

May 12, 1942.

R. SCHWARTZ

2,282,893

TELEPHONE SYSTEM

Filed March 20, 1939

3 Sheets-Sheet 1

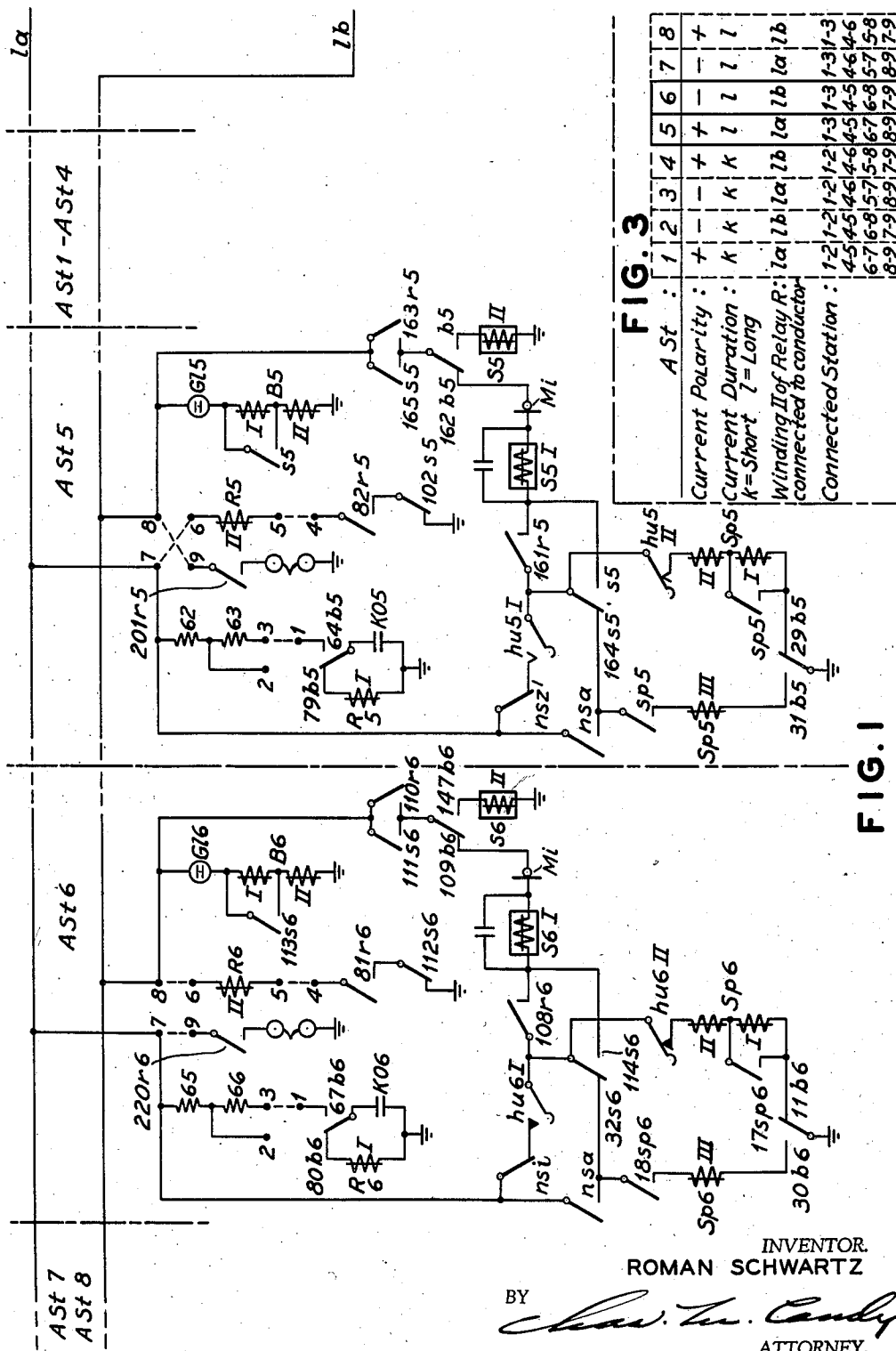


FIG. 3

$ASt :$	1	2	3	4	5	6	7	8
Current Polarity :	+	-	-	+	+	-	-	+
Current Duration :	k	k	k	k	l	l	l	l
$k = Short$ $l = Long$								
Winding II of Relay R :	1a	1b	1a	1b	1a	1b	1a	1b
connected to conductor								
Connected Station :	1-2	1-2	1-2	1-2	1-3	1-3	1-3	1-3
	4-5	4-5	4-5	4-5	4-5	4-5	4-5	4-5
	6-7	6-8	5-7	5-8	6-7	6-8	5-7	5-8
	8-9	7-9	8-9	7-9	8-9	7-9	8-9	7-9

Current Polarity :	
Current Duration :	
k=Short l=Long	
Winding II of Relay R :	
connected to conductor	
Connected Station :	

Current Polarity :	
Current Duration :	
k=Short l=Long	
Winding II of Relay R :	
connected to conductor	
Connected Station :	

Current Polarity :	
Current Duration :	
k=Short l=Long	
Winding II of Relay R :	
connected to conductor	
Connected Station :	

Current Polarity :	
Current Duration :	
k=Short l=Long	
Winding II of Relay R :	
connected to conductor	
Connected Station :	

Current Polarity :	
Current Duration :	
k=Short l=Long	
Winding II of Relay R :	
connected to conductor	
Connected Station :	

Current Polarity :	
Current Duration :	
k=Short, l=Long	
Winding II of Relay R :	
connected to conductor	
Connected Station :	

Current Polarity :	
Current Duration :	
k=Short l=Long	
Winding II of Relay R :	
connected to conductor	
Connected Station :	

