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DEVICE FOR ELECTRICAL STIMULATION OF MUSCLES

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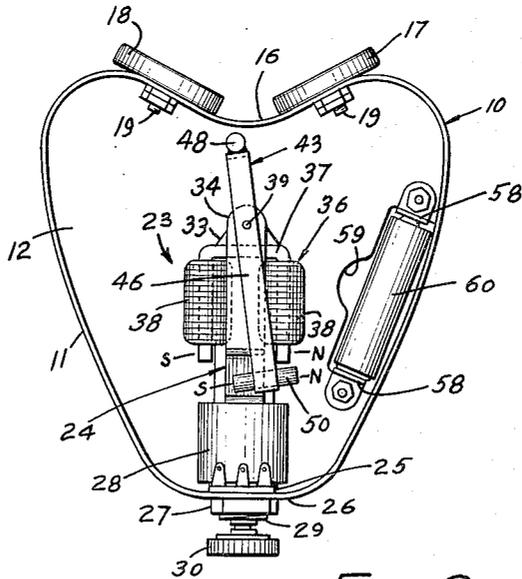
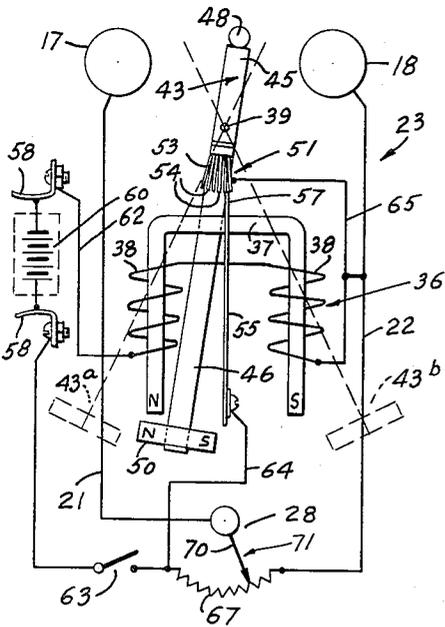
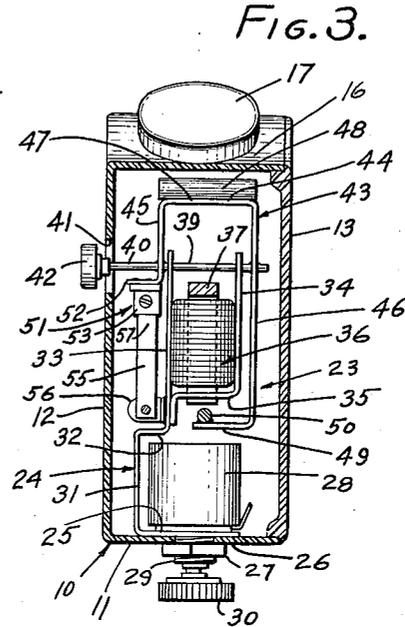
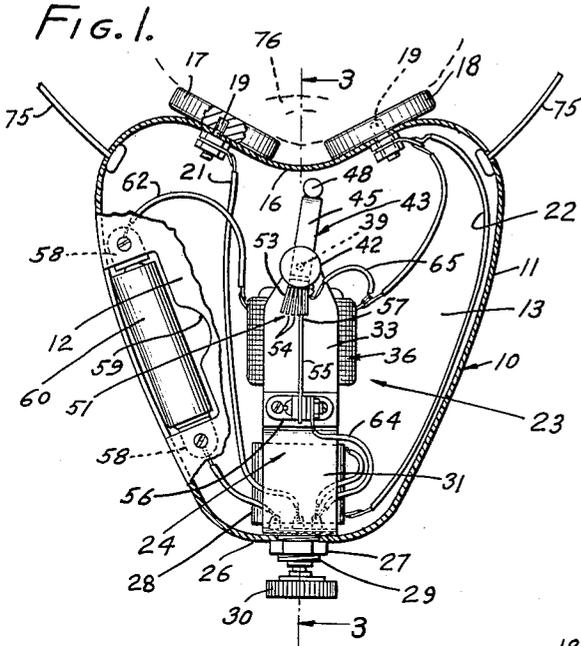


FIG. 4.

