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[54] **METHOD AND DEVICE FOR STIMULATING THE ORGANS ASSOCIATED WITH THE HUMAN SCALP**

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[21] Appl. No.: **347,899**

[52] **U.S. Cl.** **128/24.5**
[51] **Int. Cl.** **A61h 29/00**
[58] **Field of Search** 128/24.5, 410, 24.1, 24.2, 128/24.4

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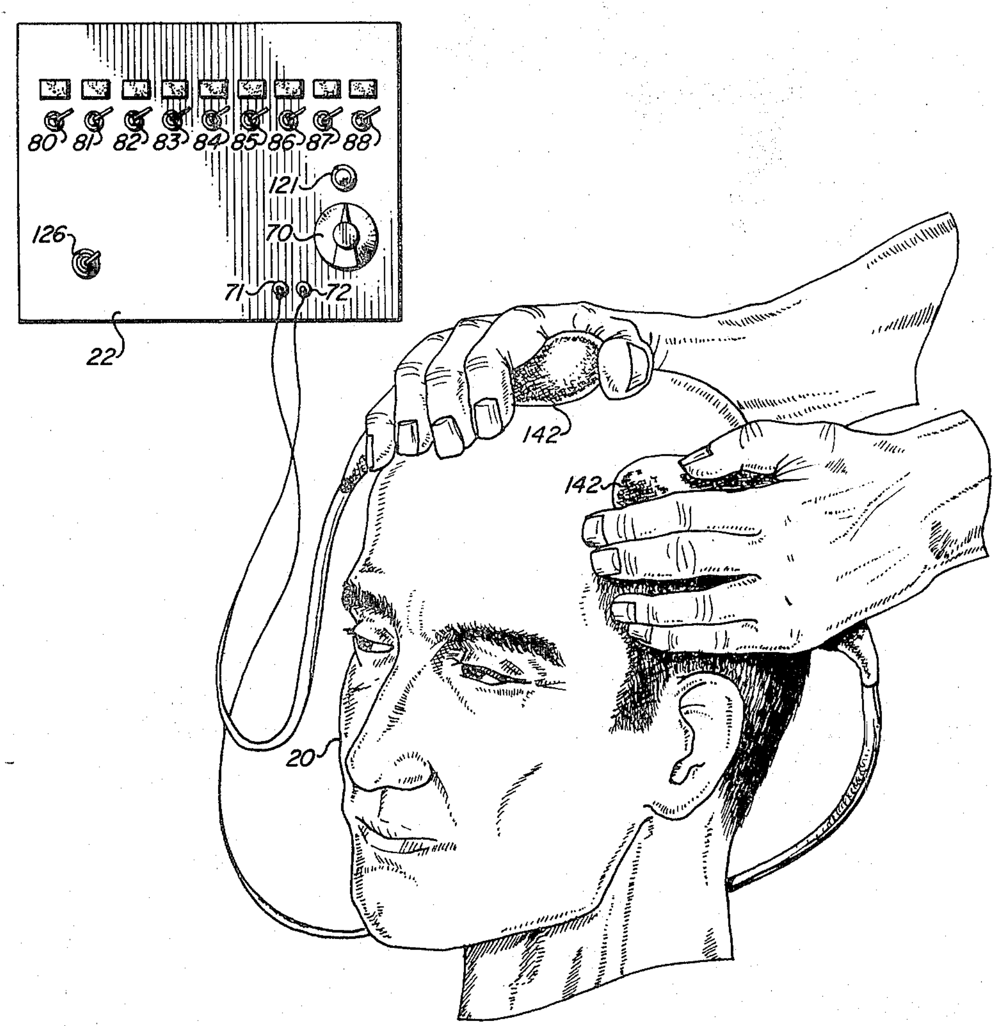
Attorney, Agent, or Firm—William H. Drummond; Don J. Flickinger

[57] **ABSTRACT**

A method for stimulating and exciting the organs associated with the human scalp. A device utilized in performing the method produces modulated waveforms within a specified frequency range to amplify the stimulation and excitation effect to achieve practical results.

