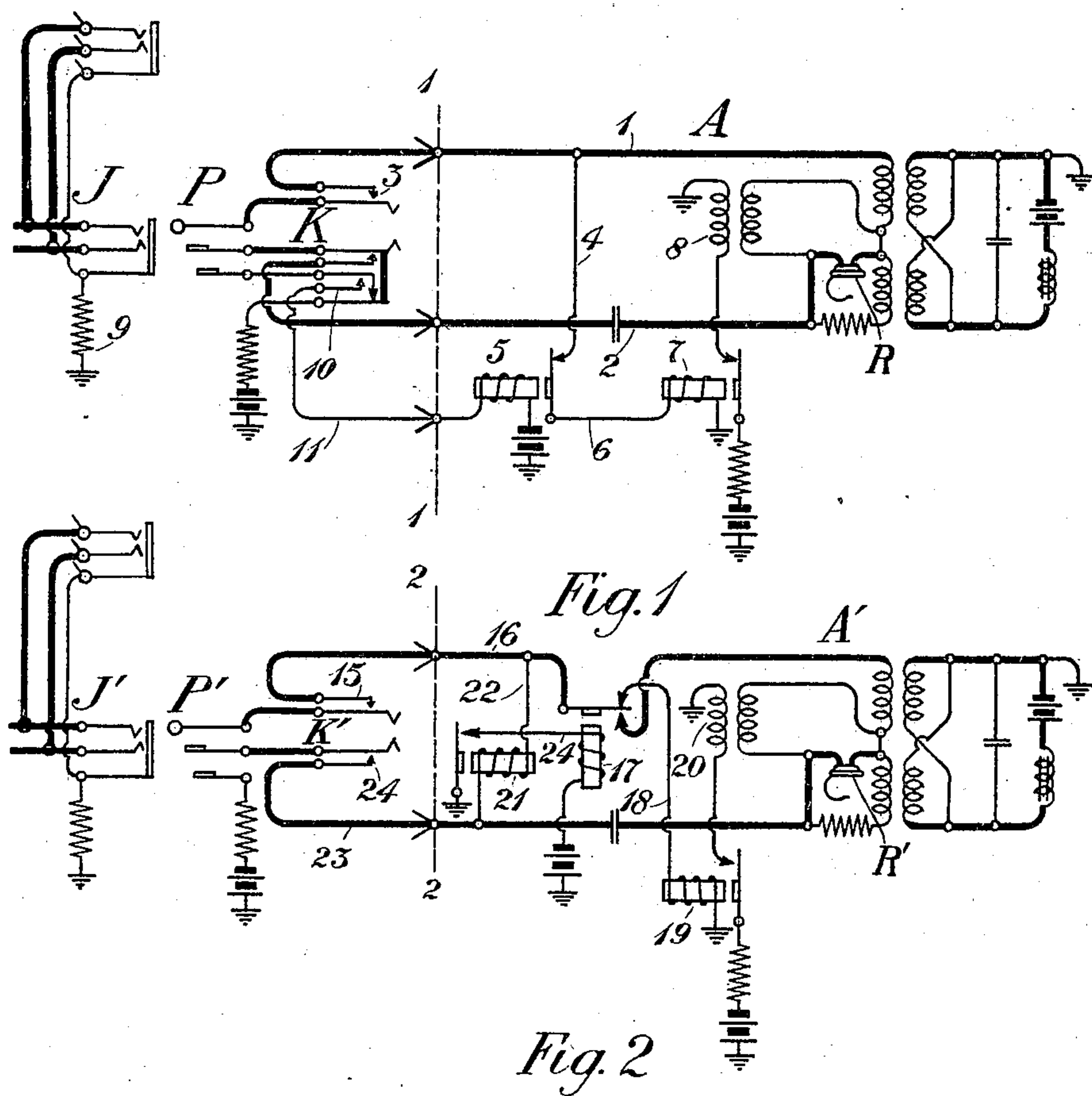


W. A. RHODES.
DESK OPERATOR'S CIRCUITS.
APPLICATION FILED DEC. 5, 1918.

1,390,545.

Patented Sept. 13, 1921.



