April 5, 1932. W. H. EDWARDS 1,852,045

SIGNALING ARRANGEMENT FOR TELEPHONE LINES

Filed April 10, 1931

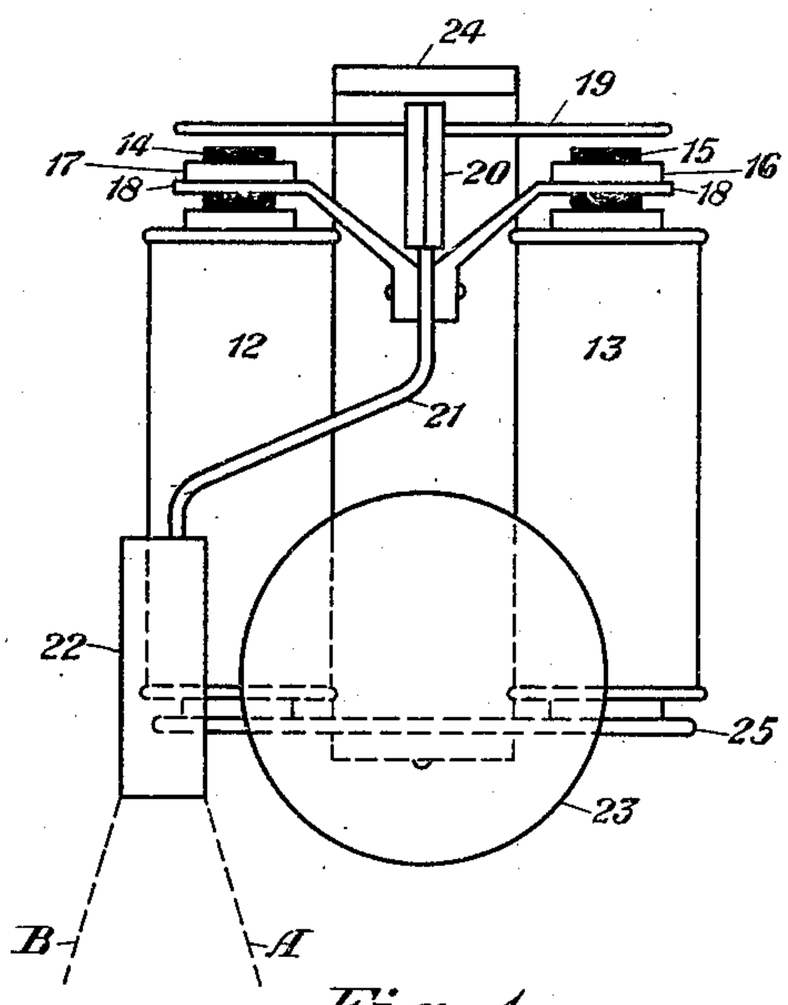

Fig. 1

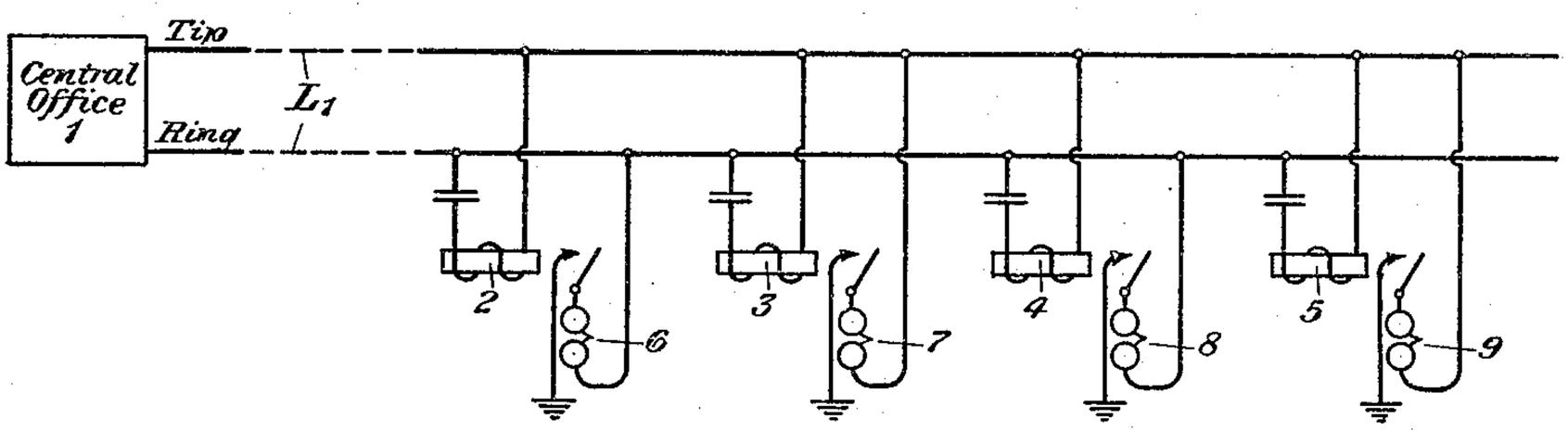

Fig. 2

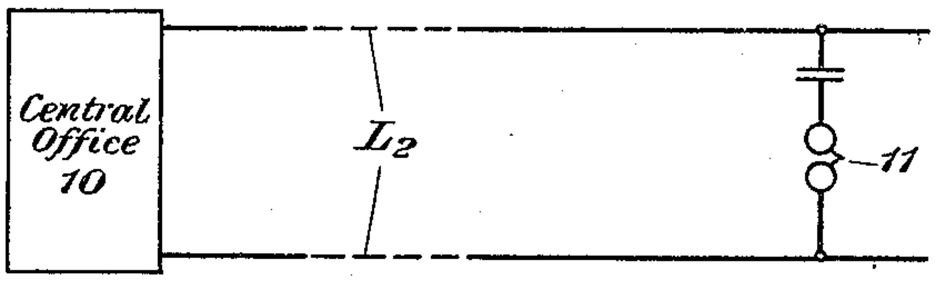

Fig. 3

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UNITED STATES PATENT OFFICE

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SIGNALING ARRANGEMENT FOR TELEPHONE LINES

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The invention relates to telephone systems and more particularly to the application of signal or ringing responsive devices to telephone lines of such systems.

One of the objects of the invention consists in the provision and application to telephone lines of ringing responsive apparatus which will be tuned to respond to a particular frequency but will not respond to frequencies considerably above or below the ringing frequency. The application of a tuned ringer to telephone lines will tend to prevent false ringing due to switchhook operation, testing, dialing, cross ringing and other causes. For example, if the ringing responsive device be tuned to frequencies of approximately 20 cycles, false operation on dialing impulses, which may be of the order of 8 to 11 cycles, may thus be avoided.

The signaling arrangements of the invention have further application to and advantages with telephone lines of the party type. In such lines, wherein a plurality of subscribers utilize a single line, it has been the practice to have the ringers at the various subscribers' sets poled and biased by means of springs to aid in making them selective to the signaling currents applied to the line. It is one of the objects of the invention to provide ringing responsive devices for party telephone lines, which devices will be selective without the need of being spring-biased and without requiring the use of several signaling frequencies, thus eliminating the need of biasing spring adjustments and reducing the maintenance expense caused thereby.

The ringing responsive apparatus of the invention has the further advantage that it may operate with a single gong rather than with two gongs as in former ringers, while at the same time giving a volume of sound with one gong practically the same as that with two gongs. Consequently, a tuned ringer of the type of the invention has the advantage of requiring a relatively small space for a large volume output, as well as having maintenance advantages. Other objects and features of the invention will appear more fully from the detailed description thereof hereinafter given.

