

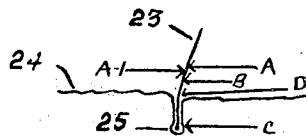
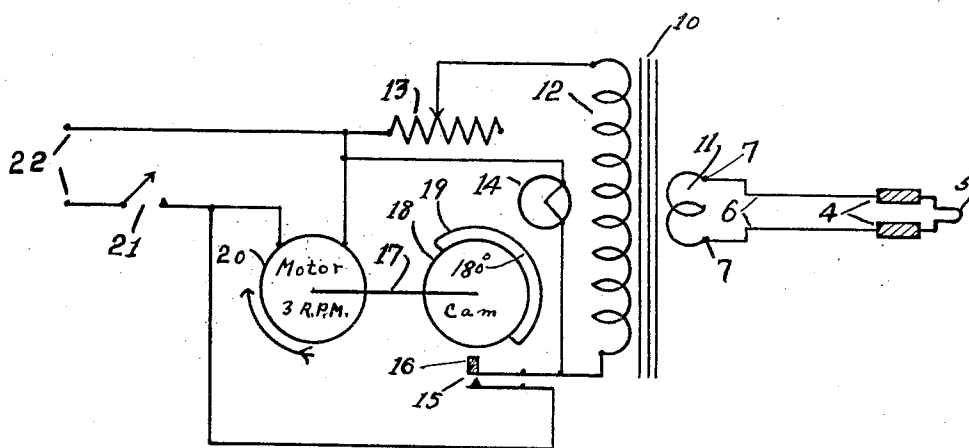
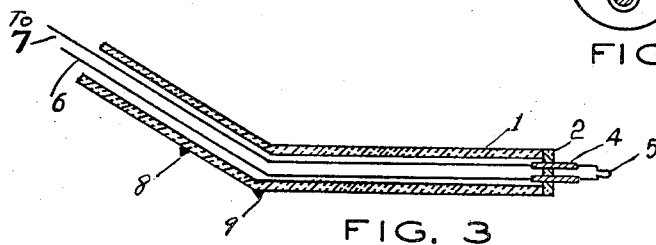
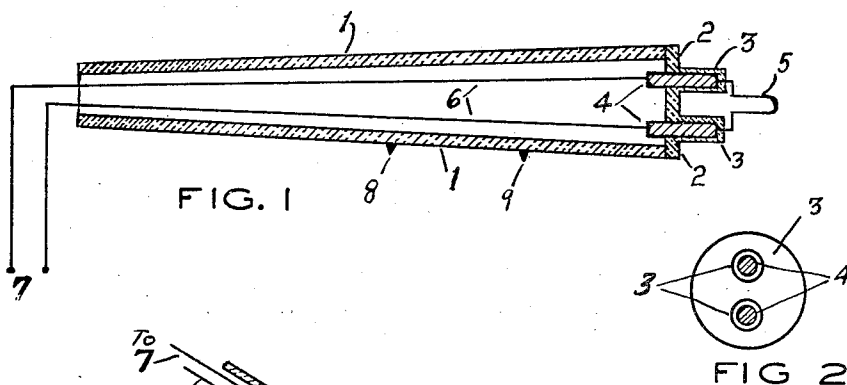
May 8, 1945.

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2,375,194

HAIR REMOVING ELECTRODE

Filed Aug. 14, 1942



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2,375,194

HAIR REMOVING ELECTRODE

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Application August 14, 1942, Serial No. 454,859

4 Claims. (Cl. 128—303.18)

This invention relates to a method of removing superfluous hair from the human anatomy, very similar to the method disclosed in my Patent Number 2,155,299, issued April 18, 1939, except that in the present invention a method is disclosed for removing superfluous hair which is superior in some respects to the method disclosed in the aforesaid patent. Specifically, this improvement is in the construction and method of operating the actual electrode used to remove the superfluous hair. In a broad sense, the method of hair removal is similar to that disclosed by my aforesaid patent, except for the improvement in electrode structure and operation disclosed herein, the improved electrode being designed and intended for use with the accessory items shown and described in my aforesaid patent, and reference should be made to this patent for a more complete understanding of this hair removing method.

Briefly, the present invention consists of a method of operating the hair removing electrode at a temperature approximating incandescence. I have discovered that hair removal may be carried out in a more satisfactory manner when the electrode used for such purpose is operated at a relatively high temperature, than would be the case if the electrode was operated at a relatively low temperature. In my aforesaid Patent Number 2,155,299, the electrode structure, as specifically illustrated by Figure 4 in said patent, does not readily lend itself to operation at high temperature.