8 Claims, 13 Drawing Figures



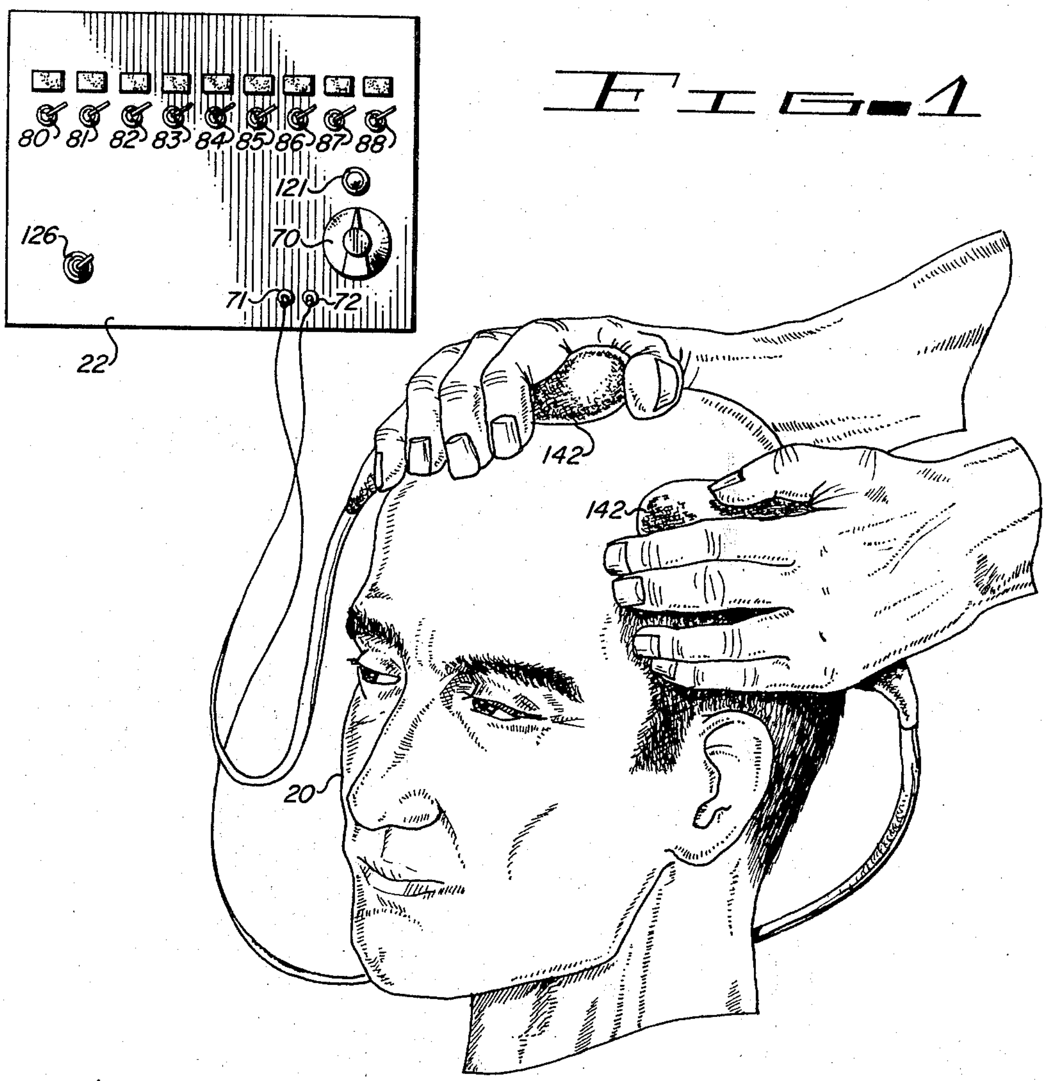


FIG-1

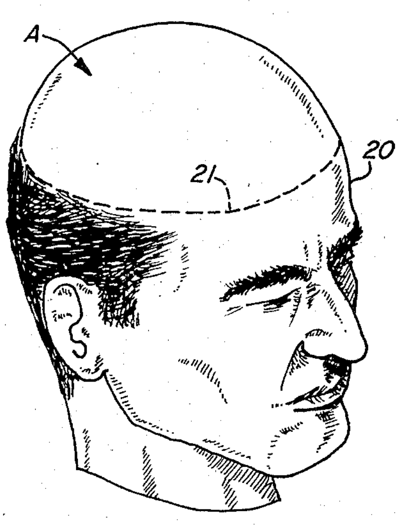


FIG-2

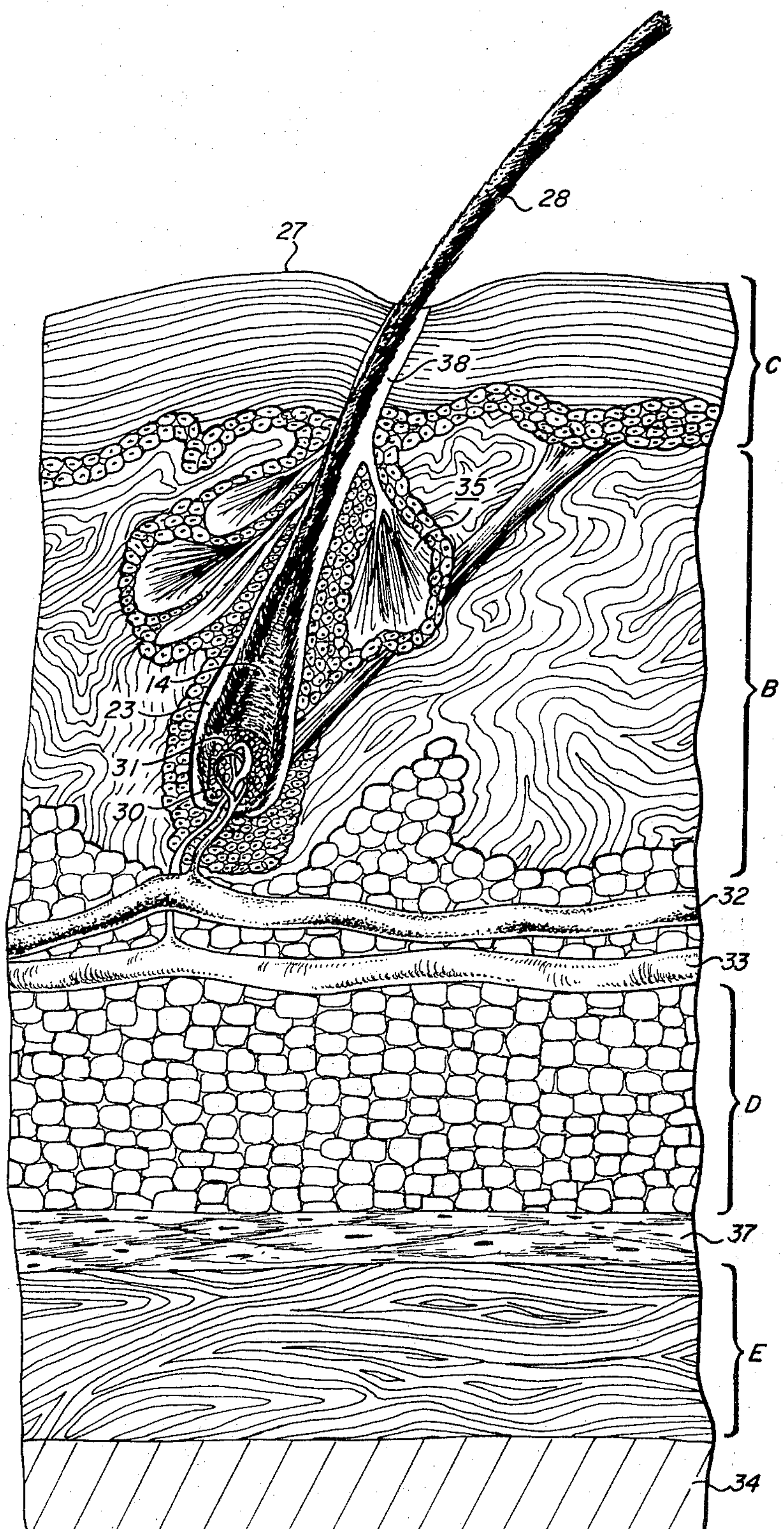


FIG. 3

FIG. 4

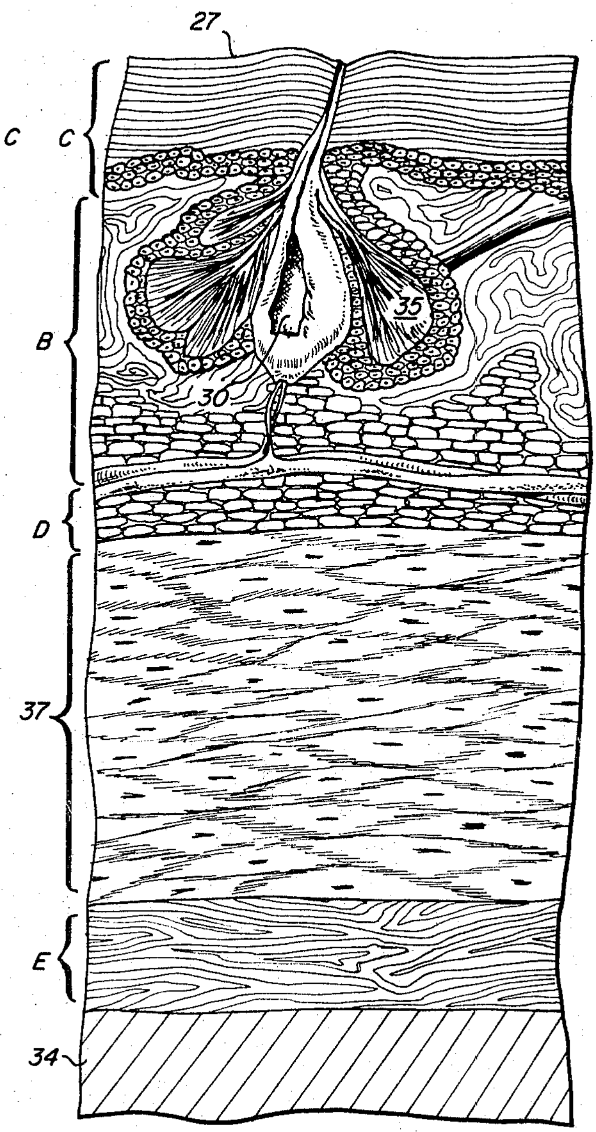


FIG. 5

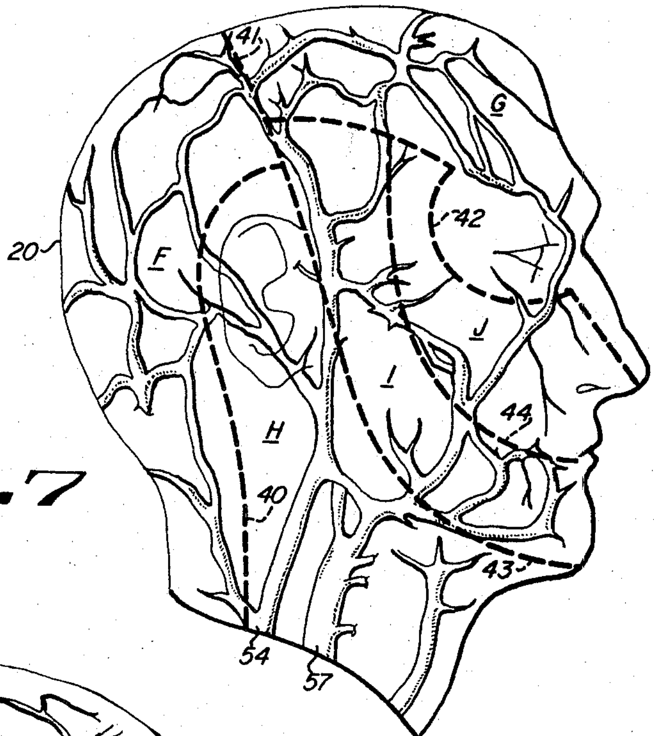

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FIG. 7

