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TELEPHONE SYSTEM

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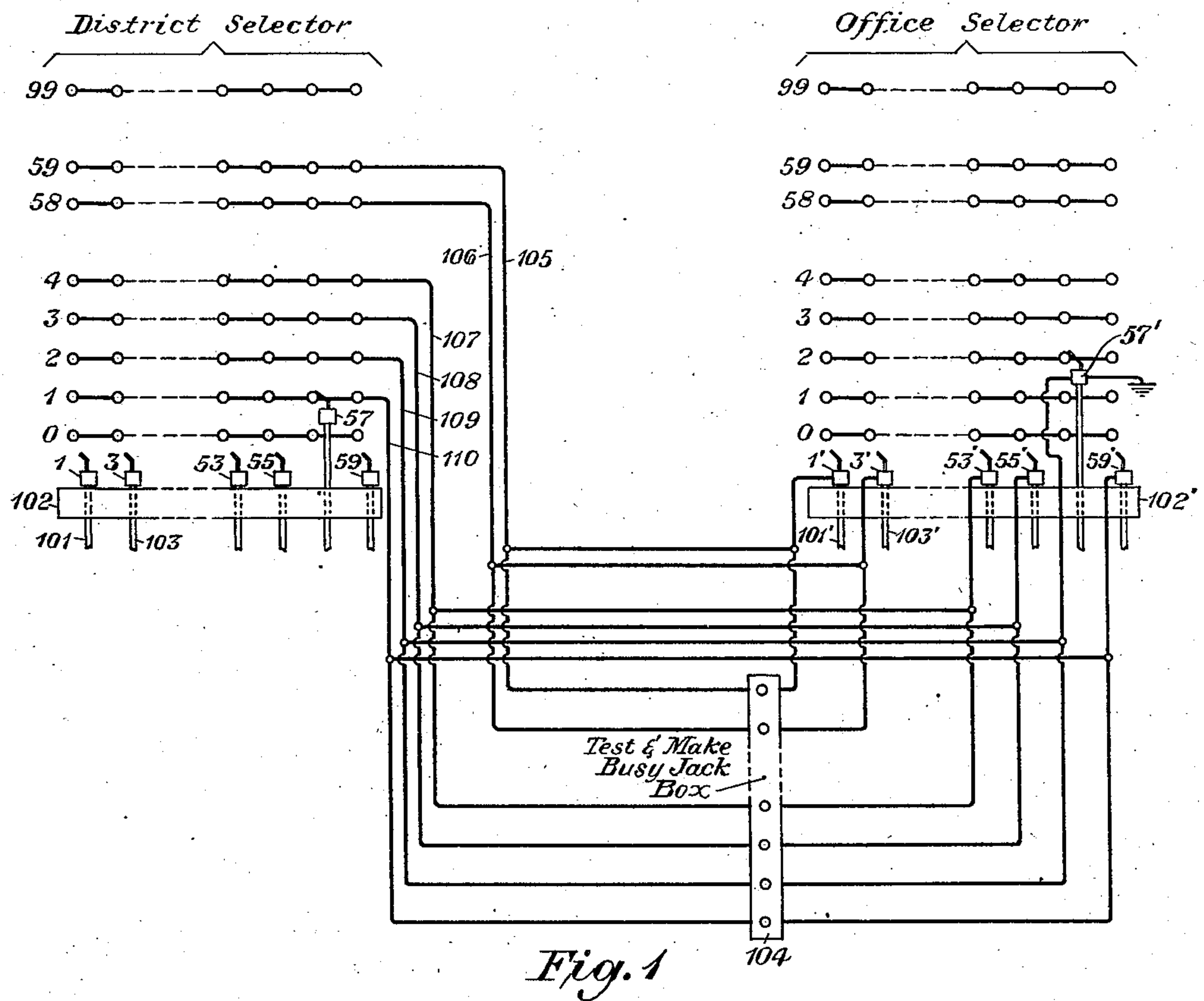


