ACCESS WINDOW ASSEMBLY FOR A BODY CAST

A device for mounting a treatment electrode (33) on the skin of a patient in an area covered by a body cast comprises an access window (11) secured intermediate the ends of a relatively flexible band (10) embedded in the body cast. The access window has a releasably latched cap (16) with a central opening in which is secured a flexible diaphragm (24) for supporting an electrode in contact with the adjacent skin area of the patient. The cap opening is normally tightly closed by a removable cover (35).
FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT Austria
AU Australia
BB Barbados
BE Belgium
BG Bulgaria
BR Brazil
CF Central African Republic
CG Congo
CH Switzerland
CM Cameroon
DE Germany, Federal Republic of
DK Denmark
FI Finland
FR France
GA Gabon
GB United Kingdom
HU Hungary
IT Italy
JP Japan
KP Democratic People's Republic of Korea
KR Republic of Korea
LI Liechtenstein
LK Sri Lanka
LU Luxembourg
MC Monaco
MG Madagascar
ML Mali
MR Mauritania
MW Malawi
NL Netherlands
NO Norway
RO Romania
SD Sudan
SE Sweden
SN Senegal
SU Soviet Union
TD Chad
TG Togo
US United States of America
Description

Access Window Assembly For A Body Cast

Background of the Invention

This invention relates to a device adapted to be incorporated in a body cast to mount an object such as a treatment electrode in predetermined relation to the body skin of a patient. More particularly, it relates to a device of this general character providing a securely reclosable opening in the cast facilitating ready access to the object and to the skin of the patient when needed for adjustment or cleaning, for example.

Technical Field

Remarkable results are being gotten today with the use of electrical stimulation in the treatment of bone fractures and other bone diseases. In one highly successful technique, the stimulation is effected by an ultrasonic electric signal applied to the skin of the patient in the vicinity of the bone fracture. Since a fracture must usually be immobilized in a cast, it has not always been easy to arrange for effective treatment with electrical stimulation. It is not desirable to embed the electrode under the cast since effective cleaning and adjustment are then not possible. Moreover, attempts that have been made to treat a patient with an electrode mounted in an opening cut in a cast have not been entirely satisfactory because of the difficulty of maintaining uniform adjustment of the electrode and preventing tampering by the patient.
Disclosure of the Invention

It is an object of the invention, accordingly, to provide a new and improved device for mounting a treatment electrode or the like in a body cast that is free from the above-noted deficiencies of the prior art.

Another object of the invention is to provide a new and improved mounting device of the above character which affords ready access to the treatment electrode and the skin of the patient for adjustment or cleaning, yet is tamper-proof and reliable in operation.

These and other objects of the invention are attained by providing a mounting device having a generally circular access window secured intermediate the ends of a flat, relatively flexible band that is adapted to be embedded in the cast as it is formed on the body of the patient. The access window has a hinged cap provided with a releasable latch for retaining it securely in the closed position. The cap has a central opening in which is secured a flexible diaphragm together with means releasably retaining a treatment electrode or the like on the underside thereof and the opening in the cap is normally tightly closed by a removable cover.

In use, after the mounting device is embedded in the cast, the cap is opened, the cover is removed from the cap and flexible spacer material is disposed above the electrode retainer so that when the cover is replaced and the cap is closed, the electrode carried by the diaphragm will be correctly positioned in relation to the skin of the patient for the treatment to be carried out. Thereafter, the access window can be readily opened to permit inspection or cleaning of the electrode or the skin of the patient merely by releasing the cap latch to permit the cap to be moved to the open position.
Brief Description of Drawings

The invention may be better understood from the following detailed description, taken in conjunction with the accompanying drawings in which:

Figure 1 is a plan view of one form of mounting device constructed according to the invention;

Figure 2 is a side view of the mounting device shown in Figure 1;

Figure 3 is an enlarged partial view in section taken along the line 3-3 of Figure 1 and looking in the direction of the arrows, showing details of the access window and the way the device may be embedded in a cast on a body member;

Figure 4 is a plan view of a modified form of mounting device suitable for use with navicular fractures where the size of the cast is usually small; and

Figure 5 is an enlarged partial view in section taken along the line 5-5 of Figure 4, looking in the direction of the arrows.

