June 13, 1939. R. H. CAMPBELL 2,162,372

COMMUNICATION SYSTEM

Filed Nov. 1, 1937

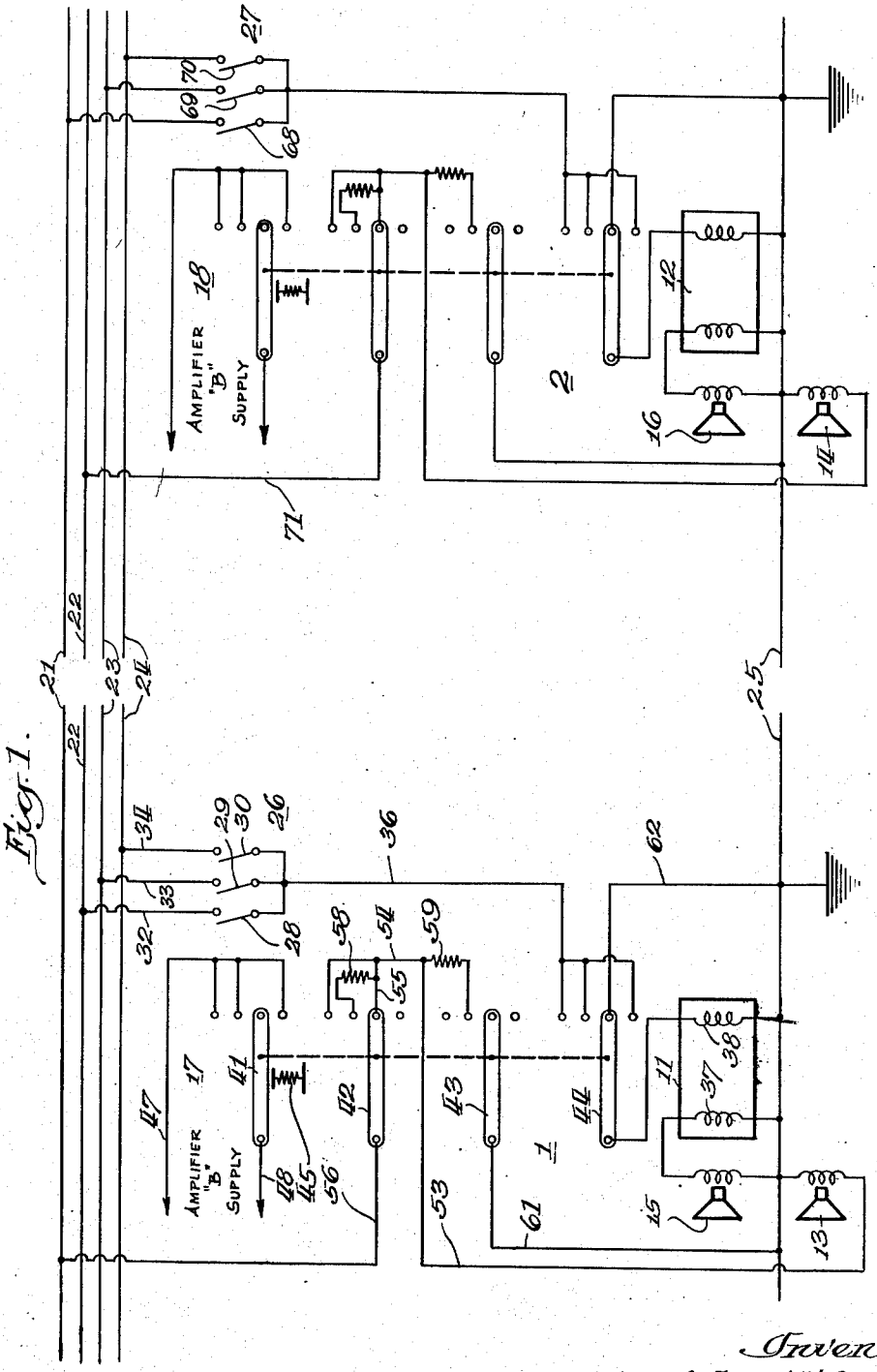


Fig. 1.

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Patented June 13, 1939 2,162,372

UNITED STATES PATENT OFFICE

2,162,372

COMMUNICATION SYSTEM

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Application November 1, 1937, Serial No. 172,103

27 Claims. (Cl. 179—1)

The present invention relates to intercommunication systems and particularly to telephonic communication systems comprising a plurality of remotely located stations, each supplied with suitable voice receiving and transmitting means, and means for amplifying fluctuations in electrical current created in the transmitting means.