The objects of this invention are:

First, to provide a method of removing superfluous hair by means of an electrode operated at a temperature approximating incandescence.

Second, to provide a method of operating a relatively small diameter electrode at a temperature approximating incandescence, without destruction of the electrode.

Third, to provide a method of operating a relatively small diameter electrode at a temperature approximating incandescence by alternately energizing and de-energizing such electrode.

Fourth, to provide a method of combining any or all of the objects above in a single device.

With such an electrode operated at a relatively low temperature, such as, for example 800 degrees C., the hair is singed off very near the point of contact with the electrode. As the temperature is raised, for example, to 1100 degrees C., the hair is destroyed for an appreciable distance beyond the point of contact with the electrode. As the

temperature is further raised, for example, to 1500 degrees C., which approximates incandescence, the hair is destroyed to a still greater length from the point of contact with the electrode, and in this case if the point of contact between the hair it is desired to remove and the electrode used for such removal is sufficiently close to the skin, such as, for example, a distance of $\frac{1}{8}$ inch, the hair will, in effect, ignite and be destroyed from said point of contact to the follicle. This result can only be obtained when the electrode is operated at an elevated temperature approximating incandescence.

The temperatures and distances mentioned in the foregoing paragraph are not intended to be absolute, it being understood that these values are mentioned for purposes of example only, and that any values giving satisfactory results may be used, it being further understood that such satisfactory results can only be obtained with an electrode operated at a relatively high temperature.

In order to successfully remove superfluous hair by means of a heated electrode, two practical requirements must be met: first, the total electrode area raised to an elevated temperature must be relatively small in order that the radiated heat shall not be sufficient to cause discomfort or an actual burn to the patient; second, the current in amperes used to energize such an electrode must be such that a relatively light connecting cord between the electrode and the source of electrical energy for such an electrode may be used.

I have found that an electrode having a diameter of .025 inches and a total length approximating $\frac{3}{4}$ inches, preferably of nichrome, or some similar high resistance wire, produces satisfactory results when this electrode is so mounted that only the center $\frac{1}{3}$ of its total length reaches the actual elevated temperature desired, the temperature of both ends being at a lower temperature due to heat loss through radiation and convection by reason of relatively large, low resistance contacts, as will be explained in detail further below. It is not intended that the electrode dimensions given immediately above must be adhered to in the practice of this invention, it being understood that these dimensions are given merely for purposes of example and as being representative of dimensions I have successfully used in actual practice. It is understood that other dimensions may be used successfully with properly adjusted operating conditions.

An electrode of the dimensions shown in the

example above can be brought to an incandescent temperature by the passage of a current on the order of 15 amperes. This current is considerably in excess of the normal rated current of nichrome wire of the size used in the example above. Nichrome wire having a diameter of .025 inch is normally rated to carry 6 amperes and becomes cherry red at this current. However, in this instance, it is desired to operate this electrode at a temperature approximating incandescence, which can be accomplished by the passage of 15 amperes. If this current of 15 amperes is passed continuously, the electrode will burn out within 30 to 60 seconds. However, if such an electrode is operated intermittently in such a manner that the electrode is alternately energized and de-energized, continued operation may be carried out.

In actual practice, I have found that with an electrode of the size given above, that a current of 15 amperes may be used with a duty cycle of 10 seconds "on" and 10 seconds "off," which provides incandescence at the electrode tip for a period of approximately six seconds out of each 10 seconds of the "on" period, 4 seconds being required to reach this elevated temperature. It is understood that the duty cycle of 10 seconds "on" and 10 seconds "off" is shown here merely by way of example and that a duty cycle of different timing may be used where other operating conditions vary from the example given, and that in the example given, that said duty cycle is not intended to represent absolute values but is merely representative of those values I have found to be satisfactory in actual practice.

The advantage of this intermittent electrode operation is readily apparent to those skilled in the art. It allows the use of a relatively small electrode operated at a relatively high temperature. Such a relatively small electrode could not be operated continuously at this relatively high temperature as fracture and destruction of the electrode would result. Operating the electrode at a temperature low enough that continued operation is possible does not provide sufficient heat to satisfactorily destroy superfluous hair in the desired manner. Use of a larger diameter electrode requires a much greater current, and this factor increases rapidly so as to make a larger size electrode impractical. For example, increasing the electrode diameter from .025 inch to .040 inch, a change of only .015 inch, requires a current of 25 amperes to reach a cherry red temperature, not high enough to be satisfactory for the purpose intended, and still higher currents are necessary to produce a temperature approximating incandescence.

