

Nov. 15, 1938.

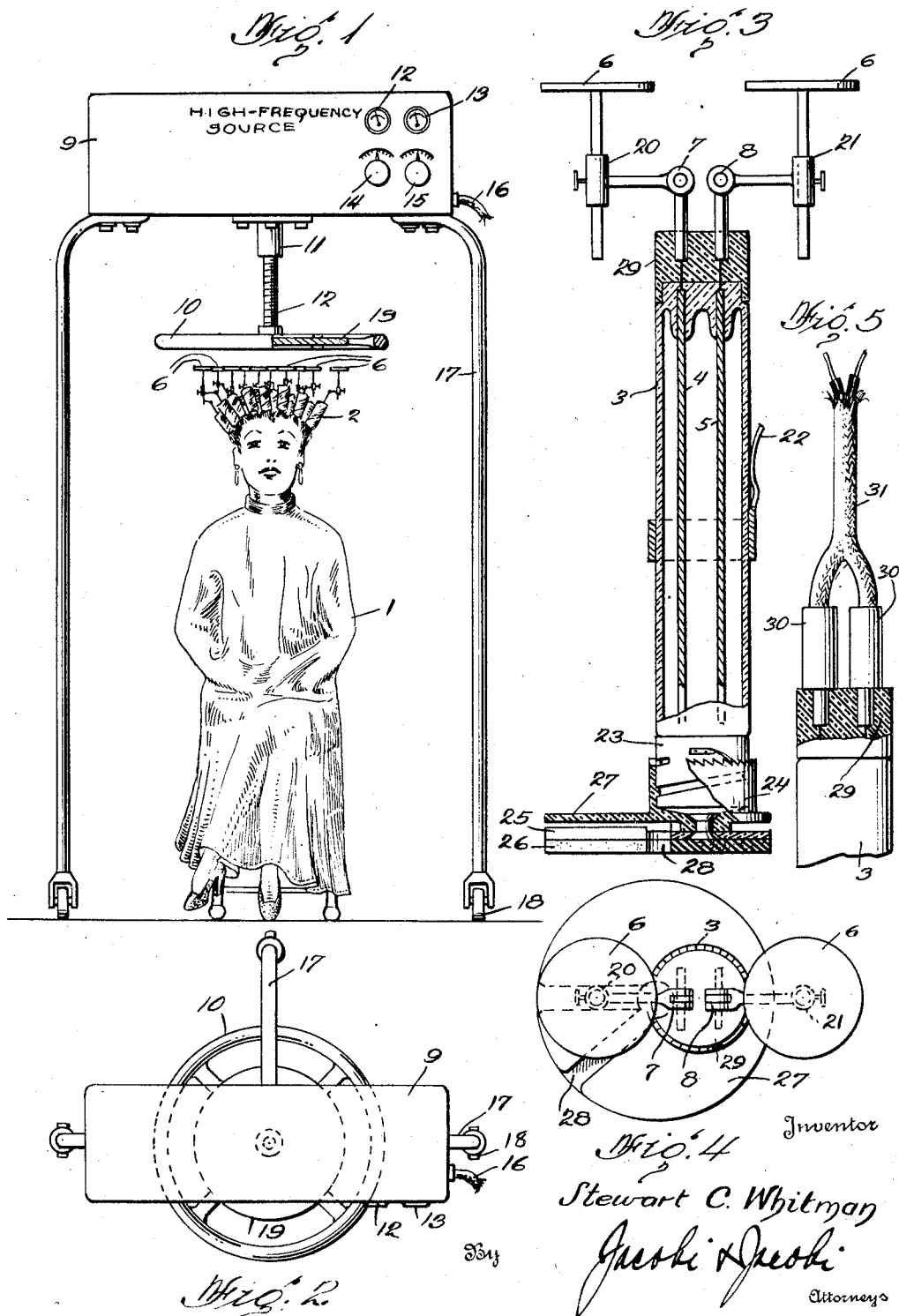
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ELECTRICAL DISCHARGE TUBE HAIR WAVING DEVICE

