April 24, 1951 A. R. McINTYRE ET AL 2,549,836

ELECTRODE-CARRYING HEADGEAR FOR ELECTROENCEPHALOGRAPHIC ANALYSIS

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Fig. 1.

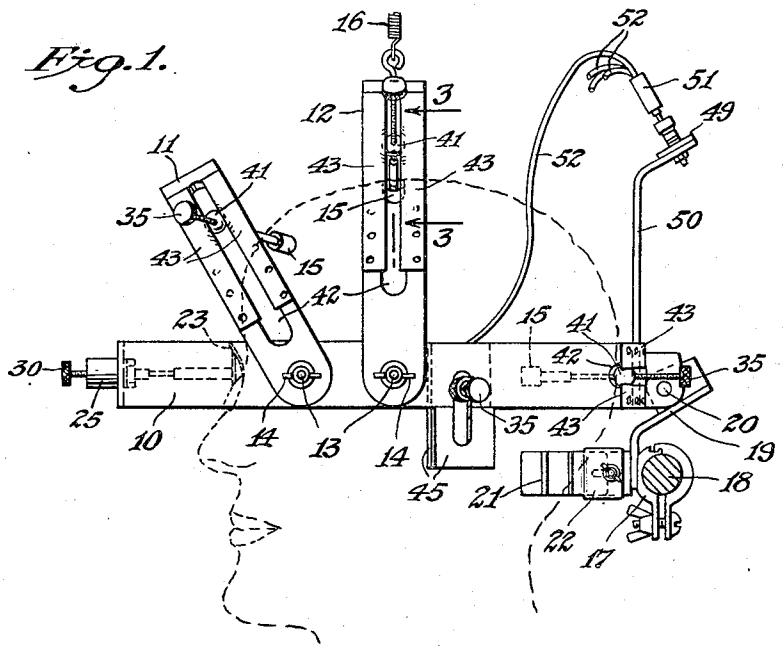

Fig. 2.

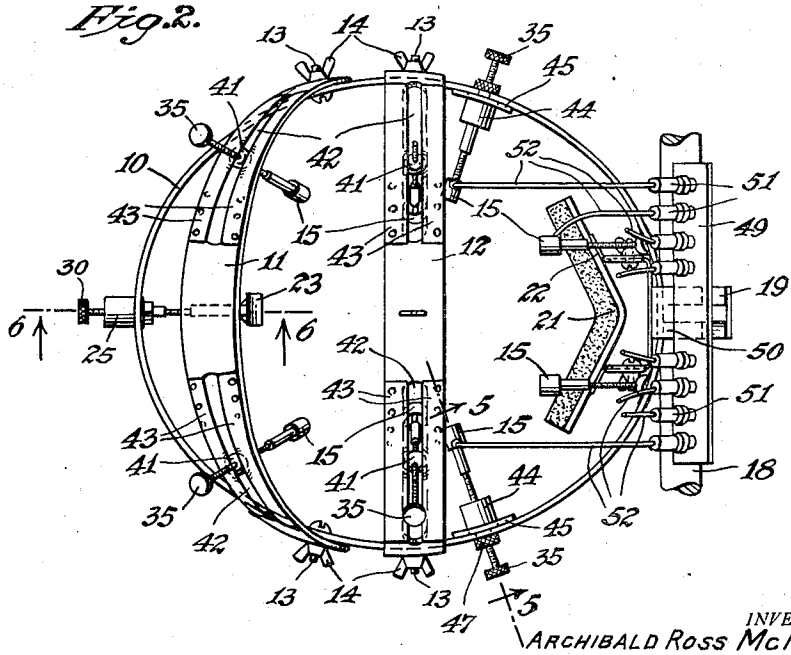

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Fig. 3.

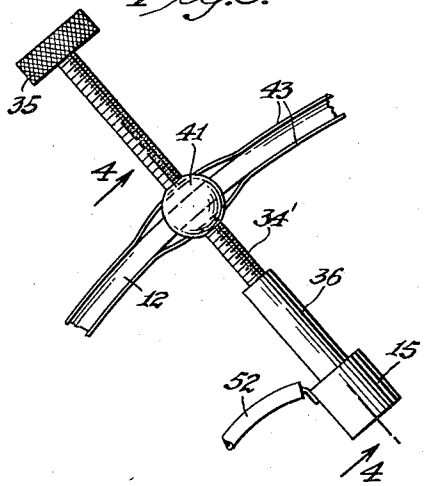


Fig. 4.

