

Nov. 23, 1965

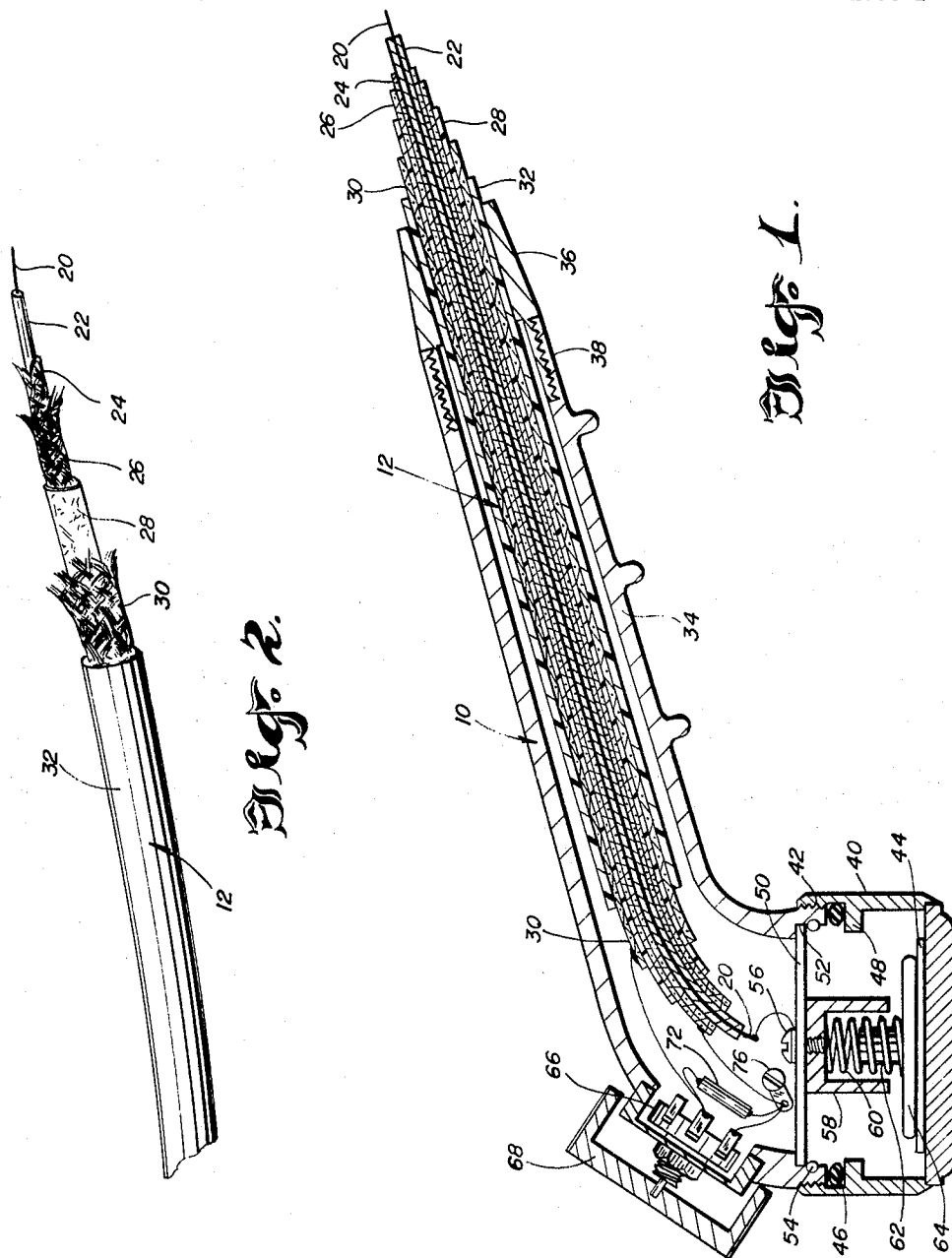
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3,219,029

REMOTE CONTROL MEDICAL THERAPY INSTRUMENT

Filed March 25, 1963

3 Sheets-Sheet 1



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REMOTE CONTROL MEDICAL THERAPY INSTRUMENT

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3 Sheets-Sheet 2

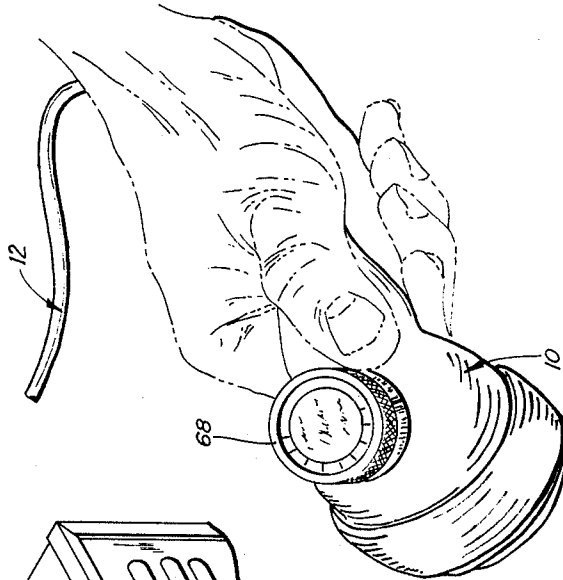


Fig. 3.

