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CA 2515230 C 2011/04/26

(11)(21) 2 515 230

(12) BREVET CANADIEN
CANADIAN PATENT

(13) C

(86) Date de dépôt PCT/PCT Filing Date: 2004/02/05
(87) Date publication PCT/PCT Publication Date: 2004/08/19
(45) Date de délivrance/Issue Date: 2011/04/26
(85) Entrée phase nationale/National Entry: 2005/08/05
(86) N° demande PCT/PCT Application No.: EP 2004/001059
(87) N° publication PCT/PCT Publication No.: 2004/069088
(30) Priorité/Priority: 2003/02/07 (DE203 01 973.3)

(51) Cl.Int./Int.Cl. *A61F 13/00* (2006.01), *A61N 1/04* (2006.01), *A61N 1/18* (2006.01), *A61N 1/36* (2006.01), *A61N 1/20* (2006.01)

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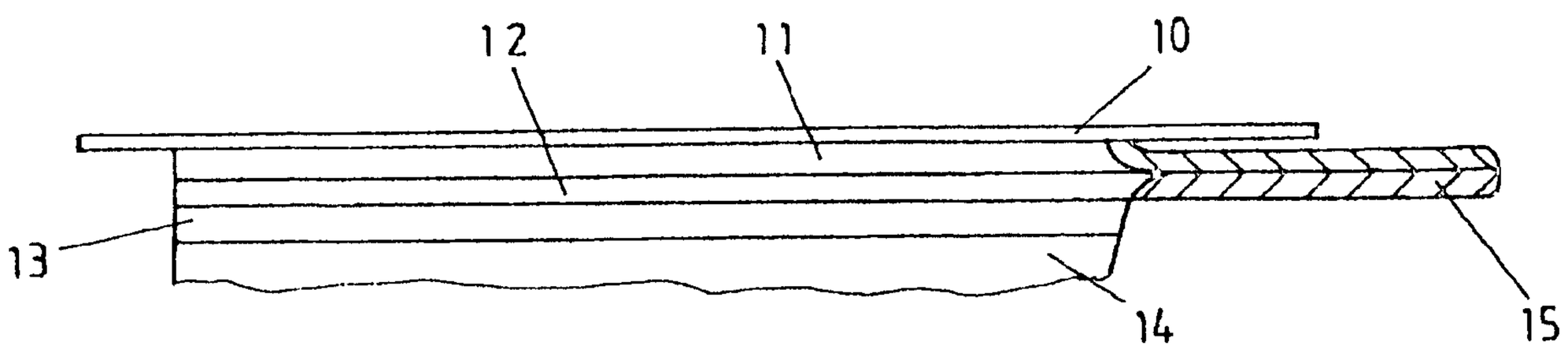
(54) Titre : COMBINAISON MULTICOUCHE D'UNE ELECTRODE DE STIMULATION ELECTRIQUE ET D'UN PANSEMENT

(54) Title: MULTI-LAYER COMBINATION OF AN ELECTRIC STIMULATION ELECTRODE AND A WOUND DRESSING



(57) Abrégé/Abstract:
The present invention provides a wound dressing (100) with at least one energy transfer agent (11, 12) and a wound dressing (13), namely a combination of wound dressing and electrode for the stimulation treatment, with which an uniform electrostimulation of the wound can be achieved so that the wound healing process is considerably improved, it is proposed that the energy transfer agent has at least two layers and that the energy transfer agent (11, 12) has at least two adjacent layers (11, 12), a first layer (11) - energy supply - and a second energy - distribution of energy - (12), whereby the first layer (11) has a lower electric resistance and the second layer (12) a higher electric resistance.

Abstract

The present invention provides a wound dressing (100) with at least one energy transfer agent (11, 12) and a wound dressing (13), namely a combination of wound dressing and electrode for the stimulation treatment, with which an uniform electrostimulation of the wound can be achieved so that the wound healing process is considerably improved, it is proposed that the energy transfer agent has at least two layers and that the energy transfer agent (11, 12) has at least two adjacent layers (11, 12), a first layer (11) - energy supply - and a second energy - distribution of energy - (12), whereby the first layer (11) has a lower electric resistance and the second layer (12) a higher electric resistance.

