

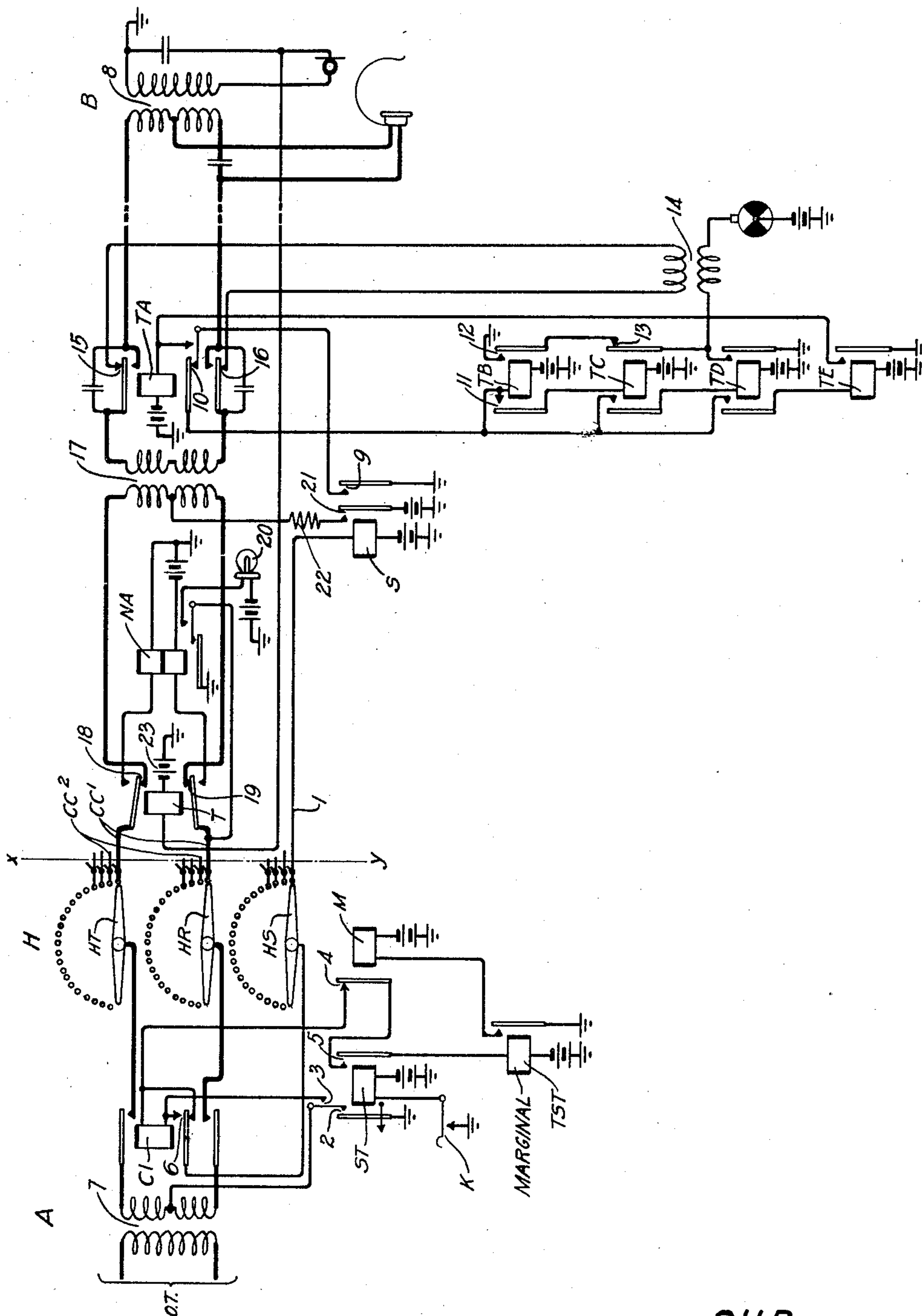
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to telephone systems and more particularly to automatic selection of idle order wires, interoffice trunk circuits and the like.