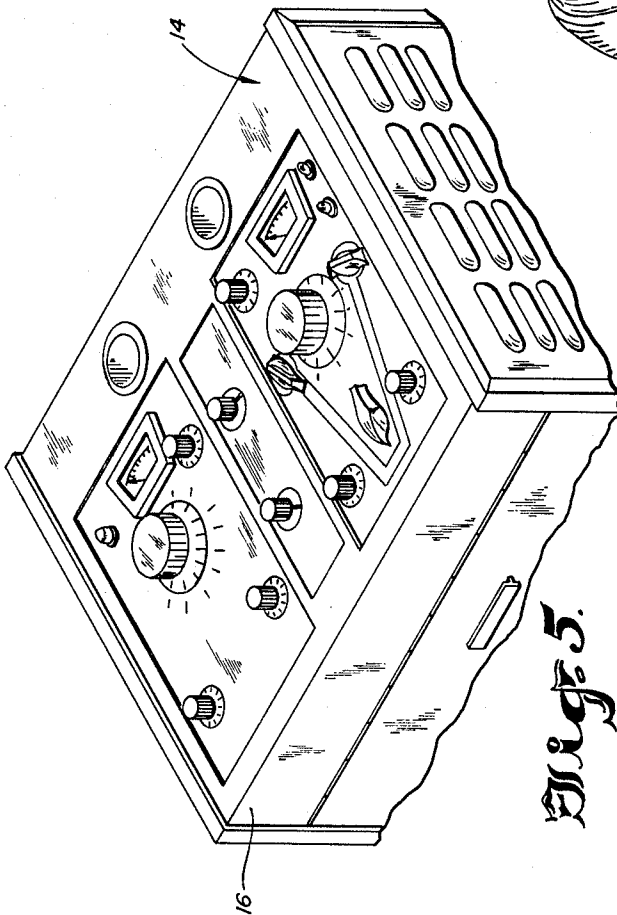


Fig. 5.

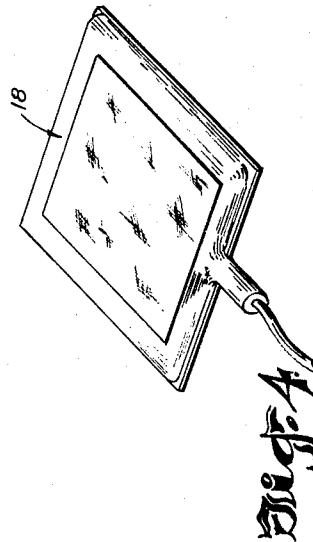


Fig. 4.

