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[54] **FACIAL NERVE STIMULATOR**
15 Claims, 5 Drawing Figs.

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ABSTRACT: A facial nerve stimulator including a number of electrode structures which are to contact the face of the user and electrically stimulate certain facial nerves and the related muscles, and a frame carrying the electrode structures on the face and adapted to be supported by engagement of a forward portion of the frame with the bridge of the nose, and by engagement of two side portions of the frame with the ears of the user

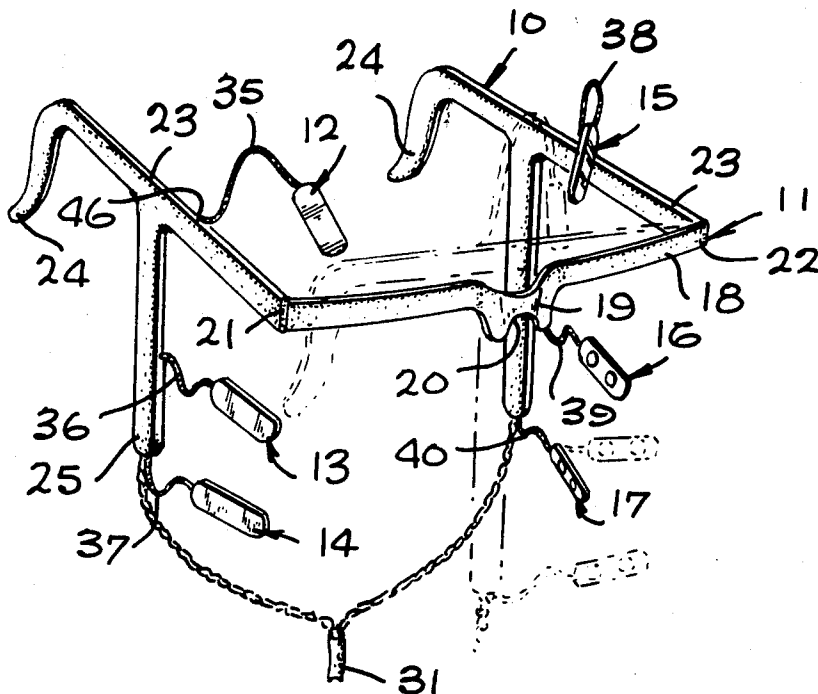


Fig. 1

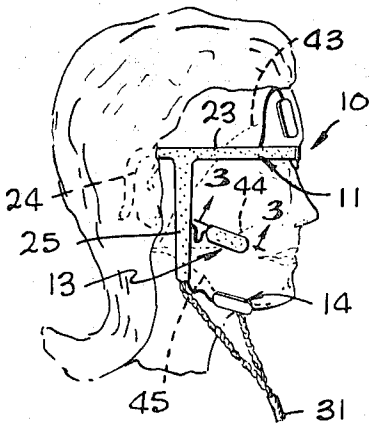


Fig. 2

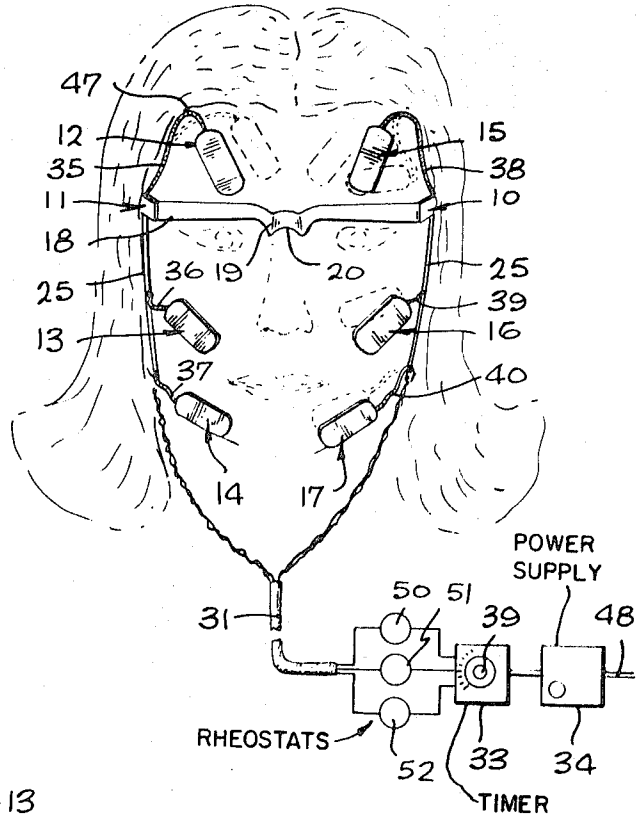


Fig. 3

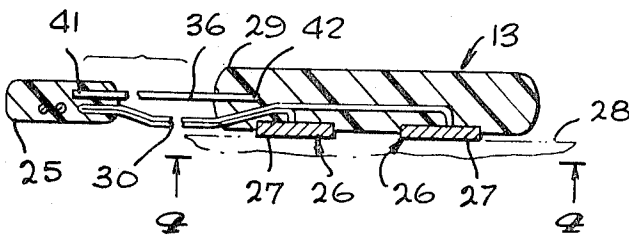


Fig. 4

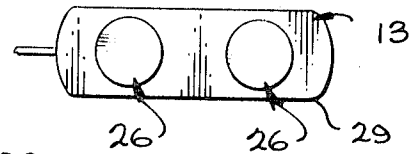
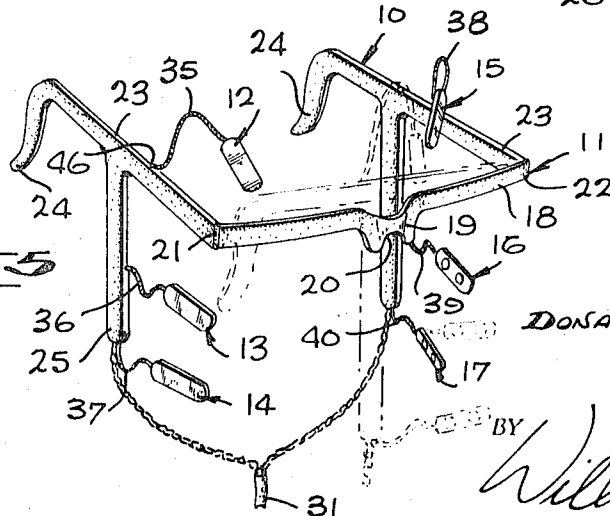


Fig. 5



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FACIAL NERVE STIMULATOR

CROSS REFERENCE TO RELATED APPLICATION

Certain features of the stimulating device shown in the present application have been disclosed and claimed in my copending application Ser. No. 785,906, filed Dec. 23, 1968 on "Facial Stimulator."

BACKGROUND OF THE INVENTION

This invention relates to apparatus for supplying electrical impulses of predetermined potential to the facial nerves of a user, in order to cause movement of and thereby exercise the associated muscles of the face.

In my above identified prior application, I have disclosed a facial stimulating device of the general character, including a frame to be mounted on the user's head, and carrying a number of electrode structures for contacting and conducting electricity to different nerve locations on the face. Preferably, each electrode structure includes a pair of electrodes, which engage closely adjacent portions of the user's face to provide a suitable difference in electrical potential between those points. The electrodes may be mounted to the frame by arms which are deformable or bendable to different conditions, in a manner enabling positioning of the electrodes at any of numerous different locations relative to the frame, to properly contact and stimulate faces having different contours.

SUMMARY OF THE INVENTION

The present invention provides improvements in this general type of facial stimulating device, and particularly relates to an improved way of quickly and conveniently and yet effectively securing the frame of the device to the user's face, and supporting the frame and the electrode structures during a period of use of the equipment. As will appear, the invention enables the device to be mounted on the face without disturbing the hair arrangement of the wearer, and without the necessity for attaching any straps, fasteners, or the like to hold the frame in place, and yet with the frame and electrode structures being held in position in a sufficiently positive and secure manner to assure proper locating of the electrode structures in contact with the desired facial nerve areas.

To achieve these results, I specially form the frame of the device to have a forward portion which extends across the front of the wearer's face and rests on the bridge of the nose, and to have two opposite side or ear portions which extend rearwardly from the forward portion and rest on the ears of the wearer. These ear portions may extend downwardly at the back of the ears, to prevent forward motion of the frame, and may carry downwardly projecting portions at the front of the ears to which some of the electrode structures are mounted. More particularly, the downwardly projecting portions in front of the ears desirably carry two forwardly extending pairs of electrode structures, for engagement with two lower sets of facial nerves, while an upper pair of electrode structures are carried by the frame at a higher location and project upwardly for contact with the forehead of the wearer.