Filed Jan. 19, 1938

3 Sheets-Sheet 1



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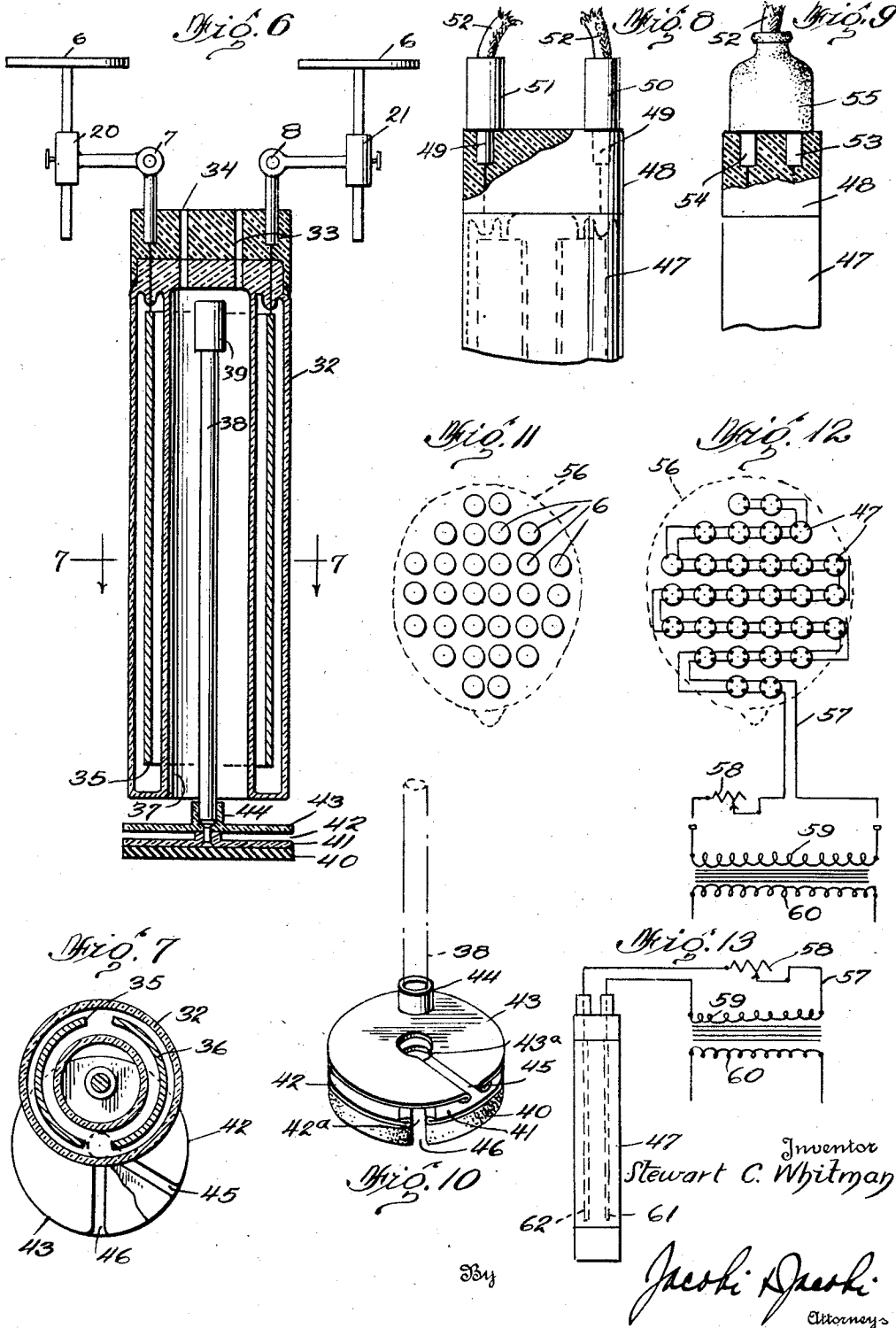
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3 Sheets-Sheet 2