MULTI-LAYER COMBINATION OF AN ELECTRIC STIMULATION ELECTRODE AND A WOUND DRESSING

Field of Invention

The present invention relates to a wound dressing.

Background to the Invention

In the prior art, electrostimulation apparatuses are known which are used for the treatment of wounds, in particular of bad healing chronic wounds.

In prior art publication, EP 0 504 715 A1, a wound treatment device is disclosed which consists of an electrically non conductive layer which has an opening and of an electrically conductive non metallic material. Moreover, the wound treatment device has a substantially non adhering wound contact layer.

In prior art publication, DE 201 03 311 US, a wound coating is disclosed which consists of a combination of an energy transfer agent and at least one wound coating means. Here an electrode is used as energy transfer agent. However, the disadvantage of this device is that a homogeneous current distribution cannot be achieved by the electrode used. The electrodes used in the prior art, in particular close to the points of contact to which the current of the respective electrode is supplied, show current peaks such that an uniform eletrostimulation of the wound surface is consequently not possible. This results from the fact that large surface injury wounds cannot be treated uniformly by such a wound coating.

Summary of the Invention

The present invention seeks to make available a combination of wound dressing and electrode for the stimulation treatment which an uniform electrostimulation of the wound can be achieved so that the wound healing process is considerably improved.

A wound dressing with the elements of claim 1 is proposed to achieve this aim.

According to the present invention, a novel wound dressing with an energy transfer agent, consisting of an energy supplying layer and an energy distribution layer, a wound coating and a protection and fixation layer, is created which is used for the stimulation treatment, in particular with electrostimulation apparatuses.

According to the present invention, the energy transfer agent has at least two adjacent layers, a first energy supplying layer and a second energy transferring layer. It is important that the first layer has a lower electric resistance and the second layer a higher electric resistance. In such a configuration, it has been shown that a homogeneous current distribution can be reached over the whole surface of the energy transfer agent. The first layer which has a lower electric resistance provides the homogeneity. The current flows into the second layer adjacent to the first layer which has a higher resistance.

Contrary to those wound electrodes known in the prior art, it is possible with the present invention to achieve a nearly uniform energy loaded stimulation treatement of the wound so that the wound healing process is considerably improved.

Preferable further developments of the wound dressing are described.

In a preferred embodiment, the first layer has a protection and fixation layer on the side opposite to the second layer. A wound coating which rests directly on the wound to be treated is functionally placed on the side of the second layer which is opposite to the first layer. One of the advantages of the wound dressing according to the invention is that the wound coating which serves for the protection and the care of the wound surface, must not, contrary to the known wound devices, be expressly removed for a stimulation treatment, which would not be beneficial to the healing process of the wound. Each change of the wound dressing is always linked with the risk of

infection, despite a thorough cleaning of the wound. But the wound dressing according to the invention remains on the wound to be treated, even if no stimulation treatment is carried out. Besides the saving in dressing material, a considerable reduction of the treatment time through the nursing staff is achieved with the wound dressing of the present invention.

Preferably, the first layer is a silver layer so that a low electric resistance is obtained in the first layer. The incoming current is homogenously distributed in the silver layer over the whole surface of the energy transfer agent because of its good electrically conductive properties and then arrives over the second layer into the wound coating. Thus, the silver layer constitutes an effective means of the wound dressing, according to the present invention, in order to obtain an uniform stimulation treatment of the wound to be dressed. Furthermore, due to the use of the silver layer there is the possibility of placing a current feed at any point of the energy transfer agent as an optimal current distribution is guaranteed even for a lateral arrangement, or for example, at a corner of the energy transfer agent. Current peaks are nearly minimal with the wound dressing of the present invention. An additional advantage of the silver layer is that it has an antimicrobial effect which is particularly positive in the healing process of wound surfaces.

According to the present invention, the wound coating may be hydrophilic and electrically conductive, whereby the wound coating is a gel, in particular a hydrogel. It is also conceivable to use hydrocolloids, alginates or polyurethane foams as wound coating. Contrary to the known inactive wound coatings, in particular gauze compresses, pads or absorbent nonwovens, the afore mentioned wound coatings, in particular hydrogels are preferable for the treatment of damaged skin and wounds. The advantage of their use is, among others, that they have a good biological tolerance, in particular when they are applied during a longer period of time. Because of their hydrophilic property, the wound coating can absorb liquid such as wound exudat (protein containing liquid which comes out from the vessels by inflammations) in larger quantities by an increase in volume without losing its coherence. Furthermore, due to the homogeneous electric conductivity of the wound coating, the electrostimulation can easily pass through and arrive uniformly at the wound area to be treated. It is particularly advantageous that the elec-

trostimulation of the wound coating or of the wound heat is fed as well so that, in accordance with medical findings, a better and quicker healing process is obtained.