BRIEF DESCRIPTION OF THE DRAWING

The above and other features and objects of the invention will be better understood from the following detailed description of the typical embodiment illustrated in the accompanying drawing, in which:

FIG. 1 is a side view of a facial nerve stimulator constructed in accordance with the invention, and shown positioned on the face of a wearer;

FIG. 2 is a front view of the stimulator and wearer of FIG. 1;

FIG. 3 is an enlarged section taken on line 3—3 of FIG. 1;

FIG. 4 is a view taken on line 4—4 of FIG. 3; and

FIG. 5 shows the stimulator in perspective, illustrating in broken lines the manner in which the ear portions and carried parts may fold or swing forwardly to retracted positions.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The stimulator device 10 illustrated in the drawings includes a frame designated generally at 11, and six electrode structures 12, 13, 14, 15, 16 and 17 respectively. The frame includes a forward portion or section 18 (FIG. 2), which extends generally horizontally above the eyes of the wearer, and which has a central nosepiece 19 having an undersurface at 20 shaped to conform to and engage downwardly against the bridge of a wearer's nose, and to thereby rest on and be supported by the bridge of the nose. At its opposite ends, the front section 18 of the frame is connected by two hinges 21 and 22 to the forward ends of two elongated rearwardly extending generally horizontal ear portions 23 of the frame, with hinges 21 and 22 having essentially parallel and essentially vertical hinge axes. At their rearward extremities, the ear portions 23 curve downwardly at 24 (FIG. 1), to engage the back side of the wearer's ears in a manner hooking the frame on the ears and preventing the frame from moving forwardly from its FIG. 1 position on the ears.

At locations spaced forwardly of portions 24, and near but just forwardly of the ears of the wearer, the two portions 23 of the frame carry downwardly projecting essentially parallel and essentially vertical additional portions 25 of the frame, which may be integral with and fixed relative to portions 23. For this purpose, portions 23 and 25 may be molded from a suitable very rigid resinous plastic material, and may have stiffening wires extending through portions 23 and 25 maintain their shapes. Similarly, the forward section 18 of the frame may be formed of an appropriate essentially stiff or rigid resinous plastic material, typically containing an appropriate reinforcing wire.

As seen best in FIG. 3, each of the electrode structures 12, 13, 14, 15, 16 and 17 preferably includes two spaced typically circular electrodes 26, whose preferably flat and circular undersurfaces 27 are desirably aligned essentially within a common plane, for contact at spaced locations with the skin surface 28 of the wearer's face. The two electrodes may be carried by and preferably embedded and retained within an appropriate single carrier body 29, which may be formed of a suitable electrically insulative resinous plastic material such as polystyrene. The electrode discs themselves may typically be formed of chrome-plated copper, or another suitable highly electrically conductive material. Lead wires 30 for conducting electricity to the two electrodes 26 respectively may extend through and be embedded within the plastic material of carrier body 29, with all of the leads from the various electrodes eventually connecting into a six conductor cable 31 (FIG. 2) leading to a control timer 33 and power source 34.

The various electrode structures 12, 13, 14, 15, 16 and 17 are mounted to the frame 11 individually by separate mounting arms 35, 36, 37, 38, 39 and 40, which are constructed to permit adjustment of the positions of the various electrode structures relative to the frame, and within sufficiently wide limits to enable effective contacting of all of these structures with any of the numerous different types of faces which may be encountered. As seen best in FIG. 3, each of these mounting arms 35, 36, 37, 38, 39 and 40 has one of its ends 41 rigidly attached to the frame of the device, desirably be extending this arm into a position of embedment within and rigid attachment to the resinous plastic material of the frame. The other end 42 of the same arm 35, 36, 37, 38, 39 or 40 is rigidly attached to and carries the body 29 of the associated electrode structure 12, 13, 14, 15, 16 or 17, with this attachment also desirably being effected by extending the arm into and embedding it within the material of the body 29. Between its two ends 41 and 42, each arm is bendable to different conditions for enabling the above discussed change in position of the various electrodes, as between the broken line and full line positions of FIG. 2, to appropriately contact different facial contours. To permit such bending, the arms are formed of a material which is suitably deformable, but which though

