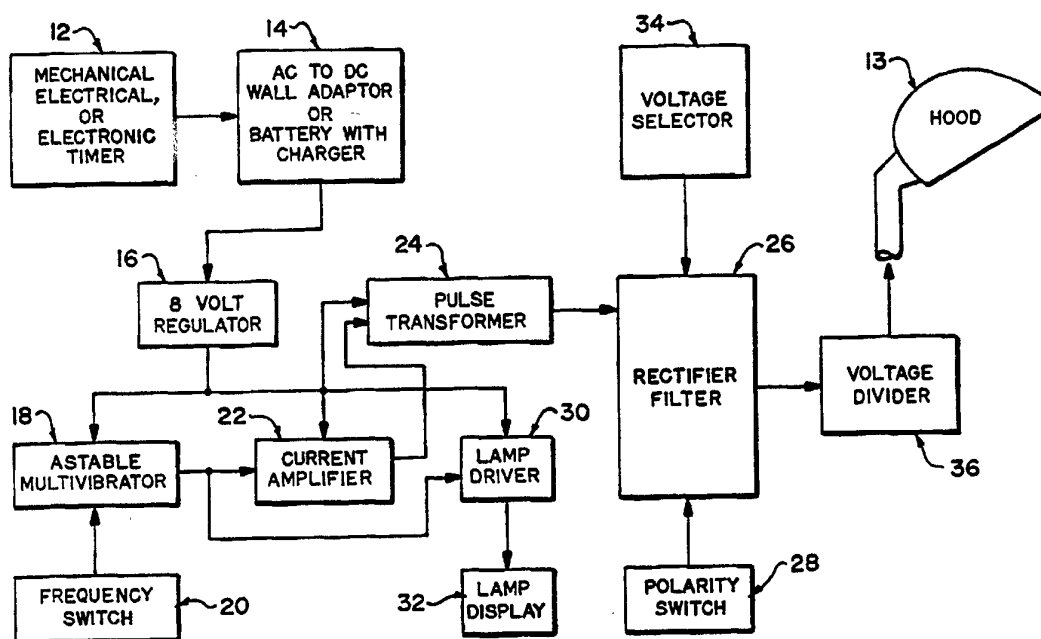




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(54) Title: HAIR REGROWTH METHOD AND APPARATUS



(57) Abstract

Hair regrowth is promoted or hair loss mitigated by positioning two or more electrodes (11) closely proximate, but not touching, a subject's scalp. A low voltage positive or negative polarity pulse train signal having a pulse repetition frequency in the range of about 5 to 35 hertz is applied to the electrodes (11) for about twelve minutes. The subject undergoes a treatment cycle spanning a period of about thirty-two weeks during which one or two of the treatments aforesaid are applied per week.

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HAIR REGROWTH METHOD AND APPARATUSField of the Invention

This application pertains to a method and apparatus for promoting hair regrowth and/or mitigating hair loss in humans.

Background of the Invention

Many individuals are troubled by premature baldness, receding hairlines, or other conditions in which hair is lost from the head. Over the years, a variety of chemicals have been marketed as hair regrowth aids but with mixed, generally disappointing results. Many individuals have invested considerable sums in artificial hair pieces. Some individuals have even undergone surgical hair implantation procedures requiring the exercise of highly skilled medical expertise which is generally unavailable to a wide cross-section of potential beneficiaries. It will thus be appreciated that there is a need for a reasonably inexpensive hair regrowth process capable of being administered by relatively unskilled personnel and capable of promoting hair regrowth in the widest possible population cross-section.

The prior art discloses that a variety of electrical stimuli have been employed in an effort to promote hair growth. For example, United States patent No. 861,349 issued 30 July, 1907 for an invention of R.E. Beaubien entitled "Apparatus for Treating the Scalp" discloses an "apparatus for promoting the growth of hair upon the human head". The apparatus appears to rely upon a combination of pneumatic, vacuum and electrical effects, in combination with the application of medicated lotions and massage to the scalp. According to Beaubien, any desirable form of electrical battery or current may be used. The present applicant however believes that this is not the case and that in order to satisfactorily promote hair regrowth, specific electrical signals must be employed.

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United States patent No. 735,581 issued 4 August, 1903 for an invention of Pollacsek, et al. entitled "Therapeutical Apparatus" discloses a device "by means of which vibrations of diseased parts of the body can be produced".

5 Pollacsek, et al. indicate that the device may be shaped as a cap to be placed on the head and that the cap may be introduced into a magnetic field produced by an electric current passing through the windings of an iron core. However, there is no indication of the specific nature of

10 the electric or magnetic signals or fields employed, nor is there any suggestion that Pollacsek, et al. considered applying their device to promote hair regrowth.

United States patent No. 740,385 issued 6 October, 1903 for an invention of W.B. Bassell entitled "Electrotherapeutic Appliance" provides another device "adapted to subject the wearer to the action of a current of electricity for curative purposes". Bassell explains that his invention is to be utilized for the relief and cure of

15 nervousness, insomnia, headache, and other kindred troubles. He suggests that this may be accomplished by subjecting the head of the wearer to the action of a comparatively mild current of electricity provided by a small battery. Again however there is no suggestion that Bassell

20 considered the use of his device to promote hair regrowth, nor are any specific electrical signals discussed.

United States patent No. 3,872,859 issued 25 March, 1975 for an invention of Pitzen, et al. entitled

30 "Method and Device for Stimulating the Organs Associated with the Human Scalp" examines the problem of promoting hair growth in some detail. Pitzen, et al. provide a method and apparatus in which a plurality of wave form generators output signals having frequencies varying from

35 230 hertz through 2650 hertz. The waveform generators are also pulsed at repetition rates varying from 3 times per second to 26 times per second. The signals so produced are

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applied to hand-held massaging electrodes which are in turn applied to the subject's scalp.

