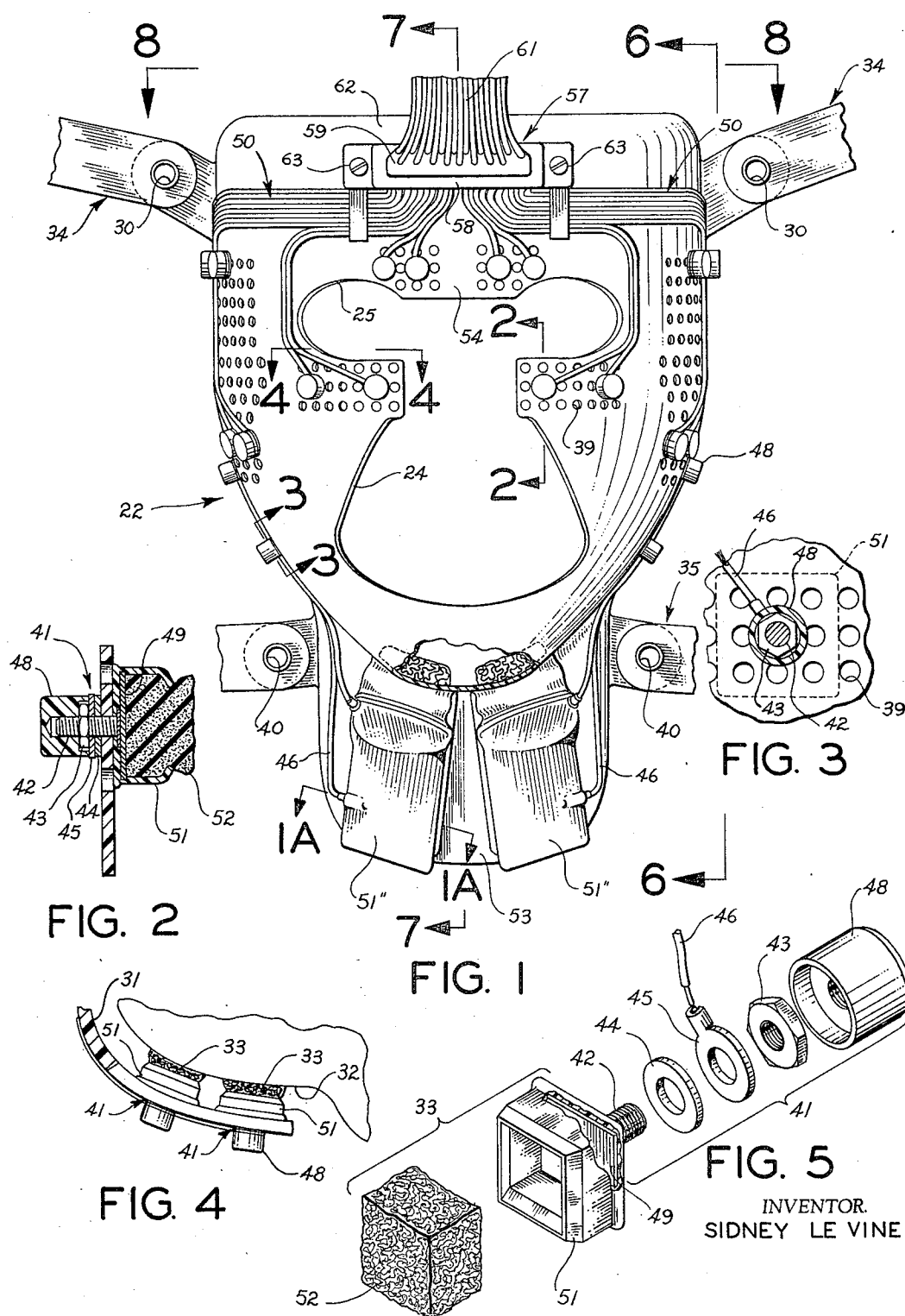


3,279,468

Filed May 14, 1963

5 Sheets-Sheet 1



Oct. 18, 1966

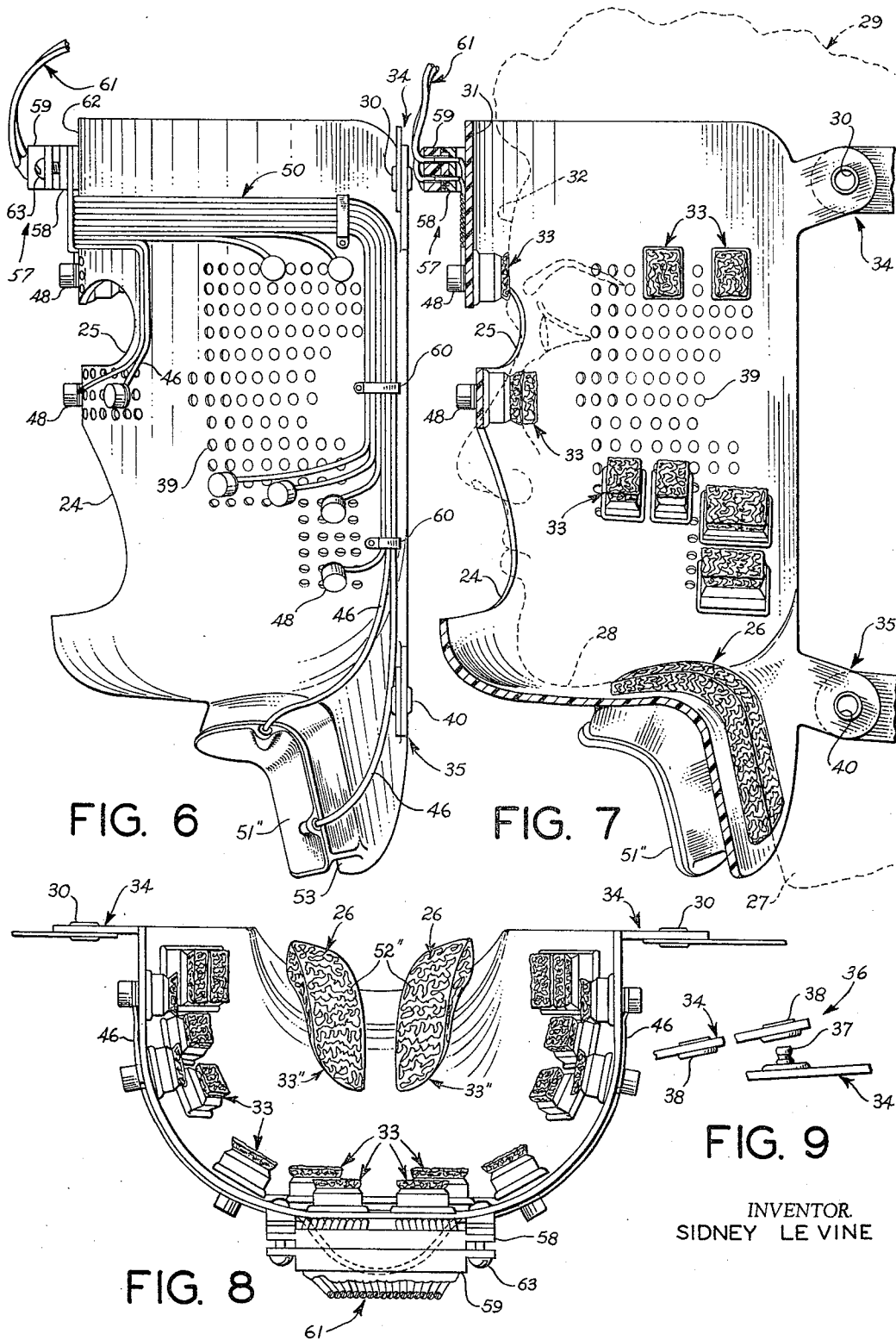
S. LE VINE

3,279,468

ELECTROTHERAPEUTIC FACIAL MASK APPARATUS

Filed May 14, 1963

5 Sheets-Sheet 2



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3,279,468

ELECTROTHERAPEUTIC FACIAL MASK APPARATUS

Filed May 14, 1963

5 Sheets-Sheet 3

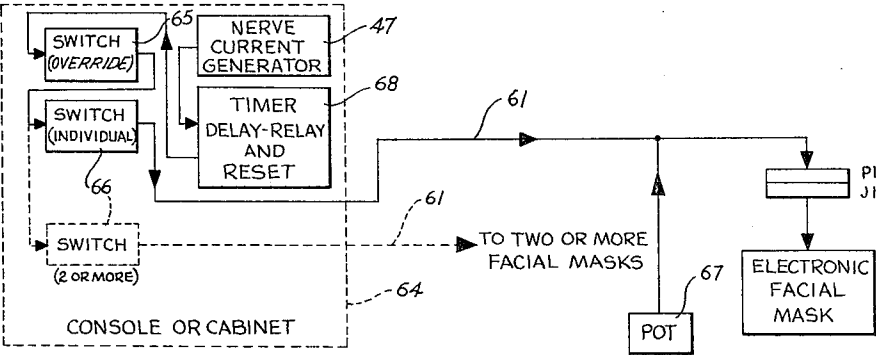


FIG. 10

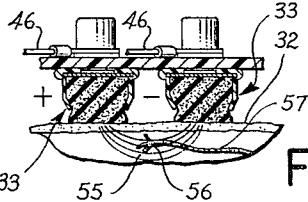


FIG. 11

FIG. 12

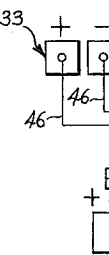
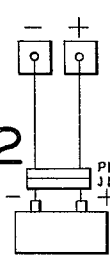


