

May 19, 1936.

G. N. SAUL ET AL

2,041,090

GROUPING CIRCUITS

Filed Dec. 29, 1934

7 Sheets-Sheet 1

FIG. 1

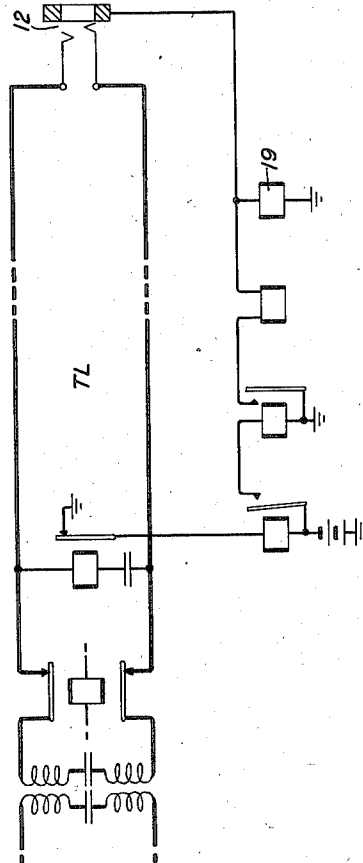


FIG. 8

FIG. 1	FIG. 2	FIG. 3	FIG. 4	FIG. 5	FIG. 6	FIG. 7
