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ELECTRIC SIGNALING SYSTEM

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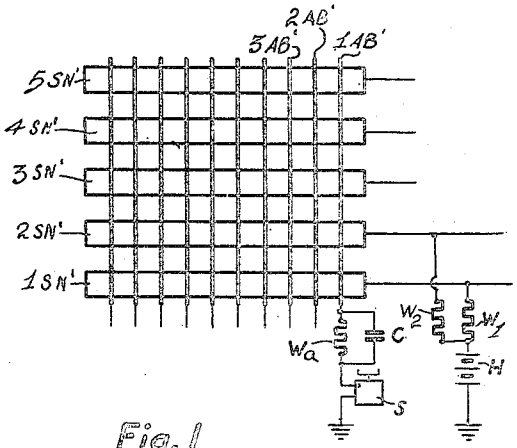

Fig. 1

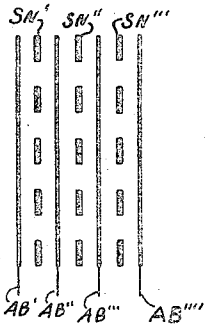

Fig. 2

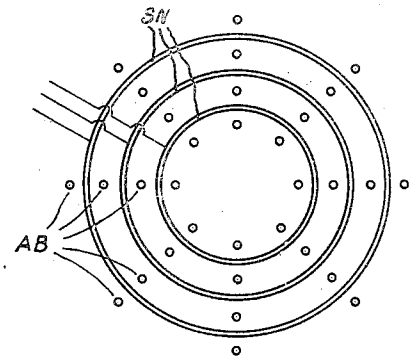

Fig. 3

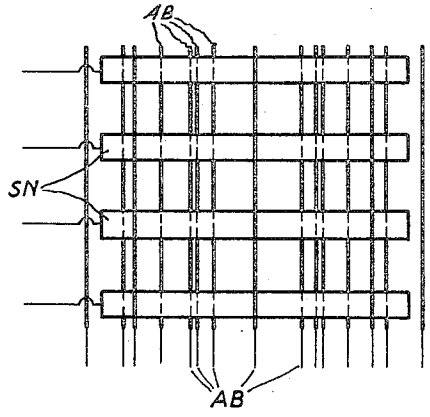

Fig. 4

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ELECTRIC SIGNALING SYSTEM

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5 Claims. (Cl. 179—18)

This invention relates to an electrical signaling system more particularly of the kind in which a sender may be automatically put into electrical connection with a certain one of a plurality of receivers or a receiver into connection with a certain one of a plurality of senders and has for its object improved arrangements for establishing and maintaining the connection.

It is already known to use as a substitute for mechanical selectors in the establishment of such a connection a selector of which the wiper consists of a ray of light. However such an arrangement is expensive as regards costs both of installation and of operation since the ray of light must be modulated in order to be able to transmit speaking currents. It also has been proposed, in Patent No. 2,122,102 of June 28, 1938, to provide an arrangement by which establishment and maintenance of a connection between a sender and one of a plurality of receivers or between a receiver and one of a plurality of senders is automatically established by the aid of electron discharge paths in tubes, for example, cathode ray tubes, having arrangements for producing and directing a concentrated ray of energy towards one or more electrodes of a set under control of a potential on the electrode or electrodes or under control of impulses from the sender. The deflectable rays either transmit the speaking currents directly or cause a discharge between different electrodes which discharge completes a desired circuit.

An object of the present invention is to provide an arrangement by which the electron or discharge paths are controlled from the sender directly without the aid of deflectable rays for the establishment and maintenance of the connection and to this end each sender or receiver respectively is arranged to be connected to one of a plurality of receivers or senders respectively over one of a plurality of discharge paths which are arranged between an electrode connected to a sender or a receiver respectively and a plurality of electrodes connected to different receivers or senders respectively and which have different ignition tensions and are connected in series with resistances of such magnitude that by discharge between two electrodes the tensions of the discharge paths between the electrodes and the other electrodes are below the corresponding ignition tensions.

The invention is hereinafter described with reference to the accompanying drawing showing arrangements which can be employed in various kinds of signaling systems but which for the purposes of explaining their operation have been described as forming parts of an automatic telephone system.

In the drawing:

Figures 1 and 2 are a top view and a side view respectively of an arrangement of the electrodes according to the invention; and

Figures 3 and 4 are a top view and an elevation view of a modified arrangement of the electrodes.