One of the primary objects of the present invention is the provision of a communication system comprising a number of remotely located stations, each including amplifying means and a pair of loudspeaker units of the permanent magnet type, of which one is used as a transmitter and the other as a receiver, in which feed back between the receiving and transmitting means is substantially eliminated.

A more specific object of the invention is to decrease the feed back when both loudspeaker units at each station are used by reducing the output of the receiver so that less sound energy is transmitted from the latter to the transmitter upon establishment of two-way communication.

A further object of the invention is to reduce the feed back by placing resistances in series with the receiver loudspeaker units upon establishment of two-way communication, and to accomplish this without disturbing the impedance match between the output transformers of the amplifiers and the receiver circuits which include the aforementioned receiver loudspeaker units and resistances.

A further object of the invention is to provide a multiple station intercommunicating system of the type described above with control means having a normal position in which the "B" supply to the amplifier is cut off and the output terminals of the latter are short-circuited to prevent amplification of any extraneous electrical disturbances that might be impressed across its input terminals and at the same time avoid undesired clicks.

A further object of the invention is to provide an intercommunication system that can be selectively operated to obtain full two-way communication at reduced volume without manipulation of switches after the selection is made or operated to obtain similar results at one station at full volume, and a system in which this selection can be made in a simple manner.

Other objects and advantages of the present invention will become apparent from the ensuing description, in the course of which reference is had to the accompanying drawing, the single figure of which represents schematically one embodiment of the invention.

Referring now to the figure, reference numerals 1 and 2 indicate two stations of a multiple station intercommunication system. These stations are located remote from each other and from the remaining stations of the system which have been omitted from the figure for the purpose of simplicity and brevity, but which are provided with apparatus identical to that found at the illustrated stations.

The stations are provided with amplifiers 11 and 12, voice receiving means 13 and 14, and voice transmitting means 15 and 16, respectively. These are identical in construction and preferably are loudspeaker units of the permanent magnet type now commonly utilized in systems of the type to which the present invention pertains.

The communication circuits and the supply of power at the two stations are controlled by combined power and communication control switches, 17 and 18. These switches are multi-pole, multiposition switches constructed and arranged in the various circuits in such manner that they occupy a normal position in which the stations are conditioned for reception of a call and the amplifiers de-energized and are operable to a plurality of displaced positions. They are operable to a first displaced position in which the stations are conditioned for transmission, and from which position they are returned to their normal position by suitable biasing means, to a second displaced position in which the stations are conditioned for transmission at full volume and reception at reduced volume, and to a third position in which the stations are conditioned for both transmission and reception at full volume. When switches at two stations are operated into their second displaced positions, in which they are adapted to remain until manually operated to another position, two-way communication may be carried on between stations without further manipulation of switches. When the switch at one station is operated into its third displaced position that station is conditioned for reception and transmission at full volume, but, in order to prevent feed back it is necessary for the switch at another station to be operated in such manner as to render ineffective either the receiver or transmitter, depending upon the direction of communication. The switch construction and circuit arrangement whereby these various conditioning operations are effect-

ed and the advantages thereof are described shortly.

To enable operators at each station to communicate with any or all of the remaining stations to the exclusion of unselected stations, there are provided a number of independent inter-station conductors equal to the number of stations, a single common conductor, and a station selector. In the figure, where inter-station conductors 21 to 24, inclusive, have been illustrated, conductors 21 and 22 are the inter-station conductors associated with stations 1 and 2, respectively, while the others are associated with stations not shown. The common conductor, indicated by reference numeral 25, is grounded and extends to all stations as do the other inter-station conductors. The selector means are indicated by reference numerals 26 and 27 and the former, which is located at station 1, consists of a plurality of switch blades 28 to 30, inclusive. These blades are adapted to be actuated into engagement with contacts connected by conductors 32 to 34, inclusive, to inter-station conductors 22 to 24, respectively. The blades are all connected to a common conductor 36 leading to the power and communication control switch 17, which is adapted selectively to connect the conductor to the output of the amplifier in a manner hereinafter described.

The amplifier 11 at station 1 may be of any well-known type comprising one or more stages of audio amplification and is preferably provided with transformers having input and output coils 37 and 38, respectively, each of which has one terminal connected to the common conductor 25. It should be understood that other forms of input and output connections may be utilized in place of the coils illustrated.