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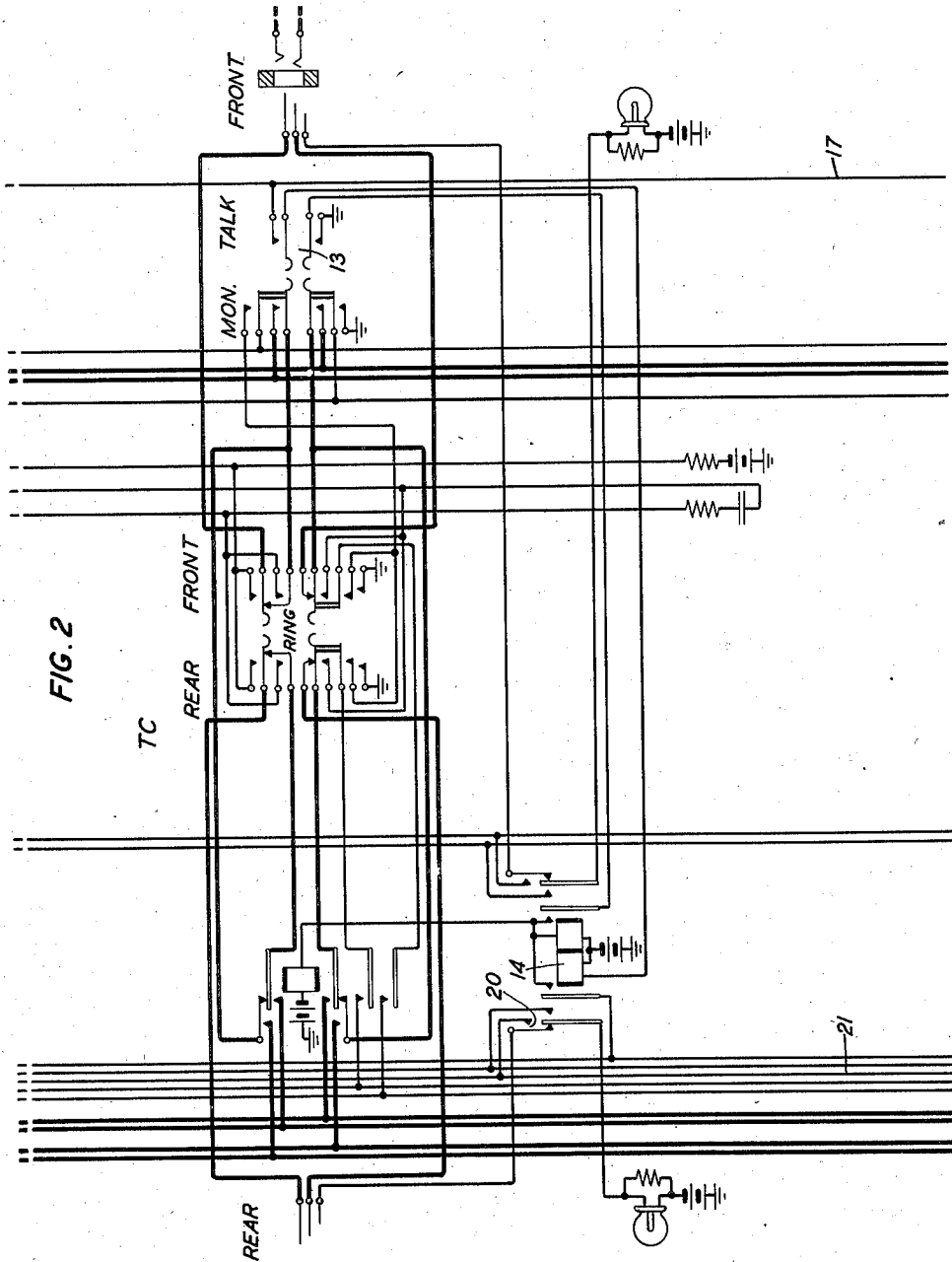
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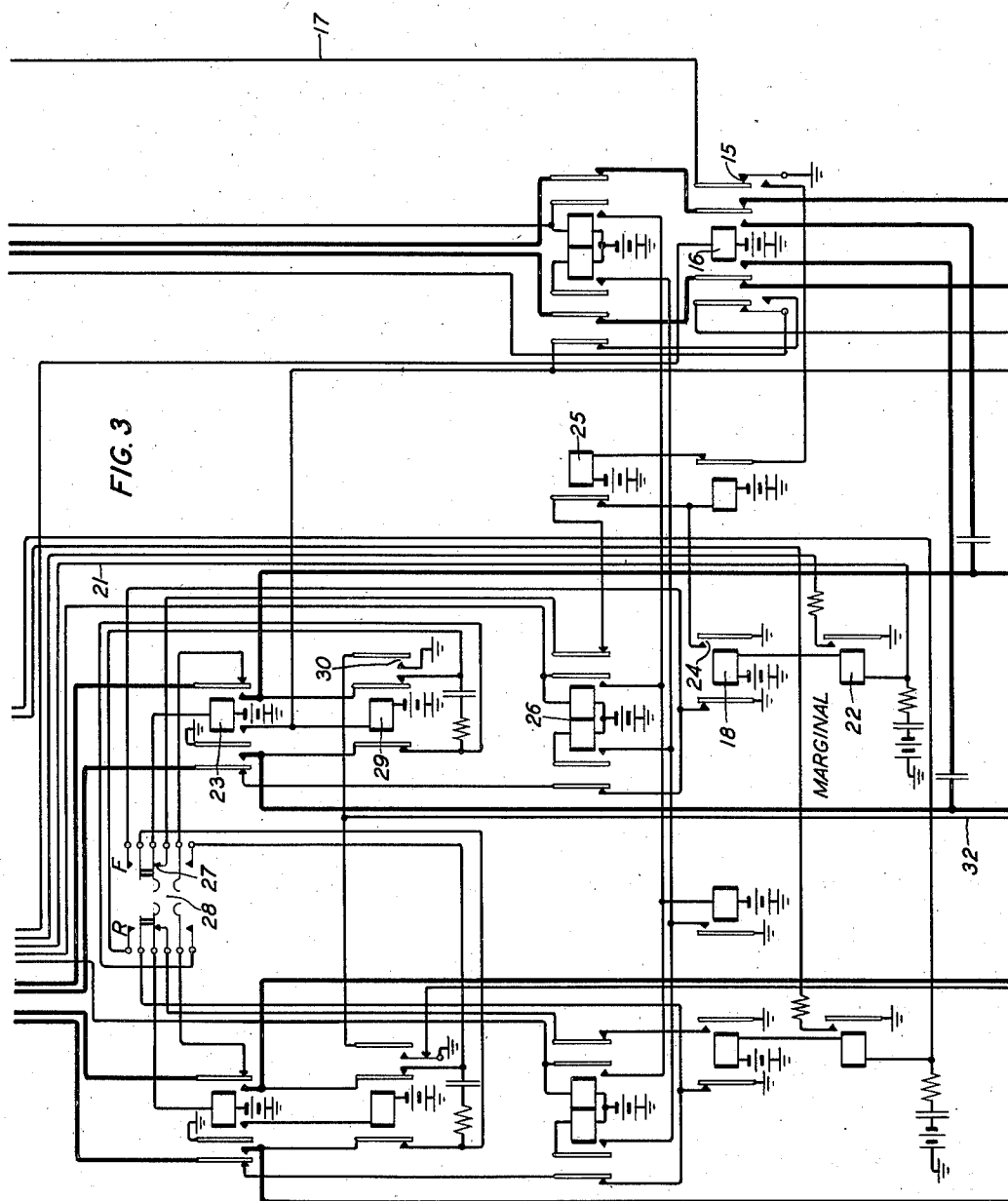
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7 Sheets-Sheet 3