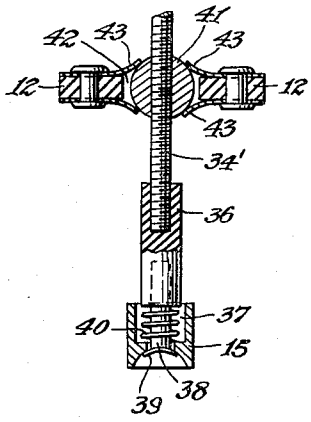


Fig. 5.

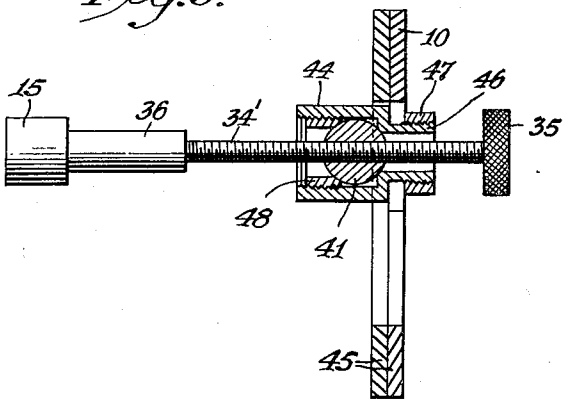
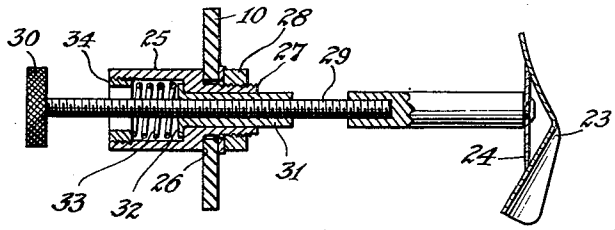


Fig. 6.



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ELECTRODE-CARRYING HEADGEAR FOR ELECTROENCEPHALOGRAPHIC ANALYSIS

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2 Claims. (Cl. 128—2)

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This invention relates to an electrode-carrying headgear for use in electroencephalographic examinations. More particularly, it relates to a headgear equipped with a plurality of electrodes each adjustable to any desired position in a given area of the scalp of the patient on whom the headgear is used.

In making an examination of this type, it is necessary to locate electrodes at different positions on the scalp and to make a record of electrical data as it is influenced by the characteristics of the conducting paths between the particular electrodes used for a given reading. It has been proposed to use gauze or bands to hold such electrodes in place but that technique is slow, unwieldly, and uncertain. It has also been proposed to fasten the electrodes in place with collodion or similar cementing materials, but that technique is likewise slow and best results require a skillful operator to apply and remove the electrodes.

The headgear herein described is devoid of the disadvantages inherent in earlier methods of making electroencephalographic examinations. It facilities shifting pairs or groups of electrodes rapidly to any part of the skull, enabling an examination to be made in a minimum of time and with maximum cooperation from the patient.

Referring to the drawings:

Fig. 1 is a side elevation of a headgear for making electroencephalographic examinations and which incorporates the instant invention.

Fig. 2 is a plan view of the headgear shown in Fig. 1.

Fig. 3 is a partial vertical sectional view on line 3—3 of Fig. 1.

Fig. 4 is a sectional view on line 4—4 of Fig. 3.

Fig. 5 is a vertical sectional view on line 5—5 of Fig. 2, and

Fig. 6 is a vertical sectional view on line 6—6 of Fig. 2.