Fig. 1

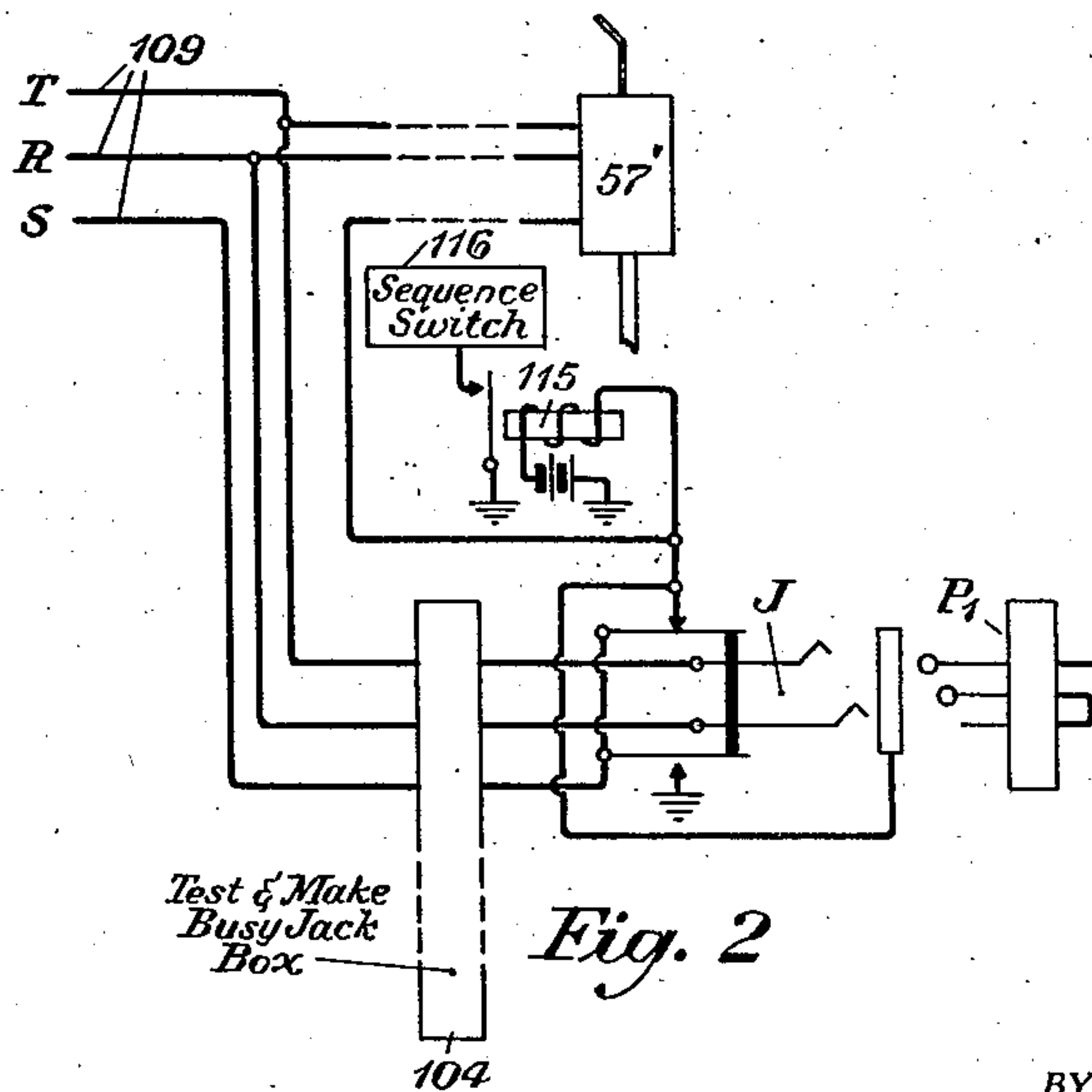


Fig. 2

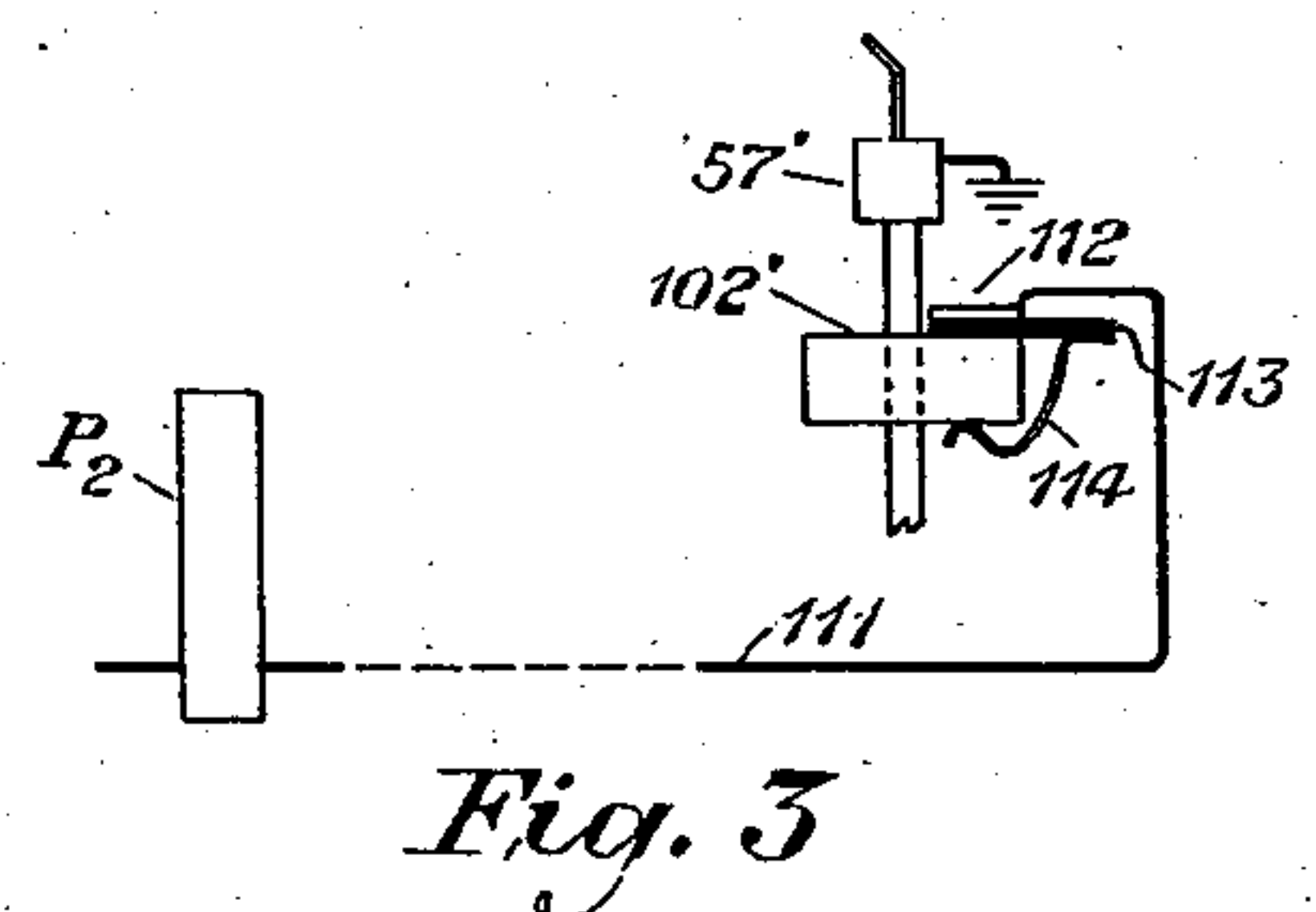


Fig. 3

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TELEPHONE SYSTEM

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3 Claims. (Cl. 179—175.21)

This invention relates to telephone systems and more particularly to improvements in machine switching apparatus of the panel type utilized in such systems.

As is well known in the art, the mechanism required to establish a panel machine switching connection consists essentially of a series of units, known as selectors, which operate under control of a central office device, known as a sender, which, in turn, is controlled by the subscriber through the medium of his dial. A selector might be termed a device for automatically connecting a given trunk to any one of several other trunks or to any one of several lines. Each panel selector unit would usually consist of sixty multiplied terminals in each of one hundred rows with a separate brush being provided for each of the sixty terminals of the multiple. The trunks or lines outgoing from a selector unit are connected to the multiple banks of terminals in front of the brushes. Certain of these outgoing trunks or lines would be terminated on a set of selecting brushes of the next selector unit. The brushes are so arranged that they may be driven upward over the multiple bank terminals until the desired terminal has been reached. The connections established by these lines or trunks between the multiple banks of terminals of one selector unit and the brushes of another selector unit would under certain circumstances be completed through a test and make-busy jack box. An illustration of this would be where the connections were between a district selector and an office selector although such jack boxes might also be used in connection with other types of selectors.

