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ELECTROTHERAPEUTIC DEVICE

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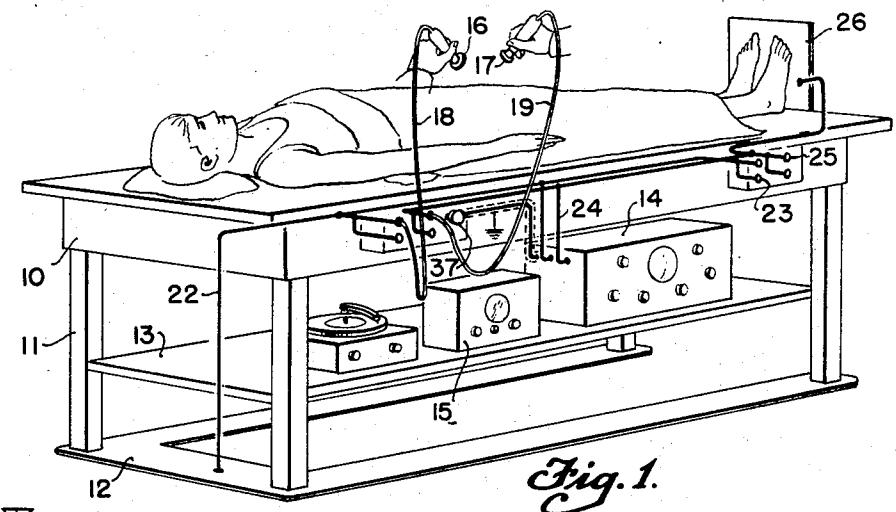

Fig. 1.

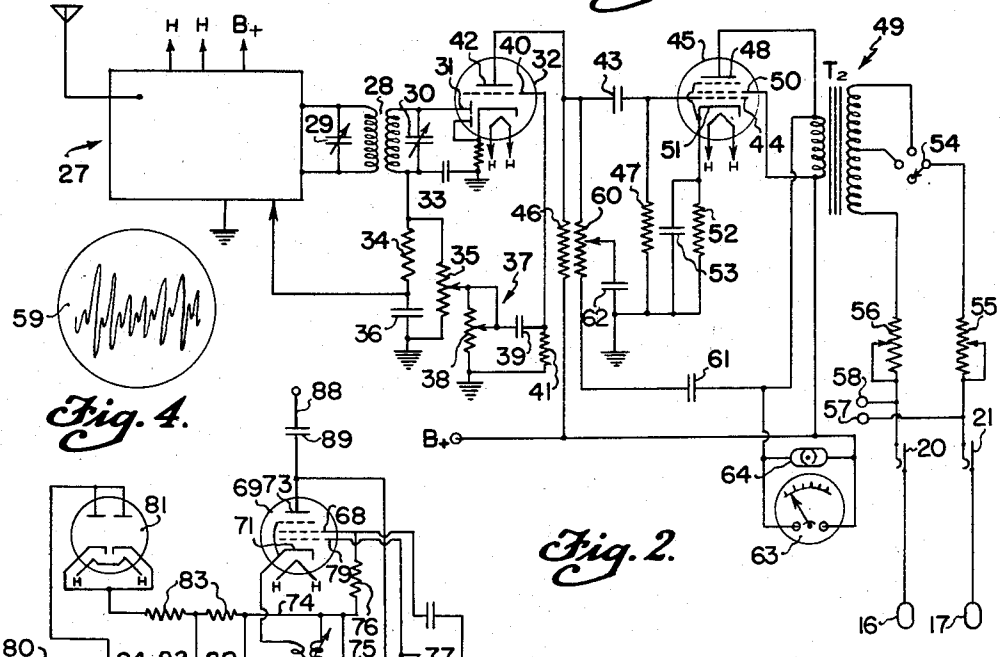

Fig. 4.

Fig. 2.

Fig. 3.

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ELECTROTHERAPEUTIC DEVICE

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3 Claims. (Cl. 128—422)

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This invention relates to electro-therapeutic apparatus, and has reference to a device for applying electrical impulses to afflicted parts of the body.

The invention has been found to be particularly useful in the treatment of arthritis and related ailments, and it is believed that the spurs of calcareous deposits are dissipated when subjected to the varying frequencies produced by the present apparatus. The calcareous spurs are of various sizes, and each spur responds to and is disbursed by a particular frequency. Thus, by continuously applying frequencies from a widely varying range to the afflicted part, all of the spurs of the calcareous deposits will be reduced.