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3 Sheets-Sheet 3

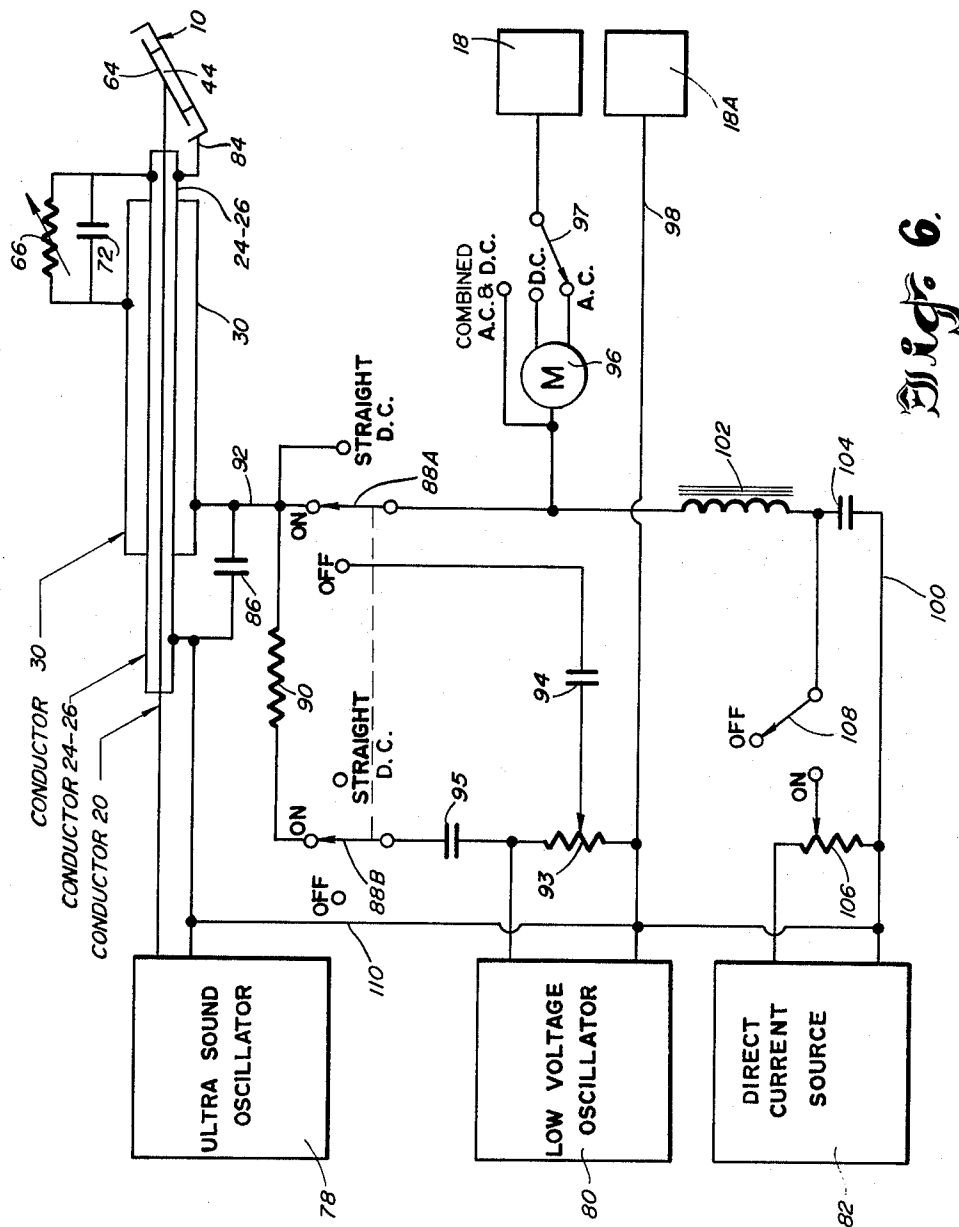


Fig. 6.

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REMOTE CONTROL MEDICAL THERAPY
INSTRUMENT

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7 Claims. (Cl. 128—24.5)

This invention relates to improvements in medical therapy apparatus and more particularly, but not by way of limitation, to a device for simultaneously transmitting a plurality of electrically signals of various frequencies and voltages, and particularly designed and constructed for remote control of one or more of these signals, either simultaneously or independently.

In recent years medical science has found the utilization of simultaneous and synchronized electrical and mechanical stimulation to be of benefit to therapeutic treatments. A simultaneous synchronized electrical and mechanical or ultra-sound stimulation may be provided to a patient's tissues and muscles through a single instrument or by the use of an apparatus, such as disclosed in the Mark E. DeGroff, Patent No. 2,830,578, issued April 15, 1958 and entitled "Electro-Sonic Apparatus." This electro-sonic apparatus comprises a low voltage generator co-ordinated with an ultra-sonic generator whereby an electrode pad member, operably coupled to the low voltage generator, and a sound head applicator device, operably coupled to the ultra-sound generator, provide a combined electrotherapy and ultra-sonic therapy for simultaneous use to produce a superimposed synergistic action in patient treatment. This type of therapeutic treatment has proven successful and normally utilizes one or more pads which may be disposed on predetermined portions of a patient's body and a movable probe or applicator which may be directed to various other portions of the body for muscle stimulation or treatment of the body tissues. The amplitude of the electrical stimulation is controlled by a variable resistor located in the main housing of the apparatus and as a practical matter, during utilization of the apparatus it has been found that the operator of the device must often divide his attention between the patient and the instrument housing controls therefor to attain the desired variations for the muscle or tissue stimulation. For example, when it is desired to adjust the current frequencies of the impulses or signals being transmitted to or from the sound head the appropriate controls on the instrument housing must be manipulated by the operator of the device, and since the control housing is usually remotely disposed with respect to the portable and movable sound head applicator a certain amount of inconvenience is encountered.

