

March 31, 1936.

H. C. CURL

2,036,023

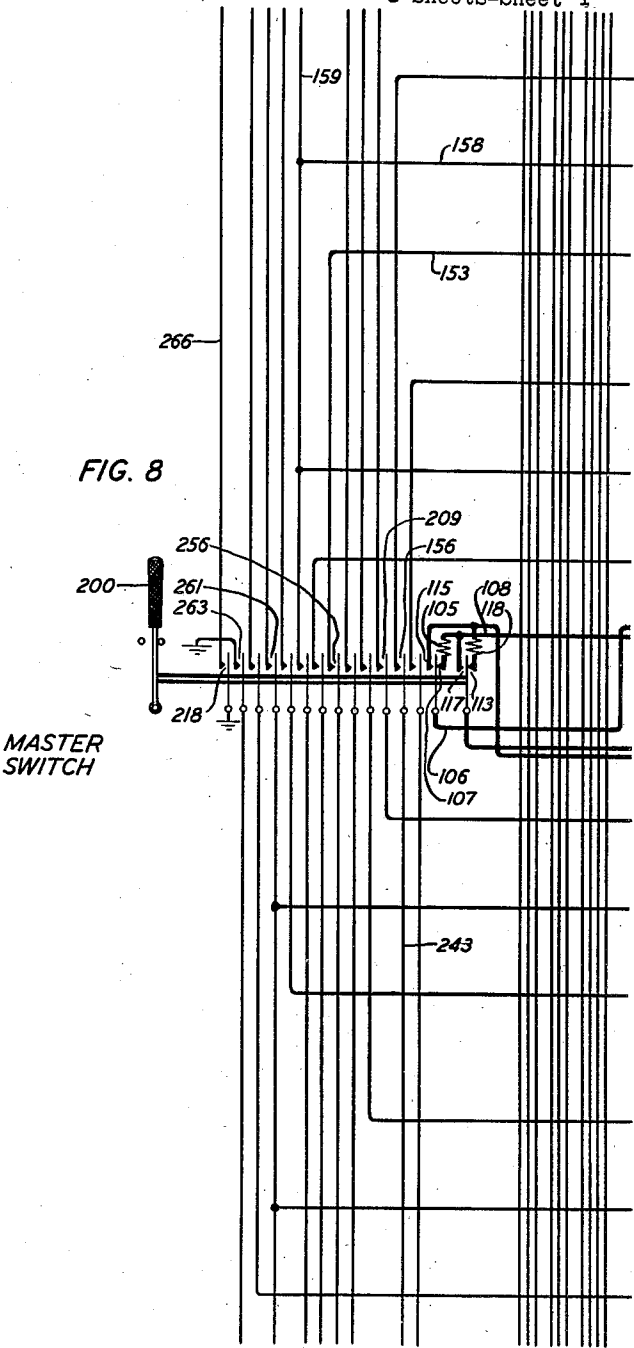
TELEPHONE SYSTEM

Filed June 9, 1933

8 Sheets-Sheet 1

FIG. 1

FIG. 2	FIG. 3	FIG. 4
FIG. 8	FIG. 9	
FIG. 5	FIG. 6	FIG. 7



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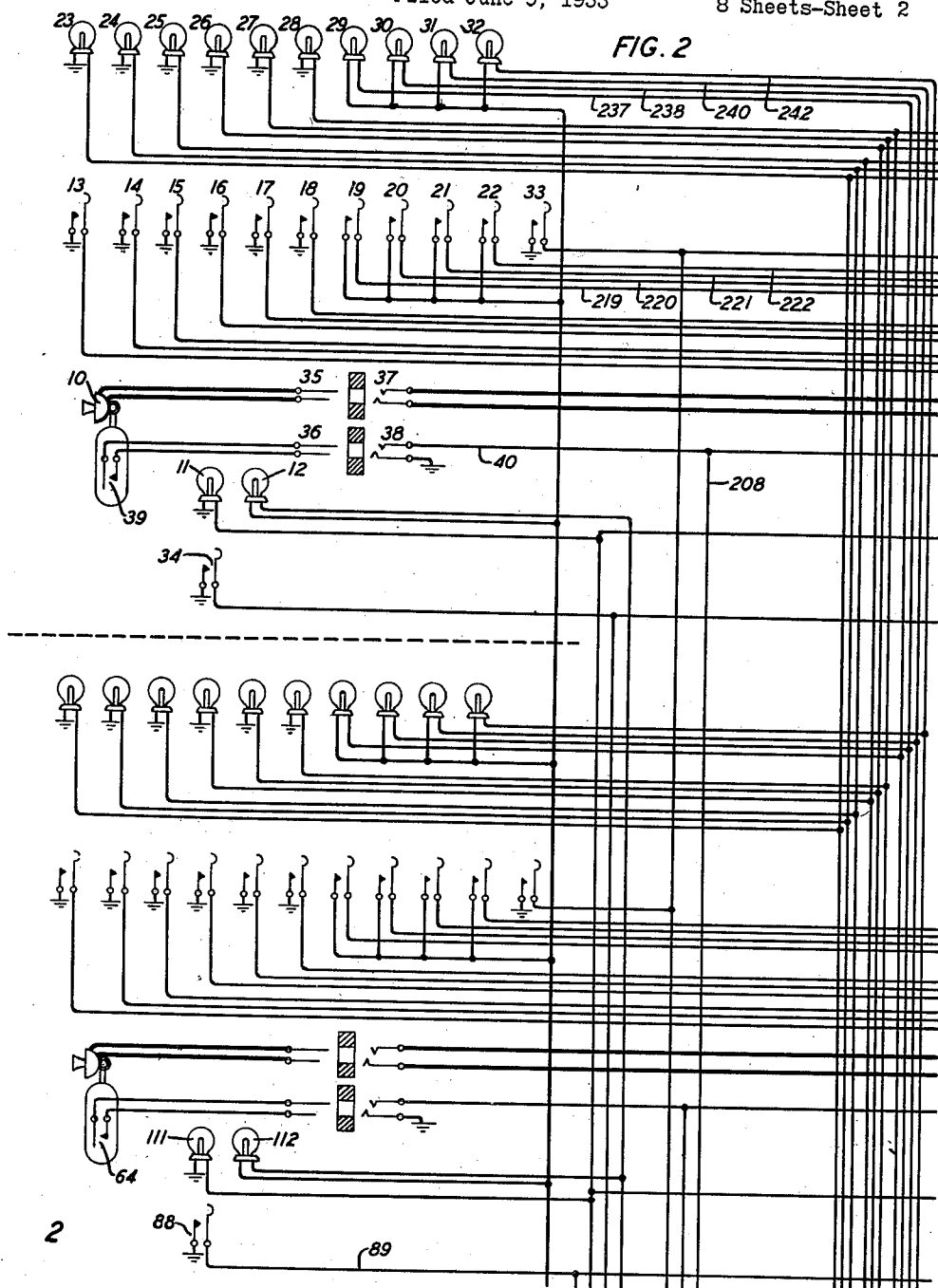
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8 Sheets-Sheet 2