Best Mode for Carrying Out the Invention

Referring now to Figure 1, a typical mounting device according to the invention comprises an elongated band 10 formed with a circular, relatively rigid access window 11 intermediate its ends. The band 10 has short, downwardly angled, lateral extensions 12 on opposite sides of the access window 11 and it is preferably formed with a number of openings 13 to aid in retaining it securely in a conventional plaster cast. The band 10 may also be provided with spaced transverse grooves 14 to enable segments to be broken off to adjust the length of the band to the size of the cast.

Hinged at 15 on the band 10 on one side of the access window 11 is a cap 16 formed with upper and
lower ring members 17 and 17a which are tightly secured together. The cap 16 is mounted for limited rotation about the axis of the window 11 from a position in which it is latched to the band 10 to an unlatched position. To this end, the upper and lower ring members 17 and 17a are provided with arcuate flange portions 18 and 19, respectively, adapted to cooperate with a matching arcuate groove 20 and a flange 21, respectively, on the hinge 15 to permit limited rotation of the cap in opposite directions.

At the opposite end of the lower cap ring 17a is formed a latch member 22, which when the cap 16 is rotated counterclockwise to its limit (the unlatched position) is located so as to be able to enter a matching recess 23 formed in the side wall of the access window 11. With the latch member 22 inserted in the recess 23, rotation of the cap 16 clockwise to its opposite limit (the latched position) locates the latch member 22 under the adjacent edge of the band 10 so that the cap 16 is locked in the closed position. Preferably, conventional snap retainer means (not shown) may be provided for retaining the latch member 22 releasably in the locked position.

Clamped between the upper and lower cap rings 17 and 17a is a diaphragm 24 made of suitable flexible material having a flat, central, upper portion 25 surrounded by a downwardly depending annular portion 26. Secured to the diaphragm upper portion 25 is a retainer for an electrode or the like comprising an upper disk 27 to which is fastened a downwardly extending cylindrical retainer member 28. The retainer member 28 has an opening 29 at its lower end adapted to receive a snap-in connector 30 on an electrode holder 31.

The electrode holder 31 may be a plastic disk 32 having molded in the lower face thereof a thin contact
electrode 33 made of stainless steel, for example. The electrode 33 is connected to an insulated conductor 34 embedded in the holder which extends through the band 10 so as to be accessible from the outside of the cast in which the latter is mounted.

The central opening in the upper cap ring 16 is closed by a snugly fitting snap-in cover 35 made of suitable material such as plastic foam, for example. As best shown in Figure 1, the cover 35 may be provided with a tab 36 extending into a matching recess 37 in the upper cap ring 16. A narrow slot 38 may be provided between the end of the tab 36 and the recess 37 for the insertion of a thumbnail to facilitate removal of the cover 35 as required.

In use, the band 10 is embedded in the conventional body cast used to immobilize a bone fracture so that the bottom access window 11 is spaced a short distance above the skin of the patient, as shown generally in Figure 3. The cover 35 is removed and the cap 16 rotated counterclockwise to the unlatched position so that it can be opened. An electrode holder 31 with an electrode 33 mounted thereon is snapped into the retainer member 28. A spacer or spacers 39 are then placed on top of the retainer disk 27 so that when the cover 35 is replaced and the cap 16 is returned to its closed latched position, the electrode 33 will be in proper contact with the skin of the patient as required for the electric stimulation procedure. In practice, the body cast assemblies are usually mounted on opposite sides of the body cast for treatment of a fracture or the like therebetween.

The modification shown in Figures 4 and 5 is intended to be used in the treatment of navicular fractures, for example where the space available is usually limited. In this form, the access window 11 is mounted on a band 10a formed with a plurality of
thin, very flexible, longitudinal tabs 39, 39a, 40, 40a and lateral tabs 41, 41a, 42 and 42a to facilitate incorporating it in a plaster cast on the wrist of a patient, for example. The access window 11 is substantially the same as in Figure 1 except that the cap 16 is not hingedly mounted on the band. It may be secured to the latter by cooperating latches like the latch member 22 in Figure 1 located on opposite sides of the access window 11 so that when it is rotated counterclockwise it is unlatched and can be lifted off the window 11. Also, an electrode retainer extension 44 (Figure 5) may be interposed between the retainer member 28 and the electrode 31, if necessary to lower the latter sufficiently when mounted in a thick cast to put the electrode in contact with the skin of the patient.

The invention thus provides simple and highly effective means for mounting a treatment electrode or the like in a body cast. The provision of an access window with an openable closure as described enables easy adjustment of the position of the electrode in relation to the skin of the patient, while affording easy access by a doctor or technician to the electrode and to the electrode and the patient's skin for inspection and cleaning as desired. Moreover, with the cap closed and latched, the electrode is maintained in proper contact with the skin of the patient and essentially tamper-proof.