The headgear is essentially a frame consisting in part of an oval band 10 made of 1½ x ⅛ inch fiber strip and dimensioned to allow approximately 2 to 3 inches clearance all around between head and band when placed over a male head of average size (Figs. 1 and 2). The frame consists further of two members 11 and 12 which arch above the head and which, at their lower ends, are pivotally connected as at 13 to the oval band at its opposite sides. These connections are made with bolts and wing nuts 14 which facilitate pivotally adjusting the arched members and securing them in their different adjusted positions.

The arched members 11 and 12, like the oval

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band 10, may be made of 1½ x ⅛ inch fiber strip and preferably dimensioned to clear the head by about 2 to 3 inches. The oval band 10 and the arched members 11 and 12 are equipped with electrodes 15 to which further reference is made later on.

During an electroencephalographic examination, it is important that no portion of the weight of the headgear be transmitted to the head of the patient. To this end, the headgear may be supported by a spring 16 or by a supporting device which includes a split cylindrical clamp 17 adapted to be tightened in place on a fixed horizontal bar support 18. An angular shaped metal bracket 19, fastened at its lower end to one member of the split clamp 17, is connected to the oval band 10 at the rear by a hinge 20 which makes it possible quickly and easily to swing the headgear into or out of position relative to the patient's head.

A head rest 21 at the rear of the headgear serves to support the patient's head. It is V-shaped, padded at the front for comfort and is held in place by a U-shaped bracket 22 at the outer ends of whose legs it is secured. The legs are each made in two parts which telescope together and provide for a limited adjustment of the head rest in a fore and aft direction. Thumb screws which pass through registering slots in the telescoping legs enable the head rest to be secured in its different adjusted positions. The U-shaped bracket in turn is secured to the clamp 17 which constitutes the primary support for the headgear.

During an examination, the patient's head is clamped between the head rest 21 which engages the head at the rear and a nose member 23 which engages the head at the front (Figs. 1, 2 and 6). The nose member is supported in the oval band at the front and is adjustable in a fore-and-aft direction to accommodate heads of different sizes.

The nose piece is adapted to engage the bridge of the patient's nose. To this end, it is bent forwardly at the top to clear the forehead and forwardly at the bottom where it is concave to fit the nose. The upper and lower portions are connected together by a reinforcing element 24 which swivels at the inner end of the adjustable mounting.

The adjustable mounting includes a cylindrical supporting member 25 having a larger outer portion presenting a shoulder 26 which engages the oval band 10 at the front and a smaller portion 27 passing through a hole in said band. A nut 28 is threaded up tight on the smaller portion 27

of the member 25 to hold the latter securely in place. The adjustable mounting further includes a rod 29 formed with a head 30 at its outer end and which is threaded through a sleeve 31 slidably arranged in the supporting member which is axially drilled for the purpose. The sleeve is formed at its outer end with a flange 32 which is received in an enlarged hole drilled in the larger outer portion of the supporting member 25. This enlarged hole presents a shoulder at its base against which the flange 32 is resiliently held by a spring 33 reacting between the flange and a bushing 34 threaded into the enlarged hole at its outer end. The rod 29 which is threaded through the sleeve 31 has an enlarged extension at its inner end to which the nosepiece 23 is swiveled. With this arrangement, the nosepiece 23 is moved inwardly into engagement with the patient's nose as the screw head 30 is turned in one direction and, as the nosepiece engages the bridge of the patient's nose, its further movement is against the reaction of the spring 33 which thus determines the clamping pressure exerted.

The headgear as shown supports four pairs of electrodes 15, although a greater number may be used if desired. Those for examining the frontal and parietal portions of the head are carried by the arched bands 11 and 12, whereas those for examining the occipital portion of the head are carried by the oval band 10 near the rear. In addition, there are two mastoid electrodes adapted to engage the head just behind the ear.

Each electrode 15 is carried by an adjustable element comprising a threaded rod 34' formed at one end with an adjusting knob 35 and provided at the other end with an insulating rod 36 which is threaded or molded on the rod 34' (Figs. 3 and 4). The electrode itself is cylindrical in shape, overlies a substantial area of the head and is concave at the outer end where it makes contact with the head. It is hollowed out at its other end as at 37 to receive the insulating rod 36. The electrode 15 is drilled through axially to accommodate a short rod 38 which, at its inner end, is threaded into the insulating rod 36, and at its outer end is upset to form an annular shoulder 39. A spring 40 which encircles the rod 38 and reacts between the end of the insulating rod and the base of the hollowed out portion 37 of the electrode, causes the concave surface of the electrode resiliently to engage the shoulder 39. Sufficient clearance is provided around the bar 38 to permit the electrode to pivot and assume whatever axial angularity is demanded to fit snugly against the head in a manner to encompass substantially the entire underlying area thereof. The spring 40 holds the electrode resiliently in place.

