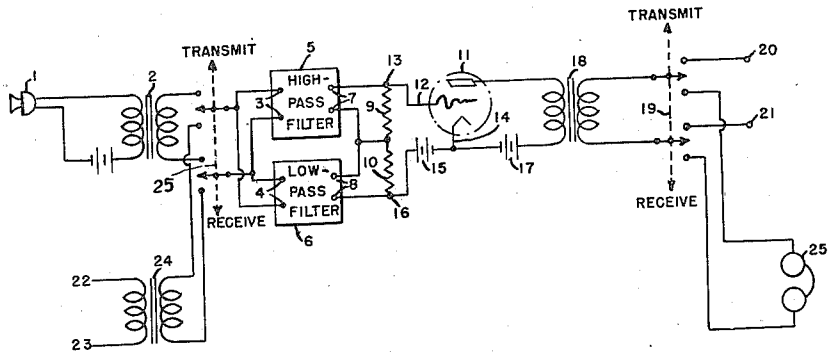
Nov. 7, 1944. E. N. DINGLEY, JR 2,361,930

SPEECH GARBLING APPARATUS

Filed Oct. 3, 1940



INVENTOR
EDWARD N. DINGLEY, JR.

BY W. Glenn Jones

ATTORNEY

Patented Nov. 7, 1944 2,361,930

UNITED STATES PATENT OFFICE

2,361,930

SPEECH GARBLING APPARATUS

Edward N. Dingley, Jr., Arlington, Va.

Application October 3, 1940, Serial No. 359,503

2 Claims. (Cl. 179—1.5)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

My invention relates to improvements in apparatus for separating, inverting, and recombining certain portions of the electrical wave energy representing speech transmission over wires in such a manner as to render the wave energy unintelligible when converted into acoustical wave energy by conventional means such as an electro-acoustical transducer or ear-phone.

My invention also relates to improvements in apparatus for reversing the aforestated process so as to convert the wave energy thus made unintelligible into intelligible speech.

The major purpose of my invention is to provide means whereby voice conversations transmitted by wire or radio may be rendered unintelligible to the casual listener-in.

The foregoing and other objects of my invention will clearly appear by reference to the following specifications and drawing in which the single figure is a schematic diagram of my novel apparatus.

Referring to the drawing, the microphone 1, of conventional type converts acoustical speech energy into electrical energy in the primary of transformer 2 in the conventional manner. The secondary of the transformer 2 is connected through the switch 20 (in the upper or Transmit position) to the input terminals 3 of the high-pass filter 5 and also to the input terminals 4 of the low-pass filter 6. The high-pass and low-pass filters 5 and 6 are of conventional design and are designed to have a common cut-off frequency such as 1000 cycles per second so that the output terminals 7 supply energy having frequencies of 1000 c. p. s. and above to the resistor 9 and the output terminals 8 supply energy having frequencies of 1000 c. p. s. and below to the resistor 10.

The sum of the voltages existing across resistors 9 and 10 is applied to the input circuit of the vacuum tube 11 by connecting the grid 12 to the point 13 and by connecting the cathode 14 through the bias battery 15 to the point 16. The vacuum tube 11 may be a triode as shown or may be a tetrode or pentode as desired. Its sole purpose is to provide a high impedance coupling to the points 13 and 16 and to provide a certain amount of desired signal amplification.

From the manner in which the circuits are shown to be connected it is apparent that a signal having a frequency of say 750 cycles passing through the low-pass filter 6, will develop a voltage between the points 13—16 in opposite phase to the voltage it would have developed had it been able to pass only through the high-pass filter 5.

From the foregoing, it is apparent that the signal present on grid 12 of vacuum tube 11 will consist of substantially all of the voice frequencies present in the secondary of transformer 2 and that the voice frequencies on the grid 12 in the range 1000 c. p. s. and below will be opposite in phase from these same frequencies as they appear at the secondary of transformer 2.

The reversal of phase of substantially half of the voice frequencies renders the speech signal completely unintelligible. This unintelligible speech signal is delivered from the output circuit of vacuum tube 11, through the coupling transformer 18, through the switch 19 (in its upper or Transmit position) to the output terminals 20 and 21 where it may be transmitted over a wire line or used to modulate a radio transmitter.

The unintelligible voice signal, after transmission over a wire line or over a radio circuit, is received at a receiving point equipped with a duplicate of the speech scrambling device shown. At the receiving point, the unintelligible signal is delivered to the input terminals 22 and 23 of the transformer 24. From the secondary of transformer 24, this signal is delivered through the switch 25 (in the down or Receive position) to the input terminals 3 of the high-pass filter 5 and to the input terminals 4 of the low-pass filter 6. The unintelligible speech is divided by the filters into frequencies above and below 1000 c. p. s. and combined, as before, in reverse phase in the resistors 9 and 10 so that the signal reaching grid 12 of vacuum tube 11 contains substantially the same frequencies in the same phase relationship as the original intelligible voice signal at the secondary of transformer 2. This intelligible signal is taken from the plate circuit of vacuum tube 11, through the output transformer 18, through the switch 19 (in its down or Receive position) to the electro-acoustical transducer or ear-phones 25 where it is translated into an intelligible acoustical signal.

The cut-off point of the filters 5 and 6 should be as sharp as possible in order to reduce the range of frequencies which are transmitted with equal amplitude through both filters and which consequently completely cancel each other in the resistors 9 and 10. It has been demonstrated experimentally that as much as 20 percent of the entire speech spectrum may be cancelled out in this manner without appreciably reducing the intelligibility of normal speech.

It is obvious that the security and privacy of

the above described system may be enhanced by occasionally varying, at pre-arranged times, the cut-off point of the filters 5 and 6 from 1000 c. p. s. to other frequencies near the center of the normal speech spectrum.

While the two functions of the network have been shown as being performed by switching from a transmitting instrumentality to a receiver, to avoid duplication of the principal part of the drawing, it will be understood that in practical use it will probably be preferable to provide one network for transmission and another for reception. It is also to be understood that the term "garbling" covers phase invertion of portions of the same wave, whether changing from intelligible to unintelligible, or vice versa, since the same operations and apparatus are involved in both.

The invention herein described and claimed may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. Speech garbling apparatus, comprising means for converting sound energy into correspondingly fluctuating electrical energy, a high pass and a low pass electric wave filter, the lower cut-off frequency of the former being substantially the same as the upper cut-off frequency of the latter, an impedance, means connecting one output terminal of each said filter to a respective terminal of said impedance, means connecting the other output terminal of each said filter to the center point of said impedance, a vacuum tube having at least an anode, a cathode and a grid, said cathode and grid being respectively connected to opposite terminals of said impedance to apply potentials from said two filters to said tube in opposite phase, means to connect both said filters selectively to said converting means or to receive a signal wherein upper and lower frequency portions are present in opposite phase, and output means connected between said anode and said cathode.

2. Speech garbling apparatus, comprising means for converting sound energy into correspondingly fluctuating electrical energy, a high pass and a low pass electric wave filter, the lower cut-off frequency of the former being substantially the same as the upper cut-off frequency of the latter, means to supply said fluctuating energy to both said filters, an impedance, means connecting one output terminal of each said filter to a respective terminal of said impedance, means connecting the other output terminal of each said filter to the center point of said impedance, a vacuum tube having at least an anode, a cathode and a grid, said cathode and grid being respectively connected to opposite terminals of said impedance to apply potentials from said two filters to said tube in opposite phase, and output means connected between said anode and said cathode.

EDWARD N. DINGLEY, JR.