bendable upon the imposition of an appropriate force, is nevertheless sufficiently stiff and rigid to remain essentially permanently in any condition to which the various arms are bent, until the arms are subsequently purposely deformed into another setting. For this purpose, the mounting arms 35, 36, 37, 38, 39 and 40 may be formed of a metal wire, typically steel, preferably having the characteristics of a malleable or ductile material, and which is desirably essentially or substantially nonresilient in character, so that it does not return to its original conditions after bending. The deformability of the wire or other material forming arms 35, 36 and 37 is sufficient to enable the various electrode structures to be bent in any of numerous different directions, that is, inwardly toward the face, outwardly away from the face, upwardly, downwardly, or laterally, all in a manner enabling optimum positioning of each of the various electrode structures.

In FIG. 1, the seventh nerve at one side of the face is illustrated in broken lines as having three branches, including the upwardly extending frontal branch 43, the maxillary branch 44, and the mandibular branch 45. In the preferred arrangement shown in the figures, the two upper electrode structures 12 and 15 form together a pair of such structures having corresponding positions at opposite sides of the face, and located to engage the upper frontal branches 43 of the two seventh nerves, at the opposite sides of the forehead of the user. To position these electrode structures for such contact of the forehead, the wire arms 35 and 38 mounting these structures are relatively long, say for example between about 2 and 4 inches, and desirably about 3 inches, and extend first upwardly from their points of connection at 46 to generally central regions of the horizontal ear portions 23 of the frame. After extending upwardly, these arms 35 and 38 may curve downwardly at 47 to their points of connection with upper portions of the carried electrode structures.

Similarly, the two electrode structures 13 and 16 may be at corresponding positions at opposite sides of the face, to contact the face at the locations of the maxillary branches of the two seventh nerves, and may have their mounting arms or wires 36 and 39 connected into the downwardly projecting portions 25 of the frame at vertically intermediate locations. The final pair of electrode structures 14 and 17 may be positioned to stimulate the mandibular branches of the two seventh nerves, and for this purpose may have their mounting wires connected into the lower extremities of the two downwardly projecting portions 25 of the frame. Preferably, the wires 36, 37, 39 and 40 which mount the lower two pairs of electrode structures 13, 14, 16 and 17 are relatively short as compared with the previously discussed wires 35 and 38 which mount the upper electrode structures, wires 36, 37, 39 and 40 typically being between about one half and 2 inches, and for best results about 2 inches.

The lead wires 30 from each of the electrode structures are insulated and sufficiently flexible to bend in correspondence with the positioning of the associated electrode structures, and all may extend into the material of portions 23 or 25 of the frame (adjacent the associated mounting wires 35, 36, etc.), and extend downwardly within that material to the lower ends of portions 25, from which the wires may continue into cable 31.

Power source 34 may be any of the numerous types of sources heretofore utilized in nerve-stimulating equipment, and acts to develop intermittent regularly timed voltage impulses, which may be of the alternating current type, or of the direct current type. The source 34 may receive its energy from batteries carried within the source, or may be supplied with commercial power through a line represented at 48. The timing interval between successive pulses may be regulated by suitable adjustment of power source 34. Timer 33 acts when set by an appropriate control knob 39, or other control element, to progressively advance through a predetermined timed cycle of operation, in a manner sequentially delivering the electrical output of source 34 through three separate rheostats 50, 51 and 52 to the three pairs of electrode structures respectively.

To now describe a cycle of use of the apparatus, a user may first place the frame 11 on her face in the position of FIGS. 1 and 2, and may then forcibly bend each of the various mounting wires or arms 35, 36, 37, 38, 39 and 40 to properly position the corresponding electrode structure in contact with the appropriate portion of the face, with the two electrode discs of each electrode structure desirably being received at opposite sides of the nerve branch which is to be energized by that structure, so that the voltage pulses may pass across the skin area at the location of the desired nerve branch. After a particular user has once set the various electrode structures for proper contact with the desired portions of her particular face, it is unnecessary on subsequent uses to reset the electrode structures, since they will remain in the set positions unless forcibly bent to other positions by a different user.