FIG. 13

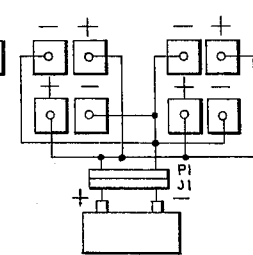


FIG. 14

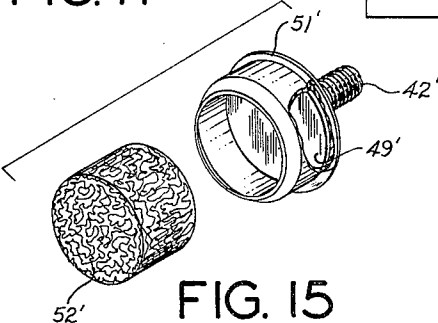


FIG. 15

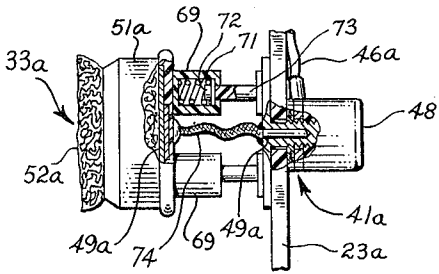


FIG. 16

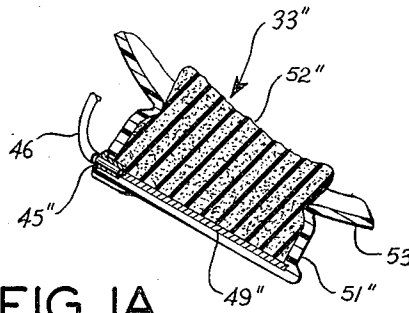


FIG. 1A

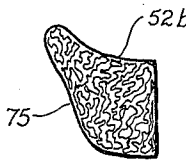


FIG. 17

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3,279,468

ELECTROTHERAPEUTIC FACIAL MASK APPARATUS

Filed May 14, 1963

5 Sheets-Sheet 4

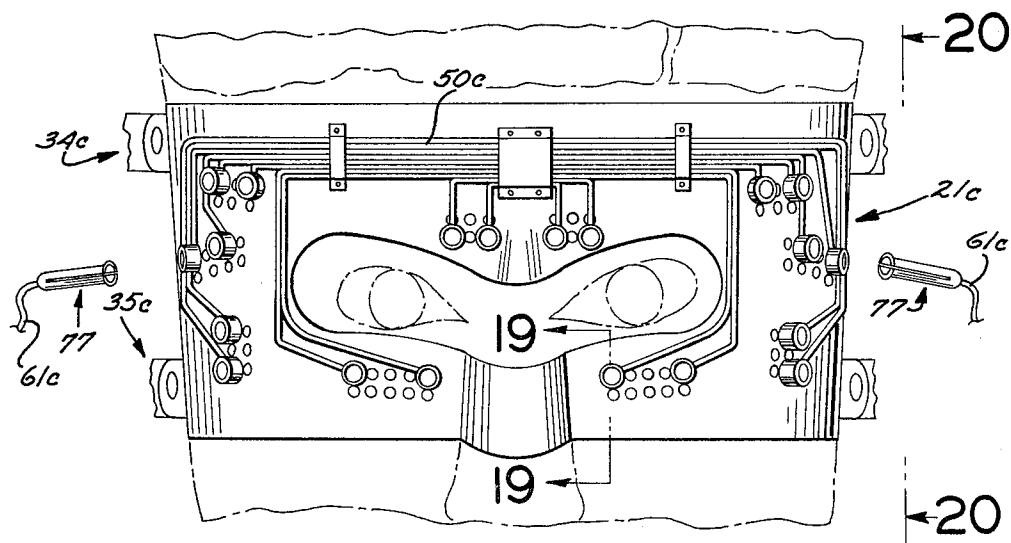


FIG. 18

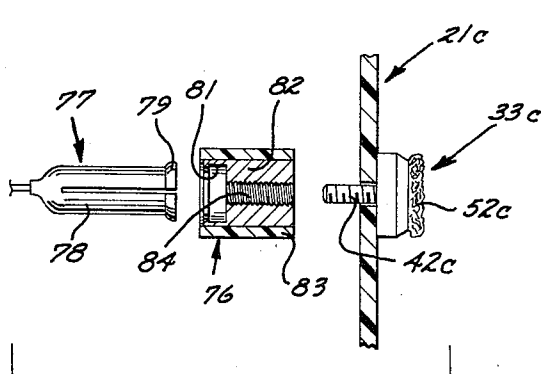


FIG. 19

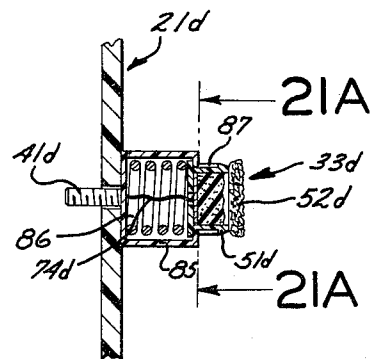


FIG. 21

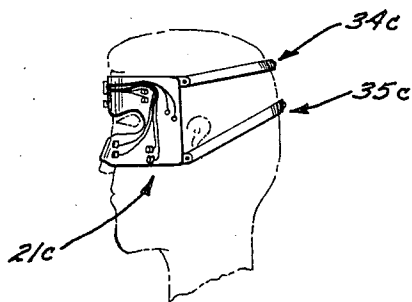


FIG. 20

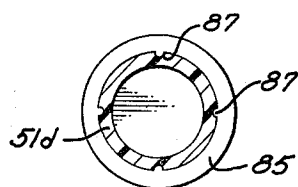


FIG. 21A

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3,279,468

ELECTROTHERAPEUTIC FACIAL MASK APPARATUS

Filed May 14, 1963

5 Sheets-Sheet 5

FIG. 22

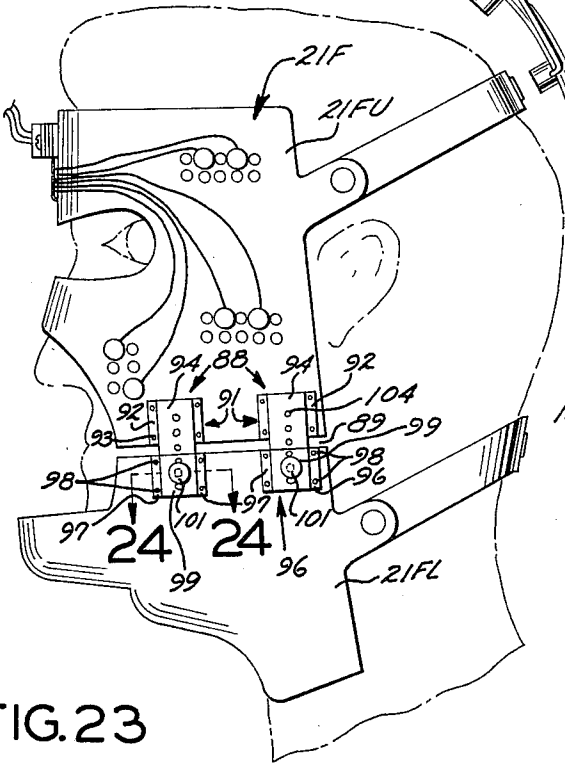
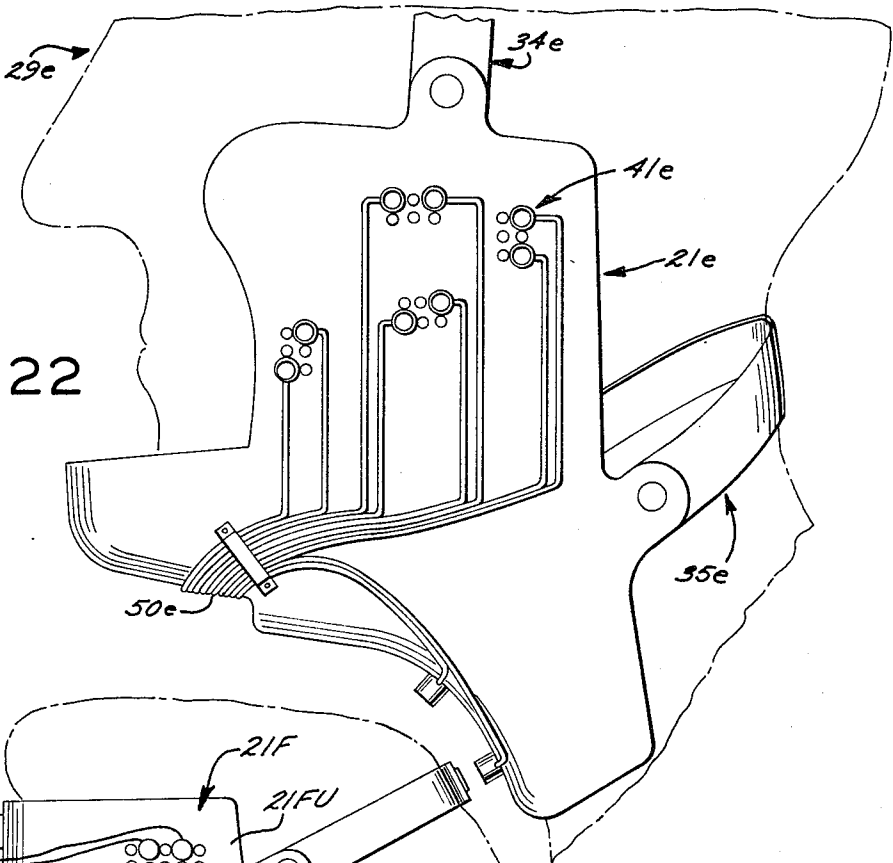


FIG. 23

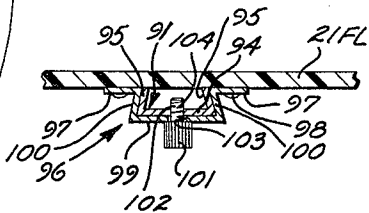


FIG. 24

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1

3,279,468

ELECTROTHERAPEUTIC FACIAL MASK APPARATUS

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Filed May 14, 1963, Ser. No. 280,304

6 Claims. (Cl. 128—410)

Generally speaking, the present invention relates to electrotherapeutic apparatus and method for use in a form of electrotherapy treatment adapted to apply what might be termed artificial nerve currents and/or potentials to one or more motor points (usually a pair of motor points or multiple thereof) where motor nerves enter corresponding muscles whereby to cause corresponding alternate contraction and relaxation of said muscles in a manner which may be said to comprise exercise thereof.

