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ANATOMICAL LACING WITH ACTUATING MEANS FOR
EXERCISING FACIAL MUSCLES
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FIG. 1.

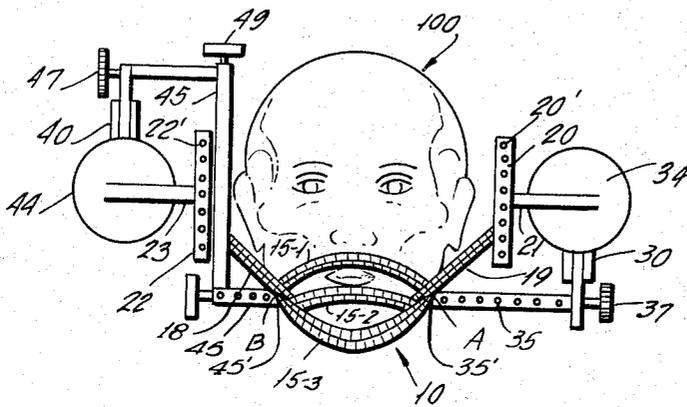


FIG. 2.

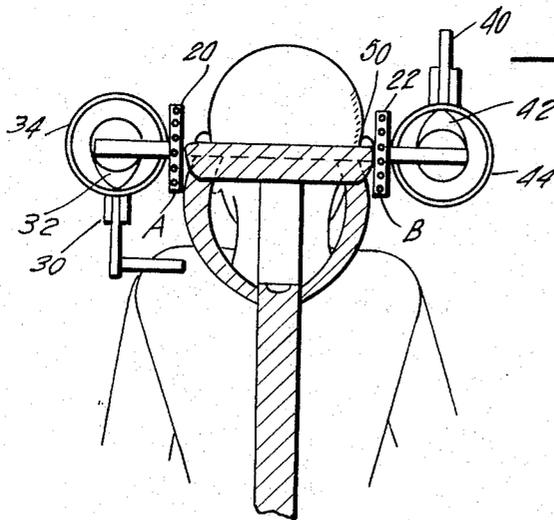
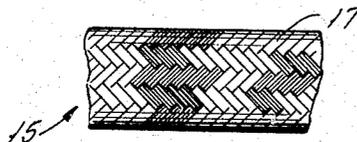


FIG. 4.



FIG. 3.



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9 Claims. (Cl. 128-63)

My invention relates to an anatomical lacing for treating muscular dysfunction and, more particularly, to such a lacing which is constructed to treat the muscles about the head and neck which the associated with malocclusion, mastication, the organ of speech, expression and aesthetics.

It is known that muscular dysfunction is one of the basic underlying causes of treatment difficulties and unsatisfactory functional and aesthetic results in mechanotherapy. That is, abnormal muscular forms and tonus produce a muscular balance dictating an improper denture form and a faulty tooth positioning. Various exercises have been previously devised for correcting such dysfunction of the masticatory muscles. However, such exercises have been found to be quite tedious and difficult and have not proved satisfactory in restoring such dysfunctioning muscles to normal tonus.

It has also been suggested that a continual force be exerted about the facial regions containing these muscular junctions. The exertion of such a continual force has been used for treating other portions of the body, but has failed to provide significant muscular improvement with respect to those muscles associated with the neck and head in conjunction with mechanotherapy treatment.

My invention advantageously applies a lacing of individual coil means in overlying relationship with respect to preselected neuro-muscular junctions about the patient's head and neck. These individual lacing members are joined at juncture points bilaterally located at respectively opposite commissure regions of the mouth. A reciprocal linear motion is applied to each of these juncture points such that the individual coil members alternatively expand and contract to effect a massaging action about the neuro-muscular junctions. The massaging action preferably is carried out at a frequency within the range of normal muscular contraction, i.e. 40-60 cycles per minute, so as to induce normal muscular movement in a non-fatiguing and non-damaging manner. I have further found that particular advantageous clinical results have been obtained by cooling the lacing members and continuing the treatment for a length of time sufficient to induce numbness about the massaged regions.

As a particularly advantageous aspect of my invention, individual coil lacing members contain an inner extensible member formed of rubber, Teflon or other suitable plastic, peripherally coated by an expandable braided surface. The braided surface is of a suitable configuration so as not to capture the hair particles of the user. Previously, the suggestion of using conventional coil-type springs as the lacing members, has caused considerable discomfort to the user, resulting from the catching and pulling of individual hair particles thereby.

The linear reciprocal motion of the lacing assembly is preferably provided by a portable actuating unit which is compactly assembled to be secured to the back rest of a conventional dental chair. Cam members are located adjacent opposed sides of the user's head with their cam followers being related in phased opposition such that as one cam follower moves upward, the other cam follower moves downward. Hence, by connecting the lacing juncture points to the opposed cam followers, the linear reciprocal movement of the lacing assembly will be provided corresponding to the movement away and towards

each other of the reciprocally translated cam follower arms. Advantageously, the linkage interconnecting the lacing juncture points to the cam follower includes an adjustment to suitably vary the extent of such linear reciprocal movement in accordance with the particular requirements of the patient under treatment.

