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THERAPEUTIC APPARATUS

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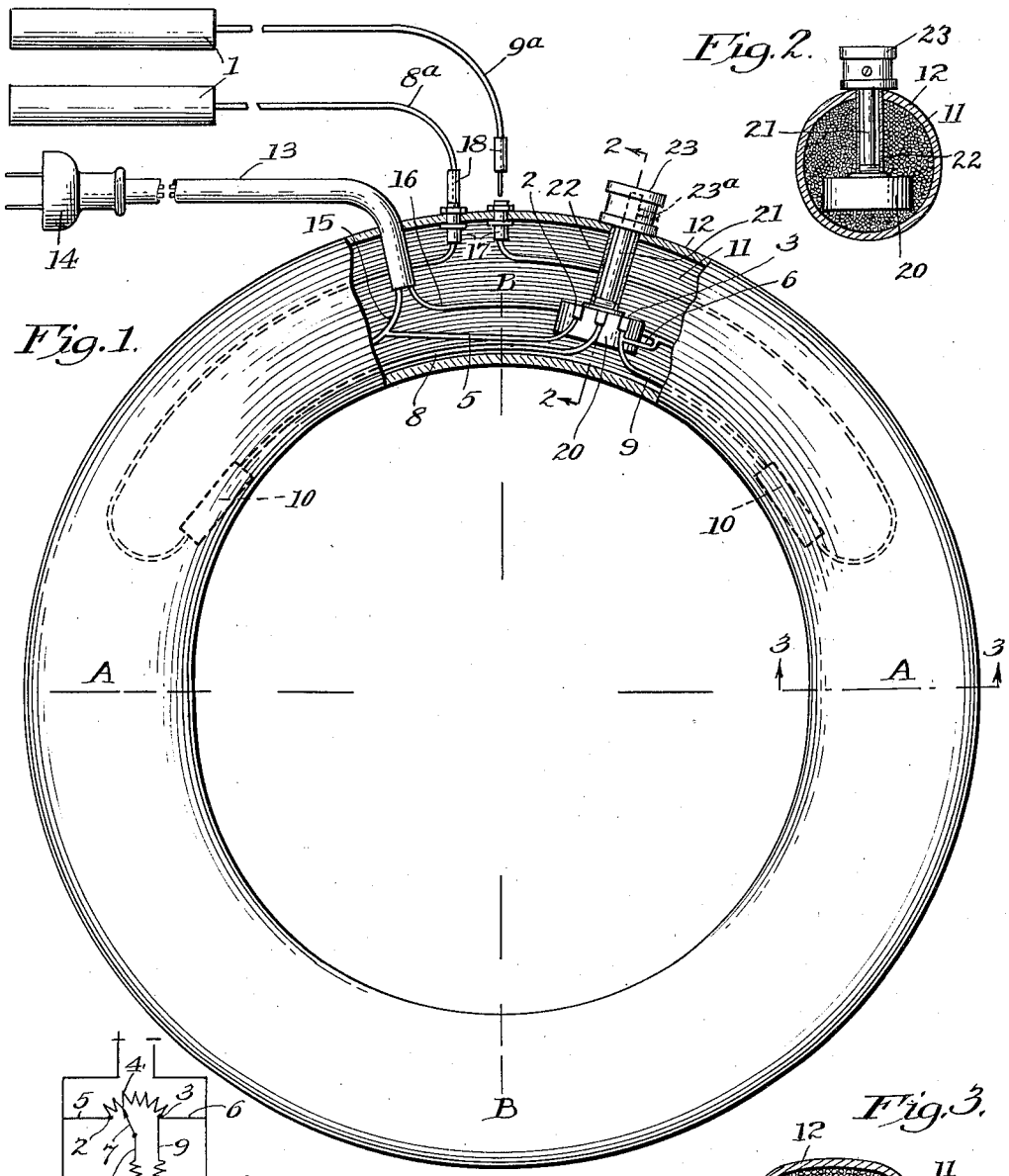


Fig. 1.

Fig. 2.