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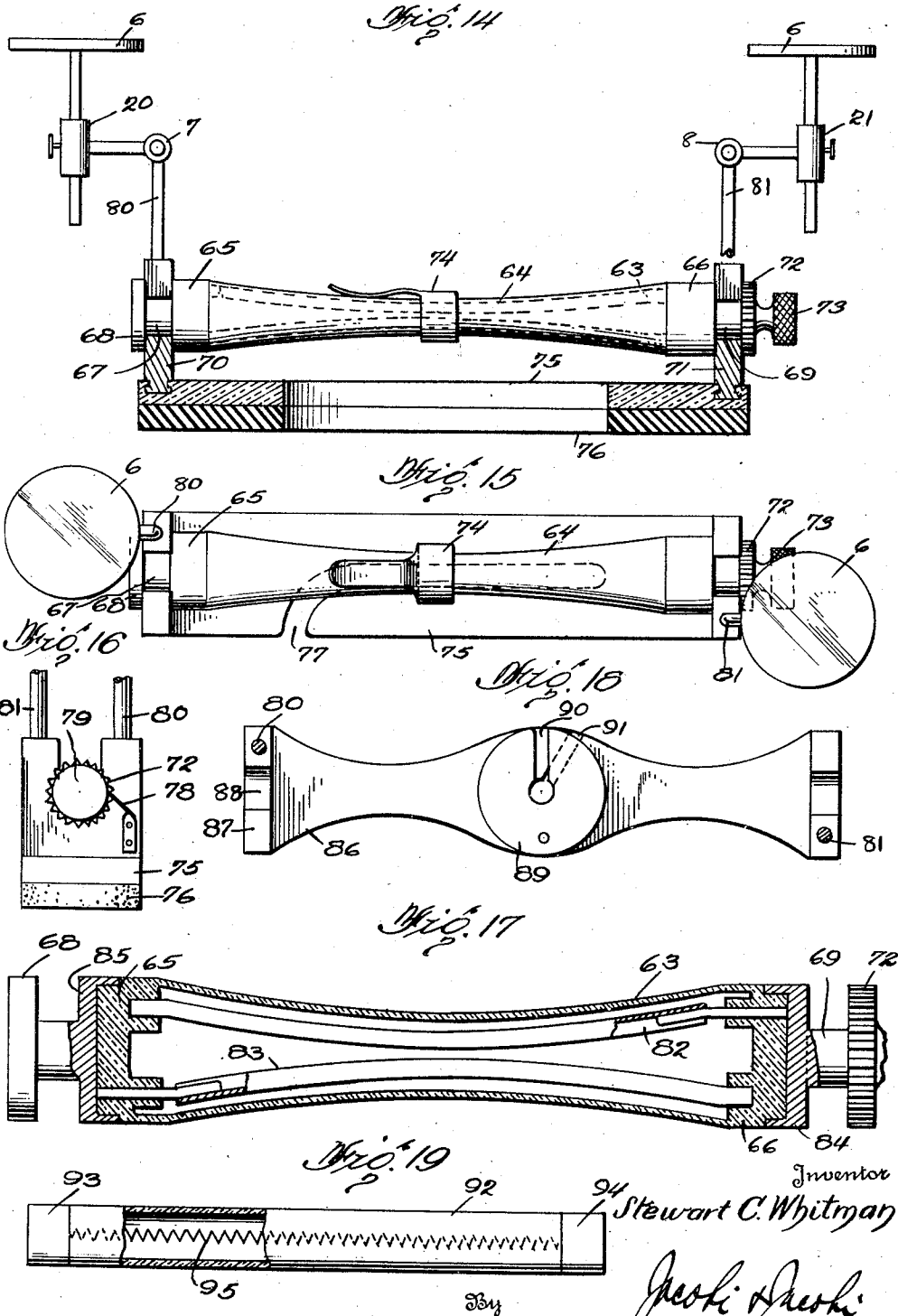
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ELECTRICAL DISCHARGE TUBE HAIR WAVING DEVICE

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UNITED STATES PATENT OFFICE

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ELECTRICAL DISCHARGE TUBE HAIR
WAVING DEVICE

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14 Claims. (Cl. 219-24)

My invention relates broadly to hair waving and curling apparatus and methods of the type wherein heat is utilized to lend permanency to the wave.

5 In the waving and curling of hair the general practice is to apply heat together with moisture or other treating medium to produce a wave that will be retained. Various methods of producing and applying such heat are known. The methods
10 heretofore employed have had certain inherent disadvantages, such as frequent burning of the scalp when the heating element should get slightly out of control, the non-uniform application of heat to different parts of the hair, the danger of
15 chemical burns in heating elements employing a chemically exothermic reaction, and the short life and frequent burn-outs of nichrome wire resistance elements often used.

20 An object of my invention is to provide a type of electrical gaseous discharge tube as a source of applied heat in the waving and curling of hair.

Another object of my invention is to provide hair waving apparatus having a gaseous discharge tube to which electrical energy is applied non-
25 conductively and capacitively.

A further object of my invention is to provide means for adjusting the application capacitively of electrical energy to gaseous discharge tubes employed for hair waving.

30 Still a further object of my invention is to provide a heating element for use in hair waving which is free from any danger of electrical short circuit adjacent the scalp, and free of danger of chemical burns of the scalp.