In particular due to the exclusion of atmospheric oxygen from the wound, the healing process can be further accelerated because the wound is forced to bring oxygen into the wound area over the blood. This takes place by an increased formation of new vessels so that the wound healing is improved. Hydrogel as well as hydrocolloids, alginates or polyurethane foams, are appropriate means to create substantially oxygen-free conditions in the wound.

In a further preferred embodiment of the wound dressing, the wound coating can have wound healing promoting substances. These substances are preferably growth factors. While the wound coating rests on the wound area to be treated and absorbs wound exudate, it simultaneously sets wound healing promoting substances free for the wound so that the healing process of the wound is accelerated. In particular, for poorly healing chronic wounds, a wound coating with wound healing promoting substances is advantageous.

An electrode for the electrostimulation can be used as energy transfer agent for the wound dressing according to the invention. It is also conceivable to configure the energy transfer agent as a foil. The energy transfer agent has an electrical connecting means which can be connected with the energy producer which supplies the wound dressing during the stimulation treatment with current or with electric pulses. Preferably the connecting means is placed on the first layer which, for example, goes through an opening provided in the protection/fixation layer above and which can be connected with the energy producer. Preferably, metal or an electrically conductive synthetic material, in particular rubber, is conceivable as the energy transfer agent.

Furthermore, the wound dressing has on the side opposite to the energy transfer agent an additional layer which is preferably a peelable foil. Such a layer protects the wound coating from impurities. The foil can be easily removed from the wound dressing before applying it onto the wound area. It is advantageous if the foil preferably made of polyethylene, polypropylene or polyurethane is impermeable to water and active substances. After the foil

has been removed from the wound dressing, the wound dressing, in accordance with the present invention, is applied onto the wound. The wound coating appropriately has adhesive properties on its surface opposite to the wound so that a reliable application on the wound surface is guaranteed.

It is particularly advantageous that the wound dressing is flexible and elastic so that it can be adapted to the contour of the human body, in particular to various parts of the body.

Brief Description of the Drawings

The present invention will now be explained in detail below with reference to the drawings, in which:

Fig. 1 shows a top view of an embodiment of a wound dressing according to the present invention;

Fig. 2 shows a pure schematic section of the wound dressing according to the present invention taken along line II-II of fig. 1;

Fig. 3 shows a top view of a second embodiment of a wound dressing according to the present invention; and

Fig. 4 shows a pure schematic section of the wound dressing according to the present invention taken along line III-IV of fig. 3.

Detailed Description

Figs. 1 and **2** show a preferred embodiment of a wound dressing **100** according to the present invention. The wound dressing **100** has an energy transfer agent **11, 12** in form of a two-layer electrode which is configured with a first - energy supplying - layer **11** and a second - energy distributing - layer **12**. These layers **11, 12** rest on each other with their upper faces. In order to provide an uniform current distribution on the surface of the energy transfer agent **11, 12** the first layer **11** is a silver layer. This layer is preferably of low impedance, or has a lower electric resistance. On the side oppo-

site to the second layer **12** a protection/fixation layer **10** which covers the energy transfer agent **11, 12** is placed on the first layer **11** so that the energy transfer agent is fixed on the surrounding skin. The non electrically conductive protection/fixation layer **10** consists of plastic foil type material. It is also possible to make the protection/fixation layer **10** for example of plaster foil type or foam foil type material.

An opening **16** which is illustrated in particular in **Fig. 2** is placed for the represented embodiment on the protection/fixation layer **10** in order to be able to realize an electrical connection with the electrode **11, 12** covered by the protection/fixation layer **10**. An electrical contact **15** which consists of the first and second layer **11, 12** passes through the opening **16**. As shown in the drawings, the opening **16** can be configured for example as a shackle which can be bent up. The end of the electrical contact 15 can be connected with an energy producer (not shown).

