Jan. 9, 1934. R. B. BUCHANAN 1,942,471

OPERATOR'S POSITION EQUIPMENT

Filed April 4, 1933 2 Sheets-Sheet 1

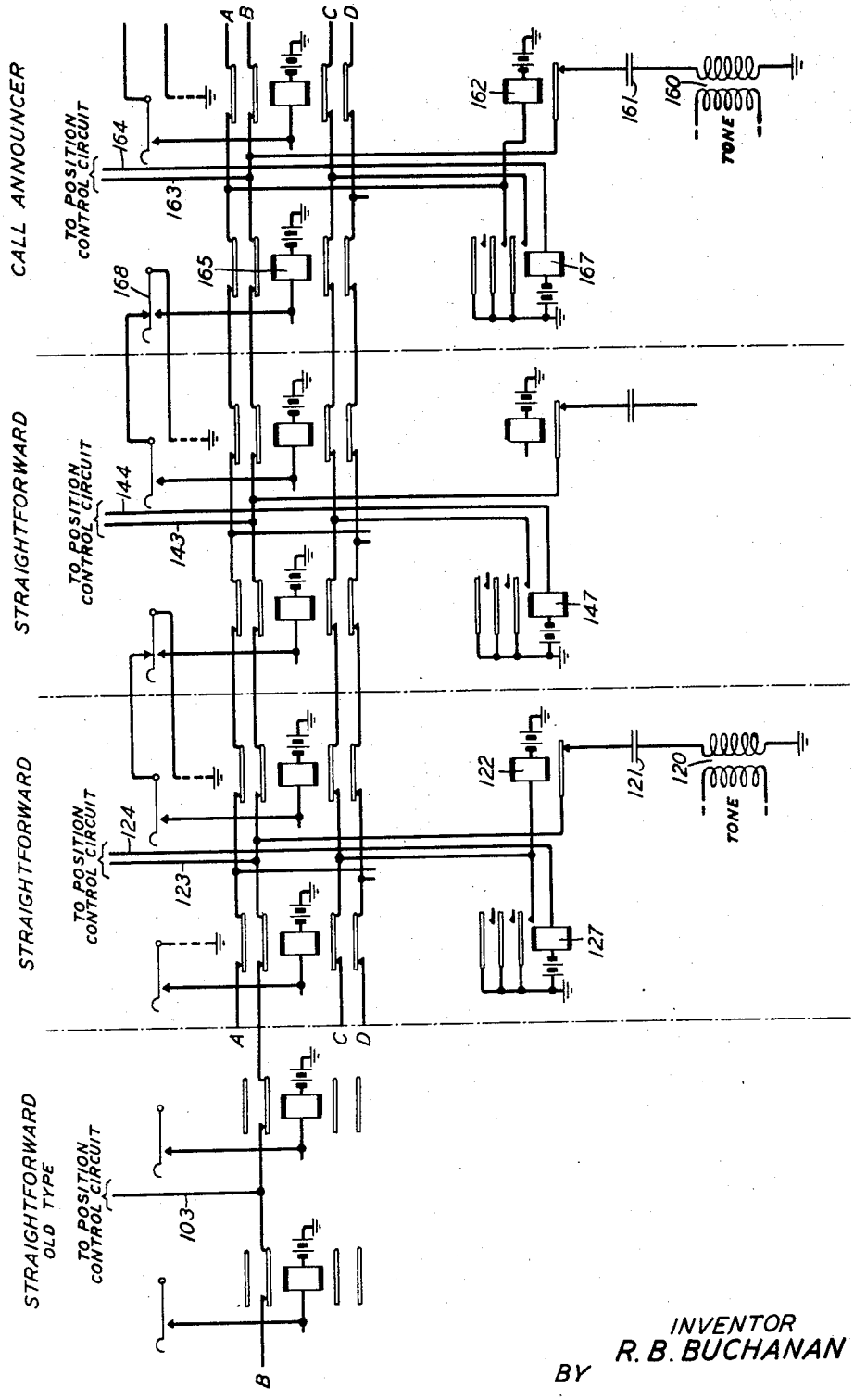

FIG. 1

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OPERATOR'S POSITION EQUIPMENT