The particular advantage of the apparatus and method of the present invention is that it makes it possible to apply such artificial nerve currents and/or potentials to a plurality of such motor points in a highly selective manner without correspondingly stimulating sensory nerves which would cause pain.

Indeed, in prior art systems this has been a major problem and has made it virtually impossible to use such electrotherapeutic apparatus where large numbers of sensory nerves are located close to the exterior skin surfaces of the body.

For this reason, most prior art electrotherapeutic apparatus for inducing muscle contraction has been used on the body or limbs of an individual at locations having relatively few sensory nerves adjacent to the surface of said body or limb portion. This has made it possible to apply sufficient current and/or potential to activate the desired motor points of the desired motor nerves without correspondingly activating sensory nerves and producing undesirable pain. In other words, the prior art practice in this respect has merely been to avoid placing applicatory electrodes closely adjacent to sensory nerves.

The above-mentioned prior art practice has been relatively effective for certain areas of the human anatomy as pointed out above.

Additionally, it should be noted that the conventional prior art practice, in electrotherapeutic stimulation of muscle action, also comprises the placing of a pair of electrodes in spaced relationship with a substantial portion of the person's tissue therebetween and in a manner such that a motor point which it is desired to activate lies in the path between the two spaced electrodes.

One conventional prior art practice in this connection is to place the two electrodes on opposite sides of a portion of a limb or the like which is to be electrically stimulated and with one of the electrodes lying over the motor point which is to be activated. This provides no particular problem where the portion of the body being stimulated contains relatively few sensory nerves and where no large sensory nerves are likely to lie in the the body tissue between the spaced electrodes at locations close enough to the maximum current flow or maximum potential distribution through the tissue.

In other words, with the above-mentioned conventional prior art electrode opposition-spacing practice with a substantial portion of a limb or the like between the spaced electrodes, activation of the desired motor point could be accomplished without undesired stimulation of sensory nerves to a degree such as to cause undesirable pain.

However, this type of prior art practice, which might be termed avoiding the problem rather than solving it, has not made it possible for effective electrotherapeutic stimulation of facial muscles to be practiced without causing severe pain.

In other words, the facial tissue (which it shall be understood includes the face, head, and adjacent neck

2

regions throughout this application) contains so many sensory nerves in any substantial tissue portion thereof which might lie between opposition spaced electrodes applied thereto in accordance with the above-mentioned conventional prior art practice, as to normally produce severe pain long before sufficient current and/or potential has been applied by the spaced electrodes to activate a desired motor point of a motor nerve entering a motor muscle which it is desired to exercise.

Therefore, it has been found, in accordance with the above-mentioned conventional prior art practice, that pain always precedes effective muscle activation and, therefore, the above-mentioned prior art practice, and the prior art means and method employed in connection therewith, has not been able to provide a satisfactory means and method for facial muscle stimulation and activation of a type which would improve muscle tone and blood and lymph circulation through the facial tissue and which would tend to bring back the original facial contour prior to the conventional signs of aging comprising the jowling of the cheeks, the sagging of various facial structures around the mouth and eyes and underneath the chin, and the general separation, displacement, and what might be termed sagging of the entire face and various portions thereof.

A preferred form of the apparatus lends itself particularly well to the provision of a novel and improved means and method for applying an artificial simulated nerve current to electrosensitive areas of the skin of the face, head, throat, and/or neck for the purpose of exercising the fifty-five or so muscles of these areas and improving blood and lymph circulation through them. Such application will benefit the facial skin, muscles, and subcutaneous tissues for the purpose of ultimately resulting in the substantial elimination of, or prevention of, facial wrinkles, lines, and/or sags.

For use in this particular application of the invention for effective facial rehabilitation, the invention may include a particular means for applying to a plurality of selected facial regions non-painful electrical stimuli for producing electrically caused facial exercise for the purpose of inhibiting and/or eliminating facial lines, wrinkles, sags, etc.; and said means being of a relatively simple, inexpensive, and highly efficacious nature ideally adapted for natural facial muscle rebuilding and consequent effective facial rejuvenation toward an optimum normalized condition.

It is an object of the present invention to provide electrotherapeutic apparatus for muscle stimulation and/or activation in accordance with the generic and/or any or all of the various specific aspects referred to above.

It is a further object of the present invention to provide apparatus and/or method for electrical muscle stimulation by activation of motor points of motor nerves entering muscles and with virtually no undesired stimulation of sensory nerves resulting therefrom, thus producing a substantially non-painful muscle stimulation and/or activation system.

It is a further object to provide apparatus in accordance with the preceding objects which is specifically adapted for stimulation and activation of muscles, skin, and tissue of the facial tissue and/or region for the hereinbefore-mentioned facial rehabilitation and/or facial rejuvenation purposes.

It is a further object of the present invention to provide apparatus in accordance with the preceding object including novel means for applying to a plurality of selected facial regions non-painful electrical stimuli for producing electrically caused facial exercise.

It is a further object of the present invention to provide apparatus as specified in the preceding object wherein said applying means comprises a novel facial or face mask adapted to adjustably carry a plurality of inwardly di-

rected appropriately spaced electrode means for electrical contact with corresponding facial skin areas in a manner such that all substantial current flow through facial tissue will occur between closely spaced electrodes having a motor point located in facial tissue therebetween and spaced inwardly from the skin surface thereover. In other words, the face mask mounts the plurality of spaced electrodes in a paired instantaneously oppositely polarized and spaced arrangement such that only minimal currents will flow through tissue regions carrying any substantial amount of sensory nerve fibers—the arrangement being such that motor nerve activation and consequent exercising of the corresponding muscle will occur long before the pain threshold level of electrical sensitivity of any sensory nerve is reached. This will produce a virtually completely non-painful means for electrically stimulating complete exercising muscle action of various groups of facial muscles in a manner such as to bring about the above-mentioned facial rehabilitation and rejuvenation.

It is a further object of the present invention to provide means for activating motor nerves while not activating sensory nerves and which comprises an arrangement for applying instantaneously opposite polarity artificial nerve currents and/or potentials of a non-steady-state, pulsating type and which comprises the relatively close and laterally adjacent spacing of instantaneously opposite polarity electrode means and/or the potentials applied thereby, with the tissue between said instantaneously opposite polarity electrodes and/or potentials applied thereby comprising portions of the facial tissue and/or musculature not carrying any very large bundle of sensory nerve fibers but carrying a motor point where a motor nerve enters a muscle which it is desired to exercise. In other words, in this novel arrangement of the present invention, no substantial quantity of electric current is passed through major sensory nerve regions such as through the brain from one side of the head to the other, through the sinuses, through the teeth, through the superficial tri-facial nerve or through the sublingual structures which carry a large number of sensory nerves. The hereinbefore-mentioned prior art practice resulted in the passage of substantial quantities of electric current through these highly sensitive regions carrying large quantities of sensory nerves and, therefore, produced the severe pain of such prior art practice referred to hereinbefore. It is precisely because the novel means and method of the present invention does not pass any substantial level of current through these highly sensitive regions containing large amounts of sensory nerves, that no such pain results. However, it should be clearly noted that the novel means of the present invention does not result in the reduction of current flowing through motor points in the facial tissue to a degree such as to prevent them from being activated. Indeed, the current flowing through said motor points is entirely adequate to provide a desired type of muscle activation and subsequent exercising action while maintaining such a low level of current flow through sensory nerve-containing regions of the facial tissue as to produce no pain whatsoever. This is an extremely important object of the present invention since it makes possible the electrotherapeutic muscle stimulation of facial tissue (and, for that matter, of any other tissue containing large amounts of sensory nerves) in a manner which has heretofore been completely unattainable with conventional prior art apparatus for the reasons noted above.

It is a further object of the present invention to provide a facial muscle stimulation means of the character referred to above wherein the mask is of a nature such as to be adaptable for a great variety of facial shapes, sizes, and configurations and may, if desired, be provided in several distinct sizes in order to be adaptable for use with all facial sizes and shapes and which, in one preferred form, effectively comprises a well ventilated "off-the-face" mask which is substantially spaced from the person's face so that a cooling flow of air may flow over the skin of the

person's face during a facial rehabilitation and rejuvenation treatment. Also, in the preferred exemplary form of the mask just referred to, it may have a mouth and nose cut out so as to be completely unobstructed in that region whereby to allow free breathing and talking as desired by a user of the device, and to do so right through a facial muscle stimulation treatment. It may also have an eye cutout so as to not obstruct a wearer's field of view.