Current Polarity :	
Current Duration :	
k=Short l=Long	
Winding II of Relay R :	
connected to conductor	
Connected Station :	

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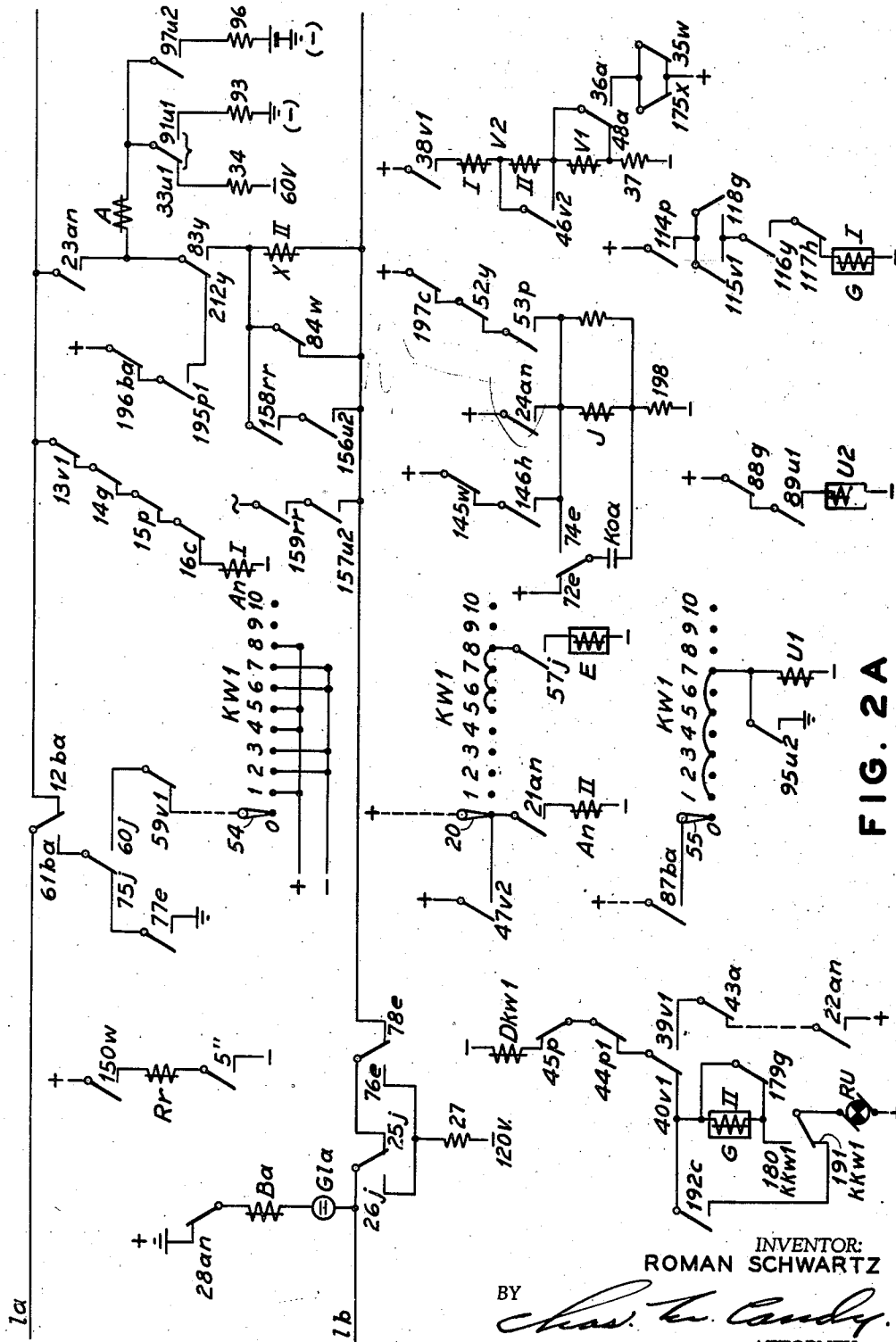


