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BUSY TEST CIRCUIT FOR TELEPHONE CORD CIRCUITS

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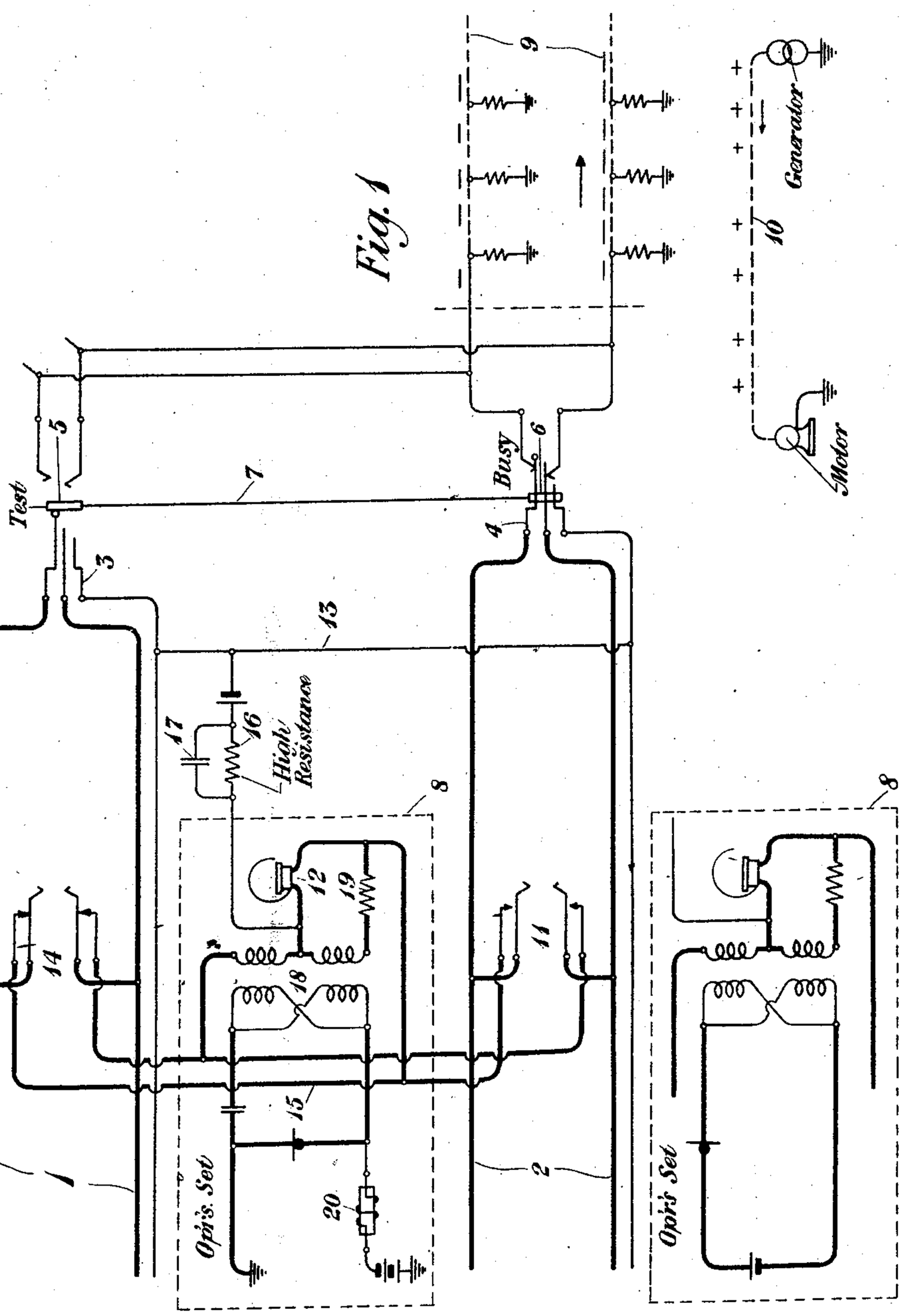

Fig. 1

Fig. 2

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EGINHARD DIETZE, OF BROOKLYN, NEW YORK, ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

BUSY-TEST CIRCUIT FOR TELEPHONE CORD CIRCUITS.

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To all whom it may concern:

Be it known that I, EGINHARD DIETZE, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Busy-Test Circuits for Telephone Cord Circuits, of which the following is a specification.

This invention relates to telephone operators' cord circuits, and more particularly to arrangements associated therewith by means of which tests may be made to determine the busy or idle condition of telephone lines terminating at telephone switchboards.

In practice it has been customary in the smaller telephone exchanges, where the use of repeating coils in the cord circuits would not be justified because of the high expense involved, to use special induction coils which are provided in connection with the operators' sets. These induction coils have had their windings grounded at midpoints and considerable difficulty has been experienced on account of noise created in the operator's receiver, especially during the period the jack of a line was being tested to determine its busy or idle condition. This disturbance by noise is caused by induction created between the telephone lines and parallel high power lines. Accordingly, it is an object of this invention to provide a busy test circuit in connection with cord circuits which will eliminate the inductive noises in the operator's receiver during the period of testing in a simple and inexpensive manner.

The invention may be now more fully understood from the following description, when considered in connection with the accompanying drawing.

