

June 9, 1936.

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2,043,348

COMMUNICATION SYSTEM

Filed March 30, 1932

3 Sheets-Sheet 1

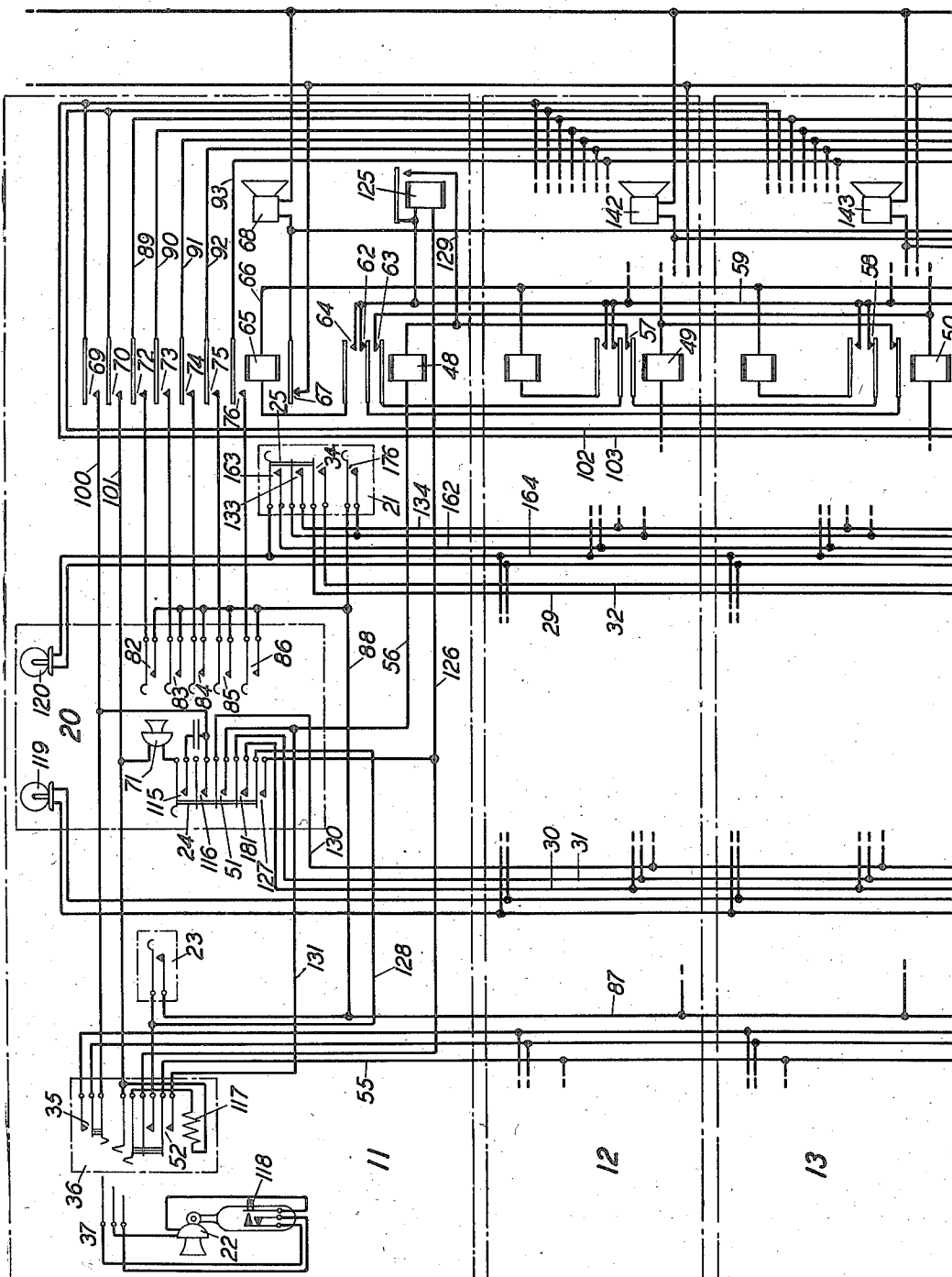


FIG. 1

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3 Sheets-Sheet 2

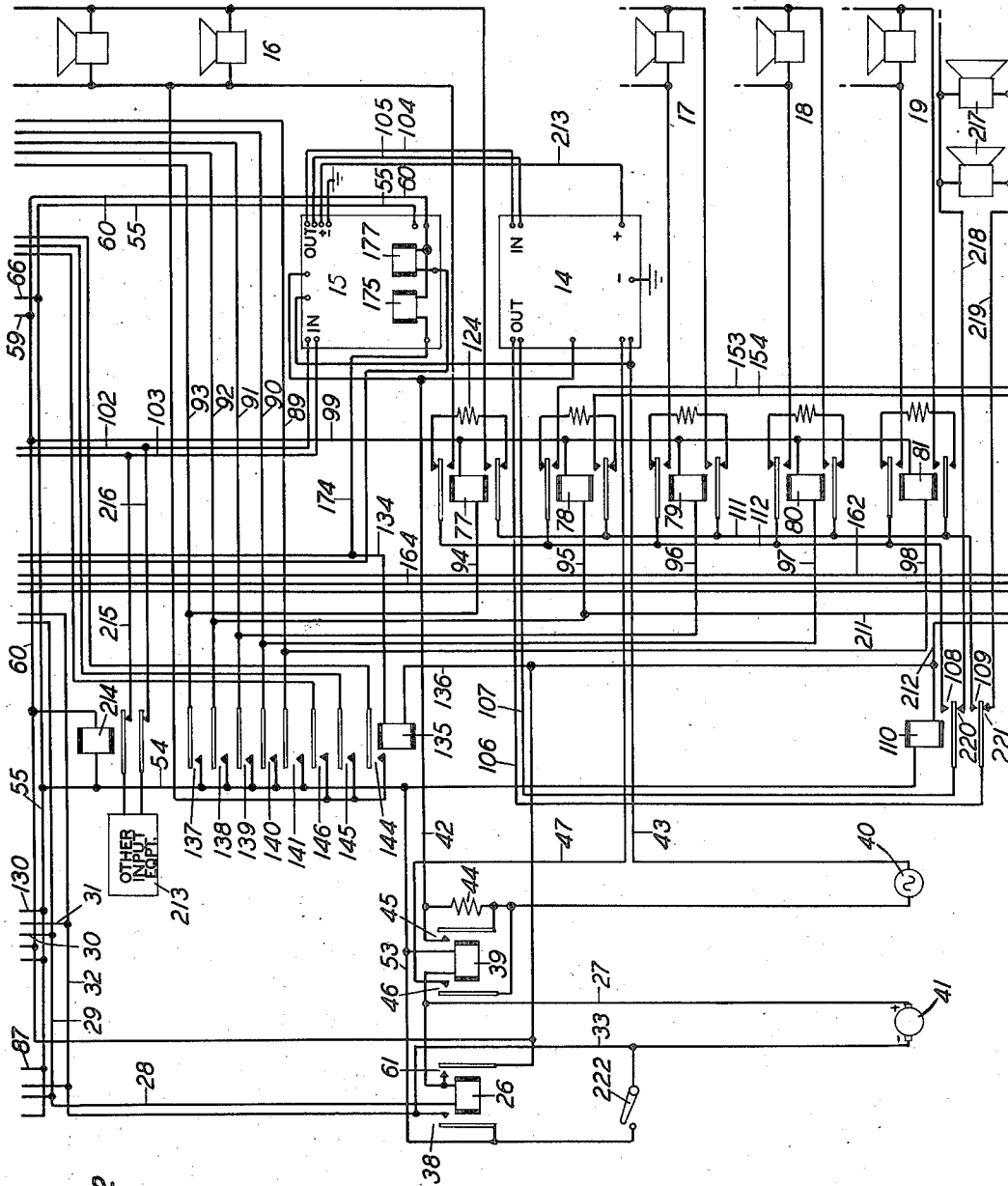


FIG. 2

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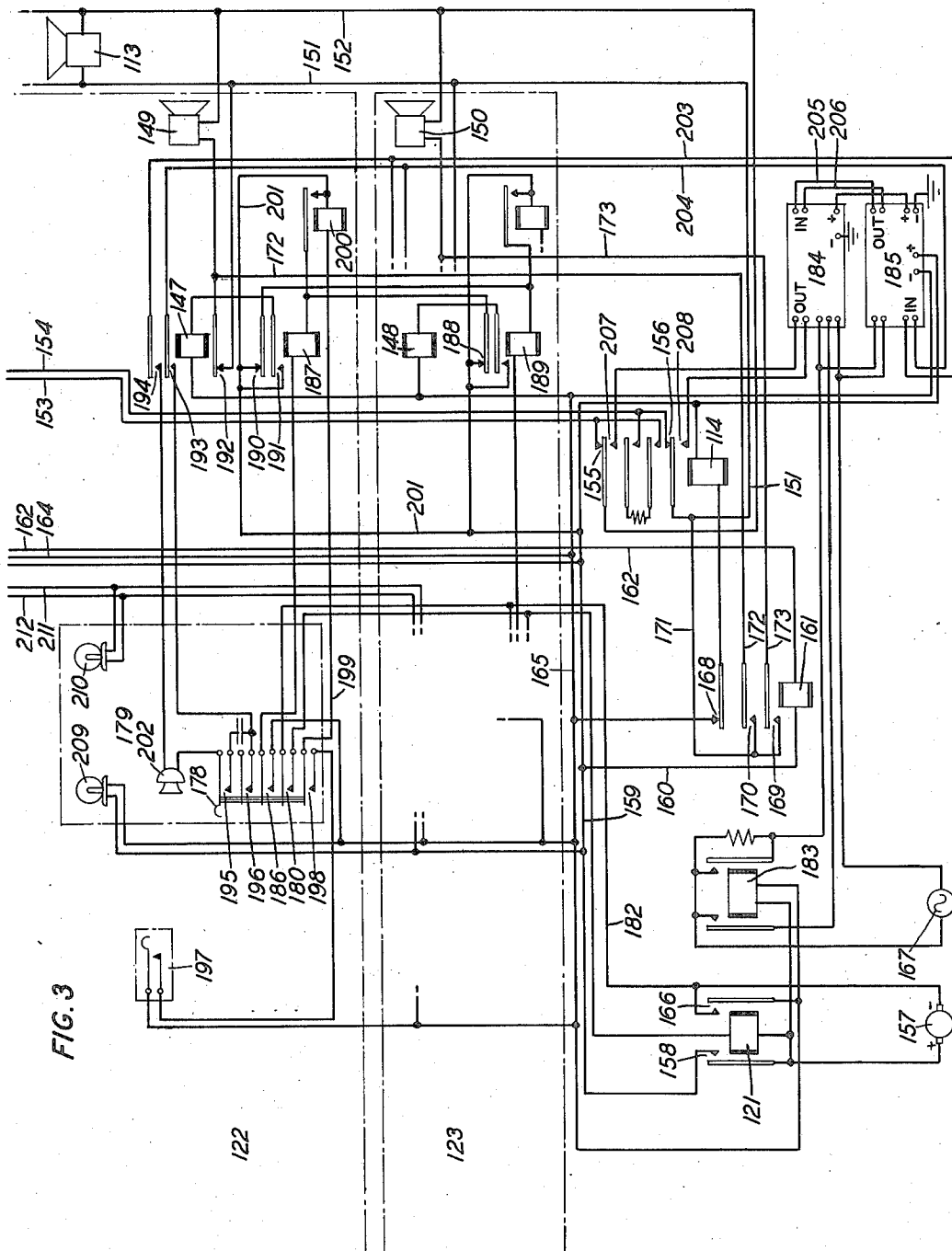


FIG. 3

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COMMUNICATION SYSTEM

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8 Claims. (Cl. 179-2)

This invention relates to communication systems and the object of the invention is to improve and correlate several such systems so as to obtain a desired priority between the transmitting stations of the several systems for the various purposes for which they may be used.

Announcing systems have been proposed heretofore in which a number of groups of receivers are energized from a single amplifying system with which a number of transmitting stations are associated, each having selecting switches for connecting the desired receiver groups and means for locking out other transmitting stations to avoid interruptions while messages are being transmitted.

In some applications, such as naval ships for example, it has been found desirable to provide several such systems which normally function independently of each other. According to the present invention, the transmitting stations of one of these systems are equipped to transmit either telephone messages or code signals for alarm purposes and, for general announcing purposes, means is provided at such stations for connecting to the system the receivers of the other systems if they are not already in use. For alarm purposes such stations may obtain control of all the receivers of the several systems whether or not they are already in use.

An important feature of the invention is means at each station which may be operated to permit a station locked out by another station using the system, to assume control of the system when the circumstances warrant such action. If another station operates its corresponding mechanism, such other station is operatively connected but cannot disable the first station as it would under normal operating conditions.