FIG. 2A

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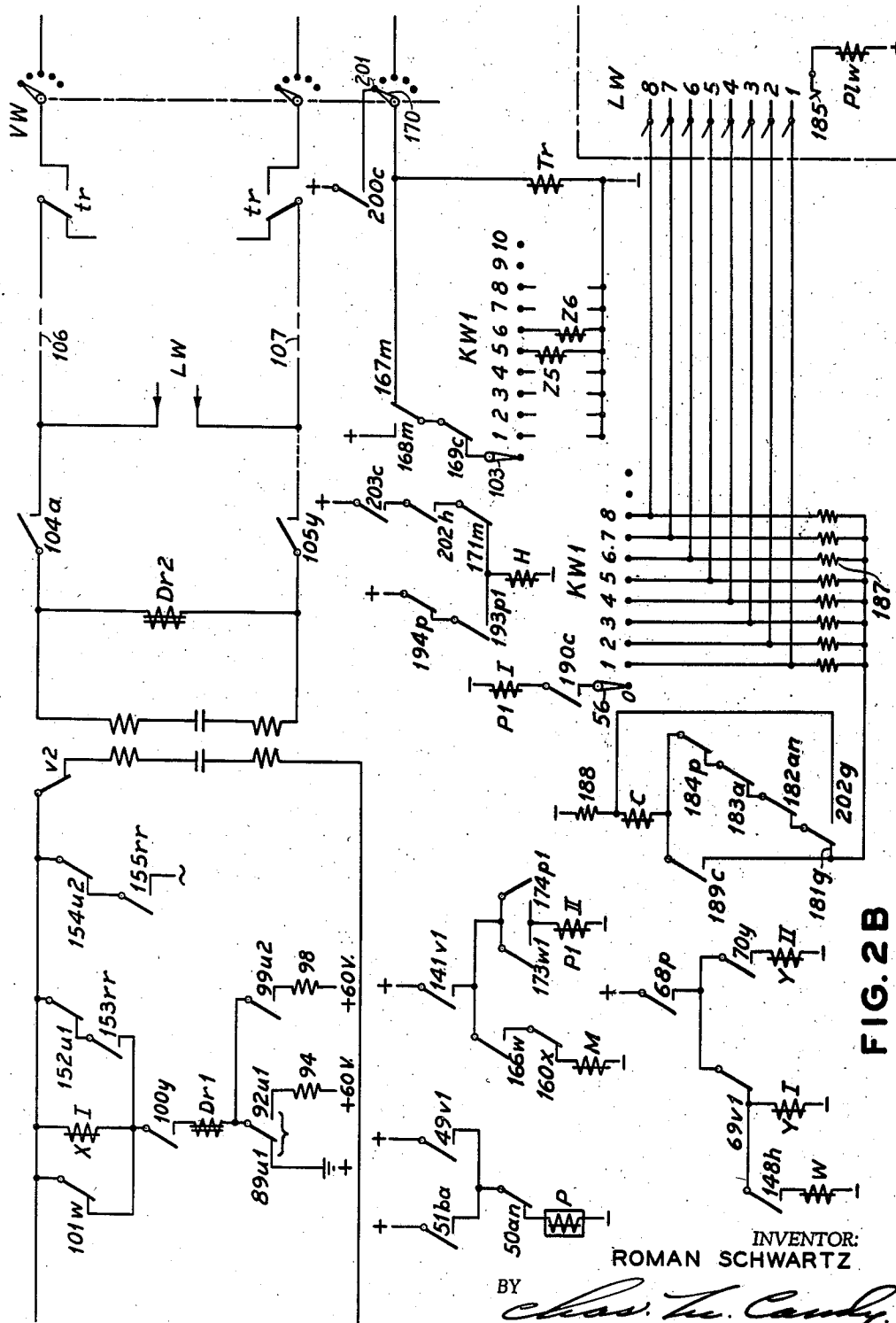
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UNITED STATES PATENT OFFICE

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TELEPHONE SYSTEM

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19 Claims. (Cl. 179-17)

In remote signalling in particular telephone installations it is known that a party on a party line does not connect himself to the party line by making a call, but that this connection is carried out in such a manner that switch means at his branch set are controlled by switching devices, which are arranged in an exchange accessible to the party line. Thus, for example, under the control of a call impulse transmitted from a branch set in the exchange, various marking signals associated with the individual branch sets are connected to the party line. After each signal has been connected a testing operation follows to see whether the branch set marked by this connection is the calling one.

The invention avoids the successive connections of the various marking signals to the party line and the testing following on each connection as to the calling condition of the marked branch set, in that by means of an impulse train sent out from and characterizing the calling branch set (pre-setting impulse train) switching devices in the exchange are controlled, which bring about the transmission of only the marking signal associated with the calling branch set and under the control of this signal and of the calling condition of the calling branch set the latter is connected to the party line by the selecting device and the connecting means of the calling branch set.

If the impulse train, which marks the calling branch set, is sent out automatically on the lifting of the receiver, the necessary period for building up an outgoing connection and hence, the seizing period of the party line are reduced considerably.

If the impulse train marking the branch set of the calling subscriber is transmitted by special operation of the dial switch, then on the average the time for connecting the branch set to the party line is not essentially shorter than in the arrangement mentioned above, but the danger of false connections is considerably reduced. These false connections occur when the calling subscriber operates his dial switch before receiving the exchange signal indicating that he may begin with the impulse transmission for setting up the connection. With the arrangement according to the invention, since the completion of the impulse train takes place directly the connection of the calling branch set takes place, the subscriber can begin immediately with the impulse selection for setting up the connection. The period which the calling subscriber had to wait is cut out.

In the drawings an embodiment of the invention is shown. All that is not essential for the understanding of the invention, i. e., circuit details, are omitted for the sake of clarity.

5 Figure 1 shows two branch sets *ASt5* and *ASt6* of a party line with eight branch sets.

Figures 2A and 2B show the devices in the exchange associated with the party line.

Figure 3 is a collection of the marking features 10 associated with the individual branch sets. In it the wiring of the junctions 1-9 at the individual branch sets can be seen.

1. The branch sets *ASt6* makes a call and is connected

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The subscriber of the branch set *ASt6* takes up his instrument. The hook switch contact *hu6I* is closed and the hook switch contact *hu6II* opens after a time. The ringing circuit is completed: earth, contact 11*b6*, windings I and II of relay *Sp6*, hook switch contacts *hu6II*, *hu6I*, impulse contact *nsi*, junction 7, conductor 1*a*, contact 12*ba*, 13*vi*, 14*g*, 15*p*, 16*c*, winding I of relay *An*, —. The relays *Sp6* and *An* operate. The relay *Sp6* short circuits its winding I at contact 17*sp6* and at contact 18*sp6* prepares a holding circuit over its winding III.

The relay *An* locks up over: +, wiper 20 of the indicating selector *KW1*, normal position of the same, contact 21*an*, winding II of relay *An*, —. At contact 22*an* the setting of the characterizing selector *KW1* is prepared. The relay *A* is applied to the conductor 1*a* over the contact 23*an*. At contact 24*an* the relay *J* is connected, which opens contact 25*j* and closes 26*j*. The negative pole of a battery of 120V is applied over resistance 27 to the conductor 1*b*. The lamps, which are in the branch sets of the conductor 1*b* light up and the B-relays connected in series with them operate. In the exchange the lamp *G1a* cannot light up and the relay *Ba* is not energized, since earth is disconnected at contact 28*an*.

