July 4, 1933. F. M. ENDE 1,916,722

DIATHERMY

Filed June 15, 1931

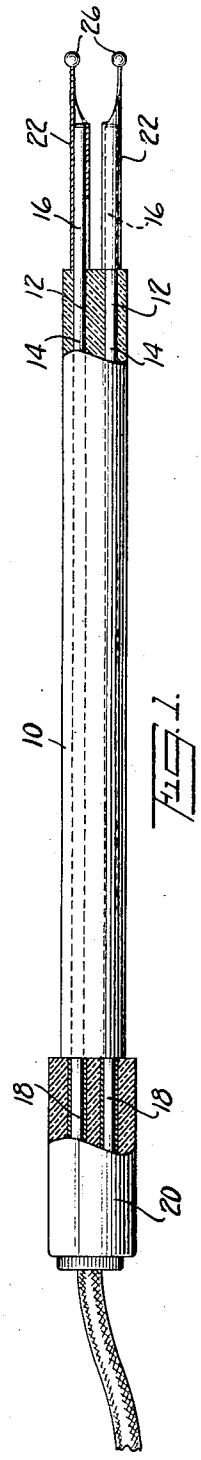

FIG. 1.

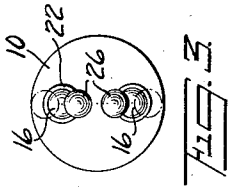

FIG. 3.

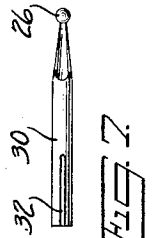

FIG. 7.

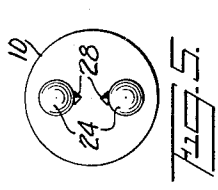

FIG. 5.

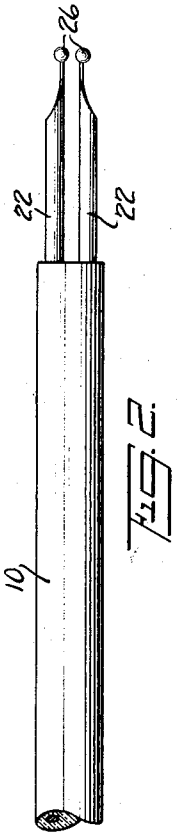

FIG. 2.

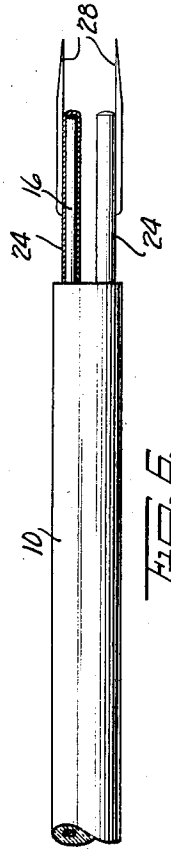

FIG. 6.

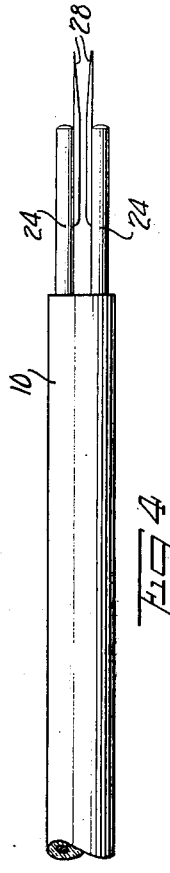

FIG. 4.

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UNITED STATES PATENT OFFICE

FRANK M. ENDE, OF LOS ANGELES, CALIFORNIA

DIATHERMY

Application filed June 15, 1931. Serial No. 544,491.

My invention relates to diathermy apparatus and particularly to improved adjustable electrodes for the local coagulation of tissue. The present invention is an improvement on the apparatus of my prior co-pending application Serial No. 275,154, filed May 4, 1928, which application matured into Patent No. 1,814,791, dated July 14, 1931.

In accordance with my said application a therapeutic apparatus is provided for destruction of tissue by high frequency current comprising bipolar electrodes together with means for supporting the same at a predetermined distance from each other, which distance is a small fractional part of an inch, so that such distance remains fixed during use, and with means for connecting up said electrodes to complete the output circuit of a source of high frequency electrical current through tissue intervening between and in contact with the electrodes, and which is provided with a non-conducting handle by which it may be manipulated.

