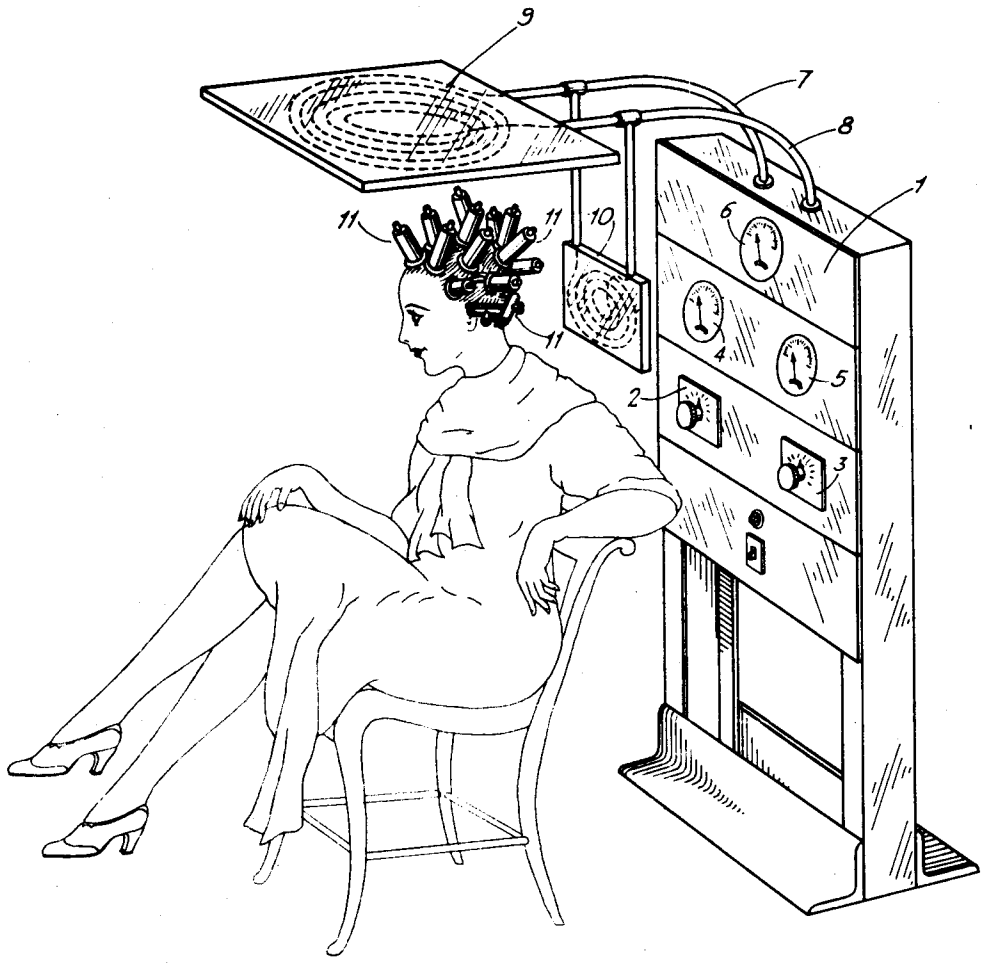
May 24, 1938. W. L. DOUDEN 2,118,594

PERMANENT WAVE MACHINE

Filed Dec. 28, 1933 2 Sheets-Sheet 1

Fig. 1



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PERMANENT WAVE MACHINE

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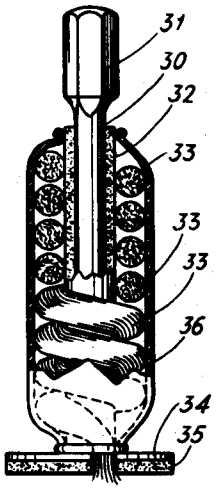


