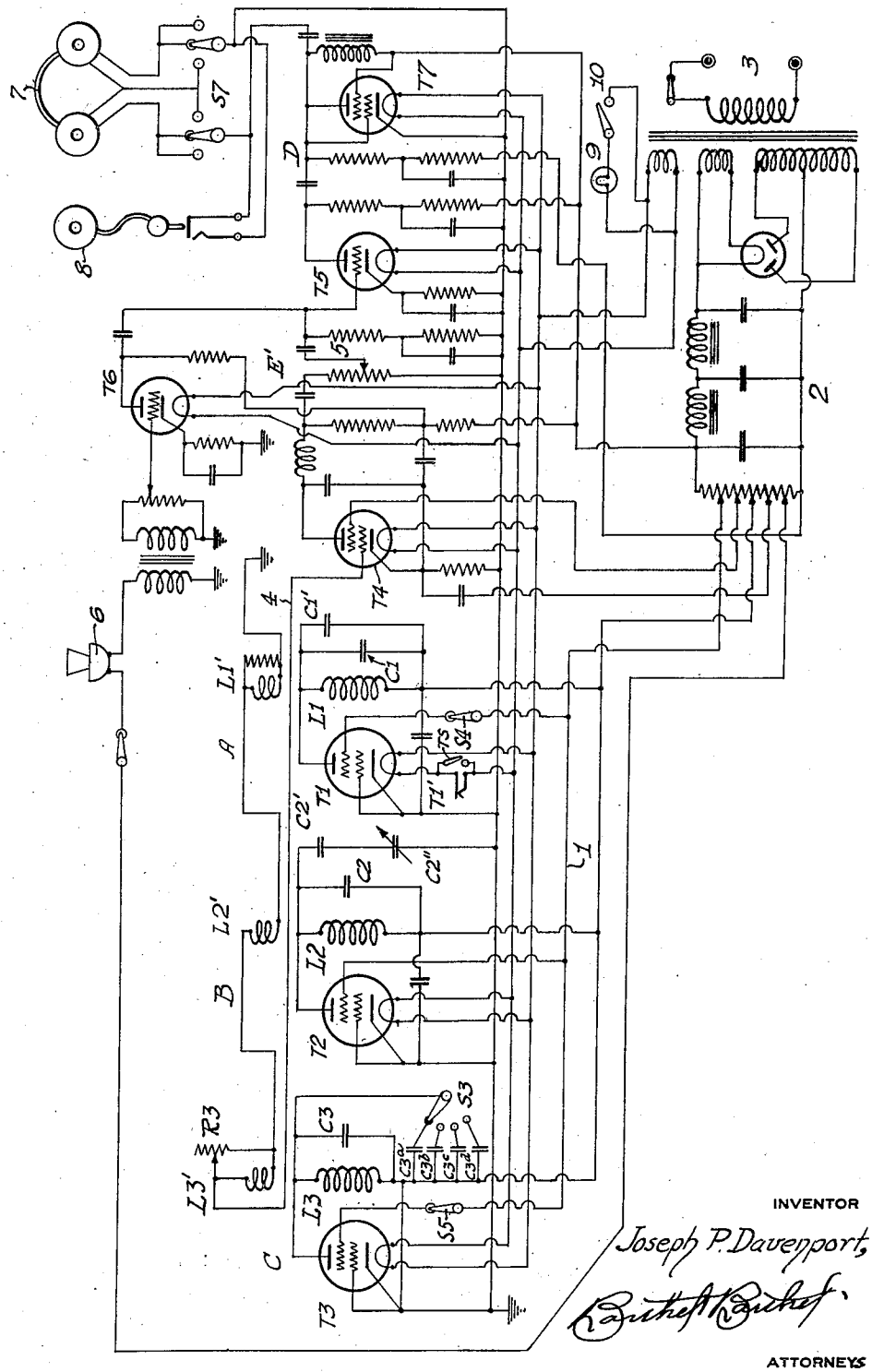
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EAR EXERCISING DEVICE

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EAR EXERCISING DEVICE

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The present invention pertains to apparatus for measuring and exercising the human ear.