The invention may be more fully understood from the following description, together with the accompanying drawings, in the Figures 1, 2 and 3 of which the invention is illustrated. Fig. 1 shows a side view of a preferred form of the ringing device of the invention. Fig. 2 is a circuit diagram showing the application of the ringer to a four-party selective line. In Fig. 3 the ringing device is shown applied to an ordinary subscriber's line.

The ringer shown in Fig. 1 comprises two coils 12 and 13 mounted on a base 25 and having pole pieces 14 and 15. Mounted on these pole pieces by means of the lock nuts 16 and 17 is a supporting member 18. This supporting member holds a stiff reed spring (not shown) to which is affixed the clamp 20 which holds the armature 19 and the stem 21 of the clapper 22. This may be termed the armature assembly. A single gong 23 is shown adjacent to the clapper. The permanent magnet 24 is provided as shown. The relatively stiff reed spring and heavy clapper permit the armature assembly to be tuned to a desirable ringing frequency, for example, 20 cycles, but with slow build up of amplitude on small currents. The tuning of the armature assembly presents the advantage of preventing false operation of the gong due to switchhook or dialing impulses transmitted over the line. Tuning of the armature assembly together with the feature of slow build up of armature amplitude travel on small currents presents the further advantage of preventing false operation on party lines due to cross ringing currents until the tripping relay operates. On larger currents lasting for the full duration of the ringing period a strong signal is obtained once full amplitude is obtained. This is due to the fact that the movement of the clapper is controlled solely by the operation of the armature and the positioning of the single gong and is not limited by a second gong or stopping devices. When the clapper is moving away from the gong, the pull on the armature carries the assembly to a point where the force is balanced by the restoring force of the reed. There is no energy lost except