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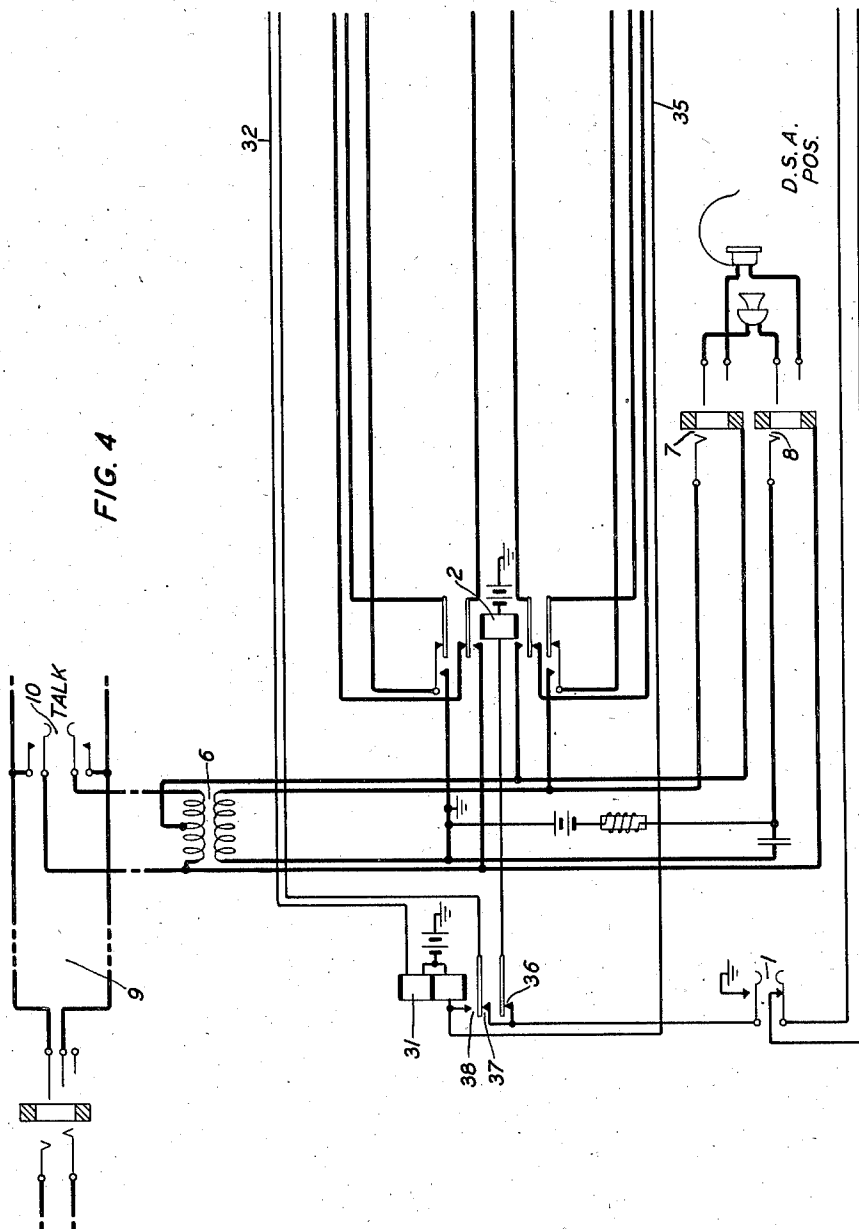
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7 Sheets-Sheet 4