The test and make-busy jack box would be provided with a jack individual to each of the connections between one selector unit and another selector unit, and its purpose is to provide a means whereby a busy condition may be applied to each of the connections by the test man so that the office selectors associated therewith may be tested. When the test man decides to test a certain connection, he inserts a make-busy plug into the jack individual to the connection to be tested. Before inserting the make-busy plug into the jack he would have to look at the selector frame and see if the brush of the connection in question had returned to normal, or back to its bearing plate, after the termination of a service call. If the plug were inserted in the jack during the connection period, apparatus would function to cut off the connection in question and interrupt the service call. Accordingly, the test man must

wait for the circuit to restore to normal before inserting the standard make-busy plug in the make-busy jack. It has been found that this may cause a considerable waste of the test man's time, particularly in flat rate and suburban areas, where holding times of selectors in the talking chains may be excessive. It is the primary object of the arrangements of the invention to provide arrangements which may be inserted in the make-busy jack before the circuit has restored to normal and while a service call is in being without causing a cut-off of the call. When the call is completed, the arrangements of the invention automatically make busy the connection under consideration, and a test thereon may be made at the convenience of the test man. Thus considerable time may be saved on the test man's part. Other objects and features of the invention will appear more fully 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, 2 and 3 of which the invention is illustrated. In Fig. 1 is shown a circuit diagram of portions of a district selector and an office selector with connections from certain of the multiple banks of terminals of the district selector to certain of the brushes of the office selector, the said connections being completed through a test and make-busy jack box. Fig. 2 shows in detail the circuit arrangements of one of the jacks in the jack box and the standard make-busy plug usually utilized therewith. In Fig. 3 are shown in detail the arrangements of the invention adapted to be used with the test and make-busy jack box under certain conditions instead of the standard make-busy plug. Similar reference characters have been utilized to denote like parts in all of the figures.

In Fig. 1, at the left of the drawing, is shown a portion of a district selector of the panel type which is well known in the art. Such a selector would usually consist of one hundred rows of multiple terminals, each row or bank having sixty terminals. Only rows or banks 0, 1, 2, 3, 4, 58, 59 and 99 are shown and only a portion of the sixty terminals in each row or bank have been shown. For each of the sixty terminals in the banks there would be provided a selector brush. Only the brushes of one bank of selectors 1, 3, 53, 55, 57 and 59 have been shown. These brushes would normally, when not being used to complete a call, rest on a bearing plate

102. Each of the brushes would be provided with an elevator rod. For example, brush 1 is provided with the elevator rod 101 and brush 3 is provided with the elevator rod 103. These elevator rods would cause the brushes to move vertically until they reached a desired terminal on a desired row or bank of contacts. At the right of the figure is shown a similar portion of an office selector. Only rows or banks 0, 1, 2, 3, 4, 58, 59 and 99 are shown, and only a portion of the sixty terminals in each row or bank have been shown. This selector would also be provided with brushes of which 1', 3', 53', 55', 57' and 59' are shown. These brushes in a similar manner would be provided with elevator rods. For example, brush 1' and brush 3' are shown with the elevator rods 101' and 103'. In the district selector the brush 57 has been elevated to the number one bank of contacts, and the other brushes are shown resting on the bearing plate indicating that they are not being used to complete a call. In the office selector the brush 57' has been shown elevated to the number two row of contacts to indicate that it is being used to complete a call. Certain of the banks of multiple terminals of the district selector would be connected to the brushes of the office selector. For the purposes of illustrating this invention the 59th row of district terminals is shown connected by conductors 105 to the brush 1' of the office selector and the 58th row of terminals is connected by conductors 106 to brush 3'. In a similar manner the 4th, 3rd, 2nd and 1st rows of the terminals of the district selector are connected, respectively, by conductors 107, 108, 109 and 110 to the brushes 53', 55', 57' and 59' of the office selector. In connecting the rows of terminals of the district selector to the brushes of the office selector, the conductors 105 to 110, inclusive, will be associated with a test and make-busy jack box 104. This jack box would have a jack individual to each of the sixty selectors provided on the office frame. The purpose of this jack box is to allow the test man to place a busy condition on any one of the conductors such as 105 to 110, inclusive, so that he may test the selectors associated therewith. To do this the test man would normally insert a standard make-busy plug into the jack individual to the office selector he wished to test. Before doing this the test man would have to look at the office selector and see whether the brush associated with the selector he desired to test was in an elevated position such as brush 57', or was in its normal position such, for example, as brushes 53' and 55'. If for the purposes of illustration, the test man wished to test the selector associated with conductors 109, and having looked at the office selector frame and ascertained that the brush 57' was not resting on the bearing plate 102', he could not insert his standard make-busy plug into the jack in the jack box 104 because to do so would cause the circuit associated with brush 57' which was in service, to be cut off. A more detailed description of the mechanism for performing this cut-off will be given hereinafter. Accordingly, he would have to wait until brush 57' returned to its normal position or back to the bearing plate 102 when the call was completed. As heretofore pointed out, this sometimes would cause a considerable delay due to the fact that the call in question might be unduly prolonged.

