

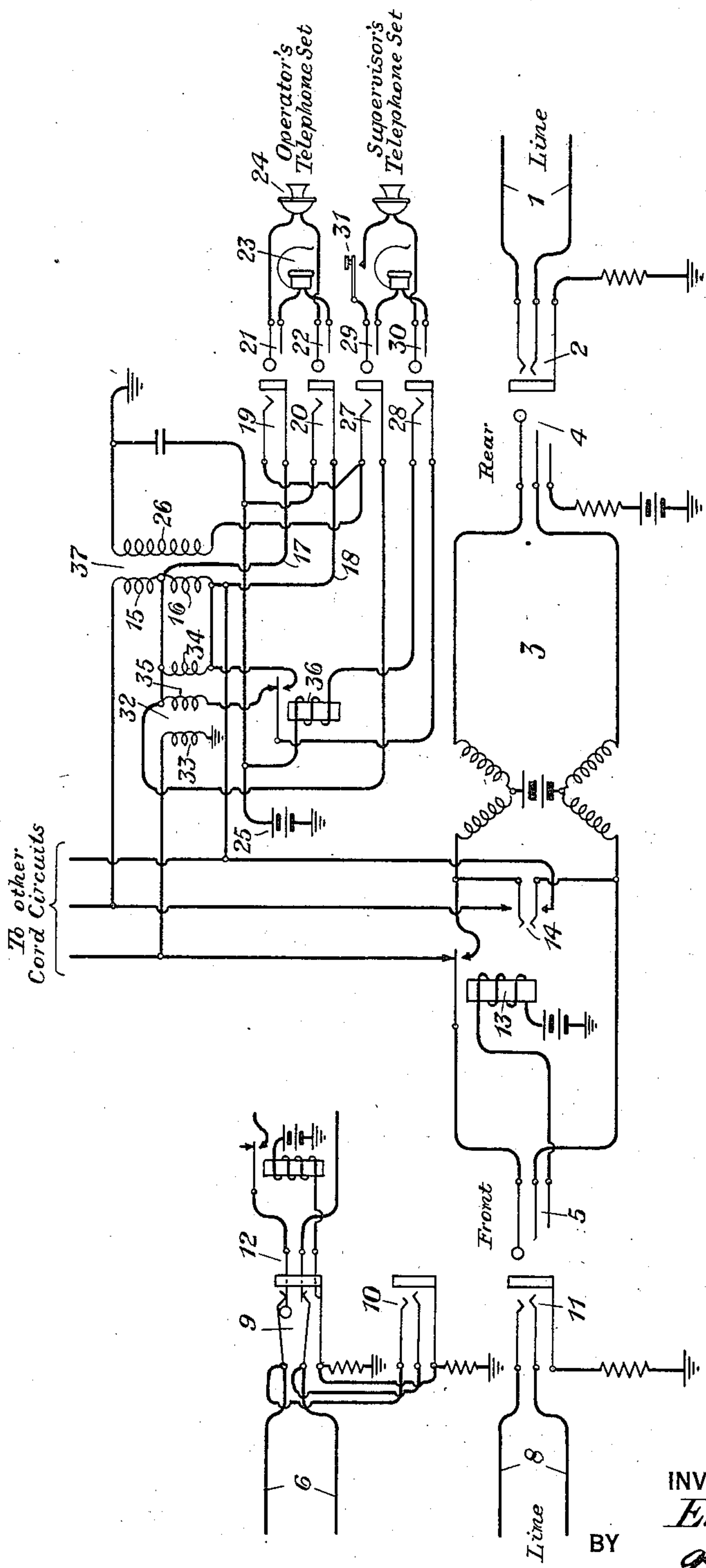
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OPERATOR'S TELEPHONE CIRCUIT

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OPERATOR'S TELEPHONE CIRCUIT

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This invention relates to operators' telephone circuits, and particularly to a system for monitoring on such circuits without impairing the operator's transmission over such circuit during the monitoring operation.