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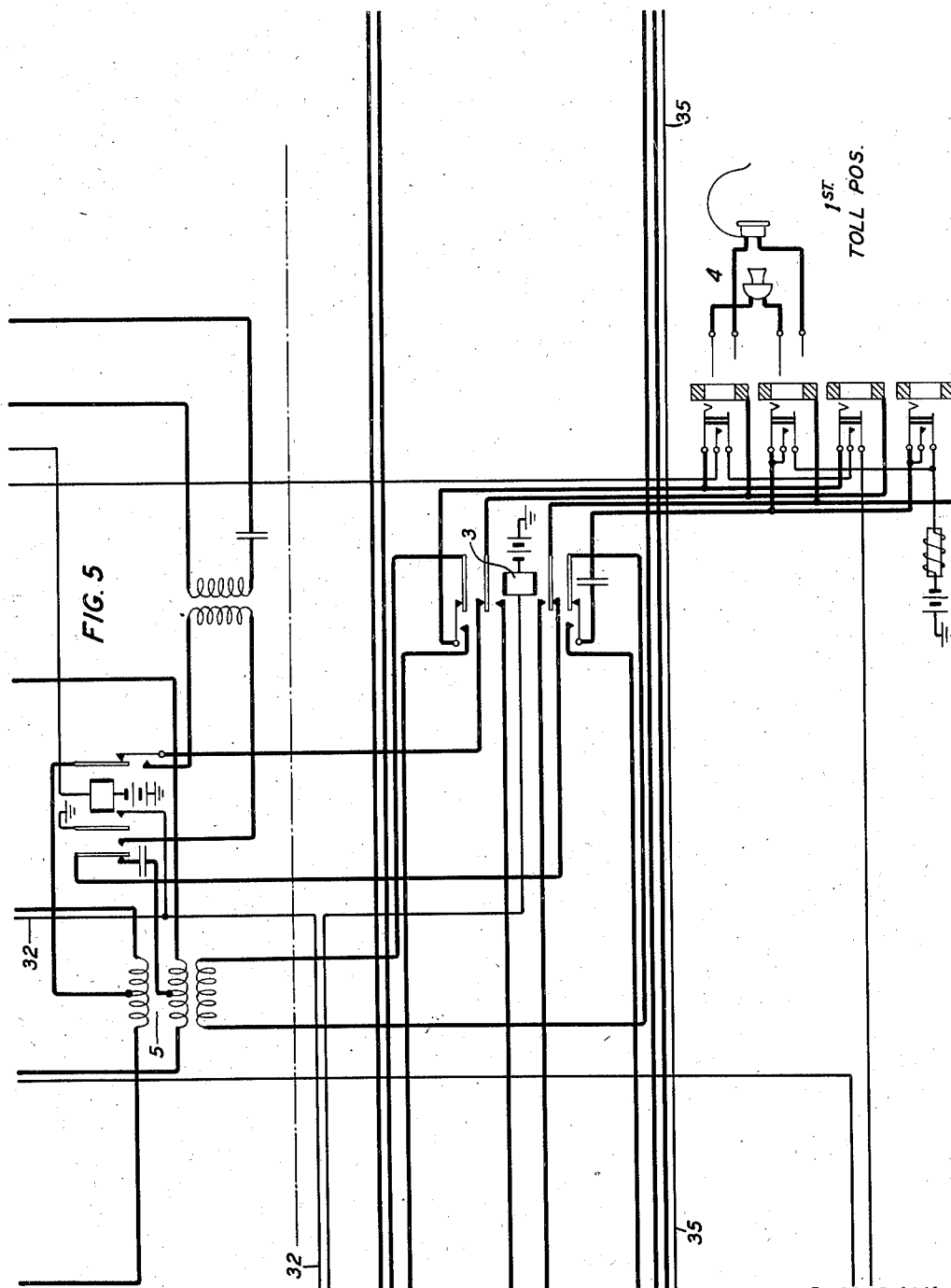
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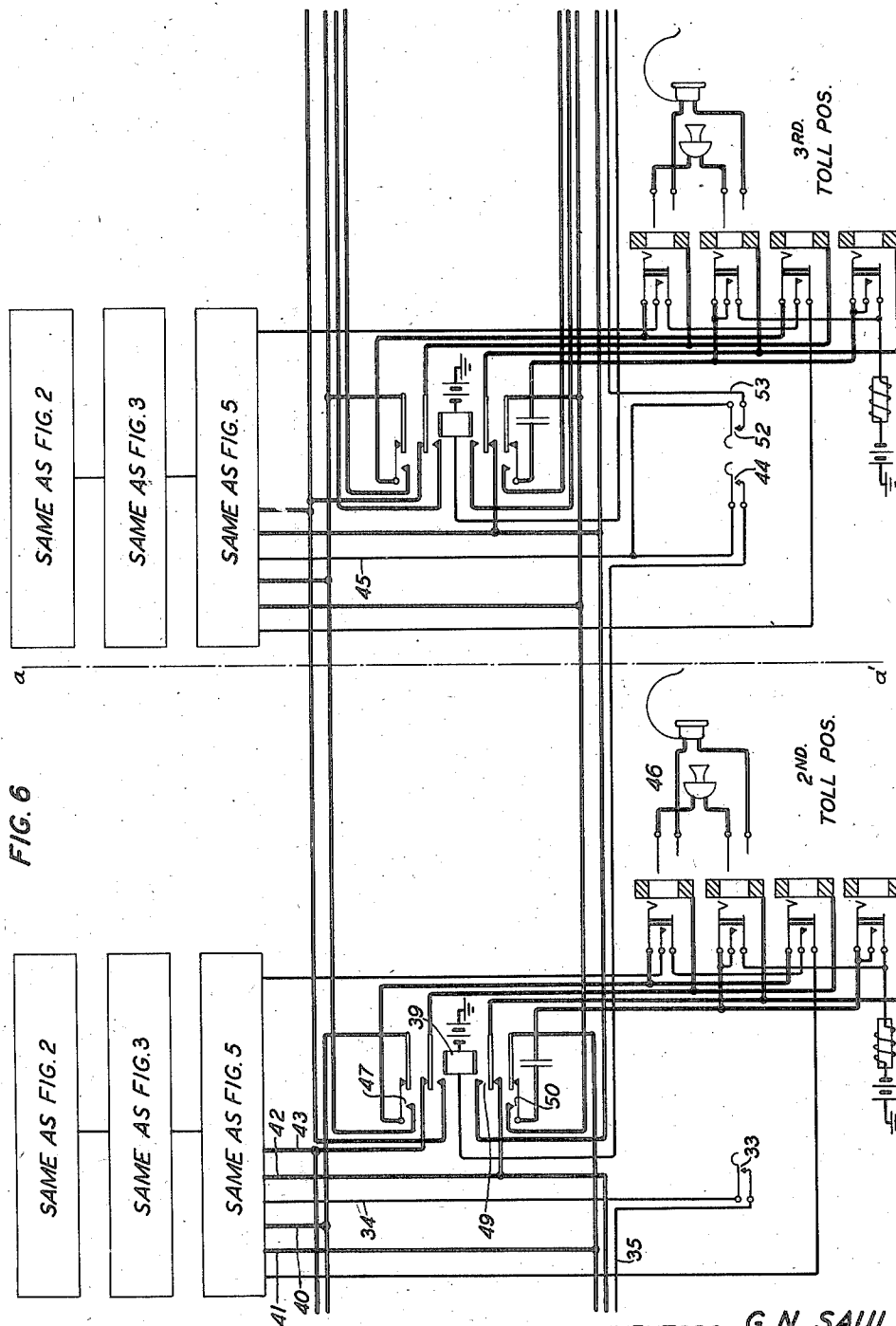
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7 Sheets-Sheet 6