Published French patent application No. 2,484,262
5 of Paul Maurice Viallis provides another electrical apparatus and method for treating the human scalp to combat seborrhoea, hair loss, dandruff, etc. A conductive electrode cap is fitted over the scalp and a secondary electrode is placed in contact with another area of the body.
10 A current of the order of 8-15 mA is applied for a period of 5 to 30 minutes depending upon the type of complaint and type of treatment prescribed. The object of Viallis' invention is apparently to ionize the scalp area so that ointments or other applied treatment compositions may
15 penetrate the scalp with greater effectiveness.

Published West German patent application No. 3,618,933 discloses an invention of Masaki, et al. pertaining to an electrotherapeutic device for promoting eyebrow
20 hair growth. The apparatus is shaped to fit on a patient's head. Electrodes are applied to the eyebrows. A pulse-like current preferably having a square or trapezoid waveform is applied to the electrodes, with a biphasic action, potential-like oscillation having a frequency in
25 the 1/500 to 1/200 second range and pulsed at a frequency of .5 to 2 seconds is preferably applied to the electrodes.

Two published British patent application Nos. 2,160,426A and 2,160,427A of Masaki appear to correspond to
30 the West German application aforesaid, although the British applications do not appear to restrict themselves to eyebrow hair growth.

United States Patent No. 3,946,745 Hsiang-Lai et
35 al teaches a system in which electrical pulses are applied directly to a living body, for example by attaching elec-

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trodes to the body by means of an acupuncture needle or spring-loaded earring.

German patent application DE 29 52 850 A1 teaches
5 the use of electromagnetic pulsating fields for stimulating the body functions furthering the growth of hair. Frequencies in the 400-420 hertz range are mentioned, with the subject undergoing continuous exposure to the fields, for example by having the subject carry a battery powered
10 apparatus on his/her person.

French patent No. 1,350,890 teaches a hair dryer having an electrode structure to which a high frequency voltage generator is electrically coupled in order to apply
15 an intense high frequency electric field to the hair so as to heat and evaporate water from the hair. The patent mentions that the applied field also has a stimulating effect on the cells of the skin and improves blood circulation, which is favourable to the metabolism and to healthy
20 growth of hair.

Although not wishing to be bound by any theory, the inventors believe that dormant body hair cells (i.e. hair cells from which hair is not actively growing) may be
25 electrically stimulated to promote active hair growth from such cells. More particularly, the inventors believe that hair regrowth can be promoted if the body's hair cells are stimulated by subjecting them to a low voltage pulse train having a pulse repetition frequency in the range of about
30 5 to 35 hertz. The higher portion of this frequency range is considered appropriate for subjects who exhibit normal or hyperactive energy levels. The lower portion of the frequency range is considered appropriate for individuals who exhibit hypoactive or slow metabolism energy levels.

35

Summary of the Invention

In accordance with the preferred embodiment, the invention provides a process for promoting hair regrowth and/or mitigating hair loss in which two or more electrodes are positioned closely proximate to, but not contacting the subject's scalp. A low voltage electrical pulse train signal having a pulse repetition frequency in the range of about 5 to 35 hertz is continuously applied to the electrodes for about twelve minutes. The polarity of the signal may be either positive or negative. A complete hair regrowth treatment cycle typically spans about thirty-two weeks, during which time the subject undergoes a sequence of twelve minute treatments as aforesaid. Throughout the treatment cycle the subject undergoes one or two twelve minute treatments per week, during which the treatment frequency, signal polarity and voltage level are preferably varied according to the following schedule:

	<u>Number of Treatments</u>	<u>Polarity</u>	<u>Voltage Level</u>	
20	1st week	2	Positive	110 v.
	2nd week	2	Positive	110 v.
	3rd week	1	Negative	110 v.
	4th week	1	Negative	110 v.
25	5th week	1	Negative	110 v.
	6th week	1	Negative	110 v.
	7th week	1	Negative	110 v.
	8th week	1	Negative	110 v.
	9th week	1	Negative	110 v.
30	10th week	1	Negative	110 v.
	11th week	1	Negative	110 v.
	12th week	1	Negative	110 v.
	13th week	1	Negative	110 v.
	14th week	1	Negative	110 v.
35	15th week	1	Negative	110 v.
	16th week	1	Negative	110 v.
	17th week	2	Positive	55 v.
	18th week	2	Positive	110 v.
	19th week	1	Negative	55 v.
40	20th week	1	Negative	110 v.
	21st week	1	Negative	55 v.
	22nd week	1	Negative	110 v.
	23rd week	1	Negative	55 v.
	24th week	1	Negative	110 v.
45	25th week	1	Negative	55 v.
	26th week	1	Negative	110 v.

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	27th week	1	Negative	55 v.
	28th week	1	Negative	110 v.
	29th week	1	Negative	55 v.
	30th week	1	Negative	110 v.
5	31st week	1	Negative	55 v.
	32nd week	1	Negative	110 v.

The invention also provides a hair regrowth apparatus having at least two electrodes which are adapted to be positioned closely proximate to, but not touching a subject's scalp. A voltage pulse generator is electrically coupled to the electrodes for application thereto of a low voltage pulse train. A frequency selector is electrically coupled to the voltage pulse generator for varying the pulse repetition frequency of the pulse train. A polarity selector is electrically coupled between the voltage pulse generator and the electrodes, for varying the polarity of the pulse train. A voltage selector is electrically coupled between the voltage pulse generator and the electrodes, for varying the voltage of the pulse train.

Advantageously, a plurality of electrodes are provided. The electrodes are mounted within a hood positionable over the subject's head to form an array of concentric electrically conductive electrode rings. The rings can be applied to an outer surface of an electrically insulating liner insertable within the hood. The array preferably comprises five rings mounted within the hood to subtend a 90° arc on both sides of a central perpendicular axis of the hood. The four upper electrodes each subtend an arc of about 15° and the fifth (lower) electrode subtends an arc of about 6°, with 6° arc gaps between each pair of electrodes on either side of the central perpendicular axis. The voltage pulse generator's output signal is applied across the two upper electrode pairs, with alternate electrodes being connected to one of the two output terminals of the voltage pulse generator. A voltage

divider applies a reduced voltage signal to the lower electrode.

Brief Description of the Drawings

5 Figure 1A is an elevation view of a schematically represented hood liner bearing an electrode array configured for use in practising the invention. Figure 1B is a top view of the Figure 1A structure.