A wound coating **13** which is a gel **13** in the represented embodiment is placed below the second layer **12** - on the side opposite to the first layer **11**. This gel is hydrophilic and electrically conductive and can contain wound healing promoting substances. The gel **13** is in direct contact with the wound/skin **14**. However, before the wound dressing **100** is applied on the wound **14**, a foil (which is not represented) is removed which is placed on the surface of the gel **13** and thus protects the gel **13** from impurities. However, it is important that a slight stripping of the foil is possible without removing areas from the wound coating **13** at the same time. The foil is configured impermeable to water and active substances so that the wound dressing **100**, in particular the gel **13**, does not lose liquid or the wound healing promoting substances during storage.

After the foil has been removed, the wound dressing **100** is applied onto the wound to be treated **14**. The gel has adhesive properties on its surface so that it remains sticked efficiently on the skin/wound **14** - even over longer periods of time.

During the stimulation treatment, the wound dressing **100** is loaded with current, in particular with pulses. The current flows from the energy producer

over the electrical contact **15** into the first layer - energy supply - **11** of the electrode **11**, **12**. Because of the low resistance of the first layer **11**, the current is uniformly distributed and flows then into the second layer - energy distribution - **12** with the higher resistance. From there the electronic stimulation is further transmitted by the subjacent gel **13** which has a homogeneous electrical conductivity - to the wound **14** so that an uniform stimulation over the wound surface **14** can be achieved with the represented embodiment.

During the stimulation treatment, the gel **13** can release wound healing promoting active substances to the wound **14** so that the healing process can be accelerated. Simultaneously the gel **13** is able, because of its composition, to absorb wound exudate in higher quantities. This being, the absorbency of liquid (such as water oder wound exudate) is guaranteed by absorbers. Polymers are for example appropriate as absorbers. Moreover, the gel **13** has a stable structure, in particulr during the stimulation treatment of the wound **14** and during the resting on the wound **14**.

Figs. 3 and **4** show a further preferred embodiment of the wound dressing 100. The same parts have the same reference numerals as the corresponding parts in **Figs. 1** and **2** and the same description is valid for them. The difference consists in the lateral arrangement of the electrical contact **13** which serves as connecting means and which is here connected with the layers **11**, **12** by being laterally led through.

LIST OF REFERENCE NUMERALS

100	Wound dressing
10	Protection/fixation layer
11	First layer of the energy transfer agent - energy supply
12	Second layer of the energy transfer agent - energy distribution
13	Wound coating/gel
14	Skin, wound
15	Connecting means, electrical contact
16	Opening

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Wound dressing comprising at least one energy transfer medium, an electrically conducting wound pad and a protecting/fixing layer, wherein the energy transfer medium is a foil, a first layer of said foil provides for the energy supply with a homogenous current distribution across the total area of the energy transfer medium, and a second layer of said foil is provided for energy distribution,

the first layer has a lower electric resistance and the second layer a higher electric resistance, the first layer comprises the protective/fixing layer at the side facing away from the second layer,

the second layer comprises the wound pad at the side facing away from the first layer, and that the wound pad is heat conducting or is generating heat when energy it applied thereto.

2. Wound dressing according to claim 1, wherein the first layer is a silver layer.

3. Wound dressing according to any one of claims 1 to 2, wherein the wound pad is hydrophilic.

4. Wound dressing according to any one of claims 1 to 3, wherein the wound pad comprises adhesive properties.

5. Wound dressing according to any one of claims 1 to 4, wherein the wound pad is selected from the group consisting of a hydrogel, a hydrocolloid, an alginate and a polyurethane foam.

6. Wound dressing according to any one of claims 1 to 5, wherein the wound pad comprises substances stimulating wound healing.

7. The wound dressing according to claim 6, wherein the substance stimulating

wound healing is a growth stimulating factor.

8. The wound dressing according to claim 7, wherein the wound healing or stimulating substance contains antibiotics, antiseptics, vitamins, analgesics or other active agents.

9. The wound dressing according to any one of claims 1 to 8, wherein the energy transfer medium is an electrode for electrostimulation.

10. The wound dressing according to any one of claims 1 to 9, wherein the energy transfer medium consists of metal or electrically conducting plastics.

