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SIGNALING SYSTEM

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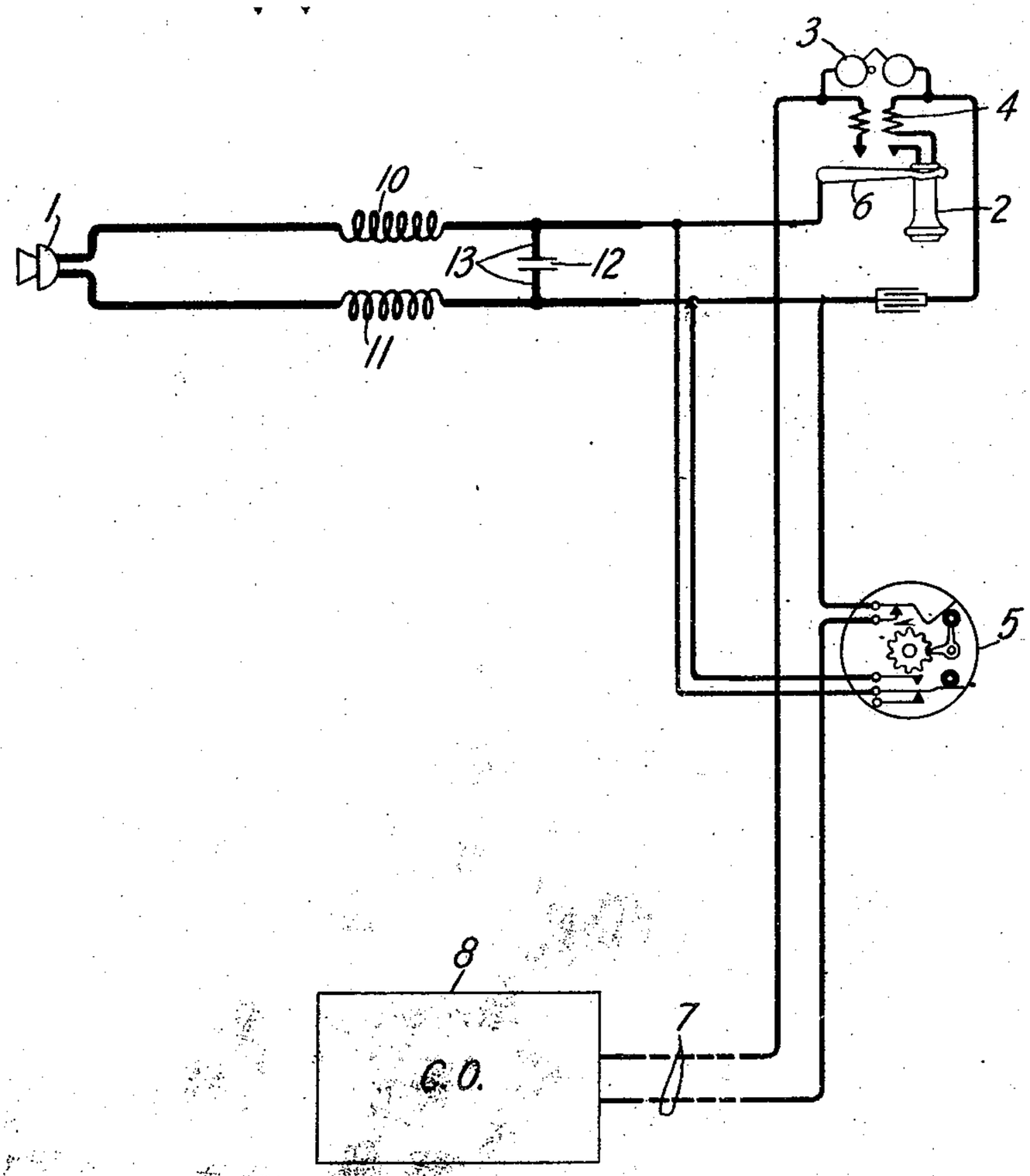

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UNITED STATES PATENT OFFICE

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SIGNALING SYSTEM

Application filed November 19, 1926. Serial No. 149,301.

This invention relates to signaling systems, particularly those employing carbon button transmitters.

An object of the invention is to protect instruments in the circuit from the harmful effects of high frequency oscillations such as are set up by switching operations.

A further object of the invention is to prevent electrical packing or cohering of the carbon granules of a transmitter.

It has been found that in a telephone system, switching operations, such as the operation of the switchhook to signal the operator, the operation of the calling dial when the transmitter short-circuiting contact fails to function, or the operation of the central office equipment in machine switching systems, set up high frequency oscillations of comparatively high voltage which cause electrical packing or cohering of the carbon granules in the transmitter. This cohering persists until relieved by a mechanical disturbance or otherwise and reduces the resistance of the transmitter and decreases its sensitivity. The most troublesome effects frequently experienced are produced by the operation of the switchhook, so that in the ordinary types of desk and wall phones in which the mechanical shock accompanying the operation of the switchhook at least partly restores the transmitter to its normal condition, there are no particularly deleterious consequences, although the packing may shorten the life of the transmitter. However, the transmitter of a hand set is not mechanically disturbed by the operation of the cradle switch and the packing resulting from such operations produces an objectionable reduction in efficiency.