10 Figure 2 is a block diagram of a hair regrowth apparatus constructed in accordance with the preferred embodiment of the invention.

15 Figure 3 is a partial schematic/block diagram depicting further details of the circuitry utilized with the preferred electrode array.

20 Figure 4 is an electronic circuit schematic diagram depicting additional details of the preferred apparatus.

Detailed Description of the Preferred Embodiment

25 As shown in Figures 1A, 1B and 2, the exterior surface of hood liner 10 carries a plurality of electrodes 11. When liner 10 is inserted within hood 13 and the hood placed over a subject's head, electrodes 11 are positioned closely proximate to, but do not touch the subject's scalp.

30 The apparatus is turned on and off with the aid of a mechanical, electrical or electronic timer 12 (Figure 2) operatively connected to power supply 14 which may be a conventional 110 volt A.C. to 12 volt D.C. transformer. The 12 volt D.C. signal output by power supply 14 is regulated down to 8 volts D.C. by voltage regulator 16 and
35 the resultant 8 volt D.C. signal is then used to power the remaining electronic components depicted in Figure 2. Instead of directly coupling a 110 volt A.C. power source

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to the circuitry as aforesaid, one may alternatively use power supply 14 to charge a 12 volt D.C. battery. The charged battery can then be used to fulfil the apparatus' power requirements and power supply 14 can be disconnected
5 from the 110 volt A.C. power source while the apparatus is in use with a subject.

A voltage pulse generator means 18 such as an astable multivibrator is electrically coupled to electrodes
10 11. Pulse generator 18 applies a low voltage train of short duration pulses to electrodes 11 at a selectable pulse repetition frequency. Specifically, frequency selector switch 20 is electrically coupled to pulse generator 18 to enable the operator to vary the pulse repetition frequency within the preferred range of about 5 to 35 hertz.
15 Lamp driver 30 provides a visual indication, via lamp 32, of the selected pulse repetition frequency (i.e. lamp 32 blinks on and off at the selected frequency).

The low voltage pulse train output by pulse generator 18 is amplified by current amplifier 22 and then presented to pulse transformer 24 which outputs one of two operating voltages (55 volts peak-to-peak; or, 110 volts peak-to-peak). A "signal polarity selector means"; namely,
25 rectifier/filter 26, is electrically coupled between pulse transformer 24 and electrodes 11, thereby enabling the operator to vary the polarity of the signals output by pulse transformer 24 through manual selection of one of two positions for polarity switch 28. A "voltage selector
30 means"; namely, two position switch 34 is provided to enable the operator to select one of the two operating voltages aforesaid for the pulse train applied to electrodes 11.

35 Further details of the preferred circuitry are now provided with reference to Figures 3 and 4. The 12 volt D.C. signal output by power supply 14 is electrically

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coupled to voltage regulator 16 which, in the preferred embodiment, is an LM7808 integrated circuit 8 volt regulator with internal current limiting, thermal shutdown capability and safe area compensation for the internal pass transistor. Capacitors C4 and C5 respectively provide low frequency filtering for the input and output of regulator 16, which produces an 8 volt D.C. output signal used to power the remaining electronic components.

Astable multivibrator 18 is a NE555 integrated circuit pulse generator. The trigger input of astable multivibrator 18 is connected to the threshold input thereof (represented by the dashed line shown in integrated circuit U2 in Figure 4) in order to continuously retrigger the circuit for astable operation thereof. Resistors R1, R2 and R5, together with potentiometers R3 and R4 and timing capacitors C1 and C2 control the frequency of the pulse train output by astable multivibrator 18. The output frequency is selected by manual positioning of switch SW1 (reference No. 20 in Figure 1) which is a single pole, double throw switch (assuming configuration of the apparatus to supply pulse trains of two different frequencies; comparable switching arrangements can be provided if the apparatus is to be configured for use with three or more such frequencies). When switch SW1 is in the "F1" position, astable multivibrator 18 produces a low voltage, pulse train at a first frequency. When switch SW1 is in the "F2" position astable multivibrator 18 produces a low voltage, pulse train at a second frequency. More particularly, when switch SW1 is in the "F1" position, the steady state frequency of the voltage pulse train output by astable multivibrator 18 is determined by:

$$F1 = \frac{1}{T1} = .693(R2 + R4 + R5)C2$$

Similarly, when frequency selector switch SW1 is in the "F2" position, the steady state frequency of the voltage

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pulse train output by astable multivibrator 18 is determined by:

$$F2 = \frac{1}{T2} = .693(R1 + R3 + R5)C2$$

5 The frequency selected is visually indicated by flashing light emitting diode D1, which is driven through current limiting resistor R7 and inverting amplifier transistor Q3. Resistor R8 provides current limiting for light emitting diode D1.

10

Capacitor C1 is used to bypass pin 5 of the astable multivibrator 18 to ground, preventing noise from altering the width of the pulses output by astable multivibrator 18. Capacitor C3 is a bypass capacitor which eliminates high frequency noise on the power line.

The low voltage pulse train output by astable multivibrator 18 passes to a current amplifier 22 comprising transistors Q1 and Q2, which are configured to operate in a class B switching mode to provide the higher peak currents passed through pulse transformer 24. More particularly, when pulse transformer 24 is switched on, a pulse is imposed on the transformer primary winding. Because the transformer provides D.C. isolation, the higher voltage end of the transformer can safely be used to produce a positive or negative-going pulse through the polarity selector means comprising pulse transformer 24 together with a first rectifier means (i.e. diode D2 shown in Figure 3), a second rectifier means (i.e. diode D3 shown in Figure 3) and polarity switch SW2 (reference No. 28 in Figure 1). When switch SW2 is in the "positive" polarity position, diode D2 in combination with filter capacitor C6 and discharge resistor R9 shape the pulses output by switching transformer 24, while blocking negative-going portions of the pulse train. Similarly, when polarity selector switch SW2 is in the "negative" polarity position, diode D3 blocks positive-going portions of the pulse train. The voltage

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output across resistor R9 is coupled to the electrodes within hood 13. Limit resistor R10 and voltage selector switch SW3 (reference No. 34 in Figure 1) enable the operator to select between one of two operating voltages
5 (55 volts peak-to-peak; or, 110 volts peak-to-peak in the preferred embodiment.