The present invention contemplates a sound head applicator particularly designed and constructed for remote control of the output voltage with respect to the instrument housing at the same time that the probe or applicator is moved over the body whereby the operator of the instrument may more effectively and efficiently treat the patient without dividing his attention between the patient and the instrument. A relatively simple cable means, such as normally utilized for transmitting only ultra-sonic signals, has been designed and developed for conducting A.C. current, D.C. current and ultra-sonic signals or frequencies, either independently or simultaneously to the sound head applicator. The complete unit or medical therapy apparatus generally comprises an ultra-sonic oscillator, a low voltage oscillator, and a direct current source, similar to that set forth in the aforementioned DeGroff Patent No. 2,830,578. The output from the ultra-sound oscillator is connected to a transducer provided in the sound head applicator through a novel three-

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conductor cable similar to that known as a triaxial cable. The intensity of this voltage is preferably adjusted by means of a control device provided within the ultra-sound oscillator of the unit, and this particular signal is preferably not remotely controlled. However, since it is frequently desirable to simultaneously apply low voltage A.C. electrical current or signals to the patient under treatment in combination with the ultra-sound as hereinbefore set forth, means have been provided on the sound head applicator itself for controlling this low voltage from a position remote with respect to the unit or medical therapy apparatus. Of course, means are also provided on the unit itself for controlling this low voltage in the event such is desirable. A D.C. electrical current may be simultaneously applied to the transducer of the sound head applicator and the amplitude of the combined signal is controllable by the remote control means provided on the sound head applicator. Either direct current or low voltage A.C. current or a combination of both may be independently employed through the ultra-sound head applicator by reducing the ultra-sound output to zero by means of the ultra-sound intensity control or by turning the ultra-sound generator off.

The remote control feature of the sound head applicator greatly facilitates the utilization thereof in patient treatment in that the operator of the device may direct his attention to the patient and control the stimulus during the therapeutic treatment in a manner substantially precluding distraction from the treatment process. In addition, the improved triaxial cable greatly improves the overall operating efficiency of the sound head applicator.

It is an important object of the invention to provide a novel medical therapy apparatus for producing a superimposed synergistic action of combined ultra-sonic and electrotherapy wherein the stimulation produced for patient treatment may be regulated by remote control as the movable probe is moved over the body of a patient.

It is another object of this invention to transmit through a single electrode both a low voltage current and an ultra-sonic frequency for improved therapeutic treatment wherein the voltage may be regulated by remote control for facilitating the operation thereof and increasing the efficiency of the operator of the apparatus during the treatment period.

Still another object of this invention is to provide a novel sound head applicator operably connected for receiving ultra-sonic voltage and both A.C. and D.C. voltage through a single triaxial cable.

And still another object of this invention is to provide a novel triaxial cable particularly designed and constructed for improving the operating qualities thereof.

A further object of this invention is to provide a novel triaxial cable for transmitting ultra-sonic signals and both A.C. and D.C. signals or electrical current either independently or simultaneously.

Other and further objects and advantageous features of the present invention will hereinafter more fully appear in connection with a detailed description of the drawings in which:

FIGURE 1 is a sectional elevational view of a sound head applicator embodying the invention.

FIGURE 2 is a broken perspective view of a triaxial cable embodying the invention.

FIGURE 3 is a perspective view of the sound head applicator shown in an operating position in the hand of an operator.

FIGURE 4 is a perspective view of an electrode pad, such as may be used in conjunction with the invention.

FIGURE 5 is a perspective view of a portion of a medical therapy apparatus for producing combined ultra-sonic and electrotherapy patient treatment.

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FIGURE 6 is a schematic circuit drawing of the electrical portions of the invention.

Referring to the drawings in detail, reference character 10 generally indicates a sound head applicator operably connected by a suitable triaxial cable 12 to a combined low voltage generator and ultra-sonic radio frequency apparatus 14 of any suitable type and preferably of the general type disclosed in the aforementioned DeGroff Patent No. 2,830,578. The unit 14 in apparatus 14 preferably comprises a suitable outer housing or chassis portion 16 for encasing the electrical components for the entire unit and is adapted for connection to any alternating current line with voltage preferably ranging from one hundred ten to one hundred twenty-five volts, and with a frequency between fifty and sixty cycles. The triaxial cable 12 is operably connected with the electrical portions of the apparatus or unit 14 in any suitable manner such as a plug and removable jack connection (not shown) whereby the sound head applicator 10 may be utilized for medical therapy treatments. A suitable electrode pad 18 may also be used in conjunction with the sound head applicator 10 and is operably connected to the electrical portions of the unit 14 in a manner as will be hereinafter set forth.

The triaxial cable 12 may be of any suitable or well known type, but the type depicted herein is of a unique construction to provide improved shielding with respect to more conventional types of triaxial cables. It is to be understood that substantially any triaxial type cable may be utilized but that set forth herein has been found to be exceedingly efficient. As shown in FIGURES 1 and 2, a central lead or conductor 20 extends longitudinally through a suitable sleeve 22 which may be constructed of polyethylene, or the like. A second conductor portion 24 preferably comprising woven or braided strands of copper wires, or the like, encases the sleeve 22 and provides shielding for the conductor 20. In the usual triaxial cable of this type it has been found that the woven nature of this second conductor 24 contains many voids and as a result the shielding qualities are not sufficient for the purpose of the present invention. Thus, a second shielding sleeve 26 generally similar to the conductor 24 is provided for the cable 12 and encases the conductor 24. It has been found that this additional layer 26 increases the shielding qualities to provide a more efficient function for the cable 12. The second shielding portion 26 may be encased in a sleeve or covering of suitable material 28, such as polyethylene and a third conductor portion 30 of a similar woven type construction to that of the conductor 24 and shield 26 surrounds the sleeve 28, thus providing for conducting of three voltages through the single cable 12. Of course, the third conductor 30 is covered by a suitable insulating material or sleeve 32 which may be rubber, or the like, as is well known. It has been found that a triaxial cable of this novel construction may be utilized for transmitting the ultra-sound signals in addition to D.C. and A.C. current, either independently or simultaneously, whereas hereinbefore this type of cable has been utilized for transmitting only the ultra-sound signal.

