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ELECTRICAL TESTING AND TREATMENT APPARATUS

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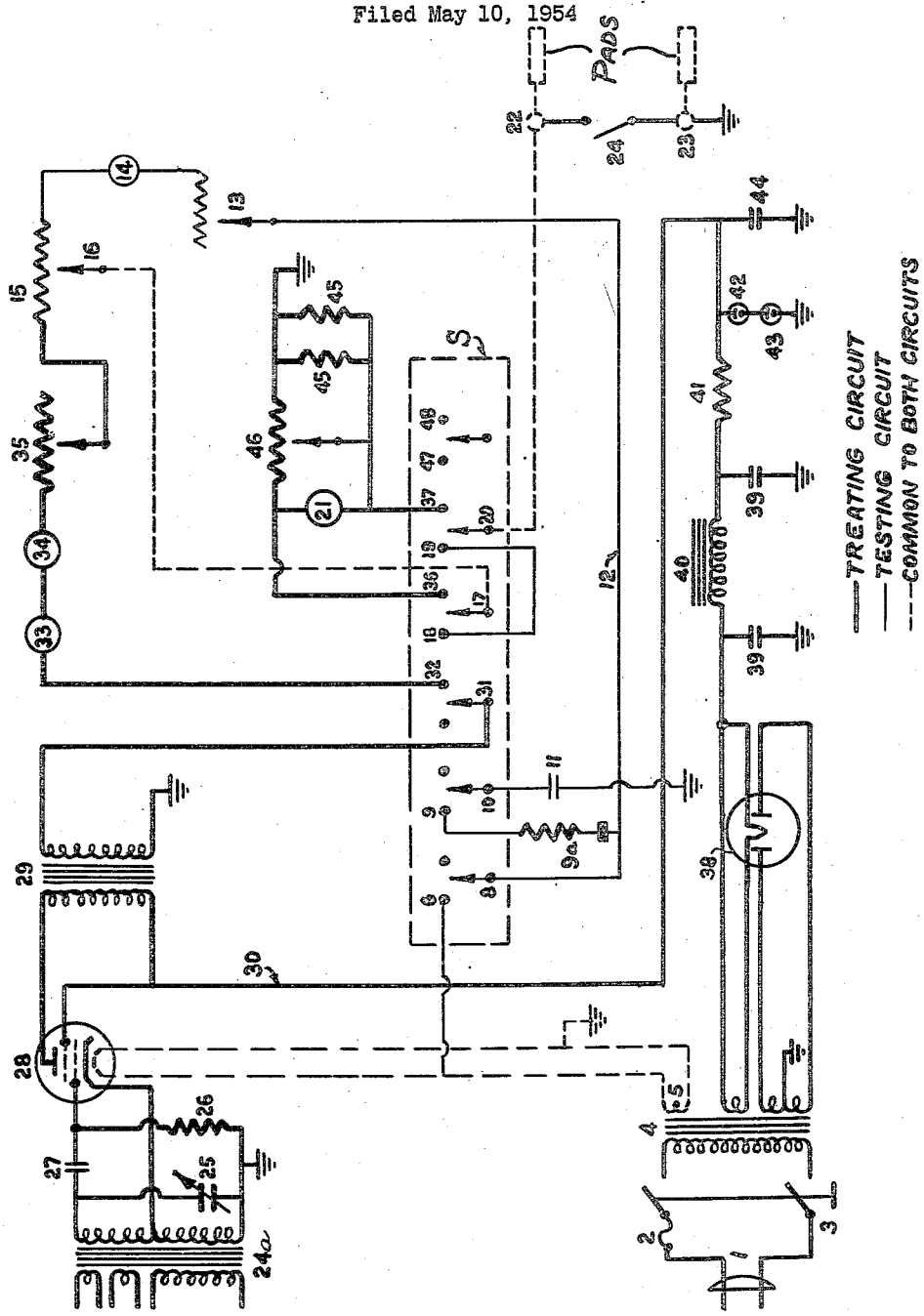