Reverting to Figures 1A and 1B, the preferred electrode array consists of five electrodes 11, each
10 comprising a thin band of conductive material such as copper foil. The bands are applied to form approximately concentric rings on the outer surface of hood-shaped liner 10, which is formed of an electrically insulating material such as plastic. Liner 10 supports the electrode bands and
15 prevents them from contacting the subject when liner 10 is inserted within hood 13. More particularly, hood 13 (which may be a conventional commercial hair dryer hood) is placed over the subject's head so that the inner (i.e. non-electrode bearing) surface of liner 10 is adjacent the
20 subject's head. Typically, the subject's scalp is separated from the inner surface of liner 10 by a gap of several centimetres.

The number of bands, the width of each band, the
25 spacing between each band, and the relative placement of each band on liner 10 are selected so that the electric fields imposed on the subject's scalp under each band are approximately equal and to prevent imposition of excessive electric fields on the subject's scalp outside the region
30 thereof adjacent electrodes 11. In the preferred embodiment, electrodes 11 subtend a 180° arc (i.e. 90° on either side of the central perpendicular axis of hood 13 as seen in Figure 1A), with the four upper electrodes each subtending arcs of about 15° and the fifth (lowermost) electrode
35 subtending an arc of about 6°, with 6° arc gaps between each pair of electrodes on either side of the central perpendicular axis.

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The full voltage signal output by rectifier/filter 26 is applied across electrode pair A and B; and, across electrode pair C and D. A voltage divider 36
5 supplies a half-strength voltage signal for application to electrode E. This reduced voltage assists in preventing imposition of excessive electric fields to the subject's scalp outside the region thereof adjacent to the electrodes, as mentioned above. As shown in Figure 3, voltage
10 divider 36 comprises three series-connected resistors R_{11} , R_{12} , and R_{13} . Electrode bands A and C are electrically connected to the voltage dividing point between R_{11} and R_{12} , band E is electrically connected to the voltage dividing point between R_{12} and R_{13} , and bands B and D are electrical-
15 ly connected to the opposite end of R_{13} . In the preferred embodiment, the resistance values of R_{11} and $R_{13} = 1.2 \text{ M}\Omega$ and $R_{12} = .39 \text{ M}\Omega$.

Figure 3 also shows further details of rectifier/filter 26, polarity switch 28 and voltage selector switch 34. Specifically, rectifier/filter 26 preferably includes a capacitor C_6 connected in parallel across a pair
20 os series-connected resistors R_9 , R_{10} ; with the capacitance value of $C_6 = 1.8 \text{ pf}$, and the resistance values of R_9 and $R_{10} = .56 \text{ M}\Omega$. Polarity switch 28 preferably includes a pair of diodes D_2 , D_3 which may be alternatively switched into the circuit path emanating from either one of the two output
leads of pulse transformer 24. (The polarity of the voltage signal applied across any pair of electrode bands
30 is the sign of the voltage difference across those electrodes. In the case of the Figure 1 electrode array, the polarity is the sign of the voltage applied to electrode band A.) Voltage selector switch 34 is coupled across R_{10} such that, in one position of switch 34 the voltage devel-
35 oped across R_9 is applied to voltage divider 36, and in the other position of switch 34 the voltage developed across

the series-connected combination of R₉ and R₁₀ is applied to voltage divider 36.

In operation, the subject's head is positioned within hood 13, so that electrodes 11 lie closely proximate to, but do not touch the subject's scalp. Power is applied to the circuit and switches 20, 28 manually positioned to select a desired signal output frequency and polarity. Signals of the selected frequency and polarity are applied to electrodes 11 for about 12 minutes, following which the power is disconnected and hood 13 removed from the subject's head. Repetitive treatments over many weeks will be required depending upon the individual characteristics of the particular subject.

An entire hair regrowth/hair loss mitigation treatment cycle will typically span about 32 weeks, during which time the subject undergoes one or two 12 minute treatments as aforesaid per week. The following table provides the weekly treatment frequency, the signal output polarity and the voltage level preferably employed (according to empirical determinations) during each week of the 32 week treatment cycle:

	<u>Number of Treatments</u>	<u>Polarity</u>	<u>Voltage Level</u>
1st week	2	Positive	110 v.
2nd week	2	Positive	110 v.
30 3rd week	1	Negative	110 v.
4th week	1	Negative	110 v.
5th week	1	Negative	110 v.
6th week	1	Negative	110 v.
7th week	1	Negative	110 v.
35 8th week	1	Negative	110 v.
9th week	1	Negative	110 v.
10th week	1	Negative	110 v.
11th week	1	Negative	110 v.
12th week	1	Negative	110 v.
40 13th week	1	Negative	110 v.
14th week	1	Negative	110 v.
15th week	1	Negative	110 v.
16th week	1	Negative	110 v.

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	17th week	2	Positive	55 v.
	18th week	2	Positive	110 v.
	19th week	1	Negative	55 v.
	20th week	1	Negative	110 v.
5	21st week	1	Negative	55 v.
	22nd week	1	Negative	110 v.
	23rd week	1	Negative	55 v.
	24th week	1	Negative	110 v.
	25th week	1	Negative	55 v.
10	26th week	1	Negative	110 v.
	27th week	1	Negative	55 v.
	28th week	1	Negative	110 v.
	29th week	1	Negative	55 v.
	30th week	1	Negative	110 v.
15	31st week	1	Negative	55 v.
	32nd week	1	Negative	110 v.

Some subjects may respond more favourably to alternative signal polarities than those set forth above. Accordingly, based upon professional review, the treatment regimen may be varied by, for example, replacing two of the negative polarity treatments with two positive polarity treatments and then returning to negative polarity treatments as prescribed for the balance of the treatment cycle.

25

As will be apparent to those skilled in the art in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.

