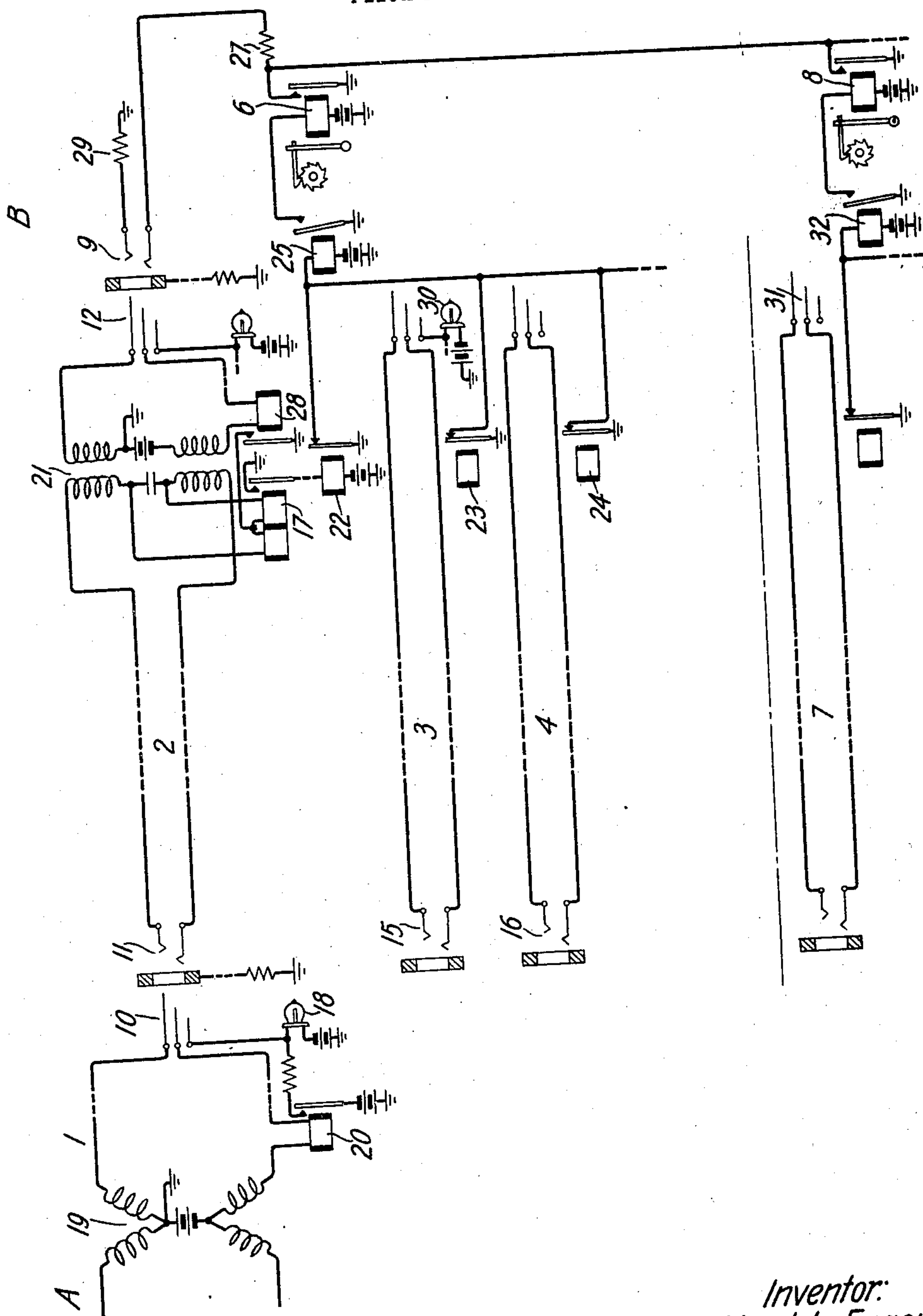


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TELEPHONE SYSTEM

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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

Application filed December 9, 1926. Serial No. 153,702.

This invention relates to telephone systems and more particularly to means for testing all-trunks-busy registers and circuits therefor in a trunking system.

5 According to this invention a circuit arrangement is provided whereby a register responsive to the busy condition of a group of trunks, and located at the trunk terminating station, may be tested as to its operation
10 under the all-trunks-busy condition, and whereby the results of such a test may be indicated at the trunk originating station.