It is common practice now on the part of the supervisor or her assistant in monitoring on the operator at a telephone switchboard, for the purpose of instructing the operator or assisting her in the handling of calls, to use a special telephone set equipped with a high impedance receiver in order that a minimum bridging loss will be introduced when the supervisor's telephone set is connected to the operator's telephone circuit in parallel with the operator's own telephone set. Obviously, such high impedance receiver does not permit as good reception as the lower impedance receiver used by the switchboard operator. Consequently, when the supervisor wishes to operate at the switchboard, that is, to take her place at the switchboard as an operator, or wishes to talk to a party with which the operator's telephone circuit is connected, during her work as a supervisor, it is necessary for the supervisor to use a different telephone set from that employed by her in the monitoring operation, that is, to use a set having a receiver of lower impedance so that her reception may not be impaired.

My invention resides in an arrangement for monitoring on an operator at a switchboard position by using a telephone set which, in its essential elements, is identical with the telephone set used by the operator at such position so that the same telephone set may be used both for monitoring as well as for operating at the switchboard. The arrangement is such that when monitoring the impedance of the receiver of the supervisor's telephone set is made substantially high relative to the impedance of the operator's receiver so that substantially no receiving loss is caused to the operator when a supervisor or other person listens in on the conversation.

Other objects of this invention will be apparent from the following description when read in connection with the attached drawing which shows one form of embodiment of the invention in connection with a cord circuit. In the figure, the line 1 represents any type of line, for example, a subscriber's line, terminating at a switchboard in the jack 2. The signaling apparatus normally associated with such line has been purposely omitted for the sake of simplicity since it forms no part of the invention. A cord circuit 3 having plugs 4 and 5 is intended to connect the line 1 with other lines such as 6 and 8. That is accomplished

by inserting the rear plug 4 in the jack 2 and a front plug 5 in the jacks 9, 10 or 11, in which the lines 6 and 8 terminate at the switchboard. For the purpose of illustrating this invention a plug 12 of a cord circuit shown in fragmentary form, is represented as being in engagement with the jack 9. That jack is also connected in parallel with the contacts of jack 10. The relay 13 associated with the circuit 3 is the busy-test relay and serves to keep the tip conductor of the cord circuit open until after the front plug has been inserted in the jack of the line over which it is intended to establish communication.

The key 14 is intended to connect the operator's telephone set across the conductors of the cord circuit. That is done by connecting the outer terminals of windings 15 and 16 of the induction coil 37 to the contacts of the switch 14 and by connecting the inner terminals of those windings together so that those windings of the induction coil will be connected across the cord circuit when the switch is operated. The winding 16 is connected by the conductors 17 and 18 to the sleeves of the jacks 19 and 20. Those jacks are intended to cooperate with the plugs 21 and 22 of the operator's telephone set, which includes the receiver 23 and the transmitter 24. The tip contact of jack 20 is connected to a source of potential 25 and the tip contact of jack 19 is connected to the secondary winding 26 of the induction coil 37 so that when the plugs 21 and 22 are inserted in the jacks 19 and 20, respectively, current will flow from the source 25 through the transmitter 24, and thence through the winding 26 to ground. The jacks 27 and 28 are intended to cooperate with the plugs 29 and 30 of the supervisor's telephone set, thereby facilitating the connection of that set to the operator's telephone circuit.

The transmitter branch of the supervisor's telephone set includes a switch 31, the purpose of which will be understood from the description of the mode of operating this circuit. The induction coil 32 comprises three windings one of which, 33, is connected to the upper contact of the busy-test relay 13 and serves, in cooperation with winding 34, to give the busy test to the operator by producing a clicking sound in her receiver. The winding 34 is bridged across the winding 16 of the other induction coil 37, across which are connected the conductors 17 and 18 of the receiver circuit of the operator's telephone set. The third winding, 35, of the induction coil 32 has one of its terminals connected to the sleeve of the jack 27, connected to the receiver of the supervisor's telephone set, and has its other terminal con-

connected to the upper contact of the relay 36. The lower contact of that relay is connected to one of the terminals of winding 34. The winding of relay 36 is connected in series with the source of potential 25 and the transmitter of the supervisor's telephone set when the plugs 29 and 30 are inserted in the jacks 27 and 28. That transmitter branch also includes the winding 26 of the induction coil 37.