Fig. 2

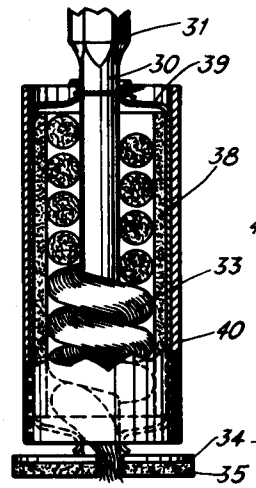


Fig. 3

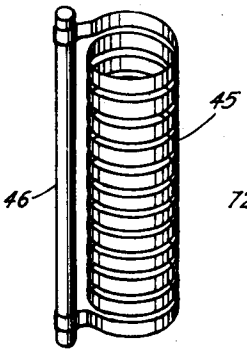


Fig. 4

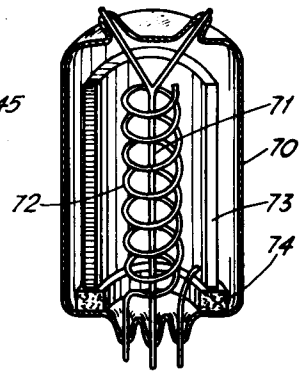


Fig. 10

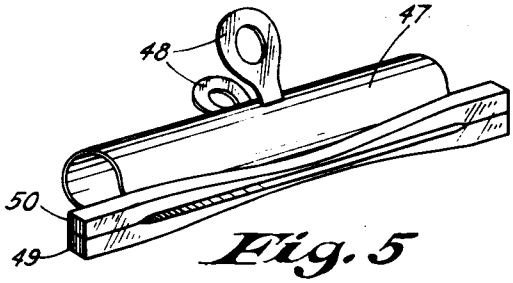


Fig. 5

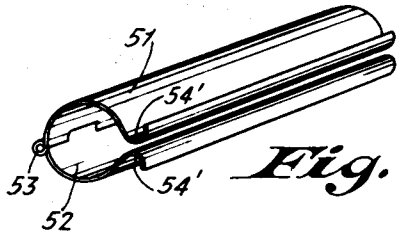


Fig. 7

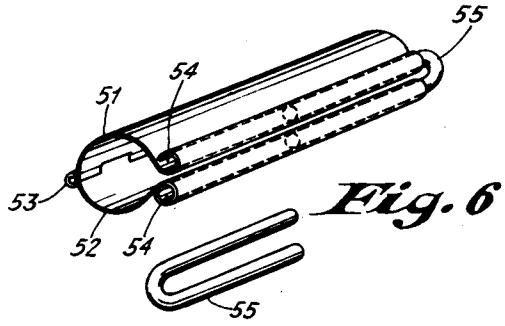


Fig. 6

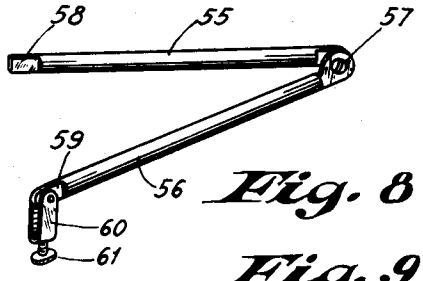
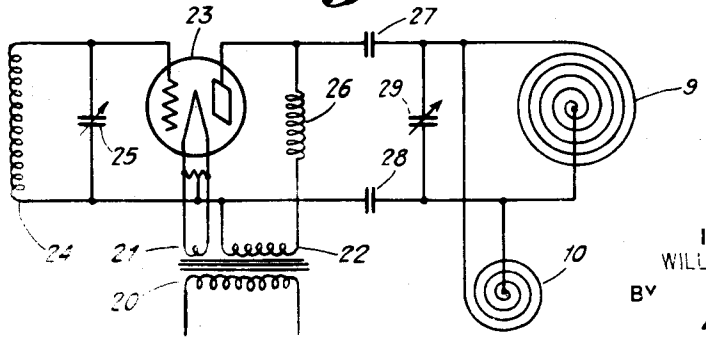


Fig. 8

Fig. 9



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Patented May 24, 1938 2,118,594

UNITED STATES PATENT OFFICE

2,118,594

PERMANENT WAVE MACHINE

William L. Douden, Brooklyn, N. Y., assignor to Radio Corporation of America, a corporation of Delaware

Application December 28, 1933, Serial No. 704,243

4 Claims. (Cl. 219—24)

This invention relates to a new and useful improvement in permanent wave machines. As is well known, the art of permanent waving of human hair is accomplished by winding the hair upon an appropriate mandrel or spindle saturating it, or treating it, with an appropriate solution which serves to soften it under heat, and then heating the hair while wound upon such mandrel for the proper length of time and to the proper temperature, the time and temperature being determined by the qualities of the hair and the nature of the solution used.

Heretofore such heating has been usually accomplished by surrounding the hair upon the mandrel with a pad saturated with the solution, and then surrounding this pad with a heater of the electrical resistance type wherein current from the power supply is fed through wires to the several heaters and heats an insulated resistance wire therein to an appropriate temperature. Heating has also been accomplished by enclosing the air upon the mandrel within a steam-tight enclosure and providing the proper temperature by steam supplied from a steam boiler or other equivalent source. There have also been other proposed ways of heating as, for example, by chemical reaction within a pad surrounding the hair.