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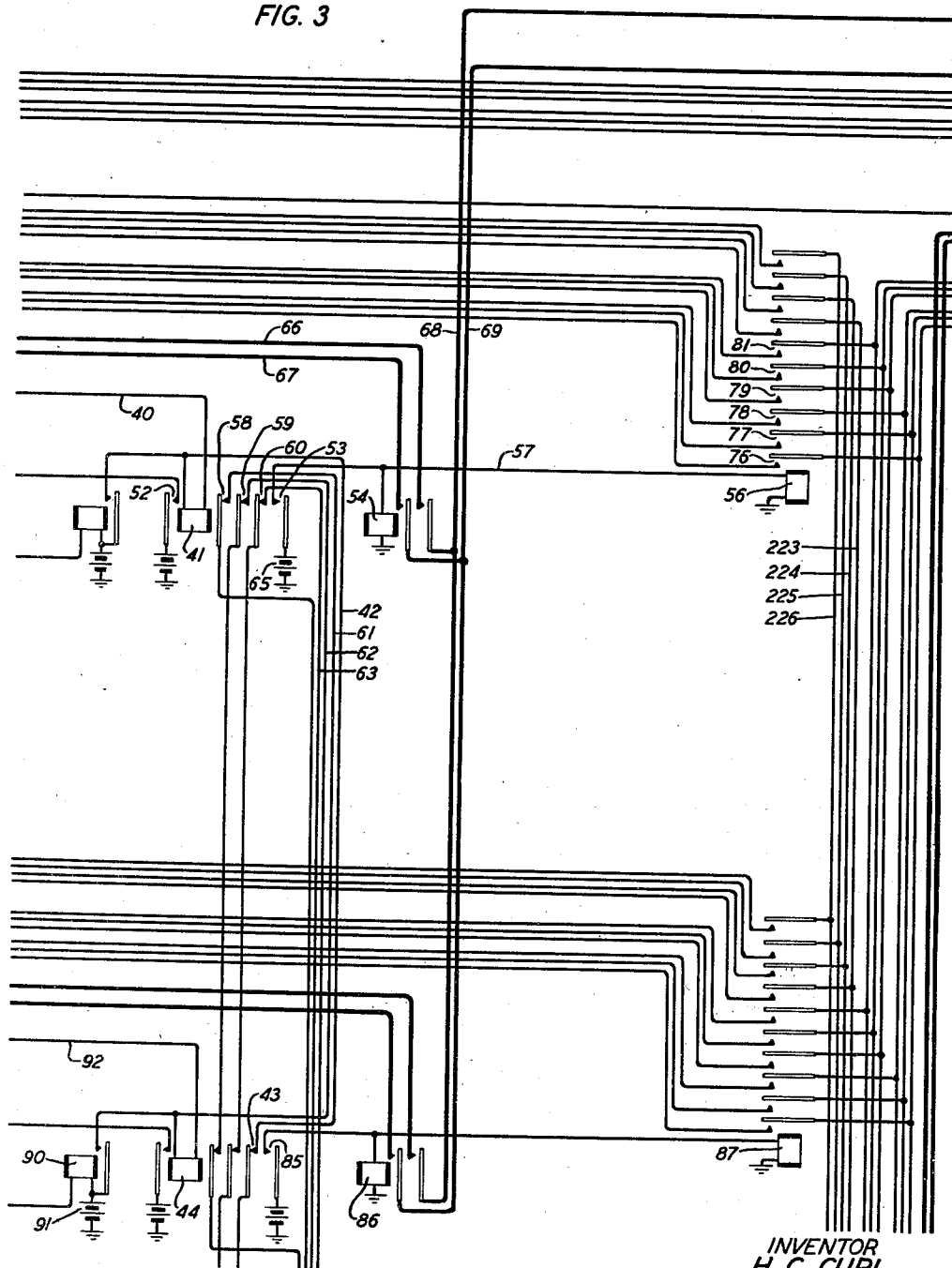
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8 Sheets-Sheet 3