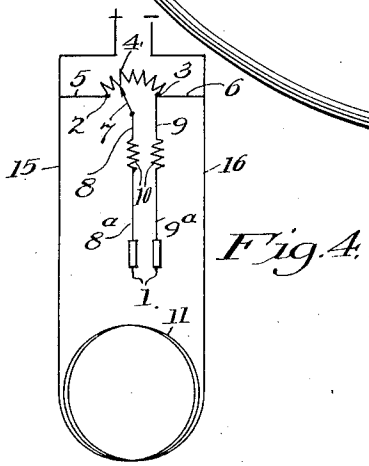


Fig. 4.

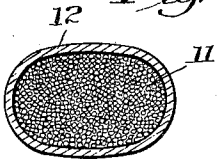


Fig. 3.

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THERAPEUTIC APPARATUS

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10 Claims. (Cl. 128—1.5)

This invention is a therapeutic apparatus, and has for its object to provide an extremely simple and compact assembly whereby an electric current may be supplied to a patient for electrotherapeutic treatment, or an electric coil may be applied to the patient, e. g. for thermal treatment, or the electrotherapeutic appliance and the electric coil may be conveniently used at the same time.

More particularly it is the object of the invention to provide an electric coil having a usual supply cable which may be readily plugged into a source of current for completing a circuit through the coil, with lead wires for electrodes adapted for quick-detachable plugging into the casing of the coil for connection to the electric circuit so that current may be supplied to a patient via the electrodes, and with a resistance for the circuit through the electrodes housed within the casing of the electric coil. By plugging in the supply cable at a usual outlet box, the electric coil is thus adapted for use with or without using the electrodes, depending upon whether or not the lead wires for the electrodes are plugged into the casing of the electric coil, and by plugging the lead wires for the electrodes into the casing of the electric coil, current may be supplied to a patient via the electrodes and at the same time the electric coil may be used or not as desired, with the electric coil, in either event, providing a convenient connection for supplying current to the electrodes and also providing a convenient support for the resistance which is included in the electrode circuit.

It is a further object of the invention to provide a variable resistance for the electrode circuit whereby any desired potential may be applied to the electrodes, with the variable resistance mounted in the casing for the electric coil, and having its adjusting means projecting to the exterior of the casing where it is readily accessible.

It is a still further object of the invention to provide a fixed resistance in the wire leading to each of the electrodes, so as to protect the patient and the apparatus against excessive current resulting from the accidental contact of either of the electrodes or the patient with a grounded conductor.

Further objects of the invention will be readily understood from the following description of the accompanying drawing, in which:

Fig. 1 is a plan view of the apparatus, partly broken away.

Figs. 2 and 3 are sections on the lines 2—2 and 3—3 respectively of Fig. 1.

Fig. 4 is a wiring diagram.

The electrotherapeutic appliance comprises a pair of electrodes 1 which are adapted to be applied to a patient and which are terminals for an electric circuit which is completed through the body of a patient and which may be energized by usual commercially available alternating sinusoidal current, such as 50 or 60 cycle, 110 volt current supplied for domestic uses.

A variable resistance is provided in the circuit for the electrodes, and is arranged as a so-called potentiometer resistance, i. e. the terminals 2—3 of its resistor 4 are connected by lead wires 5—6 to a supply circuit, and the adjustable contact 7 of the variable resistance is connected by wires 8—8a to one of the electrodes 1, while wires 9—9a lead from the terminal 3 of the resistor to the other electrode 1. By this shunt arrangement of the resistance, the supply circuit may apply a fixed potential difference between the terminals 2—3 of the resistor, and any desired intermediate potential difference may be obtained between the terminals 7—3 for regulating the current which is supplied to the body of the patient via the shunt circuit which includes the electrodes.

A fixed resistance is preferably provided in this shunt circuit and in practice this resistance comprises a resistance element 10 in each of the wires 8—9, so as to protect a patient and the apparatus against excessive current resulting from accidental contact of either of the electrodes or the patient with a grounded conductor.

In practice the variable resistance may provide a maximum resistance of from 15,000 to 25,000 ohms, and the resistances 10 may be each of 2,000 ohms, so that when lead wires 5—6 are connected to usual commercially supplied sinusoidal alternating current of 110 volts, the current passing through the patient via electrodes 1 may be regulated to provide any desired current within the range of therapeutic value.

