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APPARATUS FOR ELECTROMEDICAL TREATMENT

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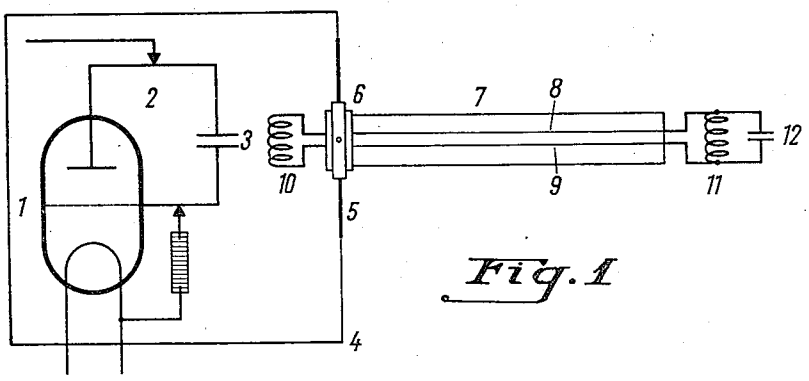

Fig. 1

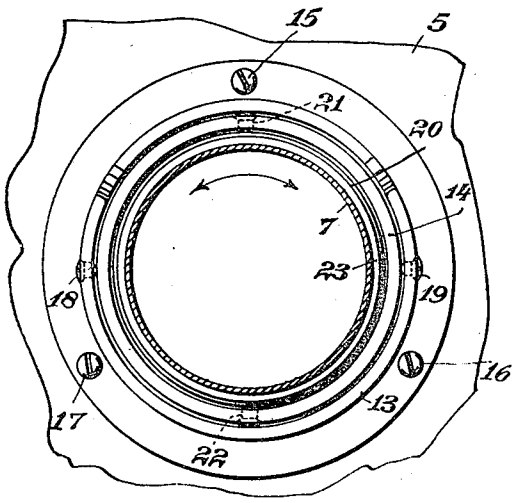

Fig. 2

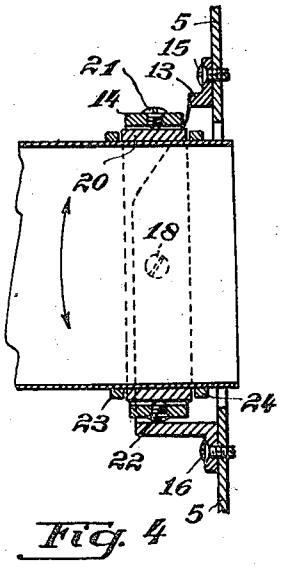

Fig. 4

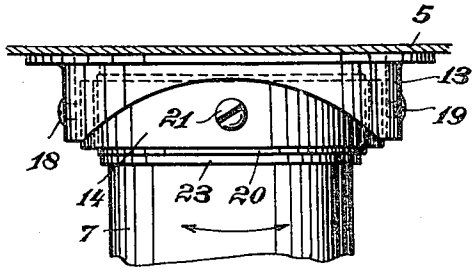

Fig. 3

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APPARATUS FOR ELECTROMEDICAL TREATMENT

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12 Claims. (Cl. 128—418)

The present invention relates to apparatus for electro-therapeutic treatment, and is particularly concerned with means for the application of medical treatment with electric oscillations.

It is well known that a treatment with very high frequencies may be accomplished in several ways. The subject to be treated can be exposed either to a magnetic high frequency alternating field or to a high frequency electric field. It is also possible to connect the subject to be treated in a galvanic circuit excited by high frequency oscillations. The fact that parts of the generator are under high tension, and the further fact that high frequency generators alter their frequency upon the moving of conducting parts, even upon moving the patient or responsive to the movement of the operator, are in all the above mentioned methods of great disadvantage for the proper operation of the equipment as well as for the subject to be treated and for the operator applying the treatment.