The nature of the invention will be clear from the following description of the mode of operation of the circuit in the handling of a call. Let it be assumed that a subscriber connected to the line 1 is calling another party. The operator, upon the operation of the signal (not indicated), inserts the plug 4 in the jack 2 and at the same time throws the listening key 14, thereby effectively connecting her telephone set to the said line. The operator's circuit at that instant may be traced from the upper contact of switch 14 to the outer terminal of winding 15, thence through the said winding and over conductor 17 to the sleeve contacts of jack 19 and plug 21, thence through the receiver 23 and through the sleeve contacts of plug 22 and jack 20, and thence over conductor 18 to the other contact of switch 14. That connects the receiver to the cord circuit and at the same time the transmitter 24 is effectively connected thereto through the windings 26, 15 and 16 of the induction coil 37. The transmitter will be energized by the source of potential 25. The operator is then capable of talking to the subscriber connected to line 1 and also of receiving from the subscriber the number of the called party. The lines 6 and 8 in front of the operator may be either subscribers' lines or trunks to a distant office.

Assuming that the called party is in another central office district reached by the trunk circuits 6 and 8, the operator will then test those trunks in front of her to obtain an idle one. This she does by touching the tip of the plug to the sleeve of the jack in the usual manner. If the tip of the plug 5 touches the sleeve of the jack 10, which is multiplied in another position with jack 9, she will receive a busy test from the battery that is connected to the sleeve of the jack 9. That result is effected by the flow of current from that battery over the sleeve contacts of jacks 9 and 10 and through the tip contact of plug 5, the upper contact of relay 13 and the winding 33 of the induction coil 32. The current that flows through that winding will induce an impulse in winding 34 which will be impressed across conductors 17 and 18 and will produce a click or clicks in the receiver 23 of the operator's telephone set. The operator will thereupon test another line, such as 8, in a similar manner, and upon getting no clicks will insert the plug 5 into the jack 11. This will cause the operation of relay 13, which disconnects the busy-test winding 33 from the cord circuit and establishes a through connection between the tip contacts of the plugs 4 and 5.

Now, let us assume that the supervisor wishes to supervise such connection and perhaps to talk to the parties. This is accomplished by inserting the plugs 29 and 30 into the jacks 27 and 28. Thereupon the receiver of the supervisor's telephone set will be connected to the winding 35 of the induction coil 32, the connection including the upper contact of relay 36, the sleeve contacts of jack 28 and plug 30, the said receiver, the sleeve contacts of plug 29 and jack 27, and the said winding 35. Winding 35 is so proportioned

with respect to winding 34 that the impedance of an ordinary telephone receiver, such as 23, of the operator's telephone set, will be stepped up by the windings 35—34 so that the supervisor's receiver will have high impedance as compared to the receiver of the operator's telephone set. Consequently, the establishment of such a monitoring connection by the supervisor introduces substantially no loss or impairment of reception in the operator's telephone set which, of course, is connected at the same time. Furthermore, that desirable effect has been attained even though the receiver employed in the supervisor's telephone set is the same type as that employed in the operator's telephone set. The desirable result has been attained by connecting the supervisor's receiver in series with the third winding of the induction coil 32, which gives the same effect as if a high impedance receiver has been connected directly in parallel with the receiver 23 of the operator's telephone set.

Now, let it be assumed that the supervisor desires to talk to the parties connected to the lines that are joined by the cord circuit 3. To do so the supervisor presses the key 31 which connects her transmitter to the circuit, the connection including the source of potential 25, the winding of relay 36, the tip contacts of jack 28 and plug 30, the said transmitter, the key 31, the tip contacts of plug 29 and jack 27, and the grounded winding 26. Current will, of course, flow through the transmitter and the speech variations will be induced by the winding 26 in the windings 15 and 16 and will be impressed across the cord circuit and the connected lines. There is, however, another and important effect. When the key 31 was closed, relay 36 was energized and its armature moved downward, opening its upper contact and closing the lower. The effect of that is to cut out of the receiver circuit of the supervisor's telephone set the winding 35 and to connect the receiver of that set directly across winding 34, which is conductively connected across the same terminals of winding 16 as the receiver 23 of the operator's telephone set. The supervisor's receiver, therefore, has its normal impedance, which is the same as that of the operator's receiver, and consequently the supervisor would receive, as well as the operator, and both could talk with equal facility to the parties connected to the lines.

