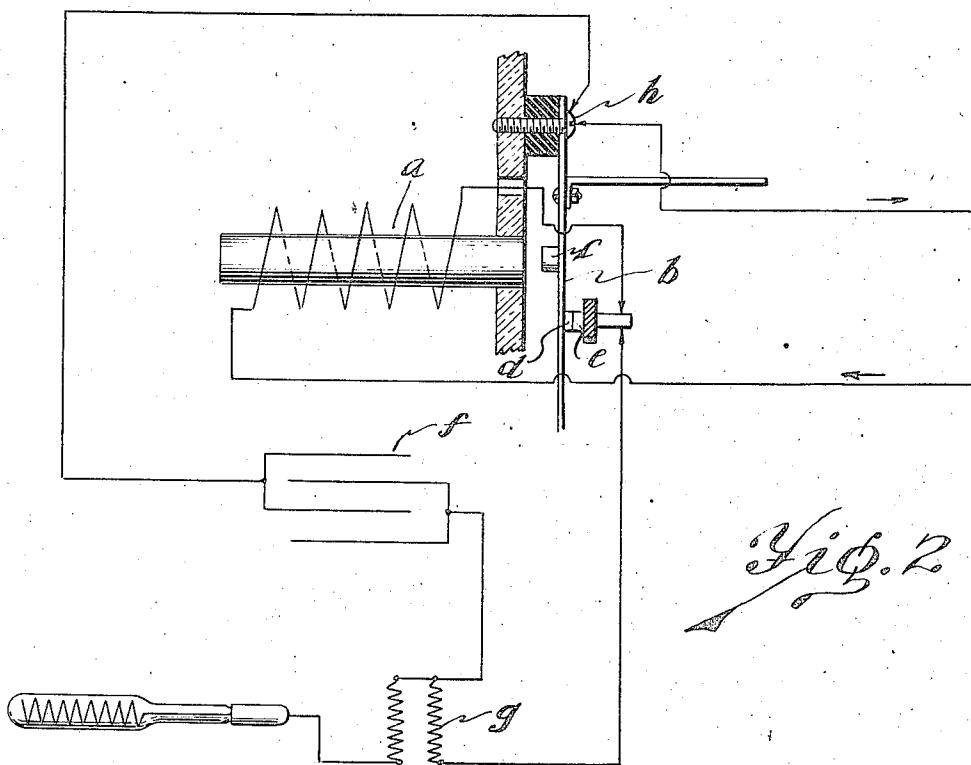
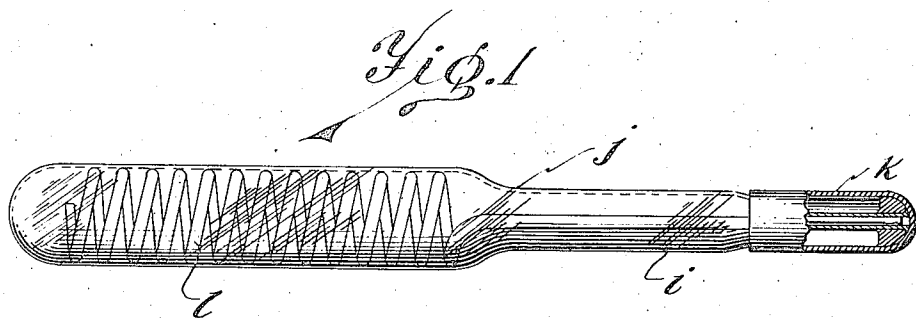


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ELECTRODE.
APPLICATION FILED NOV. 5, 1919.

1,390,429.

Patented Sept. 13, 1921.



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ELECTRODE.

1,390,429.

Specification of Letters Patent. Patented Sept. 13, 1921.

Application filed November 5, 1919. Serial No. 335,881.

To all whom it may concern:

Be it known that I, JOSEPH STANLEY CAPE, a subject of the King of Great Britain, residing at Detroit, in the county of Wayne, and State of Michigan, have invented certain new and useful Improvements in Electrodes, of which the following is a specification.

This invention relates to electrodes for electro-therapeutic apparatus. Heretofore it has been customary in the so-called "violet ray" machines, which are high frequency machines, to use either a glass vacuum electrode or else a metal electrode. The glass vacuum electrode does very well but cuts down the strength of the current almost one-half, due to the resistance of the rarefied air which acts as a conductor. Hence when it is desired to obtain the full effects of the current it has been customary to use a metal electrode. This metal electrode is satisfactory except where a patient becomes grounded, in which case he is very liable to get a severe shock.

It is the object of the present invention to afford an electrode which has practically all the advantages of the metal electrode and at the same time affords complete immunity against undue shocks from grounding of the primary current through the body. This will be explained more in detail after the apparatus has been described.

In the drawings,—

Figure 1 is an elevation partly in section of the electrode.

