May 3, 1927. E. LAST 1,626,617

ELECTRODE TO BE APPLIED TO THE HUMAN BODY AND PROCESS OF MAKING THE SAME

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Fig.1

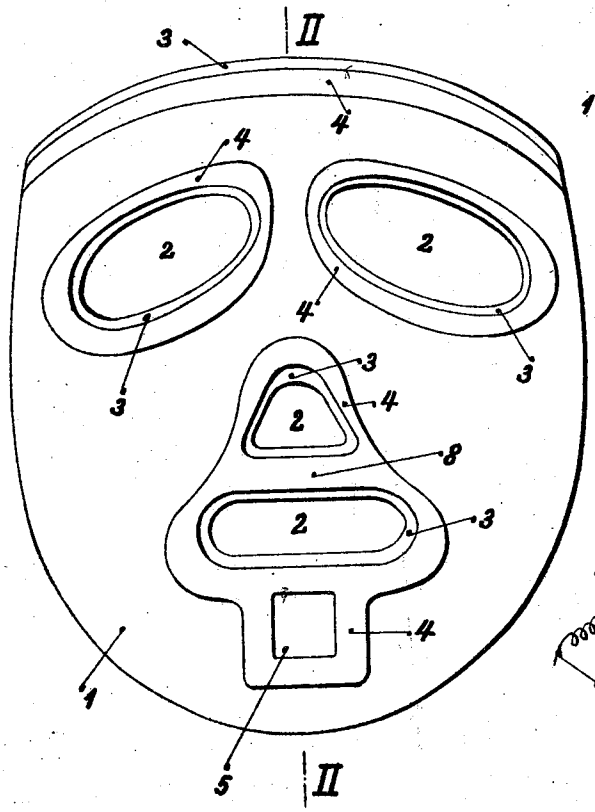
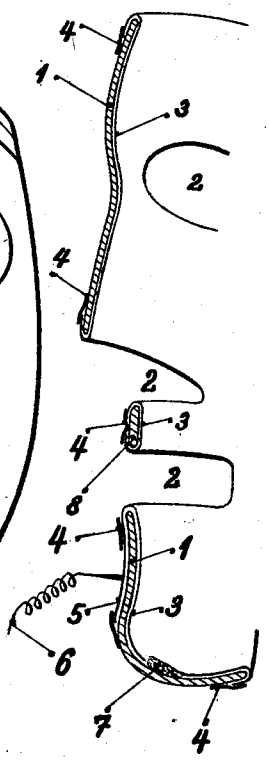