It is obviously impractical to use an electrode diameter large enough that a temperature approximating incandescence may be obtained continuously for two reasons: first, the heat radiation would be too high for the use intended, and secondly, the current required would be on the order of 50 to 100 amperes, which would require a connecting cable so heavy as to render the use of such an electrode totally impractical.

This invention will be best understood from a consideration of the following detailed description in view of the accompanying drawing forming a part of the specifications; nevertheless, it is understood that the invention is not confined to the disclosure, being susceptible to such changes and modifications as define no material departure from the salient features of the inven-

tion as expressed in the appended claims. In the drawing:

Figure 1 shows one form of an electrode structure which may be used in the practice of this invention.

Figure 2 shows in cross section an end view of Figure 1.

Figure 3 is a longitudinal section of a modified form of the electrode shown in Fig. 1.

Figure 4 shows in schematic form a power supply which may be used as a source of energy for the electrode structures shown by Figures 1 and 3.

Figure 5 shows, in grossly exaggerated relationship, the amount of destruction of a single human hair caused by electrodes operated at various temperature levels.

Referring more specifically to Figure 1, which illustrates in cross section one form of electrode which may be used in the practice of this invention, where 1 represents the electrode handle which may be of bakelite, or other insulating heat resistant material, 2 represents the head section of handle 1, which may be of material similar or identical to that in handle 1 but preferably of a heat resistant ceramic material such as porcelain, 3 represents an extruded section of head 2 and is intended to be integral with head 2 although section 3 may be separate if so desired. The numeral 4 represents relatively heavy low resistance contact sections, preferably of copper while 5 represents the actual electrode, preferably of nichrome or other high resistance material, 6 represents the connecting wires, which are firmly attached to contacts 4 and connected to a source of energy 7. Points numbered 8 and 9 are merely intended to represent mounting points which may be used to mount the electrode structure in a manner described in detail in my aforementioned Patent Number 2,155,299, and reference should be made to this patent for further detail as to manner of mounting.

Referring now to Figure 2, a cross section of the head piece of the electrode of Figure 1 is shown, all reference numbers being the same as those in Figure 1, where 4 represents the low resistance contacts, 3 the insulating head resistant material surrounding said contacts and 2 represents the head piece section.

Referring now to Figure 3, a modification of the electrode structure of Figure 1 is shown, all reference numbers and other details being identical with Figure 1.

It is understood that the electrode structures illustrated by Figures 1, 2 and 3 are used here merely to illustrate the principle disclosed by this invention and that the design of such an electrode is not restricted to the examples illustrated by Figures 1, 2 and 3 and that such details of design as the electrode handle, head piece and other details may be modified as desired without departing from the methods and principles disclosed by this invention.

Referring now to Figure 4, one form of a power supply for use as a source of energy for the electrodes of Figures 1 and 3 is shown. In Figure 4, the electrode structure of Figures 1 and 3 is represented by the numerals 4, 5, 6 and 7, these designations being the same as those used in Figures 1, 2 and 3, where 7 represents the terminal ends of connecting cord 6. 10 represents a transformer having a primary 12 designed for use on regular line supply voltage and a secondary 11 designed to energize electrode tip 5 through connecting cord 6 and contacts 4. Assuming for purposes of ex-

ample that electrode 5 is a Nichrome wire with a diameter of .025 inch and an overall length of $\frac{3}{4}$ inch between the points of contact with contacts 4 and having a net resistance approximating .09 ohm, that connecting leads 6 are of No. 16 copper wire with a total length of 10 feet in both leads, and having a net resistance approximating .04 ohm, and that the total contact resistance through contacts 4 and all other contact resistance between secondary winding 11 and electrode tip 5 has a resistance approximating .07 ohm, then the overall resistance of the electrical circuit external to secondary winding 11 will approximate .02 ohm. Based on the foregoing assumption, secondary winding 11 must supply 45 volt amperes of energy, 3 volts at 15 amperes; a more practical design, for purposes of example, would be 4 volts at 20 amperes, with primary voltage adjusted to provide the exact value desired.

