United States Patent [19]

Hurley

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[54] **MEDICAL ELECTRODE**

[76] Inventor: **James S. Hurley,** 120 Merwins Ln., Fairfield, Conn. 06430

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[52] **U.S. Cl.** ..... **128/2.1 E,** 128/DIG. 4, 128/417

[51] **Int. Cl.** **A61b 5/04**

[58] **Field of Search** ..... 128/2.1 E, 2.06 E, DIG. 4, 128/416–418, 404–405, 410, 411, 172.1

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Primary Examiner—Richard A. Gaudet
Assistant Examiner—Lee S. Cohen

[57] **ABSTRACT**

A medical electrode adapted to be placed on the skin of a patient and being disposable. The electrode is formed of a soft sheet of closed cellular material adapted to be shaped to the contour of the skin and has included therein a well having its mouth portion facing the skin with a male snap fastener element connected at the base of the well having the snap fastener projecting therefrom and the flange portion secured in the bottom of the well. The flange portion contacts a compressed sponge member saturated with a liquid electrolyte so as to carry current from the snap fastener to the skin of the patient. When stored, the sponge is compressed and the well forms a barrier to prevent leakage of the electrolyte, and a release paper is removed from the back of the sheet material allowing it to be adhesively secured to the skin.

7 Claims, 5 Drawing Figures

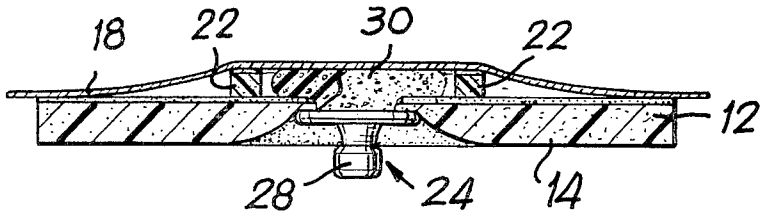


FIG. 1

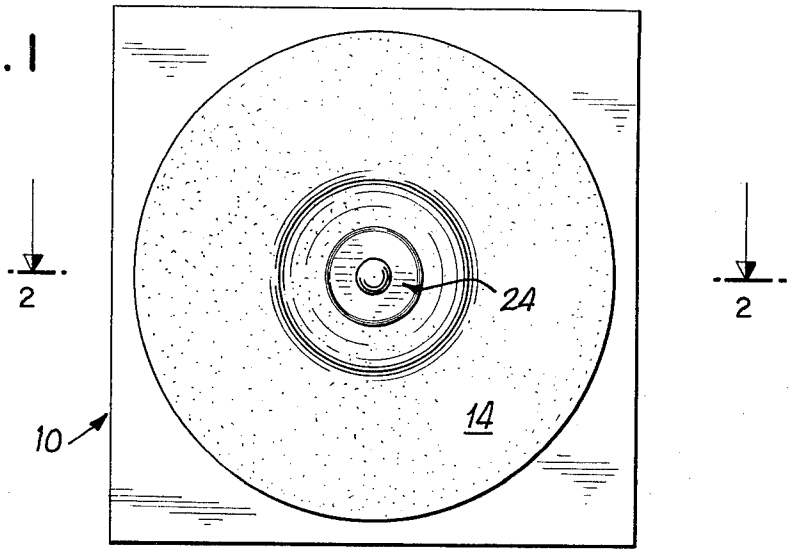
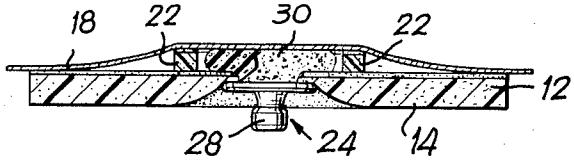


FIG. 2



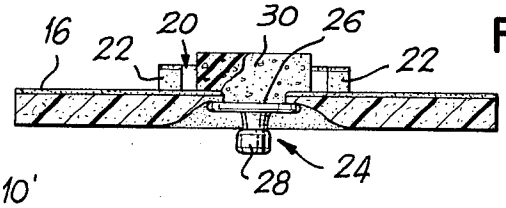
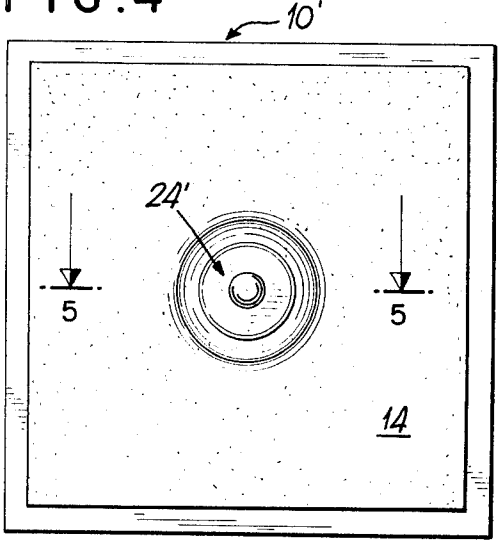


FIG. 3

FIG. 4



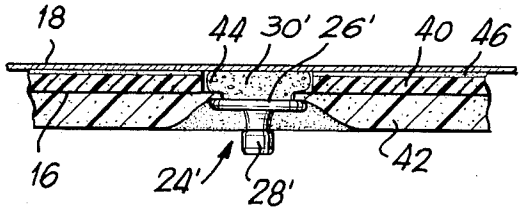


FIG. 5

MEDICAL ELECTRODE

BACKGROUND OF THE INVENTION

This invention relates to a medical electrode, and more particularly, to a medical electrode which is disposable and has advantageous features.