35 Yet another object of my invention is to provide a gaseous discharge tube having a central passage for receiving a mandrel wound with hair for the heating thereof.

40 A still further object of my invention is to provide a device which is simple and rugged in construction and dependable in operation, and which may be manufactured in quantities at low cost.

45 With these and numerous other objects in view, my invention consists in the novel features of construction, combination and arrangement of parts as will be hereinafter referred to and more particularly pointed out in the specification and claims.

50 My invention possesses marked advantages over devices heretofore employed for the purpose in view, in simplicity in operation and maintenance, as well as the elimination of risks of burns of the subject or operator, and has been found to be very satisfactory and dependable in every respect.

55 My invention will be understood by reference

to the following specification and the accompanying drawings wherein like characters of reference denote corresponding parts and wherein:

Figure 1 is a general assembled view in elevation of the gaseous discharge tubes and the high-
5 frequency electrical energizing means arranged for application to a subject;

Figure 2 is a top plan view of the assembled apparatus of Figure 1;

Figure 3 is a longitudinal sectional view of one
10 of the gaseous discharge tube heating elements with attached capacitive electrical energizing elements;

Figure 4 is a top plan view of the gaseous discharge tube element of Figure 3;

Figure 5 is a side elevation with parts broken away of a discharge tube element similar to that of Figure 3 but with plug-in conductive connections for conductive electrical energization;

Figure 6 shows a modified form of gaseous discharge tube having a longitudinal central pas-
20 sage for receiving a mandrel wound with hair and provided with capacitive energizing elements;

Figure 7 is a sectional view taken on the line
25 7-7 of Figure 6;

Figure 8 shows in side elevation with parts broken away the form of tube of Figure 6 with two separate plug-in connections adapted for conductive electrical energization;

Figure 9 shows in side elevation with parts broken away a gaseous discharge tube with a unitary
30 plug-in connecting means having two conducting elements and one plug for conductive energization;

Figure 10 is a perspective detail view of the
35 hair-lock element carried by the mandrel in the form of Figure 6;

Figure 11 is a diagrammatic top plan view of a multiplicity of tube elements of the form of Figure 6 with their capacity energizing elements
40 in position on a subject's head for capacitive electrical energization;

Figure 12 is a diagrammatic top plan view of a multiplicity of discharge tube heating elements interconnected by conductive connections to a
45 source of power;

Figure 13 is a circuit diagram of one of the discharge tube heating elements conductively connected to a transformer source of power;

Figure 14 is a side elevation with parts broken away of a further modification of my invention adapted for capacitive electrical energization wherein the discharge tube is removably mounted
55 on a base carrying the capacitive energizing ele-

ments and whereon the tube may be rotatably adjusted;

Figure 15 is a top plan view of the form of my invention shown in Figure 14 and adapted for producing large broad curls showing the slotted structure of the base;

Figure 16 is an end elevation of the form of my invention of Figure 14 showing the pawl and ratchet arrangement for maintaining the tube in fixed position after tightening the hair there-around;

Figure 17 is a longitudinal sectional view on an enlarged scale of the form of my invention of Figure 14 showing the electrode structure;

Figure 18 is a top plan view of the base structure of a base member suitable for employment with the form of tube shown in Figure 14 but provided with another form of hair locking device; and

Figure 19 shows a form of gaseous discharge tube which may be employed with my invention and is provided with a long continuous conductive filament which is connected to its terminal electrodes.

The electrical discharge tubes which I employ are filled with a suitable gas under relatively high pressure, such as a noble gas, for example a mixture of argon and mercury vapor. Under practical operating conditions, the discharge tubes which I employ generate a very considerable amount of heat, which is amply sufficient to impart permanency to the hair wave. The discharge tube may be formed by Pyrex, Corex-D, Vita glass, or lead and lime glasses of more usual type. The kind of glass and thickness of wall must be selected to withstand a considerable amount of heat.