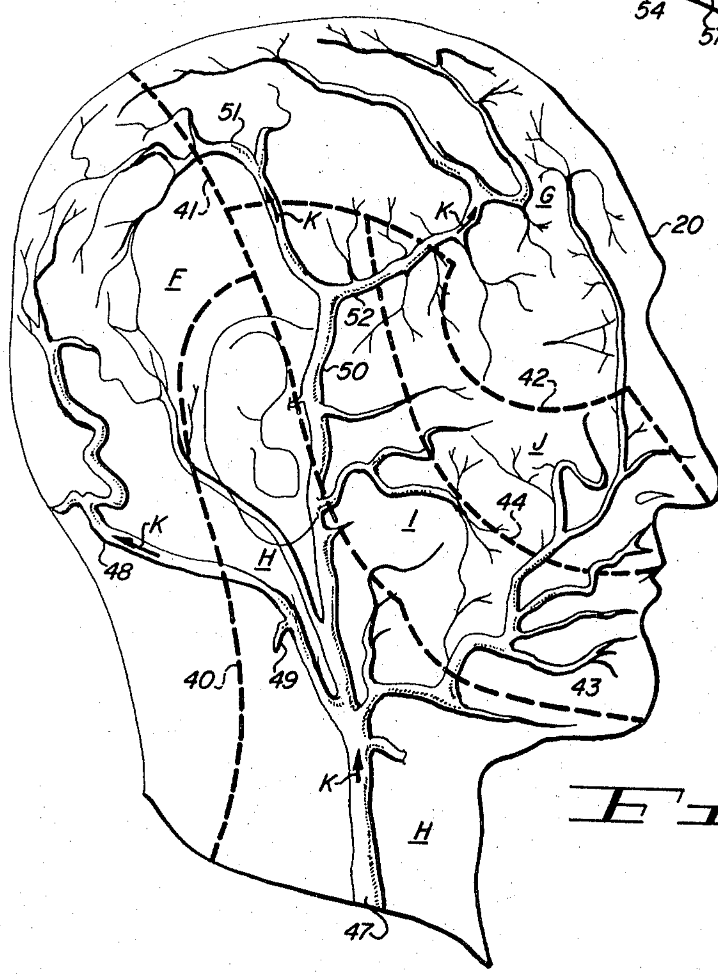
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FIG. 6

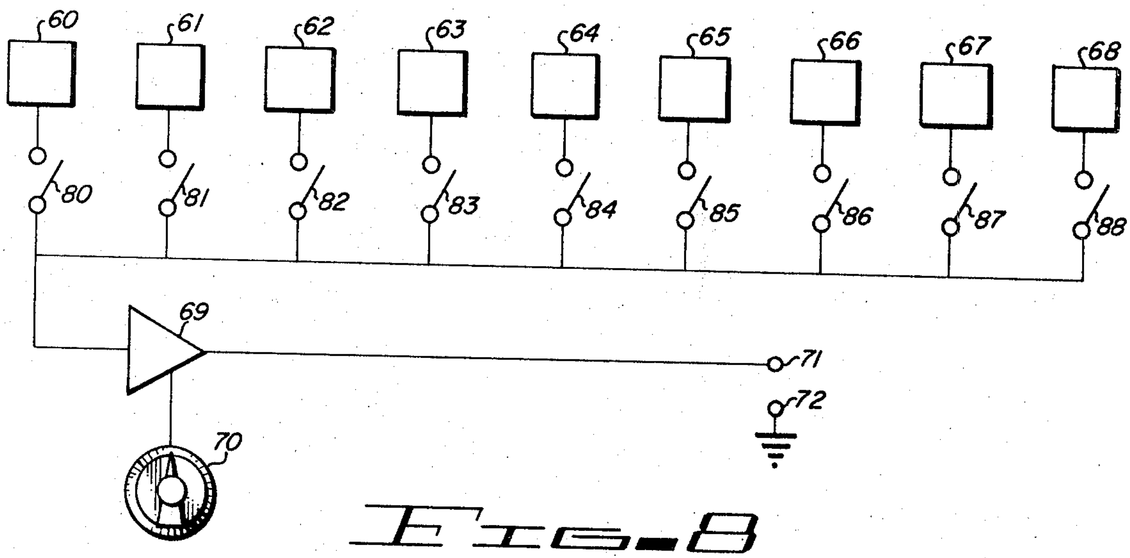
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FIG. 8

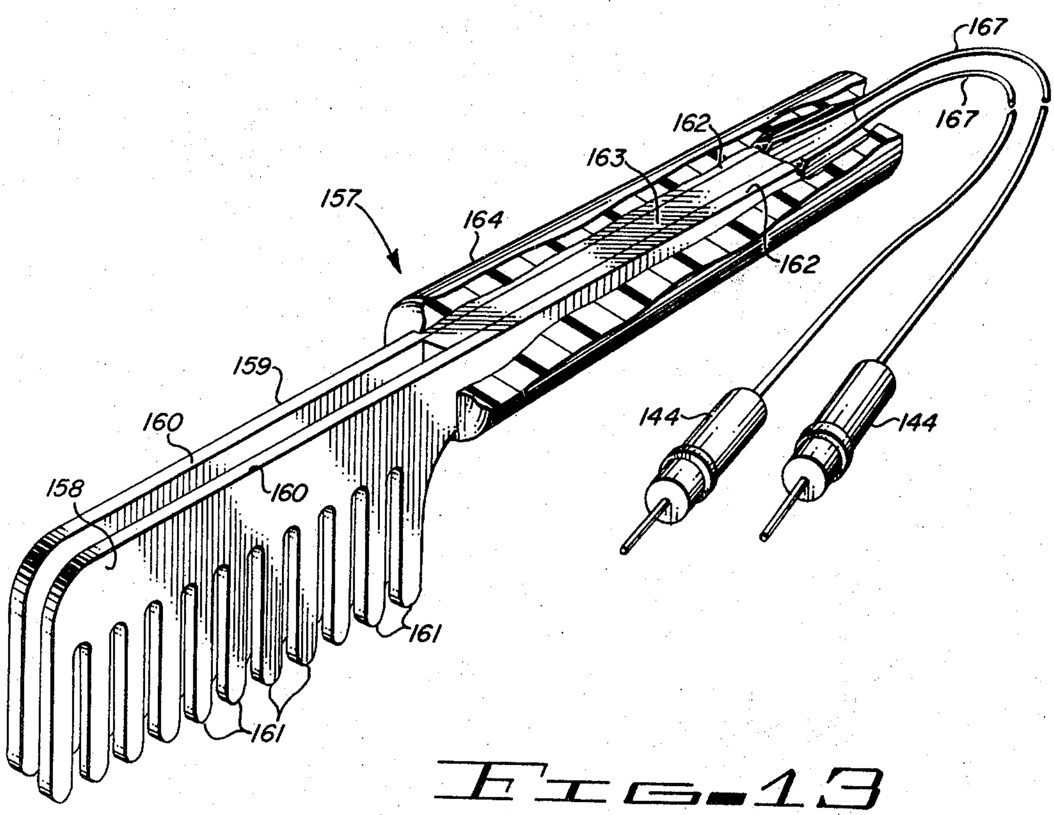
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FIG. 13