The arrangement also makes it possible to determine if the register, under the all-
15 trunks-busy condition, is actuated due to the combined effect produced by circuit operation of all of the busy trunks in the group; that is, tests may be made to ascertain if each individual trunk is actually involved, when
20 busy, in effecting the operation of the register.

The invention has been illustrated in the accompanying drawing in which it has been applied to a straightforward trunking system.
25 tem.

Referring to the drawing, 1 shows the calling end of an ordinary cord circuit, and 2, 3 and 4 show straightforward trunk circuits in diagrammatic form which are representative of a group of such trunks originating at station A and terminating at station B. An all-trunks-busy register 6 and its circuit arrangement is associated with these trunks at station B. The straightforward trunk 7 belongs to another group which has an all-trunks-busy register 8 associated therewith. An all-trunks-busy test jack 9 is connected with registers 6 and 8 in a circuit arranged in accordance with this invention.
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40 In testing register 6 and its circuits at station B by the operator at station A, it may be agreed between the operators at these two stations that trunk 2 and cord 1 shall be used for transmitting and indicating the results of the tests to the operator at A and that other cords shall be used in connection with the other trunks in the group to test the conditions of these trunks in regard to the control that they have over the operation of the register. It is assumed that the test of the all-trunks-busy register 6 will be conducted when the traffic over this group of trunks is light so as not to interfere with the regular use of the system.
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55 The first operation will be for the operator

at A to insert plug 10 into jack 11 of the trunk 2 and for the operator at B to insert plug 12 of trunk 2 into the all-trunks-busy test jack 9. The next operation will be for the operator at A to insert the plugs of other
60 records into jacks 15 and 16 of trunks 3 and 4 and into the corresponding jacks of all of the other trunks of the group. When all of the trunks of this group have been made busy in this manner, relays such as 17 will
65 be actuated in all the trunks, and all the supervisory lamps such as 18 of all the cords connected to the trunks in this group will be lighted. The supervisory lamp will be lighted through the sleeve circuits. The
70 circuit for the operation of relay 17 may be traced from battery at the repeating coil 19 of cord 1, the supervisory relay 20, ring terminals of plug 10 and jack 11, ring conductor of trunk 2, the lower left-hand winding of repeating coil 21, the windings of relay 17 in series, upper left-hand winding of repeating coil 21, tip conductor of trunk 2 and tip terminals of jack 11 and plug 10 to ground at repeating coil 19. The operation
80 of relays, such as 17, of trunks 3 and 4 and the other trunks in the group causes the operation of relays, such as 22, 23, 24 and the corresponding relays of the other trunks, to be actuated. The complete circuit for the
85 operation of relay 22 due to the operation of relay 17 has not been shown, but it has been indicated that the operation of relay 17 closes a connection to ground for a circuit that will be closed in ordinary straightforward trunks to one end of the winding of relay 22, the other end of which is connected to battery, while the circuits for the operation of relays 23 and 24 have been entirely omitted. For a more complete disclosure of
95 straightforward trunk circuit operations reference may be had to the application, for patent of Horace W. Ulrich, Serial No. 156,570, filed Dec. 23, 1926.

It is evident from the drawing that relays 22, 23 and 24 and the other corresponding relays of the other trunks in the group in operating open the circuit for relay 25 at their armatures and back contacts. Hence, under these circumstances, relay 25 will release and close an obvious circuit for the operation of register 6. Register 6 now closes a circuit for the operation of the supervisory relay 28, from battery, right-hand lower winding of repeating coil 21,
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winding of supervisory relay 28, ring terminals of plug 12 and jack 9, resistance 27, armature and front contact of register 6 to ground. The operation of relay 28 is possible due to the connection of a ground to the tip terminals of plug 12 and jack 9 through resistance 29 which causes the tripping of the usual ringing relay (not shown) in the trunk circuit 2 which causes the circuit for relay 28 to be closed as is well known in the art. The ringing circuit arrangement for trunk 2 has not been shown, as it forms no part of this invention. The operation of supervisory relay 28 short-circuits the high resistance right-hand winding of relay 17. This, as is well-known in the art, causes the operation of supervisory relay 20 and the operation of this relay causes the supervisory lamp 18 to be extinguished. The extinguishing of lamp 18 indicated to the operator at A that the register 6 has operated as a result of the busy condition of all of the trunks in the group.