FIG. 3



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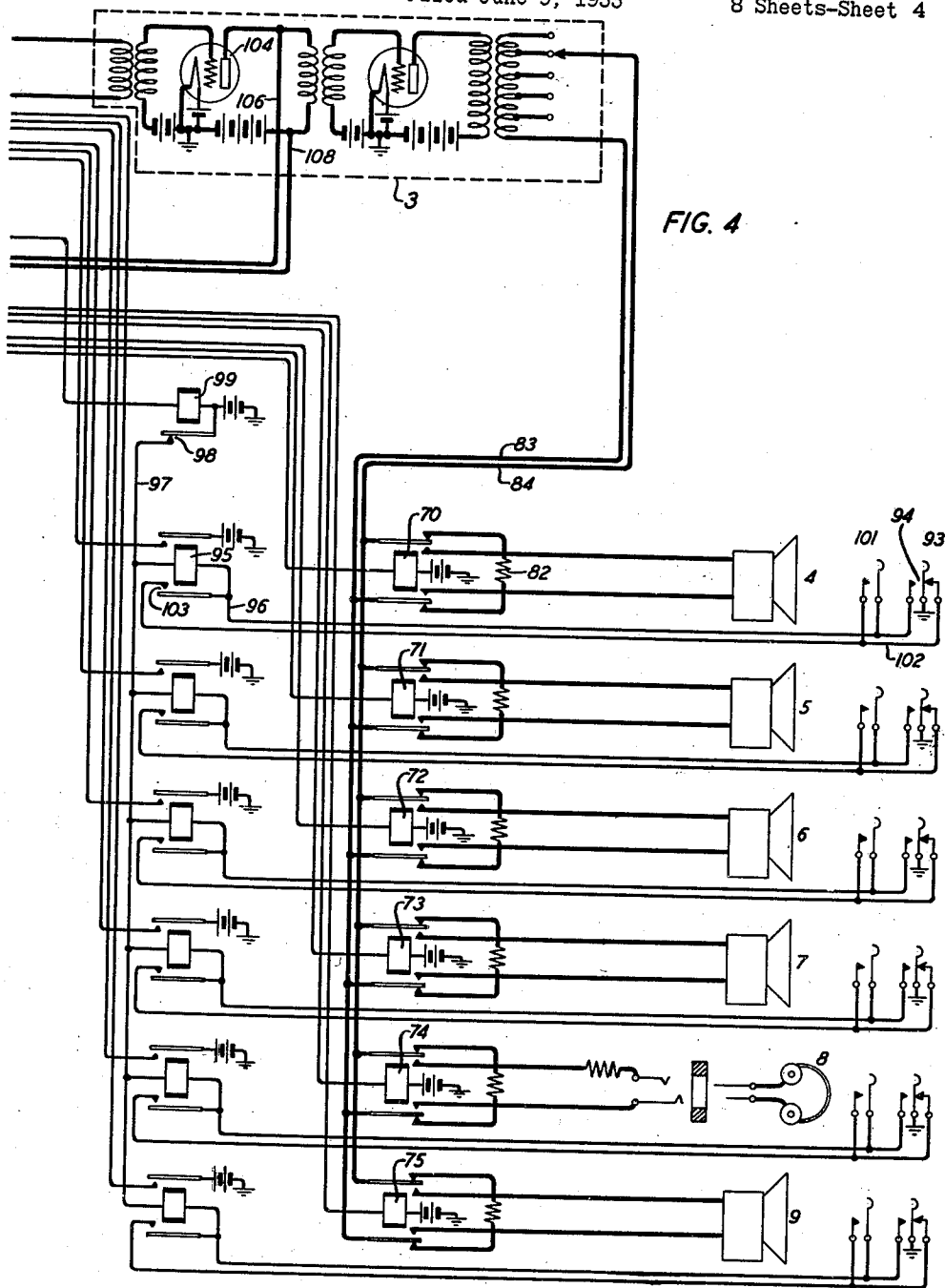
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2,036,023