Referring to the figures in detail, in Figure 1 the subject 1 to whose locks of hair generically represented by 2 a permanent wave is being imparted, is seated beneath a source of high-frequency electric energy and directly beneath a metal plate indicated at 19 and relatively close thereto. The locks of hair 2 are wound around electric gaseous discharge tubes 3, preferably of long tubular form and filled with a suitable noble gas at relatively high pressure as above set forth. The tube 3 is provided with suitable internal electrodes 4 and 5 which preferably extend lengthwise of the tube and have external connections to metallic universal joints 7 and 8 which by suitable arms respectively carry adjustable sleeve members 20 and 21. Flat capacity elements 6 are provided with mounting rods which adjustably slidably engage the bore in sleeve members 20 and 21 in which they may be fixed in position by a screw adjustment. The parts just mentioned are formed of metal or other electrical conductive material so that capacity area elements 6 are in electrical connection with the internal electrodes 4, 5. While I have here described a tube provided with two external capacity area elements, I wish it to be understood that my invention may be practiced by employing a single capacity area element, since the capacity of the subject to ground including that of the tube itself is sufficient to provide a return path.

The tube 3 is provided with a suitable clip 22 for retaining in position the lock or strand of hair after it has been wound around the tube. The tube 3 is provided with a base 23 formed of Bakelite or other suitable insulating material and is mounted in the socket 24 carried on a base having a Bakelite wafer 27 and a Bakelite plate

25 whereon is carried a disc 26 of rubber or felt to form a cushion against the head.

At 17 is shown a supporting framework within which the subject is seated. This framework may advantageously be made of chrome-nickel tubing and at the top forms a platform whereon is mounted a suitable source of high-frequency electric energy 9 provided with meters 12 and 13 which may be used for measuring respectively the oscillator current and the output plate current and with dial controls 14 and 15 for respectively controlling the oscillator current and the output plate current. A threaded sleeve 11 is mounted on the bottom of the casing of high-frequency source 9 and engageably carries a threaded shaft 12. At the lower end of shaft 12 there is carried the metal capacity area element 19, of considerable area as shown to extend somewhat beyond the contour of the head. An adjusting ring 10 of Bakelite or other suitable insulating material is carried by capacity area element 19 by spokes as shown or other suitable means, and this ring 10 may be grasped by the operator to effect a screw adjustment of the height of the capacity area element 19 without the operator receiving high-frequency voltage. A power lead 16 delivers electric power for energizing high-frequency source 9. Framework 17 is provided with casters 18 so that it may be readily moved.

As shown in Figure 1, it is desirable after the tubes 3 are in position on the head with the locks of hair wound therearound, to adjust the heights of the respective capacity area elements 6 so that they will be in substantially the same horizontal plane, which adjustment may be effected by adjustable sleeves 20 and 21. Also as shown in Figure 1, the capacity area element 19 should be lowered by the screw adjustment until relatively close to capacity area elements 6 so as to apply a strong high-frequency electric field for energizing capacity area elements 6.

In Figure 5 there is shown a form of the gaseous discharge tube 3 having upper base 29 provided with plug-in connections 30 and a power cable 31, which arrangement is intended for use with a low-frequency source of electrical energy such as from a transformer, instead of for actuation by a high-frequency source, thus providing a unitary structure. While such conductive energization of the discharge tubes 3 does not have all of the advantages of high-frequency energization capacitively as above set forth, nevertheless the employment of the electric discharge tubes of the type shown in Figure 5 with conductive energization has marked advantages over forms of hair-waving devices heretofore employed such as the use of nichrome wire resistance elements.

In Figure 6 I have shown a modified form of my invention having a long tubular gaseous discharge element provided with a central discharge passage 37 wherein an arbor or mandrel 38 having terminal portion 39 is positioned and whereon is wound a strand or lock of hair for insertion within the central passage 37. The gaseous discharge tube 32 therefore is of substantially annular cross section as shown in Figure 7, and has curved electrodes 35 and 36 which are connected through the upper base of insulating material 33 to universal joint 7 and capacity area elements 6. As shown in Figure 6, the central passage within tube 32 is closed at one end on which is fitted the upper base 33, but there are formed extending through the closed end of tube 32 and upper

base 33 the steam holes 34 through which steam or other gaseous products formed within the central passage by heat treatment may escape. Tube 32 may be about five inches long.

5 The mandrel 38 is provided with a hub portion 44 for mounting the mandrel on the head cushion. A Bakelite wafer is shown at 43 and is separated by space 42 from Bakelite plate 41 whereon is carried the rubber or felt cushion 40 which cushions against the head. This form of my invention shown in Figure 6 is very advantageous in producing a satisfactory wave quickly. Figure 7 shows a detail of the engaging and locking slot structure 45 and 46.