The specific embodiments described are intended to be merely illustrative and modifications in form and detail are possible within the scope of the appended claims.
Claims

1. An access window assembly for mounting in a body cast comprising
   a band,
   an access window carried by the band,
   a removable cap positionable to form a closure for said access window, said cap having releasable means locking it in the closed position,
   a treatment member, and
   adjustable retainer means in the cap for supporting a said member therein in predetermined relation to the body over which the cast is formed.

2. An access window assembly as defined in claim 1 in which said cap is insertable in said access window to form a closure therefor and is rotatable in one direction therein to actuate said locking means to lock the cap in the closed position and is rotatable in the opposite direction to actuate the locking means to unlock the cap so that it can be removed.

3. An access window assembly as defined in claim 1 in which the access window is generally circular, the cap is also generally circular and is hingedly mounted on the bank so as to be movable to open and closed positions.

4. An access window assembly as defined in claim 3 in which the cap is mounted for limited to and fro rotation with respect to said hinged mounting so that rotation in one direction actuates the locking means to lock the cap in the closed position and rotation in the opposite direction
actuates the locking means to unlock the cap so that it can be moved to the open position.

5. An access window assembly as defined in claim 2 or claim 4 in which the cap is ring shaped and supports a flexible diaphragm at the periphery thereof, the diaphragm carries a retainer for supporting a member thereon in predetermined relation to the body surface over which the cast is formed, and the cap has a removable cover.

6. An access window assembly as defined in claim 5 in which the member supported by the retainer is an electrode and spacer means is interposed between the cover and the diaphragm to position the electrode at the desired location.
INTERNATIONAL SEARCH REPORT

International Application No PCT/US85/00829

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) 3
According to International Patent Classification (IPC) or to both National Classification and IPC
Int. Cl. 3 A61B 5/04
U.S. Cl. 128/644

II. FIELDS SEARCHED
Minimum Documentation Searched 4

<table>
<thead>
<tr>
<th>Classification System</th>
<th>Classification Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>128/419F, 787,802,792,639,644</td>
</tr>
</tbody>
</table>

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 4

III. DOCUMENTS CONSIDERED TO BE RELEVANT 1, 4

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of Document, 16 with indication, where appropriate, of the relevant passages 17</th>
<th>Relevant to Claim No. 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US, A, 3,508,541 28 April 1970 WESTBROOK et al</td>
<td>1-6</td>
</tr>
<tr>
<td>A</td>
<td>US, A, 4,323,076 06 April 1982 SAMS</td>
<td>1-6</td>
</tr>
<tr>
<td>A</td>
<td>US, A, 4,365,637 28 December 1982 JOHNSON</td>
<td>1-6</td>
</tr>
<tr>
<td>P,A</td>
<td>US, A, 4,448,199 15 May 1984 SCHMID</td>
<td>1-6</td>
</tr>
<tr>
<td>P,Y</td>
<td>US, A, 4,491,128 01 January 1985 HASCHEKE</td>
<td>1-6</td>
</tr>
<tr>
<td>P,A</td>
<td>US, A, 4,456,001 26 June, 1984 PESCTORE</td>
<td>1-6</td>
</tr>
<tr>
<td>A</td>
<td>IS, A, 4,445,518 01 May 1984 EGGLI et al</td>
<td>1-6</td>
</tr>
<tr>
<td>Y</td>
<td>US, A, 3,279,468 18 October 1966 LE VINE</td>
<td>1-6</td>
</tr>
<tr>
<td>A</td>
<td>US, A, 3,967,628 06 July 1976 VREDENBREGT</td>
<td>1-6</td>
</tr>
<tr>
<td>Y</td>
<td>US, A, 2,367,690 23 January 1945 PURDY</td>
<td>3-6</td>
</tr>
</tbody>
</table>

* Special categories of cited documents: 15
  "A" document defining the general state of the art which is not considered to be of particular relevance
  "E" earlier document but published on or after the international filing date
  "L" document which may throw doubt on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  "O" document referring to an oral disclosure, use, exhibition or other means
  "P" document published prior to the international filing date but later than the priority date claimed

**"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"A" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search 2
30 May 1985

Date of Mailing of this International Search Report 3
17 JUN 1985

International Searching Authority 4
ISA/US

Signature of Authorized Officer 50
Edward M. Coven

Form PCT/ISA/R10 (second sheet) (October 1981)