All of these methods and apparatuses have been highly dangerous to the customer. In the chemically heated type, for example, if any of the chemical escaped from the pad to the scalp, a serious burn both from the heat and from the chemical action was almost certain; while in the electrically or steam-heated types, a connection from each of the heaters to the power supply was necessary and any movement of the head of the person being operated upon was quite likely to displace either the heater itself or the solution-enclosing pad, and this often resulted in severe burns either from contact of the scalp with the heater, or contact with the mandrel, or from leakage of boiling solution from the pad to the scalp.

My invention relates to an improved method of and apparatus for heating the hair wound upon the mandrels without any mechanical connection between the heating devices and the source of power, whence the person's head may be moved freely without any possibility of the heater or appurtenances thereto becoming disarranged, or otherwise so moved as to cause a burn.

One object of my invention is to produce a permanent wave machine having no mechanical connection between the heaters and the source of power.

Another object of my invention is to provide such a machine wherein the heat distribution over the head may be controlled.

Another object of my invention is to provide such a machine wherein the supply of heating power will correspond in order of magnitude with the radiation losses from the several heaters.

Another object of my invention is to provide such a machine wherein there is no possibility of electrical shock to the customer.

Another object of my invention is the provision of a novel type of vacuum tube for the power supply of such apparatus.

Another object of my invention is the provision of novel heating elements for applying the heat to the hair in such apparatus.

Other and ancillary objects of my invention will be apparent to those skilled in the art from a reading of the following specification and inspection of the accompanying drawings.

In the drawings:

Figure 1 is an illustration of apparatus according to my invention in use.

Figures 2 and 3 show types of heaters used in my device in operative position.

Figures 4, 5 and 6 show other types of heaters for use in my device.

Figures 7 and 8 show an additional type of heater and conductive clamp for use therewith.

Figure 9 shows an appropriate circuit for the connection with the apparatus, and

Figure 10 shows the novel type of vacuum tube which I have designed for the actuation of the apparatus.

Referring first to Figure 1: A power supply panel 1 is provided carrying upon its face appropriate meters and controls, and shielding at its rear a high frequency power supply apparatus. This panel is provided with appropriate meters indicating, for example, filament voltage and plate voltage applied to an oscillator tube and a meter indicating the total power output of high frequency electricity. For example, the control knobs 2 and 3 may control the filament voltage and plate voltage respectively applied to the oscillator, while the corresponding meters 4 and 5 indicate the respective voltages, and the meter 6 indicates the power output in amperes or watts.

At the top of the power panel there extends a pair of conductors 7 and 8 which connect the power supply to the inductor units 9 and 10.

These conductors are preferably insulated in an appropriate manner as are the dependent conductors attached to the member 10.

The inductor units 9 and 10 are preferably con-

structed in the manner illustrated in the form of a flat spiral moulded into an appropriate insulated material such, for example, a phenolic condensation product, or hard rubber. The former is preferable as such a compound as hard rubber may be softened by the heat rising from the heating units. The purpose of this insulation is, of course, to protect the customer or operator in case of any accidental contact with the inductor coils.

High frequency current provided from the power channel 1 through the conductors 7 and 8 is passed through the inductors 9 and 10 and induces currents in the heating devices, generally indicated at 11, on the customer's hair. The frequency used is preferably one of more than 50 kilocycles and less than 1,000 kilocycles, as lower frequencies than the former are difficult to produce and require bulky and cumbersome apparatus, while frequencies appreciably higher than the latter have a tendency to produce undesired physiological effects.

The heaters 11 are, as will be described hereafter, in more detail, composed of short-circuited turns of an appropriate conductor such as aluminum in which currents of high amperage are generated which produce an adequate heating effect. It will be apparent that each of these heaters shields the others to a certain extent from the inductive effect of the coils 9 and 10. However, each of the heaters, being itself heated, shields the other heaters also from radiation to the atmosphere and with a proper arrangement of heaters such as that illustrated, these two effects offset each other so that a perfectly uniform heating of the hair is secured. Such uniform heating has heretofore been impossible as each heater supplied the same amount of heat as every other irrespective of lack of radiation, and therefore the heaters not around the margin of the scalp had a severe tendency to become overheated and scorch the hair. It will be apparent that any such undesirable effect is automatically avoided in my device since the closer the heaters are together the greater the shielding effect produced.

The relative heat distribution on the top and back of the head can be readily adjusted by properly positioning the customer in relation to the two coils 9 and 10. For example, if more heat is desired at the top of the head and less at the back, the customer is seated slightly higher and farther forward, or the position of the inductors is otherwise correspondingly adjusted.