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ELECTRICAL TESTING AND TREATMENT APPARATUS

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This invention pertains or relates to an electrical testing treatment circuit, apparatus, method of control and operation wherein minute or small alternating electrical currents are caused to pass through a barrier of high electrical resistance to various objects or substances to be treated; the effective control of such currents and the operation of the apparatus. This circuit, apparatus, method of operation and control is particularly useful or adapted for the purpose of producing an effective stimulus and/or normalization to various nerves of the human nervous system and has been successfully tested clinically by more than 20,000 treatments of over 100 different types of illness without any noted adverse effects to the nerves, tissues, or muscles.

In order to clearly understand the purpose of one phase of this invention, a summary of known facts of the nervous system is briefly outlined as follows:

It has been found that various nerves produce their own electrical impulses, but at a speed much slower than ordinary electrical currents. The outside of the nerve membrane is composed mostly of sodium and is normally positive while the inside of the nerve is composed largely of potassium and is normally negative. Scientists have proven that in the wave of a normal nerve impulse, approximately 90% of the normal potential is used in reaching the crest or peak of a normal impulse wave and that upon reaching this crest or peak the polarity changes momentarily, the inside to positive and the outside to negative, hence producing an alternating current. At approximately the crest or peak of a normal impulse wave, the balance of the original potential, or approximately 10%, starts the ensuing impulse, but only after a brief known refractory period. The nerve will not take ensuing impulses without this refractory period, hence a correct frequency is necessary for an effective normalization or stimulation of an abnormal nerve. It has also been proven that a section of a nerve may be anesthetised or otherwise blocked out, and if a little more than 10% of life remains in the nerve, an electrical current may jump the blocked out section and continue along the membrane. So it is reasonable to assume that abnormal nerves have a little more than 10% of life remaining and may be normalized and/or stimulated with the proper frequency of alternating current and voltage. It requires a voltage of less than two tenths of a volt to create the impulse and regardless of how much more voltage is used, the results are the same.

As the dendrites of various nerves are adjacent and immediately beneath the skin, which has an exceptionally high electrical resistance, the clinical administration of minute currents and their control necessary for an effective normalization and/or stimulus to various nerves, has been the object of electro-therapists for some time. Anderson's Pathology, a standard text work, states that a person may withstand a current of 100 milliamperes at 40 volts without harm. The present circuit, apparatus, method of operation and control makes it impossible

to administer more than a maximum of four and one half milliamperes at 7 volts.

It is the primary object of the present invention to provide an electrical apparatus embodying an electrical circuit which, when the human body is connected therein, functions to normalize and/or stimulate the nerves with the proper frequency of alternating current and voltage for the purpose explained above.

Other objects of the invention will appear from the following description and from the drawing which is a schematic diagram of the complete electrical circuit embodying the principles of the invention.

Referring to the drawing, the reference numeral **1** represents a common source of 60 cycle 115 volt alternating current passing through a 1 amp. fuse **2**. The apparatus has a main service switch **3** of the single throw, double pole type. A 350–350 high voltage power transformer **4** is fully fluxed and statically shielded and is provided with 6.3 volt and 5 volt taps used for tube heaters and also for a test circuit. The 6.3 volt tap is connected to the heater of a beam pentode tube **28**, in this case a 6V6 type. The cathode of this tube is connected to the center tap of a transformer **24***a*, in which the primary side is used with the core for inductance, across the terminals of this transformer. In this case, a 1 mfd. condenser **27** effects a frequency of 85 C. P. S. this frequency being varied by carefully calibrated condensers (not shown) connected to switch contacts on a panel with indications of 80, 85, 90, 95 and 100 C. P. S. easily set by a control arm.

The circuit, including a 27,000 ohm resistaance **26**, one terminal of a variable condenser **25**, one terminal of inductance of transformer **24***a* to ground, the other terminal of the transformer **24***a* through the 1 mfd. condenser **27** to the other side of resistance **26** and to grid of the tube **28** (similar to the conventional Hartley oscillating circuit), produces a frequency range of from 80 C. P. S. to 100 C. P. S. for corrective treatment.