FIG. 2.

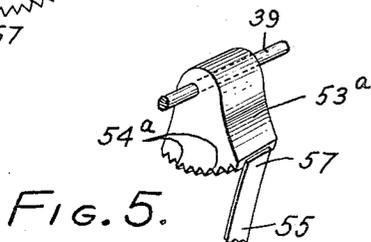


FIG. 5.

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DEVICE FOR ELECTRICAL STIMULATION OF MUSCLES

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This invention relates to means for the electrical stimulation of human tissues and relates in particular to a device for electrically effecting contraction of the muscles of a selected part of the body and in particular the chin so as to effect the firming of the chin.

It is an object of the invention to provide a device including a supporting member or casing having at least one pair of electrodes thereon for engagement with spaced areas of the body when the support is brought into a position contiguous to the body, the support having thereon a generator of muscle contracting current connected to the electrodes.

It is a further object of the invention to provide an electrical muscle contracting device adapted to be placed against the posterior portion of the chin, near the line where the chin merges with the neck, said support having thereon a pair of spaced electrodes for engagement with the posterior chin surface and said support having also thereon an electrical generator for delivering muscle stimulating current through the electrodes and the bodily tissues lying between the electrodes, there being means for holding the support in engagement with the selected portion of the chin. In the preferred form of the invention the device includes a relatively small and light casing with a strap member extending from opposite sides of the casing and over the top of the head, to hold the electrodes situated on the upper portion of the casing in engagement with the selected skin areas of the chin.

One of the advantages of the invention is that it may be used for its intended purpose while the user is occupied with other matters. For example it may be employed by a woman to exercise the muscles of the chin-neck area while she proceeds with her normal daily activities.

It is an object of the invention to provide a muscle toning device having means which may include a strap or belt for holding electrodes in contact with selected surfaces of the body and simple means supported upon the body of the patient for supplying electrical potential through the electrodes to the parts of the body to be treated, making it possible for the patient to be ambulatory if desired.

A further object of the invention is to provide a device for supplying muscle-contracting current wherein a simple arrangement of oscillatory circuit components includes an induction coil in circuit with a small battery, such as a penlight battery and a multiplicate switch means adapted to rapidly cause a variation in the current through the induction coil in response to relative movement of the contacts of the switch means.

It is also an object of the invention to provide an electrical generator of this character wherein the inductance coil provides energy utilized in actuation of the multiplicate switch means.

It is a further object of the invention to provide for the device a simple oscillating motor having an electromagnet, a swingable member carrying a permanent magnet into a position wherein the electromagnet will repel the permanent magnet when the electromagnet is energized, and means controlled by the swingable member for periodically varying the current through the electromagnet.

Further objects and advantages of the invention may

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be brought out in the following part of the specification wherein relatively small details for the invention are described for the purpose of competence of disclosure without intention, however, of limiting the scope of the invention defined in the accompanying claims.

Referring to the accompanying drawings, which are for illustrative purposes only:

FIG. 1 is a face view of a preferred form of the invention;

FIG. 2 is a back view of the same;

FIG. 3 is a sectional view taken as indicated by the line 3-3 of FIG. 1;

FIG. 4 is a schematic disclosure of the device shown in FIGS. 1-3; and

FIG. 5 is an enlarged fragmentary view showing one form of the multiple switch means.

The form of the invention shown in the drawings includes a support in the form of a casing 10 having a modified heart shaped side wall 11, this side wall 11 extending around both sides and the top and bottom of the casing 10 as shown in FIGS. 1 and 2, and connecting front and back walls 12 and 13.

The upper portion 16 of the side wall 11 is externally concave to correspond in general to chin curvature. Circular electrodes 17 and 18 are arranged near the ends of the concave portion 16. These electrodes 17 and 18 comprise metal discs which are disposed in inverted positions and are supported upon the portion 16 of the wall 11 by posts 19 which extend through the wall 11 so that electrical conductors 21 and 22 may be connected therewith.