It has, therefore, been suggested to separate the generator from the treatment equipment proper, i. e., from the field electrodes in case of treatment in a condenser field, and to connect the same by means of a transmission system. It must be borne in mind, however, that such a transmission system must be one which is particularly adapted for the transmission of high frequency electric oscillations, that is to say, it must be a high-frequency-feed-line system. This is of utmost importance since the energy losses in the transmission system, relative to the generator, due to damping and to stray effects, are unbearably great in the case of ordinary transmission systems. In accordance with the terminology employed in the art of high frequency, the designation high-frequency-feed-line system is applied to a system characterized by the production of standing waves. The so-called Lecher conductors have been found particularly suitable for this type of transmission. It is possible, by means of such a transmission system, to transmit the energy of the high frequency generator almost free of losses and practically over any desirable distance.

However, the peculiarity of this transmission system requires a rigid connection of the treatment equipment proper with the generator. It is, therefore, necessary to approximate the position of the patient to the position of the treatment apparatus. This introduces complications which are removed by the present invention.

It is proposed, according to the invention, to provide means between the generator and the treatment equipment connected thereto over a high-frequency-feed-line system, which means will permit to approximate and to adjust the position of the treatment apparatus to the position and to the peculiarity of the subject to be treated.

This means is preferably represented by a joint secured at one end of the shell or housing enclosing the high-frequency-feed-line system. A Cardan or universal joint will be found suitable for this purpose since horizontal and vertical movements of the treatment apparatus proper relative to the generator will be sufficient in most cases for adjusting the treatment apparatus to the needs of the patient and operator.

In cases of equipment including an enclosed generator and a high-frequency-feed-line disposed within an envelope, this joint, i. e., a Cardan or universal joint as above mentioned, may be employed for providing the connection between the envelope of the transmission system and the housing of the generator.

The practical utility of the above described arrangement will be increased if provision is made for rotating the treatment equipment proper around the longitudinal axis of the high-frequency-feed-line system, in addition to the provisions for moving the same horizontally and also vertically. The mechanism which is disclosed in the present invention permits such movement, and the provision of the means disposed between the generator and the treatment equipment, for taking care of the above mentioned mobility of the treatment equipment is, therefore, to be considered a further object and characteristic of the invention. It may be remarked at this point that ball joints permit any desired motion of the corresponding parts relative to one another. However, they are unsuitable in the case of a feed line system which is enclosed within an envelope such as employed in the present case. The diameter of the envelope is usually so large that the use of suitable ball joints would entail either prohibitive cost in production or result in inaccurate operation. The novel method of securing the Cardan joint to the envelope of the high-frequency-feed-line system, disclosed herein, represents a further object and characteristic of the invention.

An embodiment of the invention is illustrated in the drawing in which

Figure 1 shows a total view of the means for applying medical or therapeutic treatment in a condenser field of electric oscillations of very high frequency, wherein the treatment equipment

proper (application condenser) is disposed at a distance from the generator, being connected thereto by means of a high-frequency-feed-line system with a joint interposed as mentioned previously;

Figure 2 is a partial view of the apparatus showing the joint in sectional front elevation on a larger scale;

Figure 3 is a plan of the joint; and

Figure 4 is a longitudinal section through the joint.

The generator is enclosed within the housing 4 and consists of a three electrode tube connected in a so-called three point circuit. In this circuit the three electrodes are connected with three points of an outer oscillating circuit formed, in the example shown, by a capacity 3 connected in parallel to the inner tube capacity with the leads to the condenser as inductance. Such an oscillating circuit is sufficient for producing the desired electric oscillations. The treatment apparatus proper is represented by the condenser 12. This condenser 12 may be formed of two metal electrodes covered with insulating material and arranged for application relative to the subject to be treated and suitably spaced therefrom. In the example illustrated, the treatment condenser 12 is bridged by an inductance 11 serving the purpose of adjusting the treatment apparatus to the frequency of the generator.