These and other features of the invention will be more clearly understood from the following detail description and the accompanying drawings in which Figs. 1, 2 and 3 considered together show a complete system according to the invention.

The system shown by way of illustration comprises two normally independent but interconnected systems one of which is shown on Figs. 1 and 2 and the other on Fig. 3. The first system comprises three transmitting stations 11, 12 and 13, amplifiers 14 and 15 and several groups of loud speaking receivers 16, 17, 18 and 19. Each station, as shown in detail for station 11 is equipped with a telephone transmitting set 20, an alarm signal set 21, a portable transmitter 22 worn by the operator and a cut-in switch 23 for

obtaining control of the system when it is already in use by another station. Since stations 12 and 13 are identical with station 11, similar connections are omitted in order to simplify the drawings.

The system of Figs. 1 and 2 is put in condition for operation by first closing either the master switch 24 of the set 20 or the master switch 25 of the signal set 21 according to whether speech or code signals are to be transmitted. Relay 26 (Fig. 2) is thereby operated by current from the positive of the direct current source 41 traversing a circuit including conductor 27, the relay winding, conductors 28, 29 and 30, contact 31 of the master switch 24, conductors 31, 32 and conductor 33 leading to the negative terminal of the generator or other source of supply 41.

If the master switch 25 is operated instead of switch 24 the circuit for relay 26 is completed by the current in conductor 29 traversing contact 34 of switch 25 and conductor 32 to negative as before. If speech is to be transmitted by means of the portable transmitter the circuit for this relay is made by contact 35 of the jack 36 when the transmitter plug 37 is inserted.

The operation of relay 26 closes contact 38 to make current available for operating the other relays and operates relay 39 which connects alternating current from the source 40 directly to the power supply unit of the amplifiers 14 and 15. It will be observed that before the operation of this relay the current flows to the amplifiers by way of conductors 42, 43 and resistance 44 which is sufficient to keep the amplifier tube filaments just below the emission temperature. The operation of the relay 39, however, closes contact 45 which shunts out the resistance so that the filaments are quickly raised to operating temperature. The closing of contact 46 completes the circuit for the rectifier of amplifier 14 over conductor 47 so that plate voltage is made available for amplifier 14 and for amplifier 15 by means of conductor 213. This arrangement avoids delay in starting by making it unnecessary to wait for the tubes to become heated.

Priority relays 48, 49 and 50 are provided, one for each of the transmitting stations of Fig. 1 and the first station to operate its relay gets exclusive control of the system. For example at station 11 relay 48 is operated by the closing of contact 51 of switch 24, or contact 52 of jack 36, the circuit extending from negative conductor 33, contact 38, of relay 26, conductors 53 and 54 to conductor 55, then to either contact 51 or 52, conductor 56, the winding of relay 48, contact 57

of relay 49, contact 58 of relay 50 to conductors 59, 60, contact 61 of relay 26 and conductor 27 to positive.

The operation of relay 48 opens contact 62 in the operating circuit of relay 49 and contact 63 in the operating circuit of relay 50 so that neither station 12 nor 13 can now obtain control of the system in the normal manner. Relay 48 also closes contact 64 to complete a circuit for relay 55 extending from positive conductor 59, contact 64, winding of relay 65, conductor 66 to negative conductor 55. Relay 65 opens contact 67 in the circuit of local receiver 68 so that "singing" due to acoustic coupling between the local transmitter and the local receiver is prevented. If preferred, a resistance of suitable value may be connected across contact 67 so that the breaking of the contact merely reduces the volume level at which the local receiver can operate. Relay 65 also closes contacts 69, 70 in the talking circuit of transmitters 22 and 71 and contacts 72, 73, 74, 75 and 76 which prepare operating circuits for receiver group selecting magnets 77, 78, 79, 80 and 81 (Fig. 2). The operator then closes one or more of the locking keys 82 to 86 according to the number of receiver groups to be energized. The corresponding relays are then operated over a circuit extending from negative conductor 55, conductors 87, 88, through the operated keys, contacts 72 to 76 of relay 65, conductors 89 to 93, conductors 94 to 98, through the relays 77 to 81 to conductor 99 and positive conductor 60.

