ELECTRONIC MACHINE FOR THERAPEUTIC PURPOSES

FIG. 1

FIG. 2

FIG. 3

INVENTOR.

PSTN. S. HANWAY

BY [Signature]
The present invention pertains to the art of electronics, and it comprises a radio-frequency transmitter. In its practical application, the invention of the present disclosure comprises a therapeutic machine.

The machine of the present invention comprises a radio-frequency transmitter which is adapted to transmit radio waves, and in the practical machine of the disclosure the radio waves are adapted to be transmitted into or through a body. The body may, for example, by a human body or a portion thereof, and the radio waves may be utilized for the treatment of some ailment or injury.

The transmitter comprises a transmitting circuit which is energized by a generating circuit, the transmitting and generating circuits being constructed to be out of resonance. Applicant has discovered that exceptionally improved healing is accomplished when the transmitting circuit is out of resonance with the generating circuit thereof. Enhanced beneficial results are thereby attained in the treatment of certain ailments or injuries.

Pursuant to the purposes of the present invention, a high voltage step-up transformer is provided, the primary winding thereof being in the generating circuit and the secondary winding in the transmitting circuit. The transmitting circuit is accordingly energized by the generating circuit through the step-up transformer, and the transformer is particularly constructed for the transmitting and generating circuits to be out of resonance.

The step-up transformer is constructed for maximum energy output at some turn of the secondary winding that is between the ends thereof and spaced away from the ends. A tap is provided at or near the turn of maximum energy output, and other taps are provided at spaced intervals along the secondary winding away from the turn of maximum energy output. This provides several steps of energy output for selectively controlling the strength or intensity of treatment that may be given by the machine. An additional control is provided for varying the degree of softness of the treatment, which is thereby rendered more or less soothing selectively for a given intensity of treatment.

Thus, the machine of the present invention differs from conventional prior art machines in that it lacks the tuning mechanism commonly present to tune the transmitter into resonance. A principal characteristic of importance in the present machine is that it is operated out of resonance.

At least one of the electrodes in the machine of the present invention embodies a conductor terminal with a dielectric envelope, is suitable for the purpose, and is employed under preferred practice of the invention.

A more detailed understanding of the principles of the invention will be derived from the accompanying drawings to which attention is now directed, and which disclose one practical embodiment of the invention. In the drawings:

Fig. 1 is a wiring diagram of an electrical circuit in a machine embodying the present invention.

Fig. 2 illustrates a form of electrode which may be employed in the machine of Fig. 1, and Fig. 3 illustrates another form of electrode which is also employed in the machine of Fig. 1.

The machine of the disclosure is a radio-frequency transmitter comprising a transmitting circuit generally illustrated at 11 in Fig. 1, and a generating circuit generally illustrated at 12, the generating circuit serving to energize the transmitting circuit.

A power unit or power pack, such as is generally illustrated at 15, supplies the generator, and the power pack may be of any suitable and conventional structure. The power pack is supplied from the line 16 which may be the usual standard which carries 115 volts. A. C., at 60 cycles.

The rectifier tube 17 of the power pack 15 has the plate thereof connected to one terminal of the secondary of the plate transformer 18, and the primary of the plate transformer has one terminal connected directly to the line 16, and has its other terminal connected to the movable arm of a potentiometer 19 which has its resistance making bridged across the line 16. A line switch 20 and a fuse 21 are included in series with one side of the line. The filament of the tube 17 is heated by the secondary of the filament transformer 22, the primary of which is connected across the line 16.

The power pack 15 supplies the radio-frequency generator 12 through two conductors 26, one of which is connected to the secondary of the plate transformer 18 and the other of which is connected to the center tap 24 in the secondary winding of the filament transformer 22. The power pack is constructed to supply about 2500 volts, D. C. Each side of the line 23 has a radio-frequency choke 25 in series therewith to prevent high-frequency feed-back into the power pack 15 from the generator 12.
The power pack 15 is housed and enclosed in a casing indicated at 28 which is made of metal or the like electrical conducting material to form a shield. The radio-frequency components 11 and 12 are similarly housed together in a like shield. Both casings 27 and 21 are preferably housed in a casing 28 which may also be formed of metal or which may be metal lined. Each of the containers 25, 27 and 28 is grounded as indicated, and they function to shield the power pack 15 and the radio-frequency components 11 and 12 from each other, and to minimize disturbing radiations to outside equipment.

