Oct. 20, 1959 R. REITER 2,909,178

APPARATUS FOR ELECTRIC SHOCK THERAPY

Filed May 8, 1956

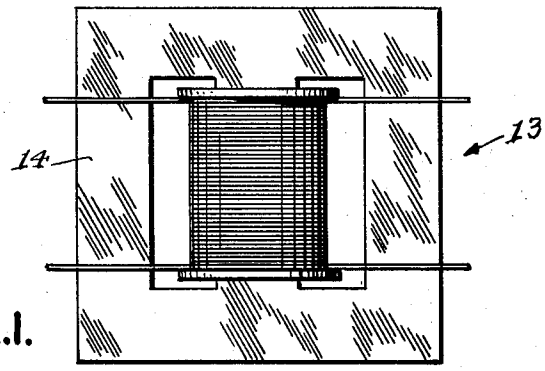


FIG.1.

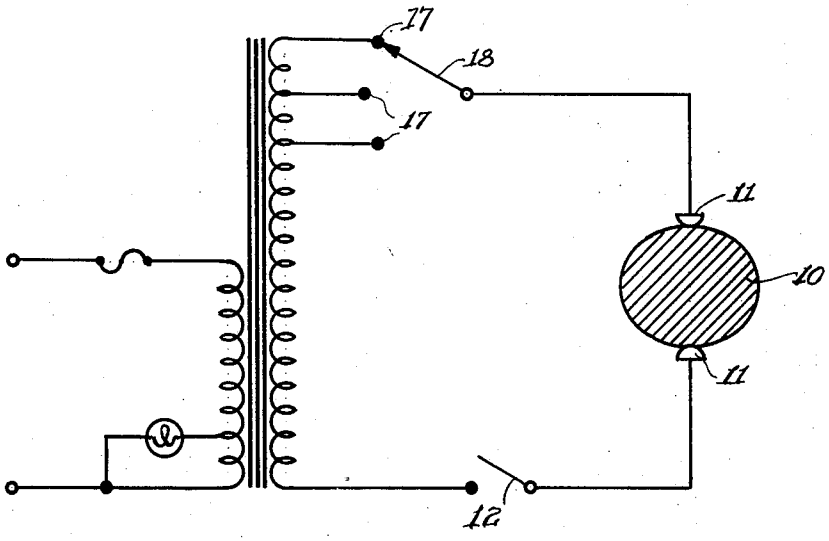


FIG.2.

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United States Patent Office 2,909,178
Patented Oct. 20, 1959

2,909,178

APPARATUS FOR ELECTRIC SHOCK THERAPY

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Application May 8, 1956, Serial No. 583,589
1 Claim. (Cl. 128—419)

This invention relates to an electric shock treatment machine utilizing alternating current as its source of power and as its output.

The invention consists in applying maximum voltage at the initial instant of pressing the treatment switch, maintaining it for a matter of very few milli-seconds, and then automatically reducing it to approximately half the value of the original applied voltage. To recapitulate, the initial voltage applied to the patient on closing the treatment switch is relatively high for a matter of milliseconds, and then reduces to a relatively low value, approximately half the original value, automatically.

Referring to the drawings which are for illustrative purposes only:

Fig. 1 is a plan view of a transformer used with the present invention.

Fig. 2 is a schematic diagram of the apparatus employed.

The automatic feature of the invention is solely a matter of circuitry and design. The transformer in use, for example, is rated to operate from the ordinary 115 v. A.C. line or household outlet. The secondary of the transformer has a number of taps **17** and an adjustable arm **18**. The present preferred arrangement uses a maximum secondary open circuit voltage of 195 v., known as our high position, a second tap that provides 180 v. open circuit, known as the medium position, and a third tap supplying 165 v. open circuit, known as the low position. When this open circuit voltage is applied to a normal load, in this case the patient's head **10**, in series with typical electrodes **11** of sponge material, the closed circuit voltage drops to 100 v. on the high position, 95 v. in the medium position and 92 v. in the low position, approximately. The approximate statement is due to the fact that the secondary closed circuit resistance is dependent on a number of additional parameters, but the figures given are substantially correct. The additional parameters on which the secondary closed circuit voltage and current will depend are the nature of the surface contact between the sponge electrode and the skin of the patient, the degree of greasiness of the patient's skin, and the extent to which the grease has been pushed aside on application of the electrodes.