In accordance with this invention there is connected between the transmitter and the circuit into which it operates, a circuit or network which will readily transmit waves of signaling frequencies produced by the transmitter but which will suppress high frequency transient oscillations and thereby protect the transmitter from their harmful effects. Most adequate protection is obtained by the use of a low-pass filter consisting of series inductance and shunt capacity. However, a condenser of proper value connected in shunt to the transmitter greatly reduces the effect of the disturbances.

Since the troublesome oscillations are of very high frequency, those of chief importance being of the order of several hundred thousand cycles per second or higher, it is necessary that the leads associated with the shunt condenser be very short otherwise their inductive reactance at these high frequencies will be so large as to give the shunt path a high impedance. Also the series inductance elements must have very low distributed capacity. For this reason a coil of low inductance and minimum distributed capacity may be found more advantageous than a coil of higher inductance but of inherently higher distributed capacity.

While this invention is primarily related to the protection of transmitters it has been found that similar protection is often desirable for other light contact devices. For example, similar arrangements have been found advantageous for protecting voice frequency relays, the light contacts of which may otherwise cohere or freeze due to the high voltages of the oscillations set up by switching operations, or other disturbances either originating in the circuit itself or produced by an outside source of energy.

This invention may be more readily understood by reference to the following detailed description in connection with the drawing which shows diagrammatically one embodiment thereof in a telephone subset.

There is shown a subscriber's set comprising a transmitter 1, a receiver 2, calling bell 3, inductance coil 4, dialing switch 5, and a switchhook or cradle switch 6 connected in the usual manner. The set is connected through a loop circuit 7 to a central office 8.

When the switch 6 is operated to signal the operator or when the dialing switch 5 is operated, high frequency oscillations are set up in the circuit due to the effect of the inductance coil 4 and the capacity of the windings and connections. These oscillations are of comparatively high voltage and cause the granules of the transmitter to pack, reducing the resistance and efficiency of the instrument. In the ordinary wall or desk set in which the

switch 6 and transmitter 1 are mounted together, the operation of the switch jars the transmitter and loosens the carbon granules. However, in a hand set in which the switch 6 is operated, while the transmitter and receiver are held in the hand, there is very little or no restoring effect.

In order to protect the transmitter from these oscillations, inductance coils 10 and 11 are connected in series in the connections leading to the transmitter, and a condenser 12 is connected in shunt to the coils and transmitter. These elements form a low pass filter which transmits the voice frequency currents generated by the transmitter but effectively suppresses the high frequency oscillations produced by the switching operations. The effect of the inductance coils is further increased by winding them on the same coil in series aiding relation. Since the troublesome oscillations are of very high frequency, the most important being of the order of several hundred thousand cycles per second, it is necessary that the connections 13 associated with the condenser 12 be very short. Otherwise, their inductive reactance at these high frequencies will be so large as to give a high impedance in the shunt path thus in effect counteracting the action of the condenser. For a similar reason, the coils 10 and 11 must be designed to have very low distributed capacity.

In one embodiment it was found satisfactory to give the condenser 12 a value of 0.006 microfarads and each of the coils 10 and 11 a value of self inductance of 0.00014 henries.

In some cases sufficient protection may be obtained by the use of the condenser or the inductance coils alone. However, most effective protection is obtained by the use of both elements.

What is claimed is:

1. In a telephone substation circuit, a carbon button transmitter, and means for preventing switching operations from causing electrical packing in the transmitter, said means comprising an inductance element in series with the transmitter and a capacity element in shunt to the transmitter and inductance element.

2. In a telephone subscriber set, a carbon button transmitter, an inductance coil in series with each terminal thereof, and a condenser in shunt to said transmitter and inductance coils, said condenser, coils and the associated leads having such impedance values as to prevent ultra audible transient oscillations, such as are set up by switching operations, from causing electrical packing in the transmitter.

3. In combination, a circuit containing a carbon button transmitter, a switching device, and means comprising a condenser connected between said switching device and said transmitter for preventing packing of the carbon in said transmitter.

4. A subscriber's line circuit having therein a transmitter containing carbon, a switching device, and a condenser connected across the transmitter for preventing operations of said switching device from causing electrical packing of the carbon in said transmitter.

5. In an electrical circuit, the combination of a carbon transmitter, an induction coil winding and a switching device in series therewith, and means comprising a condenser connected in shunt to said transmiter for preventing packing of the carbon in said transmitter.

In witness whereof, we hereunto subscribe our names this 17th day of November, A. D. 1926.

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