The generator 12 includes a spark-gap oscillator 30 with adjustable gaps, which may be of any suitable construction and of which there are a number of well known types available. The spark gap oscillator 30 is bridged across the conductors 23, and in parallel therewith is the primary 31 with condenser 32 in series therewith. This primary excites the secondary winding 34.

The generating or tank circuit 12, which includes the primary 31 and the condenser 32 connected in parallel with the spark gap 30 and its resistor, may be devised, for any suitable frequency. For the therapeutic machine of the disclosed practical application of the invention, the secondary or tank circuit 12 should preferably be somewhere within the range between 200 kc. and 2000 kc. and the generating circuit should be constructed accordingly.

The jack 36 is connected to the tap 35 which is at one end of the secondary winding 34, the connection being through the movable arm of the three-way switch 37. The jack 36 is similarly connected to the tap 35 which is at the other end of the secondary winding 34, this connection being through the three-way switch 40.

The step-up transformer 33 is constructed for the generating and transmitting circuits 12 and 11 to be out of resonance. Maximum energy output is derived from less than the total number of turns of the secondary coil of transformer 33. Accordingly, when the jack 36 is supplied from the end tap 34 of the secondary 34, the energy output of the machine is relatively low. Energy output increases progressively with successive turns away from end tap 34 to a turn of maximum output beyond which the energy output decreases progressively. In the transmitter of the disclosed embodiment, maximum energy output is about at the turn in the middle of the secondary 34. I have no mid-tap connection at this point. The tap 33 is placed at the turn of the maximum energy output desired. This means that I get a predetermined energy transfer or output which can go no higher than desired, and that when this desired maximum output is being obtained, the two circuits 12 and 11 cannot resonate with each other.

Taps 34 and 35 thus afford the extremes of energy output of the machine between the maximum and minimum. As many intermediate steps as are desired may be provided between the maximum and the minimum, and in the disclosed embodiment a single intermediate step is sufficient. The tap 42 is placed for a magnitude of energy output about midway between the maximum and minimum of respective taps 34 and 35, and is therefore placed at the middle turn between the turn of tap 43 and the end tap 35.

The switch 37 includes three contacts 45, 44 and 41 which are respectively connected to the taps 43, 42 and 35. The switch 37 thus enables the jack 36 to be selectively connected with the taps 42, 43 and 35 for maximum, intermediate and minimum energy outputs respectively. The rheostat 16 of the power pack 15 affords additional adjustments of energy output, and takes care of the ranges between taps 43, 42, and 35. The machine may thus be set universally for any energy output within the range of the machine.

One construction of the step-up transformer that has been used, and which has proven suitable for practice of the invention, embodies the primary 31 of 9½ turns and the secondary 34 of 330 turns. The primary is wound on a diameter of 2 inches, and is ¾ inch long. The secondary coil 34 is wound on a diameter of 2¾ inches, and is 5¾ inches long. The tap 33 of maximum energy output is placed at 165 turns, and the tap 42 of intermediate energy output is at 248 turns. The primary 31 and the secondary 34 are mounted concentrically, with the primary at the end embodying the tap 36. Obviously other specifications will be suitable for the step-up transformer 33, and will come within the scope of the invention.

The jack 39 is connected to the end tap 38 of the step-up transformer 33, and this connection is either directly or alternatively through the modifier tubes 49 and 50, which will increase and modify the voltage, current, and consequently the power, the tube 50 adding more resistance than the tube 49. The modifier tubes 49 and 50 vary the degree of softness of a given treatment.