The sound head applicator 10 may be of any suitable type adaptable for manipulation by a human hand for movement over the body of a patient to be treated and as shown herein comprises an outer housing 34 providing a gripping or handle portion for the device. The housing 34 is constructed from a suitable shielding material, such as aluminum, and is coated with a suitable non-conductive material, such as rubber, or the like, but not limited thereto. The cable 12 extends substantially throughout the length of the housing 34, as clearly shown in FIGURE 1 and for a purpose as will be hereinafter set forth. A cap member 36 may be readily secured at 38 to one end of the housing 34 for receiving the cable 12 therethrough and facilitating retention of the triaxial cable 12 within the housing portion 34. A head member or applicator portion 40 may be threadily secured at 42 to the opposite

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end of the housing 34 and is suitably constructed for retaining a transducer or crystal member 44 therein. A sealing ring 46 may be interposed between the housing 34 and an inwardly directed shoulder 48 provided in the head portion 40 to provide a seal therebetween.

A plate member 50 is disposed in an annular groove 52 provided in the housing 34 in the proximity of the head member 40 and is retained therein in any suitable manner, such as a lock washer 54, or the like. A centrally disposed screw 56 extends through the plate 50 for retaining a cup member 58 thereon which extends in a direction toward the crystal 44. A suitable helical spring 60 is disposed within the cup and around a stem member 62 provided on an electrode member 64. The pressure of the spring 60 acting against the electrode 64 constantly urges the electrode in a direction toward the crystal 44 and maintains continual contact therebetween.

The innermost conductor 20 of the cable 12 is connected to the screw 56 in the usual manner whereby the ultra-sound frequency is transmitted to the electrode 64 through the spring 60. The electrode 64 being disposed adjacent the crystal member 44 transmits radio frequency energy to the crystal whereupon the crystal is resonated or vibrates at its natural frequency. In the present instance, the crystal 44 is preferably polished or ground in such a manner that it will vibrate only at a frequency of one megacycle per second.

A remote control rheostat 66 is suitably mounted on the housing 34 and is provided with the usual knob member 68 for manual control or regulation thereof. The rheostat 66 is electrically connected with a conductor 30 and is also operably connected with a capacitor 72. The conductor or shield 26 is electrically connected to a suitable ground or lug member 76, or the like, and the rheostat 66 and capacitor 72 are similarly electrically connected to the ground or lug 76. Thus, when the sound head applicator 10 is manually grasped, as shown in FIGURE 3, the thumb or other fingers may be utilized for rotating the knob 68 in the desired direction for varying the output of the electrical current passing through or carried by the cable 12.

Referring to FIGURE 6, a general schematic circuit is shown wherein the ultra-sound oscillator portion of the unit 14 is indicated generally by the block 78, the low voltage oscillator as indicated by the block 80 and the direct current source as indicated by the block 82. As hereinbefore set forth, the triaxial cable 12, comprising conductors 20, 24-26, and 30 may be plugged into the unit 14 by any suitable connection means such as a plug and movable jack (not shown) and the conductor 20 transmits ultra-sonic frequency to the transducer or crystal member 44 through the electrode member 64. The conductor 24-26 is electrically connected with the movable probe or applicator 10 or the ground lug 76 through a lead 84, and the rheostat 66 and capacitor 72 are electrically connected between the conductors 24-26 and 30, as clearly shown in FIGURE 6. In addition, a second capacitor 86 is connected between the conductors 24-26 and 30 and to the ultra-sound oscillator 78. The capacitors 72 and 86 are provided to bypass any induced ultra-sound voltage in conductor 30 to the grounded conductor 24-26.

The low voltage oscillator 80 is electrically connected with a suitable gang switch 88A-88B, preferably of a three position type wherein one position is "off," a second position is "on," and a third position connects direct current only with the rheostat 66, as will be hereinafter set forth. A resistor 90 is provided in the circuit to prevent overload and consequent stopping of the low voltage oscillator 80. The switch 88A-88B is electrically connected to the conductor 30 through a lead 92 whereby in the "off" position no electric current from either the low voltage oscillator 80 or the D.C. source 82 is passed to the rheostat 66; and in the "on" position of the switch, both the D.C. source 82 and the low voltage oscillator

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or A.C. source 80 are electrically connected with the rheostat 66; and in the third position of the switch only the D.C. source 82 is connected with the rheostat 66. A resistor 93 and capacitors 94 and 95 are included in the circuit and the capacitors 94 and 95 are provided to prevent partial short-circuiting of the D.C. by the resistors 90 and 93.