An object of the invention is to provide an apparatus whereby voltages varying in frequency from 3 pulses per second to approximately 15,000 pulses per second may be continuously applied to the patient throughout the therapeutic treatment.

A particular object of the invention is to utilize the frequencies of recorded and broadcast music for obtaining a range of frequencies which have been found to be particularly desirable in the type of treatment referred to.

A further object of the invention is to provide, in an electro-therapeutic apparatus, means whereby radio frequencies are changed into audio frequencies so as to avoid the generation of heat in the part of the patient's body where the current is applied.

These and other objects of the invention will become apparent from the following description of the accompanying drawings, wherein:

Figure 1 is a perspective view of my new electro-therapeutic apparatus and showing the wiring diagram schematically applied thereto.

Figure 2 is a schematic wiring diagram of the apparatus illustrated in Figure 1.

Figure 3 is a schematic wiring diagram of a phono-oscillator which may be adapted for use in connection with the circuit illustrated in Figure 2.

Figure 4 is an elevation of the screen of an oscilloscope, and showing the frequency characteristics of the therapeutic voltage applied to the patient.

The form of the invention shown includes a table 10 supported on legs 11 and having a U-shaped plate 12 beneath the corners of said legs as a static ground. On a shelf 13 beneath the upper surface of the table 10 there is a radio frequency amplifier 14 and an oscilloscope unit 15. Applicator electrodes 16 and 17 of suitable material, such as copper, steel, etc., are connected with the outer ends of flexible insulated leads 18 and 19, the inner ends of which are provided with terminals 20 and 21. The first referred to electrode may be connected at locations on the table 10 with the ground 22 by means of terminal jacks 23. Similarly, the other electrode 17 is connected with an output lead 24 also having terminal jacks 25 which are respectively located near the first referred to jacks 23. As shown in Figure 1, the ground 22 is connected with the U-shaped plate 12, and is additionally connected with a vertical plate 26 attached to one end of the table, and against which the patient may place his bare feet when his legs and feet are to be treated.

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Referring now to Figure 2, the radio frequency amplifier is generally designated by the numeral 27, and is connected with a demodulator and audio frequency amplifier schematically illustrated and hereinafter referred to in detail. An intermediate frequency transformer 28 is connected with the radio frequency amplifier 27 and includes primary and secondary tuning condensers 29 and 30. One end of the secondary of the intermediate frequency transformer 28 is connected with one of the diode plates 31 of a vacuum tube 32. The other end of the secondary of the transformer 28 is connected with a condenser 33 which in turn is connected with the chassis ground. The secondary of the transformer 28 is also connected with a resistor 34 and a grounded potentiometer 35. The resistor 34 is connected with the radio frequency amplifier 27 to provide automatic volume control. A bypass condenser 36 is connected with the resistor 34 so as to filter the radio frequency component from the automatic volume control voltage. A control 37 in the form of a potentiometer 38 is connected with the sliding contact of the first potentiometer 35. A condenser 39 connects the sliding contact of the control 37 with the control grid 40 of the vacuum tube 32, and grid resistor 41 connects the control grid 40 of said tube with the ground. One terminal of the potentiometer 38 is grounded. The plate 42 of the tube 32 is connected with a blocking condenser 43 which is connected to the grid 44 of a vacuum tube 45, whereas a resistor 46 connects the plate 42 with the high voltage B supply from the radio frequency amplifier 27. A grid return resistor 47 connects the control grid 44 to the ground. The plate 48 of the vacuum tube 45 is connected to the primary of a stepup

transformer 49, and the opposite side of the primary winding of said transformer is connected with the high voltage B+ supply from the radio frequency amplifier 27. Similarly, the screen grid 50 of the vacuum tube 45 is connected with the high voltage B+ terminal from the radio frequency amplifier 27. The cathode 51 of the vacuum tube 45 is connected to the ground after passing through resistor 52 and is bypassed to the ground by means of a bypass condenser 53.