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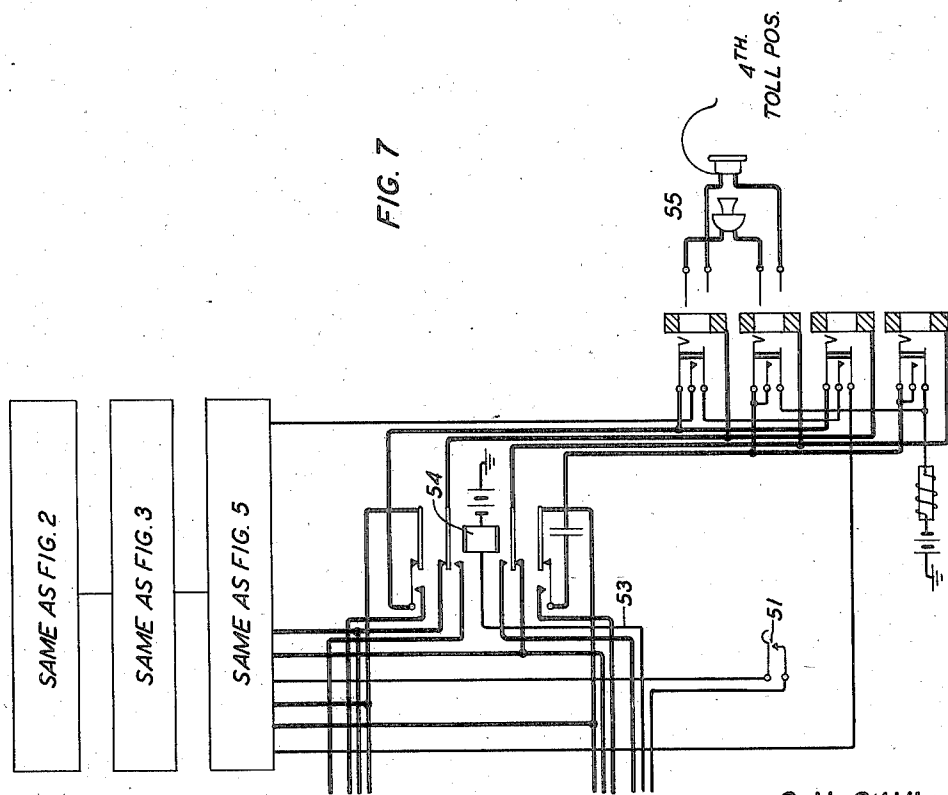
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GROUPING CIRCUITS

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7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE

2,041,090

GROUPING CIRCUIT

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7 Claims. (Cl. 179—51)

This invention relates to telephone systems and more particularly to what are known as grouping arrangements for telephone switchboards whereby an operator whose telephone set is connected to one position may answer and complete calls at an adjacent unattended or vacant position by means of the cord circuits at that position without the necessity of manually disconnecting her telephone set from her home position and connecting it to the unattended position.

An object of the invention is, therefore, to group unattended positions to an adjacent position at which an operator is stationed whereby the operator's telephone set may be connected to any busy cord circuit of either position merely by actuating the usual cord circuit talking key associated with the busy cord.

A feature of the invention whereby the foregoing object is attained resides in switching means jointly controlled by a common grouping key and any talking key and sleeve relay of the unattended position, for automatically disconnecting the operator's transmitter and receiver from her home position telephone circuit and connecting it to the telephone circuit of the unattended position whenever the grouping key is operated and a talk key associated with a busy cord at the vacant position is operated.