It is believed that the preferable results achieved by my invention in restoring normal muscular movement are effected by suitably modifying the electrical field distribution about the neuro-muscular junctions. More specifically, it is known that the opposed sides of a muscle fiber are of opposite polarity. However, the region about the opposed fiber ends normally contains an electrical ion distribution tending to equalize the charges at the opposed muscle fiber ends and, accordingly, counteract the force of attraction therebetween. The tenso-frictional forces developed about the tissue resulting from the pressurized massaging action of my invention superimpose an electrical field about the muscle fibers in a manner counteracting the above-described neutralizing ions, such that the opposed ends of the normal muscles will attract in their desired manner.

It is, therefore, seen that the basic concept of my invention resides in a novel lacing structure for massaging the neuro-muscular junctions associated with malocclusion, mastication, speech, expression and aesthetics so as to correct muscular dysfunction thereof.

It is, therefore, a primary object of my invention to provide a massaging apparatus for inducing proper muscular tonus in those muscles associated with the malocclusion and mechano-therapy, thus assisting in the patient's treatment.

An additional object of my invention is to provide an anatomical lacing for treating muscular dysfunction for those muscles associated with malocclusion, mastication, speech and respiration wherein lacing means are provided about preselected neuro-muscular junctions and a reciprocal linear motion is imparted thereto to effect massaging of the neuro-muscular junctions.

An additional object of my invention is to provide an anatomical lacing wherein the reciprocal linear motion is provided by a pair of cams located adjacent opposed sides of the user's face, and rotated in phase opposition such that their respective cam followers are moved in opposite directions.

Still another object of my invention is to provide such an anatomical lacing wherein the reciprocal linear motion is at a frequency within the range of normal muscular contraction whereby massaging thereof is effective in a non-fatiguing and non-damaging manner.

These and other objects of my invention will readily become apparent upon consideration of the following drawings in which:

FIGURE 1 is a front view showing an anatomical lacing in accordance with my invention being secured to the head and neck regions of the patient.

FIGURE 2 is a rear view showing the actuating means for imparting the preferred linear reciprocal motion of my invention.

FIGURE 3 is a side view of the preferred lacing members used in my invention.

FIGURE 4 is an end view of FIGURE 3 shown in cross-section.

Reference is first made to FIGURE 1, wherein the anatomical lacing generally denoted as 10 is shown secured about the lower head and neck regions of the user 100. It is to be noted that according to the particular muscular dysfunction of the individual user 100, different neuro-muscular junctures will be in particular need of massage, with the assembly shown in FIGURE 1 being merely typical of numerous lacing arrangements which may be provided within the general spirit and scope of

my invention. Further, the size of the individual lacing members of unit 10 will vary in accordance with the facial dimensions of the particular user.

The individual lacing members 15 overlie preselected neuro-muscular junctions, as will be henceforth described in further detail. These members press against the skin of the user 100 a sufficient amount to prevent slipping while providing a predetermined compression of the facial tissue. For example, I have found that an approximately $\frac{1}{8}$ " compression of the facial tissue has provided clinically satisfactory results.

The individual lacing members 15 are preferably constructed of an extensible spring-like member as shown in FIGURES 3 and 4. The hollow inner core 16 is formed of an elastic member, such as rubber, Teflon or other suitable plastic. The outer surface 17 is of a twisted braided structure typically made of 18-8 stainless steel, the coil construction 15 being typically of the type manufactured by the Aero-Quip Corporation of Bronx, New York.

A first coil arrangement 15-1 is shown overlying and lacing the neuro-muscular junctions at the upper lips, about the base of the nose and cheeks. A second coil arrangement 15-2 similarly overlies the neuro-muscular junctions at the lower lip and chin, and a third coil arrangement 15-3 is located under the chin. The opposed ends of all these coil members meet at juncture points A, B, located at respectively opposed cheeks. Juncture point A is connected to end 35' of a linkage 35, and juncture point B to end 45' of linkage 45. The juncture points A, B are also connected to fixation members 20, 22 by extensible coil members 18, 19, respectively. Relative adjustment of fixation points is provided by a number of apertures, such as 20', 22', within the lacing fixation members 20, 22, respectively, to facilitate adjustment in accordance with the particular user. Fixation members 20, 22 are pivotable about their respective axial supports 21, 23, respectively, within planes substantially parallel to the user's face, to provide still further adjustment of the massaging action in conformance with the needs of the particular user.

The linearly reciprocal movement of the juncture points A and B, to promote the desired massaging effect of the anatomical lacing structure above described, is provided by reciprocally movable cam follower or piston members 30, 40, respectively, located about the opposed sides of the user's head. These members are moved in opposite directions as by conventional cams 32, 42, rotated by conventional motors 34, 44, respectively. The fixation members 20, 22, as well as the actuating arrangements, 30, 32, 34 and 40, 42, 44, are secured to a common transverse member 50 which is, in turn, adapted to be secured to the rear portion of a conventional dental chair.

