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TELEPHONE SYSTEM

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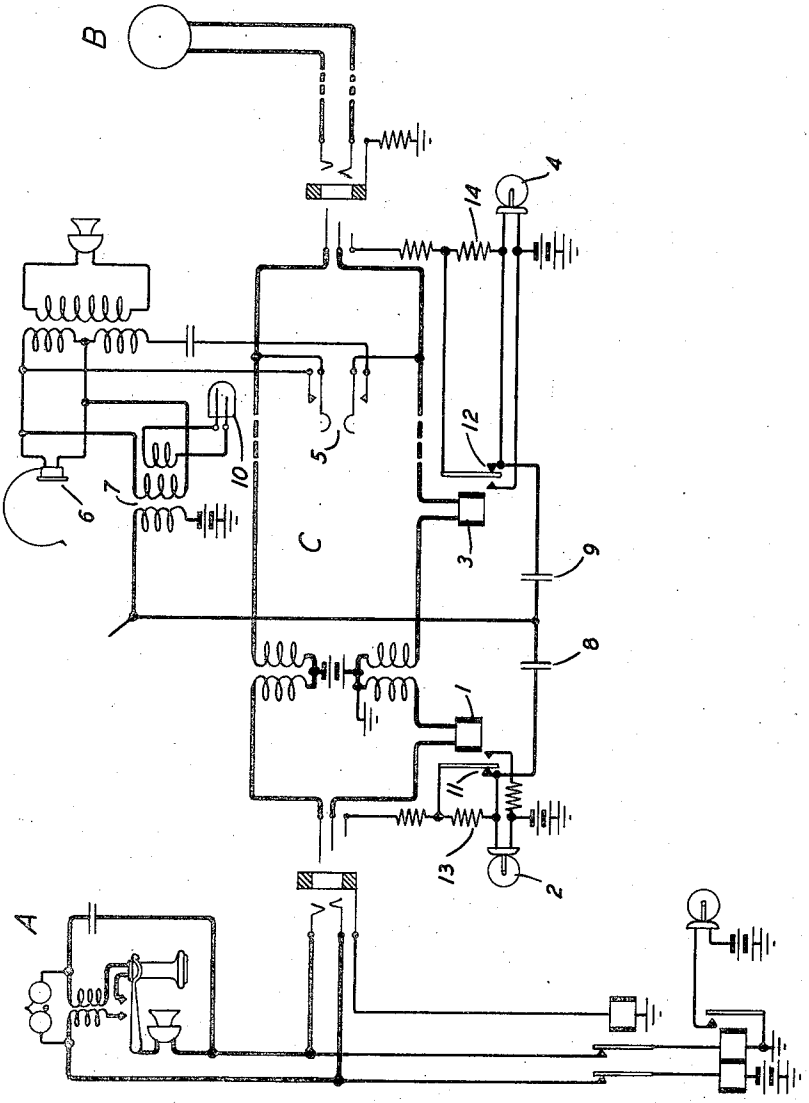

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TELEPHONE SYSTEM

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This invention relates to recall systems for telephone operators whereby a connected calling subscriber may attract the operator's attention before the connection to his line is taken down.

An object of the invention is to audibly notify the operator that an answered calling subscriber is moving his receiver hook up and down to attract her attention.

Patent 933,335, dated September 7, 1909 to W. F. Paca discloses a system of this character wherein the up and down movement of the subscriber's switchhook produces a clicking sound in the operator's receiver in conjunction with the usual visual supervisory signal or lamp, and the means whereby this effect is produced consists of an induction coil having one winding in series with the visual signal and another winding connected to the operator's telephone receiver whereby intermittent current impulses flowing through the supervisory lamp and the induction coil winding as a result of the subscriber's movement of his switchhook will induce current in the other coil winding connected to the receiver thereby causing clicks to be heard by the operator.

In connection with certain types of trunk lines, incoming to an operator's position from a dial office, in which automatic switches are involved, it has been found necessary to provide means for maintaining a continuous potential on the sleeve conductors of the trunks at the operator's position by connecting a suitable resistance across contacts of the supervisory relays in such a manner that during the transit of the supervisory relay armature from its back to its front contact, there will not be an interval when the sleeve of the trunk is unguarded which might cause release of the switch mechanism at the distant dial office.

Under these circumstances an arrangement, such as disclosed in the Paca patent and provided with continuity resistances, in which the circuits to battery for all supervisory lamps pass through a common induction coil winding, offers a serious objection for the reason that when several answering cords are connected to calling lines there would be a relatively large amount of current flowing through the primary coil winding due to the parallel paths provided by the continuity resistances associated with each supervisory relay armature and the inductive effect on the secondary winding of the induction coil caused by the flashing of a single lamp would be inversely proportional to the number of answered connections and a point would soon be reached where the inductive effect would be insufficient to cause the desired receiver click.

The present invention is an improvement over the arrangement disclosed in the Paca patent, in that it insures a satisfactory click in the operator's receiver regardless of the number of answered connections at the position. A feature of the invention whereby this result is effected resides in connecting the primary winding of the common induction coil in shunt to each lamp and by inserting a condenser, of suitable capacity, in series with each shunt connection instead of connecting each lamp directly in series with the primary winding of the induction coil as heretofore.