It will be apparent, of course, that in order to have the position of the inductors adjustable, the supporting rods of the inductor 10 may slide upon the conductors 7 and 8, and these conductors 7 and 8 may be correspondingly slidably supported vertically. However, it is better practice to always maintain the head in the same relation to the inductors and to vary the total heat applied by varying the heating time.

The circuit used for supplying power to this apparatus may conveniently be that shown in Fig. 9. In this figure, the power supply from the mains is supplied to the primary 20 of a transformer which is provided with a secondary filament heating winding 21 and a secondary high voltage winding 22. The current from the winding 21 is used to heat the cathode of an appropriate thermionic oscillator tube 23 which is provided with the usual grid and plate. An inductance 24 of appropriate value is provided in the grid circuit of the tube and is tuned to the desired frequency by means of the condenser 25 shunted thereacross. The high voltage winding 22 of the transformer is connected through the choke 26 to the plate tube 23.

It will be apparent that this circuit is of what is known as the self-rectifying type and no external rectifier is provided. Such an arrangement is permissible in the present device as the 60 cycle (or other frequency) alternating current supplied which produces a corresponding periodic variation from zero to maximum and then back to zero, thereby modulating an oscillatory current produced, does not produce any deleterious effect on the mean temperature of the heaters, due to their thermal inertia.

The plate circuit of the tube 23 is connected through the blocking condensers 27 and 28 to the inductors 9 and 10. These inductors may be connected either in series or in parallel, and are tuned to the desired frequency by the variable condenser 29.

It will be apparent, of course, that the coil 10 may be omitted and the heat distribution secured by properly positioning the coil 9 in relation to the head or by making it of other figurations.

Having now described my apparatus in general and the circuit employed therein, I will now describe the several types of heaters which can be used.

The heater shown in Fig. 2 is composed of a cylindrical tube 30 which may be the same general construction as the "rods" ordinarily used in winding a spiral wave. Preferably, however, the knob 31 used in winding hair tightly upon the rod is made of insulating material and the circular conductivity of the rod is maintained uniform from one end to the other to provide a uniform heating effect. Upon this rod is wrapped the pad 32 which is saturated with an appropriate permanent-wave solution and around this there is wrapped in the usual fashion the hair indicated at 33. Appropriate fibre and felt spacers 34 and 35 are provided to protect the head from accidental contact with the rod. Around the hair there is placed an appropriate water- and steam-tight wrapping 36 which, as shown, may be of rubber with a slight thickening at each end to maintain a steam-tight joint.

A second form of heater is shown in Fig. 3. In this type of heater any usual form of rod for spiral waves may be used provided, like that of Fig. 2, that an appropriate handle of non-conducting material and upon this the hair 33 is wound in the usual fashion and is surrounded by any usual type of pad 38 and the usual steam-tight wrapper 39. The heater in this case consists of an aluminum tube 30 which surrounds the entire assemblage consisting of the foregoing members. In this case, however, the tube 40 is heated by the induced currents therein instead of the rod 30 being heated, and the tube 40 serves as an electric shield for the rod 30 in case the latter be of an electrically conducting material.

In Fig. 4, I have shown a still different type of heater. This heater consists of a helix of appropriate conducting material 45 consisting of a number of turns and the entire helix is short circuited by the conducting member 46. This form of heater may be applied to two diametrically opposite uses, each distinguishing from those of the heaters of Figs. 2 and 3. If the number of turns of the helix 45 and the dimensions thereof are so chosen that the natural period of electrical oscillation thereof is the same as or approximates closely the frequency at which

the oscillator is operated, a condition of electrical resonance will exist causing greater currents in the helix 45 than would otherwise occur, and correspondingly increasing the heating effect of this unit and producing a correspondingly higher temperature. If, however, the number of turns of the helix 45 is materially less than that required to produce such electrical resonance while consisting of more than a single turn, then the resistance thereof will be materially greater than that of a sleeve such as 40 of corresponding external dimensions, while the portion of the field intercepted will remain the same and, due to the less current passing through the greater resistance the heating effect will be correspondingly less than that of a sleeve such as shown at 40 and still less than that of a helix tuned to resonance. Likewise, if the helix 45 is composed of a greater number of turns than required to produce resonance with the oscillatory circuit, then the self-inductance of the coil will react against the induced high frequency currents and tend to decrease the current flowing therethrough, thereby producing a less heating effect.