The plate of tube **28** is connected to the primary of a three-to-one interstage transformer **29** of 10,000 ohm impedance, thence to screen grid of the tube **28** which is tapped at **30** to one terminal of a voltage regulator circuit and to a condenser **44**, at which point a +255 volt grid bias is obtained, and thence through this condenser to ground.

The voltage regulator circuit is tapped from the 5 volt tap of the transformer **4** and includes a double diode full rectifier tube **38**, in this case a 5Y3GT with 350 volts per plate, the plates being connected to the 350–350 volt tap of the transformer **4**, with the center tap grounded. Current flows from one terminal of the filament of tube **38** through a choke coil **40** of 10.5 henries, 220 ohms. Condensers **39**, **39**, each of 40 mfd., are connected to the terminals of the choke coil **40** and ground. Current then flows through resistance **41** to the terminal of the voltage regulator circuit at the condenser **44**. Two glow discharge diode, cold cathode voltage regulator tubes **42** and **43** are connected to this circuit between the resistance **41** and condenser **44** and are grounded. Tube **42** is an OD3 having its cathode connected to current flow, and tube **43** is an OC3 having its cathode connected to the plate of tube **42**, plate of tube **43** being grounded. This combination of components produces an effective stabilized circuit.

The test circuit of the apparatus uses the 6.3 volt tap of transformer **4**. As shown, one side of the tap contact **6** of a two position, six circuit, multiple rotary switch, indicated generally at S. When switch arm **8** engages contact **6**, of the switch S, current flows to test circuit conductor **12** which has a branch line leading to contact **9**. Interposed in this branch is a IN34 germanium crystal diode **9***a*. Engagement of switch arm **10** with contact **9** of

switch S effects current flow through 25, volt, 100 mfd. electrolytic condenser 11 to ground.

Test current flows by way of the conductor 12 to a "zero" set variable 500 ohm resistor 13, thence through ohmmeter 14 to a high bank variable resistance 15. This current then flows through movable arm 16 of this resistance unit to the switch arm 17 of the multiple switch and thence to contact 18 which, as shown, is connected by a jumper to contact 19, and switch arm 20, the latter being connected to one of the output terminals 22. The other output terminal 23 is grounded and this forms a complete resistance testing circuit and avoids the need for batteries and other complications.

A test is made with the circuit, as thus far described as follows: Applicator pads are placed on the body at pathological locations and all panel controls are set at zero, the multiple switch S is turned to test position, that is, the switch arms are moved to their left-hand locations. This action cuts out of the testing circuit all of the resistance of variable resistance 15. An exact reading of ohmmeter 14 is now made and carefully noted and push button switch is depressed to a "short" across the output terminals 22 and 23. This operation has a distinct advantage as it eliminates the necessity of dislocating the applied electrode pads or disturbing the patient or altering resistance in any way. After noting the ohmmeter reading and while push button 24 is in short position, a control on the panel is turned until ohmmeter reads exactly as before carefully noted. Push button switch 24 is now released to open position and the multiple switch is thrown to "treat" position. This operation eliminates from the variable resistance 15 the exact amount of resistance of the patient as previously noted and inserts into the treatment circuit the patient's resistance as registered between the treatment electrode pads, thus maintaining balance of circuit at all times. With only four easily accessible controls, the entire operation of testing and shifting into the treatment circuit can be done accurately, without any complicated calculations, in less than two minutes, by a capable operator.

