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TELEPHONE SYSTEM

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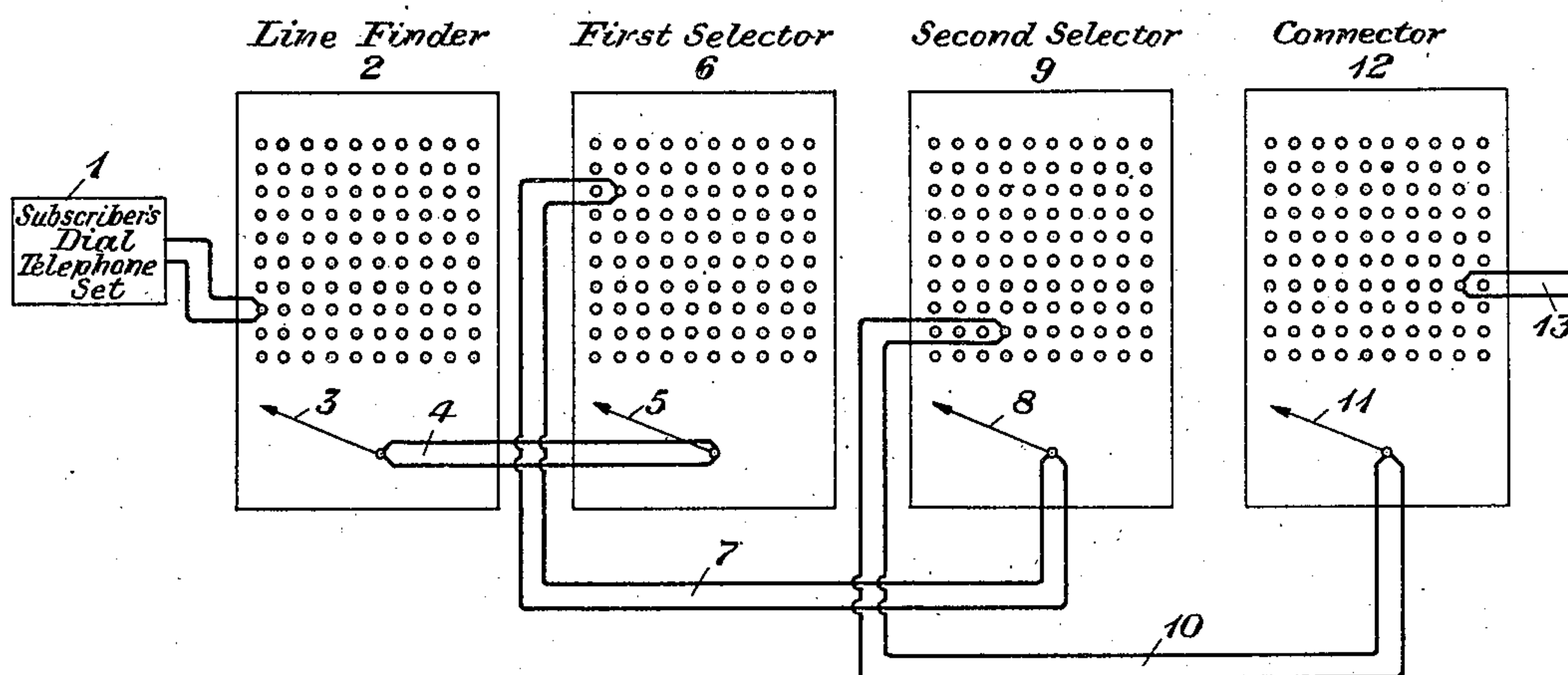