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8 Sheets-Sheet 4



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TELEPHONE SYSTEM

2,036,023

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8 Sheets-Sheet 5

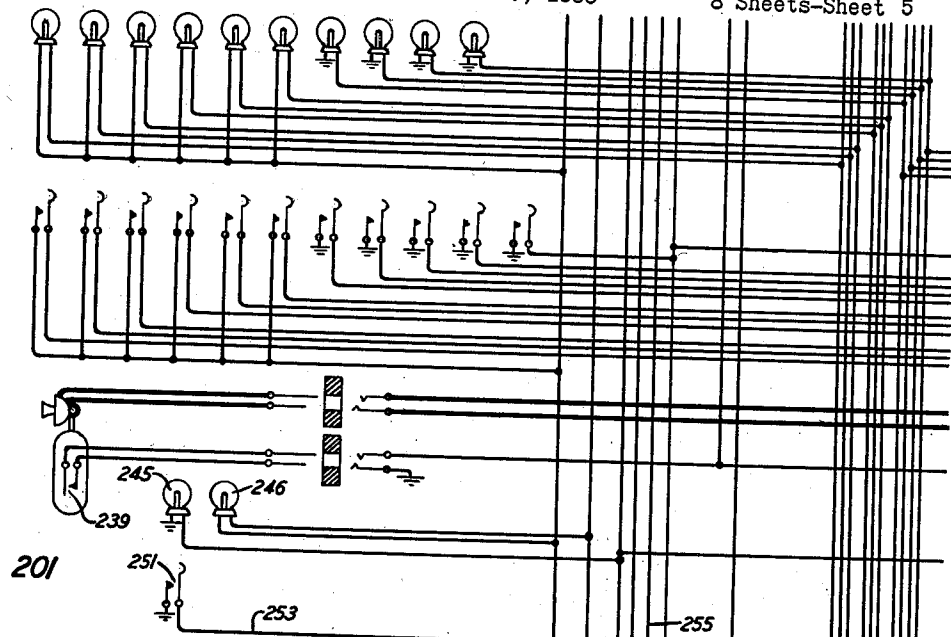


FIG. 5

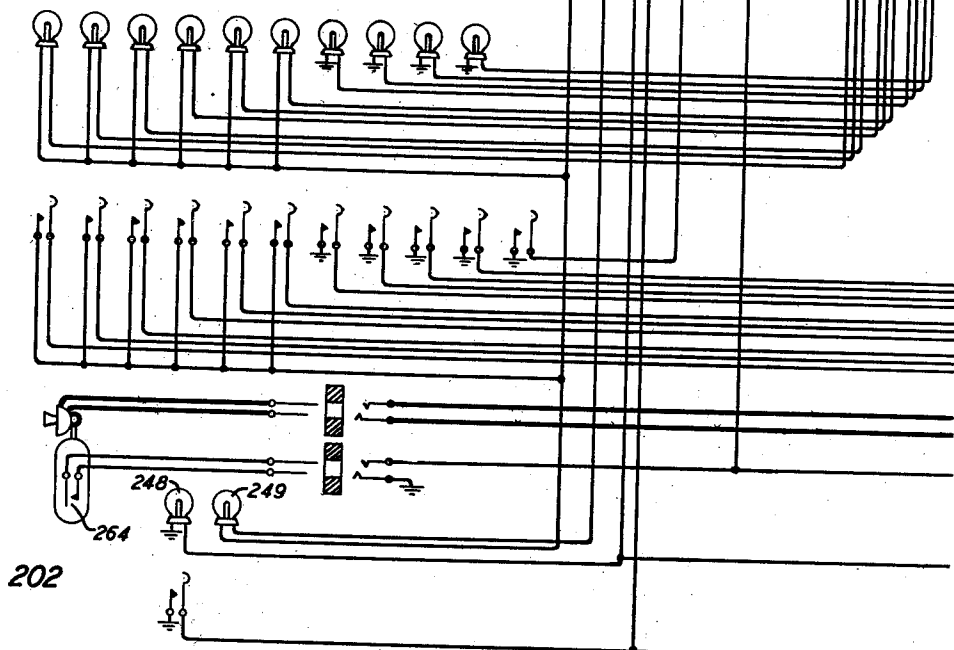


FIG. 6

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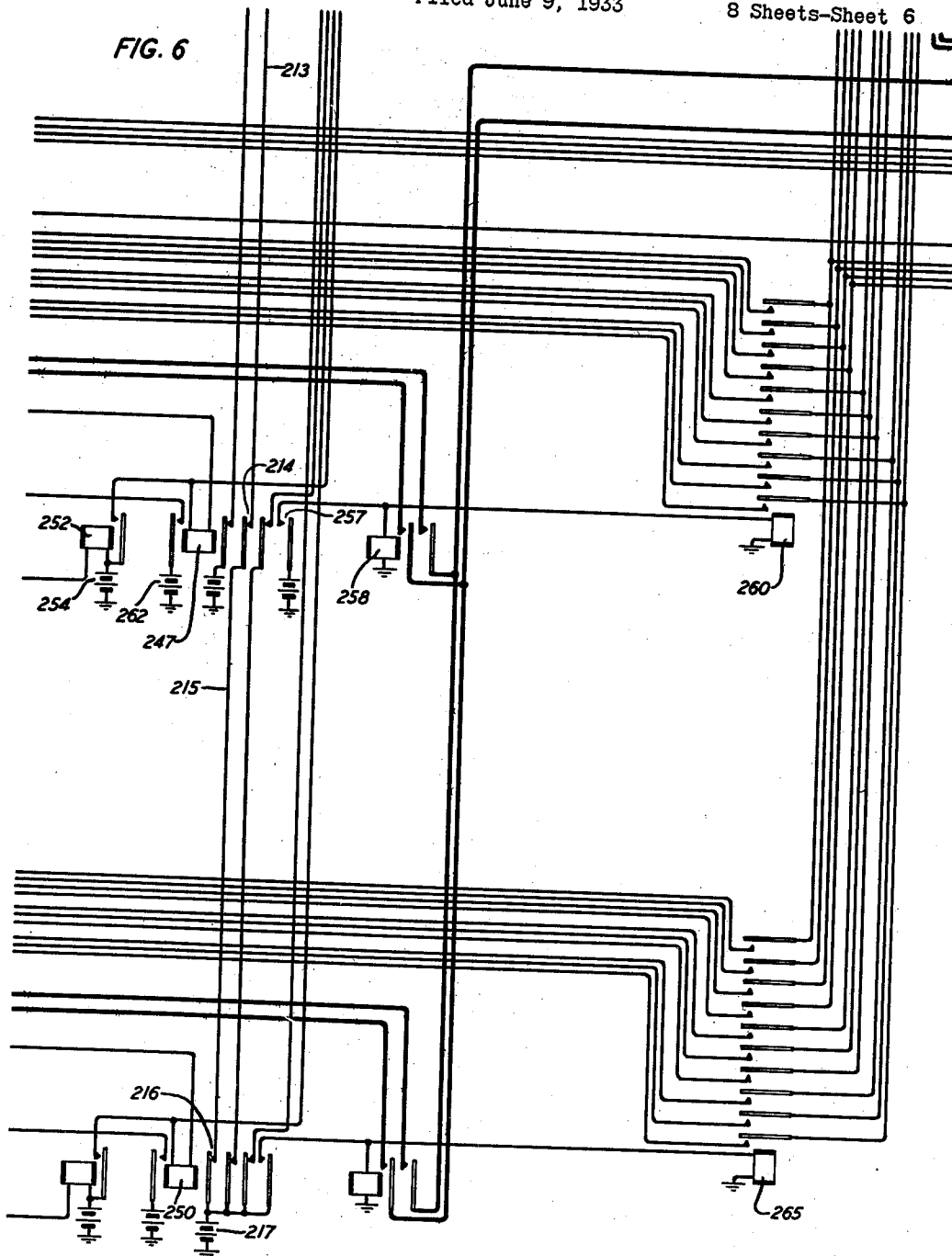
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TELEPHONE SYSTEM