The energizing circuit for the B-relay of the branch sets *ASt5* and *ASt6* shown in Figure 1 extends as follows: —120V, resistance 27, contact 26*j*, lead 1*b*, branch set *ASt5*: junction 8, lamp *G15*, windings I and II of relay *B5*, earth and branch set *ASt6*: junction 8, lamp *G16*, windings I and II of relay *B6*, earth. The contacts 50 11*b6* (in *ASt6*), 29*b5*, (in *ASt5*) are opened and the contacts 30*b6* (in *ASt6*), 31*b5*, (in *ASt5*) are closed. By the operation of the B-relays all branch sets with the exception of the calling branch set *ASt6* are guarded, since by the opening of the contact 29*b5* and of the corresponding

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contacts of the branch sets *ASt1* to 4 and 7/8 ringing circuits can no longer be set up in these branch sets.

By means of the B-relays of the branch sets, which were energized in the circuit extending over a conductor (*1b*) of the party line the selecting devices which in the embodiment consist of condenser resistance arrangements are connected. The selecting devices are later controlled by connection of particular marking signals from the calling branch set by means of the pre-setting impulse train sent out. At the branch set *ASt6* the selecting device to which the resistances 65 and 66 in the condenser *Ko6* appertain is connected over the contact 67b6 and the conductor *1a*. At the branch set *ASt5* the resistances 62, 63 are connected as well as the condenser *Ko5* over the contact 64b5.

The relay *Sp6* at the calling branch set *ASt6* remains energized in a circuit extending over the relay A in the exchange: earth, contact 30b6, winding III of relay *Sp6*, contacts 18sp6, 32s6, *hu6I*, *nsi*, junction 7, lead *1a*, contacts 12ba, 23an, relay A, contact 33v1, resistance 34, —. The relay A operates and connects the relay *V1*: +, contacts 35w and 175x, 36a, relay *V1*, resistance 37, —. The relay *V2* connected over contact 38v1 cannot operate since it is short circuited over the contacts 36a and 35w or 175x. At contact 39v1 the circuit over the rotary magnet *Dkw1* of the indicating selector *KW1* is prepared.

It is assumed that the presetting impulse train, which marks the calling branch set is not sent out automatically on the lifting of the receiver but that the calling subscriber selects his own characterizing digit 6. By using specially constructed dial switches with special finger holes for the pre-setting impulse train the subscribers of all branch sets must operate the dial switch from this special finger hole after calling. The dial switches are however so constructed that only the impulses corresponding to the characterizing digit of the set are sent out as after the transmission of these the impulse contact *nsi* is short circuited by the closing of the contact *nsa*.

The impulses of the pre-setting impulse train are transmitted to the exchange by the impulse accepting relay A over the rotary magnet *Dkw1* of the indicating selector *KW1*: +, contacts 22an, 43a, 39v1, 44p1, 45p, rotary magnet *Dkw1*, —. During this impulse train the relay *V2* is also energized since on the opening of contact 36a the short-circuit is removed from the windings I and II. At contact 46v2 it short circuits its winding II and holds therefore during the momentary closing of contact 36a. Over the contact 47v2 the winding II of the relay *An*, remains energized after the wiper 20 has left its normal position. Also the relay *V1* holds during the impulse transmission and the momentary closing of contact 48a.

At the end of the pre-setting impulse train the relay A remains energized. The contact 36a is permanently closed and the relay *V2* restores. At contact 47v2 the relay *An* is disconnected. Over the contact 28an + (earth) is applied to the winding of the relay *Ba* so that since —120V is still connected over contact 26j to the conductor *1b* the lamp *G1a* lights up and relay *Ba* operates. At the same time the relay *P* is energized: +, contact 49v1, 50an, relay *P*, —. The contact 51ba is parallel to contact 49v1 so that relay *P* remains energized after the release of relay *V1*. Over the series contacts 197c, 52y and

53p the relay *J* is maintained energized after the opening of contact 24an.

The release of the relay *An* also results in the release of the relay A since this relay is disconnected from the conductor *1a* by the opening of the contact 23an. The contact 36a is opened and the contact 48a is closed. The relay *V1* restores and among other things closes contact 59v1. The marking signal selected by the pre-setting impulse train by means of a selector *KW1* and associated with the calling set is then applied to the party line.

Figure 3 shows the marking signals associated with the branch *ASt1* to 8 of the party line. It is clear that in order to connect each branch set a current of particular polarity (— or +) and of particular duration (short or long) is necessary and that further the holding windings of a connecting relay are connected either to the conductor *1a* or to the conductor *1b*.

For connecting the branch set *ASt5* the transmission of a long — impulse over the party line is necessary. The holding of the connecting relay *R6* takes place over the conductor *1b*.

The selection of the connecting signal takes place by means of the characterizing selector *KW1* set by the pre-setting impulse train and the wipers of this selector rest on the contact 6 in their contact bank. In order to connect a calling branch set only the switching operations carried out over the wipers 20, 54 and 55 are of importance.

The selecting impulse initiating the connection of the calling branch set *ASt6* extends over the following circuit: —, contact 6, wiper 54 of the characterizing selector *KW1*, contacts 59v1, 60j, 61ba, conductor *1a*, at all branch sets over the condensers *Ko* to earth, and actually at the branch set *ASt5* shown over junction 7, resistance 62, 63, junction 3, 1, contact 64b5, condenser *Ko5*, earth and the calling branch set *ASt6* over junction 7, resistance 65, 66, junction 3, 1, contact 67b6, condenser *Ko6*, earth. The condensers over two series resistances corresponding to the resistances 65, 66 (*ASt6*) are also connected at the branch sets 7 and 8 as is clear from the table. At the branch sets 1 to 4, at which the junctions 1 and 2 are connected the condensers are only connected over the resistance corresponding to the resistance 65 (*ASt6*) at the junction 7 and hence in the conductor *1a*.