The electrotherapeutic appliance is arranged whereby its parts may be conveniently supported and it may be readily connected to a source of current, and the arrangement is preferably such that the electrotherapeutic appliance may be optionally used in connection with a usual electric coil. The electric coil is shown as having a cable projecting from its casing whereby it may be connected to a usual outlet box for commercially supplied electric current, and preferably houses the variable resistance for the electro-

therapeutic appliance, and has sockets on its casing whereby the wires 8a—9a for the electrodes 1 may be readily plugged in. The electric coil may thus be applied to a patient for any desired purpose, e. g. thermal treatment, with the wires 8a—9a disconnected when it is not desired to use the electrotherapeutic appliance, and also provides convenient means for plugging in and using the electrotherapeutic appliance either alone or at the same time that the electric coil is applied to a patient.

As an instance of this arrangement an annular electric coil 11 may be housed within a flexible casing 12, and is preferably of a size whereby it may encircle a leg or the neck, and is preferably flattened in cross-section at diametrically opposite points A—A as shown at Fig. 3, so that it may be conveniently placed against various parts of the body or laid upon by the patient. A cable 13 projects from the casing 12 and at its outer end has a usual contact plug 14 which is adapted for quick-detachable connection with a usual outlet box (not shown), such as ordinarily provided in homes and offices for supplying A. C. for lighting and domestic purposes. The wires 15—16 of the cable are connected to the terminals of coil 11; and the variable resistance for the electrotherapeutic appliance is mounted within the casing 12 and is shunted across the wires 15—16 by means of wires 5—6, with the terminals 7—3 of the variable resistance connected by the wires 8—9 to sockets 17 which project from the casing 12 and which are adapted for quick-detachable engagement by cooperating pins 18 at the ends of the wires 8a—9a. The resistances 10 are preferably housed within the casing 12 and are inserted in the respective lead wires 8—9. The electrodes 1, which are connected to wires 8a—9a, may be supplied in different sizes and shapes adapting them to be readily grasped in the hands or conveniently applied to any desired part of the patient.

The variable resistance for the electrotherapeutic appliance may be contained within a usual cylindrical housing 20 which is mounted in casing 12 and which has an axially projecting operating shaft 21 projecting outwardly beyond the casing 12. The strands of the annular coil 11 extend around the housing 20 and its projecting shaft 21, with the shaft preferably enclosed in an insulating bushing 22. When winding the coil 11 its strands may be wound around a core (not shown) extending radially through the annular coil and which is removed after the coil is wound so as to provide a radial opening through the coil in which the housing 20 and its projecting shaft 21 with its insulating bushing 22 are then inserted; and the strands of the coil are compressed snugly around the housing 20 and the bushing 22, as shown at Fig. 2, so as to maintain an approximately cylindrical cross-section of the electric coil at diametrically opposite points B—B which are in quadrature to the points A—A. The coil may thus be flattened out at the points A—A to produce the desired cross-sectional contour as shown at Fig. 3, with the casing 20 embedded in the coil adjacent one of the points B where a substantially circular cross-section is maintained. A knob 23 for adjusting the variable resistance is fixed on the projecting end of the shaft 21 at the exterior of casing 12, preferably by a set screw 23a.

The invention thus provides a convenient and compact therapeutic apparatus, which when the pins 18 are disengaged from sockets 17 provides an electric coil of usual construction adapted to be plugged into a usual current outlet box by means of cable 13, for use of the coil in usual manner, e. g. thermotherapeutic treatment, by applying it to the body of a patient. By inserting the pins 18 in the sockets 17 the electrodes 1 may be used for electrotherapeutic treatment, with the electric coil used or not at the same time, and with the electric coil providing a convenient means for connecting and supporting the electrotherapeutic appliance, and with any circuit which is completed through one or both of the electrodes, protected by the resistances which are provided in the respective wires leading to the electrodes.

I claim:

1. In combination, an electric coil adapted to be applied to the body of a patient, a contact plug adapted for quick-detachable connection to an outlet box for sinusoidal alternating electric current, conductors leading from the contact plug to the coil, a variable resistance mounted in the coil and comprising a resistor and a cooperating adjustable contact, an operating shaft for the adjustable contact projecting to the exterior of the coil, the resistor being shunted across the conductors, sockets at the exterior of the coil, conductors leading from the adjustable contact and from one terminal of the resistor to the respective sockets, a resistance in each of the last mentioned conductors, said resistances being mounted in the coil, pins adapted for quick-detachable engagement with the sockets, conductors leading from the respective pins, and an electrode connected to each of said last mentioned conductors.