Fig.2



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Fig.3

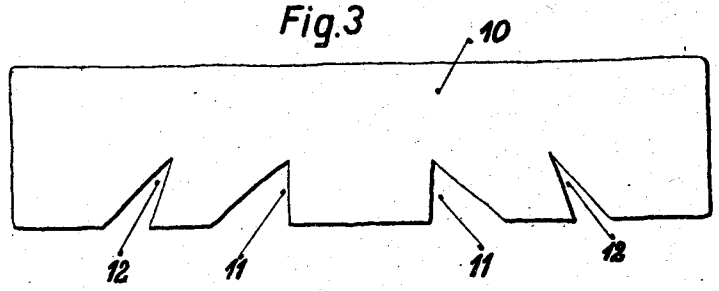


Fig.4

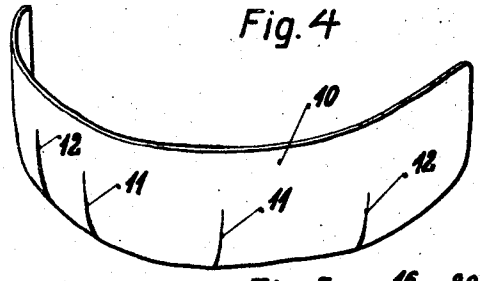


Fig.5

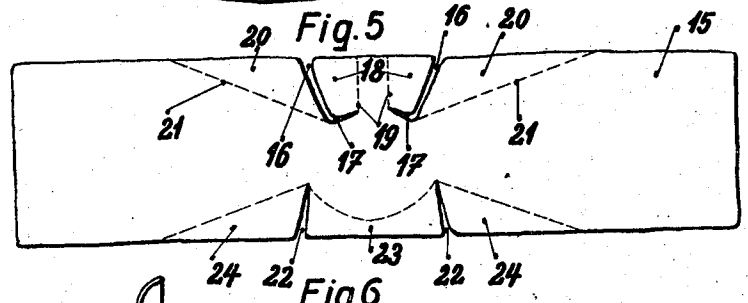
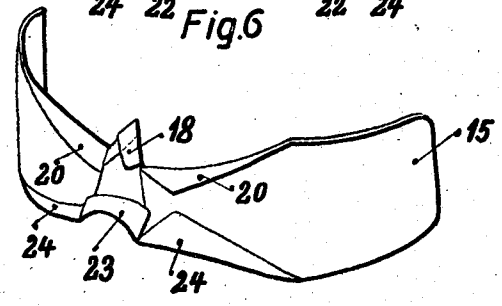


Fig.6



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Fig.7

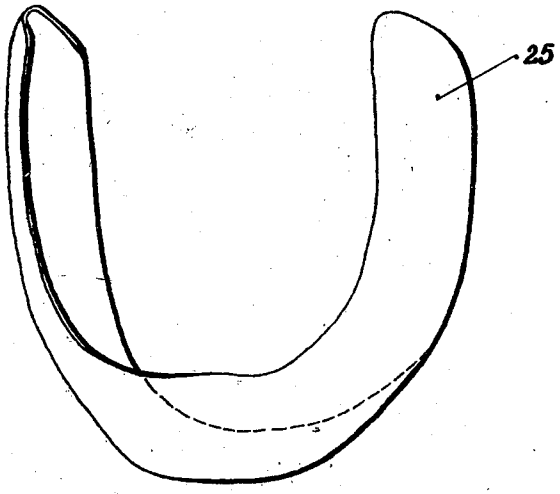
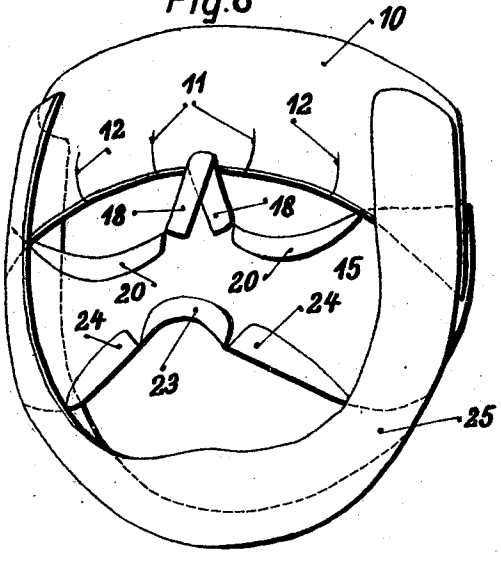


Fig.8



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Patented May 3, 1927. 1,626,617

UNITED STATES PATENT OFFICE.

ERWIN LAST, OF VIENNA, AUSTRIA.

ELECTRODE TO BE APPLIED TO THE HUMAN BODY AND PROCESS OF MAKING THE SAME.

Application filed December 18, 1925, Serial No. 76,165, and in Austria November 14, 1925.

The application of electrodes to parts of the human body of irregular configuration, more particularly the face, nose, the chin and so on meets with difficulties because the rigid lead electrodes heretofore used cannot be made to fit nicely the curvatures of the various parts of the face. Owing to the imperfect contacts injury to the skin could not be reliably avoided, more particularly in the diathermic treatment where comparatively considerable current intensities are resorted to. It has been attempted to avoid these drawbacks by using tin foil as the material for making the electrodes. While tin foil has the pliability required for nicely fitting the configuration of the various parts of the face, it is difficult to be brought into and held in proper positions owing to its lack of mechanical strength, nor can it be used often, but the electrodes must be replaced by fresh ones after a comparatively short time.