Fig. 1

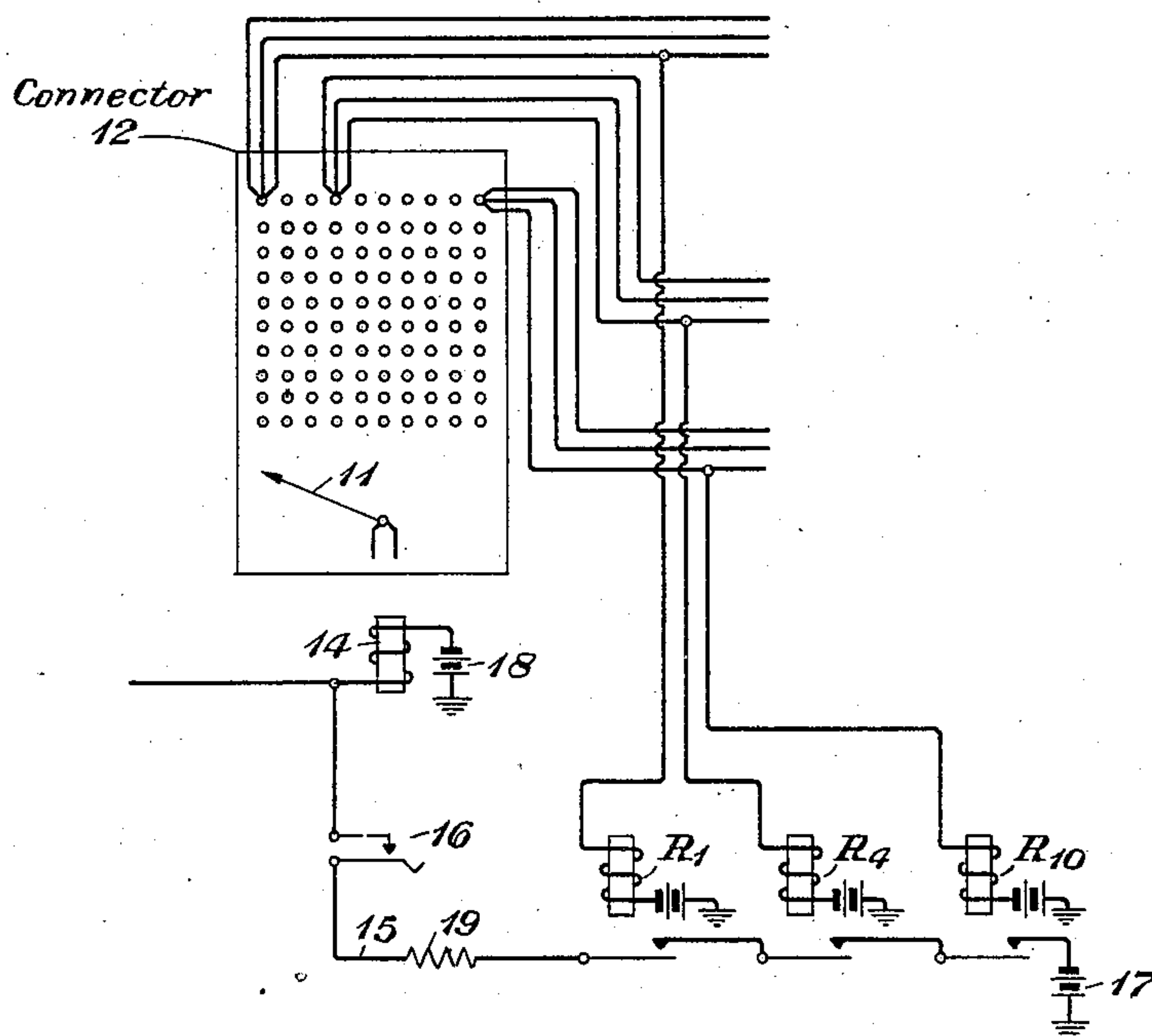


Fig. 2

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TELEPHONE SYSTEM

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3 Claims. (Cl. 179—18)

This invention relates to telephone systems and more particularly to improvements in automatic telephone systems of the step-by-step type.

More specifically, the invention relates to improvements in the connectors used in such step-by-step systems whereby the regular trunk-hunting connector may operate as a level-hunting connector over certain levels of the connector. Such an arrangement would be particularly advantageous in instances where a customer applies for a P. B. X system having over ten trunks, as for example, between ten and twenty trunks, in an office where there has previously been no requirement for level-hunting service and where the installation of any other large P. B. X system in the near future is unlikely. By providing the regular rotary trunk-hunting connector with the arrangements of the invention the expense of installing a group of level-hunting connectors for such a customer would be avoided and the rotary-hunting action on the other levels not assigned to this customer is retained. With the arrangements of the invention a larger number of small systems may be assigned in the hundred trunk group of the connector than if a group of level-hunting connectors were installed. Other objects and features of the invention will be more clear from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description together with the accompanying drawing in the Figures 1 and 2 of which the invention is illustrated. Fig. 1 shows schematically a step-by-step telephone system to which the arrangements of the invention are applicable. Fig. 2 shows in detail the circuit arrangements of the invention. Similar reference characters have been used to denote like parts in both figures.

In the step-by-step telephone system illustrated schematically in Fig. 1 there is shown a calling subscriber's dial telephone set 1, a line finder 2, a first selector 6, a second selector 9, a connector 12 and a trunk 13 leading to the called subscriber. For purposes of illustration it may be assumed that the called subscriber's number is 8249. The act of taking the receiver off the hook will start a line finder, such as 2, in operation to locate and make a connection with the calling subscriber. The call will then be extended over the wiper arm 3 and trunk 4 to the wiper arm 5 of the first selector 6 and a dial tone will be sent back to the calling subscriber who will then

dial the number 8249. The dialing of number 8 will cause the wiper arm 5 to move up to the eighth level of contacts and then the selector will move horizontally along this level until an idle trunk is found. The call will then be extended over trunk 7 to the wiper arm 8 of the second selector 9. The dialing of number 2 will cause the wiper arm 8 to move up to the second level of contacts and then the selector will move horizontally along this level until an idle trunk is found. The call will then be extended over trunk 10 to the wiper arm 11 of the connector 12. The connector 12 is of the rotary trunk-hunting type. The dialing of number 4 will cause the wiper arm to move up to the fourth level of contacts and the dialing of the number 9 will cause it to move horizontally along this level to the ninth contact. The call will then be completed over trunk 13 to the called subscriber. The foregoing arrangements are well known in the art.

