of said lines when said potential is connected thereacross, a polarized relay in each switch connected across the conductors of said lines successively during the hunting of that switch for a line having said potential connected thereacross, said relay operated responsive to the connection of same across the conductors of the line having the potential connected thereacross and effective to halt the operation of said switch, and means including said relay for then disconnecting said potential from the line and connecting thereto a potential of the opposite polarity, thereby to prevent subsequently operated ones of said switches from being halted on that line.

4. In a switching system, a plurality of lines each having two conductors, a potential of predetermined polarity connected across each of said lines, means operated to disconnect said potential from any one of said lines and to connect thereacross potential of the opposite polarity, a switch then operative to hunt for said one line, a polarized device connected across the conductors of each of said lines in turn during the hunting of said switch, said device responsive only to said

potential of the opposite polarity and effective to cause said switch to seize said one line.

5. A switching system as claimed in claim 4, wherein said device comprises a bridge containing a relay and a rectifier connected in series.

6. In a switching system, a relay, a plurality of lines each having two conductors, a potential of predetermined polarity normally connected across each of said lines, means operated to disconnect said potential from any one of said lines and to connect thereacross a potential of the opposite polarity, a switch operative responsive to said operation of said last means to connect said relay across the conductors of said lines successively, said potential of the opposite polarity effective to operate said relay responsive to the connection thereof across the conductors of said one line, and means including said relay for halting the operation of said switch responsive to said operation of the relay.

7. In a switching system, a relay, a plurality of lines each having two conductors, a potential of predetermined polarity normally connected across each of said lines, means operated to disconnect said potential from any one of said lines and to connect thereacross a potential of the opposite polarity, a switch operative responsive to said operation of said last means to connect said relay across the conductors of said lines successively, said potential of the opposite polarity effective to operate said relay responsive to the connection thereof across the conductors of said one line, and means including said relay for restoring the potential across said one line to normal responsive to said operation of the relay.

8. In a telephone system, a primary speech path, a plurality of secondary speech paths, means for impressing a potential upon any one of said secondary speech paths, a switch terminating said primary speech path thereafter operative to search for said one secondary speech path and to connect thereto said primary speech path, a discriminating device in said switch connected to each secondary speech path in turn during said hunting of said switch, said potential effective to operate said device responsive to the connection of said device to said one speech path, and means controlled by said device for halting the operation of said switch responsive to said operation of the device.

9. In a telephone system, a plurality of speech paths, a potential of predetermined polarity impressed on each one of said speech paths engaged in a call, means operated to initiate a call over any other one of said speech paths, a potential of the opposite polarity impressed upon said last speech path responsive to said operation of said means, a switch operative to search for said last speech path to extend a connection therefrom, a discriminating device in said switch connected to said plurality of speech paths successively during said search and responsive only to said potential of the opposite polarity to cause said switch to seize said last speech path.

10. In a telephone system, a primary speech path, a plurality of secondary speech paths, a potential of predetermined polarity normally impressed upon each of said secondary paths, means operated to remove said potential from any one of said secondary paths and to impress thereupon a potential of the opposite polarity, a switch terminating said primary path thereafter operative to search for said one secondary path and to connect thereto said primary path, a relay in said switch connected to said secondary paths succes-

sively during said hunting of the switch, said potential of the opposite polarity only effective to operate said relay responsive to the connection of said relay to said one secondary path, and means including said relay for terminating the operation of said switch responsive to said operation of the relay.

11. A telephone system as claimed in claim 10, wherein the operation of said switch is initiated by said operation of said first means.

12. In a telephone system, a primary speech path, a plurality of secondary speech paths, a potential of predetermined polarity normally impressed upon each of said secondary paths, means operated to remove said potential from any one of said secondary paths and to impress thereupon a potential of the opposite polarity, a switch terminating said primary path thereafter operative to search for said one secondary path and to connect thereto said primary path, a relay in said switch connected to said secondary paths successively during said hunting of the switch, said potential of the opposite polarity only effective to operate said relay responsive to the connection of said relay to said one secondary path, and means including said relay for terminating the operation of said switch and for restoring the potential across said one line to normal responsive to said operation of the relay.

13. In a telephone exchange, subscribers' lines, switching apparatus, means for seizing said apparatus over any of said lines to extend either a local or an outgoing call, means in said apparatus for normally feeding talking current over the calling line in a particular direction, and means operated over the calling line only if said apparatus is seized to extend an outgoing call to cause said current to be fed over the calling line in the opposite direction.

14. In a telephone exchange, subscribers' lines, a special line, an automatic switch having access to said lines, means for seizing said switch over any of said subscribers' lines and for operating same either to extend a call to any other one of said subscribers' lines or to connect with said special line, a battery feed bridge in said switch supplying current in a particular direction to the calling line if the call is extended to another of said subscribers' lines, means for rendering said bridge ineffective if said special line is connected with, and a battery feed bridge in said special line effective if said special line is connected with to supply current in the opposite direction to said calling line.

15. In a telephone system, an exchange, subscribers' lines terminating in the exchange, a potential of predetermined polarity connected across each of said lines when that line is engaged in a call, a trunk outgoing from the exchange, means operated by a subscriber over any one of said lines to initiate an outgoing call, means for connecting a potential of the opposite polarity across said one line responsive to said operation of said last means, a switch terminating said trunk line operative to hunt for said one line and to connect thereto said trunk line, a discriminating device in said switch connected across each of said lines in turn during said hunting of the switch, said potential of the opposite polarity effective to operate said device responsive to the connection of

said device to said one line, and means controlled by said device for terminating the operation of said switch responsive to said operation of said device.

16. A telephone system as claimed in claim 15, wherein said first means comprises an automatic switch having access to said subscribers' lines.

17. In a telephone system, a calling line having a particular potential connected across the line conductors thereof, a local switch train including a local switch, means responsive to a call from said line for extending a connection therefrom to said switch, another switch having access to said line, means for operating said local switch over said line in response to the transmission of a particular digit, means responsive to said operation of said switch to change the potential across said calling line and cause said other switch to hunt for said line, said other switch responsive to said changed potential to seize said line.

18. In a telephone system, a line having a particular potential connected across the line conductors thereof, a local switch, a finder switch responsive to a call from said line for extending a connection therefrom to said local switch, means for operating said local switch over said line in response to the transmission of a particular digit, another switch having access to said line, means operated over a wiper of said finder switch responsive to said operation of said local switch and effective both to change the potential across said calling line and to cause said other switch to hunt for said line, said other switch responsive to said changed potential to seize said line.

19. In a telephone system, a plurality of lines, a plurality of local switch trains common to said lines and each including a local switch, another switch having access to said lines, means responsive to a call from any one of said lines for extending a connection therefrom to one of said local switches, a particular potential connected across the line conductors of the calling line, means for operating said one switch over the calling line in response to a particular digit, means individual to said one switch and operated over a wiper thereof responsive to said operation of said switch to change the potential across said calling line and cause said other switch to hunt for said line, said other switch responsive to said changed potential to seize the calling line.

20. In a telephone system, a plurality of groups of lines, a plurality of switches each having access to the lines of one of said groups, a local switch train including a local switch, means responsive to a call from one of said lines for extending a connection therefrom to said local switch, a particular potential connected across the line conductors of the calling line, means for operating said local switch over said calling line in response to the transmission of a particular digit, means responsive to said operation of said local switch to change the potential across said calling line and cause that one of said plurality of switches having access to said calling line to hunt for said calling line, said one switch responsive to said changed potential to seize said calling line.

HANS TATZL.