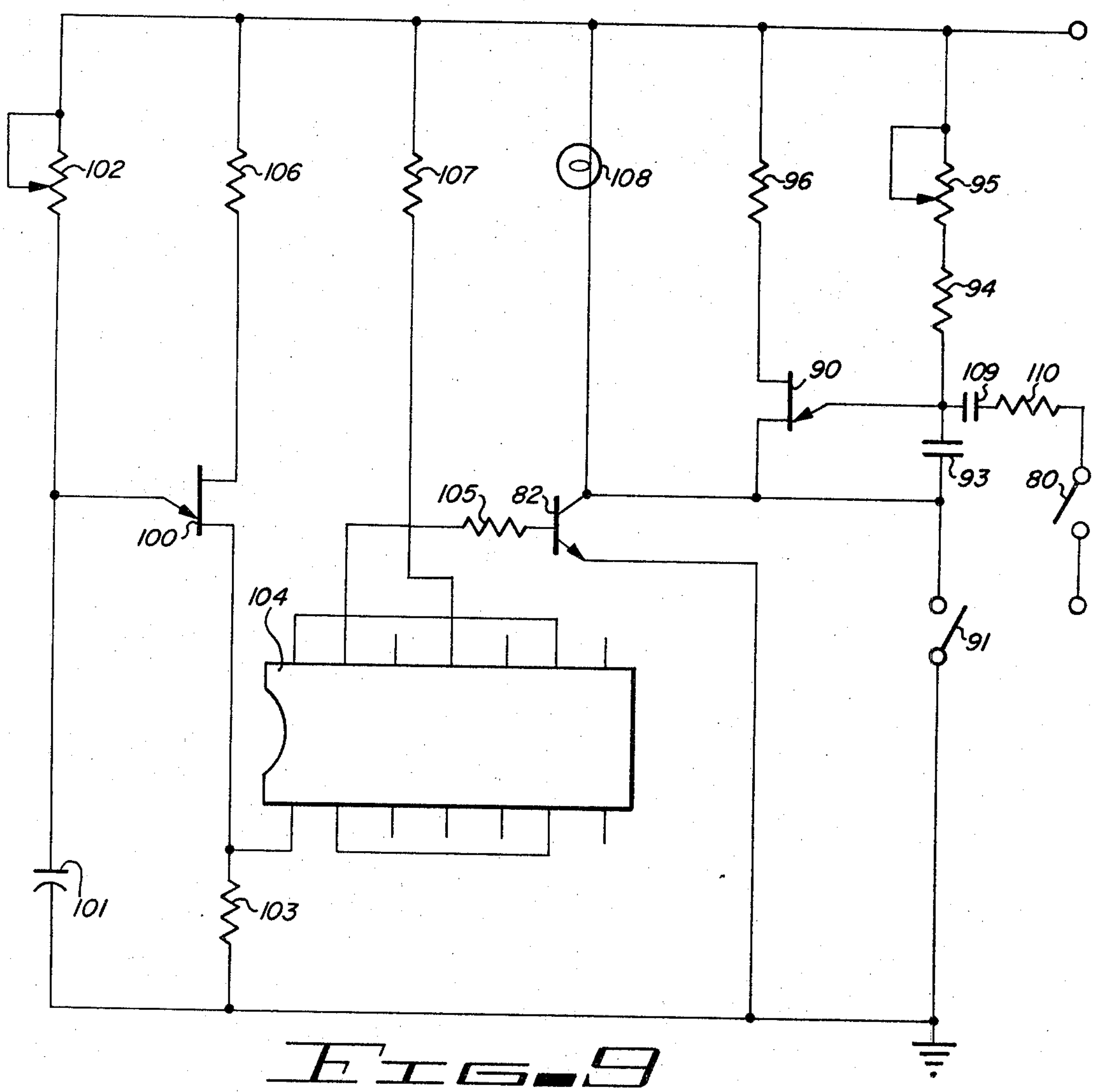
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FIG. 9

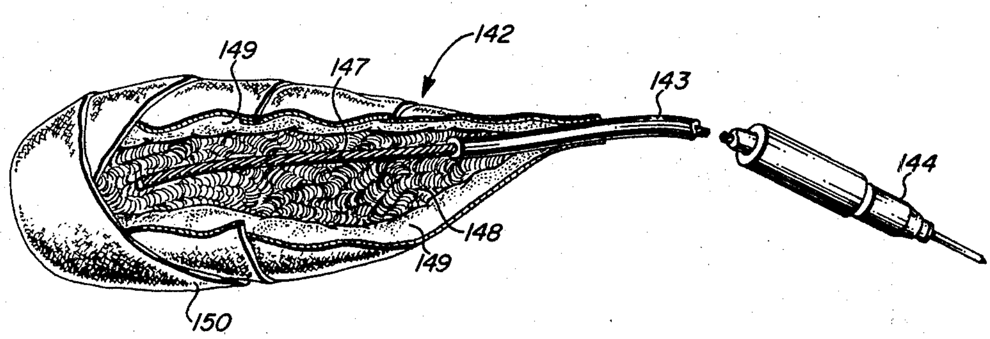
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FIG. 12

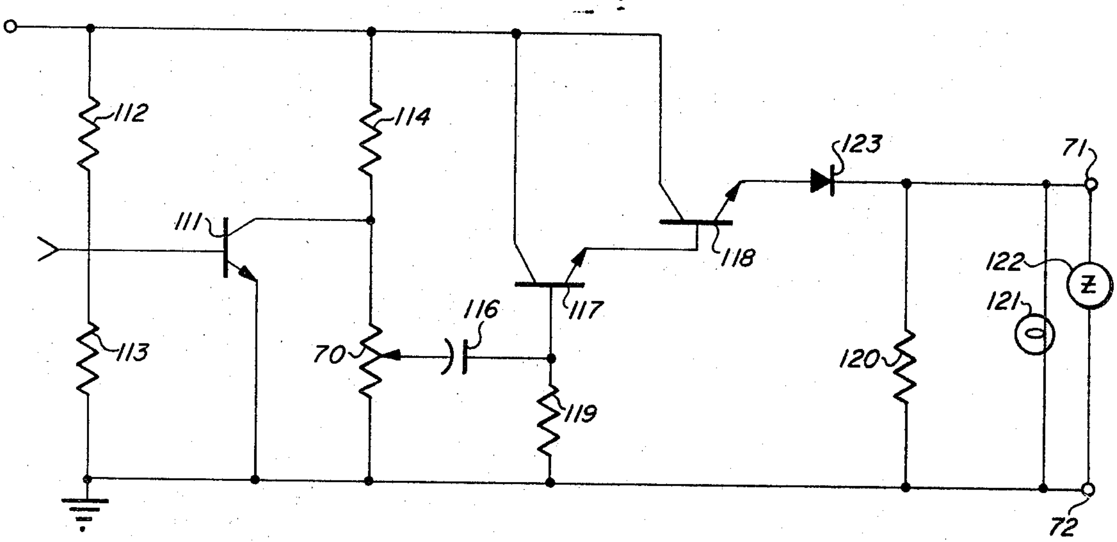
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FIG. 10

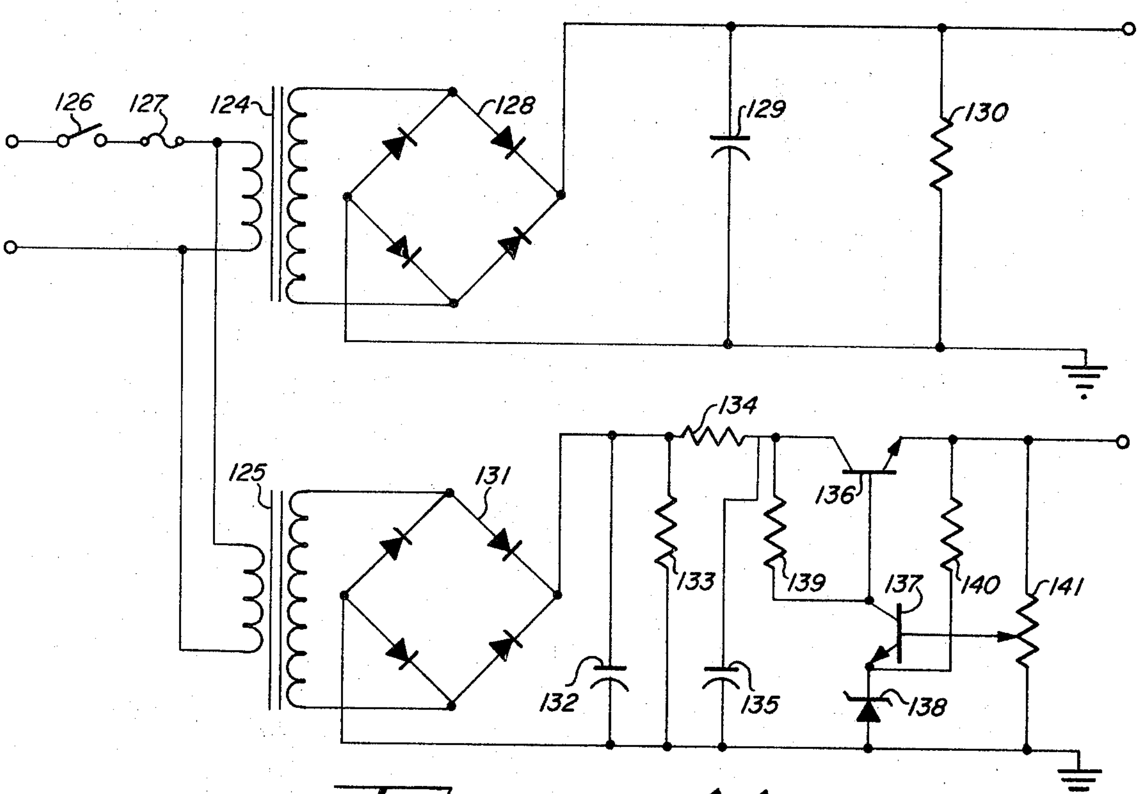
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FIG. 11

METHOD AND DEVICE FOR STIMULATING THE ORGANS ASSOCIATED WITH THE HUMAN SCALP

In another aspect, the invention concerns a device useful in the above method and particularly adapted to amplify the stimulation and excitation of specific human organs.