The treatment circuit continues through the secondary 90,000 ohms of transformer 29, one side of which is grounded. The other secondary terminal of transformer 29 is connected to switch blade 31 one station of the two position, six circuit, rotary multiple switch. Treatment current then flows through contact 32 and then to and through timer clock 33, then to "zero to ten" milliammeter 34, and thence to a 25,000 ohm variable resistor 35 having a control on the panel to control current from zero to four- and one-half ma. Treatment current then flows to the variable resistor 15 which is common to both the test and treatment circuits and which is one of the features of the invention. Thousands of treatments have shown that various skins have various resistances, depending on the texture of the skin, the dampness of the applicator pads and the degree of contact of pads to the parts of body. This skin resistance will vary from as low as 1,500 ohms on a baby, to approximately 15,000 ohms on others. The bank of variable resistance 15 is, in this case, 25,000 ohms and is kept so for average treating at this rating so as to provide a more accurate and critical indication on the lower side of the ohmmeter 14 when used for testing. This high bank of resistance 15 may be increased to any limit within reason for exceptional skin resistances.

The treatment circuit then flows from the resistance 15 to a movable arm 16 to and through switch blade 17 to contact 36 which is connected to a voltmeter 21 and a 10,000 ohm potentiometer 46 that controls the output voltage from zero to seven volts. The output voltage is also controlled from higher voltage at the output terminals by two limiting resistors 45—45 of 12,000 ohms each. The other terminals of 21, 46, and 45—45 are grounded when in the treatment circuit. The regulated voltage current passes to switch contact 37, then to the switch blade 20 and thence to the output terminal 22, the other output terminal 23 being grounded. Between output terminals 22 and 23 is the push button switch 24 for crossing the output as before explained.

The method of operation is simple and can be mastered by the ordinary operator in a few minutes. After a diagnosis by the doctor, the patient is placed in a comfortable position so as to be less likely to move or change position. Damp applicator pads (not shown) are attached to electrodes and are placed according to instructions. Conductors from the electrodes are placed into the output terminals. All controls are set at "zero" and the multiple switch is turned to test position. This eliminates the entire treatment circuit from the test circuit as they are absolutely independent of each other. An indication of resistance is registered on the ohmmeter 14 and push button switch 24 is actuated to short the output terminals 22, 23. With the circuit thus shorted, the movable arm 16 of the variable resistance 15 is turned until the patient's resistance, as previously noted between the electrode pads, registers on the ohmmeter 14. Push button switch 24 is then released to open position and the multiple switch is thrown to "treat" position. The timer clock 33 is set, milliampere dosage as prescribed is set from zero to four, the potentiometer 46 is opened to the prescribed voltage and the control on the variable condenser 25 is set for the prescribed frequency. It is important to note that the patient cannot receive a charge of more than four and one half milliamperes and seven volts and this is conducive to perfect safety and maximum effectiveness. Many infants have been successfully treated on this device with no adverse effects noted. The operation as above described allows alternating current to pass the high skin resistance so as to apply minute alternating currents for normalization and/or stimulation to affected parts without danger and this has been substantiated by the many clinical treatments given, some of which have been quite phenomenal.

Various other applications of this apparatus, method of operation and control may be made. The above description is one pertaining to clinical therapeutical work in particular. The term "circuit" or "circuits" as used herein is intended to include conductors, components, and other parts used in this apparatus for the purpose of flow and control of small electrical currents to obtain results above outlined and described.

I claim:

1. An electrical apparatus for testing the resistance of the skin of a human subject to passage of electricity therethrough, including: an alternating current circuit; a transformer connected therein and having a 6.3 volt tap having one side grounded and the other side connectible to a conductor extending to one terminal of a pair of output terminals, the other terminal being grounded; a zero set, 500 ohm resistor, an ohmmeter and high bank variable resistor connected in series in said conductor between the transformer and said output terminal in the order named; a branch line connected between said conductor and ground at a point between said transformer and said zero set, 500 ohm resistor; a germanium crystal diode and a 25 volt, 100 mfd. electrolytic condenser arranged in said branch line between said conductor and ground in the order named; and a circuit-shorting switch connected between said output terminals, said output terminals being connectible to electrodes placeable against the skin of a subject to be treated.