Within the casing 10 there is a generator 23 of muscle-contracting electric current. The generator 23 has a metal frame 24 bent from a metal strip and having a base portion 25 which is clamped against the inner surface of the bottom portion 26 of the side wall 11 by the clamping nut 27 of a combination off and on switch and rheostat unit 28 having a tubular, externally threaded stem which projects downwardly through the base portion 25 of the metal frame 24 and also through the bottom portion 26 of the side wall 11. This switch and rheostat unit 28 is actuated by a downwardly projecting knob 30.

The metal frame 24 has a lower vertical portion 31, an offset portion 32 and an upper vertical portion 33. The frame 24 has a second upper vertical plate portion 34 spaced from the portion 33 by a bracket portion 35. An electromagnet 36 is supported between the portions 33 and 34 of the frame 24. As shown in FIGS. 2 and 3, this electromagnet 36 has a horseshoe core 37 arranged with its north and south poles projecting downwardly and having a two-part coil 38 wound upon the poles or legs N and S.

The upper ends of the plate portions 33 and 34 of the frame 24 have aligned openings supporting a horizontal shaft 39 having a front end portion 40 which projects through an opening 41 in the front wall 12 of the casing 10 and has a small knob 42 thereon. A swingable member 43 is fixed on the shaft 39. This swingable member 43 is a lever and is bent from a metal strip 44 in the manner shown in FIG. 3 so as to include a relatively short front lever portion 45, the lower end of which lies adjacent the outer face of the upper end of the frame portion 33, and a relatively long lever portion 46 which extends across the rear face of the frame portion 34 and is connected to the front portion 45 by a transverse strip 47 on which a counterweight 48 is mounted. At the lower end of the relatively long lever portion 46 a lateral extension 49 is extended under the bracket 35. A bar permanent magnet 50 is secured to the extension 49 of the swingable member 43 in such position that, when the swingable member 43 is in centralized position or nearly

centralized position, as shown in FIGS. 1, 3 and 4, the north pole of the permanent magnet 50 will be adjacent the north pole of the electromagnet 36 and the south poles of the permanent magnet 50 and the electromagnet 36 will be adjacent each other.

The swingable member 43 is arranged to move one contact of a multiplicate switch means 51. The front portion 45 of the swingable member 43 has a forwardly bent toe 52 on which is mounted a downwardly projecting multiplicate contact member 53 comprising a plurality of metal leaves 54 spread apart so that the lower end of the contact 53 is serrated. That is to say it comprises a plurality of ridges with spaces therebetween, each of these ridges consisting of a separate contact point. The switch means 51 includes a leaf spring contact 55 supported at its lower end by a bracket 56 mounted on the lower part of the frame portion 33 directly below the center line of the shaft 39. The upper end 57 of the contact 55 is positioned so that it will be engaged by the points or ridges of the multiplicate contact 53 as the same is swung back and forth as the result of the back and forth swinging of the swingable member 43. Clips 58 mounted on the front wall 12 of the casing 10 at the ends of an opening 59 in the wall 12 engage and support a penlight battery 60 which may be inserted through said opening 59 so that it will occupy a position within the casing 10.

FIG. 4 is a schematic view of the mechanism and indicating the cooperating relation of the parts. The movable contact 53 is shown in engagement with the upper end of the spring contact 55. A conductor 62 connects one of the battery clips 58 with one end of the coil 38. The remaining battery clip 58 is adapted to be connected through the switch 63 of the switch and rheostat unit 28, and through a conductor 64 with the lower end of the leaf contact 55. A conductor 65 connects the moving contact 53 with the remaining end of the coil 38. The resistance element 67 of the rheostat or potentiometer 71 forming a part of the unit 28 is bridged across the conductors 22 and 64, and the conductor 22 is arranged to connect the electrode 18 with the conductor 65. The electrode 17 is connected through the conductor 21 with the moving switch part 70 of the rheostat 71.