Filed April 4, 1933 2 Sheets-Sheet 2

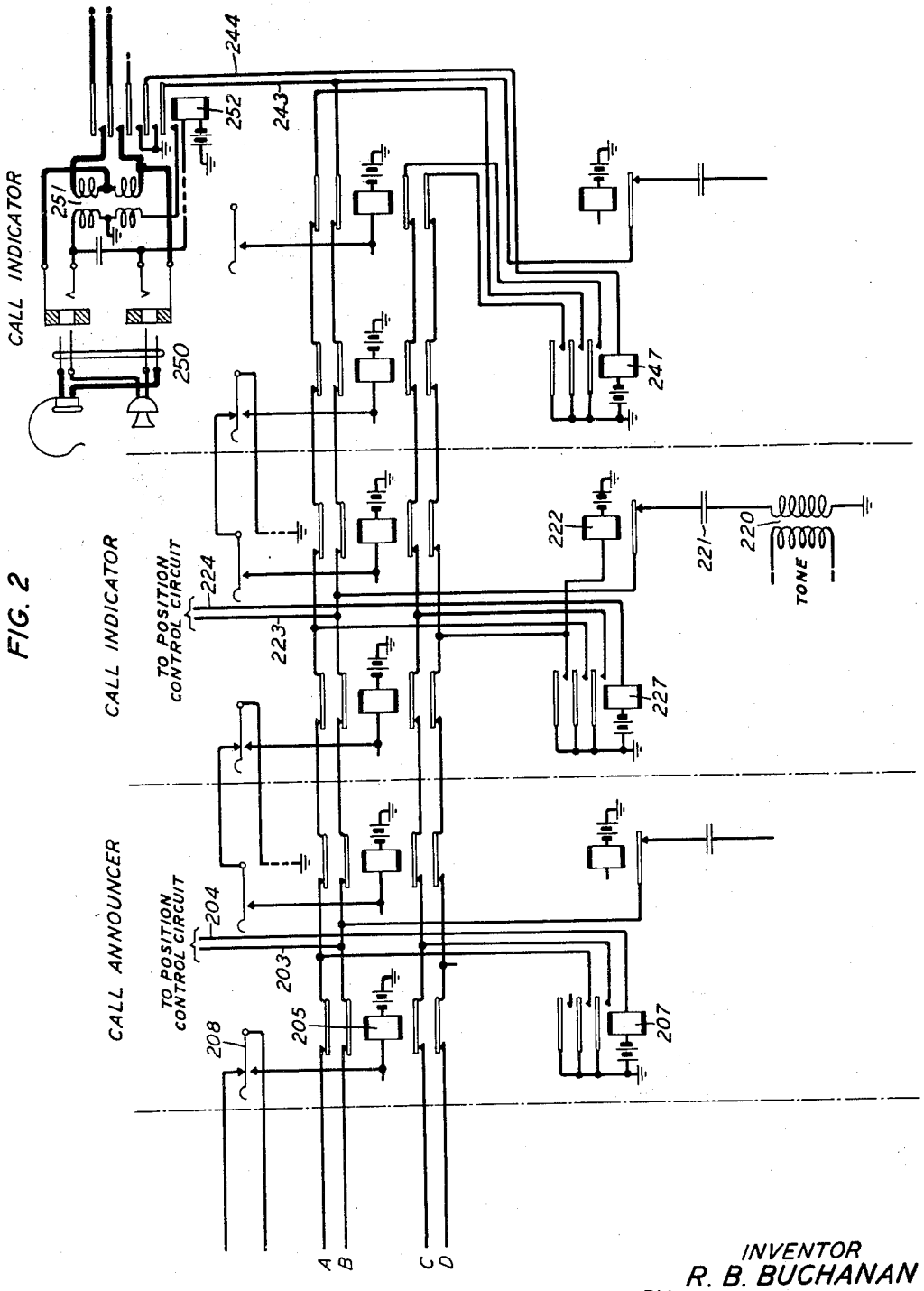

FIG. 2

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OPERATOR'S POSITION EQUIPMENT

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Application April 4, 1933. Serial No. 664,298

15 Claims. (Cl. 179—41)

This invention relates to telephone systems and has for its object to facilitate the work of operators in such systems.