To the rotary trunk-hunting connector 12 there might be connected one hundred individual subscribers' trunks, such as 13, or there might be connected thereto a lesser number of subscribers' lines and a number of private branch exchanges. In order to accommodate a subscriber who desired a private branch exchange with more than ten trunks, as for example, between ten and twenty trunks, the connector might be changed from the rotary trunk-hunting type to the level-hunting type. In the level-hunting type of connector the wiper arm would move up to a certain level of contacts and then move horizontally over this level until an idle trunk was found and if no idle trunk existed on this level, it would automatically move to the next level of contacts and search on that level until an idle trunk was found. With such an arrangement one subscriber could readily be supplied with a private branch exchange of twenty trunks but the other eight levels of contacts could only serve one subscriber apiece. Accordingly a level-hunting connector would only be economical if it were serving a number of relatively large private branch exchanges.

In the arrangements of the invention the ordinary rotary trunk-hunting connector is modified so that it will operate as a level-hunting connector over a certain of the levels of contacts but not over the other levels. Over these other levels it will function as a trunk-hunting connector. In other words, with the arrangements of the invention the connector will provide both trunk-hunting and level-hunting. The arrangements for accomplishing this are shown in Fig. 2.

If a customer desired a private branch exchange with between ten and twenty trunks, or for purposes of illustration, twenty trunks, two levels of contacts of the connector would be assigned to him. It might be desirable to assign the customer the two upper levels in this instance. It is pointed out that whenever a connection is made with any of the ten trunks connected to the top level, ground would be applied to the sleeve conductor of said trunk in a manner well known in the art. In accordance with this invention a chain of ten relays would be provided having a relay individual to each of the said ten trunks. Three of these are shown as R_1 , R_4 and R_{10} . However, it is understood that one relay would be provided for each trunk. Each relay would be connected in a circuit completed over the sleeve of its respective trunk. Accordingly, whenever a connection is made with a trunk, its associated relay would operate. This chain of relays has associated therewith a circuit 15 which would be completed over the contacts of all of said relays when they are operated. The circuit 15 would also have included therein a switch 16, a resistance 19 which might be of 50 ohms and the winding of the customary stepping magnet 14. The winding of the stepping magnet 14 would be connected to battery 18. The other end of circuit 14 would be connected to battery 17.

As heretofore pointed out the two upper levels of ninth and tenth levels are assigned to the customer with the twenty trunk private branch exchange. When his number, which would be that corresponding to one of the terminals on the tenth level, is dialed, the wiper arm 11 will move to the tenth level if there are any idle trunks on this level and will then move horizontally and pick out an idle trunk. In moving to this tenth level it will cause the cam switch 16 to close when it reaches the ninth level. As heretofore pointed out circuit 15 is completed over the contacts of all of the ten R relays in the chain and hence if there is an idle trunk in the tenth level the circuit 15 will not be completed. However, if all of the trunks on the tenth level are busy, all of the R relays will be operated and hence when the wiper arm 11 reaches the ninth level and closes the cam switch 16, circuit 15 will be completed. This will connect a 50-ohm battery to battery shunt around the stepping magnet 14 and cause it to cease functioning regardless of the dialing impulses. The wiper arm 11 hence will only reach the ninth level to pick out an idle trunk therein. In other words, with the arrangements of the invention whenever this particular private branch exchange number is dialed the wiper arm will always pick out an idle trunk on the tenth level if one exists, but if all the trunks on the tenth level are busy it will be stopped at the ninth level and will pick out an idle trunk on that level if one exists.

While the invention has been disclosed as adapted to provide level-hunting action on two levels, it might readily be adapted to provide level-hunting action on more than two levels. By providing two or more chain relay circuits the arrangements of the invention could readily be extended to give level-hunting action on three or more levels. While the invention has been disclosed as embodied in certain specific forms which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. In an automatic telephone system of the step-by-step type, a connector of the rotary trunk-hunting type having a single set of wipers, a series of relays having a relay individual to each trunk of a certain level of said connector, circuits for each of said relays whereby when its associated trunk is busy the relay will be operated, and a circuit controlled by said chain of relays and operative when all of said relays are operative for holding said set of wipers of said connector at the level just below said first mentioned level so that it may search for an idle trunk in said second mentioned level.

2. In an automatic telephone system of the step-by-step type, a connector of the rotary trunk-hunting type having a single set of wipers, a series of relays having a relay individual to each of the trunks of the top level of said connector, circuits for each of said relays whereby when its associated trunk is busy the relay will be operated, a switch, a circuit completed over said switch and over the contacts of all of said series of relays when operated for halting said set of wipers of said connector at the level just below said top level so that it may search for an idle trunk in said second mentioned level, and means to close said switch when said set of wipers of said connector reaches the level of said connector below said top level.

3. In an automatic telephone system of the step-by-step type, a connector of the rotary trunk-hunting type having a single set of wipers, a plurality of chains of relays each individual to different levels of said connector, each of said chains having a relay individual to each of the trunks of the level with which the chain is associated, a plurality of circuits individual to each of said chains of relays, each of said circuits being adapted to be completed when all the relays of its associated chain are operated, and means controlled by each of said circuits when completed for halting said set of wipers at a level of just below the level with which a completed one of said circuits is associated.

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