In the electrode assembly shown in the drawing the electrodes are asumed to be enclosed in a vessel, for instance a glass bulb, with a suitable gas filling. In the first embodiment, which is shown in Figures 1 and 2 the electrodes or set consist of parallel bars which are arranged in three layers or subsets SN', SN'' and SN'''. The electrodes or set consist of metal wires arranged in layers or subsets AB', AB'', AB''' and AB'''' between and outside the bars. Each wire in the subset AB' and each bar in the subset SN' are assumed to be arranged in multiple with corresponding wires and bars in other electrode systems.

When the arrangement is used as a call finder in a telephone exchange the bars shown in Figure 1 are connected to cord circuits and the wires to subscriber lines. Each of the cord circuits is connected over a resistance W_1 and W_2 to a common source of current H. Figure 1 illustrates schematically an unifilar connection of such a type. The cord circuit connected to the lowermost bar 1SN' is connected over the resistance W_1 to the battery H in series connection, and the wire 1AB' disposed farthest to the right is connected with a subscriber set or sender S over a resistance W_a and a condenser C in parallel connection. The subscriber set is in turn connected to ground. In the same way other subscribers are connected to the other wires 2AB', 3AB' and so on and other cord circuits to the bars 1SN', 2SN', 3SN', 4SN' and 5SN', etc. For simplicity of illustration the connection is shown as a single wire connection with the earth as a return conductor. In the practical application the subscriber set is connected symmetrically so that the conductor shown in Figure 1 as being connected to earth is connected with a corresponding wire in another wire assembly over a resistance and a condenser in parallel connection, and the corresponding bar in the wire assembly is connected to the battery H over a resistance.

When a call is made in the subscriber set a circuit is completed over S, the resistance W_a

and the wire 1AB' and one of the bars SN' the corresponding resistance W_1, W_2, the common battery H and through earth. The discharge takes place between the wire 1AB' and the one of the bars which forms a discharge path in relation to the wire 1AB' with the lowest ignition tension. By sloping the planes of the wires in relation to the planes of the bars the distances and hereby also the ignition tensions will be different between different wires and bars. When a discharge is produced between the wire and the bar in the subscriber circuit shown the resistances W_a and W_1 produce a voltage drop. The resistances are so dimensioned that the tension across any discharge paths between any one of the two engaged electrodes and the remaining electrodes in the tube will be lower than the corresponding ignition tensions whereby it is prevented that another subscriber connected to one of the other wires can be connected to the engaged bar through such a discharge. In this case the bar 1SN' and consequently also the cord circuit connected thereto is therefore marked as engaged. A second calling subscriber who is connected with the wire 2AB' causes a discharge between the wire 2AB' and the one of the unengaged bars which forms a discharge path in relation to 2AB' with the lowest ignition tension. This unengaged bar is assumed to be 2SN'. A discharge between 2AB' and 1SN' cannot take place as the potential of 1SN' in consequence of the voltage drop in the resistance W_1 is too low. When the first subscriber finishes and the contact in the set is opened the potential of 1SN' increases to the potential of the battery H. A discharge between 1SN' and an engaged wire, in this case 2AB', cannot be ignited as the voltage is too low. The ionization between two certain electrodes will not spread to other bars and wires when the distances between the electrodes are sufficiently wide. Screens of insulating materials also have proved to prevent ionization from spreading. Since the speaking currents flow from S to the cord circuit the resistance W_a is shunted with the condenser C. The resistances W_1, W_2, etc., need not be shunted in corresponding manner because the speaking currents do not pass through the same but continue to the right as indicated on the drawing to a called subscriber through suitable switching members.

Figures 3 and 4 show a modified electrode arrangement wherein the bars SN are ring-shaped and arranged concentrically in groups, the individual groups being arranged one above the other. The wires AB extend between and outside the different rings.

In the electrode arrangements illustrated in Figures 1 to 4 both kinds of electrodes are in principle equivalent so that they can change duty.