The secondary taps of the stepup transformer 49 are connected to the terminals of a selector switch 54. The sliding contact of the selector switch 54 is connected to one of the electrodes 17 after passing through a balancing rheostat 55, and through the previously described terminal jack 21. The common secondary terminal of the transformer 49 is connected with the electrode 16 after passing through another balancing rheostat 56 and through the other terminal jack 20. Terminals 57 and 58 are provided for connecting the vertical deflection system (not shown) of an oscilloscope 59 between the rheostats 55 and jack 21, and rheostats 56 and jack 20, respectively.

A potentiometer 60 is connected between the plate 42 of the vacuum tube 32 and the plate 48 of the vacuum tube 45 through a condenser 61. The sliding contact of the potentiometer 60 is connected to the ground through another condenser 62, providing a means for controlling the frequency response of the audio amplifier.

A volt meter 63 is connected across the primary of the stepup transformer 49 to provide a quantitative indication of the voltage produced at the electrodes 16 and 17. A neon lamp 64 connected across the volt meter terminals provides a reference level indicator for indicating a selected voltage below which the lamp 64 will not glow. The heaters H of the vacuum tubes 32 and 45 are connected with the H terminals of the radio frequency amplifier 27.

Instead of employing the modulated radio frequency from a broadcast transmitter, a modulated radio frequency may be provided in accordance with the circuit illustrated in Figure 3, which, in effect, is a recording modulated radio frequency oscillator. The phonograph pickup 65 is connected to the volume control 66 through a jack 67, and the sliding contact of the volume control 66 is connected with the second grid 68 of a vacuum tube 69. An oscillator transformer 70 has one winding connected between the cathode 71 of the vacuum tube 69 and the B— supply lead 72, whereas the other winding of the oscillator transformer 70 is connected between the plate 73 of the vacuum tube 69 and the high voltage B+74. A condenser 75 is connected between the B+ supply line 74 and the plate 73 of the vacuum tube. A resistor 76 is connected between second grid 68 and the B+ supply line 74. A grid return resistor 77 and a bypass condenser 78 are connected between the first grid 79 and the B— supply line 72. A D. C. power supply consisting of a plug 80, a rectifier tube 81, filter condensers 82, and filter resistors 83 are connected with the B+ supply line 74 and the B— supply line 72, are connected with each other in the usual manner. A dropping resistor 84 is connected in series with the tube heaters to supply the necessary heater voltage. A bypass condenser 85 is connected across the A. C. voltage source from the plug 80 and switch 86.

Another bypass condenser is connected between the B— supply line and the chassis containing the power supply or radio frequency generator thus described. An antenna 88 is connected to the plate 73 of the tube 69 after passing through a coupling condenser 89.

In operation, the patient is placed on the table 10, and if his legs or feet are to be treated, his bare feet may be placed against the vertical plate 26. The circuit illustrated in Figure 2 is then tuned to a transmitter broadcasting music having a wide frequency range. The amplified radio frequency is demodulated by the diode section of the first described vacuum tube 32, and the resulting pulses are amplified and passed into the described variable circuit, comprised of the potentiometer 60 and condenser 62. By regulating the control 37 and the balancing rheostats 55 and 56, the desired output may be applied to the patient by means of the electrodes 16 and 17 which are selectively plugged in the terminal jacks 23 and 25 for passing the current containing multiple frequencies through the afflicted part of the patient's body. The vertical plate 26 may be employed in place of one of the electrodes, if desired. The functions of the oscilloscope 59, volt meter 63, and neon tube 64 are merely to indicate the characteristics and volume of the output. The phono-oscillator illustrated in Figure 3 is, in effect, a miniature broadcasting transmitter which is received by the first described circuit, which then operates in the manner described in the foregoing.

The described form of the invention may be made in many ways within the scope of the appended claims.

What is claimed is:

1. In an electro-therapeutic device, the combination of a radio frequency amplifier including an intermediate frequency transformer, a demodulator connected with the secondary winding of said transformer, an audio amplifier connected with the plate circuit of said demodulator, a frequency control circuit connected with said plate circuit of said demodulator and with the plate circuit of said audio amplifier, an audio output transformer included in said plate circuit of said audio amplifier, and applicator electrodes respectively connected with the ends of the secondary winding of the last said transformer.

2. In an electro-therapeutic device as defined in claim 1, and wherein balancing rheostats are included between said applicator electrodes and the output transformer included in the plate circuit of said audio amplifier.

3. In an electro-therapeutic device as defined in claim 1, a voltage indicator connected across the winding of said audio output transformer.

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