A second feature resides in switching means jointly controlled by a common grouping key and any talking key of the home position whereby when the grouping key is operated the operator's telephone set is immediately disconnected from the telephone circuit of the home position and connected to the telephone circuit of the unattended position irrespective of the operative condition of the talking key thereat, and disconnected from the unattended position and reconnected to its home telephone circuit whenever a talking key of a busy cord circuit at the home position is operated.

A further feature related to the second feature resides in such an arrangement of said switching means that the operation of a grouping key individual to another unattended position also adjacent the home position and the operation of a talk key, associated with a busy cord at said other position, will disconnect the home operator's telephone circuit from the first unattended adjacent position and connect it to the other unattended adjacent position.

Other features not specifically mentioned will be apparent from the following description and appended drawings when arranged as shown in Fig. 8, which illustrate, as one embodiment of the

invention, a switchboard comprising four toll operator's positions and a so-called D. S. A. (dial system A) position located at the left of, and adjacent to, the No. 1 toll position.

Fig. 1 shows an incoming toll line;

Fig. 2 shows a toll cord circuit at the No. 1 toll position;

Fig. 3 shows the position circuit;

Fig. 5 shows the operator's telephone and grouping circuit therefor;

Figs. 6 and 7 show other adjoining toll positions 2, 3 and 4 of the toll switchboard; and

Fig. 4 shows the operator's circuit of what is called a D. S. A. position which is located adjacent to and at the left of the No. 1 toll position.

As referred to in the foregoing objects of invention, it is desirable at certain periods such as at night, Sundays and holidays when the telephone traffic is light to reduce the number of operators on duty to the minimum number necessary to adequately handle the calls. This obviously will leave certain positions unattended and it is frequently the practice to so place the operators on duty that they are located at positions which are next to or adjoin unattended or vacant positions, for example, in a switchboard having six normally occupied positions, if it is desired to reduce the operating force during the night by fifty per cent, i. e., to cover the board with three operators, positions 1, 3 and 5 can be covered and by proper switching means connect the position equipment of position 2 with that of position 1, position 4 with position 3 and position 6 with 5. By such an arrangement, the operator's position 1, for example, has as a part of her position equipment double the usual number of cord circuits, that is, in addition to the cord circuit forming a part of the position at which she is seated, she also is associated, by the switching or so-called grouping means, with the cord circuits of the adjacent or No. 2 position. Therefore, she can cover and complete calls at her own or home position in the usual manner with the cord circuits of that position and in case calls are to be answered at No. 2 position she can reach over and use the cord circuits of that position in the same manner as though they were located at her own position. In this grouped condition the operator's telephone set at the occupied position is associated with any cord in either position when the listening or talk switch, either key or relay, is operated, thereby obviating the necessity of the operator removing her telephone set plug from her home position and changing it over to the telephone jack of the

adjacent position when calls are to be answered in that position.

Heretofore, the grouping methods usually employed have consisted in disconnecting the position circuit of the vacant position from the operator's telephone circuit of that position and in connecting it to the operator's telephone circuit of the occupied position in multiple with the position circuit of that position. Such an arrangement has certain disadvantages which the present invention overcomes.

In order to more clearly understand the foregoing, a description of the operation of the grouping scheme of our invention will now be given.

D. S. A. position grouped to first toll position

It will first be assumed that it is desired to vacate the D. S. A. position, Fig. 4, and that the No. 1 toll operator, who it will be assumed is on duty, is to handle the calls at the vacated position in addition to her own.

When the D. S. A. operator leaves the position, grouping key 1 is operated to a locking position which closes an obvious circuit to operate relay 2 in the D. S. A. position and the grouping relay 3 in the adjoining or first toll position. The joint operation of these two relays transfers the toll operator's telephone set 4 from the induction coil 5 of the toll position to the induction coil 6 of the D. S. A. position. Further, the operator's telephone jacks 7 and 8 are disconnected from the induction coil 6 by the operation of relay 2.

Under the conditions above described the operator's telephone 4 of the toll position is normally disconnected from its own position and connected to the telephone circuit of the D. S. A. position and the toll operator can talk on any cord circuit 9 of the D. S. A. position merely by operating the talk key 10 associated with the cord. If, however, a call is received on a toll line TL (Fig. 1) appearing at the first toll operator's position, the toll operator will answer the call by inserting the rear or answering plug 11 of the toll cord TC, at her own position (Fig. 2), into jack 12 and operate the talk key 13 associated with the cord circuit. This causes operation of relay 14 in a circuit which can be traced from ground, contacts 15 of relay 16, (Fig. 3) conductor 17, upper contacts of talk key 13 and the left-hand winding of relay 14 to battery. The operation of relay 14 extends the sleeve circuit of the calling line and cord into the position circuit (Fig. 3) to operate relay 18, the circuit for which can be traced from ground, the high resistance relay 19 of the line, the sleeve circuit of the line and cord, contact 20 of relay 14, conductor 21, winding of marginal relay 22 and winding of relay 18 to battery. Relay 22 being marginal does not operate in series with the high resistance relay 19 but relay 18 operates and closes a circuit to operate relay 23 which can be traced from ground, contacts 24 of relay 18, back contacts of relays 25 and 26, contacts 27 of key 28 and winding of relay 23 to battery. Relay 23 in operating closes an obvious circuit to operate relay 29 which relay, in turn, closes at its contact 30 a circuit to operate relay 31 in the D. S. A. position, Fig. 4. This circuit can be traced over conductor 32. Relay 31 in operating opens at its lower contact the original energizing circuit for relays 2 and 3 which now release and reconnect the toll operator's telephone set to its own position.