When the apparatus has been properly positioned on the face, and assuming that power source 34 has been turned on to produce the desired output pulses, timer 49 may be set to commence its cycle of operation, during which it will first supply intermittent pulses to the upper pair of electrode structures 12 and 15 for a predetermined interval, followed by timed transmission of the pulses to the second pair of electrode structures 13 and 16 for a similar second interval, and with the third pair of electrode structures 14 and 17 ultimately being energized for a third interval. Thus, all of the muscles of the face are exercised effectively and in a predetermined sequence during the timing cycle of timer 33.

When not in use, the frame 11 of the device shown in the drawing may be folded to a reduced dimension condition in which the two ear portions and their carried parts may be received essentially adjacent and extend essentially along the rear side of the forward portion 18 of the frame, as indicated in broken lines for one of the ear portions in FIG. 4.

It is contemplated that, if desired, the frame 11, instead of resting directly on the bridge of the nose and the ears of the user, may be provided with clips enabling attachment of the frame to a conventional eyeglass frame worn by the user, with the overall combination of the eyeglass frame and attached electrode-carrying frame then being used in the same manner discussed above.

While certain specific embodiments of the present invention have been disclosed as typical, the invention is of course not limited to these particular forms, but rather is applicable broadly to all such variations as fall within the scope of the appended claims.

I claim.

1. A facial stimulator including a frame to be worn on the face of a user and including a forward section adapted to extend across the front of the face and forming a bridge adapted to rest on and be supported by the bridge of the nose, said frame including two side sections adapted to project rearwardly at opposite sides of the user's head and adapted to rest on and be supported by the two ears respectively of the user, said frame including hinges connecting forward ends of said two side sections to opposite ends respectively of said forward section of the frame for relative swinging movement of the two side sections between rearwardly projecting active positions and forwardly and inwardly swung inactive positions, a plurality of electrode structures carried by said side sections of the frame and adapted to engage different portions of the user's face and to electrically stimulate different facial nerves and the muscles controlled thereby, means for delivering a series of intermittent electrical impulses to said electrode structures of a value to cause substantial intermittent movements of the facial muscles, a plurality of mounting arms connected at first locations to said side sections of the frame and projecting to outer free ends of the arms and carrying said electrode structures at locations on the arms spaced from said first locations in the direction of said free ends, said arms being formed of material which is stiff but deformable to different conditions in a relation adapted to locate the individual electrode structures at any of a plurality of different positions relative to said side sections and on the face of a user, and which material is of a composition to remain by its own stiffness in said different

conditions to which it may be deformed, and to thereby hold said electrode structures in any of said different positions thereof until the arms are again forcibly deformed, and fixed connections securing said arms rigidly and essentially nonadjustably to said side sections of the frame at said first locations so that the primary adjustment for relocating said electrode structures is by said bending of said arms.

2. A facial stimulator as recited in claim 1 in which said side sections of said frame have rear portions extending downwardly and adapted to extend behind the ears of the wearer.

3. A facial stimulator as recited in claim 1 in which said side sections have two projections extending downwardly therefrom and carrying certain of said deformable mounting arms.

4. A facial stimulator as recited in claim 1 in which said side sections of said frame have rear portions extending downwardly and adapted to extend behind the ears of the wearer, and have two projections extending downwardly at locations spaced forwardly of said rear portions and adapted to be received in front of the ears of the wearer and carrying certain of said deformable mounting arms.

5. A facial stimulator as recited in claim 1 in which said electrode structures include a first pair of said structures carried by a first pair of said deformable arms and adapted to contact the forehead of the user at a level above said bridge formed by said forward section of the frame, and two additional pairs of electrode structures carried by two additional pairs of said deformable arms and adapted to engage lower portions of the face at a level beneath said bridge formed by said forward section of the frame.

6. A facial stimulator as recited in claim 1 in which said mounting arms are formed of malleable wire.

7. A facial stimulator as recited in claim 1, in which said means for delivering said electrical impulses to said electrode structures include flexible wires leading from said electrode structures and generally along said deformable arms.

