

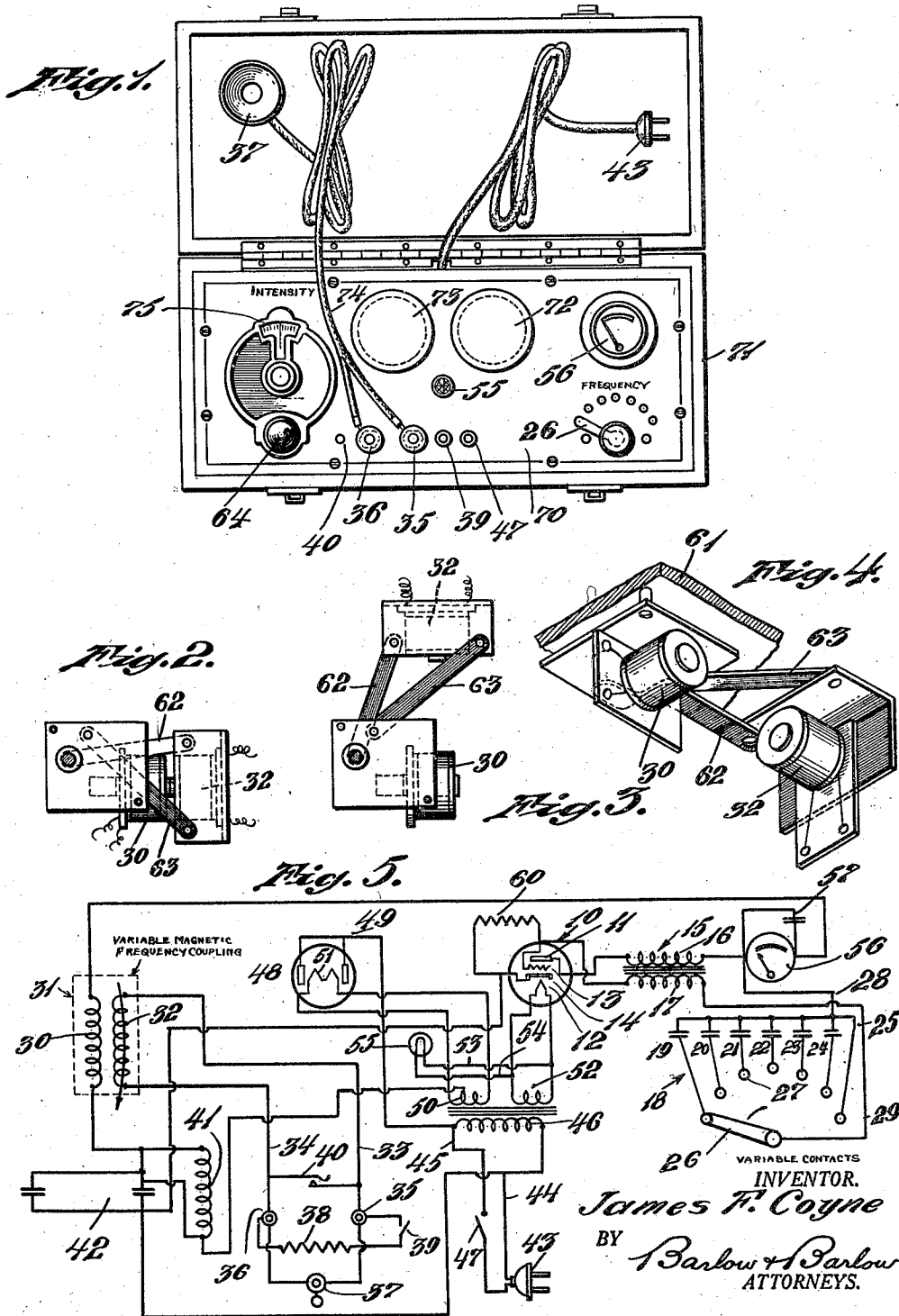
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AUDIOMETER

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AUDIOMETER

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1 Claim. (Cl. 179—1)

This invention relates to an audiometer; and has for one of its objects the provision of an audiometer in which the frequency or pitch of the tone produced may be varied in distinct steps of predetermined value and in which the intensity of the tone may be nicely controlled throughout the audible range required for such testing.