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8 Sheets-Sheet 6

FIG. 6



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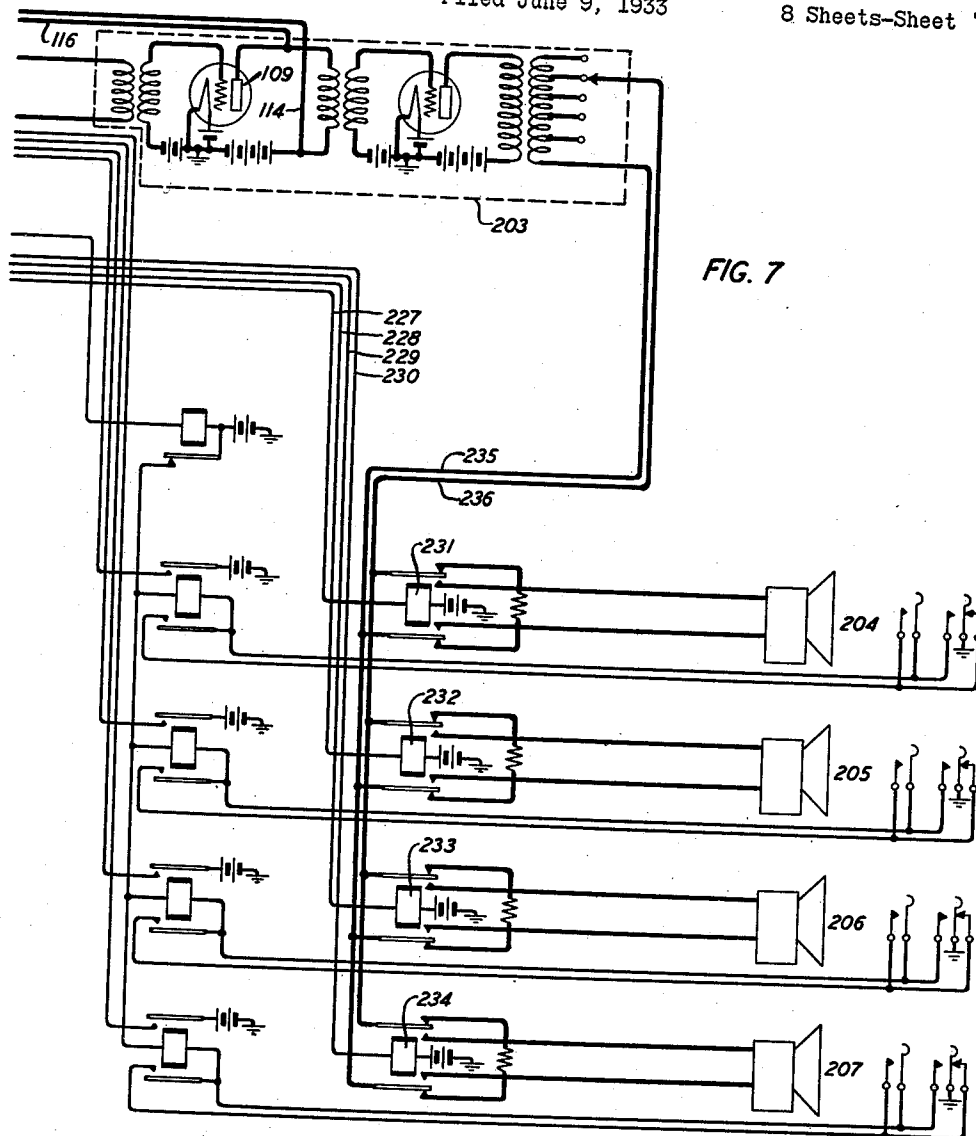
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2,036,023

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8 Sheets-Sheet 7



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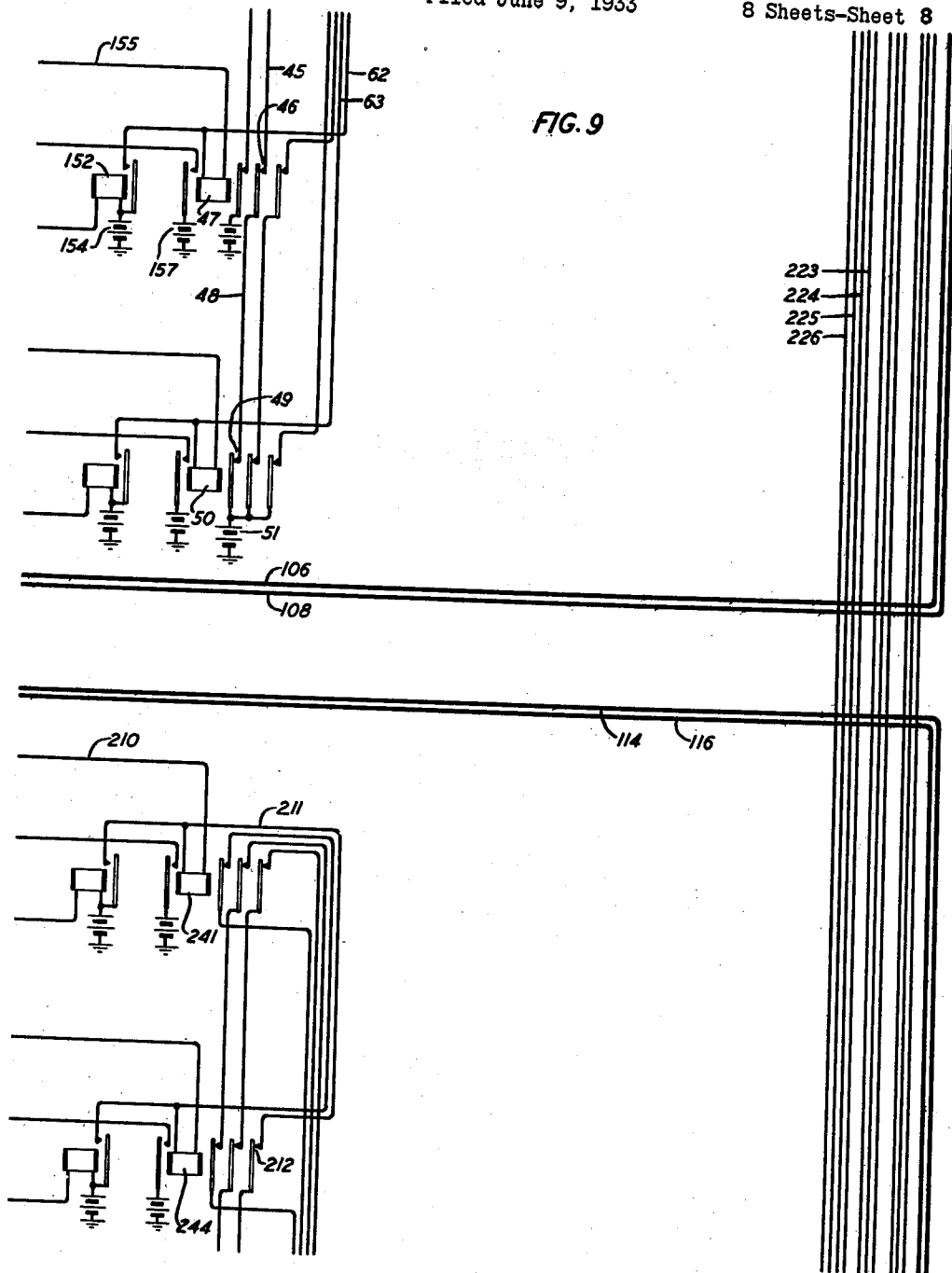
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H. C. CURL
TELEPHONE SYSTEM

2,036,023

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8 Sheets-Sheet 8



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UNITED STATES PATENT OFFICE

2,036,023

TELEPHONE SYSTEM

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Application June 9, 1933, Serial No. 675,051

5 Claims. (Cl. 179-1)

This invention relates to announcing telephone systems and the object of the invention is to provide such a system comprising two or more unit systems which may be operated entirely independently or as one complete system, as desired.