15 In Figure 8 there is shown an arrangement of the form of my invention of Figure 6 for conductive connection by two separate conductors to a source of low-frequency electric energy. The discharge tube 47 is provided with insulating base 48 and two separate plug-in connections 49 engaging conductor terminals 50 and 51 which are attached to two separate conductors 52.

In Figure 9 I have shown another arrangement of electric discharge tube having a unitary plug-connector for connection to a source of low-frequency electric energy. This discharge tube 47 is provided with insulating base 48 and with plug-in connectors 53 and 54 which engage the projections on unitary plug 55.

30 Figure 10 shows a detail of the hair locking arrangement carried at the outer end of the mandrel or arbor 38 of Figure 6 with its rubber cushion pad. A metal cup 44 is carried on the lower end of arbor 38. A Bakelite wafer is shown at 43 and is provided with a central aperture which is provided with metal edging 43a and also is provided with a radial slot 45. A second Bakelite wafer 41 is spacedly carried adjacent first Bakelite wafer 43 and is provided with radial slot 46 and carries a cushion pad 40 which may be formed of sponge, rubber or felt. As is well known in the art and not shown in detail in Figure 10, a ratchet adjustment is provided for maintaining the adjustment of mandrel 38 and the mounting portions carried thereon.

45 In Figure 11 there is shown a top plan view of the contour of a head 56 above which are mounted a multiplicity of the capacity area elements 6.

50 In Figure 12 there is shown a top plan view of a contour of a head 56 above which are mounted a multiplicity of the discharge tube elements 47 of the type shown in Figures 8 and 9, together with their conductive connections through conductors 57 and rheostat 58 to a transformer shown at 59, 60.

55 In Figure 13 there is shown a detail of the wiring diagram for the conductive connection of a single discharge tube 47 having electrodes 61 and 62 to the transformer source 59, 60, through conductor 57 and rheostat 58.

60 In Figure 14 there is shown a further modification of my invention wherein the electrical discharge tube whereon the hair is wound is mounted on a separate base. The discharge tube 63 has a central neck portion 64 and larger terminal portions 65 and 66 provided with shoulders 67 and 69, which engage slots in arms 70 and 71 carried on the mounting base. A disc 68 terminates shoulder 67. A ratchet 72 terminates shoulder 69 and carries knurled adjusting knob 73. The central neck portion of discharge tube 63 carries hair clip 74 for holding the lock or strand of hair in position after it is wound on the tube. The base plate 75 carries the metal mounting arms

70 and 71 and is formed of Bakelite or other suitable insulating material and on its bottom carries the cushion 76 which may be formed of sponge, rubber or felt. Metal rods 80 and 81 extend upwards from the metal arms 70 and 71, and are provided with universal joints 7 and 8 carrying sleeves 20 and 21 to support capacity area elements 6 in a manner generally similar to the capacity area element structure shown in Figures 3 and 6.

10 As shown particularly in Figure 15, the Bakelite base 75 is provided with a longitudinal curved slot 77 for receiving the hair, and this figure also shows the positioning of the capacity area elements 6 with reference to the base.

15 Figure 16 shows a detail of the end of the mounting base including ratchet mechanism 72 having ratchet wheel 79 and pawl 78.

20 Figure 17 shows on an enlarged scale details of the structure of the discharge tube 63 of Figure 14. The internally curved electrodes 82 and 83 are connected respectively to the two external metal base portions 84 and 85 through the terminal portions 65 and 66. The terminal piece 68 is also preferably formed of metal to make 25 a good contact with the arm 70.

In Figure 18 there is shown another form of base structure 86 for carrying the form of tube shown in Figure 14. This base has an enlarged central portion 89 provided with a slotted hair 30 lock arrangement shown at 90, 91, which gives a particularly advantageous positive lock.

35 Figure 19 shows a more simple form of electrical tube with high-resistance filament which may, however, be employed in my invention for producing the necessary heat. The long rugged tube 92 has insulated terminal contacts 93, 94, and has a longitudinal filament 95 of relatively high-resistance extending between terminals 93, 94. This tube may contain a filling of inert gas. A relatively heavy current is passed through the filament sufficient to generate considerable heat. The tube is preferably formed of a wall of appreciable thickness of a rugged glass but may be formed of other material. It will be understood that this form of tube may also be provided with a hair-retaining clip, like the other forms of tube, although the clip is not shown in Figure 19.

45 An advantageous arrangement is to place a suitable pad around the discharge tube heating element before the hair is wound therearound and then, after the hair has been wound around such pad on the heating element, a second pad may be wound to surround the hair and tie it 50 securely thereon.