This system of treatment has been found to be most valuable in practice, more valuable than all other methods for use with alternating current in treatment, because the control consists of merely pressing the treatment switch button **12** which may be connected in series with the secondary of the transformer, and holding it down as long as is necessary to insure adequate and full treatment without the usual former danger of overheating or applying too heavy a treatment voltage and current. As a result, it has been found that patients treated with this instrument are less confused, more quickly awakened from the treatment, and less likely to suffer from bad breathing.

The design of this unit centers about a very small transformer **13**; in fact, the transformer is the entire design.

This transformer which preferably, though not necessarily of the shell type, has been designed to have relatively small iron cross-section, and consequently, relatively high copper resistance in both the primary and the secondary coils of the transformer. In fact, the primary and secondary inductance have purposely been made extra large by incorporating many turns of very small wire in both the primary and the secondary. As a result of this unusual large number of turns of wire, the inductance of both the primary and the secondary coils is relatively very high.

With the high equivalent inductance of the transformer considered in series with the patient's load circuit, the initial transient on closing the circuit is slightly prolonged, so that the initial voltage appearing across the secondary, on the load, transmits the high open circuit voltage of the secondary of the transformer, and then quickly drops within milli-seconds to the closed circuit voltage previously enumerated.

The result of this circuitry is to provide an instantaneous high voltage on closing the treatment switch in series with one of the windings of the transformer, and very quickly thereafter the voltage and current decay to a very low relative value of voltage and current as enumerated previously. This design has been found of superior desirability in practice.

The design may roughly consist in a shell type iron core **14** of approximately ⅞" x ⅞" cross section, and having a relatively small coil of approximately 900 turns of #30 wire in the primary and 1500 turns of #32 wire in the secondary. It is recognized that this transformer design is not consistent with normal transformer design practice because of its relatively high primary and secondary resistance and inductance, relatively large number of turns, and relatively low efficiency for energy transferred from the primary to secondary. However, this design is ideal for our purpose. The large number of turns provide a relatively large initial magnetic field on which to draw energy at the initial instant of closing the push button treatment switch **12**. The large stored initial open circuit energy (the magnetic energy in the core of the transformer) rapidly decays because of the relatively low resistance load which the patient's head **10** presents to the secondary of the transformer. This stored energy is available for only a very short time on closing the treatment circuit which applies load to the secondary of the transformer. Thus there is an initial surge of voltage to the patient which rapidly drops within milli-seconds to approximately half the initial open circuit voltage. The final division of voltage is in large measure dependent upon the relative resistance of the patient as compared to the impedance (combined inductance and resistance) of the transformer. Therefore, it is not always precisely the same, but is dependent on the type of contact made with the patient's head to some degree. For this reason, we have avoided making exact statements of voltage and current.

A high inductance design is used for both primary and secondary windings of the transformer in order to have a high equivalent series inductance, which, in series with the equivalent series resistance of the transformer and of the patient, will give a time constant of magnetic decay.

The transformer serves the purposes of

(*a*) Isolating the patient from house current,
(*b*) Giving a high secondary voltage adequate for the treatment, and
(*c*) Giving a high equivalent series inductance in series with the combined equivalent resistance of the entire transformer and of the patient.

The third element, namely the inductance in series with

the resistance serves to give us the discharge time of approximately milli-seconds which is desirable for initiating the treatment, so that the initial high voltage and current, decay to the low operating value of the transformer output, which is desirable for finishing off the treatment with comfort and safety for doctor and patient.

What I claim as my invention is:

Apparatus for electric shock therapy of a human animal comprising a shell type transformer having a primary winding of on the order of 900 turns of #30 wire and a secondary winding of on the order of 1500 turns of #32 wire wound on a ⅞ inch by ⅞ inch laminated iron core, means for connecting said primary winding to a source of alternating current, a pair of contact electrodes for application to the human animal, a switch, means for connecting said switch and electrodes in series across said secondary winding for applying alternating voltage to said electrodes upon closure of said switch, the relationship of the windings to the core being such that the core operates at or near saturated flux density and the windings have both high inductance and resistance so as to provide an open circuit-to-full load voltage characteristic which decreases over an initial period of at least one or more milliseconds such that when said source of alternating current has a voltage of about 115 volts, the secondary winding voltage varies from about 190 volts at no load to about 97 volts under load, and a pair of taps on said secondary winding selectable for providing a no load-to-full load output varying from about 180 volts to about 94 volts and from about 160 volts to about 91 volts, respectively.

References Cited in the file of this patent

UNITED STATES PATENTS

1,667,451 Arnberg ---------- Apr. 24, 1928

OTHER REFERENCES

British Journal of Physical Medicine and Industrial Hygiene, January–February, 1946, pp. 8 and 9. 128–419.2. (Copy in Library.)