30

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WHAT IS CLAIMED IS:

1. A method of improving the bodily appearance of a human, in which two or more electrodes are positioned closely proximate to but not in contact with said human's scalp, said method characterized by:
 - (a) applying to said electrodes a low voltage pulse train signal having a pulse repetition frequency in the range of about 5 to 35 hertz;
 - (b) continuing application of said signal to said electrodes for about 12 minutes; and,
 - (c) repeating steps (a) and (b) at approximately weekly intervals until cosmetically beneficial hair regrowth or mitigation of hair loss is attained.
2. A method as defined in claim 1, further comprising varying said signal's polarity to utilize positive polarity during steps (a) and (b) for some of said weekly interval spaced repetitions, and to utilize negative polarity during steps (a) and (b) for the remainder of said weekly interval spaced repetitions.
3. A hair regrowth treatment cycle spanning 32 weeks, in which two or more electrodes are positioned closely proximate, but not touching, a human subject's scalp during each one of a sequence of approximately 12 minute treatments to attain cosmetically beneficial hair regrowth, said treatment cycle characterized by:
 - (a) applying to said electrodes a low voltage pulse train signal having a pulse repetition frequency in the range of about 5 to 35 hertz;
 - (b) said treatments being applied to said subject at the rate of either one or two treatments per week;
 - (c) the polarity of said signal is either positive or negative, and the voltage level of said signal is either 110 volts or 55 volts, as follows:

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		<u>Number of Treatments</u>	<u>Polarity</u>	<u>Voltage Level</u>
	1st week	2	Positive	110 v.
5	2nd week	2	Positive	110 v.
	3rd week	1	Negative	110 v.
	4th week	1	Negative	110 v.
	5th week	1	Negative	110 v.
	6th week	1	Negative	110 v.
10	7th week	1	Negative	110 v.
	8th week	1	Negative	110 v.
	9th week	1	Negative	110 v.
	10th week	1	Negative	110 v.
	11th week	1	Negative	110 v.
15	12th week	1	Negative	110 v.
	13th week	1	Negative	110 v.
	14th week	1	Negative	110 v.
	15th week	1	Negative	110 v.
	16th week	1	Negative	110 v.
20	17th week	2	Positive	55 v.
	18th week	2	Positive	110 v.
	19th week	1	Negative	55 v.
	20th week	1	Negative	110 v.
	21st week	1	Negative	55 v.
25	22nd week	1	Negative	110 v.
	23rd week	1	Negative	55 v.
	24th week	1	Negative	110 v.
	25th week	1	Negative	55 v.
	26th week	1	Negative	110 v.
30	27th week	1	Negative	55 v.
	28th week	1	Negative	110 v.
	29th week	1	Negative	55 v.
	30th week	1	Negative	110 v.
	31st week	1	Negative	55 v.
35	32nd week	1	Negative	110 v.

4. Hair regrowth apparatus having at least two electrodes (11) adapted to be positioned closely proximate to, but not touching a subject's scalp, said apparatus characterized by:
- 40 (a) voltage pulse generator means (18) electrically coupled to said electrodes for application thereto of a low voltage pulse train; and,
- 45 (b) frequency selector means (20) electrically coupled to said voltage pulse generator means, for varying the pulse repetition frequency of said pulse train.

5. Hair regrowth apparatus as defined in claim 4, further comprising signal polarity selector means (26) electrically coupled between said voltage pulse generator means and said electrodes, for varying the polarity of said pulse train.
6. Hair regrowth apparatus as defined in claim 4, further comprising a plurality of said electrodes.
7. Hair regrowth apparatus as defined in claim 4, further comprising voltage selector means (34) electrically coupled between said voltage pulse generator means and said electrodes, for varying the voltage of said pulse train.
8. Hair regrowth apparatus as defined in claim 5, further comprising a plurality of said electrodes.
9. Hair regrowth apparatus as defined in claim 5, further comprising voltage selector means (34) electrically coupled between said voltage pulse generator means and said electrodes, for varying the voltage of said pulse train.
10. Hair regrowth apparatus as defined in claim 5, wherein said signal polarity selector means (26) comprises:
- (a) a voltage transformer (24);
 - (b) rectifier means (26) for blocking selected negative-going or positive-going portions of said pulse train; and,
 - (c) polarity switch means (28) for selectably coupling said rectifier means between said transformer output and said electrodes.
11. Hair regrowth apparatus as defined in claim 10, wherein said electrodes are mounted within a hood (13) positionable over said subject's head.

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12. Hair regrowth apparatus as defined in claim 4, wherein
said electrodes further comprise an array of concentric
electrically conductive rings mounted within a
5 hood (13) positionable over said subject's head.
13. Hair regrowth apparatus as defined in claim 12,
wherein said rings are applied to an outer surface of
an electrically insulating liner (10) insertable
10 within said hood.
14. Hair regrowth apparatus as defined in claim 12,
wherein said array comprises five rings (A, B, C, D,
E) mounted within said hood to subtend a 90° arc on
15 both sides of a central perpendicular axis of said
hood.
15. Hair regrowth apparatus as defined in claim 14,
wherein said array further comprises four upper
20 electrodes (A, B, C, D) each subtending an arc of
about 15° and a fifth lower electrode (E) subtending
an arc of about 6°, with 6° arc gaps between each pair
of said electrodes, on either side of said central
perpendicular axis.
- 25
16. Hair regrowth apparatus as defined in claim 15,
wherein said voltage pulse generator means output
signal is applied across said electrode pair (A, C)
and across said electrode pair (B, D) and further
30 comprising voltage divider means for applying a
reduced voltage signal to said electrode (E).