The power and communication control switch consists of four blades 41 to 44, inclusive, all mechanically interconnected for simultaneous operation and biased from its first displaced position to its normal position, corresponding to that indicated, by spring 45. The switch is operable to two other displaced positions in either of which it is adapted to remain until manually operated therefrom.

The amplifier is supplied with power from a suitable source (not shown) and according to the present invention the cathodes of the various amplifier tubes are continuously heated to condition the amplifier for instantaneous operation while the operativeness of the amplifier is controlled by controlling the "B" supply. The "B" supply is controlled by switch blade 41 which is normally in circuit opening position, thereby cutting off the "B" supply to the amplifier and effecting not only a saving in power but also preventing amplification of undesired local electrical disturbances. In each of the three displaced positions, of which the first is below the normal one and the other two above, the "B" supply circuit is completed through conductors 47 and 48.

The voice coil of transmitter 15 is permanently connected to the input of the amplifier while the connection of the voice coil of receiver 13 to the inter-station conductor 21 associated with station 1 is controlled by switch blade 42. In the normal position of the blade the voice coil is connected directly to the inter-station conductor 21 through conductors 53 to 56, inclusive, so that station 1 may be called by any of the other stations in the system. In the first displaced position of blade 42 the connection of the receiver to the inter-station conductor is broken. This position is termed the "talking" position in which the station is conditioned for transmission alone.

In systems comprising both receivers and transmitters at each of a plurality of stations, there is a likelihood that acoustic feed back with its attendant howling will occur. This is particularly true where the receiver is of the loudspeaker type and amplifiers are utilized to actuate them. In order to decrease the possibility of this feed back, the present system is so arranged so that when two or more stations are connected for full two-way communication, after one station has responded to a call from another, the receiver output volume is decreased. This permits utilization of full volume on reception of calls and decreases acoustic feed back upon establishment of two-way communication. The reduction of volume is accomplished by interposing a resistance 58 in series with the voice coil of receiver 13 when the switch blade 42 is actuated to its second displaced position.

In some installations it is desirable to operate the system in such manner that full volume is obtainable at one station, and in the present embodiment this may be accomplished by actuating the blade 42 to its uppermost or third displaced position. In this position the receiver is connected directly to the inter-station conductor 21 through conductor 54, just as in the first displaced, or calling, position. However, to avoid feed back the communication control switch 18 must be operated selectively to disconnect the receiver and transmitter to open the feed back circuit at station 2.

The switch blade 43 is provided for the purpose of maintaining constant the impedance of the receiving circuit when the resistance 58 is placed in series with the voice coil. Thus, when the switch is operated to its second displaced position the impedance is maintained constant by connection of resistance 59 in parallel to the voice coil through conductor 61. Resistance 59 has a value dependent upon the resistances of the output transformer of the amplifier at station 2, the resistance of the voice coil of receiver 13, and the resistance 58. Assuming the resistances of the voice coil and output transformer to be 50 ohms each, and the resistance 58 to have a value of 25 ohms, then by applying well-known principles it may be determined that resistance 59 should have a value of 50 ohms in order to maintain the receiving circuit resistance constant at 50 ohms. In practice of the invention, it is not necessary that the impedance be maintained constant in the specific manner described above; other arrangements may be utilized.

The fourth switch blade 44 is adapted in its normal position to short-circuit the amplifier output transformer through conductor 62 in order to prevent clicks, amplification of undesired disturbances, and to prevent feed back that might otherwise result when the system is operated in accordance with one of the contemplated modes of operation. The mode of operation referred to is that one where one station is conditioned for transmission and reception at full volume. Then, when the other station changes over from transmitting to receiving there is a likelihood that feed back will occur for a moment because of the fact that cutting off the "B" supply on making such a change does not immediately render inoperative the amplifier. By concurrently short-circuiting the output transformer and cut-

ting off the "B" supply, even momentary feed back is eliminated. The switch blade is adapted in all three of its displaced positions to connect the output of the amplifier to conductor 36 and selector switch 26.

The apparatus at station 2 differs from that at station 1 only in the manner of connection of the selector switch 27 and receiver 14 to the inter-station conductors. The three blades 68, 69 and 70 of selector switch 27 are adapted to complete a circuit to inter-station conductors 21, 23 and 24, which are the inter-station conductors for stations other than station 2. The receiver 14 at station 2 is normally connected to inter-station conductor 22, the inter-station conductor associated with station 2, through a conductor 71 leading from the latter to the combined power and communication control switch 18. It is believed that further description of the apparatus at station 2 is unnecessary because it corresponds exactly with that found at station 1.