It should be noted that the facial or face mask referred to above may, in certain forms of the invention, comprise several portions such as an upper portion and a lower portion, for example, although not specifically so limited, which can be used conjointly or separately. When used conjointly, in one form of the invention, they may be effectively provided with controllably adjustable junction or fastening means for effectively fastening or joining the upper and lower facial mask portions together in a controllably adjustable manner whereby to make it capable to effectively change the over-all size of the complete assembled facial mask so as to be mounted on faces of greatly different sizes. When used separately, the partial facial mask portions may be used for applying the electrodes to selected upper or lower facial areas only.

It is a further object of the present invention to provide a facial muscle stimulating apparatus of the character referred to above, which may be provided with a plurality of electrodes instantaneously spaced and polarized in accordance with the principles set forth above and which are positioned with respect to the motor points of different conjointly operating groups of facial muscles whereby different ones of said groups of muscles may be stimulated in sequence one after the other during a complete facial muscle rehabilitation and rejuvenation treatment, thus providing, at one sitting and in a very short period of time, a complete treatment of all of the facial muscles and in a group-action manner similar to the natural operation of certain of said groups of muscles together, such as the ones which cause different characteristic facial expressions. These expression-causing muscles actually comprise the bulk of the facial musculature, usually being said to comprise approximately forty-five out of the fifty-five muscles involved in the facial musculature. They are also the ones which appear to stand in the most need of exercise for facial rehabilitation and rejuvenation purposes in most instances of facial aging.

It is a further object of the present invention to provide apparatus of the character referred to above wherein a plurality of persons may be simultaneously treated, if desired, by reason of the provision of a plurality of sets of pairs of electrode means adjustably carried by a corresponding plurality of face masks and each adapted to be connected by way of controllably operable electrical stimuli adjusting means to a common generator for the electrical stimuli simulating a nerve current. In this kind of an arrangement, the invention may include programmed sequencing means for causing programmed sequencing or sequential operation of different pairs of the instantaneously opposite polarity electrode means so as to operate different groups of facial muscles in sequence. This programmed sequencing means may be carried by the nerve current generator or may be otherwise positioned so as to be effectively in circuit with the lead from the common nerve current generator to each of the different sets of paired facial muscle stimulating electrodes carried by each of the different face masks so that the automatic sequencing will be provided at each mask unless disconnected therefrom.

It is a further object of the present invention to provide apparatus of the type referred to hereinbefore which provides a highly selective action which activates only desired motor points of desired motor nerves entering desired muscles which are to be effectively exercised, while carefully discriminating against other muscles, such as the normal antagonist muscles and the like, and while also

carefully discriminating against stimulation of sensory nerves so as to avoid any sensation of pain while effectively exercising precisely the muscles desired.

It is a further object of the present invention to provide apparatus of any of the various types referred to above, which may effectively apply, in the closely spaced and instantaneously oppositely polarized manner indicated above, electrical stimuli or artificial nerve currents (and/or potentials) of any of a variety of different types capable of causing a subsequent selective muscles exercising action. For example, what is commonly known in the electro-medical art as a "sinusoidal" or "sine wave" type of electrical stimuli may be employed—usually with suitable current-limiting means to prevent current in excess of a predetermined small value from flowing at any time between any pair of electrodes so as to avoid any excessively strong muscular contractions being produced thereby. However, while the electrical stimuli may be of such a "sinusoidal" or "sine wave" type, the invention is not specifically so limited and various other types of electrical stimuli or so-called "artificial nerve currents" may be employed in lieu thereof. Some of these comprise a series of pulses of waveform, shape, magnitude, duration, frequency, and rate-of-interruption, such as to closely simulate an actual nerve current carried by a real nerve to a particular muscle. This is thought to be advantageous by some authorities in producing the most effective muscle action and may be employed with the instantaneously oppositely polarized closely spaced twin electrodes of each of the plurality of pairs of electrodes of the novel electrical stimuli-applying means of the present invention. However, the invention is not specifically so limited and may employ a great variety of other types of electrical stimuli.

It is a further object of the present invention to provide apparatus of the character referred to in any or all of the various aspects mentioned above, which is of relatively simple, inexpensive, foolproof, easy-to-use, and easy-to-maintain, construction such as to be conducive to widespread use thereof wherever certain muscles are to be selectively stimulated by activation of the proper motor points of the corresponding motor nerves while, at the same time, not stimulating any of a plurality of extremely sensitive sensory nerves which normally are responsive to smaller electrical values (of current and/or potential) than motor nerves by reason of the substantial absence of an insulating myelin sheath thereover, as is the case with motor nerves, and wherever the likelihood of the stimulation of sensory nerves is further enhanced by reason of the absence of physical buffering, effective insulation, or the like, as might be provided in other sensitive regions of a person's body by the provision of substantial amounts of protective layers of fat and by reason of greater bulk of the muscles themselves, thereby affording a greater measure of protection for the sensory nerves. Where these protective conditions are absent and there is the maximum likelihood of stimulating and activating sensory nerves, the present invention provides a unique apparatus and method for selectively distinguishing said very vulnerable and unprotected sensory nerves from adjacent heavily protected motor points of motor nerves of muscles which are to be stimulated—and for doing so in a manner which allows the electrical stimuli to act substantially entirely on the desired motor point of the desired motor nerve for activation thereof, while not stimulating the nearby unprotected and extremely vulnerable sensory nerves.

Further objects are implicit in the detailed description which follows hereinafter (which is to be considered as exemplary of the invention, but not specifically limiting it) and said objects will be apparent to persons skilled in the art after a careful study of the detailed description which follows hereinafter.

For the purpose of clarifying the nature of the present invention, both with respect to the apparatus form of the invention and the method form of the invention, several

exemplary embodiments are illustrated in the hereinbelow-described figures of the accompanying several sheets of drawings and are described in detail hereinafter.

FIG. 1 is a fragmentary front elevational view showing one form of a face mask carrying electrode means according to the invention.

FIG. 1A is a fragmentary sectional view, taken in the direction of the arrows 1A—1A of FIG. 1.

FIG. 2 is an enlarged sectional view, taken in the direction of the arrow 2—2 of FIG. 1, and illustrates one form of the electrode means.

FIG. 3 is an enlarged, fragmentary view, partly in elevation and partly in section, taken in the direction of the arrow 3—3 of FIG. 1.

FIG. 4 is an enlarged, fragmentary view, partly in elevation and partly in section, taken in the direction of the arrows 4—4 of FIG. 1.

FIG. 5 is an exploded view of one typical electrode means of the square type illustrated in FIGS. 1—4 and of the means for mounting same.

FIG. 6 is a fragmentary elevational view as seen from the right side of FIG. 1 in the direction of the arrow 6—6.

FIG. 7 is a view taken on the plane and in the direction indicated by the arrows 7—7 of FIG. 1, which thus shows the inside of one half (the right half) of the mask and the apparatus.

FIG. 8 is a top view taken in the direction of the arrows 8—8 of FIG. 1.

FIG. 9 is a fragmentary, elevational view of an exemplary one of the controllably operable length-adjusting means.

FIG. 10 is a fragmentary diagrammatic view, illustrating one typical form of the present invention adapted to provide facial muscle exercise for one or more persons, up to a predetermined maximum number of persons, from a common electrical stimuli or nerve current source.

FIG. 11 is a representative view of any typical pair of closely spaced electrode means adapted to signals.

FIG. 12 is a diagrammatic view illustrating a typical arrangement of the type shown in FIG. 11 and a typical connection thereof with respect to the nerve current generator or source of electrical stimuli.

FIG. 13 is a view quite similar to FIG. 12, but illustrates a different connection arrangement for twin pairs of electrodes.

FIG. 14 is another view, generally similar to FIGS. 12 and 13, but illustrates four pairs of the electrodes with each adjacent electrode pair being generally similar to and operating in a manner generally similar to the showing of FIG. 11.

FIG. 15 is an exploded view illustrating a modification of the electrode means of the invention.

FIG. 16 is an enlarged fragmentary side view, partly in elevation and partly in section, illustrating another modification of one or more of the electrode means.

FIG. 17 is a fragmentary view illustrating a modification of the compressible pad means adapted to be carried by any or all of the electrode means.

FIG. 18 is a fragmentary, partly broken away, front view generally similar to FIG. 1 but illustrates a modified form of the invention.

FIG. 19 is an enlarged fragmentary sectional view, taken in the direction of the arrows 19—19 of FIG. 18, but illustrates the modified electrical connection means in exploded relationship with respect to the remainder of the electrode means and the fragmentary portion of the modified facial mask.

FIG. 20 is a fragmentary side elevational view as seen in the direction of the arrows 20—20 of FIG. 18 and illustrates the normal relationship of the modified facial mask means with respect to the head and face of a wearer of same (shown fragmentarily in phantom).

FIG. 21 is a fragmentary view very similar to the right hand portion of FIG. 19, but illustrates a modified electrode means.

FIG. 21A is a sectional view taken in the direction of the arrows 21A—21A of FIG. 21.

FIG. 22 is a fragmentary side elevational view illustrating another modified form of the facial mask means.

FIG. 23 is a fragmentary side elevational view which illustrates a modified form of the facial mask means.

FIG. 24 is an enlarged fragmentary sectional view taken in the direction of the arrows 24—24 of FIG. 23 and illustrates the detailed structure of one of the controllably adjustable junction or fastening means.

