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TELEPHONE CIRCUIT

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FIG. 1.

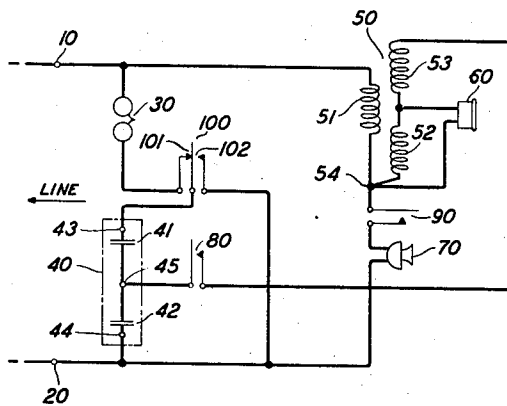
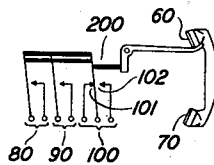


FIG. 2.



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TELEPHONE CIRCUIT

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13 Claims. (Cl. 179—81)

This invention relates to electric wave circuits and, more particularly, to telephone station or subscriber station circuits.

Subscriber station circuits usually include a signaling or ringing circuit and a speech current transmission circuit. For most efficient and effective functioning of each circuit a different magnitude of capacity is required therein. A common practice is to use two independent lumped capacities of proper values connected in such manner that one functions exclusively in the ringing circuit and the other functions exclusively in the transmission circuit, regardless of the switching operations performed to convert the circuit as a whole from the ringing to the speech current transmission condition. The two different capacities may be provided as two physically separate capacitors or condensers, with the resultant necessity for the user and the manufacturer to handle two different items. This disadvantage might be overcome by providing both capacities in the same condenser or capacitor with appropriate terminal arrangement, but there would remain the necessity of providing the space, material and labor corresponding to the sum of the two different capacities. It is possible, of course, to use a single lumped capacity to serve alternately in both the ringing and the speech current circuits by provision of suitable switching means operated by the user of the circuit, for example, in removing and replacing the receiver or handset with respect to the support for the latter. The use of a single capacitor or condenser involves the virtue of requiring the minimum number of condensers for the station circuit. The capacity of the capacitor, however, must represent a compromise between the magnitudes of the capacities requisite for the separate circuits, with the attendant disadvantage of lack of efficiency in one or both circuits.

An object of the invention is so to arrange the components of a plurality of alternating current circuits, each of which requires for its most effective functioning a different magnitude of capacity therein, that the capacity provided need total only the value considered appropriate for one of the circuits. More specifically, an object is to arrange the components of a subscriber station circuit of the two-capacities type so that the two capacities need total only the value considered appropriate for the speech current transmission circuit.

A further object of the invention is to realize further savings of material and reduction in size

by providing the required capacities in capacitors or capacitor sections of substantially equal capacity values, and to employ a dielectric thickness sufficient only for a fraction, for example, one-half of the ringing circuit voltage.

Another object of the invention is to simplify the manufacture and servicing of telephone station sets, where the practice is to use physically separate capacitors or condensers for the ringing and the speech current circuits.

Still another object is to enable increasing the efficiency of the speech current circuit in a telephone station circuit without increasing the space occupied by the speech circuit capacitor or condenser over that involved in prior practice.

A further object is so to arrange the signaling and the speech current circuits of a telephone station circuit that a plurality of capacitor or capacitor sections are included in the signaling circuit to provide one magnitude of capacity therein, and that the same capacitor or capacitor sections may also be included in the speech circuit to provide a different magnitude of capacity in the latter circuit.

In accordance with the invention, a subscriber's substation circuit may comprise a station signaling or ringing circuit including a pair of substantially identical capacitors, capacitor sections or condensers connected in series with a signaling or ringer mechanism across the line terminals of the circuit. The condensers may be housed in a common container. The station circuit will also include a speech current receiving and transmitting or speech current transmission circuit, together with appropriate switching means, whereby, for speech transmission purposes, the two condensers in the signaling circuit may be disconnected from the latter, connected in parallel, and included in the speech transmission circuit so as to provide the appropriate magnitude of capacity required for speech transmission purposes. The speech transmission circuit, of course, is intended for use involving a relatively wide band of frequencies, that is, those usually involved in telephonic communication at voice frequency, and the signaling circuit is intended for use at some conventional signaling frequency, for example, a single frequency of the order of about 20 cycles per second. In a specific circuit arrangement, two capacitors each of a capacity of one microfarad will provide a capacity of .5 microfarad for the signaling circuit, and a capacity of two microfarads for the speech transmission circuit.