I claim:

1. In a communicating system in combination a number of conductors arranged in two sets, a discharge tube, a plurality of electrodes in said tube, said electrodes being connected each to one of said conductors, discharge paths constituting talking paths between each electrode connected to one of said sets of conductors and electrodes connected to the other of said sets of conductors, said discharge paths having different ignition tensions, a first group of resistances each of which is connected to each of the conductors in one of said sets of conductors, subscriber sets each of which are connected in series with each of said resistances, a second group of resistances each of which is connected with one terminal to one of the conductors in the other set of conductors and with the other terminal to one terminal of a common source of current and connections between the other terminal of said common source of current and said subscriber sets, the resistances of both of said groups having such magnitudes that by constituting a talking path over a discharge between an electrode in one of said sets of electrodes and an electrode in another of said sets of electrodes the tension of any discharge path between any one of said two electrodes and the other electrodes in said sets of electrodes is below the corresponding ignition tensions, and said common source of current having a higher voltage than the ignition tensions of the discharge paths.

2. In a communicating system in combination a number of conductors arranged in two sets, a discharge tube, two sets of electrodes in said tube corresponding to said two sets of conductors, said electrodes being connected each to one of said conductors, one of said sets of electrodes consisting of substantially straight parallel wires or bars lying substantially in the same plane and the other of said sets of electrodes being arranged perpendicularly to the first mentioned electrode, discharge paths constituting talking paths between each electrode connected to one of said sets of conductors and electrodes connected to the other of said sets of conductors, said discharge paths having different ignition tensions, a first group of resistances each of which is connected to each of the conductors in one of said sets of conductors, subscriber sets each of which is connected in series with each of said resistances, a second group of resistances each of which is connected with one terminal to one of the conductors in the other set of conductors and with the other terminal to one terminal of a common source of current, and connections between the other terminal of said common source of current and said subscriber sets, the resistances of both of said groups having such magnitudes that by discharge between an electrode in one of said sets of electrodes and an electrode in another of said sets of electrodes the tension of any discharge path between any one of said two electrodes and the other electrodes in said sets of electrodes is below the corresponding ignition tensions, and said common source of current having a higher voltage than the ignition tensions of the discharge paths.

3. In a communicating system in combination a number of conductors arranged in two sets, a discharge tube, two sets of electrodes in said tube, said electrodes being connected each to one of said conductors, said electrodes consisting of substantially straight, parallel wires or bars and being divided into groups which are arranged alternately one about the other, the wires or bars within the same group lying in the same plane, discharge paths constituting talking paths between each electrode connected to one of said sets of conductors and electrodes connected to the other of said sets of conductors, said discharge paths having different ignition tension, a first group of resistances each of which is connected to each of the conductors in one of said sets of conductors, subscriber sets each of which is connected in series with each of said resistances, a second group of resistances each of which is connected with one terminal to one of the conductors in the other set of conductors and with the other terminal to one terminal of a common source of

current, and connections between the other terminal of said common source of current and said subscriber sets, the resistances of both of said groups having such magnitudes that by discharge between an electrode in one of said sets of electrodes and an electrode in another of said sets of electrodes the tension of any discharge path between any one of said two electrodes and the other electrodes in said sets of electrodes is below the corresponding ignition tensions, and said common source of current having a higher voltage than the ignition tensions of the discharge paths.

4. A communicating system according to claim 3, characterized in that the planes of the electrodes connected to one set of conductors occupy a somewhat sloping position in relation to the planes of the electrodes connected to the other set of conductors.

5. In a communicating system in combination a number of conductors arranged in two sets, a discharge tube, two sets of electrodes in said tube corresponding to said two sets of conductors, one of said sets of electrodes consisting of separate annular wires or bars arranged concentrically in parallel planes and the other of said sets of electrodes consisting of wires or bars positioned in one or more cylindrical surfaces parallel with the axis of the annular concentric wires, said electrodes being connected each to one of said conductors, discharge paths between each electrode connected to one of said sets of conductors and electrodes connected to the other of said sets of conductors, said discharge paths having different ignition tensions, a first group of resistances each of which is connected to each of the conductors in one of said sets of conductors, signalling devices each of which is connected in series with each of said resistances, a second group of resistances each of which is connected with one terminal to one of the conductors in the other set of conductors and with the other terminal to one terminal of a common source of current, and connections between the other terminal of said common source of current and said signaling devices, the resistances of both of said groups having such magnitudes that by discharge between an electrode in one of said sets of electrodes and an electrode in another of said sets of electrodes the tension of any discharge path between any one of said two electrodes and the other electrodes in said sets of electrodes is below the corresponding ignition tensions and said common source of current having a higher voltage than the ignition tensions of the discharge paths.

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