W. G. BLAUVELT.

TESTING SYSTEM.

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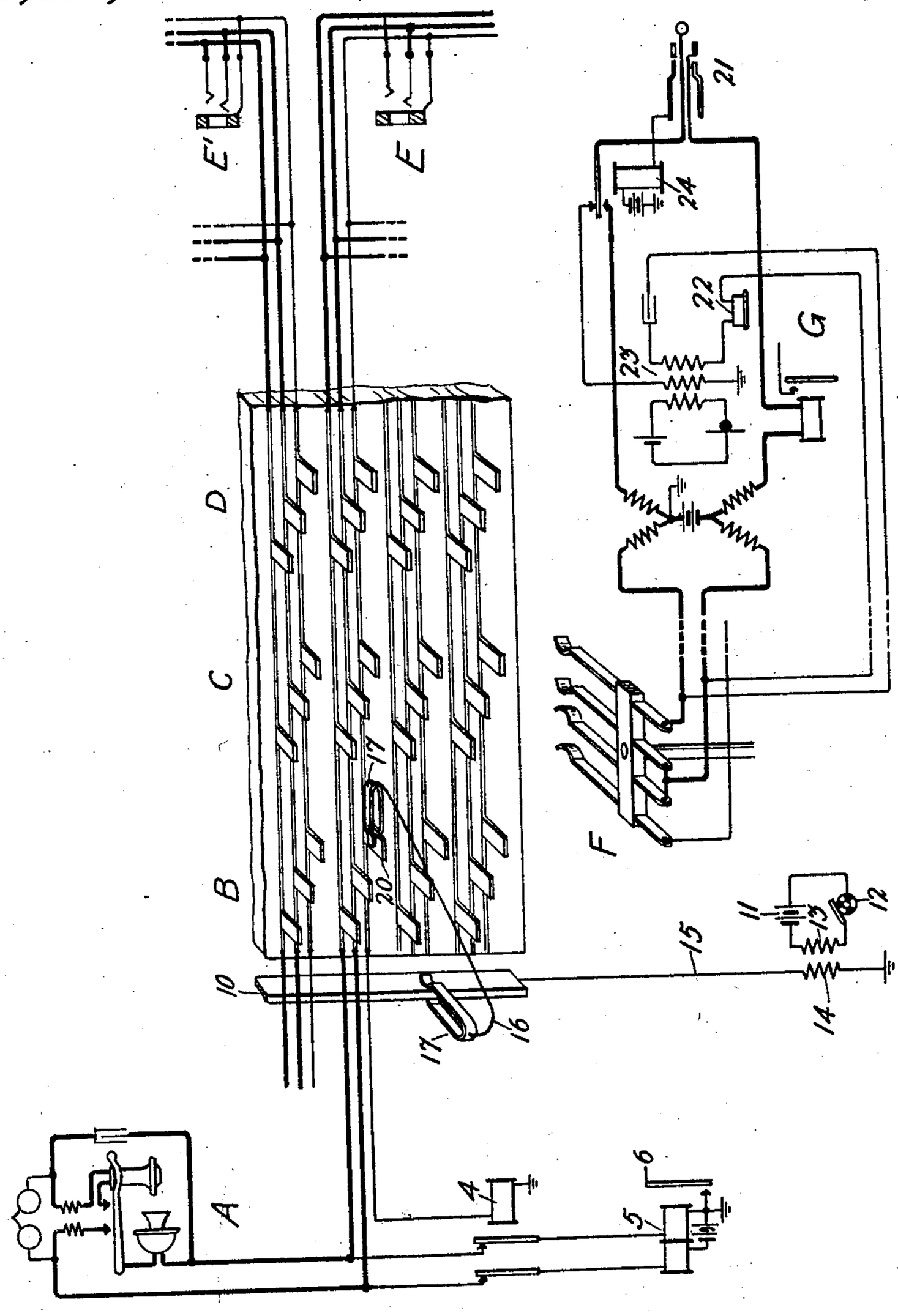
1,406,918.

Patented Feb. 14, 1922.



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UNITED STATES PATENT OFFICE.

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TESTING SYSTEM.