The operation of these relays completes the talking circuit which is as follows: from transmitter 22 or 71, conductors 100, 101, contacts 69, 70, conductors 102, 103 to the input of amplifier 15 from the output of this amplifier to the input of power amplifier 14 by conductors 104, 105, from the output of amplifier 14 by conductors 106, 107, through contacts 108, 109 of relay 110 (previously operated by the operation of relay 26) to conductors 111, 112, associated with the armatures of relays 77 to 81 and from the armatures of these relays to the respective receiver groups 16, 17, 18 and 19 and group 113 of the system of Fig. 3, when relay 114 is not operated as explained below.

Messages may then be spoken into either transmitter for reproduction by all the selected receiver groups. In order to prevent variations in loading on the amplifier system in accordance with the number of receivers being energized, each group relay has associated therewith a resistance, such as 124 of relay 77, which simulates the impedance of the corresponding receiver group and is connected across the amplifier output conductors 111 and 112 whenever the relay is not operated. It will be noted that transmitter 71 is operatively connected into the talking circuit by contacts 115, 116 of the master switch 24 and that the insertion of plug 37 into jack 35 shunts the talking circuit by a resistance 117 which is disconnected only when transmitter 22 is actually in use by operating hand switch 118 associated with the transmitter. This resistance prevents the introduction of unnecessary noise into the receiver circuits while the operator is not actually speaking.

Each telephone set 20 is provided with signal lamps 119 and 120. Lamps 119 are lighted whenever relay 26 is operated, that is whenever any one of the stations of that system is using the system either for speech or alarm signals. Lamps 120 are lighted by the operation of relay 121 of the

system of Fig. 3, that is to say these lamps give an indication at stations 11, 12 and 13 whenever either of the stations 122 and 123 of the other system is using loud speaker group 113. In such case, relay 114 (Fig. 3) will be operated so that the operation of key 85 in telephone set 20 is not effective to place receiver group 113 under the control of station 11.

If an operator at station 12 or 13 desires to use the system and, ignoring the warning of his lamp 119 that the system is already in use, operates his master switch or plugs in his portable transmitter, he cannot in this way obtain control of the system since as already pointed out the operating circuits of priority relays 49 and 50 have been opened by the operation of priority relays 48. However, if any station has some urgent message to transmit while the system is already in use, the operator may operate both his master switch and his cut-in switch. At station 11, for example, the operation of cut-in switch 23 closes a circuit for cut-in relay 125 extending from positive conductor 59 through the relay, conductor 126, contact 127 on master switch 24, conductor 128, cut-in switch 23, conductor 87 to negative conductor 55. The operation of relay 125 operates priority relay 48 over a circuit extending from positive conductor 59, armature of relay 125, conductor 129, winding of relay 48, conductor 56, contact 51, conductor 130 to negative conductor 55. If instead of operating the master switch the portable transmitter is plugged in, the circuit of relay 48 is completed from conductor 56 by conductor 131, contact 52 of jack 35 to negative conductor 55. As before the operation of relay 48 gives control of the system to station 11 and disables stations 12 and 13 by opening the circuits of relays 49 and 50.

If the operator neglects to reopen his cut-in switch which is of the locking type, when he has finished his message, relay 48 is nevertheless released by the opening of contact 52, when transmitter plug 37 is removed, or by the opening of contact 51 on master switch 24 which returns to the unoperated position automatically when it is no longer held closed. Any other station may then use the system in the normal way. However, if a second station has an emergency message to transmit while station 11 is already operating by means of its cut-in key, the second operator may close his cut-in key to operate his priority relay so that his transmitter is also connected with the system in a manner similar to that already described with reference to station 11.

If under any of the operating conditions already described a station desires to send code signals over the system, the operator closes his alarm signal switch 25. The closure of contact 34 energizes the system as already described and contact 133 closes a circuit from negative conductor 88 through the contact to conductor 134, relay 135 (Fig. 2) and conductor 136 to positive through contact 61 of relay 26. The operation of relay 135 completes the operating circuits of all group receiver relays 77 to 81 from positive conductor 60 to negative conductor 55 through contacts 137 to 141, and the circuits of local receivers 68, 142 and 143 through contacts 144, 145 and 146, respectively.