Fig. 2 is a diagrammatic view showing the electrode in connection with the apparatus for transforming the current into a high voltage high frequency current.

The electro-therapeutic apparatus that is known as the "violet ray" machine is a machine provided with a magnet coil and core *a*, an interrupter arm *b*, an armature block *c*, an interrupter contact block *d*, a terminal contact block *e*, a condenser *f* and transformer *g*. As indicated by the diagram shown in Fig. 2, the ordinary current for domestic use can be used. The circuit runs around the magnet *a* and thence to the interrupter terminal contact block *e* and the binding post *h* in contact with the armature arm *b*. The condenser *f* is bridged across the interrupter gap by being connected at one end to the interrupter contact *e* and at the other end to the binding post *h*. The

condenser has the primary winding of the transformer *g* in series.

In a machine of this character the magnet *a* operates in the ordinary way to make and break the circuit at the interrupter gap. The condenser *f* being bridged across this gap, the current from the condenser is caused to surge back and forth across this gap, resulting in a current of very high frequency and high voltage. The transformer *g* serves to step this current up to a still higher voltage, resulting in a high frequency high voltage current, which is very well adapted for therapeutic use. When a vacuum glass electrode is used, this high frequency high voltage current induces a static charge on the outside of the glass electrode which will discharge into the body of the patient in the form of highly illuminated streaks or sparks that gives to the apparatus the name of "violet ray" machine.

It has been found in actual practice that with a vacuum glass electrode the current is cut down almost in half due to the resistance of the rarefied air in distributing the current throughout the interior of the electrode. Hence when it has been desirable to have the full effect of the current for the patient, it has been customary to use a metal electrode. With such an electrode practically the full effect of the current is secured and the results are satisfactory provided the patient does not become grounded. It will be noticed from the diagrammatic view shown in Fig. 2 that the secondary circuit of the transformed *g* is grounded in the primary circuit. This is the construction of practically all apparatus of this character. Hence when the patient accidentally touches any object that is grounded a connection is established directly from the primary circuit through the patient's body. He will then get a very serious shock due to the passage of a low frequency alternating or direct current from the primary circuit directly to ground through the patient's body, shorting the high frequency apparatus. It is the purpose of the present invention to afford an electrode which has practically all the advantages of a metal electrode but absolutely protects the patient from the dangers of grounding the current in the primary circuit.

To this end an electrode having a sealed glass tube *j* is provided. The interior of

this glass tube is highly rarefied so that it is substantially a vacuum. Within the tube is an aluminum wire *i* secured at one end to the metal cap *k* for the tube and at the other end forming a coil *l* substantially filling the bore of the tube. It is found in actual experiments that this electrode is practically the equivalent of the metal electrode for allowing the full strength of the high frequency high voltage current to be received by the patient for the coil lies closely contiguous to the inside wall of the glass tube and allows practically no gap between the conductor and the glass. On the other hand, the glass interposes a dielectric which affords a successful barrier to any flow of current from the primary circuit if the patient's body should become grounded.

It would not be absolutely necessary to use a vacuum tube, if the conductor abuts the glass all along the interior, but as this cannot be exactly realized except by metal coating the interior, it is much better to use a rarefied tube which very materially cuts down any gap between conductor and glass.

The essential feature of my invention is a metal conductor in place of a rarefied atmosphere as a conductor, and the conductor arranged for as great a distribution of the high frequency current over the interior of a dielectric body of the electrode as possible.

"Vacuum tube" is used in the specification and claims in a popular but slightly inaccurate sense of a rarefied atmosphere as no so called vacuum tube is an absolute vacuum.

What I claim is:

1. In a high frequency electro-therapeutic

apparatus, an electrode comprising a vacuum tube constructed of dielectric material and a conductor of aluminum forming a coil substantially filling and contacting the interior walls of the tube.

2. In a high frequency electro-therapeutic apparatus, an electrode comprising an exhausted dielectric body and a metallic coil therein closely following and substantially contacting the interior of the wall of the dielectric body.

3. In a high frequency electro-therapeutic apparatus, an electrode comprising a glass vacuum tube and a metallic coil therein lying contiguous to and substantially against the interior face of the glass wall.

4. In an electro-therapeutic apparatus, the combination of a primary circuit of a transformer, a secondary circuit of the transformer grounded in the primary, an electrode connected with the end of the secondary circuit and comprising a vacuum tube of dielectric material and a coiled conductor within the tube distributed over the interior face of the tube in close proximity therewith.

5. In an electro-therapeutic apparatus, the combination of a primary circuit of a transformer, a secondary circuit of the transformer grounded in the primary circuit, and an electrode connected with the end of the secondary circuit, comprising a vacuum tube constructed of dielectric material and a conductor coil contained within the vacuum tube and running along the interior face of the tube in substantial contact therewith.

In testimony whereof I affix my signature.

JOSEPH STANLEY CAPE,