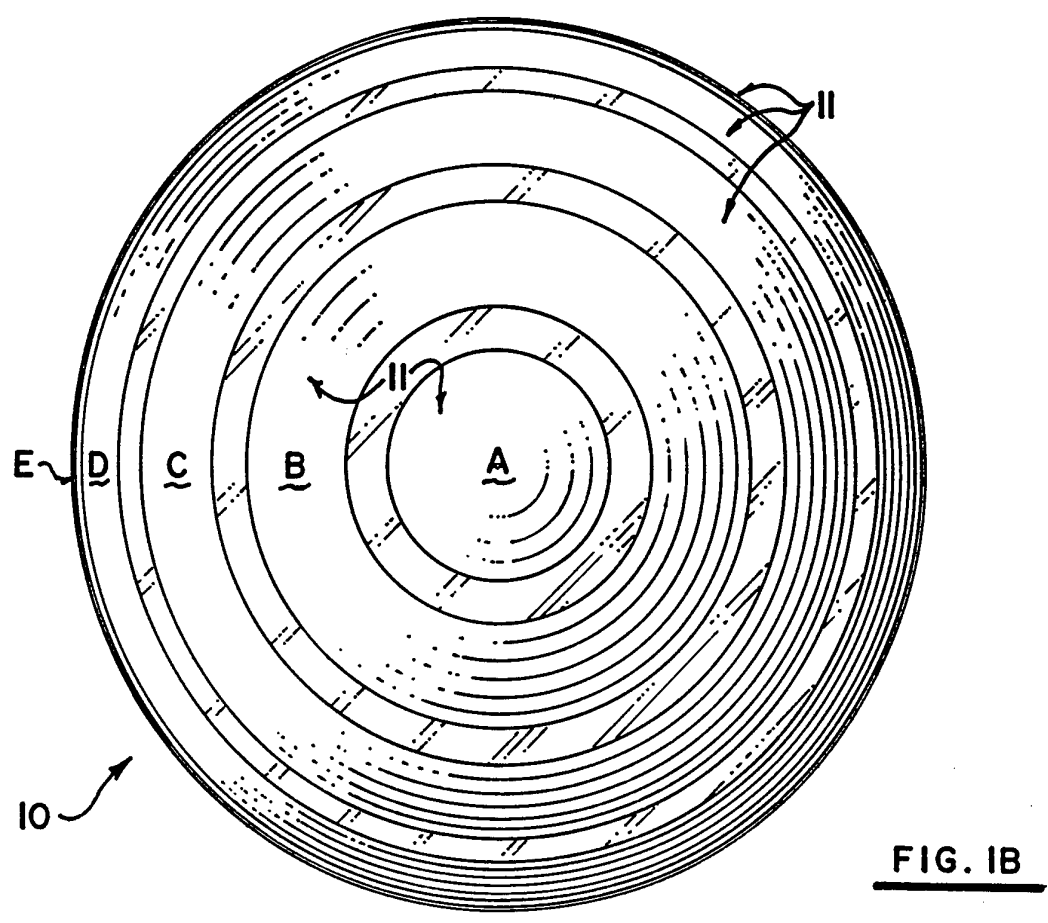
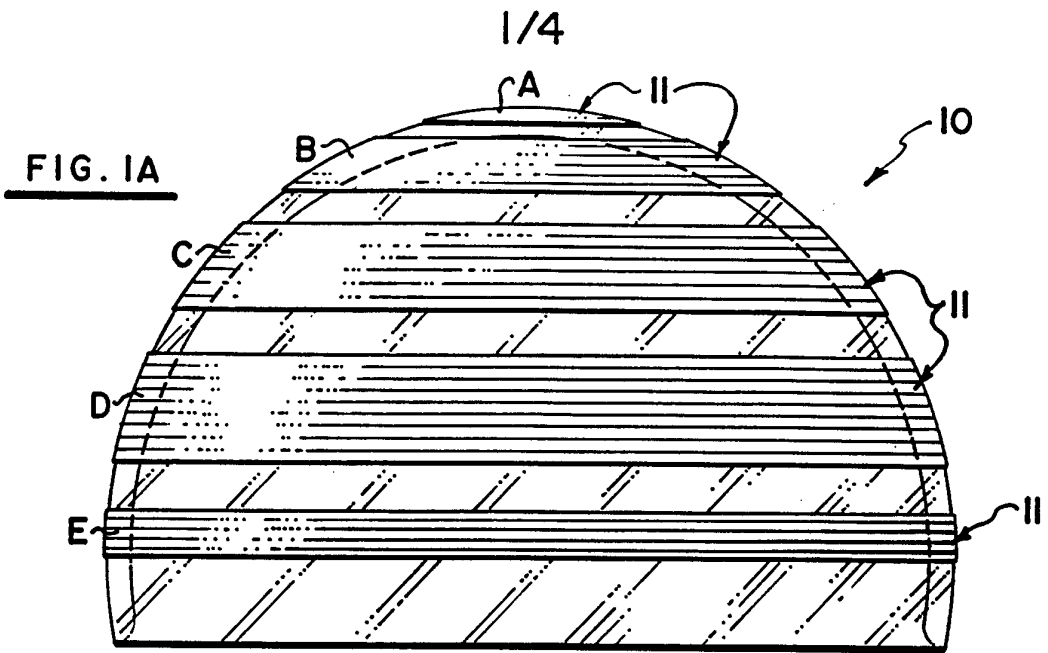