Referring to the drawing, Figure 1 illustrates diagrammatically such portions of cord circuits and associated operator's telephone set as are necessary for the purposes of this invention. This figure indicates the improved arrangement as applied to a common battery switchboard having a number of operators' positions. Fig. 2 represents a modification of the operator's telephone set as applied to a local battery switchboard.

In the drawing the numerals 1 and 2 designate cord circuits which have their sleeve conductors connected to battery, and which terminate, respectively, in plugs 3 and 4. The plugs 3 and 4 are adapted to be associated with multiple jacks 5 and 6 which are interconnected by a sleeve conductor 7. An operator's set 8 is indicated as enclosed by dotted lines and connected with the cord circuits 1 and 2. Plug 3 is shown as applied to the jack 5 for the purpose of making a busy test, and plug 4 is inserted in jack 6 for completing a call over the line 9. 10 indicates a power line paralleling the telephone line 9, said telephone line 9 having leakages shown by resistances to ground spaced at equal intervals. The positive charge on the power line induces corresponding negative charges on the telephone conductors. This permits current to flow from the power line over the telephone line introducing noise in the operator's receiver under the old arrangements. The current flow at the instant represented in the sketch is indicated by arrows.

In the operation of the improved circuit, assuming that a connection is desired with a station associated with the telephone line 9, the operator will select an idle cord circuit, for instance, the cord circuit 2. If, upon testing the wanted line by applying the tip conductor of the plug 4 to the sleeve of the jack 6 and depressing key 11, no busy indication is produced in the operator's receiver 12, the plug 4 is inserted in said jack and a talking connection established over the tip and ring conductors of the cord circuit and the line 9 extending to the called station in the usual manner.

If an addtional connection with the telephone line comprising the conductors 9 is desired during the period plug 4 is associated with jack 6 and the usual busy test is made of a jack multipled to jack 6, for instance, jack 5, the following circuit is closed: from battery, sleeve conductor 13, sleeve contacts of plug 4 and jack 6, sleeve conductor 7, sleeve contacts of jack 5, tip contact of plug 3, tip conductor of cord circuit 1, upper closed contact of key 14, talking conductor 15, through the operator's listening means 12 to the opposite pole of the battery through a network comprising a high resistance 16 and a condenser 17 in parallel therewith. The closure of this circuit causes the sleeves of the busy line to be raised to a potential opposite to that of the tip of the connected cord circuit, resulting in the condenser 17 being charged when the tip of plug 3 is touched to the sleeve of jack 5. When the tip of plug 3 is

removed from the sleeve of jack 5, the condenser 17 discharges through the high resistance 16, which is shunted around it. The discharge of the condenser 17 produces a distinctive sound or click in the operator's receiver which serves as an indication to the operator that the line is in use. The provision of the high resistance serves to reduce the current flowing through the receiver 12, and is proportioned to give the proper click volume and prevent excessive noise therein.

An induction coil 18, having primary and secondary windings, is associated with the operator's telephone set. The receiver 12 has one of its terminals connected through the midpoint of the secondary windings to the ring conductors of the cord circuits while the other terminal of the receiver is connected to the tip conductors of the cord circuits. A resistance 19 is incorporated in the coil 18 for the purpose of so balancing the line that the transmitter which is associated with the primary windings of the coil 18 has no effect on the receiver 19 during the period it is in use. The transmitter has one terminal connected to battery through the retardation coil 20, as shown in Fig. 1, while in the modification indicated in Fig. 2 the battery is connected directly in series with the transmitter.

From the above it will be apparent that by means of the improved metallic busy test circuit of this invention any interference which may arise, due to induction caused by opposite charges of current between a telephone line and a parallel high power line, is entirely eliminated from the operator's receiver.

While the arrangements of this invention have been illustrated as embodied in certain specific forms which have been deemed desirable it will be understood that they are capable of embodiment in many and widely varied forms without departing from the spirit of the invention as defined in the appended claims.

What is claimed is;

1. A test circuit for an operator's cord circuit comprising an operator's listening means having one terminal associated with the tip conductor of the cord, an ungrounded battery having one terminal connected to the other terminal of said listening means and another terminal connected to the sleeve conductor of the cord, and a network in circuit with the battery comprising a high resistance and a condenser in parallel therewith for reducing the flow of current through said listening means.

2. A test circuit for cord circuits comprising an operator's listening means having one terminal associated with the tip conductor of the cord, an ungrounded battery having one terminal connected to the other terminal of said listening means, a plurality of sets of jacks with which said cord circuits may be associated, a sleeve conductor for interconnecting each set of jacks, and means interposed between said listening means and said battery for causing said listening means to operate in a distinctive manner upon the application of the tip terminal to one of said jacks when an associated jack of the set is busy.

3. In a telephone switchboard, a plurality of subscribers' lines terminating in multipled jacks thereat, a sleeve conductor for connecting each of said jacks of a line, a plurality of cord circuits adapted to be associated with said jacks, said cord circuits including tip, ring and sleeve conductors, listening means associated with the tip and ring conductors of said cords, an ungrounded battery having one terminal connected to the sleeve conductors of said cords, and means connected to the other terminal of the battery and one terminal of the listening means responsive to the application of the tip conductor of a cord circuit to a busy jack for causing the listening means to operate in a distinctive manner.

In testimony whereof, I have signed my name to this specification this 3rd day of August, 1923.

EGINHARD DIETZE.