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MEANS FOR CONTROLLING SENSITIVITY OF VOICE OPERATED DEVICES

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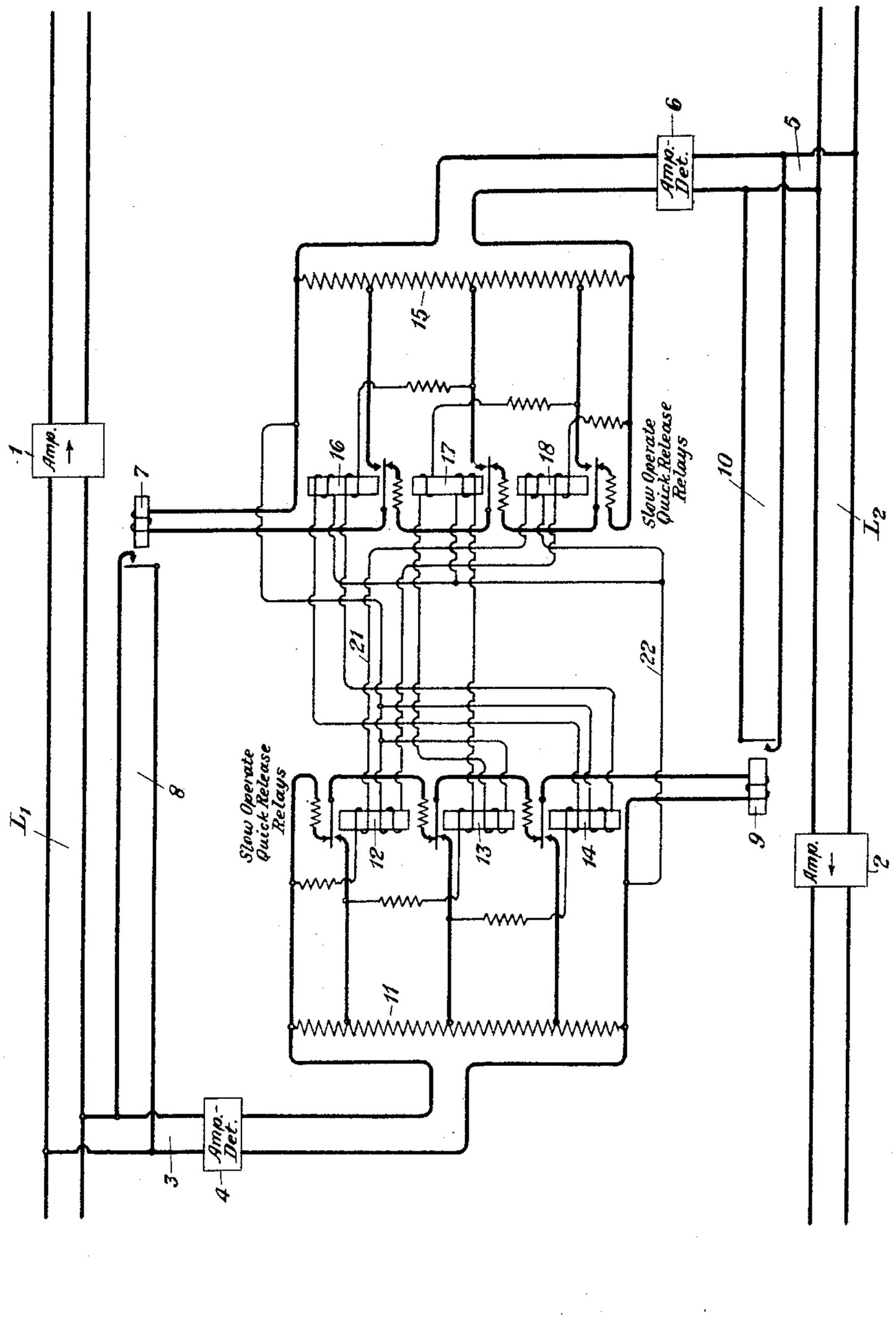

INVENTORS
S. B. Wright and D. Mitchell
BY
ATTORNEY

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SUMNER B. WRIGHT, OF SOUTH ORANGE, NEW JERSEY, AND DOREN MITCHELL, OF NEW YORK, N. Y., ASSIGNORS TO AMERICAN TELEPHONE AND TELEGRAPH COMPANY, A CORPORATION OF NEW YORK

MEANS FOR CONTROLLING SENSITIVITY OF VOICE OPERATED DEVICES

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This invention relates to improvements in voice operated devices, and more particularly to arrangements for automatically regulating the sensitivity of such devices.

An echo suppressor is such a voice operated device well known in the art and is utilized in connection with a two-way transmission system for disabling one of the one-way lines of such system, while transmission is taking place in the opposite direction over another of the one-way lines of the system, thereby preventing echo effects or reflected currents from being transmitted back to the transmitting end of the system and causing a disturbance or singing. The disabling apparatus usually comprises a short circuit which may be closed across the one-way line by the operation of a voice operated relay device connected to the one-way line for transmission in the opposite direction.

The voice operated echo suppressor must be so constructed that it will not be operated by noise currents existing on the system. Accordingly, it has been the practice to limit the sensitivity of the device by the greatest noise ever expected to be present on the line. As the line would not at all times include this maximum noise current, it is obvious that during quiet periods, the voice operated echo suppressor device would not be operating at maximum efficiency. It is the primary object of the invention to automatically vary the sensitivity of a voice operated device, such as the echo suppressor, in accordance with the volume of noise on the line so that on quiet connections its sensitivity will not be limited by the maximum noise to be expected. The arrangements of the invention for automatically regulating the sensitivity of a device are applicable to voice operated systems, four-wire echo suppressors, two-wire echo suppressors, and antisinging devices among others. 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 drawing in the figure of which is shown a circuit diagram illustrating a preferred embodiment of the invention.