Another object of the invention is the provision of a unit which will be sufficiently small to be transported from one place to another and which may be plugged in to the house current for the supply of the energy desired.

Another object of the invention is the provision of a control for the intensity through an inductive coupling and the varying of the position of the inductance coils for greater or lesser transmission of energy from one to the other.

A further object of the invention is the provision of a plurality of intensity circuits to provide several ranges of intensity operations with the same hook-up.

A still further object of the invention is the provision of a switch which may entirely cut out the frequency oscillations in the audible circuit so that the veracity of the person tested may be checked.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claim.

In the accompanying drawing:

Fig. 1 is a plan view of the box containing my audiometer with its cover in open position.

Fig. 2 is a plan view of the intensity control device in one of its positions.

Fig. 3 is a similar view showing a different position.

Fig. 4 is a perspective view showing the intensity control in the position illustrated in Figure 3.

Fig. 5 is a diagrammatic view showing the electrical hook-up of my device.

Audiometers such as are in commercial use at the present time are cumbersome to carry, their mechanisms are intricate and correspondingly expensive and the control of pitch is usually through some variable quantity in which the frequencies change gradually from one to another cycle of oscillations; and in order that different steps of frequency change may be had with no gaps but a sharp and distinct change from one pitch to another, I have provided a plurality of condensers of varying capacities which may be selectively thrown into or out of the frequency circuit to

vary the oscillations of this circuit, and consequently the oscillations in the member producing the audible vibrations which is being used for test purposes; and I have also nicely controlled the intensity of this frequency in the audible member by an inductive coupling and varied the position of the inductance members so that the pick up member may be more or less located in the magnetic field to vary the amount of energy which will be picked up and transmitted to the member producing the vibrations to be heard by the ear whereby hearing may be tested; and the following is a more detailed description of the present embodiment of this invention illustrating the preferred means by which these advantageous results may be accomplished:

Referring first more particularly to the diagrammatic view, I have provided an oscillator tube 10 having a plate 11, filament 12, grid 13 and cathode 14, an inductance 15 having coils 16 and 17 and a capacity designated generally 18 and consisting of a plurality of differently fixed condensers 19, 20, 21, 22, 23 and 24. The three elements, namely, the oscillator tube, inductance and the capacity provide the different frequencies which I require for operation of this device, and I obtain the different frequencies desired in this particular embodiment of the invention by utilizing different capacities in the frequency circuit any one of which may be selectively coupled in the circuit by throwing the switch 26 to any one of the several contacts 27 to include in the frequency circuit the desired capacity 19 to 24 or the direct connection 25 having no condenser which will provide the circuit with the predetermined frequency desired. The capacities 19 to 24 are all connected together and also to lead 25 and thru a lead 28 to the inductance coil 16, while the other side of each capacity is connected through the switch 26 and lead 29 to the inductance coil 17, the inductance being suitably connected to the oscillator tube 10 in any known manner.

There is also connected in this frequency circuit a primary 30 of an inductance or magnetic coupling, designated generally 31 with its secondary 32 connected in a circuit with a member producing the audible vibrations such as the head phone or other diaphragm operated member for producing an audible sound. This secondary 32 is connected by leads 33 and 34 to terminals 35 and 36 to which a head phone 37 is connected and there is located in this secondary circuit a resistance 38 controlled by a switch 39 so that it may be thrown in or out as desired to control the intensity of the oscillations induced in this circuit.

There is also located in this secondary or audible circuit a switch 40 which may be suitably controlled to short circuit and prevent any oscillations from reaching the ear phone 37 so that the veracity of the person being listed may be checked.