Assuming that the parts are in the positions shown in FIG. 4, closing the switch 63 will close the circuit which includes the coil 38, energizing the same so that magnetic flux will flow between the poles N and S. The north and south poles of the magnet core 37 will repel the north and south poles of the permanent magnet 50, and the south pole of the permanent magnet 50 will be attracted by the north pole of the core 37 causing the swingable member 43 to swing through the position indicated by dotted lines 43a. The swingable member 45, being slightly heavier at its lower end, acts as a pendulum, and from the position thereof indicated at 43a it will swing rightwardly toward and through the position in which it is shown in full lines in FIG. 4, the lower end of the multiplicate contact 53 wiping across the upper end 57 of the spring contact 55 so that the lower ends or ridges formed by the leaves 54 of the contact 53 will successively engage the upper end 57 of the spring contact 55, opening and closing the circuit through the multiplicate switch means 51 a number of times in rapid succession to thereby repeatedly short circuit the resistance element 67 to cause variations in the energizing current of the coil 38. The swingable member 43 will then swing to and through the dotted line position thereof indicated at 43b. The member 43 will thereafter oscillate back and forth between the position 43b and 43a, the moving contact 53 making multiplicate engagement with the upper end of the spring contact 55 each time the swingable member 43 swings in either direction.

Each time the circuit through the multiplicate switch means 51 is broken, as the consecutive contact leaves 54 pass over the end 57 of the leaf contact 55, the resulting

variation in the energizing current of the coil 38 causes an inductive voltage impulse to be applied to the circuit including the electrodes 17 and 18. These impulses are of spiculate wave form and provide an effective muscle contracting current. Referring to FIG. 1, the casing 10 has an elastic strap 75 extending upwardly from the opposite sides thereof. This strip is extended across the top of the head of the user so that the tension acting in the strap 75 will hold the electrodes 17 and 18 against spaced areas of the skin 76 under the posterior portion of the user's chin. An effective electrical contact between the electrodes 17 and 18 and the skin 76 is accomplished by the application therebetween of water or an electrolyte cream. After the device is applied in the manner described the knob 30 is actuated so as to close the switch 63. If swinging of the member 43 does not immediately start, rotation is applied to the knob 42 to start the oscillating action which will continue as long as the switch 63 is closed. The voltage of the muscle-contracting current is gradually increased by a further turning of the knob 30 until a strong contraction of the chin muscles is accomplished.

In FIG. 5, I show an alternative form of the multiplicate contact 53. Instead of this contact 53 consisting of a number of small leaves arranged in side by side relation, a contact body 53a is provided having a serrated lower end 54a forming a plurality of adjacent ridges arranged, upon swinging movement of the contact 53a, to be dragged across and make successive contacts with the upper end 57 of the leaf spring 55.

I claim:

1. A device for electrically effecting contraction of the muscles of the body comprising: a pair of electrodes; means for holding said electrodes in spaced engagement with muscles of the body; and, an electrical circuit for producing muscle contracting current of a predetermined frequency for passage through body tissues between said electrodes, said electrical circuit including a source of direct current potential and an electromagnet and a switch means, said electromagnet being generally U-shaped and having a winding disposed about the legs thereof, said legs defining the north and south poles of said electromagnet, said switch means including relatively movable contacts arranged so that one of the contacts will move across the other, one of said contacts being multiplicate so that when one of said contacts moves across the other said contacts will be closed and opened at said predetermined frequency, one of said contacts being mounted to a permanent bar magnet suspended as a pendulum to alternately swing between the legs of said electromagnet to thereby effect the movement of one switch contact across the other, said electrodes being coupled across said switching means, said switching means and said electromagnet winding being electrically connected in series across said source of direct current potential to thereby cause production of said current of said predetermined frequency at said electrodes upon oscillation of said bar magnet.