The rods 34' which carry the electrodes are each threaded through a ball 41 and those associated with the electrode carried by the arched members 11 and 12 are arranged for longitudinal adjustment along said members. For this purpose, the arched members are formed with longitudinal slots 42 large enough to accommodate the ball pivot. Each slot is equipped along its opposite edges with guides in which the ball is slidably received. The guides are formed by strips 43 of somewhat resilient metal which overlap the opposed edges of the slots and which are secured by riveting on both sides of the members 11 and 12. According to this arrangement, the rods 34' may be adjusted to move the electrodes 15 toward and away from the patient's head, may be caused to assume any desired angular position with respect to the members 10, 11 and 12 which carry them, and may be moved along the members longitudinally to any desired position within the confines of the guides. The metal strips 43 forming the guides terminate short of the ends of the slots 42 so as to permit the insertion of more electrodes, should that appear desirable.

The mastoid electrodes are in all respects the same as those just described except for the manner in which they are mounted (Fig. 5). The mounting of a mastoid electrode includes a larger cylindrical portion 44 presenting an annular shoulder adapted to engage the inner face of a fiber element 45 depending from the oval band 10 adjacent the ear, and a smaller threaded section 46 which extends through a slot in the depending element to accommodate a nut 47 which may be screwed up tightly to hold the electrode mounting in different adjusted vertical positions. The element 44 has an enlarged socket which receives the ball 41 of an electrode unit which otherwise is the same as the electrode units previously discussed. The ball is held in position by a collar 48 threaded into the socket.

Each electrode 15 is arranged to be connected with the electroencephalograph (Figs. 1 and 3). To this end there is provided a terminal board 49 near the back of the frame which is supported by an upright bar 50 fastened to the headgear at the rear. This board has connections to accommodate jacks 51 which, in turn, are connected each by a flexible wire 52 to an appropriate electrode below its insulating element.

From what has been said, it is apparent that the improved headgear enables electrodes to be applied to the head and shifted from place to place thereon with the utmost speed and facility.

The invention has been described in connection with its preferred embodiment and many modifications thereof will suggest themselves within its spirit. The invention is to be limited, therefore, only by the scope of the appended claims.

What is claimed is:

1. An electrode for a headgear arrangement for use in electroencephalographic examinations and which in use is adjustable into and out of engagement with the head, said electrode comprising a rod adapted, when mounted in the headgear, to be adjusted in a direction longitudinally of its axis, a head contacting element formed to overlie a substantial area of the head when in engagement therewith a pivotal connection securing said element at the end of the rod and permitting angular adjustment between the element and the rod, and a spring reacting between the head contacting element and the rod to cause the element normally to assume a given position with respect to the rod, said head contacting element being arranged to yield against the reaction of said spring and to adjust itself to encompass substantially the entire underlying head area as the electrode is adjusted to bring its head contacting element into engagement with the head.

2. An electrode for a headgear arrangement for use in electroencephalographic examinations and which in use is adjustable into and out of engagement wth the head, said electrode comprising an insulating rod, an electric conducting head contacting element adapted to overlie a substantial area of the head when in engagement therewith, pivotally connected at one end of the rod to permit angular adjustment between the element and the rod, a spring reacting between the element and the rod to cause the element normally to assume a given position with respect to the rod,

and a threaded extension at the other end of the insulating rod cooperating with means adapted for pivotal mounting in the headgear to facilitate angular and longitudinal adjustment of the electrode, said head contacting element being arranged to yield against the reaction of its spring to adjust itself to encompass substantially the entire underlying head area as the electrode is adjusted to bring its head contacting element into engagement with the head.

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