With the power supply conductors connected to suitable sources of power at each station and the switches in the normal positions illustrated, the system is conditioned for the calling, at full volume, of one or more stations by an operator at any one of the stations. For instance, the operator at station 1 can call station 2 by closing switch 28 and operating control switch 17 to its lowermost position. In this position, as previously described, the output of amplifier 11 is connected directly to inter-station conductor 22 through switch blades 44 and 28, while switch blade 41 closes a circuit from conductor 47 to conductor 48 to connect the "B" supply to the amplifier. Switches 42 and 43 are in circuit opening position, thereby disconnecting receiver 13 at station 1 from the system. Since transmitter 15 is permanently connected to the input of the amplifier, speech is transmitted from station 1 to receiver 14 at station 2, which is, when switch 18 is in its normal position, connected directly to its associated inter-station conductor 22. Receiver 14 is operated at full volume and persons anywhere in the vicinity thereof the apprised of the fact that an operator at some other station is calling.

If the operator at station 2 desires to respond to the call, he closes selector switch 68 connecting the output of the amplifier 12 to inter-station conductor 21, the inter-station conductor associated with station 1, the operator at station 1 having in the meantime released his switch, which returns to its indicated position. If the operators then desire to establish two-way communication, the communication control switches are actuated into their second displaced positions, in which it may be remembered, they are adapted to remain. In these positions, resistance 58 at station 1 and a similar resistance at station 2 are placed in series with the receiver voice coils to reduce the volume and prevent feed back, without disturbing the impedance match between the associated output transformer coil and receiving circuit in a manner that has been previously described. After the conversation has been completed, the operators simply return the communication control switches to their normal positions and condition the stations for further calls.

If the operator at one station, for instance station 2, desires to operate at full volume instead of reduced volume because of a high noise level at the station, as described in the previous paragraph, he can do so by operating control switch 27 into its uppermost or third displaced position. This operation results in the connection of receiver 14 directly to inter-station conductor 22 and the transmitter to inter-station conductor 21 through the amplifier. In order to effect two-way communication, it is now necessary for the operator at station 1 to operate control switch from its lowermost or "talk" position to transmit to station 2 and to release the switch to receive from station 2. Transmission from station 1 is accomplished through amplifier 11, the output of which is connected to inter-station conductor 22. During transmission the receiver 13 is disconnected from inter-station conductor 21 at switch blade 42, so that the feed back circuit is broken. Reception at station 1 is accomplished through amplifier 12 at station 2 and during reception the "B" supply to amplifier 11 is cut off and the output transformer of the latter short-circuited. As explained previously, feed back is prevented even though the amplifier is not immediately rendered inoperative by cutting off the supply.

The operators at the various stations can initiate communication also by operating the communication control switches to their second displaced positions. This mode of operation has the advantage that if the operator at a called station responds by similar operation of the control switch thereat, the system is immediately conditioned for full two-way communication at reduced volume.

The described system may be advantageously operated in another mode without occurrence of feed back. According to this mode the operator at the station desiring to talk has merely to operate his control switch to its lowermost position, and the operator at the other station permits the control switch thereat to remain in its normal position. When it is desired to reverse the direction of communication, the positions of the switches at the two stations are reversed.

The preceding portion of the description of operation has been directed solely to communication between stations 1 and 2. However, if the operator at station 1 desires to communicate with a third station, he would simply close switch 29 or 30, depending upon which of the remaining stations he desires to communicate with. Thereafter, the operation would be substantially the same as described above. It might be noted at this point, that when the operator at station 1 is communicating with the operator at station 3, the operator at station 2 cannot enter into the communication unless the operators at stations 1 or 2 permit it. This results from the fact that the receiver at station 2 is connected to the inter-station conductor 22 so that it is possible for the operator at station 2 to listen only when the selector switches at the other stations are closed to connect the output from the stations to the inter-station conductor 22.

The system can be conditioned for a conference between a plurality of stations, simply by closing all of the various selector switches, thereby to connect all the stations in parallel.

While only a single embodiment of the invention has been illustrated and described, it should be understood that it is susceptible of other and further modifications. For instance, certain features of the invention are adapted for use in systems in which different types of receiving and transmitting means are used, as where the usual type microphones are used as transmitters in place of the loudspeaker units illustrated. It should be understood further, that the specific

embodiment is not intended to limit the scope of invention in any way.