In accordance with the invention, a considerable saving of material, with a corresponding reduction of size or space requirement, is possible with the arrangement in which the two capacities total only the value appropriate for the speech current circuit. If the prior art practice were followed of providing two independent lumped capacities, for example, a capacity of two microfarads in the speech circuit and a capacity of one-half microfarad in the signaling circuit, a total capacity of two and one-half microfarads would be necessary. Since a total capacity of two microfarads only would be required with the arrangement of the invention, and if it is assumed that the same dielectric thickness is employed throughout, the saving in material would be approximately 20 per cent.

When substantially identical or equal-capacity capacitors or capacitor sections are utilized, further savings of material and reduction in size of the capacitors or capacitor sections becomes possible by employing a dielectric thickness sufficient only for a fraction, for example, one-half, of the normally-encountered ringing circuit voltages. Since the operating voltages involved in the speech current transmission condition of the telephone station circuit are normally much lower than those in the signaling circuit, the capacitors or capacitor sections will be adequate for the transmission circuit. The materials saving may be, in a particular case, of the order of 40 per cent. The use of two similar capacitors or condensers in telephone station sets arranged to include physically separate capacitors or condensers for the signaling and the speech transmission circuits, simplifies the manufacture and servicing of such sets.

It is evident, furthermore, that, if it is not desired to take advantage of the space or material saving or size reduction, additional capacity may be provided for the speech transmission circuit without increase in the size of the capacitor or of the space occupied by it compared with prior practice. The ringing circuit capacity could remain unchanged. This arrangement, however, involves two unequal capacities provided by two capacitors, capacitor sections or condensers.

A more complete understanding of the invention will be obtained from the detailed description that follows, taken in conjunction with the accompanying single-sheet drawing, wherein:

Fig. 1 illustrates a telephone station circuit embodying the invention; and

Fig. 2 illustrates a switching assembly or multiple position, multiple contact switch for association with components of the circuit of Fig. 1.

The drawing shows a telephone station or subscriber's station circuit embodying the invention. The circuit arrangement comprises as components a pair of terminals 10, 20 for connection with the conductors of a telephone line over which the circuit arrangement may be connected with a telephone exchange or central office; a station signal or ringer 30; a condenser set 40; an induction coil 50, which may comprise three windings, 51, 52, 53; a telephone receiver 60, which may be of the type disclosed in L. A. Morrison et al. Patent 2,220,942 of November 12, 1940; a telephone transmitter 70, which may be of the type disclosed in A. F. Bennett et al. Patent 2,042,822 of June 2, 1936; and a multiple-position, multiple-contact switching means 200 (see Fig. 2) comprising a plurality of pairs of spring contacts 80, 90, 100, all interconnected as shown by suitable wiring. The condenser set 40 comprises a con-

tainer for two similar or substantially identical capacitors, capacitor sections or condensers 41, 42, each of which has an individual terminal 43, 44 and a common terminal 45. The condensers are of the same capacity, and may be of the type that embodies suitably treated paper sheets as a dielectric material. The receiver 60 and the transmitter 70 may be included in a hand telephone set or handset; or the transmitter may be supported on a suitable stand or other support, with the receiver separate therefrom. In either event, the spring contacts 80, 90, 100 and the receiver may be so associated with respect to a suitable support (see Fig. 2) that, when the receiver is not in use and is resting on the support, the pairs of spring contacts are in the condition shown in the drawing, and so that, when the receiver is removed from the support, the normally-open contacts 80, 90 close or are caused to become engaged, the normally-closed front or left contact pair 101 of spring contacts 100 are caused to open, and the back or right contact pair 102 of spring contacts 100 are caused to close or become engaged.

For the arrangement shown in the drawing, the following station signaling or ringing circuit may be traced: line terminal 10, ringer 30, normally-closed contact pair 101, condenser 41, condenser 42, to terminal 20. A normally-open circuit for the transmitter may be traced from terminal 10 through line or primary winding 51 of the induction coil, contact pair 90, the transmitter 70, to terminal 20. A normally-open circuit including the receiver connected across the transmitter and the contact pair 90, may be traced from terminal 54, through receiver 60, the receiving circuit winding 53 of the induction coil, normally-open contact pair 80, condenser 42 to line terminal 20. Induction coil winding 52 is connected in parallel with the receiver and comprises a line balancing winding including a resistance component of magnitude dependent upon the subscriber's loop in which it is expected that the substation circuit may be connected. In so far as the relationship of the induction coil windings, the receiver and the transmitter are concerned, they are associated and proportioned in known manner to constitute, when the receiver is removed from its support and the substation circuit is in use, an anti-side tone circuit of the so-called Campbell type. When the receiver is removed from its support, whereby normally-open contact pairs 80, 90 are closed, normally-closed contact pair 101 opens and normally-open contact pair 102 closes, the circuit for the ringer across the line terminals is opened at contact pair 101, and condenser 41 is connected in parallel with condenser 42 by virtue of the closing of contact pair 102. In other words, when the substation circuit is in use for transmission of speech currents into the substation through the line terminals 10, 20 or out of the substation through line terminals 10, 20, the condensers 41, 42 of condenser set 40 are connected in parallel, but, when the substation circuit is in its normal or idle condition, the condensers 41, 42 of condenser set 40 are connected in series with one another and in series with the ringer 30 across the line terminals 10, 20.