INVENTOR.
W. A. Rhodes
BY *E. E. Folk*
ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM A. RHODES, OF NEW YORK, N. Y., ASSIGNOR TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK.

DESK OPERATOR'S CIRCUITS.

1,390,545.

Specification of Letters Patent. Patented Sept. 13, 1921.

Application filed December 5, 1918. Serial No. 265,438.

To all whom it may concern:

Be it known that I, WILLIAM A. RHODES, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Desk-Operators' Circuits, of which the following is a specification.

This invention relates to telephone apparatus and more particularly to testing equipment for operator's cord circuits.

In telephone exchange systems, it is customary to provide at information and other desk operators' positions equipment including a plurality of cord circuits, shown in the present instance as single ended with any one of which an operator's telephone set may be connected by means of suitable switching arrangements, such as listening keys. A plurality of cord circuits are provided at each desk position for the purpose of allowing an operator thereat to answer a second or a third call and so on, while holding the original calls on the first and second cords used, since each cord is provided with a key which may be thrown in a holding position. It is necessary at times for the desk operator to use more than one cord, since the call answered may require a considerable period of time to find the information requested and often requires the coöperation of a second operator. During this time it is possible for the desk or special operator to answer other calls and thus decrease the answering time of the various desk operators. In the use of the cord circuits the operator, before making a connection, usually touches the tip of the plug to the jack of the wanted line for the purpose of ascertaining the condition of said line. If the line is in use, the operator is so informed by the usual busy test indications. For making a so-called busy test, it has been the practice heretofore to provide a controlling relay and associated testing equipment for each and all of the cords. One of the principal objects of this invention is to provide a system in which the desired results may be accomplished by busy test equipment common to all the cords and also individual to the operator's set. Other and further objects of the invention will hereinafter appear.

In the accompanying drawing, Figure 1 diagrammatically represents one embodiment of this invention, and Fig. 2 is a modification thereof.

To the left of the vertical dotted lines 1—1, 2—2, in Figs. 1 and 2 are shown plugs P and P¹, keys K and K¹ and other equipment associated with individual cords, a plurality of which are associated with a common operator's telephone set. To the right of said lines are shown such operators' sets and busy test equipment individual to the respective sets, the operators' sets and equipment being common to all the cords.

In connection with the following description of the operation of the embodiment shown in Fig. 1 it will be assumed that connection is desired with a line terminating at jack J. If the operator at A actuates the key K and in applying the tip of the plug P to the sleeve of jack J, to ascertain in the customary manner the condition of the line, receives a click in the receiver R she will know that the line is busy. The path for current for the busy circuit may be traced from battery applied through the sleeve of a cord in a multiple of jack J, over the multiple connection to the sleeve contact of jack J, tip conductor of plug P, contact 3 of key K, talking conductor 1, conductor 4, back contact and armature of relay 5, conductor 6, winding of relay 7 to ground. Relay 7 is thereby energized and attracts its armature, and provides current for a busy test coil 8 in an obvious manner. The current induced in the busy test coil 8 causes a click in the receiver R, and serves notice to the operator that the line is busy, and she thereupon removes the tip of plug P from contact with the jack J and the apparatus is restored to normal. Should the line not be busy, there would be no potential upon any multiple of the jack J, and the operator, upon actuating the key K and making a busy test, would receive no click, whereupon she would insert the plug P in the jack J and complete the following circuit: ground, resistance 9, sleeve contact of plug P, contact 10 of key K, conductor 11, through the winding of relay 5, to grounded battery. This circuit serves to energize relay 5 which pulls up its armature, disconnects relay 7 from talking conductor 1, and breaks the busy test circuit previously described.