With the increase in size of telephone exchange areas and with the advance in design of telephone equipment, trunks terminating in any office may originate in a number of different types of offices and the equipment serving such trunks must vary accordingly. For example, a group of operators' positions at a particular manual exchange may serve two types of trunks incoming from manual offices, trunks incoming from offices equipped with call announcer machines, and trunks incoming from offices equipped with relay call indicator impulsers. Each position is equipped with a control circuit for associating the operator's telephone with the incoming trunk and for initiating the application of ringing current to the called line. Each type of manual trunk requires a slightly different control circuit, while the call announcer trunk requires a control circuit provided with means for initiating the call announcement and the call indicator trunk requires a control circuit provided with means for registering and indicating the number as transmitted by the impulser. These additional features having been added from time to time, the control circuit for the second type of manual trunk will serve the first type of manual trunk; the control circuit for call announcer trunks will serve the manual trunks as well, and the control circuit for the call indicator trunks will serve all four types of trunks. When the position is occupied, an operator's telephone is associated with the position control circuit thereby rendering it effective to serve the trunks of that position. During the busy period when each position is occupied, no difficulty arises because of the various types of trunks. However, during dull periods or at night, it is not necessary that an operator serve each position and grouping circuits are provided so that a plurality of positions may be included in a division to be served by a single operator. At such a time if positions serving a plurality of types of trunks are grouped together, it is necessary that an operator connect her telephone with a position which is equipped to serve all of the types of trunks. For example, if the group includes call announcer and manual trunks and the operator associates her telephone with a position serving manual trunks, the control circuit would not be provided with means for initiating call announcement and such calls could not be completed. If the group also contains call indicator trunks and the operator selects a position not equipped with a recorder, there would be no means for her to receive the number of the wanted line.

In accordance with the present invention, to insure that the operator associate her headset with a control circuit capable of serving all of the trunks in a group, a tone is provided for each class of trunk and when no telephone is connected with a group of trunks, this tone is extended to each control circuit of the group. When an operator connects her telephone with a control circuit this tone is disconnected from all the control circuits of the same type and those serving less complex types of trunk, while it is ineffective to disconnect the tone at the control circuits serving more types of trunks, if any such are included in the group. Therefore the tone will persist and the operator must associate her telephone with the control circuit serving the maximum number of types of trunks in the group in order to become effective.

For a clearer understanding of the invention reference may be had to the accompanying drawings in which Figs. 1 and 2, when placed with Fig. 2 at the right of Fig. 1, show portions of the grouping circuits of a plurality of operators' positions including positions serving each of the trunk types above mentioned. Fig. 1 shows one position for serving straightforward trunks of the type shown in the patent to H. W. Ulrich, No. 1,905,662, granted April 25, 1933. It also shows two positions for serving other straightforward trunks and one position for serving call announcer trunks, while Fig. 2 shows a second position for serving call announcer trunks and two positions for serving call indicator trunks. Trunk circuits of these types together with a complete grouping and control circuit are shown in the application of A. C. Powell, Serial No. 657,627, filed February 16, 1933. The position control circuit shown in the Powell application is equipped for serving all four types of trunks and therefore corresponds to that located at the call indicator positions. Call announcer positions differ from call indicator positions in that the control circuits are not supplied with recorders. Positions serving only straightforward trunks are not equipped with the identifying and other special equipment required by the call announcer and call indicator trunks. In the present drawings at each position indicated, only the tone equipment, the splitting keys and a single relay of the group controlled by each key are shown. A small portion of the position control equipment

is shown in connection with the last call indicator position.