Heretofore there have been proposed systems comprising a number of transmitting stations, a common amplifier and a number of groups of loudspeaking receivers selectively controllable from any one of the several stations. Some of these systems have been arranged so that when one station is using the system all the others are locked out, but in an emergency any other station may cut in and obtain joint (or sole) control of any desired receiver groups.

According to the present invention two or more of these systems are so interconnected that any transmitting station may control the receivers of the other systems as well as its own receivers in exactly the same manner as if the several systems were originally designed as a single system having one amplifier and a number of transmitting stations equal to the total number in the several systems. More specifically this is accomplished by paralleling the several amplifiers and providing in each unit system sufficient circuits for the operation of the total number of stations and loudspeakers in the combined system. These interconnections are preferably arranged to be made by a single master switch so that a change from unit to system operation or vice versa can be made without delay.

A further feature of the invention is signaling means adjacent each receiver so that the operator may be requested to repeat the message or be advised that the message is understood. These circuits are also interconnected between systems to function on either a unit or system basis.

These and other features of the invention will be more clearly understood from the following detailed description and the accompanying drawings, in which:

Fig. 1 is a schematic representation of the proper arrangement of the several sheets of drawings in order to show a co-ordinated system;

Figs. 2, 3, and 4 and the upper portion of Fig. 3, taken together, show one complete unit system according to this system;

Figs. 5, 6, and 7 and the lower portion of Fig. 9, taken together, show a second complete unit system; and

Fig. 8 shows the master switch for combining the unit system.

The first unit system comprises essentially two transmitting stations 1 and 2, an amplifier 3 and

six groups of receivers 4 to 9. The second unit system similarly comprises station 201 and 202, an amplifier 203 and four groups of receivers 204 to 207. Only one receiver is indicated for each group but it will be understood that any desired number of loudspeaking receivers or headsets or combinations thereof may be operated in one group. Similarly, while only two transmitting stations are shown in each system it will be obvious from the connections shown and described below how any desired additional stations may be added to the system.

The amplifiers 3 and 203 have been shown with two conventional stages primarily for the purpose of showing the manner of interconnecting them for combined system operation as described below. In actual practice a number of additional stages may be required. Ordinarily, a single common battery would be provided for the entire relay control system but individual batteries have been indicated wherever necessary, to simplify the wiring. Station 1, which is typical of all four stations of the two systems, is equipped with a transmitter 10, indicating lamps 11 and 12, ten receiver group selective keys 13 to 22 and ten corresponding receiver group indicating lamps 23 to 32. The first six lamps and keys at all stations are associated with the six receiver groups of the first unit system and the last four lamps and keys are associated with the four receiver groups of the second unit system. A non-locking key 33 is provided for extinguishing the signal lamps when an announcement has been completed and a locking key or cut-in switch 34 enables the station to cut in its transmitter while another station is using the system.

Normal operating priority between the several stations is obtained by means of priority relays 41, 44, 47 and 50, one for each station in the combined system, the operating circuit of each relay extending through the contacts on the other three relays so that the operation of one relay disables the other three. Similar priority relays 241, 244, 247 and 250 are provided in the other system but for separate unit operation only the two relays in each unit associated with the stations in that unit are operable. When the master switch 200 is closed the operating circuits of corresponding relays are in parallel so that one priority relay is operated in each unit system from each station of the combined system.

The operation of the system will be explained by first describing the operation of a unit system and then by showing how the same operating fea-

tures are obtained when the units are functioning as one complete system.

When the operator of station 1 has a message to deliver he inserts plugs 35 and 36 of his transmitter in the jacks 37, 38 and operates one or more of the locking keys 13 to 18 according to the number of receiver groups to be connected. He then closes the hand operated contact 39 on his transmitter to complete a circuit extending from ground at the jack 36 over conductor 40, the winding of his priority relay 41, conductor 42, back contact 43 of priority relay 44 of station 2, conductor 45, back contact 46 of priority relay 47, conductor 48, back contact 49 of priority relay 50 to the grounded battery 51.

The operation of relay 41 in closing contact 52 completes a circuit for the lamp 11 at station 1 and the lamp 111 at station 2 to indicate that the system is in use. Contact 53 of the relay completes the operating circuits of the relays 54 and 56 from grounded battery 65 over the conductor 57. The breaking of contacts 58, 59 and 60 of relay 41 opens the return circuit leading over conductors 61, 62 and 63 to the windings of the other priority relays 44, 47 and 50 respectively. Contact 58, therefore, disables relay 44 so that station 2 can not operate it in the usual manner by means of the transmitter switch 64.

The operation of relay 54 completes a circuit from the transmitter 10 over conductors 66 and 67, through the contacts on the relay to the conductors 68, 69 leading to the input circuit of the amplifier 3. The operation of relay 56 operates the receiver group selecting relays 70 to 75 by completing at contacts 76 to 81 the circuits previously prepared by the closing of the keys 13 to 18 at the transmitting station. In order to obtain the same volume level irrespective of the number of receiver groups connected to the amplifier, these relays 70 to 75 are equipped with substitute load resistors such as 82 which, when connected, introduce a loss in the system equal to the power consumed by the loudspeaking receiver group associated with the relay. The operation of these relays disconnects these substitute load resistors and connects the output leads 83, 84 of the amplifier directly to the receivers. The transmitter 10 is then connected to the receivers and the operator proceeds to deliver his message over the conductors 86, 87 and 88, 89 to the input of the amplifier 3 and from the output of the amplifier over the conductors 83, 84 to the receivers.