2. A therapeutic treating apparatus for passing an alternating current of a maximum 7 volts, 4½ milliamperes into a human body, including: an alternating current circuit and a transformer in said circuit; a 5 volt tap from said transformer embodying a double diode full rectifier tube, an output line from said rectifier tube extending to a grounded condenser; a choke coil of 10.5 henries, 220 ohms and a resistance connected in series in

said output line between said rectifier tube and said condenser; a 40 mfd. condenser connected to each side of said choke coil and grounded; a pair of glow discharge diode, cold cathode, voltage regulator tubes connected in series between said output line and ground at a point between said resistor and condenser; a 6.3 volt tap of said transformer connected to the heater element of a pentode tube embodied in an oscillating circuit; a second line extending from said condenser to the grid of said pentode tube; a three-to-one interstage transformer having its primary side connected between said second line and the plate of said pentode tube, one tap of the secondary of said interstage transformer being grounded and the other tap having connected thereto a third line extending to one terminal of a pair of output terminals, the other terminal being grounded; a shorting switch connected between said output terminals, said terminals being connectible to electrodes placeable against the skin of a human subject; a timer clock, a zero-to-ten milliammeter, a first 25,000 ohm variable resistor, a second 25,000 ohm variable resistor, and a voltmeter connected in series in said third line between said secondary and said output terminal in the order named; and a 10,000 ohm potentiometer and 12,000 ohm limiting resistors shunted around said voltmeter.

3. An electrical testing and treating apparatus for testing the resistance of the skin of a human subject to passage of electricity therethrough and for passing an alternating current of a maximum of 7 volts, 4½ milliamperes into the body, comprising: a test circuit including an alternating current circuit; a transformer connected therein and having a 6.3 volt tap having one side grounded and the other side connectible to a conductor extending to one terminal of a pair of output terminals, the other terminal being grounded; a zero set, 500 ohm resistor, an ohmmeter and high bank variable resistor connected in series in said conductor between the transformer and said output terminal in the order named; a branch line connected between said conductor and ground at a point between said transformer and said zero set, 500 ohm resistor; a germanium crystal diode and a 25 volt, 100 mfd. electrolytic condenser arranged in said branch line between said conductor and ground in the order named; a circuit-shorting switch connected between said output terminals, said output terminals being connectible to electrodes placeable against the skin of a subject to be tested; a treating circuit including a 5 volt tap from said transformer embodying a double diode full rectifier tube, an output line from said rectifier tube extending to a grounded condenser; a choke coil of 10.5 henries, 220 ohms and a resistance connected in series in said output line between said rectifier tube and said condenser; a 40 mfd. condenser connected to each side of said choke coil and grounded; a pair of glow discharge diode, cold cathode, voltage regulator tubes connected in series between said output line and ground at a point between said resistor and condenser; a 6.3 volt tap of said transformer connected to the heater element of a pentode tube embodied in an oscillating circuit; a second line extending from said condenser to the grid of said pentode tube; a three-to-one interstage transformer having its primary side connected between said second line and the plate of said pentode tube, one tap of the secondary of said interstage transformer being grounded and the other tap having connected thereto a third line extending to said one output terminal; a timer clock, a zero-to-ten milliammeter, a first 25,000 ohm variable resistor, a second 25,000 ohm variable resistor, and a voltmeter connected in series in said third line between said secondary and said output terminal in the order named; and a 10,000 ohm potentiometer and 12,000 ohm limiting resistors shunted around said voltmeter.