In Fig. 2 are shown, in more detail, the circuit arrangements of one of the jacks of the test and make-busy jack box 104. As heretofore pointed

out, the tip, ring and sleeve conductors 109 connect the second bank of terminals of the district selector to the brush 57'. As shown in Fig. 2, the tip and ring conductors are directly connected to the brush 57' and are multipled to the jack box 104. The sleeve conductor, however, is not directly connected to the brush 57' but is only connected thereto through the medium of the jack box 104 and the contacts of the jack J. Shown associated with the jack J is the standard make-busy plug P₁. It will be seen that if the plug P₁ is inserted in the jack J the sleeve circuit S will be opened at the upper contact of the jack. This will break the sleeve connection and this breaking of the sleeve connection will cause relay 115 to release. This will close a circuit for the sequence switch 116 which, in a manner well known in the art, will advance and cut off the tip and ring conductors. A ground will also be applied over the lower contact of the jack to the sleeve conductor to place a busy condition on conductors 109. Accordingly, if the test man should insert the standard make-busy plug P₁ into the jack J while the brush 57' is handling a service call, an existing connection would be broken and the service disturbed. As heretofore pointed out, the test man would, accordingly, have to wait an indefinite length of time until the spring 57 returned to its normal position.

To prevent any such delay or waste of time, the arrangements of the invention, which are shown in Fig. 3, are provided. These arrangements consist of a plug P₂ which has only a sleeve contact. This sleeve contact is connected by conductor 111 to a thin conducting plate 112 which is mounted on a thin non-conducting member 113 which may be affixed by the spring 114 to the bearing plate 102'. This device would be affixed, for example, in close proximity to the elevator rod of the brush, such as brush 57', connected to the line to be tested. Due to the fact that the member 113 is a non-conducting member no ground is connected to the sleeve of the plug P₂ at this time. The plug P₂ can be inserted in the jack J during the existence of a service call without having any effect on the circuit arrangements because the contact spring assembly in jack J will not be moved due to the fact that the plug P₂ has no tip or ring contacts. Accordingly, the test man can clip the device of the invention on to the bearing plate 102 and insert the plug P₂ in the jack J even while a call is in progress and continue on other business. When the brush 57' returns to its normal position on the bearing plate 102 at the termination of the call, a portion of the brush member 57', which is always grounded, will rest on the conducting plate 112. This will apply ground to the sleeve of the plug P₂ and thence to the sleeve of the circuit 109 and cause the circuit to be tested to remain busy even after the service call thereon was completed. The circuit including the selector to be tested will now remain in a busy condition so that it cannot again be utilized for service and will remain this way until the test man returns to complete his test. When the test man returns he may remove the plug P₂ from the jack and either connect a standard make-busy plug to the jack or connect other testing apparatus thereto.

While the arrangements of the invention have been disclosed as embodied in certain specific forms which are deemed desirable, it is understood that they are 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. A device adapted to be connected to a jack of a test and make-busy jack box associated with a selector frame in a machine switching telephone system of the panel type, said device comprising a plug having only a sleeve contact whereby when it is inserted in a jack of said box the spring contacts of the jack will not be disturbed and no cut-off will occur on a line connected thereto, a conductor connected to the sleeve contact of said plug, and means to affix said conductor to a selector frame whereby when a selector being tested returns to its normal position upon the completion of a call a ground will be applied to said conductor and from thence to the sleeve contact of the jack to which said plug is connected to place a busy condition on the line connected thereto.

2. A device adapted to be connected to a jack of a test and make-busy jack box associated with a selector frame in a machine switching telephone system of the panel type, said device comprising a plug having only a sleeve contact whereby when it is inserted in a jack of said box the spring contacts of the jack will not be disturbed and no

cut-off will occur on a line connected thereto, a conductor connected to the sleeve contact of said plug, a thin non-conducting member, a thin conducting member mounted on said non-conducting member and connected to said conductor, and means to clamp said non-conducting member on the bearing plate of a selector frame in such a position that when a selector which is in use and is to be tested returns to its normal position on the bearing plate the ground connected to the selector will be applied to said conducting member and thence to the sleeve of said plug to place a busy condition on the line associated therewith.

3. A device adapted to be connected to a jack of a test and make-busy jack box associated with a selector frame in a machine switching telephone system of the panel type, said device comprising a plug which may be inserted in a jack of said box without disturbing the spring contacts of the jack and causing a cut-off on a line connected to said contacts, and means for connecting said plug to a selector frame so that when a selector which is in use and is to be tested returns to its normal position, after a call is terminated ground will be applied to said selector to said plug to place a busy condition on the line associated with said plug.

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