When the system of Fig. 3 is not being used by either of the stations 122 or 123, relays 147 and 148 are unoperated so that local receivers 149, 150 are connected across conductors 151, 152

of loud speaker group 113 through the back contacts of the relays. Relay 114 will also be unoperated so that the operation of relay 78 (Fig. 2) connects group 113 to the output of amplifier 14 by means of conductors 153, 154 and back contacts 155, 156 of relay 114. If the system of Fig. 3 is being used, relay 121 (which corresponds to relay 26 in the other system) will be operated and current will flow from positive terminal of source 157 through contact 158 of the relay, conductors 159, 160, relay 161, conductor 162, contact 163 on master switch 25 (Fig. 1), conductors 164, 165 to negative terminal of source 157 through contact 166 on relay 121. The operation of relay 161 releases relay 114 by opening contact 168 to associate receiver group 113 with relay 78 of Fig. 2, thereby placing it under the control of alarm signal set 21 (Fig. 1). Relay 161 also closes contacts 169, 170 which connect local receivers 149, 150 to conductor 151 irrespective of the position of relays 147 and 148, by means of conductors 171, 172 and 173. Hence it is seen that the operation of switch 25 is effective to connect all receivers of both systems to amplifiers 14 and 15.

Contact 133 of master switch 25 which operated relay 135 also completes a circuit over conductor 174 for relay 175 in the amplifier 15. This relay converts the amplifier into an oscillator for signal purposes in the well known manner as described for example in Patent 1,571,357 to Whiting et al., February 2, 1926. The system is now in condition for transmitting code signals and the operation of key 176 in the set 21 alternately operates and releases relay 177 in the amplifier 15 to cause the amplifier to function as an oscillator intermittently and energize the receivers according to the code signals transmitted. Upon the completion of the message, key 176 and master switch 25 are released and all relays previously operated including the power supply relay 26 are thereby released so that the system may be reenergized by any other station desiring to transmit a message.

The system of Fig. 3 has already been partially described in connection with the operation of the stations of Fig. 1. This system is in general similar to that of Figs. 1 and 2 except that no portable transmitter, alarm signal stations or receiver group selecting circuits are provided. While the system as shown is effective in illustrating how two or more systems may be interconnected for emergency purposes, it will be understood that one or more of the above features may be added to the additional systems if desired.

The operation of master switch 178 of telephone set 179 at station 122 closes contact 180 to complete a circuit for relay 121. The operation of this relay connects conductor 159 to the positive terminal of source 157 to make current available for the operation of the rest of the system. The closing of contact 166 of the relay operates relay 133 which supplies current for the filaments and the plate current rectifier of the amplifiers 134, 135 from source 167 over circuits similar to those described in connection with relay 39 of Fig. 2. Contact 186 of the switch completes a circuit from negative through priority relay 187 to positive through back contact 188 of priority relay 189 of station 123, and the operation of relay 187 opens the circuit of relay 189 at contact 190 so that station 123 is now locked out. Relay 187 completes a circuit for relay 147 by closing contact 191 and the opera-

tion of relay 147 opens contact 192 to disconnect the local receiver 149 and complete at contacts 193, 194 the speech input circuit to the amplifier 185 previously prepared by the closing of contacts 195, 196 on the master switch 178.

As in the other system station 122 may obtain control of the receivers 113 even though the system is already in use by station 123 by operating the cut-in switch 197 in addition to the master switch 178. A circuit is then complete from negative through switch 197, contact 198 of switch 178, conductor 199, relay 200, conductor 201 to positive through contact 158 of relay 121. The operation of relay 200 completes a circuit for relay 137 independently of relay 139 and the operation of relay 137 gives control of the system to station 122 as before.

Currents representing speech originating at transmitter 202 enter the amplifier 185 over conductors 203, 204. The output of this amplifier enters amplifier 184 over conductors 205, 206 and the output of the latter amplifier terminates at contacts 207, 208 of relay 114. This relay is operated whenever relay 121 is operated except when its circuit is broken at contact 163 of relay 161 by the operation of an alarm signal switch in the system of Fig. 1. When operated, relay 114 connects contacts 207, 208 to conductors 151, 152 so that receivers 113 are energized by the currents from transmitter 202.

Each of the stations 122 and 123 is also equipped with signal lamps 209 and 210. The lamps 209 are lighted whenever relay 121 is operated that is, whenever either station is using the system and lamps 210 are lighted whenever the receivers 113 of this system are in use by any one of the stations of the other system. In such a case conductor 95 in the circuit of relay 78 is connected to negative through contact 138 of relay 135 and the circuit for lamp 210 extends from conductor 95 to conductor 211, through the lamps to conductors 212 and 213 to positive through contact 61 of relay 26.