1,406,918. Specification of Letters Patent. **Patented Feb. 14, 1922.**

Application filed January 8, 1919. Serial No. 270,205.

To all whom it may concern:

Be it known that I, WILLIAM G. BLAUVELT, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Testing Systems, of which the following is a specification.

This invention relates to testing systems, and more particularly to such systems employed in connection with telephone exchange systems.

In order that the operators of a telephone exchange may be advised of the condition of telephone lines with which connections are to be made—as when a telephone line is in trouble—it is customary to connect with the test terminals of such lines a source of tone supply, so that a tone is produced in the receiver of an operator when making a test of the line just prior to establishing connection therewith. In telephone systems heretofore employed, it has been the practice to provide at the switchboards special trouble or hospital positions in which appear multiple terminals of all telephone lines terminating at the exchange and cord circuits connected with sources of tone supply for connection with the multipled terminals of any desired line or lines which may be in trouble. In such prior systems, the operator at the trouble or hospital position, upon being informed that a telephone line is in trouble, connects one of the cord circuits with the multiple terminals of the particular line, thereby connecting the source of tone supply with all test terminals of that line throughout the exchange. This cord circuit remains so connected until the line is cleared of the trouble. The production of this particular tone in the receiver of an operator when making a test of the telephone line is a signal indicating that the line is in trouble and that no connections are to be established therewith.

It is the object of the present invention to simplify such system by providing means for connecting such sources of tone supply with the telephone lines independently of the switchboards and associated apparatus at which the lines terminate. In attaining the object of this invention a common busbar to which a source of tone supply is connected is located adjacent stationary terminals of a group of telephone lines preferably situated in the terminal room of the exchange so that connection may be readily and easily made between the test terminal of any line of the group and the common bus-bar. This connection is preferably made by means of a conductor to each end of which is connected a terminal clip for engaging the common bus-bar and the test terminal of the telephone line.

A more complete understanding of this invention may be obtained from the following description when considered in connection with the accompanying drawing, in which one embodiment of the invention is illustrated in connection with a semi-automatic telephone system.

In the organization illustrated in the drawing, a metallic telephone line A is shown extending from a subscriber's station to the central office or exchange where it terminates upon stationary contact terminals of a plurality of automatic line finder switches B, C and D, and on the contacts of a plurality of multiple connecting jacks, such as E positioned in various sections of a switchboard at which are stationed operators for completing connections between calling and called lines. It will, of course, be understood that many telephone lines similar to A terminate at the exchange, but for convenience the one line only is shown. Likewise, only one brush set of the line finders is illustrated, and with this brush set F there is suitably associated a cord circuit G by means of which an operator may complete connections with a called telephone line. Each telephone line has connection at the central office through the normally closed contacts of a cut-off relay 4 with the windings of a line relay 5. When the line relay 5 is energized it connects ground to the conductor 6 which is the starter or control conductor for the automatic line finder switches. The apparatus controlled over this starter conductor for controlling the operation of the line finder switches may be of any suitable type, such, for example, as that shown and described in a copending application of Samuel B. Williams, Jr., Serial No. 180,634, filed July 14, 1917. Since the control apparatus of the line finder switches forms no part of this invention, a further description thereof will be omitted.

The automatic line finder switches illustrated are of the so-called panel type in

which the stationary contact terminals of a plurality of finder switches on which the telephone lines terminate are mounted on a vertically disposed flat panel. When any of the telephone lines terminating at the central office are reported in trouble, as when the line wires are crossed or grounded or one of the line wires is open, it is desirable that this be made known to all connecting operators at the central office. A very effective way for making this known to the operators is to connect with the test terminals of the line or lines in trouble a source of tone supply, by means of which a special tone is produced in the receiver of an operator when making a test of the line just prior to the act of establishing connection therewith which serves as a signal to the testing operator indicating that the line is in trouble and that no connection is to be established therewith so long as the source of tone supply remains associated with the test terminals thereof.