The energy for the circuit is provided from the house current through a plug 43. The leads 44 and 45 are connected to the primary 46 of a transformer and are controlled by a switch 47 in one of the lines. To this coil there is also connected a full wave rectifying tube 48 at its plate terminals 49. This transformer is of the type provided with a plurality of secondaries and from one of these secondaries 50 the filament 51 of the tube 48 is heated, while from the secondary 52 the filament 12 of the oscillator tube 10 is heated. There may be tapped off from one of the lines which supplies current to the filament, leads 53 and 54 for lighting an incandescent lamp 55 which will be a telltale as to whether the main switch has been closed. I have also provided an ammeter 56 in the frequency circuit to indicate the intensity of the current therein and have shunted a condenser across the ammeter so that the oscillations may be suitably passed. This frequency circuit also contains an inductance 41 and capacities 42. A resistance 60 is also provided across the grid 13 and cathode 14 of the oscillator tube 10 for better control thereof.

The magnetically coupled coils 30 and 32 are movably related. Coil 30 is fixed on the underside of a panel 61, while the coil 32 is mounted by means of links 62 and 63 on the underside of this panel and are swingable by means of a handle 64 so as to bring these coils 30 and 32 into axial alignment or to move the coil 32 through an arc of substantially 90° and to a point spaced from the coil 30 so that their axes are at right angles to each other.

When the coils are in axial alignment and close adjacency, as illustrated in Figure 2, the coil 32 will be in the magnetic field of coil 30 and pick up the maximum amount of energy. When the coil 32 is moved to the position at right angles to the coil 30, as indicated in Figure 3, it will be removed from this magnetic field and little or no energy will be picked up by the coil in this position to be transmitted to the ear phone 37, while intermediate positions will vary in intensity of the energy picked up.

The frequency which is developed in the oscillator circuit comprising oscillator tube 10, capacity 15, and capacity 18 are of the audio range and similar audio frequencies will be developed in the secondary circuit and transmitted to the ear phone 37.

In audiometers of this character, it is desirable to select frequencies representing substantially musical scale notes, and I have selected capacity 19 as 0.1 mfd. such that I will have substantially sixty-four oscillations a second when this capacity is in circuit, and I have selected the

capacity 20 as 0.03 mfd. so that there are 128 oscillations, capacity 21 as 0.012 mfd. producing 256 oscillations, capacity 22 as 0.006 mfd. producing 512 oscillations, capacity 23 as 0.0025 mfd. producing 1024 oscillations, capacity 24 as 0.00025 mfd. producing 2048 oscillations, while line 25 is without a condenser for producing 4096 oscillations which as will be recognized represent the different octaves of the note C known in music.

All of the mechanism which I have described is mounted upon a panel 70 which will fit within a box 71 and over the tubes 10 and 48 I provide caps 72, 73 which may be readily removed for removal of the tubes for repair or replacement. The ear phone 37 is connected to its terminals 35 and 36 by a cord 75 of a length sufficient to be convenient in use.

The degree of movement of the inductance coil 32 is indicated by a dial 75 which is graduated in terms of hearing loss of sensation units so that by reading this dial a graph or cross section chart may be properly plotted by using the volume represented by the scale 75 as the ordinate for the corresponding abscissas of the frequencies of oscillation at the time of the test. In the use of my device, it is merely necessary for me to insert plug 43, close the switch 47, set the arm 26 to the selected frequency, usually the first one producing 64 oscillations, apply the ear phone 37 to the ear to be tested and turn the knob 64 until the person being tested can just hear the tone in the phone. I then throw the switch 26 to the next contact and vary the intensity in like manner and so on for each frequency, plotting each point on the graph and connecting the points by a suitable curve indicating the acuity of hearing of the person tested.

The foregoing description is directed solely towards the construction illustrated, but I desire it to be understood that I reserve the privilege of resorting to all the mechanical changes to which the device is susceptible, the invention being defined and limited only by the terms of the appended claim.

I claim:

In an audiometer, a frequency circuit, comprising an oscillator tube, a plurality of separate different capacities, means including a switch for selectively including in said circuit any one of said capacities, an audible tone-producing circuit, means for inductively coupling said tone producing circuit to said frequency circuit comprising a primary inductance coil in said frequency circuit and a secondary inductance coil in said audible circuit, means for moving one of said coils through an arc of 90° to vary the intensity in said audible circuit, and resistance means shunted across the audible circuit to vary the intensity in said audible circuit, and a switch for controlling said resistance in said circuit.

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