22 represents a source of line supply voltage for energizing motor 20, transformer 10 and pilot lamp 14. Rheostat 13 represents a primary voltage control on transformer 10 with a range sufficient to provide the variation desired at terminal 7 of secondary winding 11. Switch 21 closes the operating circuit to motor 20 which is a small reduction geared motor of any type desired having a speed of 3 R. P. M. and a direction of rotation as indicated by arrow. Shaft 17 of motor 20 is connected to cam 18 which has an extension 19 throughout 180 degrees of its total circumference, so that contacts 15 are held in the operated or closed position one-half a revolution of cam 18, during the time extension 19 exerts pressure on switch bushing 16. This represents a duty cycle of 10 seconds "on" and 10 seconds "off," so that transformer primary 12 and pilot lamp 14 are energized in accordance with this duty cycle, pilot lamp 14 being an optional feature used to indicate the actual start of each "on" cycle.

The schematic diagram of Figure 4 is used by way of example as one form of a power supply or source of energy that I have successfully used to energize an electrode of the type illustrated by Figures 1 and 2, where it is desirable that the operation be alternately "on" and "off" in a manner previously described. It is understood that many alternate methods of energizing such an electrode will occur to those skilled in the art and that such modifications may be used without departing from the method of operation disclosed by this invention.

Referring now to Figure 5, a grossly exaggerated version of a single human hair is represented, where 23 represents the single hair, 24 represents the cutaneous layer of skin and 25 the follicle of hair 23. The point designated by arrow A represents the point of contact between hair 23 and heated electrode 5 of Figures 1, 3 and 4. If electrode 5 is operated at a relatively low temperature, such as, for example, 800 degrees C., hair 23 will be singed off very close to the point of contact A, as represented by arrow A'. If, however, electrode 5 is operated at a reasonably elevated temperature, such as, for example, 1100 degrees C., hair 23 will be destroyed for some distance from point of contact A, the amount of destruction being represented in this case by arrow B. If electrode 5 is operated at a relatively high temperature, such as, for example, 1500 degrees C., then hair 23 will ignite and be destroyed for its total length between point of contact A and follicle 25, the destruction in this case being represented by arrow C. It is obvious

that a hair destroyed to point C will take longer to grow back to the point where it is visible above cutaneous layer 24 than would be the case if destruction occurs only to a point flush with cutaneous layer 24, as indicated by arrow D.

Destruction of hair in the manner described can only be accomplished when electrode 5 of Figures 1, 3 and 4 is operated at a relatively high temperature, approximating incandescence. Hair removal by this method may not be permanent and superfluous hair destroyed in the manner described may eventually grow sufficiently to be visible above the cutaneous layer of skin, but a substantial time would be required before such hair would again be visible to an objectionable degree.

While the foregoing description serves to illustrate the manner in which the objects of my invention may be carried out, nevertheless, it is understood that I do not desire my invention to be limited thereby but only by the scope of the following claims.

I claim:

1. The method of removing hair to a sub-cutaneous level from living skin tissue by an incandescent electric cautery including an electrode of high resistance wire of the order of .025" in diameter comprising intermittently heating the cautery to an incandescent temperature approximating 1500° C. by an electric current and deenergizing the cautery between successive heating periods to permit partial cooling thereof, and contacting the hair in close proximity to the skin with said cautery while it is incandescent.

2. The method of removing hair to a sub-cutaneous level from living skin tissue by an incandescent electric cautery including an electrode of high resistance wire of the order of .025" in diameter comprising intermittently heating the cautery to an incandescent temperature approximating 1500° C. by an electric current and deenergizing the cautery between successive heating periods to permit partial cooling thereof, and contacting the hair in close proximity to the skin while said cautery is incandescent, said heating and cooling periods being substantially equal and of the order of ten seconds each.

3. The method of removing hair to a sub-cutaneous level from living skin tissue by an incandescent electric cautery including an electrode of nichrome resistance wire of the order of .025" in diameter comprising intermittently heating the cautery to incandescence by an electric current in excess of 36 volt amperes and deenergizing the cautery between successive heating periods to permit partial cooling thereof, and contacting the hair in close proximity to the skin while said cautery is incandescent.

4. The method of removing hair to a sub-cutaneous level from living skin tissue by an incandescent cautery including an electrode of nichrome resistance wire of the order of .025" in diameter comprising intermittently heating the cautery to incandescence and to a temperature approximating 1500° C. by an electric current approximating 45 volt amperes and deenergizing the cautery between successive heating periods to permit partial cooling thereof and contacting the hair in close proximity to the skin while said cautery is incandescent, said heating and cooling periods being substantially equal and of the order of ten seconds each.

GRACE A. BROYLES.