8. A facial stimulator including a frame to be worn on the face of a user and including a forward section adapted to extend across the front of the face and forming a bridge adapted to rest on and be supported by the bridge of the nose, said frame including two side sections adapted to project rearwardly at opposite sides of the user's head and adapted to rest on and be supported by the two ears respectively of the user, said frame including hinges connecting forward ends of said two side sections to opposite ends respectively of said forward section of the frame for relative swinging movement of the two side sections between rearwardly projecting active positions and forwardly and inwardly swung inactive positions, a plurality of electrode structures carried by said side sections of the frame and adapted to engage different portions of the user's face and to electrically stimulate different facial nerves and the muscles controlled thereby, means for delivering a series of intermittent electrical impulses to said electrode structures of a value to cause substantial intermittent movements of the facial muscles, and a plurality of mounting arms connected at first locations to said side sections of the frame and projecting to outer free ends of the arms and carrying said electrode structures at locations on the arms spaced from said first locations in the direction of said free ends, said arms being formed of material which is stiff but deformable to different conditions in a relation adapted to locate the individual electrode structures at any of a plurality of different positions relative to said side sections and on the face of a user, and which material is of a composition to remain by its own stiffness in said different conditions to which it may be deformed, and to thereby hold said electrode structures in any of said different positions thereof until the arms are again forcibly deformed, at least one of said electrode structures including a pair of oppositely energized electrodes mounted to the same one of said deformable arms in close proximity to one another for movement together to different positions by deformation of said arm.

9. A facial stimulator as recited in claim 8 in which said side sections of said frame have rear portions extending downwardly and adapted to extend behind the ears of the wearer.

10. A facial stimulator as recited in claim 8, in which said side sections of said frame have rear portions extending downwardly and adapted to extend behind the ears of the wearer, and have two projections extending downwardly at locations spaced forwardly of said rear portions and adapted to be received in front of the ears of the wearer and carrying certain of said deformable mounting arms.

11. A facial stimulator as recited in claim 8, in which said mounting arms are formed of malleable wire.

12. A facial stimulator as recited in claim 8, in which said means for delivering said electrical impulses to said electrode structures include flexible wires leading from said electrode structures and generally along said deformable arms.

13. A facial stimulator as recited in claim 8, in which there are two of said electrode structures carried by each of said side sections beneath the level of said bridge and adapted for relative adjusting movement to positions to stimulate the maxillary and mandibular branches respectively of the facial nerve.

14. A facial stimulator as recited in claim 13, including additional electrode structures carried by said side sections and located above the level of said bridge of said forward section and adapted to stimulate the frontal branch of the facial nerve.

15. A facial stimulator including a frame to be worn on the face of a user and including a forward section adapted to extend across the front of the face and forming a bridge adapted to rest on and be supported by the bridge of the nose, said frame including two side sections adapted to project rearwardly at opposite sides of the user's head and adapted to rest on and be supported by the two ears respectively of the user, said frame including hinges connecting forward ends of said two side sections to opposite ends respectively of said forward section of the frame for relative swinging movement of the two side sections between rearwardly projecting active positions and forwardly and inwardly swung inactive positions, a plurality of electrode structures carried by said side sections of the frame and adapted to engage different portions of the user's face and to electrically stimulate different facial nerves and the muscles controlled thereby, means for delivering a series of intermittent electrical impulses to said electrode structures of a value to cause substantial intermittent movements of the facial muscles, and a plurality of mounting arms connected at first locations to said side sections of the frame and projecting to outer free ends of the arms and carrying said electrode structures at locations on the arms spaced from said first locations in the direction of said free ends, said arms being formed of material which is stiff but deformable to different conditions in a relation adapted to locate the individual electrode structures at any of a plurality of different positions relative to said side sections and on the face of a user, and which material is of a composition to remain by its own stiffness in said different conditions to which it may be deformed, and to thereby hold said electrode structures in any of said different positions thereof until the arms are again forcibly deformed, said side sections of said frame having rear extremities adapted to extend downwardly behind the ears of the wearer, said side sections having two projections extending downwardly therefrom at locations spaced forwardly of said rear extremities and adapted to be received near but in front of the ears of the wearer and which carry some of said deformable arms, said electrode structures including a first pair of said structures carried by a first pair of said deformable arms and positioned above the level of said bridge formed by said forward section of the frame and adapted to contact the forehead of a user, said electrode structures including a second pair thereof carried by a second pair of said deformable arms which are in turn carried by said projections respectively of the two side sections of the frame and project forwardly therefrom, and a third pair of electrode structures carried by a third pair of said

deformable arms which are in turn carried by said two projections respectively of the side sections of the frame and project forwardly therefrom at locations spaced beneath said second pair of electrode structures.

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