5 In certain circuit arrangements in which automatic switches are employed for completing a talking connection between two operators, the switch contacts are only called upon to pass the relatively small speech currents. It has been known for some time that a high resistance film or oxidization is apt to form upon rubbing contacts composed of base metals which is of such high resistance as to seriously interfere with speech transmission and it has heretofore been proposed to break down such film or oxidization by means of an auxiliary current of such a high value as to dissipate such resistance.

10 In previous contact cleaning systems, as shown, for example, in the German Patent 277,368, issued August 10, 1914, the so-called contact cleaning current is applied to the contacts in series and under certain circuit conditions objectionable clicks would be heard by the operators, at each end of the circuit, if the talking path were interrupted during the time the cleaning current circuit was closed.

15 An object of the present invention therefore is to prevent objectionable clicks in the operator's receivers associated with circuits employing such contact cleaning means as before described.

20 In accordance with the foregoing object, a feature of the invention resides in completing a circuit, for the source of cleaning current potential, over the switch contacts in parallel instead of in series.

25 The invention will be understood from the following description when read in connection with the accompanying drawing in which an "A" operator's position A may be connected with an idle "B" operator's telephone B over a call circuit hunting switch H and a call circuit CC'.

30 Other call circuits CC², etc., of the same group extend from the switch to other "B" operators, not shown.

35 Other groups of call circuits, not shown, may be made available to the "A" operator by

providing a hunting switch, three relays, and a key, similar to the equipment shown to the left of the broken line XY, for each additional group of call circuits to which the "A" operator is to have access.

The operation of the system, according to the present invention, will now be described.

When the "A" operator desires to connect with a "B" operator reached over the group of call circuits represented by CC', CC², etc., she will depress the corresponding call circuit key K thereby operating the slow release relay ST which prepares a circuit for the subsequent operation of relay CI and, in addition, closes a circuit for marginal relay TST.

40 The TST relay will operate if the brushes of switch H rest on busy terminals, which will be indicated by ground on conductor 1. The absence of ground on conductor 1, as shown on the drawing, will permit relay CI to operate in a circuit which can be traced from ground at the left-hand contacts 2 and 3 of relay ST, winding of relay CI, contacts 4 of the switch magnet M, contacts 5 of relay ST and the winding of marginal relay TST to battery. Due to the marginal characteristics of relay TST this relay will not operate in circuit with the high resistance winding of relay CI. Operation of relay CI extends the "A" operator's talking leads through the switch brushes HT and HR and over the call circuit CC' to the "B" operator's position shown to the right of the broken vertical line XY.

45 The operation of relay CI also connects ground, at its contacts 6, to the sleeve conductor 1 through the switch brush HS thereby rendering the B position reached over call circuit CC' busy to all other hunting switches.

50 It will be noted that the operation of the ST relay also connects ground, at its contacts 2, to the midpoint of the right-hand winding of transformer 7 and it will be later explained how this ground completes a circuit for a direct current flow over the tip and ring conductor of the call circuit CC' and through the switch contacts, whereby satisfactory speech transmission is insured.

If it is assumed, as previously mentioned and shown on the drawing, that the brushes

of switch H are standing on the first contact of the bank, to which is connected the call circuit CC', ground is connected to sleeve conductor 1 over contacts 2 and 3 of relay ST, contacts 6 of relay CI, and brush HS of switch H, to cause the operation of relay S at the distant B position.

It will be further assumed that the distant B operator is at her position and has connected her telephone set in the usual manner to the position circuit thereby causing operation of relay T, the circuit for which can be traced from the transmitter, battery 23 through the winding of relay T, the "B" operator's transmitter, and right-hand winding of induction coil 8 to ground.