The pad 18 is in electrical connection with the rheostat 66 through the switch 88A, and a meter 96 and switch 97 are interposed between the pad 18 and the switch 88A. The meter 96 is connected in series with the pad 18 and provides a means for measuring either the low voltage A.C. current or the direct current provided from the D.C. source. The switch 97 is included for selection of the proper mode of operation of the meter 96 and is preferably of a three position type wherein one position selects only A.C. or low voltage current, a second position selects only direct current, and a third position selects combined A.C. and D.C. current. Of course, a second pad 18A may also be included if desired, and is preferably directly connected with the low voltage oscillator 80 through a lead 98.

The direct current source 82 is connected with the switch 88A through a lead 100, and an inductor 102 and capacitor 104 are interposed therebetween, as clearly shown in FIGURE 6. In addition, a direct current control 106 and an "on-off" switch 108 are provided for the direct current circuit. The inductor 102 prevents partial short-circuiting of the low voltage signal by the direct current control 106 and the capacitor 104 is included to eliminate low voltage A.C. or ultra-sound voltage from being fed back into the D.C. source 82. The D.C. to A.C. ratio of the simultaneously applied electrical signal is adjusted by means of the direct current control 106. The amplitude of the combined signal is controllable by the remote control rheostat 66. It is to be noted that the direct current source 82, low voltage oscillator 80, and ultra-sound oscillator 78 are electrically connected to a common lead 110.

Operation

In using electrotherapy and ultra-sonic therapy simultaneously to produce a superimposed synergistic action in patient treatment it is usually preferable to use only one of the pad members such as 18 and the sound head applicator 10. The sound head 10 and pad 18A are electrically grounded at a common ground in the unit 14, as set forth in the previously mentioned De Groff Patent No. 2,830,578, thereby combining the low voltage current and ultra-sonic radio frequency through a single electrode to produce a combined action for the electrical therapy treatment.

Means for controlling the low voltage is usually provided in the instrument or apparatus 14 itself, but as a practical matter, it is found to be more convenient and efficient to control this low voltage remotely in the vicinity of the transducer or crystal 44 through use of the rheostat 66, which is provided in the head or probe member 10 for this remote control. To achieve this remote control operation the switch 88A-88B is positioned in the "on" position. It will thus be seen that the low voltage signal is applied between the pad 18 and the transducer or crystal 44. As hereinbefore set forth, the resistor 90 is provided in the circuit to prevent overload and consequent stopping of the low voltage oscillator.

When the control knob 68 of the remote control rheostat 66 is rotated in one direction to the maximum counter clockwise position therefor, the resistance of the rheostat 66 is essentially zero and thus the voltage appearing between the transducer 44 and the pad 18 will be at a minimum. Conversely, when the remote control knob 68 of the rheostat 66 is rotated in an opposite direction to the maximum clockwise position therefor the resistance of the rheostat 66 is at a maximum and most of the low voltage oscillator signal appears across the sound head 10

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and the pad 18. The capacitors 72 and 86 are included to bypass any induced ultra-sound voltage in the conductor 30 to the grounded conductor 24-26.

The pad 18 and the sound head applicator or probe 10 are both movable, and may be manually adjusted or moved on the skin or area of the patient to be treated as desired for the most effective treatment. The nerve controlling the painful area is often remotely located with respect to the actual pain. Thus, the electrode pad 18 may be disposed on the skin adjacent the remote nerve area and retained thereon in any suitable manner while the sound head or applicator 10 is moved along the surface of the skin of the proximity of the actual painful area, readily stimulating both the controlling nerve area and the painful area. For example, an arm muscle, or the like, may be treated by placing the pad 18 against one portion, such as the under portion of the arm, and the probe 10 may be movable adjacent the opposed portion, or upper surface of the arm, in this manner the electrical stimulation from the pad 18 and the sound head or probe 10 and the sound waves emitting from the sound head 10 co-act for producing mechanical stimulation in the tissue cells of the arm muscle in a synchronized manner with the electrical stimulation of the muscle, thereby providing a patient treatment result not possible with either type of stimulation form taken singly. Of course, it is to be noted that when desired the sound head applicator 10 may be utilized independently for ultra-sonic treatment and similarly the electrode pads 18 and 18A may be utilized independently to provide electrical stimulation.