What I claim is new and wish to secure by United States Letters Patent is as follows:

1. The method of preventing feed back in a multiple station intercommunication system in which each station is provided with a separate voice receiving and transmitting means adapted to be connected in the system so that the transmitting means at one station is connected to the receiving means at another for simultaneous two-way communication through an interstation circuit, and with amplifier means in circuit between associated transmitting and receiving means adjusted to amplify transmitted messages to a volume sufficiently high to create feed back if the stations are connected for simultaneous two-way transmission, which comprises operating the receiving means at a station at reduced volume when both the receiving and transmitting means at that station are connected for transmitting to and receiving from another station simultaneously through said interstation circuit, and at high volume when the receiving means alone at a station is connected to said circuit for reception.

2. In a multiple station intercommunication system, the combination including, separate voice receiving means and transmitting means at each station, switch means at each station adapted to connect the reciving means thereat for reception at high volume, said switch means being operable to a displaced position to connect both the receiving and transmitting means in the system for two-way communication, and means for reducing the volume of the receiving means adapted to be rendered effective when said switch means is operated to its displaced position.

3. In an intercommunication system, the combination including, a plurality of stations, each having voice receiving and transmitting means adapted to be connected so that the transmitting means at one station is operatively connected to the receiving means at another, an interstation circuit for so interconnecting the stations, amplifier means in circuit between associated transmitting and receiving means adjusted to amplify the messages to a volume sufficiently high to create feed back if the stations are connected for simultaneous two-way transmission, volume decreasing means at each station, and means including circuits and control devices at each station adapted to condition each station for reception at high volume through the interstation circuit and operable to render said volume decreasing means effective when the transmitting means at that station is operatively connected in circuit with the receiving means at another to complete connections for simultaneous two-way communication.

4. In a multiple station intercommunication system, the combination including, separate electrical voice receiving means and transmitting means at each station, switch means adapted to connect said receiving means in the system for reception at high volume, said switch means being operable to a displaced position to connect both the receiving and transmitting means in the system for two-way communication, and resistance means adapted to be placed in circuit with said receiving means for reducing the volume of said receiver when said switch means is operated into its displaced position.

5. In an intercommunication system, the combination including a plurality of stations, each having receiving and transmitting circuits, said receiving circuits having an impedance substantially equal to that of the transmitting circuits, voice receiving means in said receiving circuits, impedance means adapted to be placed in circuit with the voice receiving means to reduce the output volume thereof and to maintain substantially constant the impedance of said receiving circuit, and communication control means adapted simultaneously to effect interconnection of said receiving and transmitting circuits and to place said impedance means in circuit with the voice receiving means.

6. In an intercommunicating system, the combination including a plurality of stations, separate voice receiving means and transmitting means at each station, amplifiers at each station having input and output coils, said output coils having impedances matching those of the receiving means, switch means adapted to connect said receiving means in the system for reception at high volume, said switch means being operable to a displaced position to connect both the receiving and transmitting means in the system for two-way communication, and resistance means adapted to be placed in circuit with said receiving means for reducing the volume of said receiver when said switch means is operated into its displaced position, said resistance means being so proportioned and arranged with respect to the receiving means that the combined impedance thereof remains substantially the same as that of the receiving means alone.

7. In an intercommunicating system, the combination including a plurality of stations, separate voice receiving means and transmitting means at each station, amplifiers at each station having input and output coils, said output coils having impedances matching those of the receiving means, switch means adapted in a first position to connect said receiving means in the system for reception at high volume, said switch means being operable to a displaced position to connect both the receiving and transmitting means in the system for two-way communication, first and second resistance means adapted to be placed in series and parallel, respectively, with the receiving means for reducing the volume output of said receiver and maintaining the combined resistance of both said resistances and voice receiving means substantially constant when said switch is operated into its displaced position.

8. In an intercommunication system, the combination including a plurality of stations, separate voice receiving and transmitting means at each station, an amplifier at each station, means at each station adapted to be placed in circuit with the receiving means for reducing the volume obtainable therefrom, interstation conductors between stations, and switch means at each station for controlling the establishment of communication circuits between stations, said switch means being so constructed and arranged with respect to the apparatus and circuits that they normally condition the receiving means at the various stations for reception at high volume of calls from the remaining stations and are manually operable to place said volume reducing means in circuit with the receiving means to establish two-way communication between stations at reduced volume.

9. In an intercommunication system, the combination including a plurality of stations, sepa-

rate voice receiving and transmitting means at each station, normally inoperative amplifier means conditioned for immediate operation at each station, inter-station conductors between stations, and switch means at each station constructed and arranged normally to connect the voice receiving means thereat to an inter-station conductor for reception of a call from another station and short-circuit the amplifier output, and operable to a displaced position simultaneously to render said amplifier operative and to connect the amplifier output to an inter-station conductor.