The human scalp has an average of 1,000 hair follicles to the square inch. In the bottom of the follicle, or pocket, is a finger-like projection called the "papilla" from which the hair develops. At the extreme end of the hair root is a thickened portion called the "hair bulb" which has a socket encasing the papilla. Within the hair papilla is a rich blood and nerve supply which contributes to the growth and regeneration of the hair.

The hair follicle is supported in a layer of tissue called the "reticular layer." Overlaying the superficial fascia is the outer layer of the skin, or the "epidermis." The undersurface of the reticular layer, below the hair follicle, rests on a layer of fatty tissue termed the "adipose tissue." The skull bone is encased in a membrane known as the "subaponeurotic." Between the subaponeurotic layer and the adipose tissue is the "galea," or "tendinous" membrane. The galea covers approximately 40 square inches of the head extending from the hairline at the top of the forehead rearwardly generally to the posterior division and substantially covering that portion of the head known as the "ophthalmic" area. The galea, a sheet-like, paper-thin membrane, is approximately 0.2 millimeters in thickness. This membrane is exceedingly elastic and permits the scalp to move upon the skull with as much as one inch displacement.

Life support for the hair is the papilla which is oxygenated and nurtured by an ample blood flow. The "carotid" arteries are the main sources of blood supply to the scalp. The external carotid artery extends upwardly along the neck immediately forward of the ear. A first branch, the "occipital," leaves the external carotid artery below the ear and travels rearwardly to supply blood to the posterior division. Above the ear, the external carotid artery forms two branches — the parietal branch and the frontal branch — which extend into the rearward and frontal portions, respectively, of the ophthalmic area. A network of veins approximately paralleling the arteries returns the blood flow from the scalp through the internal jugular vein and the external jugular vein to the heart.

Associated with each hair follicle is a sebaceous gland which secretes an oily substance known as "sebum" through the sebaceous duct to the base of the hair shaft. The sebum lubricates the hair and contributes to its luster and pliability while keeping the skin soft and supple. The sebaceous gland is influenced by several factors, including blood circulation.

It is estimated that the average human head sheds 50–80 hairs per day. As each hair sheds, it separates from the papilla and the root gradually works upwardly through the follicle until it falls from the scalp. While the hair is moving upwardly through the follicle, the papilla gives life to a new hair which replaces the one being lost. The healthy functioning hair follicle, as explained above, is in the anagen or growing stage.

Current research indicates that at the age of 16 to 18 years, the normally thin resilient galea begins to thicken and loses its elasticity. This occurrence is extremely common among males and occurs to a lesser degree in females. The scalp skin is exceedingly resistant to stretching. The skull is bone and, therefore, has no general resilience. As the galea thickens, it expands outwardly from the skull, exerting pressure upwardly upon the adipose, or fatty tissue, thereby compressing the arteries and veins to retard the blood flow to the papilla. This pressure also foreshortens the hair follicle and induces the catagen or transition stage.

The fully enlarged galea exerts extreme pressure upon the skin. Also, due to the thickening and hardening of the galea, the scalp is exceedingly "tight." "Tight" is defined herein as the degree of movement of the scalp upon the skull wherein the epidermis may still move freely but the entire scalp will not displace more than one-half of an inch. Empirical observation of scalp movement and irregular baldness indicates that tightness does not develop uniformly within the area underlaid by the galea. It is important to note, however, during this advanced stage that the hair follicle has not died but has simply become inactive or telogenic.

It has now been discovered that, if pressure could be relieved from the hair follicle and from the veins and arteries such that the follicle is free to expand to its normal length and ample blood is allowed to circulate into the papilla, the follicle will return to the anagen stage and again produce a hair. The galea will relax and the scalp will become "loose." The "loose" scalp is defined as one which can be displaced in the range of one inch or more. greatly amplified beyond the stimulation produced by simple hand massage or hand massage in connection with a mechanical vibrator.

The teachings of the present invention are accomplished by a method of stimulation and excitation of the human organs associated with the human scalp. Briefly, the method embraces the continuous and progressive stimulation of the head in accordance with an established sequence. It has been discovered that the most satisfactory results are accomplished by sequentially massaging the human head beginning at the neck and working upwardly therefrom into the scalp area in approximately the pattern of the veins.

The main source of blood supply to the neck and face is delivered from the heart through a main artery termed the "external carotid artery" which subdivides into three primary branches called the "occipital branch," which nourishes the back of the head, the "anterior temporal branch," whoch nourishes the frontal portion of the scalp, and the "posterior temporal branch," which supplies the rearward portion of the scalp.

The method generally begins by progressively massaging each of the aforementioned arteries beginning at its confluence with the external carotid artery and substantially working in the general direction of the blood flow of the artery. Most satisfactory results are obtained by tracing each artery in turn, beginning with the artery branching from the external carotid artery at the lowest point and working to the artery which branches from the terminus of the external carotid artery. In this manner, the method involves first massaging the back of the head, then the frontal portion of the scalp and terminating with the rearward portion of the scalp. In order that the massage achieve practical results, it is necessary to intensify the stimulation and excitation of the human organs associated with the hair follicles by passing a low-frequency electrical current through the area being massaged. To achieve this practical result, a device is employed which produces an electrical current in the form of a low-frequency wave of not more than 3,000 cycles per second, with an energy potential not exceeding one-half watt of power in the range of 3–10 volts. The electrical current in the form of sawtooth or other suitable waveforms, of selective frequencies, is summed at a power amplifier which is provided with adjustable gain control to drive an electrode. A second electrode is maintained at ground potential to which the various signals are referred.

In practicing the method, the ground potential electrode is placed against the head generally not more than six inches from the exact area to be massaged. The second electrode is placed in contact with the head and the massaging is accomplished in the immediate area of the driven electrode. The massage, in combination with the passing of electrical current between the electrodes, intensifies the effect thereof to stimulate the flow of oxygenated and nutritive blood to the papilla while relaxing the galea. The electrical device is so constructed that various frequencies may be selectively utilized and each waveform may be operated in either a continuous output mode or a pulsating mode.

The objects and advantages of the present invention will become more readily apparent to those skilled in the art from the following detailed description thereof taken in conjunction with the drawings, in which:

FIG. **1** is a perspective view of a male head for purposes of illustrating the device of the present invention as utilized in the method of stimulation and excitation of the human organs associated with the hair follicles within the scalp;

FIG. **2** is a perspective view of a male head displaying typical male pattern alopecia;

FIG. **3** is a cross section of the upper portion of a typical male scalp especially displaying the hair follicle during the anagen stage;

FIG. **4** is a cross section of the upper portion of a typical male scalp especially displaying the hair follicle during the transition stage;

FIG. **5** is a cross section of the upper portion of a typical male scalp especially displaying the hair follicle during the telogen stage;

FIG. **6** is a schematic representation of the human head displaying the main arteries which supply blood from the heart to the head, face and neck area;

FIG. **7** is a schematic representation of the human head displaying the veins which return the blood from the head, face and neck area to the heart;

FIG. **8** is a block diagram of the apparatus for practicing the method of the present invention;

FIG. **9** is a schematic diagram exemplary of one of the waveform generators of FIG. **8**;

FIG. **10** is a schematic diagram of a power amplifier as used in connection with the wave generator of FIG. **9**;

FIG. **11** is a schematic diagram of a power supply suitable for energizing the electrical apparatus of the present invention;

FIG. **12** is a perspective view, partially broken, specifically illustrating a preferred electrode useful in massaging the human head in accordance with the method of the present invention; and

FIG. **13** is a perspective view of a pair of electrodes formed into the shape of a comb for use in connection with the device of the present invention.

Turning now to the drawings, in which the same reference character indicates corresponding elements throughout the several views, attention is first directed to FIGS. **1** and **2** which show a male head generally designated by the reference character **20** and displaying typical male pattern alopecia. As particularly seen in FIG. **2**, the alopecia is prevalent in the area designated by the reference character A encircled by the dashed line **21**. The epicranial aponeurosis, commonly called the galea, underlies the area A. It is particularly noted that the alopecia is confined to the area within the dashed line **21**, while that portion of the head below the dashed line **21** displays normal hair growth. The particular device **22** and the method as graphically represented in FIG. **1** will be explained hereinafter in substantial detail.