The object of my invention is to provide an electrode which although consisting of metal foil, which is very suitable for the present purpose, may be used for a comparatively long time, at least with one and the same patient. With this object in view my invention consists of an electrically non-conductive carrier comprising a forehead strip, a nose strip and a chin strip closely fitting the face and an electrically conductive lining on the side of such carrier next to the face and means for electrically connecting such lining with a source of current.

In the annexed drawing I have shown by way of example, an electrode for the diathermic treatment of the human face which is the part of the human body richest in irregular curvatures. Fig. 1 is a front elevation of the electrode. Fig. 2 is a section of the same on the line II—II Fig. 1. Figs. 3, 4, 5, 6 and 7 show the main parts of which the carrier of the electrode is composed. Fig. 8 illustrates the way in which the main parts of the electrode are connected with each other.

As will be seen from Figs. 1 and 2 the electrode consists of a carrier 1 moulded in the manner to be fully described later on to nicely fit the part of the patient's face. Suitable openings 2 are provided in the carrier for those parts of the face which are not to be exposed to the action of the current for instance the eyes, or which serve for respiration as the mouth and the nose. On the side next to the face the carrier is provided with a lining 3 made of metal foil such as tin foil. The lining 3 is somewhat greater than the surface of the carrier to be lined. The parts of the lining projecting beyond the carrier are folded round the edge of the carrier onto the side of the latter remotest from the face of the patient and are secured there to the carrier by any suitable means say by sticking-plaster-strips 4. At any suitable point for instance near the chin a tin foil patch 5 is secured to the side of the carrier remotest from the face of the patient and is in good electrical connection with the metal foil lining 3, and serves for connecting the latter to the supply wire 6.

The improved electrode is used for diathermic treatment in the following manner: To the part of the body to be treated is first applied a special ointment; then the electrode is brought into position and fixed by bands to prevent it from shifting during treatment. The source of electricity is connected on the one hand to the lining 3 of the electrode and on the other hand to a metal part not shown brought into intimate contact with a suitable part of the body of the patient. The circuit is then closed and the current intensity is gradually increased. If the patient feels a pricking even at a comparatively low intensity of current then the electrode does not fit nicely at all points. This is remedied by slightly lifting the metal foil off the carrier and inserting between the two a filler or backing of wad or a similar yielding substance as shown in Fig. 2 at 7. If no pricking is felt the current intensity is increased to the maximum value determined for each individual case. Owing to the strong carrier the improved electrode is sufficiently firm to be used over and over again after it has been made to nicely fit the face of the patient to be treated.

The process of making an electrode in accordance with my invention will now be described. First of all three strips of a suitable fabric, preferably starched gauze in common use for surgical purposes are used, each about 6 centimetres in width and each comprising a suitable number of layers, say 9 to 12.

The first strip 10 Figs 3 and 4 extends from one ear across the forehead to the other ear and will be called hereinafter the forehead strip. The second strip 15 Figs. 5 and