In the drawing, the invention is illustrated in connection with a voice operated echo suppressor device connected between the one-way lines of a circuit of the well-known four-wire type. The invention has been illustrated in connection with such an echo suppressor as this is believed to be a practical desirable use of the invention. Two one-way line sections for transmission in opposite directions are shown as L_1 and L_2. Amplifiers 1 and 2 are included therein. Bridged across line L_1 is a circuit 3 including an amplifier detector 4. The output of the amplifier detector 4 is connected to a voice operated relay 9 which controls a short circuit 10 to disable line L_2. Bridged across line L_2 is a circuit 5 including an amplifier detector 6. The output of this amplifier detector 6 is connected to a voice operated relay 7 which controls a short circuit 8 for disabling line L_1. The above described features of an echo suppressor device are well known in the art.

An echo suppressor of the above type without the automatic regulating features of this invention would normally have the sensitivity of its voice operated relays 7 and 9 limited by the maximum amount of noise current to be expected over lines L_1 and L_2. It is known that the amounts of noise on different circuits vary over a wide range, the difference between extreme conditions being at least 30 TU. Accordingly, it will be seen that it might be permissible to set echo suppressors 30 TU more sensitive than heretofore if the arrangements of this invention are provided to automatically reduce their sensitivity to take care of variations in noise. In accordance with this invention, the voice operated devices may be set at maximum sensitivity. Automatically operating control apparatus is provided to slowly reduce the sensitivity of both voice operated devices when either one is affected by steady noise but to quickly restore maximum sensitivity when this steady noise is not present. In other words, the arrangements of the invention will slowly reduce the sensitivity

of the voice operated device and hold it to a given value suitable for preventing operation by a continuous steady volume within the range of noise currents, and quickly increase sensitivity to a higher value when this steady volume has ceased. Arrangements are provided whereby both voice operated echo suppressor devices are acted upon in order to obviate the possibility of false operation. Thus, if the sensitivity of one suppressor only were reduced, transmission which was too weak to operate that suppressor might be strong enough as an echo to operate the other suppressor due to the difference in sensitivities.

In the circuit diagram illustrated, amplifier detectors, such as 4 and 6, with a straight line T U input current output characteristic are used so as to give a fairly wide range of operation. The output of these amplifier detectors includes the potentiometer devices 11 and 15 and acts upon series of slow operating quick release relays, such as 12, 13, 14 and 16, 17, 18, as well as upon the regular echo suppressing relays 7 and 9.

Normally, the echo suppressing relay 9 is connected directly across the large resistance, or potentiometer 11, and is thus at its maximum sensitivity. When, however, a steady current, such as noise current on line L_1, of sufficient magnitude to operate the echo suppressing relay 9 in this condition is received, the slow operate relay 12 is eventually operated, thus connecting the echo suppressing relay 9 to a lower point of resistance 11 and reducing its sensitivity below the point of operation by this steady current. The operating circuit for relay 12 may be traced from the tip conductor of the output of amplifier detector 4, upper winding of relay 12, conductor 21, upper winding of relay 18, conductor 22, to the ring conductor of the output of the amplifier detector 4. In a similar manner a stronger steady current from line L_1, may operate relay 13 and connect the echo suppressor relay 9 to a still lower point on resistance 11 and thus bring the relay out of the region of sensitivity required for operation by this magnitude. The windings of relay 13 and relay 17 are also connected in series and the windings of relay 14 and relay 16 are connected in series so that the sensitivity of both echo suppressor devices will be affected alike for reasons heretofore pointed out. The operation of the control arrangements in response to steady noise currents coming in over line L_2 is substantially similar to that heretofore decribed. The small resistances shown in the various leads in the control apparatus may be proportioned to permit the amplifier detectors 4 and 6 to always be connected to the same impedance.

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 other and widely varied forms without departing from the spirit of the invention as defined by the appended claims.

What is claimed is:

1. In association with a transmission line, apparatus responsive to voice currents in said line, and means associated therewith and responsive to alternating currents of comparatively slow variations of amplitude in said line for controlling the sensitivity of said voice current responsive apparatus.

2. In association with a transmission line, apparatus responsive to voice currents in said line, and means associated therewith and responsive to alternating currents of comparatively slow variation of amplitude in said line for slowly decreasing the sensitivity of said voice current responsive apparatus as said alternating currents increase and rapidly restoring the sensitivity of said voice current responsive apparatus as said alternating currents decrease.

3. In association with a transmission line, apparatus responsive to voice currents in said line, and means associated therewith and responsive to noise currents for slowly decreasing the sensitivity of said voice current responsive apparatus as said noise currents increase and rapidly restoring the sensitivity of said apparatus as said noise currents decrease, said noise current responsive means comprising a potentiometer controlled by a series of slow operate quick release relays associated with said line.

4. In a transmission circuit including two paths adapted for transmission in opposite directions, an echo suppressor arrangement comprising two devices each responsive to voice currents in one of said paths, and means associated with each of said devices and responsive to alternating currents of comparatively slow variation of amplitude in the respective one of said paths for controlling the sensitivity of both of said voice current responsive devices.

5. A transmission line, an echo suppressor associated therewith, and a chain of slow operate fast release relays responsive to alternating currents of comparatively slow variation in amplitude transmitted over said line for automatically varying the sensitivity of said echo suppressor.

In testimony whereof, we have signed our names to this specification this 5th day of June 1928.

SUMNER B. WRIGHT.
DOREN MITCHELL.