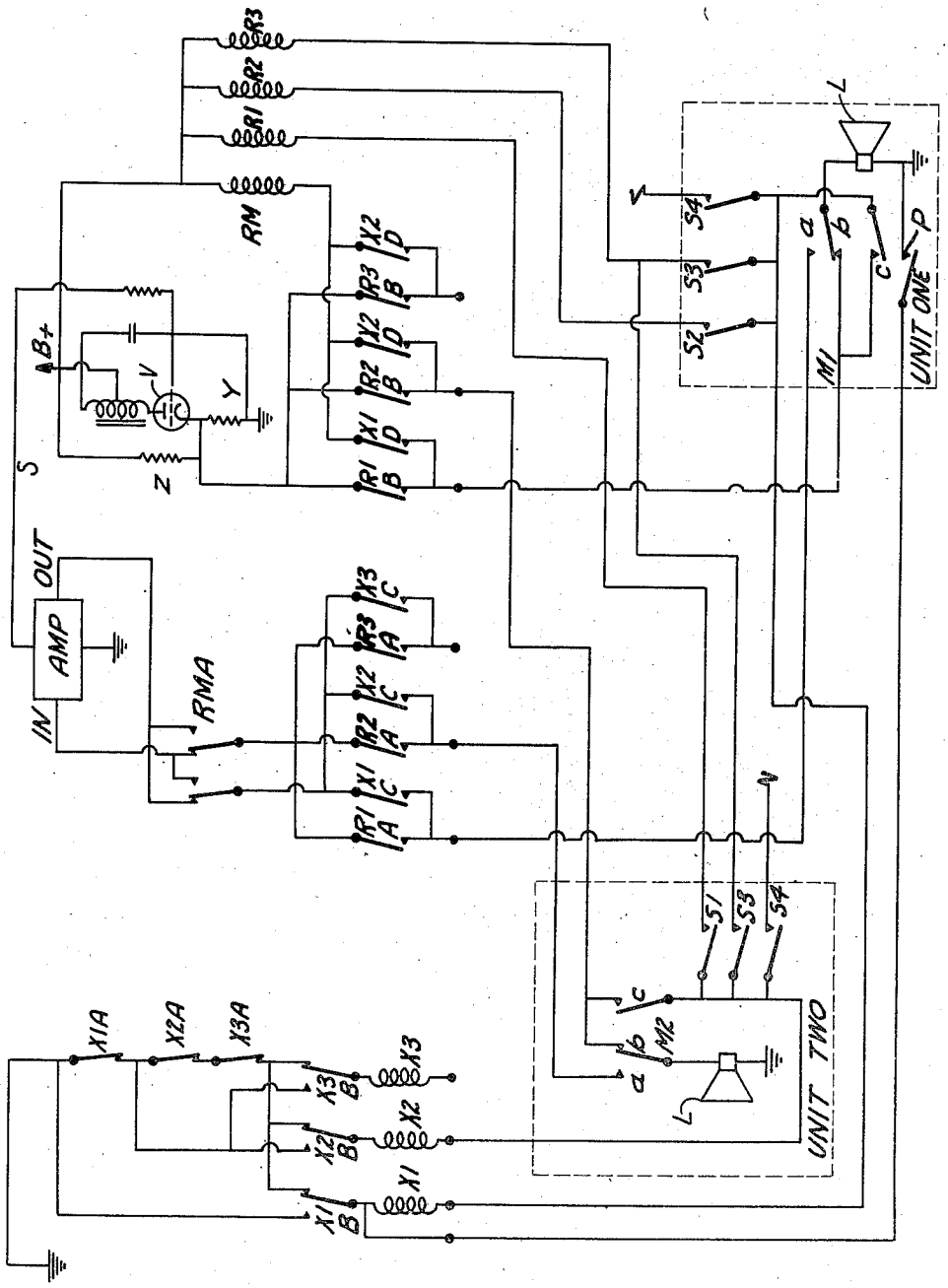
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SPEECH INTERCOMMUNICATION SYSTEM
BETWEEN REMOTE POINTS
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## SPEECH INTERCOMMUNICATION SYSTEM BETWEEN REMOTE POINTS

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1

This invention has reference to improvements in speech intercommunication systems between remote points, of the kind wherein each remote point is provided with a loud speaker device adapted for two-way speech. Such systems are known wherein a main unit can provide two-way speech communication with any one of a plurality of subsidiary units at the will of the operator of the main unit.