Assuming that none of the splitting keys is operated, so that the seven positions form one operator's division, the circuits established over the back contacts of the splitting relays may be treated as continuous conductors for the purpose of this description. That over the outer upper contacts will be identified as conductor A, that over the inner upper contacts as conductor B, that over the inner lower contacts as conductor C and that over the outer lower contacts as conductor D. When none of the positions is occupied, a circuit will be closed from ground through the right winding of tone coil 120, condenser 121, back contact of relay 122 to conductor B and thence over conductor 243 to the inner armature of relay 252 of the position control circuit of the last call indicator position. From conductor B, conductors 103, 123, 143, 163, 203 and 223 lead to similar relay armatures of the other positions. At the same time, tone is also connected to conductor B at the first call announcer position from ground through tone coil 160, condenser 161 and the back contact of relay 162. At the first call indicator position a circuit is also closed from ground through tone coil 220, condenser 221, back contact of relay 222 to conductor B. The same source of tone may be used throughout. Therefore, tone is connected to conductor B at the first position of each type and thence to all the positions forming the operator's division.

If the operator now attaches her headset 250 to the last call indicator position, a circuit is closed from ground through the upper left winding of repeating coil 251, over the tips of the headset jack and plug connection, through the transmitter to battery through the winding of relay 252. Relay 252 represents a plurality of relays operated in response to the connection of the headset 250 with the position equipment. Relay 252 connects the right windings of the repeating coil 251 to the control circuit. It also connects the lower left winding of coil 251 to conductor 243 to make the tone audible in the receiver of headset 250 and closes other circuits indicated at its middle contact to render the control circuit effective. In addition it connects ground over its next to innermost contact to conductor 244, thereby operating relay 247. Relay 247 connects ground over its three contacts to conductors A, C and D. The connection of ground to conductor A completes a circuit for relay 162 which opens the tone circuit at the first call announcer position. The connection of ground to conductor C completes a circuit for relay 122 which opens the tone circuit at the first straightforward position. The connection of ground to conductor D completes a circuit for relay 222 disconnecting tone at the call indicator position. Therefore the connection of the operator's telephone to a call indicator position completely removes the warning tone and permits calls to be handled from that position.

Although the operator's repeating coil and headset have been shown only in connection with the last call indicator positions, exactly similar equipment is to be inferred at the remaining positions with the exception of the old type straightforward position. At each position the conductor on the right extends over the contact of a relay similar to relay 252 to ground, and the conductor on the left over another contact of that relay to the test winding of the operator's repeating coil. In the old type straightforward position the conductor leading to the repeating coil is furnished but not that leading to ground.

If the operator had attached her telephone to the old type straightforward position the presence of the tone in her repeating coil would warn her that the control circuit at that position is incapable of handling certain types of calls which may be received and the tone itself would render the headset ineffective for hearing the signals and instructions necessary in completing calls. If the operator attaches her telephone to the next straightforward position ground is connected to conductor 124 closing an obvious circuit for relay 127 which grounds conductor C and operates relay 122, disconnecting the tone at that position. Similarly, the attachment of a telephone at the right straightforward position, grounds conductor 144, operating relay 147. Relay 147 connects ground over its inner contact to conductor C and over that conductor to the winding of relay 122, which disconnects tone from the straightforward positions. However, neither relay 127 nor relay 147 has any effect on the call announcer or call indicator positions and tone from these positions continues to warn that calls must not be handled from a straightforward position.

If the operator attempts to occupy the call announcer position of Fig. 1, ground on conductor 164 operates relay 167, which in turn grounds conductor A and operates relay 162 removing the tone at that point. Relay 167 also connects ground to conductor C and the winding of relay 122, so that the tone is also disconnected at the straightforward position. The connection of an operator's telephone to the second call announcer position, that shown in Fig. 2, grounding conductor 204, serves to operate relay 207 which connects ground over its middle contact to conductor A and the winding of relay 162 and over its inner contact to conductor C and the winding of relay 122. Relay 162 disconnects tone at the call announcer position and relay 122 disconnects tone at the straightforward position, but tone is still present at the call indicator position indicating that the division cannot be served from a call announcer position.