Conventional medical electrodes as generally utilized are increasingly being manufactured as disposable items for sanitary purposes. Additionally, such disposable items eliminate expensive and difficult labor time and are finding increasing popularity. Prior art electrodes of the disposable type generally include a snap fastener element which carries an electrical signal to the skin of the patient by means of a liquid electrolyte located between the snap fastener and the skin. There are existing disposable medical electrodes in which special cup members are provided to store a compressible sponge member in a non-compressed fashion prior to its utilization after which, the sponge member containing the liquid electrolyte is compressed to bear against the skin and the flange portion of the snap fastener.

These prior art electrodes have significant disadvantages. For one, they are fabricated of a number of different elements thus requiring expensive and complex machinery to assemble the same. Additionally, the cup type element is often of a rigid material and can be uncomfortable when utilized. Further, use of such a physical cup results in an unnecessarily expensive electrode thus detracting from their general utilization. Further, there can be poor conformance to patient skin surface, such as with bony prominences or infant bodies.

Other prior electrodes have been formed where the electrolyte is inserted in a cavity between the skin and snap fastener at the time of utilization. These types often are cumbersome, bulky and are difficult to activate. Further, there have been provided medical electrodes in which the storage of the liquid electrolyte is difficult often resulting in unexpected and inadvertent leaks. These leaks can be catastrophic when in hospital use since the electrolyte completing the electrical path between the patient and the monitoring apparatus or other suitable electrical apparatus is absent. Thus, in these situations, there appears to be an open circuit thus eliminating the effectiveness of the medical electrode.

Some electrodes are provided on the market with an insufficient amount of stored electrolyte. This can lead to premature drying and the absence of electrolyte conduction when the electrode is put into service.

An object of this invention is to provide an improved medical electrode.

Another object of this invention is to provide such an electrode which is inexpensive, easy to manufacture, and will enjoy a wide utilization.

Yet another object of this invention is to provide such a medical electrode which ensures that the liquid electrolyte does not leak from the electrode prior to use.

Another object of this invention is to provide such a medical electrode which is easily contoured to the shape of the patient's body without being uncomfortable.

Yet another object of this invention is to provide such an electrode with increased storage capacity for liquid electrolyte.

Other objects, advantages and features of this invention shall become more apparent hereinafter.

SUMMARY OF THE INVENTION

In accordance with the principles of the invention, the above objects are accomplished by providing a medical electrode which is formed of a non-porous sheet of material adapted to conform to the skin of a patient and having formed thereon a well in which there is placed at the bottom thereof an electrical conductor formed of a male snap fastener with the projecting portion projecting from the top surface of the sheet of material with the flange portion of the snap fastener being fixedly secured at the bottom of the well. The well is provided with walls forming a barrier and being impervious to liquid flow and when the well is filled with a saturated compressed sponge-like material, the liquid electrolyte contained therein normally cannot leak therefrom. The rear surface of the soft sheet of material is provided with adhesive, and a release sheet is removed therefrom to allow the sponge to expand and then again be compressed when the electrode is placed on the skin of a patient, the liquid electrolyte completing the electrical path from the male snap fastener to the skin of the patient being prevented from leaking while the electrode is being stored and prior to its time of utilization.

As a feature of this invention, the well may be formed of a plastic ring attached to the back surface of the sheet of material to form the barrier preventing leakage of the liquid electrolyte when the electrode is being stored. As an alternative embodiment, the well may be formed from facing sheets of material in which an aperture is cut through one, the aperture forming the walls of the well when the two sheets are laminated together.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of the disposable electrode showing the top surface thereof;

FIG. **2** is a sectional view taken along the lines **2—2** of FIG. **1**;

FIG. **3** is a view similar to FIG. **2** with the backing or release sheet removed therefrom showing the sponge like member in a non-compressed form;

FIG. **4** is a top view of another embodiment of this invention;

FIG. **5** is a sectional view taken along line **5—5** of FIG. **4**

DETAILED DESCRIPTION

Referring to FIGS. **1** through **3**, there is shown the disposable electrode **10** comprising a sheet of soft non-porous material **12** having a certain thickness, the sheet of material being provided with a top surface **14** and a bottom surface **16.** The resilient material **12** is flexible causing it to easily conform to curved and uneven skin areas of the patient. The bottom surface **16** is provided with a pressure sensitive adhesive upon which is placed a protective paper or release sheet **18,** which when removed from bottom surface **16** exposes the adhesive to allow the electrode to be attached to the skin of the patient.

