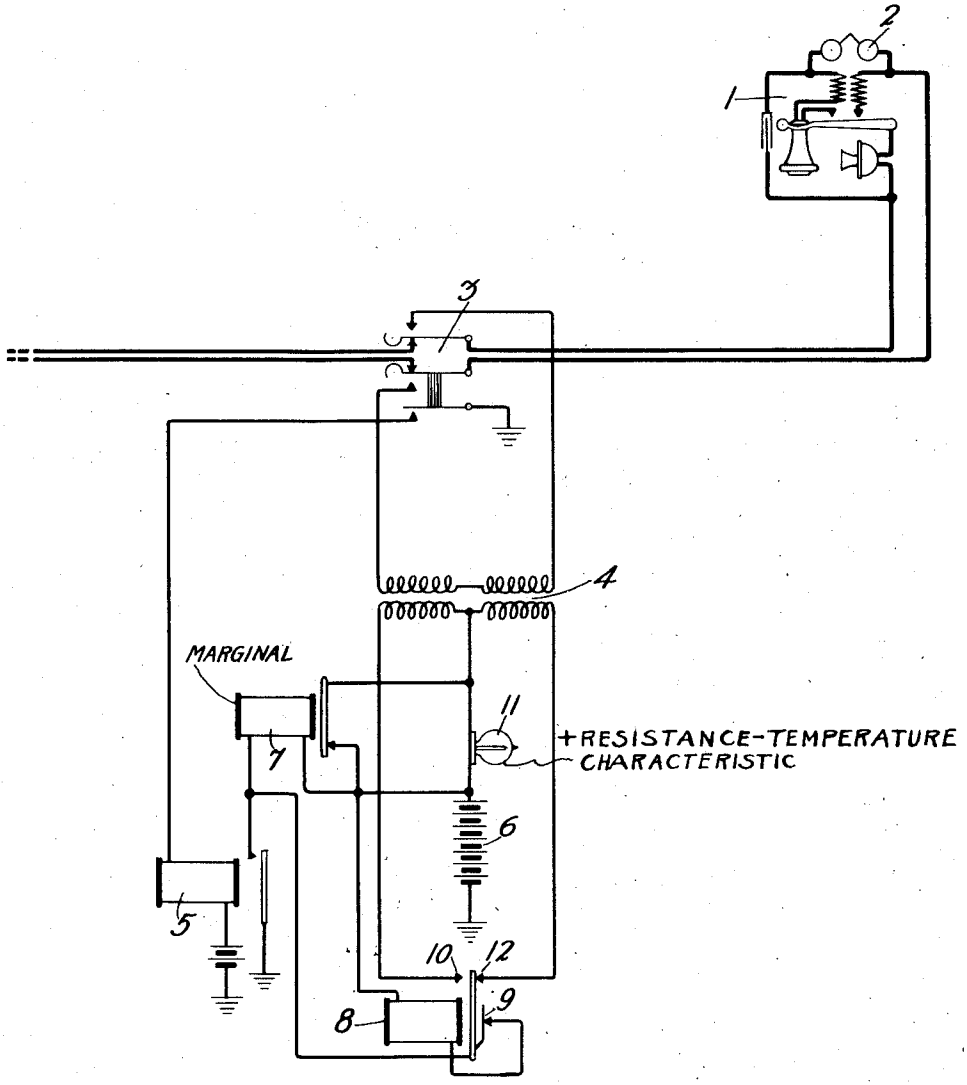
June 30, 1925. 1,543,671

E. E. HINRICHSEN

TELEPHONE SYSTEM

Filed April 23, 1920



Inventor:
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by C. P. Soper Atty.

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UNITED STATES PATENT OFFICE.

EDWARD E. HINRICHSEN, OF NEW YORK, N. Y., ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

TELEPHONE SYSTEM.

Application filed April 23, 1920. Serial No. 375,986.

To all whom it may concern:

Be it known that I, EDWARD E. HINRICHSEN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Telephone Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to improvements in signaling systems and has particular reference to a ringing circuit for telephone systems.

In systems wherein ringing transformers are employed in the ringing circuits, the range of applied battery potential is sometimes so great that if a transformer is designed to give a satisfactory alternating current when the battery potential is within a desirable range, the alternating current potential induced in the secondary or output side of the transformer will become objectionable for proper operating purposes if the battery potential should increase beyond said desirable range.