For the complete charging of the condenser at the branch sets 5 to 8 as already mentioned a longer impulse is necessary. The relay *J* is disconnected by the opening of contact 52y on the release of relay *V1*, over relay *Y* connected over the contacts 68p and 69v1 which locks up over winding II and the contact 70y. The contact 60j is opened after a time in which only the condensers at the branch sets 1 to 4 can be completely discharged over a resistance connected to the conductor *1a*. In order to increase the length of the selector impulse and hence the charging period for the condensers the slow relay *E* energized over the wiper 20 of the indicating selector *KW1* and the contact 51j retards the release of the relay *J*. Over the normal contact 12e the condenser *Koa* is charged. On the operation of the relay *E* and the closing of the contact 74e there follows the discharge of the condenser *Koa* over the relay *J* after the opening of contact 52y. During the discharging of the condenser *Koa* the relay A remains energized in its discharged circuit. This period is extended so that at the

branch sets 5 to 8 the condensers are completely charged.

After the release of the relay J a discharging circuit is closed over the conductor 1a of the party line in order that the condensers at the branch sets 1 to 4 may be discharged. Also the condensers at the branch sets 5 to 8 are partially discharged. Since the discharging circuit at these branch sets extends over two series resistances as also does the charging circuit then for example as the branch sets AS_t5 and AS_t6 over the two series resistances 62, 63 or 65, 66 these condensers still have sufficient charge after the opening of the discharging circuit to enable the operation of the connecting relay (relay R5 at AS_t5 and relay R6 at AS_t6) in a local discharging circuit.

After the discharge of the condenser Ko_a of the relay J among other things the contacts 25j, 75j are closed and the contacts 26j, 60j, 57j are opened. The relay Ba in the exchange and also the B-relays of the branch sets remain energized however since over the contact 76e the current source —120V is still connected to the conductor 1b. During the release period of the relay E earth is connected over the contacts 77e, 75j, 61ba to the conductor 1a and thus the discharging circuit for all the condensers is set up at the branch sets.

The relay E restores, disconnects earth from the conductor 1a at contact 77e and at contact 76e: —120V from the conductor 1ab. The latter is switched through at contact 78e. Relay Ba in the exchange and the B-relays at all the branch sets restore. The conductor 1a is switched through at 12ba. The condensers at the branch sets are disconnected from the conductor 1a and connected in local discharging circuits over the normal contacts of the B-relay.

At the branch AS_t5 this local discharging circuit of the condenser Ko₅ extends over the contact 79b5 and the winding I of relay R5 and at the branch set AS_t6 over the contact 80b6 and the winding I of relay R6. The relays R5 and R6 operate and among other things connect their holding windings II by closing the contacts 81r6 and 82r5. The same takes place at the branch sets AS_t7 and AS_t8. At the branch set AS_t5 and also at the branch set AS_t7 the holding winding II of the connecting relay is connected with the conductor 1a over the junction 7 while at the branch sets AS_t6 and at the branch set AS_t8 the holding windings II of the R-relays are connected over the junction 8 on the conductor 1b.

A further distinction in the connecting signal of a branch set is that the holding winding of the relay R may be connected with the conductor 1a or with the conductor 1b. Corresponding to the branch sets to be connected the pole of the central battery which is not earth is connected to the conductor 1a or to the conductor 1b in the exchange. In order to connect up the branch set AS_t6 the unearthened pole of the central battery (—) is connected over resistance 34 contact 33u1, relay A, contacts 83y, 84w to the conductor 1b. Holding current can accordingly not flow over the relay R5 of the branch set AS_t5 also energized but only over the relay R6 of the branch set AS_t6.

It has already been explained that at the branch sets AS_t7 and AS_t8 the condensers can operate the connecting relays in their discharging circuit. The holding windings at the branch set AS_t7 are also connected to the conductor 1a as is clear from Figure 3. These relays can accordingly not hold and restore. The holding

winding of the connecting relay of the branch set AS_t8 is connected over the latter to the branch set AS_t6 on the conductor 1b. The release of this relay is thus carried out so that the holding winding of the relay at the branch set AS_t8 is connected in opposite direction to that at the branch set AS_t6, i. e., the junctions 4, 6, and 5, 8 are connected with one another. The holding circuit over the winding II of the connecting relay of the branch set AS_t8 effects the de-polarizing of the connecting relay which accordingly restores.

Therefore only the connecting relay R6 at the branch set AS_t6 remains energized.

On the call from the branch set AS_t5 at the end of the pre-setting impulse train the wipers of the indicating selector KW1 rest on contact 5. After the energizing of the relay Ba the relay U1 is energized: +, contact 87ba, wiper 55, selector contact 5, relay U1, —. The relay A fitted with the slow armature attraction and release is connected: +, contact 88g, 89u1, relay U2, —. The relays U1 and U2 effect the disconnection of — from the conductor 1b and the connection of the unearthened + pole of a central battery to the conductor 1a, since the holding winding II of the connecting relay R5 is applied to the conductor 1a after the selecting of the branch set AS_t5. At the contact 91u1 earth (—) is connected over resistance 93 to conductor 1b and at contact 92u1 (+) is connected over resistance 94 to the conductor 1a. Thereupon by the opening of contact 33u1 — is disconnected from the conductor 1b1 and by the opening of contact 89u1 earth (+) is disconnected from the conductor 1a. The slowly operating relay U2 which also connects the relay U1 in a local holding circuit over its contact 95u2, connects earth (—) over the lower resistance 96 and the contact 97u2 to the conductor 1b and (+) over the lower resistance 98 and the contact 99u2 to the conductor 1a. The holding circuit of the winding II of the relay R5 accordingly extends as follows: +, resistance 98, contact 99u2, choke Dr1, contacts 100y, 101w, 12ba, conductor 1a, branch set AS_t5, junction 7, 6, winding II of relay R5, junction 5, 4, contacts 82r5, 102s5, earth. The connection of an unearthened + pole of a second current source to the conductor 1a instead of the switching over of the unearthened — pole of the central battery from the conductor 1b to the conductor 1a is necessary from the point of view of operating technique for connections between two subscribers of the same party line (for reasons not of interest within the scope of the present invention).