In Fig. 5, I have shown a type of heater particularly designed for use in what is known as a "Croquignole wave". This type of heater may be used in conjunction with any of the usual hair clamps, spacers, and winding rods for this type of wave and will, of course, be provided with the appropriate support for the specific type of winding rod used. In this heater the part 47 is made of resilient material of high electrical conductivity such as one of the aluminum bronzes and is provided with finger pieces 48 which may be pressed together to open the slotted side thereof. This slotted side is provided with a pair of jaws 49 and 50 which are, of course, separated by pressing the finger pieces 48 together for the purpose of slipping the device over the hair wound upon the rod. The jaws 49 and 50 are made of material of high electrical conductivity and have smoothly abutting faces, in order to form a completely closed inductive circuit having low resistance at the compacts in order that the heat may be uniformly distributed over the member 47.

In Fig. 6, I have shown a second type of "Croquignole" heater composed of two similar hinged members 51 and 52 connected together by a hinge pin 53 of high conductivity. Across this hinge there may also be connected appropriate flexible shunts. The jaws of this device are in the form of rolled tubes 54 into which are inserted U-shaped conductors 55, one of these conductors being inserted from each end of the tubes in order to produce a uniform clamping effect and sufficiently high electrical conductivity.

In Fig. 7, I have shown a modification of the device of Fig. 6, the tubes 54 being in the form of channels instead of complete tubes as indicated at 54'. This form of the device is adapted to adjustable clamping by means of the clamping mechanism shown in Fig. 8. This clamping mechanism consists of two conducting bars 55 and 56 hinged at 57 by any appropriate hinge mechanism of high electrical conductivity. The bar 55 is provided with two flat surfaces at one end as indicated at 58. The bar 56 is likewise provided with flat surfaces at one end as indicated at 59, and upon this pair of flat surfaces 59 is hinged the resilient conductive yoke 60 having the clamp-screw 61. The yoke 60 is made of resilient material so that it may remain firmly in conductive relation with the flat surfaces 58 and 59, and when this device is placed about the jaws of the heater of Fig. 7, the yoke 60 is swung over the flat surfaces 58, and the members 55 and 56 are then compressed firmly into the channels 54' by the clamp-screw 61.

It will be apparent that all of the foregoing heaters are adapted to be used in my improved permanent wave machine, and they may be used either selectively or jointly, the type of heater being chosen according to the particular effect desired in the location to which it is applied.

I have also devised a special and inexpensive form of thermionic valve to produce high quantity of high frequency energy necessary in my device. As shown in Fig. 10, this tube comprises a glass or other appropriate evacuated enclosure 70. Within this enclosure are provided a hot cathode or filament 71, control grid 72 and an anode 73. The power supply required in such a device as that here involved is of the order of 1 to 2 kilowatts and this power is required over a period of from ten to fifteen minutes for proper treatment of the hair. It is expensive and undesirable to provide an anode of either the water or radiating fin types and I have accordingly devised an anode of a simpler type which is adequate for the purpose. The anode 73 is made of a heavy mass of metal such, for example as nickel-plated or chromium-plated copper or iron. The mass which is necessary is determined by the radiating characteristics of the exterior of the anode and the total power to be dissipated thereby during the aforesaid period of time, and the anode is made of sufficient thermal capacity to prevent an undue temperature rise during the operating period with allowance for repeated operation at reasonable intervals such, for example, as one hour.

Due to the mass of this anode it is not convenient to support it in any of the usual fashions, and I accordingly support it upon an appropriate insulating ring of porcelain or similar material 74 which rests upon the bottom of the casing 70. The cathode 71 may be composed of a filament or rod of tungsten and is of course heated by passing an electric current through it. The grid 72 may be made as shown in the form of an open helix having the appropriate spacing of turns, but in the present apparatus it is not necessary that this grid be rigidly supported in place, as perfect stability of either frequency or power output is not essential so long as the average of each is maintained within the limits of the thermal lag of the heaters.

The heaters before described may, of course, be provided with appropriate heat insulating material at their outer surfaces in order to prevent losses of radiation and convection, and such heat insulation will of course decrease the power requirements of the apparatus, but at the same time will render it more difficult to keep the heating elements perfectly sanitary.

I claim:

1. A hair waving device for use with inductive wavers comprising a tubular electrically conducting means openable along one side, and means for electrically connecting adjacent portions of said openable side.

2. A hair waving device for use with inductive wavers comprising a tubular electrically conducting means openable along one side, clamping means for electrically connecting adjacent portions of said openable side and clamping them toward each other.

3. A hair waving device for use with inductive wavers comprising two semi-cylindrical electri-

cally conducting members, hinge means connecting said members along one side and electrically conducting means for connecting said members on the opposite side.

4. A hair waving device for use with inductive wavers comprising two semi-cylindrical electrically conducting members, hinge means connecting said members along one side and electrically conducting clamping means for electrically connecting said members on the opposite side and clamping them toward each other.

WILLIAM L. DOUDEN.