FIG. **3** illustrates the human organs of the scalp in a normally healthy male wherein the hair follicle is in the anagen or growing stage. Illustrated is a hair follicle **23** supporting a normal hair growth having a root section **24** below the skin surface **27** and a hair shaft **28** extending above the skin surface. At the lower end of the hair root **24** is an enlarged end called the bulb **29** having a socket **30** therein which encases the papilla **31**, a finger-like projection extending upwardly from the bottom of the follicle **23**. The papilla **31**, being the life support for the hair, is oxygenated and nurtured by an ample blood flow entering the papilla from the heart through the artery **32** and returning to the heart through the vein **33**. The sebaceous gland **34** secretes an oily substance known as sebum which passes through the sebaceous duct **37** to lubricate the hair and contribute to its luster and pliability.

The hair follicle **23**, sebaceous gland **34**, and the blood vessels **32** and **33** are located in the dermis or true skin layer for the scalp, as indicated by the bracket B. The epidermis or scarf skin, as designated by the bracket C, is superimposed over the dermis and forms the outer or exposed layer of scalp skin. The dermis layer generally contains those organs associated with hair growth, while the epidermis layer forms a protective layer thereover. The adipose tissue, indicated by bracket D, is a fatty layer which forms a cushion to protect the skull from injury and to allow normal expansion and contraction of the blood vessels and to the organs within the dermis. The skull bone **34** encased in the areolar tissue designated by bracket E forms a rigid base upon which the scalp, including the adipose tissue, dermis and epidermis are carried. Interposed between the adipose tissue and the areolar tissue is the epicranial aponeurosis or galea **37**. The galea approximately 0.2 millimeters in thickness and covering approximately **40** square inches of the head permits the scalp to move in relation to the skull. Separation of the scalp from the skull is readily achieved due to the resiliency of the galea. This explains the ease with which the human scalp is torn away in accidents and, quite incidentally, which permitted the Indians to provide themselves with trophies of war. The normal scalp can be readily displaced one inch or more without any accompanying pain upon the galea.

In the anagen stage, the follicle supports a fully developed hair which grows an average of about one-half inch per month. The hair has a life cycle of 2 to 6 years and as the hair sheds, the papilla gives life to a new hair which emerges shortly after the dead hair sheds or emerges from the follicle. As noted herein, the fat cells within the adipose tissue are expanded and soft, exerting no pressure either upon the blood vessels or upon the lower end of the follicle. If the hair, as shown in FIG. 3, were plucked from the head, the follicle and the other related organs would be undamaged and a new hair growth would begin.

The transition stage as shown in FIG. 4 begins at approximately 16–18 years of age for men and considerably later, if at all, in women. During the transition stage, the galea 37 gradually loses its resiliency and begins to thicken. Since the skull 34 is fixed and immovable, the galea is forced to expand outwardly as it thickens. The expansion of the galea exerts pressure upon the adipose tissue D, graphically depicted here by the slightly compacted fatty layer. The epidermis C is resistant to stretching; therefore, the pressure from the expanding galea 37 and compacting adipose tissue D is exerted upon the blood vessels 32 and 33 and the lower end of the follicle 23. The papilla 31, receiving a decreased supply of oxygenated and nutritive blood through the partially constricted artery 32 is impaired in its ability to function normally. The pressure also foreshortens the follicle.

FIG. 5 represents the galea 37 in the telogen stage. In this terminal stage, the galea has expanded to approximately ten times its normal thickness and has lost substantially all resiliency. The extreme pressure, as graphically represented by the compact adipose tissue D and dermis B, has constricted the artery 32 and vein 33 to completely diminish the blood flow to the papilla 31. As shown herein, the hair follicle responsive to the pressure has shortened to approximately one-half its original length and without nutrient flow into the papilla, has ceased to function. It is important to note that the hair follicle 23 is not dead, but has reached the telogen or resting stage. In the telogen stage, the scalp cannot generally be displaced more than one-eighth inch upon the skull.

During the anagen stage wherein the scalp moves freely upon the skull, the scalp is termed to be "loose." The loose scalp obviously denotes that the galea is thin and resilient and that no pressure is exerted upon the blood vessels or the lower end of the hair follicle and, therefore, the organs are free to function properly. In the telogen stage, wherein the galea is greatly thickened and hardened and exerts sufficient pressure upon the organs to prohibit normal functioning, the scalp is termed as being "tight." Since the galea does not thicken and harden consistently throughout its approximately 40 $in.^2$, a given scalp may have both tight spots and loose spots.

In order to clarify the preferred practice of the method of the invention, the following description of FIG. 6 graphically depicts the network of arteries within the human head 20. Superimposed upon this view are the spatial divisions of the human head. The posterior division F includes the back of the neck and extends upwardly behind the ear, as encompassed by the dashed lines 40 and 41. The ophthalmic area G, lying above the dashed lines 41 and 42, includes the top and frontal area of the scalp and head. The superficial cervical plexus H, defined by the dashed line 40 at the rear and the dashed line 43 at the front, includes the front and sides of the neck, the underside of the chin and diverges upwardly to include the ear. The mandibular area I, lying above the dashed line 43 and below the dashed line 44, generally includes the lower jaw and the temple area and extends upwardly to the ophthalmic area G. The maxillary area J, lying between the mandibular area I and the ophthalmic area G as defined by the dashed lines 44 and 42, respectively, generally includes the upper jaw and a narrow upward extension lying between the temple and the eye.

The carotid arteries are the main source of the blood supply to the head, neck and face. The internal carotid arteries, not herein shown, supply the brain, eye sockets, eyelids and internal organs. The external carotid artery 47 supplies the superficial parts of the head, face and neck. The occipital artery 48 is the first branch of the external carotid artery 47 as it delivers blood in the direction of the arrow K from the heart to the head. The occipital artery 48 supplies the scalp and the back of the head within the lower portion of the posterior division F. The sterno-cleido mastoid artery 49 branches from the occipital artery to deliver blood within the superficial cervical plexus H below and behind the ear. The superficial temporal artery 50 is an extension of the external carotid artery 47 which extends upwardly immediately in front of the ear. Immediately above the ear, the superficial temporal artery 50 subdivides into two primary branches: a first branch, the posterior temporal branch 51, which supplies the rearward portion of the ophthalmic area G and the upper portion of the posterior division F, and the anterior temporal branch 52 which supplies blood to the upper frontal portion of the ophthalmic area G. The superficial temporal artery 50 and the lower portion of the posterior temporal 51 and the lower portion of the anterior temporal 52 also supply blood to the upper portion of the mandibular area I and the maxillary area J.

A network of veins approximately paralleling the aforedescribed arteries and assuming the same names thereof return the blood to the heart through the external jugular vein 53 and the internal jugular vein 57, as graphically represented in FIG. 7.

To further clarify the method of the invention, the presently preferred apparatus used in practicing the method will now be described.

A block diagram of apparatus for practicing the method of the present invention is set forth in FIG. 8. It will be observed that a plurality of sawtooth waveform generators 60, 61, 62, 63, 64, 65, 66, 67 and 68 have their respective outputs summed at the input to a power amplifier 69. Power amplifier 69, which is provided with adjustable gain control 70, directly drives a first electrode 71. A second electrode 72 is maintained at ground potential, to which the various signals in the apparatus are referred, as will become more apparent in the detailed description thereof to follow. The electrodes 71 and 72 may take various forms to accommodate particular applications as previously indicated.

Output signals from each of the sawtooth waveform generators 60–68 may be selectively switched into or out of the summing point by means of switches 80–88, respectively. Thus, it will be understood that the summed signal observed at the input to the power amplifier 69 may be any selected combination of the outputs from the waveform generators 60–68. Additionally, as will be explained more fully below, each of the waveform generators 60–68 may be operated in either a continuous output mode or a pulsating mode. By way of example, and as utilized in a presently preferred embodiment of the invention, the nominal output frequencies of the sawtooth waveform generators 60–68 are:

230 hz, 270 hz, 325 hz, 550 hz, 1,000 hz, 1,550 hz, 1,800 hz, 2,300 hz, and 2,650 hz, respectively. When operating in the pulsating mode, the same waveform generators **60–68** pulsate at repetition rates of three times per second, four times per second, five times per second, 8.5 times per second, 10 times per second, 12 times per second, 17 times per second, 20 times per second, and 26 times per second, respectively.