The transmission of the electrical oscillations from the generator to the treatment equipment takes place by way of a high-frequency-feed-line system comprising two Lecher conductors 8 and 9 enclosed within a metal envelope 7. The conductors 8 and 9 are coupled with the generator by means of a coupling coil 10. In carrying out the invention in practice, this coil which is shown by a plurality of windings, and also the inductances of the outer generator oscillating circuit, may be formed of a simple wire loop suitably secured near the outer generator circuit.

The metallic shell or envelope 7 is secured to the wall 5 of the generator housing 4 with the Cardan joint 6 interposed therebetween. This joint permits movement of the transmission system together with the treatment apparatus in horizontal and in vertical direction relative to the generator. The wires 8 and 9 must, of course, be conducted through the joint 6 in such a manner that the coupling coil 10 is not affected by the adjusting movements.

Referring to Figs. 2 to 4, which illustrate an embodiment of the Cardan joint 6 shown in Fig. 1 on a larger scale and in greater detail, it will be observed that the joint consists mainly of an outer ring 13 and an inner ring 14. The ring 13 terminates at one side in a flange mounted on the wall 5 of the generator box by screws 15, 16 and 17. The ring 14 is connected with the ring 13 by means of set-screws 18 and 19, so that it may be turned or rocked within the ring 13 in the directions of the arrows shown in Fig. 4. The ring 14 is journaled above a ring 20. This ring 20 is mounted in the ring 14 in a similar manner as the ring 14 in the ring 13, the only difference being that the screws 21 and 22, which hold the ring 20, are displaced by 90° in relation to the screws 18 and 19. The ring 20 is therefore capable of being rocked or angularly moved within the ring 14 in the directions indicated by the arrows in Fig. 3. The ring 20 is rotatable upon the tube 7 around the longitudinal axis of the tube. The tube 7 may thus be turned around its longitudinal axis independently of the movements of the Cardan joint, as indicated by the arrows in Fig. 2. Upon the tube 7 there are also rigidly mounted narrow rings 23 and 24, which serve for guiding the ring 20 mounted between them.

With a joint arrangement of the kind described it is possible to rotate the parts connected by the joint in relation to one another in addition to moving or rocking them in the usual manner as permitted by the Cardan joint, which feature we have found of particular importance in apparatus for electro-therapeutic treatment, because it is no longer necessary to adjust the subject to be treated according to the position of the treatment circuit in space.

What we claim as our invention and desire to protect by Letters Patent is:

1. In a system for applying medical treatment with electric oscillations of very high frequency, a generator, a metal housing therefor, treatment means disposed at a distance from said generator, line means for transmitting energy from said generator to said treatment means, a rigid metal envelope enclosing said line means, and a joint connecting said rigid envelope with said generator housing, said joint including means whereby said rigid envelope may be selectively rotated and angularly moved in a plurality of planes relative to said generator housing.

2. Apparatus for applying medical treatment with electric oscillations of very high frequency comprising, a generator, treatment electrodes including an application condenser disposed at a distance from said generator, an enclosed rigid high-frequency-feed-line system including an envelope for connecting said generator with said treatment electrodes, a joint disposed at one end of the envelope of said feed line system, means in said joint for moving said envelope in a plurality of planes, and means for rotating said envelope around its longitudinal axis.

3. Apparatus for applying medical treatment with electric oscillations comprising, a generator, treatment means disposed at a distance from said generator, a high-frequency-feed-line system for connecting said generator with said treatment means, a rigid envelope for enclosing said feed line system, a joint at one end of said envelope, said joint including means whereby said envelope and said treatment means may be moved in a plurality of planes relative to said generator, and ring means disposed between said joint and the end of said envelope, said ring means being rotatable upon said envelope for rotating said envelope and said treatment means relative to said generator.