When an operator attaches her telephone to the first call indicator position, ground is connected to conductor 224 operating relay 227. Relay 227 at its uppermost contact grounds conductor D and closes an obvious circuit for relay 222 opening the tone circuit at the call indicator position. At its middle contact relay 227 closes a circuit from ground to conductor A for operating relay 162 thereby disconnecting the tone at the call announcer position. At its innermost contact relay 227 connects ground to conductor C and the winding of relay 122, disconnecting the tone at the straightforward position. It is therefore apparent that to completely remove the warning tone it is necessary to connect with a position capable of serving all of the types of trunks included in the division, in this case a call indicator position.

The arrangement of the positions shown in the drawings is merely illustrative and may be varied in any way desirable from an operating standpoint. As far as the tone arrangement of the invention is concerned, the various types of positions might be interspersed at random, the only requirement being that the tone circuit and tone disconnect relay be furnished at each position which is adjacent to a less complex position. At each straightforward position where the tone-

disconnect relay is furnished, this relay is connected to conductor C. For call announcer positions the tone-disconnect relay is attached to conductor A, and for call indicator positions the tone disconnect relay is connected to conductor D. The relay at straightforward positions which indicates that the position is occupied, connects ground to conductor C and thereover to the windings of all tone disconnect relays of straightforward positions. The position-occupied relay of call announcer positions connects ground to conductors C and A thereby operating the tone-disconnect relays of both straightforward and call announcer positions. The position-occupied relay of call indicator positions connects ground to conductors A, C and D operating all tone-disconnect relays of the division.

The operation of any splitting key, operating the corresponding group of relays, opens the four conductors, thereby interrupting the tone circuits as well as the circuits for disconnecting the tone. For example, if key 168 were operated, in turn operating relay 165, the straightforward positions would be separated from the call announcer positions and no tone from the call announcer or call indicator positions would reach the straightforward positions. Association of the operator's telephone with either straightforward position would cause the removal of the tone, although association with the old type straightforward position would not be effective. If key 208 were operated, dividing the call announcer positions from each other, tone from coil 160 would be connected to the straightforward positions and the operator would have to occupy the call announcer position in order to handle calls in the division. The effect of the operation of other splitting keys and relays will be obvious from consideration of the drawings.

What is claimed is:

1. In a telephone system, a plurality of operators' positions for serving trunks of a plurality of types incoming thereto, a control circuit for each position, certain of said control circuits serving only a single type of trunks, other control circuits serving a particular plurality of types of trunks and other control circuits serving all types of trunks, means for grouping said positions into divisions, and means to render ineffective those control circuits which do not serve all of the types of trunks included in the division.

2. In a telephone system, a plurality of operators' positions for serving trunks of a plurality of types incoming thereto, a control circuit for each position, certain of said control circuits serving only a single type of trunk, other control circuits serving a particular plurality of types of trunks and other control circuits serving all types of trunks, means for grouping said positions into divisions, an operators' headset, means normally responsive to the association of said operator's headset with a control circuit for rendering said control circuit and said headset effective, and means to render said headset ineffective if it is associated with a control circuit which does not serve all of the types of trunks included in the division.

3. In a telephone system, a plurality of operators' positions for serving trunks of a plurality of types incoming thereto, a control circuit for each position, certain of said control circuits serving only a single type of trunk, other control circuits serving a particular plurality of types of trunks and other control circuits serving all types of trunks, means for grouping said positions into divisions, an operator's headset, means responsive to the association of said headset with a control circuit for rendering said control circuit effective, a source of tone for each sort of control circuit, means for associating said source of tone with all of the control circuits included in a division, and means responsive to the association of said headset with a control circuit for disconnecting said tone source from those control circuits of the division capable of serving the same number of types of trunks and those control circuits of the division capable of serving a smaller number of types of trunks.