If station 2 desires to use the system when it is not already in use a similar series of operations take place, that is to say the transmitter of station 2 is connected to its jack and the receiver group selecting keys corresponding to the desired receiver groups are operated to prepare the operating circuit of the receiver group selecting relays 70 to 75. The closing of contact 64 on the transmitter operates priority relay 44 which lights the lamps 11 and 111, as before, opens the operating circuits of the other three priority relays and closes contact 85 to complete the operating circuits of relays 86 and 87. The operation of relay 86 connects the transmitter talking circuit to the conductors 68 and 69 leading to the input of the amplifier 3 and the operation of relay 87 completes the operating circuit of the selected receiver group selecting relays. If, however, the system is already in use by station 1 when the operator at station 2 desires to make an announcement, he is advised of that fact by his lamp 111 but if he ignores this lamp and closes his contact 64, he can not operate his priority relay 44 since,

as already pointed out, the previous operation of relay 41 has opened the operating circuit of this relay at contact 58. If the circumstances warrant emergency action he may, however, close his cut-in switch 88, which completes a circuit extending from ground through the switch and conductor 89 to the cut-in relay 90 and back to ground through the battery 91. The operation of the relay 90 prepares an operating circuit for the priority relay 44 independently of contact 58 on priority relay 41 so that upon closing the transmitter switch 64 the operating circuit for relay 44 extends from ground at the transmitter to the switch 64, conductor 92, winding of relay 44, to grounded battery 91. The operation of relay 44 thereupon operates relays 86 and 87 as before and connects to the amplifier 3 any groups of receivers selected at station 2 but not already connected to the system by station 1. The operator at station 2 may then proceed to deliver his emergency message. Upon the completion of his message he merely releases his transmitter switch 64 thereby releasing the priority relay 44 and the transmitter and receiver control relays 86 and 87. The locking key 88 is also released to release relay 90 and restore the system to normal operating condition.

Conveniently located with respect to the loudspeakers of each group is a locking key and a non-locking key. If a message delivered to receiver group 4, for example, is not understood, the non-locking key 93 is closed on contact 94 to operate the signal lamp relay 95 over a circuit extending from ground, conductor 96, winding of the relay, conductor 97, back contact 98 of relay 99 to grounded battery. The operation of relay 95 lights lamp 23 at the transmitting station over an obvious circuit. The key 93 is then released to extinguish the lamp and then reclosed to relight it repeatedly as a signal that the message has not been understood. The operator will then repeat the message and when it has been understood the key 101 is closed to operate relay 95 over a circuit extending from ground, the back, normally closed contact of the key 93, conductor 102, key 101, conductor 96, winding of the relay to grounded battery. The operation of the relay closes contact 103 to maintain the operating circuit of the relay independently of the key 101. This maintains the lamp 23 lighted as an indication that the message has been understood. When the message has been understood by all the receiving operators and the station operator is disconnecting his station from the system as previously described for station 2, he also momentarily closes his key 33 at the station to operate relay 99 and open contact 98 which releases relay 95 and any other signal lamp relays which have been locked up.

The operation of stations 201 and 202 is identical with the operation of stations 1 and 2 already described so that for unit operation of the system no detailed discussion of the circuit of the second unit system need be given.

When it is desired to operate the two units as one combined system, the master switch 200 is moved to the left to make the necessary additional interconnections between the systems. Many of the interconnections which do not interfere with the normal operation of the unit system may be permanent, as, for example, the connections between the contacts of the receiver control relays 56, 87, 260 and 264 and between receiver group indicating lamps 23 to 32 and the corresponding lamps at the other station. The return circuit for the lamps 29 to 32 and the correspond-

ing lamps at station 2, both of which relate to the receiver group in the second unit system, extends to ground through contact 218 of the switch 200 so that for unit operation contact 218 is opened and these lamps will not be lighted when the answer-back signals are being sent to stations 201 and 202. Similarly, the return circuit of the first six lamps at stations 201 and 202 extend to ground through contacts 263 to prevent signals intended for stations 1 and 2 from appearing also at stations 201 and 202. It will be noted that for unit operation the output circuit of the vacuum tube 104 of the amplifier 3 is shunted by a resistor 105 over a circuit including conductor 106, contact 107 of the switch 200, the resistor 105 and conductor 108. Similarly, the output circuit of the vacuum tube 109 of the amplifier 203 is shunted by a resistor 118 over a circuit including conductor 116, the resistor, contact 113 of the switch 200, and conductor 114. When the master switch 200 is moved to the left contacts 107 and 113 are broken and the amplifiers 3 and 203 are paralleled between their stages over the following circuit. From the plate of tube 104 over conductor 106, contact 115 of the master switch, conductor 116 to the plate of the tube 109 in the amplifier 203. The plate circuit returns are also paralleled over a circuit extending from conductor 108 in the amplifier 3, contact 117 of the master switch to conductor 114 leading to the amplifier 203. Under this condition, any messages transmitted to either of the vacuum tubes 104 or 109 will be transmitted to the output circuit of both the amplifiers 3 and 203 to energize any of the selected groups of receivers in both systems. The resistors 105 and 118 are of such value that when the amplifiers are paralleled and the resistors disconnected, transmission is not affected.

If the operator at station 1 now operates his priority relay 41, to lock out station 2 in the manner already described, the priority relay 241 in the other unit system will also be operated over a circuit extending from conductor 40, conductor 208, contact 209 of the master switch, conductor 210, winding of the relay 241, conductor 211, contact 212 of the relay 244, conductor 213, contact 214 of the relay 247, conductor 215, contact 216 of the relay 250 to grounded battery 217. The operation of relay 241 opens the operating circuit of the relays 244, 247 and 250 so that stations 201 and 202 are also locked out. Station 1 may then proceed to select any or all of the first six loudspeaker groups associated with his system and, in addition, one or more of the four groups associated with the other unit system. For example, he may close all ten keys 13 to 22.