Attention is now directed to FIG. **9** which illustrates an exemplary one of the waveform generators **60–68.** The basic sawtooth generating circuit comprises a unijunction transistor relaxation oscillator of the classical type well known in the art. Unijunction transistor **90,** when the oscillator is operating, has its base **2** electrode connected directly to ground either through continuous/pulsating switch **91** or through transistor **92** which functions as an alternative switch. Assuming initially that base **1** of the UJT **90** is grounded; at the beginning of an operating cycle, the emitter electrode thereof is reverse-biased and hence non-conducting. As capacitor **93** charges through the resistance comprising fixed resistor **94** and variable resistor **95** in series, the emitter voltage rises exponentially toward the supply voltage, 10 volts d-c regulated, to which the resistor **95** is connected. When the emitter voltage reaches the peak point voltage of the UJT **90,** the emitter becomes forward-biased, and the dynamic resistance between the emitter and base **1** drops to a low value. Capacitor **93** then discharges through the emitter. When the emitter voltage reaches the valley voltage of the UJT **90,** the emitter ceases to conduct, and the cycle is repeated. Thus, the signal observed at the emitter electrode of the UJT **90** closely resembles a sawtooth, and the frequency of oscillation of the circuit depends principally upon the values selected and adjusted for the capacitor **93** and the charging resistance comprising the resistors **94** and **95.** Resistor **96** is utilized as a compensator to stabilize operation at diverse temperatures. For a more complete discussion of UJT relaxation oscillators, one may refer to Chapter 13 of *Transistor Manual* (7th Edition), published by The General Electric Company.

As previously noted, each of the sawtooth waveform generators **60–68** may be operated in either continuous mode or a pulsating mode. If the switch **91** is closed to ground base **1** of the UJT **90,** the waveform generator operates continuously as described. However, if switch **91** is open, the waveform generator can only operate when transistor **92** is switched on to provide an alternate ground for base **1** of the UJT **90.** By switching the transistor **92** on and off at a predetermined rate, the relaxation oscillator including the UJT **90** will operate for a few cycles and then be off for a few cycles to provide a pulsating output.

The pulse rate of the waveform generator is determined by another unijunction transistor relaxation oscillator circuit which includes UJT **100.** The charge rate of capacitor **101** is controlled by its value and by that of the adjustable resistor **102.** Resistor **103** is connected between base **1** of UJT **100** and ground to permit development of the sharp leading edge developed when capacitor **101** discharges through UJT **100.** This signal is applied to the trigger input of an integrated circuit flip-flop **104** which switches state each time the capacitor **101** discharges through the UJT **100** and the resistor **103.** As a result, the output signal from the flip-flop **104,** coupled through isolating resistor **105** to the base electrode of transistor **92,** is a square wave having a frequency one-half that of the relaxation oscillator which includes the UJT **100.** The UJT **100** is provided with the usual compensating resistor **106,** and resistor **107** is connected between the regulated 10 volt d-c power supply and the power input to the integrated circuit flip-flop **104** in order to drop the voltage into the operating range of the flip-flop.

When the signal appearing at the base electrode of the transistor **92** goes positive, the transistor is forward-biased and switches into the conducting mode to clamp its collector electrode to ground. Since the base **1** of UJT **90** is connected to the collector electrode of the transistor **92,** the relaxation oscillator including the UJT **90** commences to function. Additionally, when the collector electrode of the transistor **92** is grounded, either because the transistor is switched on or because the switch **91** is closed, an incandescent lamp **108,** connected between the 10 volt d-c power supply and the collector electrode of transistor **92,** is energized to provide an indication that the relaxation oscillator is operating. When the switch **91** is open and the signal appearing at the base electrode of the transistor **92** is below the potential necessary to hold the transistor **92** on, it will switch off to isolate the collector electrode, and hence base **1** of the UJT **90,** from ground such that the relaxation oscillator ceases to operate, and the incandescent lamp **108** is de-energized. Thus, by appropriately selecting the values of the resistor **94,** the capacitor **93,** and the capacitor **101** and by proper adjustment of the variable resistors **95** and **102,** the oscillation rates and pulsation rates given above, or any others that might be desired, can readily be achieved.

The output signal observed at the emitter of the UJT **90** is a-c coupled through capacitor **109,** isolating resistor **110,** and switch **80,** to the power amplifier **69** as shown in FIG. **8.** As a practical matter, the switches **80** and **91** may be incorporated into a single three-position actuator having pulsating, off, and continuous operating positions.

The power amplifier **69** is shown schematically in FIG. **10** and will be observed to constitute a straightforward audio amplifier and therefore is only exemplary as utilized in the presently preferred embodiment of apparatus for practicing the invention. An input stage includes transistor **111** of which the base electrode is biased by resistor **112,** connected between a **40** volt d-c power supply and the base electrode, and by a resistor **113** connected between the base electrode and ground. A fixed resistor **114** and a variable resistor **115** are connected between the 40 volt d-c supply and ground, and the collector electrode of the transistor **112** is connected to the junction of the resistors **114** and **70** such that a signal of variable amplitude is picked up at the tap of variable resistor **70** to feed, through coupling capacitor **116,** the power output stage.

The power output stage includes a pair of cascaded transistors **117** and **118** with the base electrode of the transistor **117** receiving the signal from the gain control resistor **70.** Resistor **119** serves to develop the input signal to the cascade power stage in which both the transistors **117** and **118** have their collector electrodes connected to the 40 volt d-c power supply. The emitter electrode of the transistor **117** drives the base electrode of the transistor **118** directly, and the output from the power stage is taken from the emitter electrode of the transistor **118** to achieve low impedance output characteristics.

A load comprising shunt resistor **120,** incandescent lamp **121** and an impedance **122** is driven by a power output stage through a diode **123** which serves to insure a unidirectional output waveform consisting of one or more mixed sawtooth signals. The impedance **122,** which is shown in FIG. **10** to be disposed across electrodes **71** and **72,** represents the impedance of the current path between the electrodes when they are applied to the skin. This impedance is typically in the megohm region such that it will be apparent to those skilled in the electronics arts that the preponderance of the current delivered by the output stage passes through the resistor **120** and the incandescent lamp **121.** It has been found that the R.M.S. voltage appearing across the load varies between approximately **3** volts and approximately 10 volts with the component values and semiconductor types tabulated below.

Power delivered to the total load is less than one-half watt with the portion dissipated by the impedance **122** being a very small fraction thereof. Thus, the deliberate limitation of voltage output utilized in conjunction with a relatively low impedance shunt load insures that the apparatus is completely safe while nonetheless applying adequate electrical stimulus to excite the muscles in the desired manner.

A suitable power supply for energizing the apparatus is shown schematically in FIG. **11.** Primary windings of transformers **124** and **125** are connected to a conventional line source with an on/off switch **126** and a fuse **127** placed into one side of the input pair to afford conventional selective energization of the apparatus and current overload safely. The secondary winding of transformer **124,** which is disposed in a stepdown configuration, has a full-wave bridge rectifier **128** connected in the usual manner with a filter capacitor **129** and bleeder resistor **130** completing the 40 volt d-c power supply section by which the power amplifier is energized.

Transformer **125,** also connected in the stepdown configuration, has a full-wave bridge **131** connected across the secondary winding thereof and a filter capacitor **132** and bleeder resistor **133** to provide unregulated d-c. Another filter section, consisting of series resistor **134** and shunt capacitor **135,** affords additional smoothing into a series/shunt regulator circuit.

The regulator circuit includes series regulator transistor **136,** controller transistor **137,** zener diode **138,** fixed resistors **139** and **140,** and variable resistor **141,** all connected in the classical feedback configuration. The series regulator transistor **136** absorbs the voltage changes as in the ordinary series and shunt regulator. The action of this regulator can be shown by assuming a given input voltage which, in conjunction with load current through the source impedance, sets a voltage at the collector electrode **136.** The collector-base voltage of transistor **136** is set by the control current flowig through resistor **139.** This control current is determined by the base-emitter voltage and the transconductance of transistor **137.** If the input voltage increases, the control voltage ($I_{zener}R_{129}$) increases, and the output voltage will tend to be constant. The opposite effect is observed if the input voltage decreases. The output voltage can be selected by adjusting variable resistor **141** which is, in effect, a voltage divider coupled to the base electrode of control resistor **137.** For a more comprehensive discussion of this type of regulator circuit, one may refer to Chapter 3 of *Silicon Zener Diode and Rectifier Handbook*, Second Edition, published by Motorola, Inc., Phoenix, Ariz., and other standard handbooks.

The following tabulation is provided to set forth in specific detail a currently preferred embodiment of apparatus for practicing the invention. However, those skilled in the electronics arts will fully appreciate that the various elements presented in the block diagram of FIG. **8** can be substituted with a wide variety of equivalent circuits to achieve corresponding results.