Generally speaking, the first exemplary form of the invention illustrated comprises apparatus and means for applying to a plurality of selected facial regions non-painful electrical stimuli for producing electrically caused facial exercise, usually in a symmetrical manner with respect to a person's face so as to avoid producing an unequal exercising action on either side thereof.

A first form of the invention comprises a face mask, indicated generally at 22, made of flexible compliant material in the form of a thin-sheet wall formed in a manner generally similar to the exterior configuration of the facial tissue portion of a person's face. It should be noted that throughout this application said facial tissue portion of a person's face, whether so expressed or whether merely termed a facial portion or whether expressed in other equivalent language, is intended to refer to the muscles, tissue, and closely adherent overlying skin of a person's head, face, throat, and neck, which are adapted to be electrically stimulated by the present invention.

The face mask 22 may be of molded construction and may be made of polyethylene material, if desired, since this type of construction and material work very well for the purposes of the present invention, having a sufficient degree of flexibility to be highly adaptable to a variety of faces, being capable of being easily manufactured, and also being capable of being cleaned and generally maintained in a sanitary condition. However, the face mask 22 is not specifically so limited and may be made of any suitable material.

Additionally, it should be noted that the face mask 22 may be made in several distinct sizes (such as four sizes, for example, although not specifically so limited) so as to be adapted for appropriate mounting on virtually all sizes and shapes of faces.

It should also be noted that the face mask 22 is provided with a nose and mouth cutout portion 24 and an eye cutout portion 25, all connected together and lying at the exact front of the mask as clearly shown in FIG. 1 whereby to allow a person's nose and mouth to extend therethrough in a manner such as to provide for complete freedom of breathing action and talking action. Also, the eye cutout portions 25 provide unobstructed forward vision to a person wearing the mask. Thus, the central cutout portions 24 and 25 provide great freedom to a wearer of the mask even during a facial muscle rehabilitation and rejuvenation treatment.

The facial mask 22 is provided with one or more neck and chin engageable fitting portions 26 adapted to firmly engage the neck portion 27 and the chin portion 28 of a person's head 29 as shown in FIG. 7 in the double compound curvature portion thereof comprising the curve formed by the neck and chin 27 and 28 when seen from the side, as viewed in FIG. 7, and also comprising the curve at right angles thereto around the exterior periphery of the forward portion of the person's neck 27. This neck and chin engageable fitting portion 26 of the mask 22 firmly engages the neck 27 and chin 28 of the person's head 29 when the device is in mounted operative position with respect thereto in a manner such as to clearly determine the positioning of the entire mask 22 with respect to the person's face whereby the inner surface 31 of the mask 22 is spaced away from the skin 32, of the person's face; said skin 32 being shown in broken lines in FIG. 7 at the forehead region of the face, but being representative of the entire facial skin.

To further clarify the above-mentioned firm engagement of the neck and chin engageable fitting portions 26 with respect to the neck portion 27 and the chin portion 28 of a person's head 29 as shown in FIG. 7, it should be noted that the so-called chin portion 28 referred to above is intended to also mean the lower jaw portion of the person's head 29. In other words, the word "chin" or the expression "chin portion" is not intended to be limited to the front portion thereof, but is intended to include and comprehend the lower jawbones of the person's head 29, and it is actually the fitting contact of the fitting portions 26 under the jawbones of the chin portion 28 which acts to effectively position and stabilize the entire facial mask 22 with respect to the person's head 29 in the proper relationship with respect to the person's face. It should be noted that the facial mask has the proper location thereof with respect to the person's face automatically determined relative to a positioning, locking, and stabilizing point which effectively comprises the upper throat line portion of the person's head which proceeds backward and ends in an angle and curve, all lying between the chin portion 28 (including the lower jawbones) and the frontal throat portion 27 shown in FIG. 7; said fitting portions 26 fitting medially into the area of the angle and ramus portions of the mandible (lower jawbones). This makes the fitting portions 26, and the entire facial mask 22, become effectively firmly seated with respect to any face or jaw of any person's head without rocking or moving and in a manner which maintains the facial mask 22 in the proper symmetrical position and relationship with respect to the person's face.

This "off-the-face" mounting of the mask 22 provides air circulation between the inner surface 31 of the mask 22 and the skin 32 of the person's face and maintains comfort during a facial muscle exercising application of the apparatus.

Furthermore, it should be clearly noted that the mounting contact region of the neck and chin engageable fitting portion 26 with respect to the throat 27 and chin 28 of the person's head 29 is substantially universally adaptable and is so arranged as to, in virtually all cases, properly position the entire mask 22 for mounting in spaced relationship away from the facial skin 32 and with the plurality of inwardly projecting electrode means, each of which is indicated generally at 33, in actual contact with corresponding portions of the facial skin 32 whereby to provide for the application to selected portions of the person's face skin 32, of non-painful electrical stimuli for producing electrically caused facial exercise of the corresponding selected facial muscles.

With this type of mounting arrangement of an "off-the-face" mask having its only fitting contact at the compound curve of the throat 27 and chin 28 and with the remainder of the contact points comprising only the electrodes 33, it is possible to provide a substantially universally adaptable mask which is suitable for appropriate mounting with respect to virtually all sizes and shapes of faces with only a range of approximately four different sizes of masks being required.

The mask size variations referred to above may, for exemplary purposes, be based upon a system of four different measurements of various persons' faces comprising the measurement from a person's chin to the bridge of his nose, the measurement across the person's cheekbones in a horizontal direction, the width across the lower jaw, and the length from the tip of a person's chin back to the person's throat in a horizontal direction. These measurements may vary in $\frac{3}{8}$ inch or $\frac{1}{2}$ inch steps or the like, so as to provide the abovementioned four sizes which will be appropriate for proper fitting with respect to virtually any human face.

In order to properly mount the mask and the inwardly projecting multiple pairs of electrode means with respect to a person's face, the exemplary form of the invention illustrated is provided with a plurality of strap means,

comprising the upper strap means 34 and the lower strap means 35, adapted to be adjustably engaged with respect to the upper and back regions of a person's head and neck. This is indicated fragmentarily in FIG. 7. In this connection, it should be noted that each pair of strap means, such as the upper pair 34 and the lower pair 35, is provided with a plurality of controllably operable length-adjusting means, as indicated generally by the reference numeral 36 in FIG. 9. In the exemplary form of this arrangement illustrated in FIG. 9, this comprises a male snap fastener member 37 carried by one of the strap portions 34 (or 35) and a plurality of female snap fastener elements 38 spacedly carried by the other strap portion 34 (or 35). This makes it possible to tighten or loosen each set of strap means 34 or 35 as desired for a given installation of the mask. It should be noted that the upper strap means 34 and the lower strap means 35 include pivotal connection means for facilitating the head and neck fitting engagement of said strap means.

Various other length-adjusting means may be employed in lieu of the snap fastener means. For example, buckles and various other types of fasteners may be employed.

The facial mask 22 is provided with means for mounting each cooperable pair of spaced electrode means 33 at various locations for contact with corresponding facial skin portions 32 which overlie desired motor points of desired motor nerves for activation of desired facial muscles. This is shown in a representative way with respect to one pair of such electrode means in FIG. 11, which is typical of all.

Since the desired motor points may vary in position slightly from one person's face to another, it is necessary that the mounting means for mounting each pair of cooperable electrode means 33 be such as to provide for controllably positional adjustment thereof so as to provide for the optimum location thereof in a manner which will activate only the desired motor point and will do so very effectively and with a minimum current flow.

In the exemplary first form of the invention this adjustably controllable repositioning of each cooperable pair of electrode means 33 is provided by the multiple aperture means 39 carried by the face mask 22 in each of the general areas where a facial muscle stimulation operation may be desirable.

Each of the electrode means 33 is effectively provided with engaging means for adjustably mounting said electrode means 33 with respect to any of said multiple aperture means 39, thus making it possible to move each electrode means 33 of any cooperable pair, or the entire pair, as desired, for optimum facial muscle stimulation purposes.

The engaging means referred to above for mounting each of the electrode means 33 is indicated generally at 41 (best shown in FIG. 5) and comprises a through-passing threaded clamping bolt or screw means 42 and threaded nut means 43. The bolt means 42 is adapted to pass outwardly through any of the multiple apertures 39 in the face mask 22 and is then adapted to threadedly engage the nut 43 on the outer side of the facial mask 22 and to be threadedly firmly clamped together for rigidly mounting the corresponding electrode means 33 at the desired location with respect to the mask 22 and with the electrode means 33 projecting inwardly therefrom for contact with a corresponding facial skin portion 32 of a person wearing the mask, as shown in fragmentary form and partially phantom form as shown in FIG. 7.

In the specific form of the engaging means 41 best illustrated in FIG. 5, it will be noted that an insulating washer 44 is adapted to be positioned in abutment with the outer surface of the face mask 21 immediately around the corresponding aperture 39, and is adapted to have immediately thereover an electrically conductive washer 45 which firmly contacts the bolt 42 and the nut 43, which

abuts the opposite surface of the electrically conductive washer 45.

The electrically conductive washer 45 has connected to it an exteriorly insulated lead wire 46 which is a lead wire to that particular electrode means 33, and the other end of which is adapted to be effectively connected with respect to a nerve current generator, as shown in diagrammatic form at 47 in FIG. 10. This connection will be described in greater detail hereinafter.

An insulating cover or cap member 48 is threadedly engaged with respect to the bolt 42 in a manner completely covering and enclosing the entire exploded assembly indicated at 41 in FIG. 5 so as to provide not only protective cover cap means but also to exteriorly insulate the connection of the lead 46 with respect to the electrode means 33.