6, the nose strip, extends from one ear across the nose to the other ear and the third strip 25 Fig. 7 extends from one ear across the chin to the other ear. These strips are thoroughly moistened in hot water and a rapidly setting substance for instance a paste of plaster of Paris is interposed between successive layers. The whole is dried, if desired at a gentle heat, so far that while the strips are slightly stiff, yet they are plastic or pliable. The face of the patient is rubbed with petroleum jelly more particularly in the neighbourhood of the eye brows and the hairs on the temple and the hairy parts of the head are covered by a suitable cap, shawl or the like. The patient is seated on a chair having a head support and has his or her head inclined backwards. The three strips are then brought into position on the patient's face in succession. Preferably the nose strip 15 is the first and is so placed that it extends from ear to ear across the nose, an assistant holding the ends of the strip in the proper position. In order that the strip may be in uniform contact with the face an oblique cut 16 and another cut 17 at right angles to the cut 16 is made in the strip on either side of and near the middle of the strip and the flaps 18 resulting therefrom are folded outwards along the dotted line 19 on the nose. Thereby the inner eye corners are left uncovered and at the same time the part of the strip covering the upper part of the nose is strengthened and a strong projection extending to the forehead is formed which is required for forming a reliable connection with the forehead strip. Similarly by folding down the triangular flap 20 along the dotted line 21 the lower eye lid which was covered by the strip is uncovered. Besides at the lower edge of the strip on both sides of the wings of the nose the two cuts 22 are provided and the flaps 23, 24 thus formed are folded outwards for permitting the wings of the nose to be modeled. While the two ends of the strip are held near the ears by the assistant, by applying a layer of a thick paste of plaster of Paris and by rubbing and kneading the various parts of the strip are caused to nicely fit the configuration in the proximity of the nose. This modeling is continued until the strip has set to such as extent as to retain unaltered the shape into which it has been brought. Now the forehead strip 10 is placed across the forehead from one ear to the other. For accommodating the curvature of the forehead cuts 11, 12 have to be provided in the lower edge of the strip. As shown in Fig. 8 the ends of the nose strip 15 and the forehead strip 10 are placed the one above the other near the ears and may be readily held in position by the assistant. The modeling of the forehead strip 10 takes place in the same way as the modeling of the nose strip a layer of a thick paste of plaster of Paris being applied thereto. Then the projection of the nose strip strengthened by folding the flaps 18 is bent down over the lower edge of the forehead strip 10 and thus a firm connection between the nose strip 15 and the forehead strip 10 is secured, and this connection may be strengthened if desired, by a piece of gauze dipped into a paste of plaster of Paris. When the forehead strip has sufficiently hardened under continuous rubbing and kneading, the chin strip 25 Fig. 7 is brought into the position shown in Fig. 8 so that it extends from one ear to the other and may be held by the assistant. The chin strip is modeled to nicely fit the lower part of the face. The mouth is left uncovered, but if desired the upper lip may be covered by a small strip 8 of gauze dipped into paste of plaster of Paris and secured to the nose strip. For firmly connecting the three strips which up to this moment had been held in position by the assistant a strip of starched gauze moistened in hot water is wound from one temple across the chin to the other temple and back again, a thick paste of plaster of Paris being interposed between the successive layers of strips and strengthening the same. Similarly the strip is wound across the forehead for sufficiently strengthening this part too. Wherever two strips cross each other it is important to establish a firm connection between them. The electrode carrier which resembles a mask is then permitted to dry on the face of the patient, which requires about 20 to 25 minutes, whereupon the carrier is removed and finally dried for instance on a heated metal plate.

To the inside of the completely dried carrier an electrically conductive lining is applied which may consist of tin foil cemented thereto, or the electrically conductive lining may be applied by electrodeposition or by atomizing a fused metal or alloy. In any case the lining 3 must be applied with the greatest nicety any projecting points or folds and any holes being carefully avoided as they might result in injury to the skin. Irregularities in applying tin foil may be removed by polishing with a hot iron rod having a spherical end. The tin toil lining should project beyond the edge of the carrier by about 1½ centimetres. This projecting tin foil edge is folded down on the outside of the the carrier and secured thereto by any suitable means for instance by a strip 4 of sticking plaster. At a suitable part of the carrier, for instance near the chin portion of the same a patch 5 of tin foil is secured and electrically connected to the lining and to the source of electricity.

What I claim is:

1. In an electrode to be applied to the

human face the combination of an electrically non-conductive carrier consisting of a forehead strip a nose strip and a chin strip closely fitting the face and an electrically conductive lining on the side of such carrier next to the said part of the body and means for electrically connecting such lining with a source of electric current.

2. In a electrode to be applied to the human face the combination of an electrically non-conductive carrier consisting of a forehead strip a nose strip and a chin strip closely fitting the face and such strips being provided with cuts at the edges for permitting them to be curved, an electrically conductive lining on the side of such carrier next to the said part of the body and means for electrically connecting such lining with a source of electric current.

3. A process for making electrodes to be applied to the human body consisting in modeling a plurality of strips of fabric soaked with a setting material while such strips are in a plastic state, to the part of the human body to be treated, connecting such strips by similar strips and permitting the whole to set while they are on the part of the body to be treated, removing the structure built up of strips from the part of the body, completely drying such structure and applying to one side of such structure an electrically conductive lining.

In testimony whereof I affix my signature.

DR. ERWIN LAST.