When relay S operated, it connected ground at its contacts 9 to start the operation of tone relays TB, TC, TD and TE whose function is to transmit two short impulses of tone current back over the call circuit to the "A" operator as a signal that the "B" operator is at her position and ready to receive the call. The operation of these relays is as follows: Ground supplied at contacts 9 of relay S passes over contacts 10 of relay TA and through the winding of relay TB to battery. Relay TB operates in this circuit and connects ground at its contacts 12, over contacts 13 of relay TC to complete the circuit for interrupted battery through the primary winding of transformer 14 thereby causing audible frequency alternating current to be induced in the secondary winding of the transformer which is connected to the call circuit over contacts 15 and 16 of relay TA. As soon, however, as relay TB operates, it also extends its operating ground to the winding of relay TC which in turn operates and opens at its contacts 13, the circuit through the primary winding of transformer 14 thereby discontinuing the induced tone current. Relay TC in operating further, extends at its left-hand contacts, operating ground for relay TD which again closes the interrupted battery circuit through the primary winding of transformer 14 thereby again transmitting audible tone current to the call circuit. TD in operating, also extends its operating ground over its left-hand contacts to operate relay TE, which in turn connects ground to operate relay TA which disconnects the secondary winding of transformer 14 from the call circuit and opens contacts 10, thereby removing the operating ground for relays TB, TC and TE which relays thereupon restore to normal.

By the operation of relays TB, TC, TD, TE and TA, two short impulses or "zips" of audible frequency current are transmitted over the call circuit to the "A" operator as a signal to pass the call as a talking circuit now exists between the "A" and "B" operators over the transformer 7, contacts of relay CI, contacts of switch H, contacts of relay T, transformer 17, contacts of relay TA and in-

duction coil 8 of the "B" operator's telephone set.

In case the "B" operator is absent from her position, relay T will not be operated and although the tone relays TB, TC, etc. will function in the previously described manner, should the "A" operator connect to the call circuit CC' the call passing tones generated in transformer 14 will not be transmitted to the call circuit due to the fact that the relay contacts 18 and 19 of relay T are open. Seizure of the call circuit CC' will, however, cause the operation of night alarm relay NA which completes an obvious circuit for lighting the pilot lamp 20.

As previously referred to, it will be noted that when relay S at the "B" position operates, it closes a circuit from battery, through contacts 21 of relay S, and resistance 22 to the mid-point of the left-hand winding of transformer 17, thereby causing a current flow of the order of 25 mils over the tip and ring conductors of call circuit CC', in parallel, to ground at the midpoint of the right-hand winding of transformer 7 at the "A" operator's position.

The reason for this arrangement is that it has been found that a high resistance film of oxidation is apt to form on the base metal contact surfaces of selector switches which is apt to cause losses in the transmission of speech in cases where "dry" circuits are employed, that is, circuits over which battery current does not actually flow. To overcome this condition, it has been found advisable to "wet" the switch contacts by means of a current of the order of 25 mils during the conversation period and in the present circuit arrangement, this current is passed over the tip and ring contacts of the switch in parallel, instead of in series, thereby preventing clicks in both the "B" and "A" operators' receivers when the connection is broken down, which would be caused by inductive discharges through the windings of transformers 7 and 17 in case battery was serially connected through the line windings of transformers 7 and 17.

What is claimed is:

1. In a selecting circuit a two-conductor line extending between two stations, switching apparatus contacts in each conductor of said line, said contacts having a high resistance film over their contact surfaces, a source of electrical current of sufficient magnitude to eliminate said contact resistance and means responsive to taking said line for use at one station for completing a circuit for said current source over said line conductors and contacts in parallel.

2. In a selecting circuit a two-conductor line extending between two stations, switching apparatus contacts in each conductor of said line, said contacts having a high resistance oxidation film over their contact sur-

faces, a source of electrical current of sufficient magnitude to eliminate said contact resistance, and means at one of said stations responsive to taking said line for use at the other station for completing a circuit for
5 said current source over said line conductors and contacts in parallel.

In testimony whereof, we have signed our names to this specification this 8th day of
10 January, 1929.

GEORGE H. PETERSON.
WILLIAM A. RHODES.

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