Capacitors:	
93	.01–.1 MFD depending on oscillator frequency
101	2–10 MFD depending on oscillator frequency
109	.01 MFD
116	50 MFD
129	100 MFD
132	100 MFD
135	1000 MFD
Diodes:	
123	1A
128 (Bridge)	4×1A
131 (Bridge)	4×1A
138	8.2v zener
Integrated Circuit Flip-Flop: HEP C 2503 P	
Resistors	
70	10 K adj
94	13 K - 39K depending on oscillator frequency
95	10 K adj
96	330
102	10 K adj
103	330
105	470
106	220
107	220
110	47K
112	220K
113	11K
114	1,8K
119	100K
120	350
130	1.5K
133	1K
134	
139	150
140	220
141	10K adj
Transformers:	
124	115v/25.2 vct
125	115v/12.6 vct
Transistors:	
90	2N 2647
92	2N 2219
100	2N 2647
111	2N 3506
117	MJE 3055
118	MJE 3055
136	MJE 3055
137	2N 3506

FIG. 12 graphically illustrates an electrode, generally designated by the reference character **142,** which may be connected to either of the electrodes **71** or **72** hereinbefore described in connection with the detailed description of FIG. **10.** The electrode **142** consists of an insulated conductor **143** fitted at one end thereof with a conventional male phonejack-type connector **144** engageable with a female receptacle, herein not shown, integral with either of the electrode terminals **71** or **72.** A portion of the conductor **143** has the insulation stripped therefrom to bare a length of wire **147.** An electrically conductive mesh, such as a fine wire mesh **148,** preferably of stainless steel to prevent corrosion, is encased about the bared wire **147** to permit the electrical current transmitted through the wire **147** to be dissipated into the electrically conductive mesh **148** to provide a cushion between the electrically conductive mesh and the human scalp. Cloth stripping **150** is wrapped about the cotton batting **149** to maintain the shape of the electrode **142.** For sanitary reasons, the cloth **150** is in two separate strips—a first strip which permanently encases the electrode, and a second outer strip which is changed between applications of the method to various persons. When not in use, the electrode **142** is maintained in a disinfectant solution, again for sanitary reasons. However, the liquid provides an adequate conductor for transferring the current from the electrically conductive mesh **148** to the human head. In actual practice, two electrodes **142** are employed, the first electrode being designated the "driven" electrode, and the second electrode being maintained at ground potential.

An alternate electrode **157** useful in specific steps of the method of the present invention is shown in FIG. **13.** A pair of identical electrodes **158** and **159** are each found in the general shape of a comb having a substantially straight upper edge **160** and depending tooth members **161** and having tang portions **162** extending from one end of each of said comb-like electrodes **158** and **159.** An insulator strip **163** maintains the electrodes **158** and **159** in a spaced relationship approximately 0.25 inches. A handle 164 encircling the tangs **162** and the intermediate spacer **163** is sized and shaped for grasping by the human hand. A shielded electrical conductor **167** is mechanically and electrically secured at one end thereof to each of the tangs **162** while the free ends of the conductors **167** are each fitted with a male conductor **144** as hereinbefore described in connection with FIG. **12.**

The method of the present invention, in accordance with a preferred embodiment thereof, begins by applying the operative electrodes, as alternately described in FIGS. **12** and **13,** to the superficial cervical plexus H generally at the branching of the occipital artery **48** from the external carotid artery **47.** The method is best understood with reference to FIG. **6.** This area is massaged generally upward in the direction of the flow of blood of the occipital artery **48,** as designated by the arrow K, and proceeds upwardly through the posterior division F to approximate its union with the posterior temporal **51** as designated by the dashed line **41.** It has been discovered that for best results the electrode **157** is most effectively utilized for localized electrical impulse in the lower portion of the posterior division. In the central portion of the posterior division, approximately even with the ear line, the comb-like electrode **157** is discarded in favor of the pod-like electrodes **142.** While one of the electrodes **142,** designated as the ground potential electrode, is maintained in stationary contact with the head, the other electrode **142,** designated as the "driven" electrode, is utilized as a massaging device and progressively worked upward through the posterior division substantially tracing the pattern and blood flow of the occipital artery **48.**

Following the above procedure, the electrodes are moved forwardly to the upper mandibular area I at approximately the terminus of the middle temporal artery **50** and the massage procedure is repeated generally over the area of the scalp serviced by the anterior temporal artery **52** as it traverses through the middle portion of the opthalmic area G. Subsequently, the method continues in the rearward portion of the opthalmic area G by massaging that portion of the scalp serviced by the posterior temporal artery **51.**

Generally, the driven electrode **142** is not moved over the scalp but is maintained firmly against the scalp and the movement thereof in a general fore-and-aft motion is limited to the movement of the scalp collectively, including the epidermis C, the dermis B and the adipose tissue D upon the galea **37.** As hereinbefore described, the thickening and hardening of the galea **37** is not uniform throughout the scalp, thereby producing tight spots and loose spots. Since it is an object of the present invention to loosen the entire scalp, slightly varying methods are employed upon the loose areas and the tight areas. In the loose areas, the massaging is accomplished with quickened movement of the electrode with reduced pressure. Conversely, the tight spots require substantially greater pressure with slower movement of the electrode and are manipulated for a substantially greater time. In either case, the driven electrode is maintained in contact with the scalp to be moved no greater than that permitted by the particular area of the scalp.

The primary object of the present invention is the stimulation and excitation of the human organs associated with hair follicles to permit blood circulation and to soften and relax the galea. Simple hand massage could accomplish the desired results except that the duration of the required massage exceeds the physical limits of time available in any given day.

The present method and apparatus clearly bring the massage within practical time limits by the use of an electronic device which amplifies and intensifies the desired stimulation. The device employed in the present method alternately contracts and relaxes the human organs associated with the hair follicles at a rate not obtainable by hand massage or mechanical vibrators or other prior art devices.

While the preferred embodiment hereinbefore described utilizes a sawtooth or triangular wave, it will be obvious to those skilled in the art that other waveforms such as square waves or sine waves will also desirably affect the human organs, and the scope of the invention is not meant to be limited to triangular waves. As a commercial expediency, to construct the device at a reasonable price, the triangular wave is believed to be most practical. Similarly, the head and scalp area may be massaged in alternately varying patterns. The preferred sequential pattern as hereinbefore described appears to produce the most desirable results.

Having fully described and disclosed the invention and the preferred embodiment thereof in such clear and concise terms as to enable those skilled in the art to understand and practice the same.

The invention claimed is:

1. A method for stimulating and exciting the organs associated with the human scalp, said scalp having tight areas and loose areas, said method comprising the steps of:

a. successively positioning a pair of electrodes in a spaced relationship against predetermined areas of that portion of the scalp overlaying the galea;

b. passing electrical current between said electrodes wherein said current is in the form of a low-frequency wave in the range 200 to 3,000 cycles per second, with an electrical potential sufficient to stimulate said organs; and

c. massaging said scalp in the area of at least one of said electrodes.

2. The method of claim 1, wherein the positioning step further includes the partial steps of:

a. positioning at least one of said electrodes proximately over the external carotid artery near the base of one of the branches thereof; and

b. successively and progressively repositioning said electrode along said branch from the base to the end thereof to stimulate the flow of blood therethrough in the direction of the natural flow pattern.

3. The method of claim 1, wherein said massaging step is accomplished with a generally fore and aft motion with one of said electrodes in stationary contact with said scalp and said motion limited to the displacement of said scalp.

4. The method of claim 3, wherein said tight spots are massaged for a greater time with more pressure and less speed of motion than said loose spots.

5. A device for the stimulation and excitation of the human organs associated with hair follicles, said device comprising:

a. a plurality of waveform generators, each said generator operating at a different frequency within the range of 200 to 3,000 cycles per second;

b. a selectively variable power amplifier;

c. switch means for selectively and in combination coupling each of said generators to said amplifier;

d. a first electrode driven by said amplifier; and

e. a second electrode maintained at ground potential from which the signals from the first electrode are referred.

6. The device of claim 5 including means associated with each said generator for selectively operating said generator in continuous and pulsating modes.

7. The device of claim 5 wherein each said electrode includes:

a. an electrical conductor:

b. an electrically conductive mesh communicating with said conductor; and

c. a resilient covering encasing said mesh.

8. The device of claim 5, including:

a. a pair of spaced comb-like electrodes; and

b. a non-conductive intermediate spacer member disposed between said comb-like electrodes.

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