In some cases it may be desirable to use the amplifiers of systems of this kind for other purposes when they are not in use. For example on naval ships they can be used in connection with sound picture equipment or with other sound reproducing apparatus to provide entertainment or instruction. In Fig. 2 the apparatus 213 which may be of any desired type is connected to the input of the amplifier 15 by relay 214 in its unoperated position by conductors 215, 216. The output conductors 196, 197 of amplifier 14 are connected to receivers 217 by conductors 218, 219 through contacts 220, 221 of relay 110 in its unoperated position. For this purpose the amplifiers are energized by operating switch 222 to complete a circuit for relay 39 without operating relay 26. If, however, while the amplifiers are being used in this manner it becomes necessary to use them for announcing or alarm signal purposes the operator proceeds to operate the system in the usual manner and the operation of relay 26 in any of the ways already described energizes relays 214 and 110 to disconnect the input apparatus from the amplifiers and transfer their output to the group selecting relays 77 to 81 so that the system may be used in the normal manner without delay.

While the invention has been described with reference to a particular embodiment, it will be understood that it may be modified in various ways within the scope of the following claims.

What is claimed is:

1. In a communication system the combination with at least two normally independently operative component parts each comprising a plurality of speech transmitting stations, an amplifier common to the stations, a receiver and means controllable from each of the stations for connecting the receiver to the amplifier, of selecting means at one of the transmitting stations in a first part of the system operable while the receiver of a second part of the system is connected to its amplifier for connecting said receiver to the amplifier of the first part of said system.

2. In a communication system the combination with at least two normally independently operative component parts each comprising a plurality of speech transmitting stations, an amplifier common to the stations, a receiver and receiver controlling means at each of the stations for connecting the receiver to the amplifier, of means associated with the amplifier in one of the parts for producing alarm signals, and means independent of the receiver controlling means of the speech transmitting stations for connecting the receivers of all parts of the system to the alarm signal means.

3. In a communication system the combination with at least two normally independently operative component parts each comprising a plurality of speech transmitting stations, an amplifier common to the stations, a receiver and means controllable from each of the stations for connecting the receiver to the amplifier, of means at one station in a first part of the system effective when another part of the system is not transmitting but while the receiver of the other part is connected to its amplifier for connecting the receiver of the other part to the amplifier of said first part of the system.

4. In a communication system, the combination with a plurality of transmitting stations, an amplifier common to the stations, a plurality of receivers associated with the amplifier and means at each of the stations for operatively connecting the stations with the amplifier, of means operated when one of the stations is so connected for disabling the other stations, and emergency means at the disabled stations operable while the stations are disabled for connecting them to the receivers.

5. In a communication system, the combina-

tion with a plurality of transmitting stations, a vacuum tube amplifier common to the stations, a plurality of receivers associated with the amplifier, and means at each of the stations for operatively connecting the station with the amplifier, of means independent of the transmitting station for maintaining the tube filaments of the amplifier heated but below emission temperature, and means responsive to the operation of any of the stations for raising the filaments to emission temperature.

6. In a communication system, the combination with a plurality of speech transmitting stations, a plurality of signal transmitting stations, an amplifier common to the stations, a receiver, and means controlled at each of the stations for connecting the station and the receiver to the amplifier, of another transmitting station, another amplifier and another receiver, means for connecting said other station to its amplifier and receiver, means at each of the speech transmitting stations operable only when said other receiver is not connected to its amplifier and means at each of the signal transmitting stations operative at all times to connect said other receiver to the common amplifier.

7. In a communicating system, the combination with a plurality of transmitting stations, an amplifier, a plurality of receivers, and means at each of the stations for connecting the station to the amplifier and the receivers, of sound reproducing apparatus and another receiver, normally open circuit connections between the apparatus and the amplifier and between the amplifier and said other receiver, and means for energizing the amplifier and closing said connections independently of the transmitting stations.

8. In a communicating station, the combination with a plurality of transmitting stations, an amplifier, a plurality of receivers, and means at each of the stations for connecting the station to the amplifier and the receivers, of sound reproducing apparatus and another receiver, circuit connections between the apparatus and the amplifier and between the amplifier and said other receiver, means for energizing the amplifier independently of the transmitting stations, and means responsive to the operation of one of the stations for automatically opening said circuit connections.

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