These modifier tubes are merely gaseous discharge tubes, the first of which were devised by Geissler and many types of which have been produced in the intervening time. The modifier tubes referred to herein have combinations of gases therein at predetermined pressures and they have been found to be very effective in treatments by the machine. These modifier tubes are enclosed within the casing of the device and consequently do not shine on or psychologically have any effect on the patient.

Certain ailments should be given a more soothing quality of treatment than is satisfactory or desirable with others. One illustrative example is the treatment of burns, for which a soothing quality of treatment is especially desirable. It has been determined that electron discharge tubes containing certain inert gases increase the degree of softness of a given treatment, and improve the soothing qualities accordingly. Neon affords a softer and more soothing treatment than argon, for example, and the modifier tubes 47 and 50 of the disclosed embodiment accordingly contain argon and neon respectively.

In the disclosed construction, the jack 39 is connected with the tap 38 through the switch 40 for selective control of the soothing qualities of a given treatment. End tap 38 is connected to the contact 49 of switch 48 directly, to contact 47 through modifier tube 49, and to contact 48 through modifier tube 50. It is obvious that the disclosed construction is illustrative, and that other or additional degrees of softness may be provided for without departing from the scope of the invention.

The jacks 38 and 39 are outlets to which electrodes are connected, two types of electrodes being illustrated in Figs. 2 and 3 respectively.

The electrode 60 in Fig. 3 is an ionization or electron discharge tube, and it comprises the envelope 51 of glass, quartz or other similar material which contains an inert gas, argon being suitable for the purpose. The tube 61 is con-
toured to embody a contactor surface 62 which is adapted to engage and contact some portion of the human body during a treatment. The disclosed contour of the envelope 61 is illustrative, and different contours may be used. Some electrodes use the term while an assistant to reach certain organs which are not exposed or near the outer surface of the human body.

The terminal 63 of conductor material extends from the exterior of the envelope 61 to the interior thereof, and it projects to a position within the tube 64 while it is away from the contactor 62. Between the contactor 62 which comes in contact with the person being treated and the electrical terminal 63 there is interposed an electrical insulator which, in the embodiment of the tube type of electrode 60 shown, consists of the material of the envelope 61 and the inert gas contained in the tube 61.

The tube 61 is seated in the plug 64 of conductor material, and is preferably attached thereto by any suitable cement 85. Attachment of the tube 61 is located where the terminal 63 projects to the outside thereof, and the terminal 63 is connected in electrical contact with the plug 64. The plug 64 fits the socket 66, and is removably attached thereto by means of the bayonet attachment 67 or other suitable connection. The spring 68 serves to hold the plug 64 firmly seated in the socket 66 and in good electrical contact therewith. The socket 66 is housed in the tubing 70 of insulating material which affords a convenient handle for the electrode 60. The tubing 70 also contains the standard Jack 71 which is electrically connected to the socket 66 by means of the screw 72.

A plurality of cords 73 are provided, each comprising a standard jack plug 74 at each of its opposite ends. The jack plugs 74 fit the Jack 71, and also the Jacks 35 and 39, Fig. 1, which are of standard construction for the purpose.

An electrode 65 may be plugged into each of the jack 36 and 38 to complete the set-up of the machine for a treatment. For most treatments, however, and under usual practice, the conductor electrode 75, Fig. 2, is used and plugged into the Jack 39. Electrode 75 is adapted to be held in the hand, and comprises a rod of conductive material which is formed at its one end to embody the Jack 75 which fits the jack plug 74. The electrode 75 is thus enabled to be plugged in by means of a cord 73.

To operate the machine of the invention, the hand electrode 75 is plugged into the Jack 39, and a suitable tube electrode 60 is plugged into the Jack 36. The three-way switch 37 is adjusted to the correct contact 45, 44 or 41 for the energy output that provides the desired intensity of treatment. The rheostat 15 is also adjusted to control the intensity of treatment more closely to what is desired. The switch 40 is adjusted to one of the contacts 46, 47 or 45, depending upon the desired degree of softness of the particular treatment.