The primary object of the present invention is to provide apparatus for measuring the hearing ability of a person and for exercising the ears of a person with defective hearing at the deficiency frequencies disclosed by such measurement. The exercise consists of an application of simple and complex tone vibrations which in certain forms of deafness is found to have beneficial effect with improvement in the hearing ability resulting. The apparatus is designed to produce a single, sustained, clear audiotone which is manually controlled and variable in frequency between zero and twenty thousand cycles, and in intensity it is variable from zero to the maximum volume of the amplifier. The quantitative hearing ability is tested by determining the lowest signal intensity that the subject can hear, by each ear separately, or by both ears together. When the exercise takes place the apparatus may be made to super-impose on the above audiotone a throbbing, pulsating beat note, which is variable in intensity independently of the pure tone, and which is adjustable to four or more low frequencies. In this manner the organs of hearing are trained and developed by gentle applications of simple and complex vibrations. The apparatus further includes means whereby the amplified human voice may be super-imposed on the above described audiotone and beat note through the medium of a microphone and amplifier so that the operator may administer voice exercises to the organs of hearing of such simple sounds, or spoken words, as experience shows to be beneficial in certain cases.

With the above and other ends in view the invention consists in matters hereinafter set forth and more particularly pointed out in the appended claims, reference being had to the accompanying drawing, in which the figure is a diagrammatic view of the present device.

Like characters of reference are employed throughout to designate corresponding parts.

The device includes an oscillator designated generally A which consists of a vacuum tube T1 of the dynatron type, having constants of inductance L1, and capacities C1 and C1', to produce continuous oscillation of a fixed frequency somewhere between fifty and one hundred kilocycles. A thermostatic device T1' in the filament of the tube T1 automatically provides for regular heating and cooling of the filament of the tube. The thermostatic device T1' comprises a bi-metal switch member mounted in the filament circuit of tube T1 so that the current flowing through the metal causes the same to flex and open the filament circuit and after the metal again cools it again closes the filament circuit. While the filament circuit is closed the filament becomes heated and while the circuit is open the filament cools. The thermostat is, therefore, for the purpose of causing regular heating and cooling of the filament of tube T1, thereby effecting a wide variation in the plate current flowing through the tube, and in turn causing a wide variation of plate impedance and a corresponding variation of oscillation frequency.

A second oscillator is generally designated B and comprises a vacuum tube T2 of the dynatron type, inductance L2, and capacities C2, C2' and C2''. This oscillator is designed to oscillate at frequencies continuously variable from a frequency equal to that of oscillator A to one of twenty kilo-cycles either higher or lower in frequency.

A third oscillator is generally designated C and comprises a vacuum tube T3 of the dynatron type and associated inductance L3, switch S3, and capacities C3, C3*a*, C3*b*, C3*c*, and C3*d*. This oscillator is designed to oscillate at four frequencies progressively differing from that of oscillator A in steps of about thirty cycles each.

Provision is made to stop or start oscillators A and C by means of switches S4 or S5 respectively which are mounted between the tubes T1 and T3 and the line 1 leading from the power pack generally designated 2 which rectifies the electric current from the supply source 3.

Inductively coupled to each of inductances L1, L2 and L3 are similar inductances L1', L2' and L3' respectively. The inductances L1', L2' and L3' are electrically connected in series in the line 4 feeding into the input of vacuum tube T4, constants of which are such that rectification occurs in the plate circuit. The three inductances provide a means whereby some of the energy of each oscillator tube is fed into rectifier T4, producing in the plate circuit of said rectifier tube any of the following controllable effects:—

1. A pure audiotone, variable manually from zero to twenty thousand cycles, by beating oscillators A and B, oscillator C at this time being turned off.

2. A pure audiotone produced by the beating of oscillators A and B, or A and C, automatically and regularly variable over a wide frequency range because of intermittent heating and cooling of the filament in vacuum tube T1, said heat-

ing and cooling causing frequency drift because of slight capacity variations.