4. An electrical testing and treating apparatus for testing the resistance of the skin of a human subject to passage of electricity therethrough and for passing an alternating current of a maximum of 7 volts, 4½ milliamperes into the body, comprising: a test circuit including an alternating current circuit; a transformer connected therein and having a 6.3 volt tap having one side grounded and the other side connectible to a conductor extending to one terminal of a pair of output terminals, the other terminal being grounded; a zero set, 500 ohm resistor, an ohmmeter and high bank variable resistor connected in series in said conductor between the transformer and said output terminal in the order named; a branch line connected between said conductor and ground at a point between said transformer and said zero set, 500 ohm resistor; a germanium crystal diode and a 25 volt, 100 mfd. electrolytic condenser arranged in said branch line between said conductor and ground in the order named; a circuit-shorting switch connected between said output terminals, said output terminals being connectible to electrodes placeable against the skin of a subject to be tested; a treating circuit including a 5 volt tap from said transformer embodying a double diode full rectifier tube, an output line from said rectifier tube extending to a grounded condenser; a choke coil of 10.5 henries, 220 ohms and a resistance connected in series in said output line between said rectifier tube and said condenser; a 40 mfd. condenser connected to each side of said choke coil and grounded; a pair of glow discharge diode, cold cathode, voltage regulator tubes connected in series between said output line and ground at a point between said resistor and condenser; a 6.3 volt tap of said transformer connected to the heater element of a pentode tube embodied in an oscillating circuit; a second line extending from said condenser to the grid of said pentode tube; a three-to-one interstage transformer having its primary side connected between said second line and the plate of said pentode tube, one tap of the secondary of said interstage transformer being grounded and the other tap having connected thereto a third line extending to said one output terminal; a timer clock, a zero-to-ten milliammeter, a first, 25,000 ohm variable resistor, a second, 25,000 ohm variable resistor, and a voltmeter connected in series in said third line between said secondary and said output terminal in the order named; and a 10,000 ohm potentiometer and 12,000 ohm limiting resistors shunted around said voltmeter; and multiple switch means having contacts in said testing and treating circuits and operative to selectively connect either of said circuits to said first output terminal.

5. An electrical testing and treating apparatus including: an electrical test circuit connected to a low voltage alternating current source, said test circuit having outlet terminals to which electrodes are connectible and placeable against the skin of a human subject to be tested and treated so as to connect the subject in series in said circuit; a zero-set, resistor, an ohmmeter and a high bank variable resistor connected in series in said test circuit between the alternating current source and said output terminal in the order named; a germanium crystal diode and an electrolytic condenser connected to the circuit between the source of alternating current and said zero-set resistor and grounded; and a treating circuit receiving current from said alternating current source and including a rectifier means; voltage regulator means; an oscillating circuit receiving current from said voltage regulator means and embodying a pentode tube, condensers, a variable condenser and frequency varying means; an interstage transformer means; a line extending from the secondary of said transformer means and connectible to said output terminal; an electric timer, a milliammeter, a variable resistor, said high bank variable resistor and a voltmeter being arranged in said line between said interstage transformer means and said output terminal in the order named, said high bank variable resistor thus being common to said test and treating circuits; and switch

means having contacts connected in said test and treating circuits, said switch means being operable to selectively connect said output terminal to either said test or treating circuit.

6. An electrical testing and treating apparatus, including: a test circuit connected to a source of alternating current and connectible to one of a pair of output terminals to which electrode pads are connectible and placeable against the skin of a human subject to be tested and treated with the skin providing resistance to the current flow, the other terminal being grounded, said test circuit having a variable resistor, an ohmmeter and a high bank variable resistor arranged in the order named; a treating circuit connectible between said source and said one output terminal and including variable oscillator means and voltage regulator means, said treating circuit also including said high bank variable resistor; means for shorting said output terminals; and switch means for

selectively connecting either of said circuits to said output terminal, said test circuit serving to indicate on its said ohmmeter the electrical resistance of the skin to the flow of current through the body to ground with said high bank resistor set at a predetermined ohmage, said high bank resistor being adjustable, when the current flow through said testing circuit is discontinued by said shorting means and the switch is actuated to effect current flow to said one output terminal, to increase its ohmage by an amount equal to the skin resistance as indicated by said ohmmeter.

References Cited in the file of this patent

UNITED STATES PATENTS

1,999,729	Kinney	Apr. 30, 1935
2,321,659	Connerty	June 15, 1943
2,438,875	Offner	Mar. 30, 1948