As hereinbefore set forth, the electrode 64 is disposed adjacent the crystal 44 and transmits radio waves to the crystal whereupon the crystal is resonated or vibrates at its natural frequency. The vibratory motion of the crystal 44 produces ultra-sonic waves which are mechanical energy. The ultra-sonic waves or vibrations emitted from the crystal 44 produce mechanical compressions and rarefactions which are much the same as those produced by the vibrating strings of the violin or a piano. As has been determined by many medical associations, the energy produced for ultra-sound therapy is the tremendous number of vibrations of the crystal per second, which produce vibrations of an ultra-sonic nature so close together that they produce a disturbance of cell size in the tissues of the patient being treated. This cell size disturbance is often called cell massage or micro-massage. The mechanical effect of the ultra-sonic vibrations on the cell molecules of the human or animal tissues causes an agitation of the molecules, which has proven to be very beneficial in the therapeutic treatment of patients.

When the switch 88A-88B is moved to the "off" position, the control resistor 93 may then be used to adjust the low voltage signal as applied between the sound head 10 and the pad 18. It will be apparent from the schematic showing in FIGURE 6, that with the switch 88A-88B in the "off" position it will not be necessary to use the sound head 10 for the application of low voltage alone, but both of the pads 18 and 18A may be used. For the application of ultra-sound alone, neither pad 18 or 18A is used.

A direct current may be simultaneously applied through the sound head 10 and pad 18 when the switch 88A-88B and the switch 108 are both in the "on" position. As hereinbefore set forth, the capacitors 94 and 95 prevent partial short-circuiting of the D.C. by the rheostat 66 and resistors 90 and 93. In addition, the inductor 102 prevents partial short-circuiting of the low voltage signal by the direct current control 106. The capacitor 104 is provided to eliminate low voltage A.C. or ultra-sound voltage from being fed back into the D.C. source 82. The D.C. to A.C. ratio of this simultaneously applied signal is adjusted by means of the direct current control 106. The amplitude of the combined signal is controllable by the remote control rheostat 66, as hereinbefore set forth.

Direct current only may be employed by reducing the ultra-sound output to zero. In order to do this the ultra sound oscillator 78 may be turned off at the unit 14 in the usual manner (not shown) or the output control for the ultra-sound oscillator may be used for reducing the ultra-sound output to zero. With the ultra-sound output at zero and the switch 88A-88B moved to the straight D.C. position, the D.C. is applied directly to the probe 10. With the switch 88A-88B in this straight D.C. position the applied D.C. is remotely controllable at the second head 10 by means of the remote control rheostat 66. In addition, of course, the D.C. may be controlled internally by means of the control resistor 106. This D.C. signal is applied to the patient by means of the sound head 10 and pad 18 in a manner similar to that hereinbefore set forth. With the switch 88A-88B in the "off" position, the direct current is applied through the pads 18 and 18A and may be controlled by the control resistor 106.

As hereinbefore set forth, the meter 96 is included in series with the pad 18 to provide a means for measuring either the low voltage A.C. sensitivity or the D.C. provided from the direct current source 82. The switch 97 is included for selection of the proper mode of operation of the meter, whether A.C. or D.C., and when the combined low voltage A.C. and direct current are used, the switch 97 is positioned in the combined A.C. and D.C. position whereby the meter 96 is switched out of the circuit to eliminate erroneous readings on the meter.

By way of summary, the probe 10 may be utilized in conjunction with the pad 18 to provide a simultaneous and synchronized electrical and mechanical stimulation for therapeutic treatment. A three conductor cable is utilized for transmitting ultra-sonic frequency and A.C. and D.C. to the transducer in a sound head applicator. The amplitude of both the low voltage A.C. and the D.C. signals may be remotely controlled by manipulation of the rheostat 66 provided on the sound head applicator, thus greatly improving the overall efficiency of the medical therapy treatment for the patient. In addition, the three conductor cable may be of a unique type wherein a double shield is interposed between the inner and outer conductors for improving the operating qualities of the cable.

From the foregoing, it will be apparent that the present invention contemplates a novel medical therapy apparatus providing for utilization of a combined electrical and mechanical stimulation for the treatment of a variety of muscular disorders, and the like. The sound head apparatus is provided with a remote control means whereby both the low voltage A.C. and D.C. signals may be remotely controlled at the sound head, thus greatly reducing the necessity of diverting the attention of the operator of the device from his patient, such as is usually necessary when this electrical energy must be controlled from the unit itself.

Changes may be made in the combination and arrangement of parts as heretofore set forth in the specification and shown in the drawings, it being understood that any modification in the precise embodiment of the invention may be made within the scope of the following claims without departing from the spirit of the invention.