FIG. IB

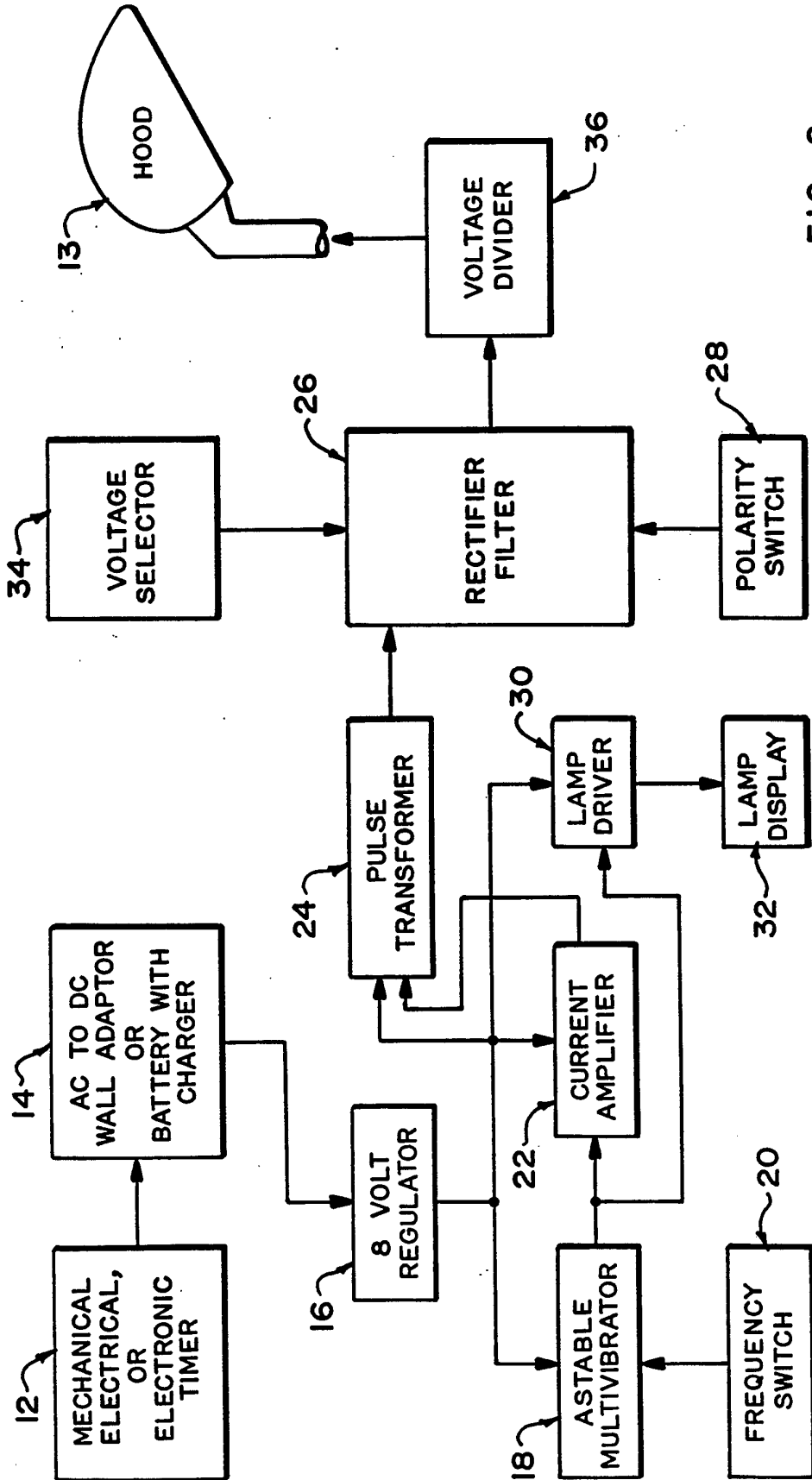


FIG. 2

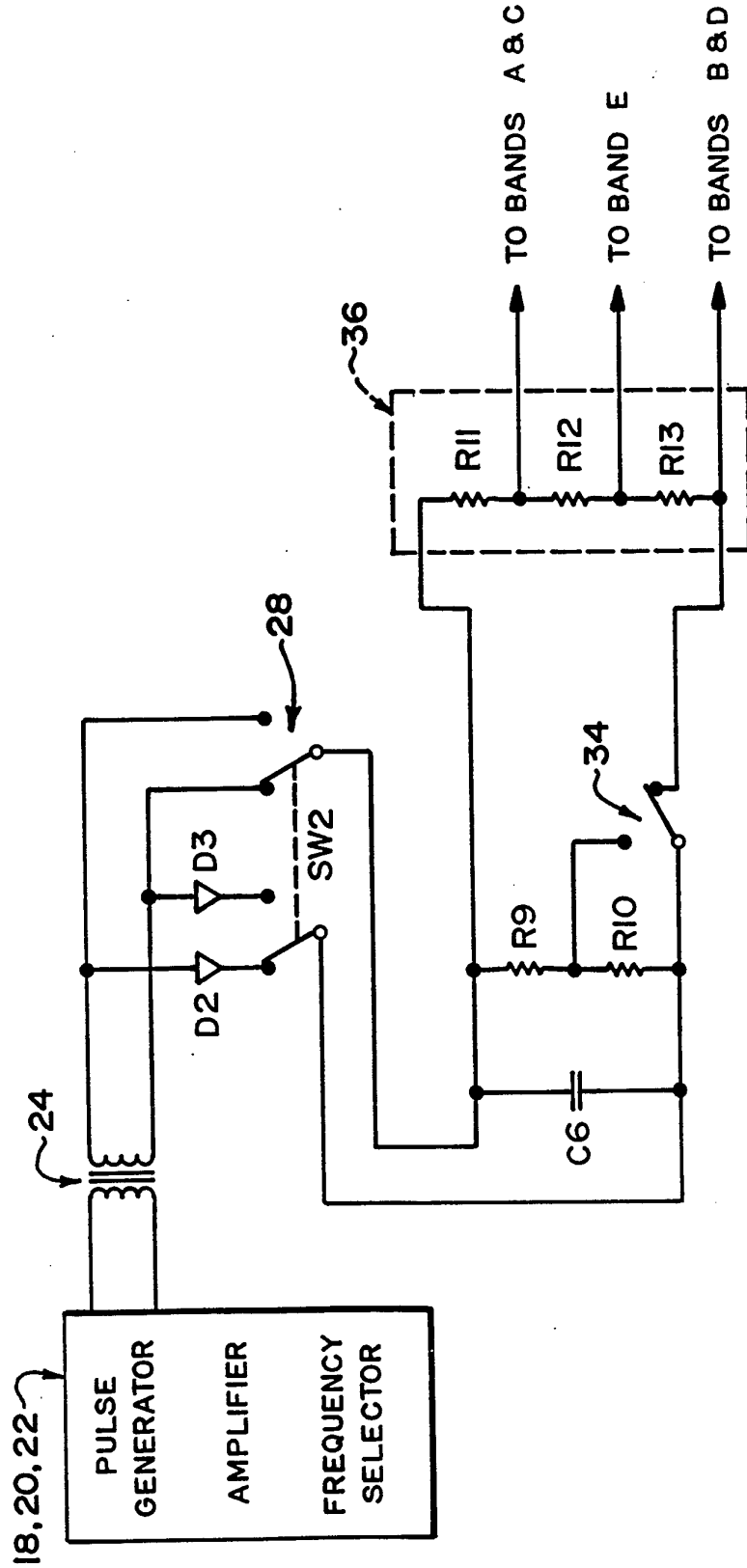


FIG. 3

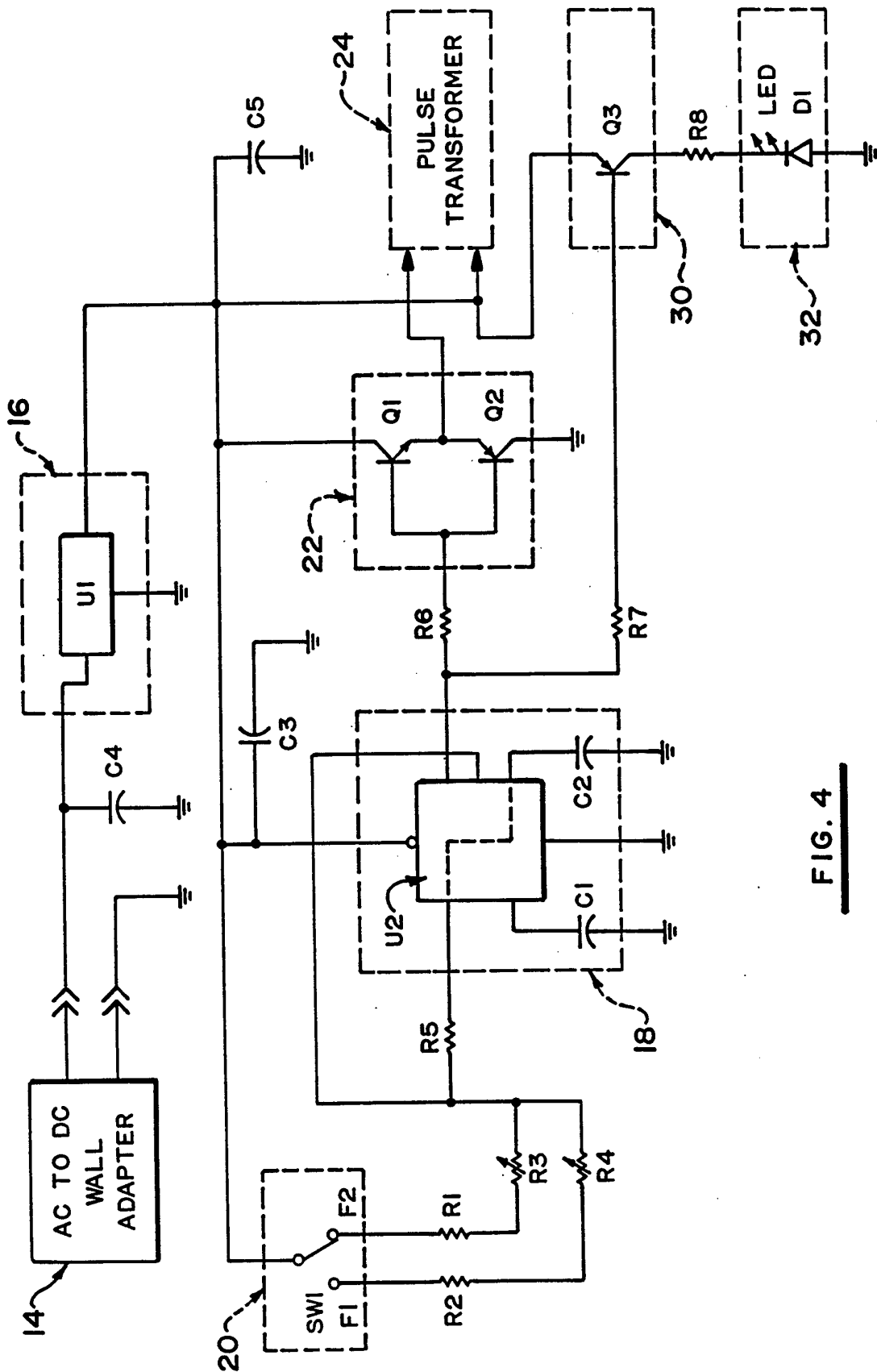


FIG. 4

INTERNATIONAL SEARCH REPORT

Inter. nal Application No
PCT/CA 93/00408

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61N1/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	GB,A,2 262 043 (ORPIN) 9 June 1993 see page 4, line 17 - page 9, line 15; figures ---	4-9, 12-14
Y	US,A,3 946 745 (HSIANG-LAI ET AL.) 30 March 1976 cited in the application see column 2, line 6 - column 5, line 43; figures ---	4-9, 12-14
A	---	10
A	FR,A,1 350 890 (HITACHI) 23 December 1963 cited in the application see page 2, line 28 - page 3, line 43; figures ---	4,6, 10-16
	-/--	

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

2 June 1994

Date of mailing of the international search report

11. 07. 94

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+ 31-70) 340-3016

Authorized officer

Rakotondrajaona, C

INTERNATIONAL SEARCH REPORT

Inter national Application No

PCT/CA 93/00408

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,3 872 859 (PITZEN ET AL.) 25 March 1975 cited in the application see column 4, line 1 - column 12, line 55; figures ---	4,6,10, 16
A	DE,A,29 52 850 (BIOLEC) 30 April 1981 cited in the application see page 8, line 17 - page 10, line 16; figures ---	4,6,11, 12
E	US,A,5 251 623 (GROUX ET AL.) 12 October 1993 see column 3, line 66 - column 6, line 48; figures -----	4-11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CA93/00408

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.: 1-3
because they relate to subject matter not required to be searched by this Authority, namely:
PCT-Rule 39.1 (iv)
Methods for treatment of the human or animal body by surgery or therapy,
as well as diagnostic methods.
2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such
an extent that no meaningful international search can be carried out, specifically:
3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all
searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment
of any additional fee.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report
covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is
restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/CA 93/00408

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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FR-A-1350890		NONE	
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US-A-5251623	12-10-93	NONE	