2. In a device for electrically effecting contraction of the muscles of the body; a pair of electrodes; casing means supporting said electrodes for engagement with spaced portions of the body; and, an electrical generator of muscle contracting current carried within said casing means and being electrically coupled to said electrodes so that the muscle contacting current will be passed through the body tissues between said electrodes, said electrical generator consisting of an electrical circuit including a battery and an oscillating electrical motor and a switch means, said switch means including two switch contacts arranged for relative movement one across the other, one of said contacts being serrated so that as one of said contacts moves across the other contacts will be closed and opened a plurality of times in close succession, said electric motor being mechanically coupled to said switch means to effect relative movement of said contacts, said

pair of electrodes being electrically coupled across said switch means, said switch means and said electric motor being electrically connected in series across said battery.

3. In a device for electrically effecting contraction of muscles of the body: output terminals for connection to the body; an electrical circuit for producing muscle contracting current; and, coupling means to transfer the muscle contracting current from said electrical circuit to said output terminals, said electrical circuit including a battery and a switch means and means for automatically actuating said switch means, said switch means including relatively movable contacts arranged so that one of the contacts will move across the other upon actuation thereof, one of said contacts being multiplicate so that when one of said contacts moves across the other said contacts will be closed and opened a plurality of times in close succession, said switch actuating means consisting of a permanent magnet and a swingable member and an electromagnet, said permanent magnet being mounted to said swingable member, said swingable member being arranged to move said permanent magnet through a path having a portion contiguous to the magnetic poles of said electromagnet, said permanent magnet being oriented so that it will be moved by predetermined variations in the magnetic flux of said electromagnet to thereby effect swinging movement of said swingable member and said permanent magnet, said switch means being mechanically coupled to said swingable member to effect relative movement of said contacts upon swinging movement of said swingable member, the contacts of said switch means and the electromagnet of said switch actuating means being electrically connected in series across said battery, said coupling means being connected across said switch means.

4. In a device for electrically effecting contraction of muscles of the body: output terminals for connection to the body; an electrical circuit for producing muscle contracting current; and, coupling means to transfer the muscle contracting current from said electrical circuit to said output terminals, said electrical circuit including a battery and a switch means and means for automatically actuating said switch means, said switch means including relatively movable contacts arranged so that one of the contacts will move across the other upon actuation thereof, one of said contacts being multiplicate so that when one of said contacts moves across the other said contacts will be closed and open a plurality of times in close succession, said switch actuating means consisting of a permanent magnet and a swingable member and an electromagnet, said swingable member being supported so that a portion thereof will move across the magnetic poles of said electromagnet, said permanent magnet being mounted to said swingable member for movement into the magnetic field of said electromagnet, said permanent magnet being oriented so that it will be repelled by the magnetic field of said electromagnet to thereby effect swinging movement of said swingable member and

said permanent magnet upon predetermined variations in the magnetic flux of said electromagnet, said switch means being mechanically coupled to said swingable member to effect relative movement of said contacts upon swinging movement of said swingable member, the contacts of said switch means and the electromagnet of said switch actuating means being electrically connected in series across said battery, said coupling means being connected across said switch means.

5. In a device for electrically effecting contraction of muscles of the body: output terminals for connection to the body; an electrical circuit for producing muscle contracting current; and, coupling means to transfer the muscle contracting current from said electrical circuit to said output terminals, said electrical circuit including a battery and a switch means and means for automatically actuating said switch means, said switch means including relatively movable contacts arranged so that one of the contacts will move across the other upon actuation thereof, one of said contacts being multiplicate so that when one of said contacts moves across the other said contacts will be closed and opened a plurality of times in close succession, said switch actuating means consisting of a permanent magnet and a swingable member and an electromagnet, said swingable member being supported so that a portion thereof will move across the magnetic poles of said electromagnet, said permanent magnet being mounted to said swingable member for movement back and forth through a position centralized with relation to the magnetic field of said electromagnet so that the magnetic field of said electromagnet will repel said permanent magnet to thereby effect swinging movement of said swingable member upon predetermined variations in the magnetic flux of said electromagnet, said switch means being mechanically coupled to said swingable member to effect relative movement of said contacts upon swinging movement of said swingable member, the contact of said switch means and the electromagnet of said switch actuating means being electrically connected in series across said battery, said coupling means being connected across said switch means.

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