When the talk key 13 is released relay 31 re-

leases and relays 2 and 3 again operate provided the grouping key 1 remains operated.

D. S. A. and second toll position grouped to first position

It will now be assumed that in addition to vacating the D. S. A. position the second toll operator's position is also to be vacated and therefore the grouping key 33 is operated in addition to grouping key 1. Under this condition the normal "set-up" is the same as before described, i. e., the first toll operator is normally connected to the D. S. A. position but is released therefrom and reconnected to its own position induction coil by the operation of relay 31 when a talk key 13 in the toll position cord (Fig. 2) is operated.

Now, if a call is received on a line appearing at the second toll position, the first toll operator will reach over into the second position (to the left of the broken vertical line *a-a'* of Fig. 6) and plug the answering end of one of the cords of that position into the calling line and operate the talking key associated therewith which corresponds to talking key 13 of Fig. 2. Operation of the talk key in the second position causes relays in the cord and position circuit of that position to operate, which relays correspond to relays 14, 18, 23 and 29 as previously described thereby establishing a ground condition on conductor 34 which is extended over the closed contacts of grouping key 33 and conductor 35 to battery through the lower winding of relay 31 of the D. S. A. position (Fig. 4).

Relay 31 operates and by opening its lowermost contacts 36 releases relay 2. Relay 31 in operating opens contact 37 thereby removing the ground supplied at the upper contacts of grouping key 1, which has been holding the grouping relay 3 (Fig. 5). Relay 3 however does not release at this time due to the presence of ground on conductor 35 and therefore continues to hold grouping relay 3 operated. We now have the condition of relay 2 being released with grouping relay 3 operated and it will be observed that the operator's telephone 4 of the first toll position is therefore disconnected from its own induction coil 5 and induction coil 6 of the D. S. A. position and connected over the operated contacts of grouping relay 3, the normal contacts of relay 2 and grouping relay 39 of the second toll position to the telephone circuit of that position, over conductors 40, 41, 42 and 43. When the talk key is released at position 2 ground will be removed from conductors 34 and 35 and relay 31 will release thereby restoring the first position telephone to its connection to the D. S. A. position by the reoperation of relay 2.

In case the operator should inadvertently operate a talk key in the second position when a talk key is already operated in the first position, the ground supplied over conductor 34 will reoperate relay 3. As relay 2 is already released due to the previous operation of relay 31 caused by operation of the talk key in the first position, we now have the condition of relay 2 released and relay 3 operated which it will be noted establishes a connection of the operator's telephone 4 with the second position to the exclusion of the first position.

From the foregoing it will be observed that operation of the grouping key 1 of the D. S. A. position groups that position to the first toll position and connects the first toll operator's telephone to the induction coil of the D. S. A. posi-

tion but the operation of a talk key in the toll position disconnects the telephone set from the D. S. A. induction coil and connects it to the toll position induction coil regardless of the condition of any talk key in the D. S. A. position and that if the grouping key 33 in the second toll position is operated, to group the second position to the first position, the operation of a talk key in the second position connects the operator's telephone 4 of the first position to the second position regardless of the operation of any talk key in either the first toll position or the D. S. A. position.

It will be evident that the second toll position can be grouped to the first position by operation of grouping key 33 when the D. S. A. position is occupied and the grouping key 1 is in its normal or unoperated position.

In like manner, if toll position 3 is unoccupied the calls incoming to that position can be handled by the operator in position 2 by operating group key 44 (Fig. 6). Under this condition, the insertion of an answering plug at position 3 in a calling line and the operation of the associated talk key, which corresponds to talk key 13 of Fig. 2, causes a ground to be placed on the ground lead 45 of position 3 which, in turn causes grouping relay 39 in position 2 to operate. Relay 39 in operating disconnects the operator's set 46 from its own position circuit and connects it over contacts 47, 48, 49 and 50 to the position circuit of position 3. Release of the talk key in position 3 removes ground from conductor 45 and grouping relay 39 releases and restores the operator's set 46 to its normal connection with its own position circuit.

Similarly, position 4 if unoccupied can be handled by an operator sitting at position 3 by operation of grouping key 51.