If it, however, is now desired to test whether or not the trunks, such as 3 and 4 and the other trunks in the group, were actually involved in causing the operation of register 6, the plugs inserted in the jacks of these trunks at station A are removed and inserted in succession. At the removal of any one of these plugs, it is evident that the corresponding relay, such as 23 or 24, on releasing will cause relay 25 to be actuated and thus release register 6. Register 6 in releasing permits the supervisory lamp 18 to be lighted. If the lamp 18 does not light when a plug is removed from one of the trunks in the group, it is evident that the circuits for this trunk were not properly involved in the operation of register 6 or that some other defect in the circuit was present.

It is evident that trunk 2 cannot be tested as to its part in the operation of register 6 unless the plug 12 is removed from jack 9 and the plug of another trunk in the group is inserted into jack 9. In this manner trunk 2 may be tested by removing and inserting plug 10 in jack 11. The results of this test will then be indicated at the supervisory lamp of the cord connected to the trunk with which jack 9 is connected.

In this manner, therefore, the operation of register 6 at station B and the proper functioning of the circuits individual to the trunks of the groups for causing the operation of register 6 when all trunks are busy, may be tested and the results indicated at station A.

The test circuit, comprising jack 9 and the circuits connected thereto at the armatures and front contacts of registers 6 and 8, may be used for testing the group of trunks to which trunk 7 belongs and the operation of register 8 in a manner identical to the testing of register 6. In this case plug 31

of trunk 7 may be inserted into jack 9 and the release of relay 32 when all trunks in this group are made busy will cause the operation of register 8.

It should be understood that the present disclosure is merely illustrative of one application of the invention and that other applications to different system could readily be made. It is evident that other test circuits such as the one connected to jack 9 and registers 6 and 8 may be provided for other groups of trunks or that any arrangement may be made to suit special requirements. For example, the individual groups of trunks may be too large to be handled by means of a single test circuit and in this case a separate test jack may be provided for each group with the ring conductor circuit controlled from the corresponding register armature and front contact.

What is claimed is:

1. In a telephone system, two stations, trunks originating at one of said stations and terminating at the other, a register at the trunk terminating station, means at the trunk originating station for making all of said trunks busy, means at the trunk terminating station for actuating said register in response to the busy condition of all of said trunks, and means for indicating the actuation of the register at the trunk originating station.

2. In a telephone system, two stations, trunks originating at one of said stations and terminating at the other, a register at the trunk terminating station, means at the trunk originating station for making all of said trunks busy, means at the trunk terminating station for actuating said register in response to the busy condition of all of said trunks, a signaling means at the trunk originating station, and means for actuating said signaling means in response to the actuation of said register.

3. In a telephone system, two stations, a group of trunks originating at one of said stations and terminating at the other, a register at the trunk terminating station, cord circuits at the trunk originating station, a signal associated with each of said cord circuits, means responsive to the connection of a cord circuit to each trunk for actuating the corresponding signal, means responsive to the connection of cord circuits to all the trunks in said group for actuating said register, and means responsive to the actuation of said register for disabling any one of said signals.

4. In a telephone system, two stations, trunks originating at one of said stations and terminating at the other, a register at the trunk terminating station, means at the trunk originating station for making all of said trunks busy, means responsive to the busy condition of all of said trunks for ac-

tuating said register, a circuit at the trunk terminating station associated with said register, means for connecting the terminating end of one of said trunks to said circuit, and
5 means responsive to said connection and to the actuation of said register for indicating at the originating end of said connected trunk the actuation of said register.

10 5. In a telephone system, two stations, a group of trunks originating at one of said stations and terminating at the other, a register at the trunk terminating station, cord circuits at the trunk originating station, a signal associated with each of said cord
15 circuits, means responsive to the connection

of a cord circuit to a trunk for actuating the corresponding signal, means responsive to the connection of a cord circuit to each trunk in said group for actuating said register, a circuit associated with said register, 20 means for connecting said circuit with the terminating end of any one of said trunks, and means responsive to such a connection and to the actuation of the register for disabling the signal associated with the cord 25 circuit connected to said trunk.

In testimony whereof, I have signed my name to this specification this 8th day of December, 1926.

LLOYD L. EAGON.