3. A throbbing, pulsating modulation of the pure audiotone produced by beating oscillators A, B and C together. The intensity of the last named modulation is controlled by means of a variable resistance R3.

The output from the rectifier tube T4 is fed into a two stage compensated audioamplifier generally designated as D through a network E of suitable coupling and filtering resistors and condensers. A calibrated volume control, or attenuator 5 is inserted between the rectifier tube T4 and the first audiotube T5 to provide variable signal intensity.

A microphone 6 feeding through tube T6 is also coupled into the input circuit of audiotube T5, having suitable volume control to permit super-imposing voice signals of a volume sufficient to be heard through the tone signals. The output from the second amplifier tube T7 is fed into a double ear phone 7 through a double pole three point switch S7, which may be operated to transfer the signal to either ear phone or to both ears phones. The output from the amplifier tube T7 is also fed into a monitor ear phone 8 provided so that the operator or attendant may listen to the signal. A small incandescent lamp 9 and push button 10 are provided in order that the subject, or person receiving exercise may make a visible signal in response to questions.

The above described machine is capable of producing a single, sustained, clear audiotone variable in frequency between zero and twenty thousand cycles, and in intensity from zero to the maximum volume of the amplifier. Upon the sustained tone the machine is capable of super-imposing a throbbing, pulsating beat note, variable in intensity independently of the sustained tone, and adjustable to four or more low frequencies. The machine may also cause a slow, regular, automatic fluctuation of the audiotone over a wide frequency range or it may combine any of the above recited to produce a series of very complex tones. Upon any of the tones the machine provides for super-imposing the human voice, or for producing alone any natural voice sounds, through the medium of the microphone, amplified and controllable in intensity. The machine is adapted to feed any of the above into one or both ears of a person listening.

Among the uses for which this device has been designed are the following:—

To provide a quantitative measurement of the hearing ability of any person using the pure audionote (a). By means of a curve drawn on a piece of graph paper, or a specially prepared chart, having the ordinates representing frequencies and the abscissae indicating attenuation, a visual measure of the defect at any frequency is obtained. The method of making these measurements is to record, at regularly increasing frequency intervals, the lowest signal intensity which person can hear. The signal intensity calibration may be made in decibels or in any arbitrary figures, once a standard has been determined. A curve drawn through the above points will then show the hearing ability with reference to the curve of normal hearing already drawn or printed on the chart. Separate curves may be plotted for each ear and one for both ears.

A further use for the machine is in the treatment of certain forms of deafness, particularly at the deficiency frequencies which above measurements disclose. It is believed that a series of frequently repeated treatments, consisting of gentle applications of simple and complex vibrations, administered by a well trained operator, advised by a physician, will result in material improvement in many cases. Not the least of the possibilities herein disclosed are the results of applications of amplified human voice sounds through the medium of the microphone and amplifier. A carefully trained operator may administer voice exercises of such simple sounds, or spoken words, as experience shows to be beneficial.

Although a specific embodiment of the present invention has been illustrated and described, it is to be understood that various changes may be made within the scope of the appended claims without departing from the spirit of the invention, and such changes are contemplated.

What I claim is:—

1. A device of the character described comprising an oscillator adapted to produce a constant audiofrequency tone, thermostatic means for automatically varying the frequency of said tone, and means amplifying said audiotone and for feeding said tone to a human ear.

2. A device of the character described comprising an oscillator adapted to produce a constant audiofrequency tone, thermostatic means for varying the frequency of said tone, an oscillator for producing and super-imposing a beat note on said audiotone, a rectifier, means inductively connecting said oscillators to said rectifier, and an amplifier connected to said rectifier.

3. A device of the character described comprising an oscillator adapted to produce a constant audiofrequency tone, thermostatic means for varying the frequency of said tone, an oscillator for producing and super-imposing a beat note on said audiotone, a rectifier, means inductively connecting said oscillators to said rectifier, an amplifier connected to said rectifier, and a microphone connected to said amplifier.