4. In a telephone system, a plurality of operators' positions for serving trunks of a plurality of types incoming thereto, a control circuit for each position, certain of said control circuits serving only a single type of trunk, other control circuits serving a particular plurality of types of trunks and other control circuits serving all types of trunks, means for grouping said positions into divisions, an operator's headset, means responsive to the association of said headset with a control circuit for rendering said control circuit effective, a source of tone for each sort of control circuit, means for associating said source of tone with all of the control circuits included in a division, and means responsive to the association of said headset with a control circuit for disconnecting said tone source from those control circuits of the group capable of handling the same number or a smaller number of types of trunks, said last mentioned means being ineffective to disconnect said tone source from any control circuits in the division which are capable of handling a larger number of types of trunks.

5. In a telephone system, a plurality of operators' positions for serving trunks of a plurality of types incoming thereto, a control circuit for each position, certain of said control circuits serving only a single type of trunk, other control circuits serving a particular plurality of types of trunks and other control circuits serving all types of trunks, means for grouping said positions into divisions, an operator's headset, means responsive to the association of said headset with a control circuit for rendering said control circuit effective, a source of tone for each sort of control circuit, means for associating said source of tone with all of the control circuits included in a division, and means for effectively disconnecting said tone source only responsive to the association of said headset with a control circuit which is one capable of serving all types of trunks included in said division.

6. In a telephone system, a plurality of operators' positions for serving trunks of a plurality of types incoming thereto, a control circuit for each position, certain of said control circuits serving only a single type of trunk, other control circuits serving a particular plurality of types of trunks and other control circuits serving all types of trunks, means for grouping said positions into divisions, an operator's headset, means responsive to the association of said headset with a control circuit for rendering said control circuit effective, a source of tone for each sort of control circuit, means for associating said source of tone with all of the control circuits included in a division, means responsive to the association of said headset with a control circuit for disconnecting said tone source from those control circuits of the division capable of handling the same number or a smaller number of

types of trunks, and means for effectively disconnecting said tone source only responsive to the association of said headset with a control circuit which is one capable of serving all types of trunks included in said division.

7. In a telephone system, a plurality of operators' positions for serving trunks of a plurality of types incoming thereto, a control circuit for each position, certain of said control circuits serving only a single type of trunk, other control circuits serving a particular plurality of types of trunks and other control circuits serving all types of trunks, means for grouping said positions into divisions, an operator's headset, means responsive to the association of said headset with a control circuit for rendering said control circuit effective, a source of tone for each sort of control circuit, means for associating said source of tone with all of the control circuits included in a division, means responsive to the association of said headset with a control circuit for disconnecting said tone source from those control circuits of the division capable of handling the same number or a smaller number of types of trunks, said last mentioned means being ineffective to disconnect said tone source from any control circuits in the division which are capable of handling a larger number of types of trunks, whereby said tone is effectively disconnected only responsive to the association of said headset with a control circuit which is one capable of serving all types of trunks included in the division.

8. In a telephone system, a plurality of operators' positions for serving trunks of a plurality of types incoming thereto, a control circuit for each position, certain of said control circuits serving only a single type of trunk, other control circuits serving a particular plurality of types of trunks and other control circuits serving all types of trunks, means for grouping said positions into divisions, a repeating coil associated with each control circuit, means for applying a tone to one winding of said repeating coil, means including another winding of said repeating coil for associating said operator's telephone with said control circuit, means responsive to the connection of said operator's telephone with said repeating coil for rendering the control circuit effective and means also responsive to said connection for disconnecting said tone from the other winding of said repeating coil only if said control circuit is one capable of handling all types of trunks in the division.

9. In a telephone system, a plurality of operators' positions for serving trunks of one type incoming from manual offices, trunks of another type incoming from manual offices, trunks incoming from dial offices equipped with call announcer machines, and trunks incoming from dial offices equipped with relay call indicator impulsers, control circuits for each type of trunk, said control circuits for one type of manual trunks being able to serve only that type of trunks, said control circuits for the other type of manual trunks being capable of serving all trunks incoming from manual offices, said control circuits for call announcer trunks being capable of serving trunks incoming from manual offices as well and said control circuits for relay call indicator trunks being capable of serving all of the types of trunks, means for grouping said positions into divisions, and means for rendering any control circuit ineffective which is not one capable of serving all trunks included in a division.