In the circuit over the holding winding II of the relay R6 the relay A in the exchange operates. The relay V1 is energized. Since also the relay Y is energized the conductors 106 and 107 are switched through. The choke Dr2 is therefore now in bridge across the conductors 106 and 107 leading to the selector VW. The call relay of the pre-selector not shown operates. The pre-selector is set on a free outgoing junction line.

By the energizing of the connecting relay R6 there follows also the connection of the instrument which is indicated by the microphone Mi to the party line. Moreover the circuit over the holding winding II of the relay R6 is as follows: +, contact 89u1, choke Dr1, contacts 101y, 101w, 12ba, conductor 1a, junction 7, contact nst, hu6I, 108r6, winding I of relay S6, microphone Mi, contacts 109b6, 110r6, junction 8, conductor 1b, contacts 25j, 78e, 84w, 83y, relay A, contact 33u1, resistance 34, —. The relay S6 operates. It closes the contacts 111s6 and 114s6 parallel to

the contacts 110r6 and 108r6, disconnects earth from the holding winding II of the connecting relay R6 at contact 112s6 so that this relay restores whereby the dissymmetry of the talking line is removed and at contact 113s6 short circuits the winding I of the relay B6 for reasons not of interest here. Further the contact 32s6 is also opened.

The connection of the branch set AS_t6 to the party line is complete.

The selecting devices at the branch sets consisting of condenser resistance arrangements are controlled at the completion of the pre-setting impulse train sent out from the calling branch set by means of selecting current of particular direction and duration bringing about the connection of the calling branch set.

After the opening of contact 69v1 the relay Y remains connected over its winding II and the contacts 70y, 68p. Further the relay VI has undertaken the necessary switching operations for setting up a required connection during the transmission to the party line.

The relay G operates over its winding I: +, contacts 114p, 115v, 116y, 117h, winding I of relay G, —. Moreover it closes contact 118g and opens contact 179g.

The transmission of the pre-setting impulse train results not only in the connection of the connecting signal associated with the calling branch set AS_t6 but also a momentary connection of the associated meter in the exchange. As described the wipers of the indicating selector KW1 rest on contact 6. Over the wiper 103 the meter Z6 is connected parallel to the locking winding of the cut-off relay Tr of the pre-selector VW and can be operated in some way or other either on the reply of the selected subscriber or during the connection or at the termination of the conversation.

When at the termination of a connection of the calling subscriber of the branch set AS_t6 with a subscriber of a distant line or at the termination of a connection with a subscriber of the same party line both subscribers give the terminating signal by hanging up their receivers, the feeding bridge relay A in the exchange restores. At contact 48a the release retarding relay VI is short-circuited. It brings about the disconnection of all relays of the party line still energized.

The release of the indicating selector KW1 set by means of the pre-setting impulse train on the initiating of a connection is performed by the connection of the rotary magnet Dkw1, in the following circuit: —, rotary magnet Dkw1, contacts 45p, 44p1, 40v1, relay G, winding II, vertical off normal contact 180kkw1, interrupter RU, +. The indicating selector KW1 steps on to its normal position and is there stopped to open the circuit indicated above at contact 180kkw1. The relay G guards the party line in the usual manner during the release.

The rest position of the device in the exchange is again set up.

At the branch set AS_t6 on the hanging up of the hand instrument the relay S6 is disconnected since the contact hu6I is opened. It restores and at the branch set sets up the normal condition again.

II. The branch sets AS_t6 are called

So long as the party line of a subscriber has taken a branch set into use a seizing of the latter over a final selector is prevented since at least one of the contacts 181g, 182an, 183a, 184p,

is opened. On the setting of the test wiper 185 of the final selector LW on the contact 6 associated with the required branch, e. g., AS_t6 the test relay Plw cannot operate.

If on the setting of the final selector on the junction AS_t6 the party line is free the test circuit is completed: +, test relay Plw, wiper 185, contact 6, resistance 187, contact 181g, 182an, 183a, 184p, relay C, resistance 188, —. The test relay Plw switches through in the final selector in the usual manner. The seizing relay C locks up over contact 189c independently of the contacts 181g to 184p and at contact 190c connects the winding I of the relay PI to the wiper 56 of the indicating selector KW1.

The seizing circuit of the party line does not extend over the cut-off relay associated with the party line. This is connected in a local circuit by means of the seizing relay C: +, contact 200c, normal contact 201 of the preselector VW, wiper 170, cut-off relay Tr, —. In known manner it cuts off the calling bridge from the conductors 106 and 107. At contact 169c the parallel path, containing the meter Z6 of a required branch set, to the winding shown of the cut-off relay Tr is opened so that on the energizing of the relay M resulting on the reply of the required branch set and closing of the contact 168m there is no energizing of the meter Z6.