4. A device for creating audible vibrations for measuring the hearing range of a human ear, said device comprising a rectifier, an oscillator connected to said rectifier and adapted to supply oscillations thereto at a constant frequency, a second oscillator connected to said rectifier, means for adjusting said second oscillator to a plurality of frequencies arranged in steps above and below the frequency of said first named oscillator, a third oscillator connected to said rectifier, means for infinitely varying the frequency of said third named oscillator through a frequency range extending above and below the frequency of said first named oscillator, an amplifier connected with said rectifier for amplifying the audiofrequency component produced by beating together the oscillations of said oscillators, and a reproducer connected to said amplifier for converting the audiofrequency component into audible sound waves.

5. A device for creating audible vibrations for measuring the hearing range of a human ear, said device comprising a rectifier, an oscillator connected to said rectifier and adapted to supply oscillations thereto at a constant frequency, a second oscillator connected to said rectifier, means for adjusting said second oscillator to a plurality of frequencies arranged in steps above and below the frequency of said first named oscillator, a third oscillator connected to said rectifier, means for infinitely varying the frequency of said third named oscillator through a frequency range extending above and below the frequency of said

first named oscillator, an amplifier connected with said rectifier for amplifying the audiofrequency component produced by beating together the oscillations of said oscillators, a reproducer connected to said amplifier for converting the audiofrequency component into audible sound waves, and an individual control member for each of said first and third named oscillators for rendering the same operative or inoperative.

6. A device for creating audible vibrations for measuring the hearing range of a human ear and for exercising the human ear, said device comprising a rectifier, a first oscillator connected to said rectifier and supplying oscillations thereto at a constant frequency, a second oscillator connected to said rectifier, means for adjusting said second oscillator to a plurality of frequencies arranged in steps above and below the frequency of said first named oscillator, a third oscillator connected to said rectifier, means for infinitely varying the frequency of said third oscillator to frequencies above and below the frequency of said first named oscillator, and for providing a visible indication of the frequency of an audiofrequency component produced by beating together the oscillations of said first and third oscillators in said rectifier, an amplifier for amplifying the audiofrequency component, means for regulating the volume of the output of said amplifier, and a reproducer for receiving the output of said amplifier and converting said audiofrequency component into audible sound waves.

7. A device for creating audible vibrations for measuring the hearing range of a human ear and for exercising the human ear, said device comprising a rectifier, a first oscillator connected to said rectifier, thermostatic means for automatically varying the frequency of said oscillator, a second oscillator connected to said rectifier, means for adjusting said second oscillator to a plurality of frequencies arranged in steps above and below the frequency of said first named oscillator, a third oscillator connected to said rectifier, means for infinitely varying the frequency of said third oscillator and providing a visible indication of the frequency of an audiofrequency component produced by beating together the oscillations of said first and third oscillators in said rectifier, an amplifier for amplifying the audiofrequency component, means for regulating the volume of the output of said amplifier and a reproducer for receiving the output of said amplifier and converting said audiofrequency component into audible sound waves.

8. A device for creating audible vibrations for measuring the hearing range of a human ear and for exercising the human ear, said device comprising a rectifier, a first oscillator connected to said rectifier and supplying oscillations thereto at a constant frequency, means for stopping and starting said first oscillator, a second oscillator connected to said rectifier, means for adjusting said second oscillator to a plurality of frequencies arranged in steps above and below the frequency of said first named oscillator, a third oscillator connected to said rectifier, means for stopping and starting said third oscillator, means for infinitely varying the frequency of said third oscillator to regulate the same to a decimal part of a cycle and for providing a visible indication of the frequency of an audiofrequency component produced by beating together the oscillations of said first and third oscillators in said rectifier, an amplifier for amplifying the audiofrequency component, means for regulating the volume of the output of said amplifier, and a reproducer for receiving the output of said amplifier and converting said audiofrequency component into audible sound waves.

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