It would, of course, be possible to employ a separate transformer to step up the impedance of the monitoring receiver instead of using an additional winding, such as 35, upon the busy-test coil 32. The use of a combined busy-test and monitoring coil provides a substantial saving in apparatus, and is considered a valuable feature of this invention.

It is desirable to point out that if the operator were to plug into jacks 27 and 28 instead of jacks 19 and 20, which are the normal ones for her to use, there would be no operating difficulty and no impairment of transmission.

This will be apparent when it is realized that there is no key in the operator's transmitter branch of her telephone set. Consequently, when the plugs 21 and 22 of her set are inserted in the jacks 27 and 28, relay 36 will be operated and her receiver will be effectively connected across the winding 16 as are also the conductors 17 and 18.

Although the invention has been described in connection with its use by a supervisory operator at a telephone switchboard, it is not so limited but is capable of being used for supervisory pur-

poses at places upon the telephone system other than at the central office. As an illustrative case reference will be made to so-called secretarial service wherein a secretary of a subscriber may listen in upon the conversation between that subscriber and a distant subscriber without introducing any substantial loss in reception, and may, by operating the key of her head-set be able to talk to the distant subscriber if such action is necessary.

While the invention has been described in a single form, it is capable of embodiment in other and different forms without departing from the spirit and scope of the appended claims.

What is claimed is:

1. An operator's telephone circuit adapted to have connected thereto an operator's telephone set and a supervisor's telephone set, both sets being substantially identical in their electrical characteristics, the said telephone circuit including means for connecting said sets to said circuit, the circuit being so arranged that the connection thereto of one of said telephone sets will introduce substantially no receiving loss in the other telephone set connected to the said circuit.

2. An operator's telephone circuit including an induction coil, an operator's telephone set, a supervisor's telephone set having a switch in the transmitter branch thereof, both sets being substantially identical electrically, a second induction coil having a plurality of windings, and means controlled by the switch of said supervisor's set to connect the receiver thereof to one or the other of the windings of said second induction coil whereby the impedance of the receiver branch of the said supervisor's telephone set is made substantially equal to or greater than the impedance of the receiver branch of the operator's telephone set.

3. In an operator's telephone circuit, the combination with a plurality of operator's telephone sets each comprising a transmitter and a receiver, of means to connect said sets to the remainder of said circuit, and means connected to said circuit and responsive to the operation of a switch associated with one of said sets to effectively change the impedance of the receiver

branch of the latter set when connected to the remainder of said circuit.

4. An operator's telephone circuit adapted to have connected thereto an operator's telephone set and a supervisor's telephone set, both sets being substantially identical electrically, the said circuit being characterized by means controllable by switching means associated with the supervisor's set to render the impedance of the supervisor's receiver branch equal to or greater than that of the operator's receiver branch, depending upon the position of said switching means.

5. An operator's telephone circuit including an induction coil having one of its windings effectively bridged across a cord circuit, an operator's telephone set having its receiver connected across a part of the said bridged winding and having its transmitter connected in series with a source of potential and the other winding of said induction coil, and a second induction coil having three windings one of which is effectively bridged across that portion of the said bridged winding of the first induction coil to which is connected the receiver of the operator's telephone set, a second operator's telephone set including a transmitter and a receiver, the transmitter being connected in series with said source of potential and said other winding of the said first induction coil, the connection including a transmitter cut-out switch and the winding of a relay, the said receiver of the second set having one of its terminals connected to the armature of the said relay and having its other terminal connected to a terminal of the said bridged winding of the said second induction coil and also to a terminal of a second winding of the same coil, the other terminal of each of the said mentioned windings of the said second coil being connected to the contacts of said relay in such manner that the said receiver will be connected to the said bridged winding of the second coil whenever the switch of the transmitter circuit of the said second operator's set has been operated to permit the flow of current through the said transmitter.

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