An object of the present invention is to prevent any undesirable increase in alternating current potenial in the secondary or output side of a ringing transformer.

In accordance with the above object, use is preferably made of a resistance element introduced into the primary of the ringing transformer and normally shunted through a contact of a marginal relay which operates only when the battery potential is in excess of the desired range. When this occurs, said resistance is included in series with the primary of the transformer and acts to prevent the current in said primary from increasing in proportion to the increase in the applied or battery potential.

The drawing illustrates diagrammatically a preferred embodiment of the invention showing its application to a manual ringing circuit.

More specifically, the drawing shows a telephone line terminating in a subscriber's substation 1 of any well known type including the ringer 2. An operator's ringing key 3 is also provided which, when actuated, connects the ringing circuit, including the secondary or output side of the ringing transformer 4, to the telephone line to operate the ringer 2 in the usual manner. Closure of the lower alternate contact of key 3 establishes an obvious energizing circuit for relay 5.

Operation of relay 5 establishes a circuit extending from grounded battery 6 through the winding of marginal relay 7 and the contact of relay 5 to ground. Relay 7 is adjusted to operate at a battery voltage corresponding to the maximum safe alternating voltage, or, in other words, will only operate when the battery potential is in excess of the range desired for operating purposes. Energization of relay 5 also establishes a circuit for the ringing interrupter or vibrator 8, of any construction known in the art, said circuit extending from battery 6 through the winding of vibrator 8, the contact 9, and the contact of relay 5 to ground. Vibrator 8 operates and thereby interrupts its own circuit at the contact 9 which causes the same to release whereupon the energizing circuit is again established. Upon each closure of the alternate contact 10, when vibrator 8 operates, current flows from battery 6 to the middle point of the primary of the transformer 4 through the contact of relay 7 thus shunting the ballast resistance element 11 which may be a tungsten lamp or other device of similar characteristics. The temperature-resistance characteristic of the element 11, is identical with Fig. 3[a] shown on page 8, section 4 of the third edition of the "Standard Handbook for Electrical Engineers". From said middle point the current flows through the left coil of said primary winding, the contact 10 and the contact of relay 5 to ground. Upon each closure of the normal contact 12, the current from battery 6 flows similarly to the middle point of the primary winding of transformer 4 and from thence through the right coil of said winding, the contact 12 and contact of relay 5 to ground. In this manner pulsating current is generated which produces alternating current in the secondary or output side of transformer 4 from whence the same flows through the upper and middle alternate contacts of key 3 to the apparatus at the substation.

If, during the application of ringing current, the battery potential exceeds the desired maximum, relay 7 operates and opens the shunt around the resistance element 11 which is then included in series with the

primary of the transformer, whereupon the resistance of said element increases as the current through it increases in the manner shown in the Standard Handbook before referred to. It will thus be apparent that when the element 11 is included in the circuit, the current flowing through the primary will be prevented from increasing in proportion to the increase in the applied potential with the result that no objectionable increase will be obtained in the potential induced in the secondary of the transformer.

What is claimed is:

1. The combinatin of a circuit including a transformer, a source of battery supply for said transformer, means for periodically interrupting said battery supply, a resistance element, and means connected in bridge of said source for effectively including said resistance element in series with said source and the primary circuit of said transformer when the voltage of said source is increased beyond a certain predetermined value.

2. The combination of a circuit including a transformer, a source of battery supply for said transformer, means for periodically interrupting said battery supply, a normally shunted resistance element associated with said transformer, and means bridged across said source for removing the shunt from said resistance element when the voltage of said source is increased beyond a certain predetermined value.

3. The combination of a circuit including a transformer, a source of battery supply for said transformer, means for periodically interrupting said battery supply, a normally shunted resistance element in series with the primary of said transformer, and means bridged across said source for removing the shunt from said resistance element.

4. The combination of a circuit including a transformer, a source of battery supply for said transformer, means for periodically interrupting said battery supply, a resistance element and a marginal relay bridged across said source for effectively including said resistance element in the primary circuit of said transformer.

In witness whereof, I hereunto subscribe my name this 21st day of April A. D., 1920.

EDWARD E. HINRICHSEN.