To translate the linear reciprocal motion of the cam follower piston members 30, 40 to the juncture points A and B respectively, an adjustable transverse linkage member 35 is shown interconnected between juncture point A and reciprocating cam follower 30 with its position along the length of piston 30 being adjustable by rotatable knob 37. Similarly, Z-shaped linkage 45 interconnects juncture point B to reciprocating cam follower 40, with its position thereof being adjustable by screw-type knob members 47 and 49. The provision of the adjustment advantageously permits the varying of the stroke length of the linear reciprocating movement with such stroke length, for example, being variable between 1 and 5 inches.

It should be understood that although I show a particular mechanical configuration for achieving the advantageous linear reciprocal movement of juncture points A and B, various other actuating arrangements may be practiced without departing from the general spirit and scope of my invention. As, for example, a single drive motor may be located intermediate the phase-opposed cam members 32, 42 and in a common shaft relationship therewith.

Having thus described the preferred structural embodi-

ment of my invention, operation is as follows: Actuation of drive motors 34, 44, as by a convenient A.-C. power source, rotates cam members 32, 42 to translate cam follower piston rods 30, 40 in a linear reciprocal manner. As shown in the figures, piston rod 30 moves downward as piston rod 40 moves upward, such that their juncture points with linkage members 35, 45, respectively, will be reciprocally moved apart and together in accordance with the r.p.m. of the motors 34, 44. This cyclic moving apart and moving together of piston rods 30, 40 linearly reciprocates juncture points A and B such that the individual lacing members 15-1 through 15-3 are cyclically expanded and relieved to effect a massaging action about the neuro-muscular juncture points they overlie. This rhythmic massaging operation has been found to restore normo-tonic state to dysfunctioning muscle fibers and to promote maximal contractions thereof. The frequency of oscillation is preferably within the range of normal muscular contraction, as for example 40-60 cycles per minute, with particular advantageous results having been clinically obtained within the general region of 48 cycles per minute.

Further, it is proposed the massaging effect about the tissues immediately overlying the muscle fibers suitably varies the electrical field thereabout such that the tensio-frictional stimulation thereof acts to promote normal muscle contraction. Individual treatment with the anatomical lacing apparatus of my invention is advantageously provided for a period sufficient to promote numbness of the region with cooling of the lacing members serving to improve the effectiveness of the treatment.

In the foregoing specification, my invention has been described in conjunction with preferred embodiments. Many variations and modifications will, however, now become apparent to those skilled in the art, and I prefer, therefore, to be limited not by the specific disclosure contained herein but only by the appended claims.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows.

1. An anatomical lacing for treating muscular dysfunction comprising a plurality of lacing means for securement about the head and neck of the user; individual ones of said lacing means positioned to overlie preselected neuromuscular junctions; first and second juncture points bilaterally located at respectively opposite commissure regions of the mouth; a first portion of said lacing means connecting to said first juncture point, and a second portion of said lacing means connected to said second juncture point; actuating means having a reciprocal linear motion of a predetermined frequency about said first and second juncture points; first means interconnecting said juncture points to said actuating means for imparting reciprocal motion of said predetermined frequency to said juncture points; first and second fixation points located adjacent opposed sides of the user's head and spaced away therefrom; second means connecting said first and second juncture points to said first and second fixation points, respectively; said reciprocal motion alternately expanding and relieving said lacing means; whereby the neuro-muscular junctions of the user are massaged at said operating frequency.

2. An anatomical lacing as set forth in claim 1, wherein said predetermined frequency is within the range of 40-60 oscillations per minute.

3. An anatomical lacing, as set forth in claim 1, wherein said lacing means is formed of an extensible member having a braided peripheral configuration.

4. An anatomical lacing, as set forth in claim 1, said actuating means comprising a first and second cam means located adjacent opposed sides of the user's head; first and second cam follower means in respective engagement with said first and second cam means; means rotating said cam means in phase-opposition to provide movement of one of said cam follower means in a first direction while providing movement of the other of said cam

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follower means in a second direction, opposite to said first direction.

5. An anatomical lacing, as set forth in claim 1, wherein said predetermined frequency is within the range of 40-60 oscillations per minute; said actuating means comprising a first and second cam means located adjacent opposed sides of the user's head; first and second cam follower means in respective engagement with said first and second cam means; means rotating said cam means in phase-opposition to provide movement of one of said cam follower means in a first direction while providing movement of the other of said cam follower means in a second direction, opposite to said first direction.

6. An anatomical lacing, as set forth in claim 4, said means interconnecting said juncture points to said actuating means comprising a linkage member selectively positionable along the length of said cam follower means, whereby the extent of said reciprocal motion is selectively adjustable.

7. An anatomical lacing, as set forth in claim 4, fixture means supporting said actuating means to form an integral assembly; means pivoting said cam means and cam follower means about said fixture means to define the location of said cam follower between first and second positions; said first position corresponding to movement

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in said first and second directions being upward and downward, respectively; said second position corresponding to movement in said first and second direction being generally horizontal.

8. An anatomical lacing, as set forth in claim 7; said fixture means including said first and said second fixation points adjacent said first and second cam means, respectively.

9. An anatomical lacing as set forth in claim 1, wherein said lacing means is comprised of stainless steel.

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