With the apparatus of my said application the particular arrangement shown for securing adjustment of distance by the electrodes consisted in jack replacement, the several jacks provided being fitted with bipolar electrodes spaced apart at varying distance, and a particular jack being chosen for use having the desired electrode spacing.

This system is effective but is expensive and requires a number of extra parts and the spacing obtained is successive rather than finely calibrated.

According to the present invention I make either one, or both, of the electrodes adjustable, thereby eliminating need for a large number of jacks containing bipolar electrodes and securing more closely accurate adjustment of the distance between the electrodes. My invention further provides a device which is entirely sanitary, readily cleaned, and which is in no way injured by application thereto of sterilizing, disinfecting, etc., treatment.

In the drawing Figure 1, is a side view partly in section of a preferred form of apparatus.

Fig. 2 is a side elevation of the electrode end of the apparatus shown in Fig. 1 with the electrode tips in a differently adjusted position.

Fig. 3 is an enlarged plan end view of the apparatus of Figs. 1 and 2.

Fig. 4 is a side view similar to Figure 2 but with a different form of electrode tip.

Fig. 5 is an enlarged top or plan view of Fig. 4.

Fig. 6 is a view similar to Fig. 4 but with the tips in a position of differently predetermined adjustment.

Fig. 7 is a side view of one of the tips such as shown in Figures 1, 2 and 3.

The insulated handle 10 of porcelain or equivalent non-conducting material is provided with a pair of channel passages 12, 12, extending parallel to one another throughout its length, for receiving the non-corrosive conducting rods or heavy wires 14, 14 which are secured in place in the handle 10, as by being molded in place therein or by being inserted with a force fit in the passages 12, 12 or the handle 10. The rods or wires 12 project beyond each end of the handle 10 as indicated at 16, 16 and 18, 18 and these ends may be interchangeable if desired. On the shanks or extensions 18, 18 at one end are connected the two sides of the source of high frequency current, such connection being made, for example, by means of a jack 20.

The cylindrical rod ends 16, 16 receive the adjustable electrode tips such as 22, 22 and 24, 24. The tips shown at 22 are provided with terminal balls 26 adapted for surface application of the diathermy treatment, and the tips 24 are provided with needles 28, and the form of the tip ends may be variously modified according to the particular therapeutic application to be made. The balls, needles and the like are preferably eccentric to the longitudinal axes of the tips.

The several tips comprise hollow shank portions 30 of a size to have a forced fit on the cylindrical projecting shanks 16, and are preferably slitted at their base ends for a part of their length as indicated at 32, Fig. 7, to enable a spring clamping action to be obtained, so that when they are forced on the projecting cylindrical shanks 16 they can be

adjusted to any desired position by rotating them axially through a suitable angle, and in which position they will be rigidly retained and held during use. I have shown both tips of the pair adjustable and this is the preferred construction because of the simplicity and interchangeability so obtained, but, if desired, only one instead of both of the tips of the pair may be made adjustable.

The distance between the cylindrical shanks 16 is a small fraction of an inch and by reason of their eccentricity the distance between the electrode tips as balls 26, 26, can be varied from a minimum distance such as shown in Fig. 2, for example, where they are very close together, to such increased distance apart as may be required for the particular diathermy application.

It will be seen that the separable tips and the entire apparatus is highly simple, there is immediate access to all parts, and desired spacing can be obtained easily and accurately, and the apparatus and all its parts can be readily cleaned, sterilized and disinfected.

I claim:

1. Therapeutic apparatus for local application of high frequency electrical current to tissue comprising an insulating handle, conductors carried and insulated by said handle, and a pair of separate electrodes carried and supported by said conductors, certain of said electrodes being rotatable and having eccentric tip portions whereby upon rotation of the electrodes about the axes of the conductors to which they are attached the spacing between the electrodes may be varied.

2. Therapeutic apparatus for local application of high frequency electrical current to tissue comprising an insulating handle, conductors carried by said handle and insulated thereby, and separate electrodes electrically connected to said conductors and supported thereby in spaced relation to each other, said electrodes being connected to said conductors so as to be attachable and detachable and also relatively adjustable to vary the spacing therebetween.

In testimony whereof, I have signed my name hereto.

FRANK M. ENDE.