55 In operation, in the form of my invention employing high-frequency electric energy, the high-frequency oscillator is energized and applies high-frequency electric energy to the energizing plate 19 above the subject. This plate 19 is positioned relatively close to the capacity area elements 6 which receive a considerable high-frequency energization. This high-frequency electric energy is transmitted from element 6 through the metallic connections of sleeve 20 and joint 7 to the internal electrodes such as 4 and 5 through the wall of discharge tube 3. After the hair has been wound around the tube or the mandrel, the position of capacity area elements 6 is adjusted to be in substantially the same horizontal plane by the screw sleeve adjustments. The position of energizing plate 19 with reference to the subject is adjusted to such a height as to avoid any unpleasant effect 75

on the subject but nevertheless to apply a strong high-frequency field to capacity area elements 6. The screw adjustment on shaft 12 permits adjustment of the apparatus for subjects of different heights. The hair is wound on the tube or mandrel and clipped thereon in the manner familiar in the art for other forms of devices and mandrels, the mandrel being locked in position by a ratchet arrangement. The voltage and frequency of the high-frequency generator are adjusted to suitable values.

In employing the form of my invention having conductive connections to a low-frequency source of power, the value of the voltage applied is adjusted by the rheostat or by adjustments of the relative positions of the transformer windings if a transformer is available having adjustably positioned windings. In employing this form of my invention, it is, of course, necessary to take more precautions than in employing the high-frequency form, since all of the connections carrying low-frequency energy must be very carefully insulated and spaced from the head.

In employing the form of my invention shown in Figure 6, it is important that the steam holes 34 be kept clear and open to provide for free egress of steam to avoid any possibility of sufficient accumulation of steam pressure within the passage of the tube to break the tube.

I have found that the form of gaseous discharge tube hair waving device which I have described has marked and important advantages over the devices heretofore used for this purpose in the art, particularly as to avoiding scalp burns. My device has been found to be simple and practicable in operation, requiring little maintenance, and not requiring the services of persons expert in electricity to maintain the apparatus in operation.

It will be manifest to those skilled in the art that my invention is susceptible of various embodiments other than those hereinabove specifically described, and all such embodiments and modifications which fall within the scope of the appended claims I consider to be comprehended within the spirit of my invention.

Having thus described the invention what is claimed is:

1. In a hair curling and waving device, a gaseous electrical discharge tube adapted for the winding of hair thereon, means carried by said tube for retaining hair wound thereon, electrodes carried on said tube for applying a voltage to the gas filling thereof, external connections for said electrodes respectively, an electrical capacity area element terminating each of said external connections, and a source of electrical energy positioned adjacent to but spaced from said capacity area elements and adapted to capacitively energize said capacity area elements.

2. In a hair curling and waving device, a gaseous electrical discharge tube adapted for the winding of hair thereon, means carried by said tube for retaining hair wound thereon, electrodes carried on said tube for applying a voltage to the gas filling thereof, external connections for said electrodes respectively, an electrical capacity area element terminating each of said external connections, and a source of high-frequency electrical energy positioned adjacent to but spaced from said capacity area elements and adapted to capacitively energize said capacity area elements.

3. In a hair curling and waving device, a gaseous electrical discharge element of tubular form having a central passage open at one end of said element and adapted to receive a mandrel, the opposite end of said tube being closed across said passage, electrodes in said discharge element, said element being provided with relatively small apertures extending from said passage to outside said element, and means for supplying electrical energy to said electrodes.

4. In a hair curling and waving device, a gaseous electrical discharge tube adapted for the winding of hair thereon, means carried by said tube for retaining hair wound thereon, electrodes carried on said tube for applying a voltage to the gas filling thereof, external connections for said electrodes respectively, an electrical capacity area element for each of said external connections, adjustable means for adjustably mounting said capacity area elements on said connections respectively, and a source of electrical energy positioned adjacent to but spaced from said capacity area elements and adapted to capacitively electrically energize said capacity area elements.

5. In a hair curling and waving device, a gaseous electrical discharge tube adapted for the winding of hair thereon, means carried by said tube for retaining hair wound thereon, a base member rotatably carrying said tube, cooperating means carried by said tube and by said base member for adjusting the rotated position of said tube on said base member, electrodes carried on said tube for applying a voltage to the gas filling thereof, external connections for said electrodes respectively, an electrical capacity area element terminating each of said external connections, and a source of electrical energy positioned adjacent to but spaced from said capacity area elements and adapted to capacitively electrically energize said capacity area elements.