In a substation circuit arrangement, for example, in which it is desired to have provided capacitance of the order of two microfarads for speech current transmission purposes, and a capacitance of the order of .5 microfarad for signaling or ringing circuit purposes, condensers 41, 42 may

be similar or substantially identical one microfarad condensers. In the series arrangement, they provide a total capacitance of .5 microfarad, and in the parallel arrangement, they provide a total capacitance of two microfarads. The dielectric thickness of the condensers need be sufficient only for a fraction, for example, one-half, of the voltages normally encountered in the ringing circuit. These voltages are considerably higher than those normally encountered in the speech circuit of the telephone station.

Although the invention has been disclosed with reference to a specific embodiment thereof, the latter is believed at this time to be the best mode of applying the invention the scope of which, it will be appreciated, is not limited to such embodiment.

What is claimed is:

1. A system comprising a pair of alternating current circuits only one of which is required to be operative during a given period, one circuit being most effective for a narrow frequency band and the other for a relatively wide frequency band, each of said circuits requiring a different magnitude of capacity therein, a pair of capacitors of substantially the same capacity, and means to connect said capacitors in series in one circuit and in parallel in the other circuit.

2. A system comprising a pair of alternating current circuits only one of which is required to be operative during a given period, one circuit being most effective for a narrow frequency band and the other for a relatively wide frequency band, each of said circuits requiring a different magnitude of capacity therein, a pair of capacitors of substantially the same capacity, and means to connect said capacitors in series in the narrow frequency band circuit and in parallel in the wide frequency band circuit.

3. A system comprising a pair of alternating current circuits only one of which is required to be operative during a given period, one of said circuits being in normally closed condition and the other in normally-open condition, each of said circuits requiring a different magnitude of capacity therein, a plurality of capacitors, and means for connecting said capacitors in series in said normally-closed circuit and in parallel in said normally-open circuit.

4. A telephone station circuit comprising telephone line terminals, a normally-open circuit connected across said terminals and including a condenser, a normally-closed circuit connected across said terminals and including a pair of serially-connected condensers one of which is the first-mentioned condenser, and switching means for closing said normally-open circuit, for opening said normally-closed circuit, and for connecting said condensers in parallel in the closed normally-open circuit.

5. A telephone station circuit comprising telephone line terminals, a normally-open speech current circuit connected across said terminals and including a condenser, a normally-closed station signaling circuit connected across said terminals and including a pair of serially-connected condensers one of which is the first-men-

tioned condenser, and switching means for closing said speech current circuit, for opening said station signaling circuit, and for connecting said condensers in parallel in the speech current circuit.

6. A telephone station circuit including a signaling circuit and a speech current transmission circuit, a pair of similar condensers, and multiple-position switching means, said signaling and speech circuits and said condensers and switching means being interconnected such that, for one position of the switching means, both of said condensers are included in the signaling circuit, and, for another position of the switching means, both of said condensers are included in said speech circuit.

7. The circuit of claim 6 in which for said one position, the condensers are connected in series, and for the other position the condensers are connected in parallel.

8. A telephone station circuit comprising line terminals, a multiwinding induction coil, a receiver, a transmitter, a ringer, a first condenser, a second condenser, and a plurality of contact pairs; a normally-open circuit connected across said line terminals and comprising one winding of the induction coil, one contact pair in open condition and said transmitter; a second normally-open circuit connected across said line terminals and comprising a pair of windings of said induction coil, said receiver, a second contact pair in open condition and said first condenser; a third and normally-closed circuit connected across said line terminals and comprising said ringer, a third contact pair in closed condition and said condensers in series; and means for connecting said condensers in parallel on closure of said first and second-mentioned contact pairs and on the opening of said third-mentioned contact pair.

9. The circuit of claim 8, in which said condensers are of substantially the same capacity.

10. A circuit of claim 8 in which said condensers have a common terminal connected with said second-mentioned contact pair.

11. A system comprising a signaling circuit and a speech current transmission circuit, and capacity means to be included alternately in said circuits, said capacity means comprising a plurality of capacitors each of the same capacity and including dielectric sufficient to sustain the normally-encountered voltages of the speech circuit.

12. A system comprising a signaling circuit and a speech current transmission circuit, the normally-encountered voltages in the signaling circuit being substantially greater than those normally encountered in the speech circuit, and capacity means to be included alternately in said circuits, said capacity means comprising a pair of capacitors each of the same capacity and with dielectric sufficient for the voltages normally encountered in the speech circuit.

13. A system as claimed in claim 12 in which means are included to connect said capacitors in series in the signaling circuit and in parallel in the speech circuit.

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