The hand electrode is held in the patient's hand, and the insulating tubing 70 is held, usually in the other hand or by an assistant giving the treatment, to place the contactor 62 of the electrode 60 at or near the injury or ailment that is being treated. The switch 20 is now turned on. The contactor 62 is held stationary in position where it is near or in contact with the injury being treated, or it may be moved over the area of the injury with a slow, even motion.

It should be understood, however, that direct contact with the injured tissue is not essential. Local treatments of one portion or organ of the human body, it has been found, have relieved ailments, or affected them beneficially, which are removed and remote from the place where the contactor 62 is applied. A treatment is continued for a predetermined length of time, after which the switch 20 is opened to discontinue the treatment.

The Jack 51 provides a reverse connection which enables a more intense treatment, and this will now be described.

The Jack 51 is connected with the tap 43 through the lead 52. For this treatment a tube electrode 60 is plugged into the Jack 51, and a hand electrode 75 is plugged into the Jack 35. The switch 37 may now be adjusted to either the contact 44 or the contact 41, to respectively use the portions of the secondary 34 from tap 43 to tap 42 or from tap 43 to tap 35.

When the switch 37 is adjusted to the contact 44, the power output and intensity of treatment is approximately the same as, or slightly higher than, power output through Jacks 36 and 35 when the switch 37 is adjusted to the contact 41. The portion of the secondary 34 from tap 35 to tap 43 is in the circuit. With the reverse connection of Jacks 51 and 36, adjustment of switch 37 to contact 41 provides an energy output about twice as great as, or somewhat more than twice as great as, the energy output through contact 44 with the reverse connection of Jacks 51 and 36.

The accompanying disclosure presents one practical application of the invention, which is not limited to the specific disclosure. The scope of the invention is determined by the accompanying claims, to which attention is now directed.

I claim:

1. In a radio-frequency transmitter for therapeutic purposes, a transformer having a primary end a coupled secondary, means connected to said transformer to supply oscillatory energy to said primary, a first output terminal, a connection between one end of said secondary and said output terminal, a second output terminal, variable switching means, a gas filled discharge tube, connections between the other end of said secondary, said switching means and said second output terminal, and other connections between said last end of said secondary, said discharge tube and said switching means, whereby said switching means may be moved to vary the output potential delivered to said terminals and consequently to any electrode connected thereto.

2. In a radio-frequency transmitter for therapeutic purposes, a transformer having a primary and a coupled secondary, means connected to said transformer to supply oscillatory energy to said primary, said secondary having a series of taps from one end inwardly and comprising a variable switching means, connections between the other end of said secondary and said primary, a first output terminal, said variable switching means being interconnected with said terminal and said taps for selectively connecting the latter to said terminal, a second terminal connected to one contact of said variable switching means and to the innermost tap of said series, a third terminal, a second variable switching means connected to said third terminal, a connection between said other end of said primary and a contact of said second switching means, a gas filled discharge tube, a second discharge tube having a gas there-
in of different characteristics from the gas in said first tube, a connection from another contact of said second switch means to said first gas filled tube and thence to said other end of said secondary, and a connection from still another contact of said second switch means to said second gas filled tube, whereby a large range of current variations may be supplied to electrodes which may be selectively connected to any combination of two of said terminals.

3. In a radio-frequency transmitter for therapeutic purposes, a transformer having a primary winding and a coupled secondary winding, means connected to said transformer to supply oscillatory energy to said primary, a first output terminal, a tap on said secondary winding intermediate the ends thereof, a connection between said tap and said terminal, a second tap formed on said secondary between one end thereof and said first tap, a second terminal, a step switch having a movable contact arm and a series of fixed contacts, a connection between said movable arm and said second terminal, individual connections between said taps and said end of said secondary, and said fixed contacts, a third terminal connected to a movable contact arm of a step switch like said first switch, a glow discharge tube, a second glow discharge tube having characteristics different from those of said first tube, and individual connections between the stationary contacts of said last switch and said tubes and the other end of said secondary winding, whereby electrodes may be selectively connected to any of said terminals, and elements connected to the stationary contacts may be selectively connected in series therewith.

PAUL S. HANWAY.

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