The object of the present invention is to provide a system of the aforesaid kind wherein any unit may be put into two-way speech communication with any other unit, means being provided for ensuring that no interference from a third unit can obtain while intercommunication is taking place.

The invention consists in a speech intercommunication system between remote points of the kind referred to wherein each point is provided with a unit comprising a loud speaker and a switch associated with a circuit to each other unit of the system remote therefrom; the operation of one of said switches closing a circuit through a pair of relays which close the circuit to the required remote unit and at the same time open contacts to isolate the remaining units of the system.

The invention will now be described with reference to the accompanying wiring diagram which for the sake of clarity embodies only sufficient of the circuit for an understanding of the invention and in which only two units designated One and Two are shown. Each unit embodies a loud speaker L and a series of switches corresponding in number to the number of other units in the system. For example, Unit One has switches S2, S3, S4, etc.; Unit Two has switches S1, S3, S4, etc.; the other units being similarly arranged. Each switch S1, S2, S3, is capable of closing a circuit through a pair of associated relays R1X1, R2X2, and R3X3, through the respective contacts X1A, X2A, X3A and X1B, or X2B or X3B. These relays and contacts and those hereinafter referred to are housed within a casing which also incorporates an amplifier A, an oscillator valve V and a suppressor circuit S, connected as shown in the diagram to a suitable source of high tension voltage supply. The oscillator valve V normally cannot operate since the cathode thereof is maintained at a high positive potential by virtue of the resistances Y and Z. When however the low resistance of a speaker is connected across the resistance Y as will hereinafter be more fully described, the high positive potential at the

2

cathode is removed and the valve oscillates emitting a calling tone from the appropriate speaker whilst emitting a faint calling tone in the speaker of the calling unit due to induction in the wiring. Each unit has a further switch M provided with "off" (contact *b* closed) "listen" (contact *a* closed) and "talk" (contacts *a* and *c* closed) positions whereby two-way speech can be obtained. The switch M is associated with a relay RM operating contacts RMA whereby the loud speaker of a unit may be connected to the input or output side of the amplifier A.

*Operation*

In operation assuming that the remote Unit One wishes to call the remote Unit Two, the switch S2 at the Unit One is closed thus closing a circuit from B+ through the relay R2, switch S2, relay X1 and contact X1B to ground. The energisation of the relay R2 closes the contacts R2B and R2A, whilst the energisation of the relay X1 closes the contacts X1C and X1D and changes the contacts X1B from the position shown in the diagram to the alternative normally open position so as to by-pass the contact X1A which is also opened by the relay X1. The opening of the A contact of the X relay shorts a similar circuit for any other remote station preventing interruption of the circuit in use unless the system is clear but, through the "by-pass," holds the relays R and X of the called and calling stations, respectively, in circuit. The B contacts of the relays X are so arranged that the normally open contact of the pair closes before the normally closed contact opens, thus eliminating fluttering.

Closure of contact R2B establishes a circuit for a calling tone to the loud speaker in the remote Unit Two from the oscillator valve V, the cathode of which is connected to the loud speaker through contact R2B and the contact *b* of switch M2 thereby removing the high positive potential which normally obtains at the cathode of the valve V. The calling tone is heard in Unit Two. Simultaneously, the relay X1 has closed contact X1C connnecting the output side of the amplifier to contact *a* of the switch M1 in Unit One. The person calling from Unit One has already moved switch M1 to the "listen" position, closing contacts *a* and thus the amplifier output is connected to the speaker of Unit One. Due to inductance and capacity between the wires of the multi-lead cable leading to Unit One, the oscillator call tone is also picked up in the

speaker of Unit One as an indication to the operator there that his call is being made.

If the system were in use by two other stations, Unit One would not be able to establish its original circuit through the series contacts A of the relays X1—$X^n$ and the lack of a call tone in its own speaker would indicate that the system was busy.

The energization of the relay R2 also has closed its contact R2A which connects the input side of the amplifier through contacts RMA to the *a* contacts of the switch M2 in Unit Two.

Assuming that the call has come through, and that the operator at Unit Two wishes to answer, he does so by moving the switch M2 to "talk" position, closing contacts *a* and *c* and opening contact *b* which restores the high positive potential at the cathode of the valve V cutting out the calling tone and at the same time connecting Unit Two loud speaker with the input side of the amplifier A through contact *a* and relay contacts R2A and RMA.