The form of electrode means shown in FIG. 5 includes an electrically conductive plate 49 (which is shown as of rectangular configuration in this form of the invention and which is shown as a circular configuration at 49' in FIG. 15, and which may actually assume any configuration). The plate 49 is connected to the screw or bolt 42 and is provided with an insulating exterior holding means or container which is shown as comprising an inwardly angularly flanged rectangular box or chamber 51 made of polyethylene or any other equivalent insulating material and which is adapted to resiliently receive and retain the compressible pad means 52, which may comprise a sponge or the like. The arrangement is such that the compressible pad 52 is positively retained within the holder 51 with a forward portion thereof projecting forwardly therefrom for contact with a facial skin area 32. Normally, the compressible pad 52 is of absorptive material adapted to be impregnated with an electrically conductive liquid or semiliquid means (which is not shown but which is assumed to be positioned within the compressible pads 52 of the electrode means 33 when the device is in the operative relationship shown in FIG. 7 with respect to the face of a person wearing the mask 21).

FIG. 15 illustrates a modified form of electrode means wherein the pad holder 51' is of circular configuration rather than rectangular and wherein the compressible pad means 52' carried therein is similarly shaped. However, the electrode means 33 may assume virtually any desired configuration.

Furthermore, FIGS. 16 and 17 illustrate further modifications thereof and will be referred to in greater detail hereinafter.

It should be noted that the previously mentioned neck and chin engageable fitting portions 26 may actually comprise a pair of electrodes 33' functionally equivalent in all respects to the other pairs of electrodes indicated by the reference numeral 33. In the specific form illustrated, however, they are shown as being sponge-like compressible pads 52'' which are removably mounted in carriers or holders 51'' which actually comprise recessed portions formed in the neck piece or throat part 53 of the face mask 21. The recessed holding portions 51'' carry electrically conductive base plate portions 49'' therein (as best shown in FIG. 1A) which are functionally equivalent to the similar elements shown at 49 in FIG. 5 and which are electrically connected to exterior terminals 45'' and the leads 46 extending therefrom and which are in every way comparable to the other typical electrode means designated by the reference numeral 33.

The throat electrode means 33' are shown as having two electrical lead means 46 connected thereto at spaced locations. This is primarily to provide a substantially equal distribution of potential over the entire relatively large surface contact area of each of the compressible pads 52'' and also to provide relatively the same extent of current flow over the large surface thereof when the electrodes are energized. However, in certain forms of the invention one of the extra lead means on each side may be eliminated, if desired.

It will be noted that all of the various pairs of electrode means 33 with the exception of the electrically conductive throat pads 52'', which are adapted to engage a person's throat, are on one side or the other of an imaginary central or medial vertical plane which bisects the mask and the head of a person adapted to carry same, into two lateral halves. With respect to the pairs of electrodes 33 carried by the main central portion of the face mask 22, this is to avoid any tendency to cause any substantial amount of electric current flow across the person's face in regions where sensory nerves abound. This also acts to prevent equal symmetrical disposition of the energized pairs of instantaneously opposite polarity electrode means 33 on opposite sides of said medial plane so as to bring about balanced muscle contraction of similar groups of muscles on opposite sides of a person's face whereby to prevent one-sided overdevelopment of any muscle group. This brings about equal, symmetrical, and balanced exercise for opposite sides of a person's face. However, at the lower throat region where the electrically conductive throat pads 52'' engage the person's throat, there are a minimum amount of sensory nerves which lie within the arcuate current path between the throat pads 52''. Therefore, this electrode arrangement at the bottom of the face mask 22 is permissible and lies within the broad scope and teachings of the present invention. However, in certain forms of the invention, even the electrically conductive throat pads 52'' may be arranged in pairs of electrode means of instantaneously opposite polarity positioned on each side of said medial plane.

Each of the pairs of electrode means 33 which cooperate with each other by reason of being closely spaced and of instantaneously opposite electrical polarity, provide an arcuate current flow which at its apex point, as typically indicated at 55 in FIG. 11, will strike only a desired motor point, such as shown at 56 in FIG. 11, of a desired motor nerve, such as shown at 57 in FIG. 11, for activation of only a particular desired muscle.

Each pair of cooperable electrodes 33 (or 33'' in the case of the throat electrodes) is provided with corresponding pairs of electrical lead means 46 which are grouped together in a common assembly of leads, as indicated at 56 on each side of the facial mask in as unobtrusive a manner as possible and extend upwardly and then across the top of the mask to a central location for connection to electrical connector and distributor means, indicated generally at 57, which is adapted to be effectively connected at one side thereof, as indicated at 58 (the mask side thereof) to all of the electrical leads 46 from all of the electrode means 33 and 33'' and adapted to be connected at the other side thereof, as indicated at 59, to a corresponding plurality of leads 61 which extend to a remote location (usually upwardly to an overhead location) for effective connection with respect to a nerve current generator or source of electrical stimuli, one form of which is indicated diagrammatically at 47 in FIG. 10.

This connection is such that half of the wires 46 will be effectively connected to one terminal of the nerve current generator 47 while the other half of the wires 46 will be effectively connected with respect to the other terminal of the nerve current generator 47.

The arrangement is such that each closely adjacent pair of electrode means 33 (and 33'' in the case of the throat electrode means) will instantaneously be of opposite polarity during the application of the nerve current or electrical stimuli thereto. This is indicated by the polarity designations shown in FIGS. 11-14.

In this connection, it should be clearly noted that the showing of FIG. 10 is entirely diagrammatic and it is, of course, to be understood that the lead means shown at 61 embodies either the plurality of pairs of different polarity leads shown at 61 in FIG. 1, or else at least two opposing polarity leads which are effectively distributed within the connector means 57 so as to be connected to every other electrode means 33 of each pair thereof. In

other words, 61 may either consist of a plurality of pairs of wire corresponding in number to the plurality of leads 46, or it may consist of only two such wires effectively connected within the connector means 57 to all of the similar polarity leads 46.

The electrical connector and/or distributor means 57 is physically mounted on the upper forehead part 62 of the face mask 22 in any suitable manner. For example, it may be mechanically mounted thereon by suitable mechanical fastening means 63, as shown in the exemplary first form of the invention or it may be fastened thereon adhesively, cohesively, or by any other suitable means.

The pairs of electrical lead means 46 may similarly be mounted with respect to the face mask 21 in a variety of ways. They may be mechanically fastened with respect to the face mask 22, as shown at 60, or adhesively or cohesively mounted thereon or, in certain forms of the invention, they may be molded within the material of the mask wall 23 at the time that the mask is made.

In said first exemplary form referred to above, the plurality of leads 46 on each side of the mask 22 are shown as comprising, at the upper portion of the mask, a joined assembly of closely laterally adjacent leads in the form of a flat, multiple wire strip, as indicated at 50. As this extends down the mask, each successive pair of leads 46 extends outwardly therefrom to the proper location for connection to the corresponding cooperable pair of electrode means 33.

The electrode means 33 of each cooperable pair thereof are more closely adjacent to each other than to any other electrode means, thus bringing about the selective current and/or potential distribution along an arcuate path which reaches an apex as indicated at 55 at a desired motor point 56 in the manner shown in FIG. 11. This will occur only at the desired locations, and elsewhere throughout the facial tissue much lesser concentrations of current and/or potential will occur—to a degree such as to prevent activation of undesired motor points and/or to prevent exceeding the pain threshold of relatively irritable and substantially unprotected sensory nerves.

FIG. 10, as pointed out hereinbefore, merely illustrates in diagrammatic form, one exemplary type of arrangement for applying the principles of the present invention.

In this version, a remote unit, which may be in console or cabinet form, may carry all of the signal-generating apparatus. This is indicated in broken lines at 64 in FIG. 10. It will be understood that one such unit 64 may be positioned in a beauty parlor or treatment facility at a convenient location, perhaps overhead, so that a plurality of sets of the lead means 61 may extend outwardly to a plurality of facial masks, such as the one shown at 22, whereby one or more persons may receive facial rehabilitation and/or rejuvenation treatment at the same time.

As shown in FIG. 10, the nerve current generator 47 produces electrical stimuli or output signals which might be termed nerve current signals and which may be of the hereinbefore-mentioned "sinusoidal" or "cine wave" type, or of one closely simulating a physiological nerve current, or of any other suitable type, which then passes through a master control switch 65 and then any of the plurality of individual switches 66 which may be controllably closed by an operator of the unit, and then outwardly through the corresponding sets of lead means 61 to the plurality of pairs of electrodes, similar to those shown at 33 and 33'' in the first form of the invention and carried by the corresponding facial mask, or plurality of facial masks 22.

The magnitude of the nerve current reaching the electrodes of any given facial mask 22 may be controlled individually by the person wearing the mask by the controllably operable magnitude-adjusting means indicated at 67 in connection with one of the masks 22 in FIG. 10. It should be understood that the remaining plurality of masks 22 may also be provided with magnitude-adjusting means, such as that shown at 67, which merely comprises suitable potentiometer means or rheostat means or any other mag-

nitude-attenuating means for controlling the magnitude of the nerve current signals actually applied to that particular person's face.

The form of the invention shown in FIG. 10 includes programmed sequencing means, indicated at 68, for providing for the energization of various of the pairs of electrode means 33 (as illustrated in the first form of the invention), or various groups of said pairs, at any given time and for the sequential energization thereafter of succeeding pairs (or groups of pairs) of others of said electrode means in a predetermined programmed sequencing manner such as to provide an optimum sequence of programmed exercising actions of different sets of facial muscles and/or groups of such facial muscles. This is highly desirable since it simulates the normal action of said facial muscles which normally occurs in certain groups.