Two-way grouping

Our invention also permits, if desired, what is termed two-way grouping, that is, grouping two positions in either directions, for example, position 4 to position 3, or position 3 to position 4. To accomplish this it is only necessary to arrange the circuit as shown in Figs. 6 and 7 and provide an additional grouping key 52 which group positions 3 to position 4. When this key (52) is operated, the insertion of an answering plug and operation of the associated talk key in position 3 will connect ground to conductor 45 as before but a circuit now extends to battery over contacts of key 52 and conductor 53 through grouping relay 54 of position 4 causing this relay to operate and disconnect the operator's telephone 55 of position 4 from its own position circuit and connect it to the position circuit of position 3.

From the foregoing it will be noted that by the circuit arrangement of this invention, an automatic transfer of the operator's telephone at the occupied position from that position to the adjacent vacant position is effected whenever a talk key in the vacant position is actuated to answer a call, which accomplishes the same result as though the operator were to remove the plug of her telephone set from the jack at the position at which she is seated and reach over and plug into the telephone jack of the adjacent position each time that she answered a call in that position.

This arrangement differs as hereinbefore mentioned, from previous arrangements in which the position circuit of the vacant position is permanently connected, during the grouping period,

with corresponding circuit element of the occupied position.

What is claimed is:

1. In a telephone grouping system, first, second and third operators' positions of one characteristic, each comprising an operator's induction coil, a position of a different characteristic also comprising an operator's induction coil, an operator's telephone set at the first position normally connected to its respective induction coil, grouping means in the first position to selectively transfer the connection of said telephone set from its associated induction coil either to the second position or to the position having a different characteristic, a grouping key adapted to cause operation of said grouping means to effect the transfer of said telephone set to the position having a different characteristic, a talk key at the first position, means operated responsive to actuation of said talk key to release said grouping means and restore said telephone set to its normal connection, a grouping key and a talk key at the second position, means responsive to actuation of the talk key at the second position effective when the grouping key at said second position is operated to cause the grouping means in the first position to transfer the telephone set of the first position into connection with the induction coil of the second position, a telephone set at the second position normally connected to its respective induction coil, grouping means at the second position adapted when operated to transfer the telephone set thereat into connection with the induction coil of the third position, a grouping key and a talk key at the third position, and means responsive to actuation of the third position talk key when the third position grouping key is operated to operate the grouping means at the second position to transfer the second position telephone set into connection with the induction coil of the third position.

2. In a telephone grouping system, first and second operators' positions, each position comprising an operator's telephone circuit and an operator's telephone set normally connected thereto, and manually controlled means for switching the operator's telephone set at one position from its associated telephone circuit to the telephone circuit of the other position, said means being effective only when a talking key is operated at said other position.

3. In a telephone grouping system, first and second operators' positions each position comprising a link circuit, an operator's telephone circuit including a normally connected telephone set and a talk key for connecting the link circuit to the telephone circuit, grouping means in the first position for disconnecting the operator's telephone set thereat from its normally connected telephone circuit and for connecting said telephone set with the telephone circuit of the second position, a grouping key at the second position adapted when operated to partially establish an operating circuit for said grouping means, and means responsive to operation of the talk key at the second position when said grouping key is operated to complete the partially prepared circuit for the grouping means and cause its operation.

4. In a telephone grouping system, first and second operators' positions, an operator's telephone set at the first position and normally connected thereto, grouping means at the first position for disconnecting the operator's set therefrom and connecting it to the second position, 75

a grouping key individual to the second position for partially closing an operating circuit for the grouping means, and means operated in response to actuation of a talk key at the second position while said grouping key is operated to complete the operating circuit of the grouping means.

5 5. In a telephone grouping system, first and second operators' positions, an operator's telephone set at each position and normally connected thereto, grouping means at each position for disconnecting the operator's telephone set thereat and connecting it to the other position, a grouping key for each position for partially closing an operating circuit for the grouping means at the other position, and means operated in response to actuation of a "talk" key at either position while the associated grouping key is operated to complete the operating circuit of the grouping means at the other position.

10 6. In a telephone grouping arrangement, first and second operators' positions each position comprising an operator's telephone circuit, an operator's telephone set at the first position nor-

mally connected to its associated telephone circuit, grouping means at the first position for transferring the connection of said telephone set from its associated telephone circuit to the telephone circuit of the second position, a grouping key adapted to cause operation of said grouping means and effect said transfer, a talk key at said first position, and means operated responsive to actuation of the talk key to release said grouping means.

10 7. The method of grouping two operators' positions whereby an operator sitting at one position is able to operate an adjacent position in conjunction with her home position without manually transferring her telephone set back and forth between the positions, which consists in automatically disconnecting the operator's telephone set at the home position from its associated telephone circuit and connecting it to the telephone circuit of the adjacent position under control of any listening key at the adjacent position.

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