6. In a hair curling and waving device, a gaseous electrical discharge tube adapted for the winding of hair thereon, means carried by said tube for retaining hair wound thereon, electrodes carried on said tube for applying a voltage to the gas filling thereof, external connections for said electrodes respectively, an electrical capacity area element terminating each of said external connections, an electrically conducting plate mounted relatively close to but spaced from said capacity area element and in capacitive relation thereto, and a generator of high-frequency electrical energy connected to said plate for applying high-frequency energy thereto.

7. In a hair curling and waving device, a gaseous electrical discharge tube adapted for the winding of hair thereon, means carried by said tube for retaining hair wound thereon, electrodes carried on said tube applying voltage to the gas filling thereof, external connections for said electrodes respectively, an electrical capacity area element terminating each of said external connections, an electrically conducting plate mounted relatively close to but spaced from said capacity area element and in capacitive relation thereto, adjusting means for adjusting the position of said plate with reference to said capacity area element, and a generator of high-frequency electrical energy connected to said plate for applying high-frequency energy thereto.

8. In a hair curling and waving device, a gaseous electrical discharge tube adapted for the application of hair thereto, means cooperating with

said tube for retaining hair applied thereto, electrodes carried on said tube for applying a voltage to the gas filling thereof, external connections for said electrodes respectively, an electrical capacity area element terminating each of said external connections, and a source of electrical energy positioned adjacent to but spaced from said capacity area elements and adapted to capacitively electrically energize said capacity area elements.

9. In a hair curling and waving device, a gaseous electrical discharge tube adapted for the application of hair thereto, means cooperating with said tube for retaining hair applied thereto, electrodes carried on said tube for applying a voltage to the gas filling thereof, external connections for said electrodes respectively, an electrical capacity area element terminating each of said external connections, and a source of high-frequency electrical energy positioned adjacent to but spaced from said capacity area elements and adapted to capacitively electrically energize said capacity area elements.

10. In a hair curling and waving device, a gaseous electrical discharge element of tubular form having a central passage open at one end of said element, the opposite end of said tube being closed across said passage, a mandrel adapted for the winding of hair thereon and insertable with said hair wound thereon in said passage for maintaining said hair in contact with the inner surface of said tubular element, electrodes in said discharge element, said element being provided with relatively small apertures extending from said passage to outside said element, and means for supplying electrical energy to said electrodes.

11. In a hair curling and waving device, a gaseous electrical discharge element of tubular form having a central passage open at one end of said element, the opposite end of said tube being closed across said passage, a mandrel adapted for the winding of hair thereon and insertable with said hair wound thereon in said passage for maintaining said hair in contact with the inner surface of said tubular element, electrodes carried on said tube for applying a voltage to the gas filling thereof, external connections for said electrodes respectively, an electrical capacity area

element terminating each of said external connections, and a source of electrical energy positioned adjacent to but spaced from said capacity area elements and adapted to capacitively electrically energize said capacity area elements.

12. In a hair curling and waving device, a gaseous electrical discharge element of tubular form having a central passage open at one end of said element, the opposite end of said tube being closed across said passage, a mandrel adapted for the winding of hair thereon and insertable with said hair wound thereon in said passage for maintaining said hair in contact with the inner surface of said tubular element, electrodes carried on said tube for applying a voltage to the gas filling thereof, external connections for said electrodes respectively, an electrical capacity area element terminating each of said external connections, and a source of high-frequency electrical energy positioned adjacent to but spaced from said capacity area elements and adapted to capacitively electrically energize said capacity area elements.

13. In a hair curling and waving device, a long electrical discharge tube adapted for the application of hair thereto, means cooperating with said tube for retaining hair applied thereto, electrodes in said tube, a long high-resistance filament extending within said tube between said electrodes, said tube having a gas filling, and means for supplying electrical energy to said electrodes.

14. In a hair curling and waving device, a long electrical discharge tube adapted for the application of hair thereto, means cooperating with said tube for retaining hair applied thereto, electrodes in said tube, a long high-resistance filament extending within said tube between said electrodes, said tube having a gas filling, external connections for said electrodes respectively, an electrical capacity area element terminating each of said external connections, and a source of electrical energy positioned adjacent to but spaced from said capacity area elements and adapted to capacitively electrically energize said capacity area elements.

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