As a feature of this invention, there is provided a well **20** formed by a wall member **22,** the wall member being an annular ring formed of a plastic material. An electrical conductor member, conventionally a male snap fastener **24** is provided with a flange portion **26** at the bottom of the well with a projecting conductor member **28** projecting from the top surface of the electrode. Within

the well there is placed a compressible sponge member **30** being saturated with a conducting electrolyte so as to provide a complete electrical path from the skin of the patient to the electrical conductor **24.** As shown in FIG. **2,** the sponge member **30** when stored prior to its utilization, is stored in a compressed fashion and the annular ring **22** serves as a barrier around the compressed sponge to prevent leakage of the liquid electrolyte. When the disposable electrode is to beused, the release paper **18** is removed from the bottom surface **16** and the sponge **30** expands as illustrated in FIG. **3,** and when the adhesive bottom surface **16** is attached to the skin of the patient, the sponge **30** again compresses, thereby forming a complete electrical path from the skin of the patient to the electrical conductor **24.**

As can be appreciated from the above, the disposable electrode, according to this invention, will enable the liquid electrolyte to remain within the well **20,** the well being formed by the annular ring **22,** the flange portion **26,** and the backing or release paper **18.** Elimination of the prior leakage problem is achieved with this simple, yet effective, construction. As can further be seen, the electrode of this invention is relatively easily to manufacture, inexpensive yet extremely effective in achieving its desired function. Use of the conventional male snap fastener **24** enables the present invention to be utilized with conventional electrical and electronic apparatus uutilized in hospitals and doctors' offices, although the present invention is not limited to only a male type snap fastener. Other electrical conductors carrying current from such an electrical apparatus through the saturated sponge **30** to the skin of the patient may be effectively utilized, as appropriate.

Referring now to FIG. **4,** there is shown an alternate form of this invention in which the well is formed of a pair of similar non-porous sheets of material designated **40** and **42,** with sheet **42** being similar to sheet **12** in the above embodiment. An aperture **44** is formed in sheet **40,** and when the sheets are placed in a laminated or facing relationship, a well or recess is formed behind the flange portion **26'**. The well thus formed comprises the wall formed by the aperture area **44** as well as the flange portion **26',** and during storage, when the release sheet **18** is applied to the bottom surface **46** of the second sheet of material **40,** the sponge **30'** is stored in its compressed fashion. When the release paper **18** is removed from the rear surface **46** of sheet **40,** the sponge **30'** expands and thereafter is compressed upon the skin of the subject patient.

Preferably, the thickness of sheets **40** and **42** is approximately equal, while the sponge member **30'** is slightly thicker than sheet **40,** in its non-compressed state. With regard to FIGS. **1–3,** the annular ring may be of a resilient plastic material and has a height of approximately half the thickness of sheet **12.** The ring can comprise a closed cell foam material. The sponge member **30** in its non-compressed state has a thickness greater than and approximately twice that of the annular ring **22.**

It may be seen that the disposable electrode of the present invention achieves the above enumerated objects, and while preferred embodiments of the present invention have been disclosed above, it will be understood that the invention is not limited thereto but may be otherwise embodied within the scope of protection sought.

I claim:

1. A medical electrode comprising a non-porous soft sheet of material having top and bottom surfaces and being adapted to be placed on the skin, an electrical conductor member embedded with said sheet of material and having a flange portion forming the bottom of a well, a recess formed between said bottom surface of said sheet of material and said flange forming a portion of the walls of said well and a non-porous wall member attached to and depending from said bottom surface, said wall member encircling said recess to form a barrier and form the remainder of the wall portion of said well, said electrical conductor member having a male electrical connector member projecting outwardly from the top surface of said sheet, a compressible sponge member saturated with an electrically conductive liquid located within said well and having a thickness greater than the depth of said well, said sponge member being in contact with said flange, said sheet of material having a self-stick adhesive on said bottom surface, and release paper means covering said bottom surface and compressing said sponge member totally in said well when said electrode is being stored prior to utilization, said well serving to form a barrier and contain said liquid to prevent said liquid from leaking when said electrode is stored.

2. A medical electrode as set forth in claim **1,** wherein said wall member comprises an annular ring secured to said bottom surface and being concentric with said flange portion.

3. A medical electrode as set forth in claim **2,** wherein said annular ring comprises a resilient plastic material.

4. A medical electrode as set forth in claim **2,** wherein said annular ring comprises a closed cell foam material, said ring having a height of approximately half the thickness of said sheet.

5. A medical electrode as set forth in claim **4,** wherein said sponge member has a thickness approximately twice that of the height of said annular ring.

6. A medical electrode as set forth in claim **1,** wherein said wall member comprises a second sheet of non-porous material having an aperture cut therein, said sheets of non-porous material being secured together in a facing relationship, said well being formed by the recess formed at the apertures when said sheets are secured together.

7. A medical electrode as set forth in claim **6,** wherein said facing sheets are approximately of equal thickness.

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