10. In an intercommunication system, the combination including a plurality of stations, separate voice receiving and transmitting means at each station, normally inoperative amplifier means conditioned for immediate operation at each station, interstation conductors between stations, switch means at each station constructed and arranged normally to connect the voice receiving means thereat to an inter-station conductor for reception of a call from another station and short-circuit the amplifier output, and operable to a displaced position simultaneously to render said amplifier operative and to connect the amplifier output to an inter-station conductor, and means biasing said switch means for movement from said displaced to said normal position.

11. In an intercommunication system, the combination including a plurality of stations, separate voice receiving and transmitting means at each station, an amplifier at each station, inter-station conductors between stations, and switch means at each station for controlling the establishment of communication circuits between stations, said switch means being so constructed and arranged with respect to the apparatus and circuits that they normally condition the receiving means at the various stations for reception of calls from the remaining stations at high volume and are operable to displaced positions in which two-way communication between stations can be maintained at reduced volume.

12. In an intercommunication system, the combination including a plurality of stations, voice receiving and transmitting means at each station, an amplifier at each station, inter-station conductors between said stations, and a single communication control switch at each station for controlling communication between stations, each of said control switches being so constructed and arranged with respect to the apparatus that it is operable to a first position to condition the stations for reception through amplifiers at remote stations, to a second position, from which it is automatically returned to said first position upon release, to condition the station for transmission through its own amplifier, and to a third position in which it is adapted to remain until manually moved therefrom to condition the station for both transmission and reception, whereby two-way communication can be maintained between stations without manipulation of switches after operation of said switches at two stations to their third positions.

13. In an intercommunication system, the combination including a plurality of stations, voice receiving and transmitting means at each station, amplifier means at each station, and plural position switch means at each station for controlling the establishment of communication circuits between said stations, said switch means being so constructed and arranged with respect to the apparatus and circuits that they are operable to positions in which they condition the stations for reception at high volume, are operable to other positions to condition the stations for transmission at high volume and to further positions to condition the stations for reception at reduced volume and transmission at high volume.

14. In an intercommunication system, the combination including a plurality of stations, voice receiving and transmitting means at each station, amplifier means at each station, plural position switch means at each station for controlling the establishment of communication circuits between said stations, said switch means being so constructed and arranged with respect to the apparatus and circuits that they are operable to positions in which they condition the stations for reception at high volume, are operable to other positions to condition the stations for transmission at high volume and to further positions to condition the stations for reception at reduced volume and transmission at high volume, and means biasing said switches for movement from said other positions to said normal positions.

15. An intercommunication system, including in combination a plurality of stations, independent inter-station conductors for each station, separate voice receiving means and transmitting means at each station, an amplifier at each station conditioned for immediate operation upon connection of a "B" supply thereto, the transmitting means at each station being connected directly to the input of the amplifier thereat, means including separate plural position switches, all mechanically interconnected for simultaneous operation for controlling the connection of the output of the amplifier to inter-station conductors other than that associated with the station, the connection of the receiving means to the inter-station conductor associated with the station, the connection of the "B" supply to the amplifier, and the connection of a first resistance in series and a second resistance in parallel to the receiving means, said switches being operable to a normal position in which the receiving means is connected directly to its associated inter-station conductor, the amplifier "B" supply is disconnected, the output thereof is short-circuited, whereby the stations are all conditioned for reception from the other stations at high volume, said switches being operable to a displaced position in which they remain until manually operated therefrom and in which the receiving means is connected to its associated inter-station conductor through said series resistance, the amplifier is connected to the "B" supply, the second resistance is connected in parallel to the receiving means, and the output of the amplifier is connected to the other inter-station conductors, whereby two-way communication may be maintained between any two stations at reduced volume without necessity of further manipulation of switches.