For example, it may be so arranged that the pairs of cooperating electrodes of the first form of the invention will be energized for several minutes so that the entire sequence will have been completed from the forehead and/or temple regions down to the throat regions in a reasonably short period of time, perhaps of the order of twenty to thirty minutes. This will give the complete facial musculature a workout of a nature such as to bring about improved muscle tone, rehabilitation, and/or rejuvenation after a relatively small number of such treatments.

While the programmed sequencing means 68 is shown in FIG. 10 as being connected between the nerve current generator 47 and each of the individual switches 66 of the corresponding lead means 61 connected to the corresponding facial masks 22, this arrangement is not to be construed as limiting. Actually, there may be an individual programming sequence means 68 connecting between each individual switch 66 and the corresponding lead means 61 going to the corresponding facial masks 22, if desired. This makes it possible to differently program and sequence different masks, if desired.

The nerve current generator shown at 47 may comprise an oscillation generator of any suitable type for producing the proper frequency, magnitude, waveform shape, and/or wave train repetition rate for optimum motor nerve stimulation purposes. Or it may comprise a conventional sine wave signal from another source of same and may appropriately modify same, if desired. Indeed, any means for producing such nerve currents or electrical stimuli may be employed and, since the invention does not lie in the precise interior details thereof, this is shown only in block diagrammatic form in FIG. 10.

The programmed sequencing means 68 for providing proper programming and sequencing of the application of the nerve current to various different pairs of the plurality of electrode means 33 may be of any type suitable for this purpose. For example, it may comprise a conventional electromagnetic stepper relay type of unit with effective time delay means (such as time delay relay means or the like) associated therewith whereby to provide an arrangement such that each time delay stepping signal will advance the stepper unit or means to a next electrical contact for effectively closing a next effective switch means for energization of the next sequential pair, or group of pairs, of the electrode means 33 while, at the same time or substantially so, opening a preceding effective switch means for de-energization of the pair, or group of pairs, of electrode means which had been previously energized. Such stepper unit means are well known in the art as are such time delay means. Therefore, no detailed description thereof is thought necessary.

Also, the programmed sequencing means 68 may take other exemplary forms if desired. For example, it might comprise a timer motor means operating at a relatively low output rate of revolutions per minute (either directly or by means of reduction gear means) and driving multiple, differently positioned, cam means located for operating at different instantaneous times a plurality of switch

means connected to the various different pairs, or groups of pairs, of the electrode means 33 for providing the proper programmed sequence of switch-opening and switch-closing operation in accordance with the teachings set forth above.

Such timer motor means, cam means, and cam-operated switch means are well known in the art and, since they do not comprise the real inventive concept of the present invention, are not shown in detail.

Also, various other types of programmed sequencing means 68 may be employed in lieu of the exemplary arrangements referred to above.

FIG. 12 merely illustrates, in diagrammatic form, one typical connection and an electrode spacing arrangement which is similar to that described hereinbefore, and, therefore, similar numbers are given to the elements thereof. No further description is thought necessary.

FIG. 13 illustrates a slight modification wherein an extra pair of electrodes 33 is connected to the leads 46 of the first pair of electrodes 33 and is positioned for combined effective action so as to operate upon several closely adjacent motor points for causing group muscle action. The elements of this diagrammatic view carry the same reference numerals as those employed hereinbefore for corresponding parts.

FIG. 14 illustrates a further slight modification quite similar in principle to FIG. 13. However, in this view, two additional pairs of cooperable electrode means 33 are connected with respect to the leads 46 in addition to the two pairs shown in FIG. 13 and are physically arranged in a manner such as to have alternate electrodes of opposite polarity at any given instant whereby to provide the effective arcuate current flow and/or potential distribution shown at 55 in FIG. 11 at a plurality of relatively closely adjacent points for the activation of a plurality of motor points of a plurality of motor nerves connected to a plurality of closely adjacent muscles for group muscle action.

FIG. 15 illustrates in exploded fragmentary form a modified version of any one of the electrode means indicated by the reference numeral 33 in the first form of the invention and indicated by the reference numeral 33' in the modified form shown in FIG. 15. Parts of this modified form similar to those illustrated in the first form of the invention, as perhaps best shown in FIG. 5, are indicated by similar reference numerals, primed, however.

FIG. 16 illustrates a modified type of electrode means which is generally designated by the reference numeral 33a. In this modification the main change is the fact that the entire electrode means 33a is spring-biased outwardly away from the engaging or mounting portion, indicated generally at 41a, thereof and from the corresponding portion of the wall 23a of the facial mask to which said engaging means 41a is controllably removably attached by way of any of a plurality of multiple apertures as shown at 39 in FIG. 1.

This forward biasing of the electrode means 33a is provided by the two cylinders 69 which carry compression springs 71 therein and which press against piston means 72 carried at the outer end of the mounting stud means 73. This provides an arrangement which causes the electrode means 33a to be extended as far as possible under the action of the spring means 71 under all normal conditions. However, whenever the compressible pad 52a is forced against a skin surface, such as the skin surface 32 of the person's face 30, indicated in phantom in FIG. 7, the spring 71 allows the degree of effective extension of the electrode means to adjust to the proper extent as determined by the contour of the person's face 30 at that location. This particular type of electrode means is particularly advantageous for contacting the skin surface of a person's face under the eyes and slightly above the cheekbone region of the person's face where normally slight recesses occur and where it may be difficult to provide effective

tive contact of the compressible pad with the skin when using electrode means of the type illustrated hereinbefore. However, the controllably extendable type of electrode means shown in FIG. 16 is ideally suited for this purpose. Also, it may be used elsewhere where this same problem is encountered.

Appropriate electrical contact between the electrode means 33a and the electrical lead means 46a is accomplished in substantially the same manner as that described hereinbefore in connection with the first form of electrode as shown in detail in FIG. 5 except that an extra electrically conductive wire means 74 which extends from the inner electrically conductive plate 49a rearwardly to an auxiliary plate 49a' which carries a mounting screw similar to that shown at 42 in the first form of the invention illustrated in FIG. 5 and which cooperates with the remainder of the structure which is identical to the structure indicated at 41 in FIG. 5.

This provides one exemplary form of telescopically extendable electrode means exemplary of the many forms which it may take.

FIG. 17 illustrates a slight modification of the compressible pad means 52 as shown in FIG. 5, 52' as shown in FIG. 15 and/or 52a as shown in FIG. 16, wherein it has a shaped or contoured forward surface portion 75 shaped for effective contact with a particular portion of a person's facial skin. It will readily be understood that this will provide very effective contact between the shaped contoured surface of the pad 52b and the correspondingly shaped skin surface of the person's face. Indeed, with this arrangement, the telescopically extendable and/or spring biased arrangement shown in FIG. 16 may be eliminated if desired even in locations where the skin surface has an extreme contour and would otherwise be quite difficult to effectively engage with the pad means 52b. It is, of course, understood that the pad means 52b may be of any desired cross-sectional shape and is adapted to be carried in a corresponding holder means in accordance with the teachings set forth in detail hereinbefore in connection with the earlier forms of the invention illustrated in the drawings and described in detail above.

FIGS. 18 and 19 are similar in many respects to FIGS. 1 and 6 and illustrate a modified form of the invention which, because of the similarity to said first form of the invention, has corresponding parts indicated by corresponding reference numerals, followed by the letter "c," however. In this modification it will be noted that the facial mask means, indicated generally at 21c, actually comprises a modified face mask equivalent to just the upper or top portion of the face mask 22 of the first form of the invention as best shown in FIGS. 1, 6 and 7, and it is adapted to be adjustably mounted on the person's head 29 by upper and lower mounting strap means indicated at 34c and 35c, which are structurally and functionally analogous to the corresponding strap means 34 and 35 of said first form of the invention.

This modified form of the invention is illustrated in one exemplary form wherein the artificial nerve current input thereto is supplied by a pair of input lead means 61c which can be connected to a nerve current generator of the type indicated at 47 in FIG. 10 or to any other type of nerve current generator, such as a conventional sine wave machine or the like, if desired. In this preferred arrangement each of the input leads 61c is adapted to be controllably manually engaged with respect to any given pair of the receptacles, indicated generally at 76, carried by a corresponding electrode means 33c by way of an electrical connection member comprising a controllably manually compressible plug, indicated generally at 77, which is adapted to be manually compressed and inserted into the corresponding receiving recess 76 and then manually released whereby to make effective physical and electrical engagement therewith. It should be noted that each of the manually compressible plugs 77 and the corresponding receiving recess 76, together comprise a modified

type of electrical connection means, best shown in FIG. 19, and functionally equivalent to the electrical connection aspect of the corresponding engaging means shown at 41 in the first form of the invention, as best shown in exploded relationship in FIG. 5.

It should be noted that each of the compressible plugs 77 comprises a slotted spring type electrically conductive body portion 78 having an enlarged split or bifurcated end portion 79 which is adapted to be compressed for insertion into the correspondingly shaped recessed opening 81 in the electrically conductive insert member 82 comprising an inner part of the receiving recess means 76, which also includes an outer insulating sleeve 83. It should be noted that the electrically conductive insert member 82 is threaded, as indicated at 84, so as to be capable of being threaded onto the threaded member 42c which corresponds to the similar threaded member 42 of the first form of the invention shown in FIG. 5. The remainder of the electrode means 33c is generally similar to that shown at 33 in the first form of the invention in FIG. 5 or to any of the other electrode means illustrated in any of the other versions of the invention.