After the operator at Unit Two has replied, further control of the conversation remains in Unit One. When he wishes to "talk," he moves switch M1 and "talk" position, closing its contacts *a* and *c* and opening its contact *b*. The closure of contact *c* establishes a circuit from $B^+$ through relay RM, contact X1D, contact *c* of switch M1, relay X1, and the now closed contact of contacts X1B to ground. This causes relay RM to shift its contacts RMA, reversing the connections of the amplifier input and output.

It will be appreciated that all units can be identical and by increasing the number of relays in the casing the number of remote units in a system can be increased, but desirably one unit of the system (in the diagram unit 1) is provided with a priority switch P. It will be noted that, although under normal operating conditions the contacts B of the relays X1, X2, X3, etc., are all similarly connected, yet the normally open contacts of these pairs for relays X2, X3, etc., are all connected in parallel to a "by-pass" lead around the series of A contacts for relays X2, X3, etc., whereas the normally open side of contacts X1B is connected to a "by-pass" which also leads around contact X1A. Thus an operator at Unit One, who has priority, can establish a circuit to any other station regardless of the call which may be in progress by interrupting the communication between the two other units by the opening of contact X1A.

If an operator at any station other than Unit One wishing to make a call finds the system busy, he cannot interrupt but can, by leaving the appropriate switch S closed, condition the system to make his call as soon as the two talking stations have restored the system by moving their switches M to "off" position.

Although the drawings and the above description show only two stations, viz., "Unit One" and "Unit Two," provision is made for connecting "Unit Three" to relays and contacts shown in the drawings and other units such as Four, Five, etc., can be installed in the system merely by duplicating the relays and connections which are already shown for "Units One and Two."

I claim:

1. In an intercommunication system, in combination, a plurality of separated stations each including a speaker, a station selector switch and a control switch, said station selector switch having a common terminal and a terminal for each station to be called, a central control including an amplifier, a called station relay corresponding to each station, a calling station relay for each station, an amplifier control relay, a source of current, said called station relays each having an operating coil that is connected between the source of current and the several station selector switch terminals corresponding to that particular called station, each calling station relay having an operating coil that is connected to the common terminal of the corresponding station's selector switch and to the return side of the source of current, a signal lead from each operator's station, an input and an output line to the amplifier, said control relay having reversing contacts connected in the input and output lines, contacts on each calling station relay and called station relay that serve to connect the signal leads of the called and calling stations to the input and output lines of the amplifier and a circuit from the calling station control switch through said control relay for conditioning the control relay for talking or listening at the calling station.

2. In an intercommunication system, in combination, a plurality of separated stations, a speaker at each station, a selector switch and a control switch at each station, said selector switch having a common terminal and a terminal for each station to be called, a signal lead from each of the separated stations, an amplifier including a source of control current, a called station relay for each separated station, said relays each having an operating coil one terminal of which is connected to the source of current and the other of which is connected to the corresponding terminal of the several selector switches, each called station relay having at least one set of normally open contacts one terminal of which is connected to the signal lead of the corresponding station, an input and an output lead for the amplifier, a control relay having reversing contacts in said input and output leads, said called stations relays each having the other of its contact terminals connected to one of the amplifier leads, a calling station relay for each separate station, each calling station relay having an operating coil one terminal of which is connected to the common terminal of the corresponding selector switch, a plurality of sets of contacts on each calling station relay, each of said calling station relays having the other terminal of its operating coil connected to the return side of the current source through a circuit including a normally closed set of contacts on that relay and a series circuit including one of the normally closed set of contacts of each calling station relay, and a circuit from each calling station relay coil that includes one of the normally open sets of contacts of that relay and that is in parallel with at least some of the series connected normally closed contacts, and an operating circuit for said control relay that includes the control switch of the calling station and a set of normally open contacts of the corresponding calling station relay, whereby operation of the selector switch at a calling station energizes the calling relay for that station and the called relay for the called station, connects the signal leads of those stations to the amplifier, connects the control relay to the calling station control switch for controlling the direction of transmission through the system, and opens the calling circuits for the other separated stations.

3. In an intercommunication system according

to claim 2, a calling oscillator, a control lead to each separate station, and a normally open set of contacts on each called station relay which contacts are connected to the oscillator, and to the control lead to energize the lead when the called station relay is energized.

4. In an intercommunication system according to claim 2, having a second control switch in at least one of the separate stations and a circuit from the operating coil of the associated calling station relay through the control switch to the current return, which circuit serves to condition that station for use in preference to other stations.

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