16. An intercommunication system, including in combination a plurality of stations, independent inter-station conductors for each station, separate voice receiving means and transmitting means at each station, an amplifier at each station conditioned for immediate operation upon connection of a "B" supply thereto, the transmitting means at each station being connected directly to the input of the amplifier thereat, means including separate plural position switch-

es, all mechanically interconnected for simultaneous operation for controlling the connection of the output of the amplifier to inter-station conductors other than that associated with the station, the connection of the receiving means to the inter-station conductor associated with the station, the connection of the "B" supply to the amplifier, and the connection of a first resistance in series and a second resistance in parallel to the receiving means, said switches being operable to a normal position in which the receiving means is connected directly to its associated inter-station conductor, the amplifier "B" supply is disconnected, the output thereof is short-circuited and disconnected from the remaining inter-station conductors, whereby the stations are all conditioned for reception from the other stations at high volume, said switches being operable to a displaced position in which they are adapted to remain until manually operated therefrom and in which the receiving means is connected to its associated inter-station conductor through said first resistance, the amplifier is connected to its "B" supply, the second resistance is connected in parallel to the receiving means, and the output of the amplifier is connected to the other inter-station conductors, whereby two-way communication may be established between any two stations at reduced volume and without further manipulation of switches, and said switches being operable to another displaced position in which the receiving means is connected directly to its associated inter-station conductor, the amplifier is connected to its "B" supply, and the output of the amplifier is connected to the other inter-station conductors, whereby a station may be conditioned for transmission and reception at high volume without further manipulation of switches thereat.

17. An intercommunication system, including in combination a plurality of stations, independent inter-station conductors for each station, separate voice receiving means and transmitting means at each station, an amplifier at each station conditioned for immediate operation upon connection of a "B" supply thereto, the transmitting means at each station being connected directly to the input of the amplifier thereat, means including separate plural position switches, all mechanically interconnected for simultaneous operation for controlling the connection of the output of the amplifier to inter-station conductors other than that associated with the station, the connection of the receiving means to the inter-station conductor associated with the station, the connection of the "B" supply to the amplifier, and the connection of a first resistance in series and a second resistance in parallel to the receiving means, said switches being operable to a normal position in which the receiving means is connected directly to its associated inter-station conductor, the amplifier "B" supply is disconnected, the output thereof is short-circuited and disconnected from the remaining inter-station conductors, whereby the stations are all conditioned for reception from the other stations at high volume, said switches being operable to a displaced position in which they are adapted to remain until manually operated therefrom and in which the receiving means is connected to its associated inter-station conductor through said first resistance, the amplifier is connected to its "B" supply, the second resistance is connected in parallel to the receiving means, and the output of the amplifier is connected to the other inter-station conductors, whereby two-way communication may be established between any two stations at reduced volume and without further manipulation of switches, said switches being operable to another displaced position in which the receiving means is connected directly to its associated inter-station conductor, the amplifier is connected to its "B" supply, and the output of the amplifier is connected to the other inter-station conductors, whereby a station may be conditioned for transmission and reception at high volume without further manipulation of switches thereat, and said switches being operable to a further displaced position from which it is biased to return to its normal position in which the receiving means is disconnected from its associated inter-station conductor, the amplifier is connected to its "B" supply and the output of the amplifier is connected to the inter-station conductors, whereby any station can call any other station.

18. An intercommunication system, including in combination a plurality of stations, independent inter-station conductors for each station, separate voice receiving means and transmitting means at each station, an amplifier at each station conditioned for immediate operation upon connection of a "B" supply thereto, the transmitting means at each station being connected directly to the input of the amplifier thereat, means including separate plural position switches, all mechanically inter-connected for simultaneous operation for controlling the connection of the output of the amplifier to inter-station conductors other than that associated with the station, the connection of the receiving means to the inter-station conductor associated with the station, the connection of the "B" supply to the amplifier, and the connection of a first resistance in series and a second resistance in parallel to the receiving means, said switches being operable to a normal position in which the receiving means is connected directly to its associated inter-station conductor, the amplifier "B" supply is disconnected, the output thereof is short-circuited and disconnected from the remaining inter-station conductors, whereby the stations are all conditioned for reception from the other stations at high volume, said switches being operable to a displaced position in which they are adapted to remain until manually operated therefrom and in which the receiving means is connected to its associated inter-station conductor through said first resistance, the amplifier is connected to its "B" supply, the second resistance is connected in parallel to the receiving means, and the output of the amplifier is connected to the other inter-station conductors, whereby two-way communication may be established between any two stations at reduced volume and without further manipulation of switches, said switches being operable to another displaced position in which the receiving means is connected directly to its associated inter-station conductor, the amplifier is connected to its "B" supply, and the output of the amplifier is connected to the other inter-station conductors, whereby a station may be conditioned for transmission and reception at high volume without further manipulation of switches thereat, said switches being operable to a further displaced position from which it is biased to return to its normal position in which the receiving means is

disconnected from its associated inter-station conductor, the amplifier is connected to its "B" supply and the output of the amplifier is connected to the inter-station conductors, whereby any station can call any other station, and means biasing said switches from said further displaced position to said normal position whereby a first station can be conditioned for transmission and reception at high volume by operation of the switches thereat to said other displaced position and another station can be placed in communication therewith without occurrence of feed back by operation of the switches thereat to their further displaced and normal positions alternately to connect either the transmitter or receiver to the first station.