The invention will be understood from the following description and its accompanying drawing which shows a calling and a called subscriber's line of the well known common battery type and the essential elements of a conventional operator's cord circuit to which has been added a circuit arrangement according to the present invention whereby the operator is audibly notified of a recall by either subscriber in case the connection has not been broken down prior thereto.

In the drawing, A represents a calling subscriber's station, B a called subscriber's station and C a common battery cord circuit of the so-called repeating coil type having an answering supervisory relay 1 and an associated supervisory lamp 2 and a calling supervisory relay 3 and lamp 4. A listening key 5 is adapted to connect an operator's telephone set, including the receiver 6, across the talking conductors of the cord circuit.

The apparatus and circuit arrangement of the present invention consists of a three-winding repeating coil 7 whose middle winding is connected across the terminals of the receiver 6 and whose left-hand winding is multiply connected in series with condensers 8 and 9 across the terminals of the supervisory lamps 2 and 4 as well as all other supervisory lamps of the remaining cord circuits at the same operator's position. Included in circuit with the right-hand winding of the repeating coil 7 is a glow lamp 10 of the gas discharge type as, for example, a neon lamp.

We will now assume for the purposes of describing the operation of the arrangement according to the invention, that subscribers A and B have been connected in the usual manner by means of the cord circuit C, that the conversation has been completed and that subscriber B has replaced his receiver on the hook thereby lighting the supervisory lamp 4 which visually

indicates this fact. It will also be assumed that subscriber A desires to attract the operator's attention immediately for the purpose of placing another call before the operator has taken down the connection which he does in a well known manner by slowly moving his switchhook up and down which causes supervisory lamp 2 to be alternately lighted and extinguished. It may be, however, that the operator is at this moment handling another call or her attention is otherwise diverted and does not immediately notice the flashing lamp 2 and hence some seconds may elapse before her attention is attracted. According to the present invention, however, she is also audibly notified by a clicking sound in her receiver each time the lamp is lighted and extinguished which is due to the connection of her receiver, to the middle winding of repeating coil 7 whose left-hand winding is in parallel with the flashing lamp whereby each time current flows from the battery through the lamp a portion of this current is diverted through the shunt circuit including the condenser 8 and left-hand winding of repeating coil 7 thus charging condenser 8 and causing a current impulse to flow in the left-hand winding of the coil. This induces a current impulse in the middle winding of coil 7 which flows through the receiver 6 and causes a clicking sound. When lamp 2 is extinguished condenser 8 discharges through the lamp 2 and left-hand winding of coil 7 thereby causing a second impulse in the opposite direction to be induced in the middle winding which again causes a click in the receiver.

The operator hearing these clicks is immediately aware that a subscriber is flashing his supervisory lamp and she then directs her attention to her plug shelf where the supervisory lamps are located and connects her headset, by means of the listening key 5, to the cord with which the flashing lamp is associated.

Connected around the contacts 11 and 12 of the supervisory relays 1 and 3 are resistances 13 and 14, respectively, which are provided in order to permit the use of cord circuit C with certain types of incoming trunk lines from dial offices in order to maintain a constant potential on the sleeve circuit during the time the plug is in the jack of the trunk line. This eliminates the possibility of the sleeve circuit being momentarily opened during the interval that the supervisory relay armature is charging from its back to its front contact or vice versa during the interval that supervisory signals are being transmitted over the trunk circuit to the operator's position.

Due to this arrangement quite an appreciable current flows from the sleeve battery through the several resistances 13, 14, etc., when several cord circuits are connected to either the subscriber's line or trunk and an arrangement, such as shown in the Paca Patent 933,335, wherein the winding of the repeating coil 7 is connected in series with the battery, would not operate satisfactorily due to the small current change caused by the flashing of a single lamp as compared with the greater steady current flowing through the multiple sleeve circuit.

The present arrangement, however, is independent of the steady current flowing in the sleeve battery circuit as the current flowing in the left-hand winding of repeating coil 7 depends solely on the change in potential across the flashing lamp.

The neon glow lamp 19 is common to the position and is so constructed as to be responsive to the induced voltage impressed on the right-hand winding of the coil 7 by the current impulses flowing in the left-hand winding. It, therefore, provides a common flashing or visual signal to supplement the audible click signal. Such an arrangement could be provided independent of the audible signal, if desired.

What is claimed is:

1. In a telephone system an operator's position, a plurality of cord circuits thereat, a supervisory signal associated with each cord circuit, an operator's receiver common to said plurality of cord circuits, an induction coil having one winding connected in parallel relation to said receiver and having another winding multiply connected in shunt across the terminals of each of said signals, and a condenser connected in series with each of said shunt connections.

2. In a telephone system, an operator's cord circuit including a sleeve conductor, a supervisory signal, a supervisory relay associated with said cord circuit adapted to control said signal, means associated with said relay to maintain a potential on said sleeve conductor during the interval the armature of said supervisory relay is passing from its back to its front contact, an operator's receiver, an induction coil having one winding connected in parallel relation to said receiver, another winding of said coil connected in shunt to said signal, and a condenser in series with said shunt connection.

3. In a telephone system, a visual supervisory signal, a controlling circuit therefor, an operator's receiver, and an induction coil having its primary winding included in a circuit comprising a condenser and its secondary winding connected to said operator's receiver, said primary winding circuit being connected in shunt with said visual signal.

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