Should a busy test be made for a busy line by the cord shown in Fig. 2, the operator upon actuating the key K¹ and touching the sleeve of jack J¹ with the tip of plug P¹, would complete a circuit from battery at a

busy multiple of jack J¹ over the sleeve of jack J¹, contact 15 of key K¹, talking conductor 16, back contact of relay 17, conductor 18, winding of relay 19 to ground, thus energizing relay 19, which thereupon pulls up its armature and provides a circuit for test coil 20, the said coil producing a click in the receiver R¹ thereby informing the operator that the line is busy, in a manner similar to that described in connection with Fig. 1. If the line should not be in use, the plug P¹ is inserted in the jack J¹ and the busy test circuit, previously referred to, is broken in a manner hereinafter described as a result of the energization of relay 21. The circuit for operating this relay may be traced from the tip contacts of jack J¹ and plug P¹, contact 15 of key K¹, talking conductor 16, conductor 22 through the winding of relay 21, talking conductor 23, contact 24 of said key, and ring contacts of said plug and jack it being understood that the jack J¹ is associated with a circuit such as a trunk having battery bridged across its talking conductors. The energization of relay 21 pulls up its armature and completes a circuit from ground, armature of relay 21, conductor 24, winding of relay 17 to grounded battery, thereby operating relay 17 and causing it to attract its armature, thus breaking the back contact thereof and likewise the busy circuit.

From the above description it will be apparent that instead of employing a relay for each cord for the purpose of disconnecting the busy test equipment, after a test has been completed, by means of this invention a relay common to all the cords is provided for performing this function with a resulting saving in installation and maintenance.

While the arrangements of this invention have been illustrated as embodied in certain specific arrangements 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.

Having thus described my invention, what I desire to secure by Letters Patent is:

1. In a telephone system, a plurality of operator's cords, an operator's telephone set common to said cords, means to associate said set with any one of said cords, means normally connected with the tip conductors of said cords to complete a busy test circuit for said set when a test is made with a cord to which the set is connected, and means common to said cords for opening said busy test circuit when a connection is established over said cord.

2. In a telephone system, a plurality of operator's cords, an operator's telephone set common to said cords, means to connect said set with any one of said cords, means normally connected with the tip conductors of

said cords to complete a busy test circuit for said set when a test is made with a cord to which the set is connected, and means associated with said set and common to said cords for opening said busy test circuit when a connection is established over said cord.

3. In a telephone system, a plurality of operator's cords, an operator's telephone set common to said cords, means to connect said set with any one of said cords, means normally connected with the tip conductors of said cords to complete a busy test circuit for said set when a test is made with a cord to which the set is connected, and a relay common to said cords for opening said busy test circuit when a connection is established over said cord.

4. In a telephone system, a plurality of operator's cords, an operator's telephone set common to said cords, means to connect said set with any one of said cords, means normally connected with the tip conductors of said cords to complete a busy test circuit for said set when a test is made with a cord to which the set is connected, and relay means associated with said set and common to said cords for opening said busy test circuit when a connection is established over said cord.

5. In a telephone system, a plurality of operator's cords, an operator's telephone set common thereto, means to connect said set with any one of said cords, means normally connected with the tip conductors of said cords to complete a busy test circuit for said set where a test is made with a cord and the operator's set is connected thereto, means common to said cords to open said busy test circuit when a connection is established over a cord and the operator's set is connected thereto, and means to again prepare said busy test circuit when the operator's set is disconnected from the cord.

6. In a telephone system, a plurality of operator's cords, an operator's telephone set common thereto, means to connect said set with any one of said cords, means normally connected with the tip conductors of said cords to complete a busy test circuit for said set when a test is made with a cord and the operator's set is connected thereto, relay means common to said cords to open said busy test circuit when a connection is established over a cord and the operator's set is connected thereto, and means to again prepare said busy test circuit when the operator's set is disconnected from the cord.

7. In a telephone system, a plurality of operator's cords, an operator's telephone set common thereto, means to connect said set with any of said cords, a relay normally connected with the tip conductors of said cords to complete a busy test circuit for said set when the tip conductor of the plug of a cord is associated with the sleeve conductor of a jack and the operator's set is connected to

said cord, and means common to said cords to open the busy test circuit when the plug is inserted in the jack.

5 8. In a telephone system, a plurality of operator's cords, an operator's telephone set common thereto, means to connect said set with any of said cords, a relay normally connected with the tip conductors of said cords to complete a busy test circuit for said set
10 when the tip conductor of the plug of a cord

is associated with the sleeve conductor of a jack and the operator's set is connected to said cord, and relay means common to said cords to open the busy test circuit when the plug is inserted in the jack.

15 In testimony whereof I have signed my name to this specification this third day of December 1918.

WILLIAM A. RHODES.