19. A unit for use in an intercommunicating system, including in combination, a voice reproducer of the loudspeaker type, an interstation conductor, resistance means, and means including a switch and circuits controlled thereby for selectively connecting the reproducer directly to said interstation conductor or in series with said resistance means to said interstation conductor.

20. For use in a multi-station intercommunicating system, the combination including, a voice reproducer of the loudspeaker type, a microphone, an amplifier having input and output connections, said microphone being connected to the input connections, a pair of interstation circuits, resistance means, and means including electrical circuits and a switch controlling said circuits operable into a first position to connect said reproducer directly to one of said interstation circuits and to a second position to connect said reproducer to said one of said interstation circuits through said resistance means and the output of said amplifier to the other of said pair of interstation circuits.

21. In an intercommunicating system, the combination including, a plurality of stations each having a voice reproducer, a microphone, and means including a switch and circuits controlled thereby for controlling communication between stations, said switch means being so constructed and arranged in said circuits that one-way communication in either direction can be carried on through predetermined alternate operation of the switches at two stations, and two-way communication can be carried on without further manipulation of said switches upon operation thereof into another position.

22. In an intercommunicating system, the combination including, a plurality of stations each having a voice reproducer of the loudspeaker type, a microphone, an amplifier, electrical connections for directly connecting the microphone to the input of the amplifier, and means including a switch and reproducer and amplifier output circuits controlled thereby for controlling communication between stations, said switch means being so constructed and arranged in said circuits that one-way loudspeaking communication in either direction can be carried on through predetermined alternate operation of the switches at two stations, and two-way loudspeaking communication can be carried on without further manipulation of said switches upon operation thereof into another position.

23. In an intercommunicating system, the combination including a plurality of stations each having a voice reproducer of the loudspeaker type, a microphone, an amplifier, electrical connections directly connecting the microphone to the input of the amplifier, and means including a plural position switch and reproducer and amplifier circuits controlled thereby for controlling communication between stations, said switch means being so constructed and arranged that messages can be transmitted in alternate directions between a plurality of stations at a relatively high volume by alternate operation of said switches at the stations and two-way communication can be carried on at a lower volume without manipulation of said switches.

24. In an intercommunicating system, the combination including a plurality of stations, separate voice receiving and transmitting means at each station, normally inoperative amplifier means at each station conditioned for immediate operation upon the supply of "B" potential thereto, interstation conductors between stations, said voice transmitting means being directly connected to the amplifier input, and switch means at each station constructed and arranged normally to connect the voice receiving means thereat to an interstation conductor for the reception of a call from another station and to disconnect the output of the amplifier from the interstation conductors, and operable to a displaced position simultaneously to render said amplifier operative and to connect the amplifier output to an interstation conductor.

25. In a multiple station intercommunication system, the combination including, an amplifier, a microphone connected to the input thereof, a loudspeaker at each station, volume reducing means, a control switch and circuits controlled thereby at each station so constructed and arranged with respect to the amplifier, loudspeaker and volume reducing means that messages may be transmitted from said station to another similar station in alternate directions at high volume by alternate operation of the switches at the two stations and two-way communication may be carried on at reduced volume without manipulation of the switches.

26. In an intercommunication system, the combination including, a plurality of stations, each having separate voice transmitting and receiving means, said receiving means being adapted to be connected to transmitting means at another station through an interstation conductor, an amplifier, circuits for connecting said voice transmitting means to the input of the amplifier, means including a resistor for decreasing the volume of said receiving means, and means including a switch and circuits controlled thereby for connecting the voice receiving means at one station directly or through said resistor to said interstation conductor.

27. In an intercommunication system, the combination including, a plurality of stations, each having separate voice transmitting and receiving means, an amplifier, circuits for connecting said voice transmitting means to the input of the amplifier, said receiving means being adapted to be connected to transmitting means at another station through an interstation conductor and having an impedance substantially equal to the impedance of the output of the amplifier, means for decreasing the volume of said receiving means, and means including circuits, resistance means and a switch for connecting the voice receiving means at one station directly to said interstation conductor or through said resistance means, said resistance means being so proportioned and arranged that the impedance of the receiving circuit remains substantially constant.

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