The indicating selector KW1 which on the call of a branch set is set by a pre-setting impulse characterizing the latter and by connecting of the connecting signal of the party line brings about the connection of a calling branch set serves also to connect the connecting signal for the branch set selected at the final selector on the seizing of the party line over a final selector. The contacts of the final selector are connected with the contacts of the contact bank indicated by the wiper 56 of the indicating selector KW1. The indicating selector KW1 is started up on the closing of a circuit for the driving magnet Dkw1 at contact 192c: —, rotary magnet Dkw1, contacts 45p, 44p1, 40v1, 192c, vertical off normal contact 191kkw1, interrupter RU, +. The indicating selector executes a single step, the vertical off normal contact 191kkw1 is opened and the vertical off normal contact 180kkw1 is closed. The circuit for the rotary magnet Dkw1 now extends over this contact and the contact 179g. When the wiper 56 of the indicating selector reaches contact 6 the relay PI is energized: —, winding I of relay PI, contact 190c, wiper 56, contact 6 on the indicating selector KW1, and on the final selector LW, wiper 185, test relay Plw, +. The relay PI operates and by opening contact 44p1 stops the indicating selector KW1. The relays H and A are connected: —, relay H, contacts 193p1, 194p, +; and —, resistance 34, contact 33u1, relay A, contacts 212y, 195p1, 196ba, + (earth). Over the contacts 36a and 35w or 175x the relay VI is connected and over contact 49v1 energizes the relay P. The relay J is energized: +, 145w, 146h, relay J, resistance 198, —. In the manner already described —120V is applied to the conductor 1b over the contact 26j. The B-relays at all the branch sets and the relay Ba in the exchange operate. At contact 196ba the circuit over the relay A is opened, the relay and hence also the relay VI restore.

By the setting of the indicating selector KW1 corresponding to the branch set indicated at the final selector the connection of the — impulse of long duration bringing about the connection

of the branch set AS6 to the conductor 1a is prepared. After the release of the relay VI and closing of contact 59v1 there follows the charging of the condensers at the branch sets in the manner described in section I by means of the current source connected over wiper 54 of the indicating selector KW1 and the selector contact 6.

The relay Y is energized: +, contacts 68p, 69v1, winding I of relay Y, -. At contact 70 it connects its winding II in a holding circuit, opens the contact 212y and closes the contacts 83y and 100y.

The relay W is energized: +, contacts 68p, 69v1, 148h, relay W, -. The contact 35w in the circuit of the relay VI is opened. Further, the short circuit over windings I and II of the differential relay X is removed by the opening of contacts 101w and 84w. The relay X operates in the circuit extending over its winding I and serving to maintain the energization of relay R6 at the branch sets and opens the contact 175x in the circuit of the relay VI and the contact 160x in the circuit of the relay M. Although the holding circuit of the relay R6 extends over the relay A which operates, the relay VI cannot be energized since both contacts 35w and 175x are opened.

Over the contacts 150w the circuit of the call relay Rr is closed. The relay Rr operates for example every 5 seconds when - is connected over the time switch 5''. At contact 153rr the winding I of the relay X is short circuited and at contact 155rr the alternating current source is connected to the conductor 1a. The call current operates the bell of the selected branch set AS6: call current source, contacts 155rr, 154u2, 12ba, conductor 1a, junction 7, 9, contact 220r6, bell, earth.

When the called branch set AS6 replies the winding I of relay S6 is connected between the conductors 1a and 1b: conductor 1a, contact nsi, hu6I, 108r6, winding I of relay S6, instrument, contact 109b6, 110r6, junction 8, conductor 1b. The relay S6 operates, closes the contacts 114s6 and 111s6 parallel to the contacts 108r6 and 110r6. It opens the holding circuit over the winding II of the relay R6 at contact 112s6. The dissymmetry of the line set up after the selection of the branch set AS6 is thereby removed. In the exchange the differential relay X restores. It closes the contact 160x. At contact 175x the circuit of the relay VI is closed, the relay operates and among other things prepares the circuit of the relay G at contact 115v1. The relay M operates: +, contacts 141v1, 166w, 160x, relay M, -. The contact 167m is opened and the contact 168m is closed. The meter Z6 does not operate however since the contact 169c is opened.

At contact 171m the holding circuit over the relay H is opened. The relay H restores and at contact 117h closes the circuit for the relay G: +, contacts 114p, 115v1, 116y, 117h, windings I of relay G, -. At contact 179g the short circuit for windings II and the circuit of the rotary magnet Dkw1 is removed and at contact 202g the short circuit for the seizing relay C is prepared.

The release of relay H also brings about the disconnection of the relay W by opening of the contact 148h. At the contacts 101w and 84w the windings of the differential relay X are short circuited. At contact 150w the call relay Rr is disconnected.

When at the termination of the connection the subscriber of the branch set AS6 hangs up his instrument the relays A and VI restore. By means of the contacts 184p, 183a, 182an, 202g the seizing relay C is short circuited and restores. Among other things the contact 190c is opened and thus the test relay PI disconnected. This relay restores and at contact 44p1 closes the circuit of the rotary magnet Dkw1. The indicating selector steps on to its normal position.

By the opening of the contact 190c the test relay P1w of the final selector restores and brings about its release.

What is claimed is:

1. In a telephone or like system, an exchange, a partly line terminating at said exchange, a plurality of stations on said line each having a device normally disconnected from the line, means at each of said stations operated at times while the device at that station is disconnected from the line to transmit over said line to the exchange impulses characteristic of that particular station, means at the exchange controlled by said impulses for transmitting over the line a selecting impulse characteristic of said station, and means at each station for connecting up the device at that station responsive only to the receipt of a selecting impulse characteristic of that station.

2. In a telephone or like system, an exchange, a partly line terminating at said exchange, a plurality of stations on said line each having conversational equipment, means at each station normally disabling the conversational equipment thereat, means at each of said stations operated when the subscriber thereat desires to extend a call for transmitting over said line to the exchange a train of impulses characteristic of that particular station, means at the exchange controlled by said impulse train for transmitting over the line a selecting impulse characteristic of the calling station, and means at each station for rendering the disabling means thereat ineffective responsive only to the receipt of a selecting impulse characteristic of that station.

3. In a system as claimed in claim 2, a plurality of devices at the exchange each individual to one of the stations on said line, said means at the exchange controlled by the impulses transmitted from the calling station to connect up the device individual to said calling station.