The receiver groups 4 to 9 will be selected in the manner already described and in addition the closing of keys 19 to 22 will select the receiver groups 204 to 207 in the following manner: A circuit is made from ground at the master switch through contact 218, conductor 266, keys 19 to 22 over all four conductors 219 to 222, through the upper four contacts of the relay 56 which has already been operated to conductors 223 to 226 and conductors 227 to 230 to grounded batteries through the relays 231 to 234. The operation of these relays disconnects the substitute load resistors and connects the loudspeaker groups 204 to 207, through the conductors 235 and 236 to the output circuit of the amplifier 203. By virtue of the parallel connection between the amplifiers these receiver groups will then be energized by messages sent from station 1 simultaneously with the receiver group in the first unit system. Since

the signal lights 29 to 32 in the station 1 and the corresponding lamps are now connected to ground on one side by conductor 219 and connected in parallel with the corresponding lamps in stations 201 and 202 by conductors 237, 238, 240 and 242, they may be operated for signal purposes from the receiver groups 204 to 207 in the same manner as the corresponding lamps in stations 201 and 202 when these receiver groups are energized from one of the stations in that unit system.

In an emergency the operator at station 2 may, by means of the switch 88, cut in his transmitter in exactly the same manner as for unit operation and either station 201 or 202 may also cut in in a similar manner. For example, the operation of the switch 251 completes a circuit for cut-in relays 252 and 152 extending from the switch, conductor 253 to grounded battery 254 through relay 252 and over conductor 255, contact 256 of the master switch, conductor 153 to grounded battery 154 to relay 152.

The operation of relay 152 completes a circuit for priority relay 47 independently of contact 59 of relay 41, extending from battery 154, winding and relay 47, conductor 155, contact 156 of the master switch, conductor 243 to ground through the transmitter switch 239. The operation of relay 47 lights lamp 12 and 112 in stations 1 and 2, respectively, over a circuit extending from grounded battery 157, conductors 158 and 159, through the lamp to conductor 219 and ground at the master switch. These lamps give an indication at stations 1 and 2 that one of the stations 201 or 202 is using the system. The operation of relay 252 operates relay 247 independently of the relay 241 which has already been operated by station 1, over a circuit from battery 254, through the relay 247 to ground through the transmitter switch 239. In closing contact 257, relay 247 operates relay 258 to connect the transmitter 259 to the amplifier 203 and relay 260 to prepare operating circuits for the selecting relays of any desired receiver groups not already connected by station 1. Station 201 may then proceed to deliver a message to all the selected receiver groups and when finished disconnect his station from the system as already described for station 1. When it is desired again to use the system as two independent units it is only necessary to restore the master switch to the position shown and the combined system is immediately reconverted to two independent systems with their original operating features.

It will be seen from the foregoing description that for unit operation lamps 11 and 111 are lighted when either station 1 or 2 is operating and lamps 245 and 248 are lighted when either station 201 or 202 is operating. For the combined system operation, lamps 11, 111, 246 and 249 are lighted when either station 1 or 2 is operating, and lamps 12, 112, 245 and 248 are lighted when either station 201 or 202 is operating. When one or more stations of each unit system is operating, both lamps at all four stations will be lighted. If, for example, the operator at station 1 finds his lamp 11 lighted, it is an indication that station 2 is already operating; if lamp 12 is lighted, he knows that one of the stations of the other unit is using the combined system and if both lamps are lighted, he knows that both station 2 and one of the stations in the other units are using the combined system.

While the invention has been described with reference to a particular circuit for purposes of

illustration, it will be understood that various changes may be made within the scope of the following claims.

What is claimed is:

1. In an announcing system the combination with at least two normally independent unit systems each including a plurality of transmitting stations, an amplifier, a plurality of receivers, means at each of the stations for connecting the stations and the receivers to the amplifier, means operated when one of the stations is so connected for disabling the other station, and emergency means at each station operable while the station is disabled for connecting it to the amplifier, of cross connections between the unit systems and a switch therein for effectively combining the unit systems into a single system in which each transmitting station may control all the receivers in the same manner as it controls the receivers in the corresponding system when operating as an independent unit.
2. In an announcing system the combination with at least two normally independent unit systems each including a plurality of transmitting stations, a priority relay in each system for each station in all the unit systems, an operating circuit therefor, an amplifier, a plurality of receivers, a receiver-control relay for each receiver in all the unit systems, an operating circuit therefor, means at each station for operating the corresponding priority and receiver-control relays of said unit systems to connect the stations and the receivers to the amplifier, and contacts on said priority relays for opening the operating circuits of the other priority relays, of cross connections between the unit systems and a switch therein for paralleling the amplifiers and the operating circuits of the corresponding priority and receiver-control relays of the several systems.

3. In an announcing system the combination with a plurality of transmitting stations, an amplifier, a plurality of receivers, and means at the stations for selectively connecting the receivers and the stations to the amplifier, of a plurality of indicators at the stations, means at each receiver for operating an indicator at each station, and means at each station for resetting operated indicators.

4. In an announcing system, the combination with at least two normally independent unit systems each including a plurality of transmitting stations, an amplifier, a plurality of receivers, means at each of the stations for connecting the stations and the receivers to the amplifier, and an impedance normally connected in shunt to the amplifier, of cross connections between the unit systems, a switch therein for effectively combining the unit systems into a single system, and contacts on the switch for paralleling the amplifiers and disconnecting said impedance.

5. An announcing telephone system comprising at least two normally independent unit systems each including a plurality of transmitting stations and a plurality of receiver circuits selectively controllable therefrom, a priority relay in each unit system for each station of all the unit systems, an operating circuit for each relay extending through the contacts of each of the other relays of the unit system, and controllable from the corresponding station, means responsive to each priority relay for completing a talking circuit between a transmitting station and selected receiver circuit, and means for combining the unit systems into a single system comprising a switch and contacts thereon paralleling the talking circuit and the corresponding priority relay of the unit systems.

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