What is claimed is:

1. A medical therapy apparatus comprising in combination an ultra-sound oscillator, means for producing electrical impulses for electrical therapy stimulation, an electrode pad member, a probe member having an electrically conductive head, a transducer mounted on said head within said probe member for transforming ultra-sound energy into ultra-sound mechanical vibrations, a triaxial cable having a first conductor connected to said transducer, a second conductor connected to said head and a third conductor connected to said pad, the output from said ultra-sound oscillator being connected with said first and second conductors of said triaxial cable, said means for producing electrical impulses being connected

between said second and third conductors of said triaxial cable, and means mounted on said probe and connected between said second and third conductors of said triaxial cable for varying the amplitude of the electrical impulses.

2. In combination with a medical therapy apparatus including an ultra-sound oscillator, a low voltage oscillator and a direct current source, a movable probe member having an electrically conductive head, a triaxial cable connecting said probe member with said medical therapy apparatus, an electrode pad member, a transducer mounted on said head within said probe member for transforming ultra-sound energy into ultra-sound mechanical vibrations, said triaxial cable having a first conductor connected to said transducer, a second conductor connected to said head and a third conductor connected to said pad, the output from said ultra-sound oscillator being connected with said first and second conductors of said triaxial cable, the output of said low voltage oscillator being connected between said second and third conductors of said triaxial cable, said direct current source being connected between said second and third conductors of said triaxial cable, and rheostat means mounted on said probe member and connected between said second and third conductors of said triaxial cable to provide remote control for the amplitude of the electrical impulses carried thereby.

3. In combination with a medical therapy apparatus including an ultra-sound oscillator, a low voltage oscillator, and a direct current source, a movable probe member having an electrically conductive head, a cable connecting said probe member with said medical therapy apparatus, an electrode pad member, a transducer mounted on said head within said probe member for transforming ultra-sound energy into ultra-sound mechanical vibrations, said cable having a first central conductor connected to said transducer, said cable having a second conductor co-axial with said first conductor and connected to said head, said cable having a third conductor co-axial with said first and second conductors and connected to said pad, the output from said ultra-sound oscillator being connected with said first and second conductors, a first switch means for selectively connecting the output of said low voltage oscillator with said second and third conductors, a second switch means for selectively connecting the output of said direct current source with said second and third conductors and variable resistance means mounted on said probe and connected between said second and third conductors for varying the amplitude of the electrical impulses carried thereby.

4. In combination with a medical therapy apparatus having an ultra-sound oscillator, a low voltage oscillator, and a direct current source, a movable sound applicator, a cable connecting said sound head applicator with said medical therapy apparatus, a transducer provided in the sound head applicator for transforming ultra-sound energy from the ultra-sound oscillator into ultra-sound mechanical vibrations, electrode means in said applicator disposed adjacent the transducer, an electrode pad member, said cable having a first central conductor connected to said transducer, said cable having a second conductor co-axial with said first conductor and connected to said electrode means, said cable having a third conductor co-axial with said first and second conductors and connected to said electrode pad member, the output of said ultra-sound oscillator being connected to said first and second conductors, the output of said low voltage oscillator being connected with said second and third conductors, the output of said direct current source being connected with said second and third conductors, a variable resistor means mounted on the sound head applicator and connected with said second and third conductors whereby the electrical impulses provided by said low voltage oscillator and said direct current source may be

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varied by remote control independently of the ultra-sound mechanical vibrations.

5. The combination set forth in claim 4 wherein switching means are included between said low voltage oscillator and said direct current source and the conductors therefor to provide for selection of either straight alternating current electrical signals, straight direct current electrical signals or combined direct current and alternating current electrical signals to be transmitted to the variable resistor.

6. In combination with a medical therapy apparatus having an ultra-sound oscillator, a low voltage oscillator, a direct current source and an electrode pad member, a movable sound head applicator, a cable connecting said medical therapy apparatus with one end of said applicator, said applicator comprising an outer housing encasing at least a portion of said cable and providing a handle for facilitating manipulation of the sound head applicator, transducer means provided in the proximity of the other end of said housing for transforming ultra-sound energy received from said ultra-sound oscillator into ultra-sound mechanical vibrations, an electrode member disposed at said other end of said housing adjacent to said transducer, said cable having a first central conductor connected to said transducer, said cable having a second conductor co-axial with said first conductor and connected to said electrode member, said cable having a third conductor co-axial with said first and second conductors and connected to said electrode pad member, the

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output of said ultra-sound oscillator being connected to said first and second conductors, the output of said low voltage oscillator being connected to said second and third conductors, the output of said direct current source being connected to said second and third conductors, variable resistor means mounted in the housing adjacent said other end and connected with said second and third conductors whereby the amplitude of the electrical impulses carried by said second and third conductors may be varied independently with respect to the ultra-sound energy.

7. The combination set forth in claim 6 wherein switching means are included between said low voltage oscillator and said direct current source and the conductors therefor to provide for selection of either straight alternating current electrical signals, straight direct current electrical signals or combined direct current and alternating current electrical signals to be transmitted to the variable resistor.

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RICHARD A. GAUDET, *Primary Examiner.*