2. In combination, an electric coil adapted to be applied to the body of a patient, means for connecting the coil in an electric circuit, a variable resistance mounted in the coil and connected to the electric circuit, conductors leading from the variable resistance and projecting outwardly beyond the coil, a resistance in each of the conductors, said resistances being mounted in the coil, and an electrode connected to each of the conductors.

3. In combination, an electric coil adapted to be applied to the body of a patient, means for connecting the coil in an electric circuit, a variable resistance mounted in the coil and connected to the electric circuit, conductors leading from the variable resistance and projecting outwardly beyond the coil, and an electrode connected to each of said conductors.

4. In combination, an electric coil adapted to be applied to the body of a patient, means for connecting the coil in an electric circuit, a variable resistance mounted in the coil and connected to the electric circuit, and means for completing a shunt circuit through the variable resistance and through a patient.

5. In combination, an electric coil adapted to be applied to the body of a patient, means for connecting the coil in an electric circuit, a variable resistance mounted in the coil and shunted across the electric circuit, means for completing a shunt circuit through the variable resistance and through a patient, and a resistance in said shunt circuit.

6. In combination, an electric coil adapted to be applied to a patient, an electric circuit supplying current to the coil, a pair of electrodes for electrotherapeutic treatment, and means for selectively connecting or disconnecting the elec-

trodes with the electric circuit, for use of the coil with or without the electrodes and for use of the electrodes with or without using the coil.

7. In combination, an electric coil comprising a coiled wire, a flexible casing enclosing the coiled wire, the enclosed coiled wire being flattened in cross-section at approximately diametrically opposite portions so as to increase its area of contact with any surface upon which it rests, the enclosed coiled wire being substantially circular in cross-section at approximately diametrically opposite portions which are approximately at right angles to its flattened portions, conductors for the electric coil projecting to the exterior of the enclosed coiled wire, a variable resistance for the electric coil, a housing for the variable resistance and a bushing projecting therefrom, the housing and bushing being embedded between strands of the coiled wire at one of those portions of the enclosed coiled wire which is substantially circular in cross-section, with the bushing extending to the flexible casing, an operating shaft for the variable resistance projecting from the housing through the bushing to the exterior of the enclosed coiled wire, the variable resistance comprising a resistor and a cooperating adjustable contact mounted within the housing, the resistor being shunted across the conductors, conductors leading from the adjustable contact and from one terminal of the resistor, the last mentioned conductors projecting to the exterior of the enclosed coiled wire, a resistance in each of said last mentioned conductors embedded between strands of the coiled wire, and an electrode connected to each of the last mentioned conductors at the exterior of the enclosed coiled wire.

8. Means for portably mounting an electric coil and a pair of electrodes for selective use, comprising a coiled wire forming an electric coil, conductors for the electric coil projecting to the exterior of the coiled wire, a variable resistance for the electric coil, a housing for the variable resistance embedded between strands of the coiled wire, an operating shaft for the variable resistance projecting from the housing to the exterior of the coiled wire, the variable resistance comprising a resistor and a cooperating adjustable contact mounted within the housing, the resistor being shunted across the conductors, conductors leading from the adjustable contact and from one terminal of the resistor, the last mentioned conductors projecting to the exterior of the coiled wire, a resistance in each of said last mentioned conductors embedded between strands of the coiled wire, and an electrode connected to each of the last mentioned conductors at the exterior of the coiled wire.

9. Means for portably mounting an electric coil and a pair of electrodes for selective use, comprising a coiled wire forming an electric coil, conductors for the electric coil projecting to the exterior of the coiled wire, a variable resistance for the electric coil, the variable resistance being embedded between strands of the coiled wire, means for operating the variable resistance projecting to the exterior of the coiled wire, the variable resistance being shunted across the conductors, conductors projecting from the variable resistance to the exterior of the coiled wire, a resistance in each of said last mentioned conductors embedded between strands of the coiled wire, and an electrode connected to each of the last mentioned conductors at the exterior of the coiled wire.

10. In combination, an electric coil adapted to be applied to the body of a patient, means for connecting the coil in an electric circuit, a variable resistance in the circuit, a pair of electrodes, conductors leading from the variable resistance to the respective electrodes, and a resistance in each of said conductors.

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