4. Apparatus for applying medical treatment with electric oscillations comprising, in combination, a generator and a housing therefor, treatment means disposed at a distance from said generator and said housing, a rigid tubular envelope disposed between said housing and said treatment means, a joint at one end of said tubular envelope, said joint including means whereby said treatment means may be selectively moved vertically and horizontally relative to said generator and said housing, means in said joint for rotating said tubular envelope and said treatment means relative to said generator and said housing, and a high-frequency-feed-line system extending from said generator through said housing and through said rigid tubular envelope to said treatment means for transmitting electric energy from said generator to said treatment means.

5. An apparatus of the class described, for applying medical high frequency treatment comprising, in combination, a generator, angularly movable and rotatable treatment means disposed at a distance from said generator, a high-frequency-feed-line system including a rigid tubular envelope for connecting said generator with said treatment means, conductors extending from said generator through said rigid envelope to said treatment means, a joint at one end of said rigid envelope including means for moving said envelope and said treatment means vertically and horizontally relative to said generator, and means in said joint whereby said rigid envelope and of said treatment means may be rotated around its longitudinal axis.

6. In electro-medical apparatus, a source of high frequency current, a high-frequency-feed-line system, means for adjustably connecting one end of said feed line system to said source of current, said means including a joint whereby said feed line system may be moved vertically and horizontally and whereby said feed line system may be rotated in any vertical and horizontal position within the limits of adjustment, and treatment means connected to the other end of said feed line system at a distance from said generator.

7. A therapeutic system comprising, a high frequency generator, a housing therefor, a joint secured to said housing and a single unitary rigid metallic envelope projecting from said joint, said joint including means arranged to permit freedom of movement of said envelope relative to said housing, an application device secured to the free distant end of said envelope, and conductors disposed within said envelope and connecting said generator with said application device.

8. A therapeutic system comprising, a high frequency generator, a housing therefor, a joint secured to said housing and a single unitary rigid metallic envelope projecting from said joint, said joint including means arranged to permit freedom of movement of said envelope relative to said housing, an application device secured to the free distant end of said envelope, and conductors disposed within said envelope and connecting said generator with said application device, said conductors being disposed within said envelope in substantially unalterably fixed parallel position to one another.

9. A therapeutic system comprising, a high frequency generator, a housing therefor, a joint secured to said housing and a single unitary rigid metallic envelope projecting from said joint, said joint including means arranged to permit freedom of movement of said envelope relative to said housing, an application device secured to the free distant end of said envelope, and conductors disposed within said envelope and connecting said generator with said application device, said conductors being disposed within said envelope in substantially unalterable fixed parallel position to one another and forming a high frequency feed line system extending from said generator to said application device and arranged to transmit the predetermined high frequency oscillations thereof without alteration regardless of the position of said application device during the use thereof.

10. In a therapeutic system of the class described, a high frequency generator, an applicator disposed at a distance from said generator, and a high frequency feed line means for connecting said generator with said applicator arranged to transmit the oscillations of said generator substantially without distortion and without loss, said feed line means comprising, a metallic tube carrying said applicator at its free distant end and conductors disposed within said tube in parallel and in substantially fixed and rigid relation to each other, and a joint between said tube and said generator whereby said tube may be selectively rotated and angularly moved in a plurality of planes relative to said generator.

11. Therapeutic apparatus of the class described comprising, a generator arranged to produce oscillations of predetermined frequency, a housing for said generator, a metallic tube, a joint for connecting one end of said tube with said housing, said joint including means for rotating said tube around its longitudinal axis and means whereby said tube may be moved angularly relative to said housing, conductors disposed within said tube in parallel and in substantially fixed position relative to each other and relative to said tube for transmitting said oscillations of predetermined frequency substantially without distortion and without loss, and a treatment device disposed at the free distant end of said tube arranged to receive said oscillations.

12. A therapeutic apparatus comprising a generator, a distantly disposed applicator, conductor means for connecting said applicator with said generator, a substantially rigid envelope for enclosing said conductor means and a joint for connecting said envelope with said generator, said joint including means whereby said envelope may be selectively rotated and angularly moved in a plurality of planes relative to said generator.

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