In accordance with the present invention the source of tone supply is associated with the test terminals of the line or lines in trouble in the following manner: Adjacent one end of the bank or panel of stationary contact terminals forming a portion of the line finder switches, there is provided a bus-bar 10 which is common to such line finder switches. A source of tone supply comprising a battery 11 and an interrupter 12 connected in series with the primary winding 13 of a transformer whose secondary 14 is connected with the bus-bar 10 by means of a conductor 15 is provided at the central office for producing the special indicating tone in the receiver of a testing operator. In order that the test terminals of any line or lines may be connected with the bus-bar 10, there is provided a plurality of insulated flexible conductors, such as 16. To each end of each flexible conductor 16, there is connected a terminal clip 17 adapted to clamp the bus-bar 10 and a test terminal of the line in trouble. A separate test terminal for each line may be provided on the panel or, as illustrated in the drawing, the end line finder switch may be left unequipped with a brush set, whereby the terminal clips 17 may be readily clamped onto the test terminals. The source of tone supply is thereby connected with the test terminals of the multiple connecting jacks at the switchboard. By providing the bus-bar adjacent the line finder switches, the source of tone supply is made available where any line in trouble may be very quickly placed in such condition to give a signal to any operator when making a test thereof. Furthermore, by embodying the features of this invention in telephone systems, there is provided a very flexible system in which the source of tone supply may be connected with one only or a very few lines that may be in trouble, or when many lines are in trouble as is occasionally the case in times of severe storms, the test terminals of all such lines may be connected with the source of tone supply. The only equipment necessary is a supply of terminal clip-ended flexible cords 16.

Assuming that telephone line A is in trouble, the test terminal 20 thereof will be connected with the bus-bar 10 by means of the clip ended flexible conductor 16, and the source of tone supply will be connected with all test terminals of this line. Assuming also that an operator has been advised by a calling subscriber that connection is desired with telephone line A, the operator makes a test of this line by bringing the tip contact of the plug 21 into engagement with the sleeve or test terminal of the jack, whereupon a spacial tone is produced in the operator's receiver 22 due to a flow of current from the grounded bus-bar 10 through the terminal clip 17, conductor 16, the other terminal clip 17, test terminal 20, sleeve contact of the jack E, tip contact of the plug 21, normal contact of the relay 24 and the tertiary winding of the induction coil 23 associated with the operator's telephone set, which induces current in the circuit including the operator's receiver.

What is claimed is:

1. In a testing system for telephone exchanges, in combination, a plurality of telephone lines arranged in groups, connecting jacks for the lines provided in a switchboard at the telephone exchange, test terminals for each line multiplied to the corresponding jacks, a bus-bar common to the test terminals, a source of tone supply connected with the bus-bar, and means for electrically connecting any one or all of the test terminals with the bus-bar.

2. In a testing system for telephone exchanges, in combination, a plurality of telephone lines arranged in groups, connecting jacks for the lines provided in a switchboard at the exchange, test terminals for each line multipled to the corresponding connecting jacks, a bus-bar common to the test terminals, a source of tone supply connected with the bus-bar, and means including a conductor and associated terminal clips for connecting any one or all of the test terminals with the bus-bar.

3. In a testing system for telephone exchanges, in combination, a plurality of telephone lines arranged in groups, connecting jacks for the line provided in a switchboard at the exchange, test terminals for the lines multipled to the corresponding connecting jacks, a panel in which the test terminals are mounted, a bus-bar adjacent the panel, a source of tone supply connected with the bus-bar, and a connecting link including terminal clips for electrically connecting

any one or all of the test terminals with the bus-bar.

4. In a testing system for telephone exchanges, in combination, a plurality of telephone lines, automatic line finder switches having stationary line and test terminals for the telephone lines, a bus-bar in proximity to the line finder switches, a source of tone supply connected with said bus-bar, and means for electrically connecting one of the test terminals with the bus-bar.

5. In a testing system for telephone exchanges, in combination, a plurality of telephone lines, automatic line finder switches having stationary line and test terminals for the telephone lines, a supporting panel in which the terminals are mounted, a bus-bar common to the line finder switches, a source of tone supply connected with the bus-bar, and means including a conductor and connected terminal clips for electrically connecting the test terminal of one of the lines with the bus-bar.

In testimony whereof, I have signed my name to this specification this 3rd day of January, 1919.

WILLIAM G. BLAUVELT.