10. In a telephone system, a plurality of operators' positions for serving trunks of one type incoming from manual offices, trunks of another type incoming from manual offices, trunks incoming from offices equipped with call announcer machines, and trunks incoming from offices equipped with relay call indicator impulsers, a plurality of different types of control circuits, one type serving trunks of the first type only, another serving all trunks incoming from manual offices, a third type serving manual trunks and call announcer trunks and a fourth type serving all of said types of trunks, means for connecting said positions into divisions, a source of tone, means for connecting said tone source to all of the control circuits included in said division, an operator's headset, means for associating said headset with any control circuit, means responsive to the association of said headset with a control circuit of said second type to disconnect said tone from all control circuits of both first and second types, means responsive to the association of said headset with a control circuit of the third type to disconnect said tone from control circuits of said first, second and third types, and means responsive to the association of said headset with a control circuit of the fourth type for disconnecting said tone from the control circuits of all types.

11. In a telephone system, a plurality of operators' positions for serving trunks of one type incoming from manual offices, trunks of another type incoming from manual offices, trunks incoming from offices equipped with call announcer machines, and trunks incoming from offices equipped with relay call indicator impulsers, a plurality of different types of control circuits, one type serving trunks of the first type only, another serving all trunks incoming from manual offices, a third type serving manual trunks and call announcer trunks and a fourth type serving all of said types of trunks, means for connecting said positions into divisions, a source of tone, means for connecting said tone source to all of the control circuits serving a division, an operator's headset, means for associating said headset with any control circuit, means responsive to the association of said headset with a control circuit of said second type to disconnect said tone from all control circuits of both first and second types, means responsive to the association of said headset with a control circuit of the third type to disconnect said tone from control circuits of said first, second and third types, means responsive to the association of said headset with a control circuit of the fourth type for disconnecting said tone from the control circuits of all types whereby connection of said headset with a control circuit is effective to completely remove said tone only if said control circuit is of a type capable of serving all trunks in a group.

12. In a telephone system, a plurality of operators' positions for serving trunks of a plurality of types incoming thereto, a control circuit for each position, certain of said control circuits serving only a single type of trunk, other control circuits serving a particular plurality of types of trunks and other control circuits serving all types of trunks, means for grouping said positions into divisions, an operator's headset, a source of tone associated with each type of control circuit, and means responsive to the association of said headset with any control cir-

cuit of a particular type for removing said tone from all control circuits of that type.

13. In a telephone system, operators' positions for serving trunks of a plurality of types, control circuits of a plurality of progressively more complex types, each more complex type serving one more type of trunks than the next less complex type, means for grouping said control circuits, means for connecting a tone to all of the control circuits in said group, an operator's telephone, and means responsive to the association of said operator's telephone with a control circuit for disconnecting said tone from all of the control circuits of the same and less complex types.

14. In a telephone system, operators' positions for serving trunks of a plurality of types, control circuits of a plurality of progressively more complex types, each more complex type serving one more type of trunks than the next less complex type, means for grouping said control circuits, means for connecting a tone to all of the control circuits in said group, an operator's telephone, and means responsive to the association of said operator's telephone with a control circuit for disconnecting said tone from all of the control circuits of the same and less complex types, said connecting and said disconnecting means being effective only within said group.

15. In a telephone system, operators' positions for serving trunks of a plurality of types, control circuits of a plurality of progressively more complex types, each more complex type serving one more type of trunks than the next less complex type, means for grouping said control circuits, means for connecting a tone to all of the control circuits in said group, an operator's telephone, and means responsive to the association of said operator's telephone with a control circuit for disconnecting said tone from all of the control circuits of the same and less complex types, said connecting and said disconnecting means being effective irrespective of the size of said group.

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