that due to windage and internal friction in the reed. When the clapper is at the limit of its stroke, the pull on the armature is reversed and this energy added to that stored in the reed is imparted to the gong. The tuned effect of the armature assembly results in expending the energy for one whole cycle in sounding one gong with double volume rather than sounding two different gongs, each with energy from one-half cycle of current. In other words, the energy applied to the armature assembly during its movement away from the single gong is stored in the reed clapper and armature support instead of being dissipated in heat when the armature strikes the core as in former types of ringers. This energy is added to the electrical energy of the return stroke and is imparted to the gong. Accordingly, the tuned ringer of the invention has the further advantage of giving a volume of sound with one gong which is practically the same as that produced heretofore with two gongs with the further advantage of compactness of structure.

In Fig. 2 the ringing arrangements of the invention are shown as applied to a four-party selective line L_1. Obviously the ringing arrangements of the invention may be applied to other types of party lines. The line L_1 may be connected to a central office 1 at which several types of current may be applied to the line, such, for example, as current of a ringing frequency, alternating ringing current with a direct current component of either polarity superimposed thereon, switchhook impulses or dialing impulses. The ringers 6, 7, 8 and 9 of the type shown in Fig. 1 are shown directly connected either to the tip or ring of the line. The ringers are controlled by relays 2, 3, 4 and 5 connected across the line in series with condensers and responsive to alternating current. When superimposed ringing current is applied to the line both alternating current and direct current will be transmitted through the ringers. When direct current is sent through the ringer, a magnetic bias is given to the armature, shifting the point of rest of the armature and clapper assembly to one side or the other, depending on the polarity of the direct current. The oscillations produced by the alternating current applied at the same time will be very much the same as for operation on regular alternating current except that the center of oscillation will be about the point of rest determined by the direct current. In other words, the clapper may be made to oscillate along the line A of Fig. 1 when the proper polarity of superimposed ringing current is used and will actuate the gong. When the opposite polarity of current is used, the clapper will oscillate along the line B of Fig. 1, and will not strike the gong. Accordingly, if the gong is adjusted so that it will be struck by the clapper when one polarity of superimposed current is used and is out of range of the clapper when the other polarity is used, the ringer arrangements may be used for selective signaling on party telephone lines in the manner above described.

In Fig. 3 the ringing device of the invention is shown applied to an ordinary subscriber's telephone line L_2. The ringer is shown as 11 and is bridged across the line L_2 in series with a condenser. The line L_2 is connected to a central office 10. Ringing currents may be applied to the line L_2 from the central office 10 and also current impulses caused by dialing, switchhook and other operations. As has been heretofore pointed out, if a tuned ringer of this invention is used, false operation due to dialing or switchhook impulses may be avoided.

While the invention has been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. In a telephone system, a party telephone line, means for applying to said line an alternating current with a direct current component of either polarity superimposed thereon, a plurality of ringing responsive devices operatively connected to different sides of said line, and a plurality of relays associated with said line and responsive to said alternating current for closing the circuits of sand ringing responsive devices, said ringing responsive devices being of the tuned armature assembly type and having their operativeness controlled by the polarity of the direct current component applied to the line.

2. In a telephone system a party telephone line, means for applying to said line an alternating current with a direct current component of either polarity superimposed thereon, and a plurality of ringing responsive devices connected to different sides of said line, each of said ringing responsive devices comprising an armature tuned to the frequency of said alternating current, a single gong, a clapper solely controlled by the operation of said armature and the position of said gong, and means controlled by the polarity of the direct current component superimposed on said line for shifting the center of oscillation of the clapper away from or closer to the gong whereby the operation of the gong may be controlled.

3. A telephone line, a tuned single gong ringer having an armature with a reed support connected to said line, and means for applying to said line an alternating current with a direct current component of either polarity superimposed thereon whereby a magnetic bias may be given to the armature

for shifting the center of oscillation of the armature and clapper assembly to one side or the other depending upon the polarity of said direct current component.

In testimony whereof, I have signed my name to this specification this 9th day of April 1931.

WILLIAM H. EDWARDS.