4. In a telephone or like system, an exchange, a partly line terminating at said exchange, a plurality of stations on said line each having a device normally disconnected from the line, means at each station for connecting the device at that station to the line, means at the exchange for controlling said last means to connect the device at any one of the stations alone to the line, and means at any calling one of said stations for transmitting impulses characteristic of that station over the line to the exchange to control said means at the exchange to cause the device at said calling station to be connected to the line.

5. In a system as claimed in claim 4, means operated on an incoming call to any of said stations to control said means at the exchange to cause the device at that station to be connected to said line.

6. In a telephone or like system, an exchange, a partly line terminating at said exchange, a plurality of stations on said line each having

means for transmitting distinctive impulses thereover to the exchange, and means at the exchange automatically controlled by the impulses received over said line from one of said stations to transmit over said line a station selecting impulse varying in duration depending upon said received impulses.

7. In a telephone or like system, an exchange, a party line terminating at said exchange, a plurality of stations on said line each having means for transmitting distinctive impulses thereover to the exchange, and means at the exchange controlled by the impulses received over said line from one of said stations for transmitting over said line a station selecting impulse depending in duration and polarity upon said received impulses.

8. In a system as claimed in claim 7, a device at each station normally disconnected from the line, and means at each station for connecting the device thereat to the line responsive to the receipt over the line from the exchange of a station selecting impulse of a particular duration and polarity.

9. In a system as claimed in claim 7, conversational equipment at each station, means at each station normally disabling the conversational equipment thereat, and other means at each station for rendering said disabling means ineffective responsive to the receipt over the line from the exchange of a station selecting impulse of a particular duration and polarity.

10. In a telephone system, an exchange, a party line terminating at the exchange, a plurality of stations on said line each having means operated at times from the exchange to unbalance said line, means in the exchange controlled by the unbalancing of said line by the means at one of said stations for transmitting ringing current over the line to signal said one station, and means for balancing said line responsive to the subscriber at said one station answering said signalling, thereby to control said last means to terminate the transmission of said ringing current.

11. In a telephone or like system, a substation and a line therefor, a relay at said substation, means at the substation controlled over said line to connect said relay to said line, means responsive to said connecting of said relay to said line for causing ringing current to be impressed upon the line to signal said substation, and means for disconnecting said relay from said line responsive to the subscriber at said substation answering said signalling, thereby to cause said last means to stop impressing said ringing current upon the line.

12. In a telephone or like system, a substation and a line therefor, said substation having a ringer and a relay each normally disconnected from said line, means controlled over said line for connecting said relay to said line, means controlled by said connecting of the relay to said line for causing ringing current to be impressed upon the line, means for maintaining said relay operated over said line until the subscriber at said substation answers the ringing, said relay effective while operated to maintain said ringer connected to said line.

13. In a telephone or like system, a substation and a line therefor, said substation having a ringer and a relay each normally disconnected from said line, means controlled over said line for connecting said relay to one side of said line, means

controlled by said connecting of said relay to said one side of the line for causing ringing current to be impressed on the other side of said line, means for maintaining said relay operated over said one side of the line until the subscriber at said substation answers the ringing, said relay effective while operated to maintain said ringer connected to said other side of said line.

14. In a telephone or like system, an exchange, a party line terminating at said exchange, a plurality of stations on said line, means for initiating a call from any of said stations, a register at said exchange, means for controlling said register over said line to register the identity of the calling station whenever a call is initiated from one of said stations, means then controlled by said register to transmit over said line from said exchange an impulse depending in duration upon the identity of said calling station, said impulse being of different duration for the different stations, normally disabled equipment at each of said stations, and means at each station controlled by said impulse transmitted from the exchange to render said equipment at that station effective if said impulse is of a particular duration.

15. In a telephone or like system, an exchange, a party line terminating at said exchange, a plurality of stations on said line, means for initiating a call from any of said stations, a register at said exchange, means for controlling said register over said line to register the identity of the calling station whenever a call is initiated from one of said stations, means then controlled by said register to transmit over said line from said exchange an impulse depending in duration and polarity upon the identity of said calling station, normally disabled equipment at each of said stations, and means at each station controlled by said impulse transmitted from the exchange to render said equipment at that station effective if said impulse is of a particular duration and polarity.

16. In a telephone or like system, an exchange, a party line terminating at said exchange, a plurality of stations on said line, means for initiating a call from any of said stations, a register at said exchange, means for controlling said register over said party line to register the identity of the calling station whenever a call is initiated from one of said stations, and means then controlled by said register to transmit over said line from said exchange a station selecting impulse depending in duration upon the identity of said calling station, said impulse being of a different duration for the different stations.

17. In a telephone or like system, an exchange, a party line terminating at said exchange, a plurality of stations on said line, means for initiating a call from any of said stations, a register at said exchange, means for controlling said register over said party line to register the identity of the calling station whenever a call is initiated from one of said stations, and means then controlled by said register to transmit over said line from said exchange a station selecting impulse depending in duration and polarity upon the identity of said calling station.

18. In a telephone or like system, an exchange, a register at the exchange, a party line terminating at said exchange, a plurality of stations on said line, subscriber controlled means at each of said stations for operating said register variably over said party line, and means controlled

by said register, after said operation thereof by said subscriber controlled means, to automatically transmit over said line from said exchange a variable station selecting impulse, said impulse varying in duration depending upon the way in which said register was operated by said subscriber controlled means.

19. In a telephone or like system, an exchange, a register at the exchange, a party line terminating at said exchange, a plurality of stations on

5 said line, subscriber controlled means at each of said stations for operating said register variably over said party line, and means controlled by said register after said operation thereof by said subscriber controlled means to transmit over said line from said exchange a station selecting impulse depending in duration and polarity upon the way in which said register was operated by said subscriber controlled means.

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