It will readily be understood that the arrangement just described provides for the quick and easy manual engagement and disengagement of the pair of plugs 77 with respect to any of the pairs of receiving recess means 76, as desired, for stimulating various facial muscles, or groups of facial muscles, in the upper portions of a person's face. Since each of the wires 50c interconnect a different pair of similarly positioned electrode means 33c on opposite sides of the facial mask, the insertion of the two plugs 77 into two selected receiving recess means 76 of a given pair of electrode means 33c on one side of the facial mask 21c, or on opposite sides thereof, will effectively apply electrical potential to four of the electrode means 33c—two of them on opposite sides of the facial mask being of the same polarity and the other two, also on opposite sides of the facial mask and each being very closely adjacent to the corresponding one of said first pair of electrode means 33c, being of the same polarity with respect to each other but of instantaneously opposite polarity with respect to the other or first-mentioned pair of electrode means 33c whereby to bring about the desired type of selective muscle exercising action effectively described in detail hereinbefore.

FIG. 21 is a fragmentary view very similar to the right portion of FIG. 19, but illustrates a modification of the electrode means of a general type similar to that illustrated in FIG. 16 wherein the electrode means is of a spring-biased type. In view of the similarity of this electrode means to the earlier forms, with particular reference to the form illustrated in FIG. 16 (although it is oppositely directed), similar parts are indicated by similar reference numerals, followed by the letter "d," however. In this modification the electrode means, indicated generally at 33d, includes a cylindrical outer sleeve portion 85 which carries therein biasing spring means 86 which normally presses against the inner end of the electrically conductive cup means 51d which carries the pad means 52d. In order to maintain proper alignment of the movable cup means 51d with respect to the fixed electrically conductive cylinder 85, which has its base fastened to the screw 41d, both said cylinder 85 and said cup 51d are provided with a plurality of longitudinal dimple and crimp means, as indicated at 87. It will be understood that the arrangement just described provides a very effective telescopically-extendable, spring-biased arrangement functionally similar in many respects to the form of the invention illustrated in FIG. 16 and intended for the same general purposes.

FIG. 22 illustrates a further modification of the facial mask means of the first form of the invention, as best shown in FIGS. 1, 6, and 7, and because of the similarity thereto, corresponding parts are indicated by similar reference numerals, followed by the letter "e," however. In this modification, it will be noted that facial mask

means 21e is of a modified type substantially equivalent to just the bottom portion of the facial mask 22 of the first form of the invention, as best shown in FIGS. 1, 6, and 7. The modified facial mask 21e is adapted to be adjustably fastened with respect to a person's head 29e by upper and lower fastening strap means, indicated generally at 34e and 35e, which are functionally similar to the corresponding strap means 34 and 35 of the first form of the invention.

In this modification of the invention, the face mask means 21e is provided with a plurality of electrical connection and engaging means of the same type as indicated in FIGS. 18 and 19, although the invention is not specifically so limited. Also, in this modification of the invention, the artificial nerve current is adapted to be supplied through two leads and corresponding manually compressible plugs similar to the showings at 61c and 77 in FIG. 18.

Also, in this modification, the interconnecting wires between the similarly positioned electrode means on opposite sides of the facial mask 21c lie under the chin portion of the mask, as indicated at 50e, and are connected and operate in the same manner as the connecting wires 50c shown in FIG. 18.

FIGS. 23 and 24 illustrate a further modification of the invention wherein the facial mask means is of a multiple element type interconnected by controllably adjustable junction or fastening means for effectively changing the over-all size of the mask so as to make it adaptable for mounting on faces of greatly different sizes. In view of its similarity to earlier forms of the invention, similar parts are indicated by similar reference numerals, followed by the letter "f," however. In this modification the facial mask means is indicated generally at 21f and includes the upper portion 21fU and the lower portion 21fL which, together, are very similar to the facial mask means indicated at 22 in the first form of the invention, as best shown in FIGS. 1, 6, and 7, and said modified facial mask means 21f is adapted to be provided with electrode means and engaging means which are positionally adjustable in substantially the same manner as the corresponding elements shown at 33 and 41 in said first form of the invention.

The important difference in the modified facial mask means 21f shown in FIG. 23 is the fact that it includes a plurality of controllably adjustable junction or fastening means, indicated generally at 88.

In the specific example illustrated, it is provided with four such controllably adjustable junction or fastening means 88, two on each side of the facial mask 21f and adapted to extend across the horizontal separation line 89 between the upper mask portion 21fU and the lower mask portion 21fL whereby to make it possible to either vertically extend said upper and lower mask portions or vertically retract said upper and lower mask portions 21fU and 21fL with respect to each other as desired in order to fit a particular face.

The detail of a typical one of said controllably adjustable junction or fastening means 88 is shown in enlarged fragmentary cross section in FIG. 24 and comprises a first dovetail member 91 having edge portions 92 fastened, as indicated at 93, to the corresponding surface portion of the upper facial mask portion 21fU and having a raised central portion 94 which is connected to the edges 92 by diverging side wall portions 95 whereby to provide an effective dovetail structure. The controllably adjustable junction or fastening means 88 also comprises a second dovetail member 96 having edge portion 97 fastened, as indicated at 98, to the corresponding surface portion of the lower facial mask portion 21fL and having a raised central portion 99 which is connected to the edges 97 by diverging side wall portions 100. Said second dovetail member 96 is slightly larger than the first dovetail member 91 carried in alignment therewith by the upper mask portion 21fU whereby to provide an arrange-

ment such that the lower dovetail member 96 receives the extended lower portion of the upper dovetail member 91 therein in an effectively telescopically extendable and retractable manner. This provides an arrangement such that each of the pairs of upper and lower dovetail members 91 and 96 can be vertically telescopically adjusted into a desired relationship and then can be locked in said relationship by a knurled locking screw 101 which has a threaded shaft portion 102 adapted to extend through any of a plurality of upper apertures 103 in the raised central portion 99 of the lower mask dovetail member 96 and then into threaded engagement with any one of a corresponding plurality of threaded apertures 104 in the upper mask dovetail member 91. This will, of course, firmly lock each such corresponding junction or fastening means 88 in any selected longitudinal relationship.

It should be understood that the figures and the specific description thereof set forth in this application are for the purpose of illustrating the present invention and are not to be construed as limiting the present invention to the precise and detailed specific structure shown in the figures and specifically described hereinbefore. Rather, the real invention is intended to include substantially equivalent constructions embodying the basic teachings and inventive concept of the present invention.

I claim:

1. Electrotherapeutic apparatus for applying to selected organic tissue non-painful electrical stimuli, comprising a facial mask having an interior surface portion larger than, and generally shaped in a manner similar to the average exterior configuration of one range of human facial sizes and shapes, a source of electrical stimuli having a pair of output terminals, a plurality of pairs of electrode means positioned on each side of said mask, lead means for connecting said pairs of electrode means to respective ones of said output terminals, electrode mounting means for mounting the electrode means of each of said pairs in closely spaced relationship extending outwardly and spaced apart by a distance sufficient to define an electrical stimulation path through a motor point of a motor nerve entering muscle tissue which is to be electrically stimulated by a substantially arcuate electrical stimulation path between said pair of electrode means, said electrical stimulation path defined by each pair of electrode means being shorter than the distance between any two pairs of electrode means, thereby avoiding stimulation of sensory nerves when said electrical stimulation path is excited to hit the motor unit of a motor nerve.

2. Apparatus as defined in claim 1 wherein said electrode-mounting means is provided with controllably positionally adjustable engaging means for controllably positionally adjusting the location of said electrode means whereby to provide for positional adjustment thereof to provide for optimum stimulation of said motor point.

3. Apparatus as defined in claim 1 wherein said electrode-mounting means is provided with controllably positionally adjustable engaging means for controllably positionally adjusting the location of said electrode means with respect to said electrode-mounting means whereby to provide for positional adjustment thereof to provide for optimum stimulation of said motor point at a particular desired location, said controllably positionally adjustable engaging means comprising multiple aperture means carried by said electrode-mounting means and controllably engageable clamping and fastening means carried by each of said electrode means for clamping and fastening engagement with respect to any one of the apertures of said multiple aperture means whereby to provide for optimum positional adjustment of any of said electrode means with respect to said electrode-mounting means.

4. Apparatus as defined in claim 1 wherein said electrode-mounting means is provided with supporting means adapted to be supported in a desired relationship with respect to a particular desired motor point, said supporting means comprising effectively and controllably length-

adjustable strap means for supporting said electrode-mounting means in said desired relationship with respect to said desired motor point which is to be electrically stimulated.

5. Apparatus as defined in claim 1 including electrical connector and distributor means adapted to be connected between each pair of said electrode means and said lead means, said electrical connector and distributor means being mounted on and carried by said facial mask means adjacent to the top thereof at a location positioned outwardly of a portion thereof adapted to lie forwardly of the forehead of a wearer of said facial mask means.

6. Apparatus as defined in claim 1 wherein said source of electrical stimuli comprises a generator for producing nerve-current-stimulating electrical stimuli having a waveform, amplitude and frequency for stimulating contraction of desired facial muscles in an optimum manner, and also comprising programmed sequencing means for providing for the energization of certain pairs of said elec-

trode means at any given time and for the sequential energization of succeeding pairs of said electrode means in a predetermined programmed sequenced manner such as to provide an optimum sequence of programmed contractions and relaxations of different sets of facial muscles.

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