11. The wound dressing according to any one of claims 1 to 9, wherein the energy transfer medium consists of rubber.

12. The wound dressing according to any one of claims 1 to 11, wherein the energy transfer medium comprises an electric connecting means, which can be connected to an energy generator.

13. The wound dressing according to claim 12, wherein the connecting means is arranged at the first layer.

14. The wound dressing according to claim 12, wherein the connecting means is arranged at the first and second layer.

15. The wound dressing according to any one of claims 1 to 14, wherein the protecting/fixing layer is formed with an opening.

16. The wound dressing according to any one of claims 1 to 15, wherein the protecting/fixing layer consists of self-adhesive material.

17. The wound dressing according to any one of claims 1 to 16, wherein the wound pad comprises an additional layer at the side facing away from the energy transfer medium.

18. The wound dressing according to claim 17, wherein the additional layer is a strippable foil.

19. The wound dressing according to claim 18, wherein the foil consists of polyethylene, polypropylene or polyurethane.

20. The wound dressing according to claim 18 or 19, wherein the foil is impermeable for water and active agents.

21. Wound dressing according to any one of claims 1 to 20, wherein the wound dressing is flexible and resilient.

Fig.1

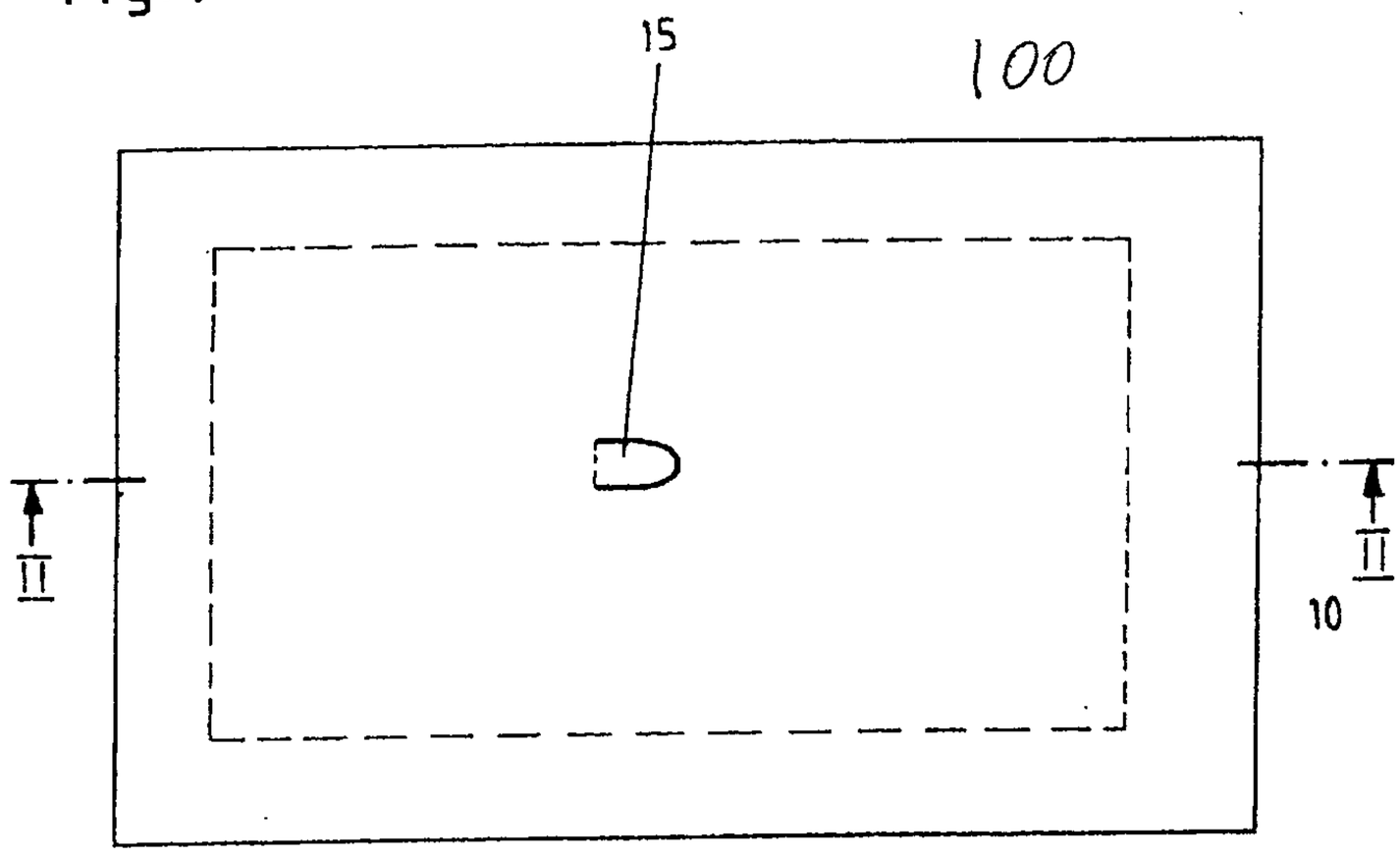


Fig.2

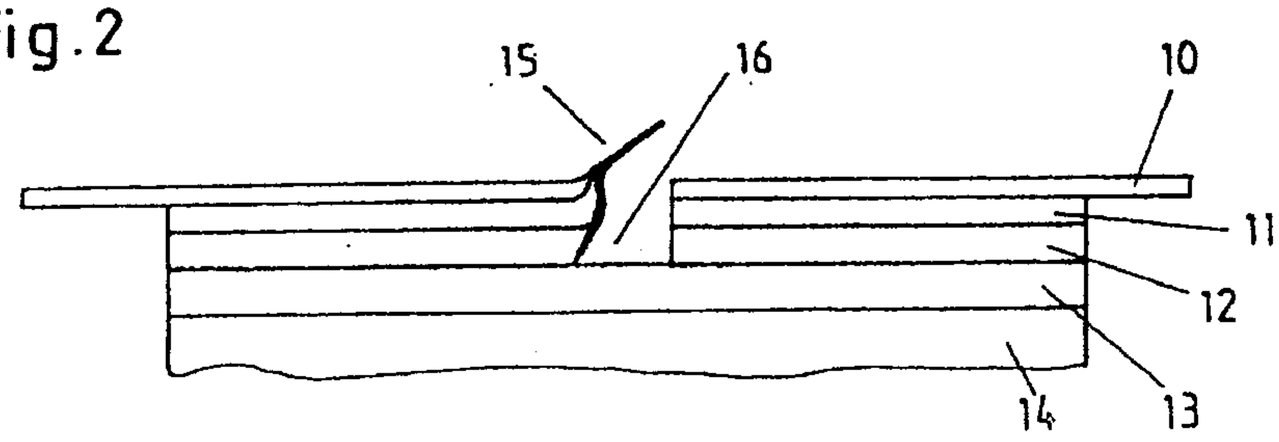


Fig. 3

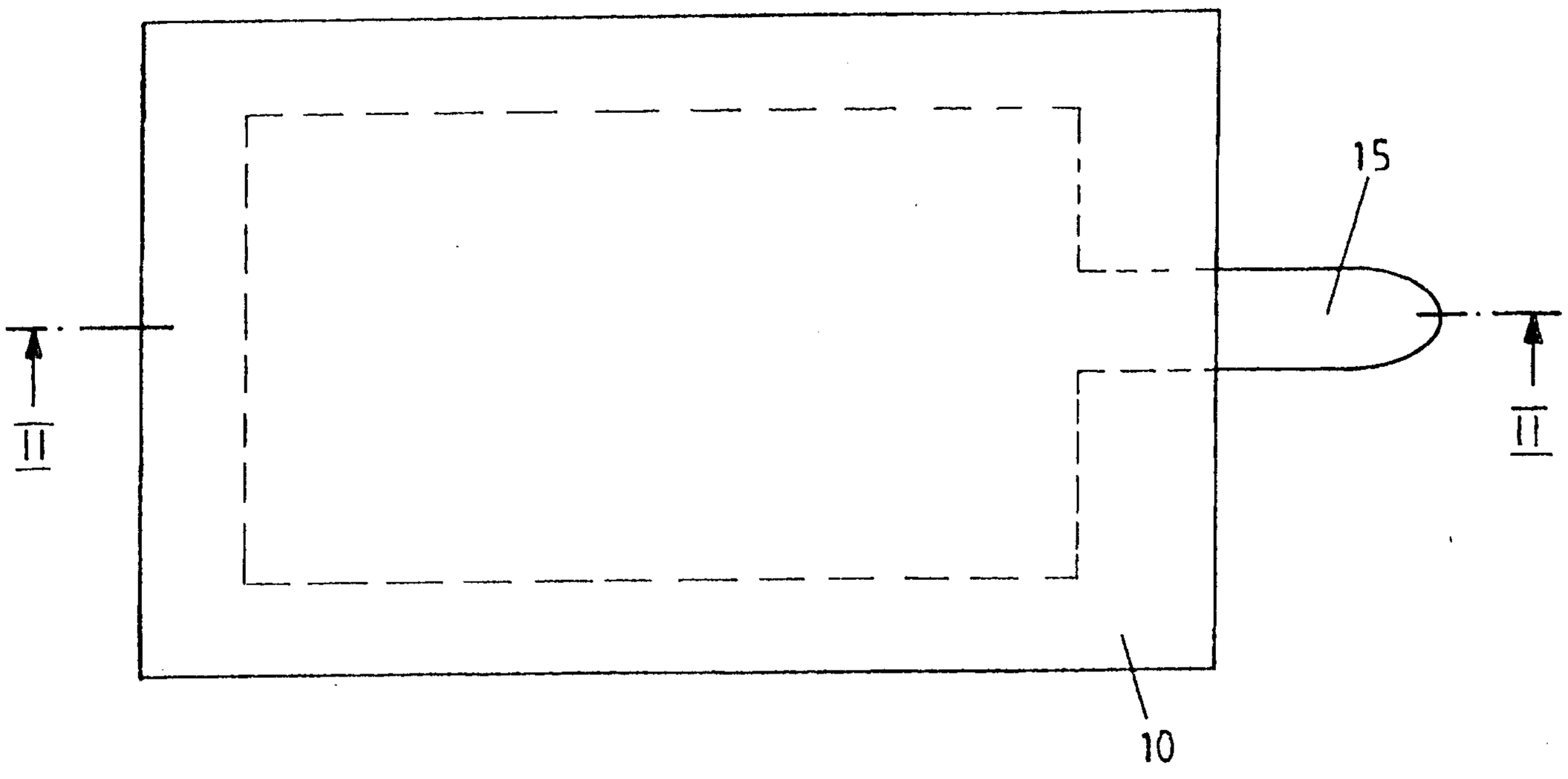
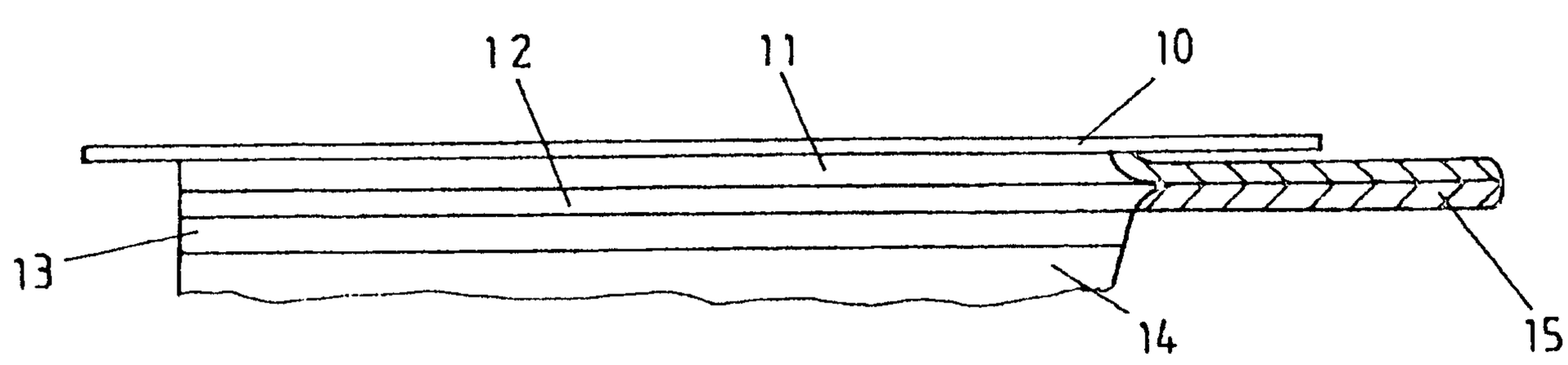
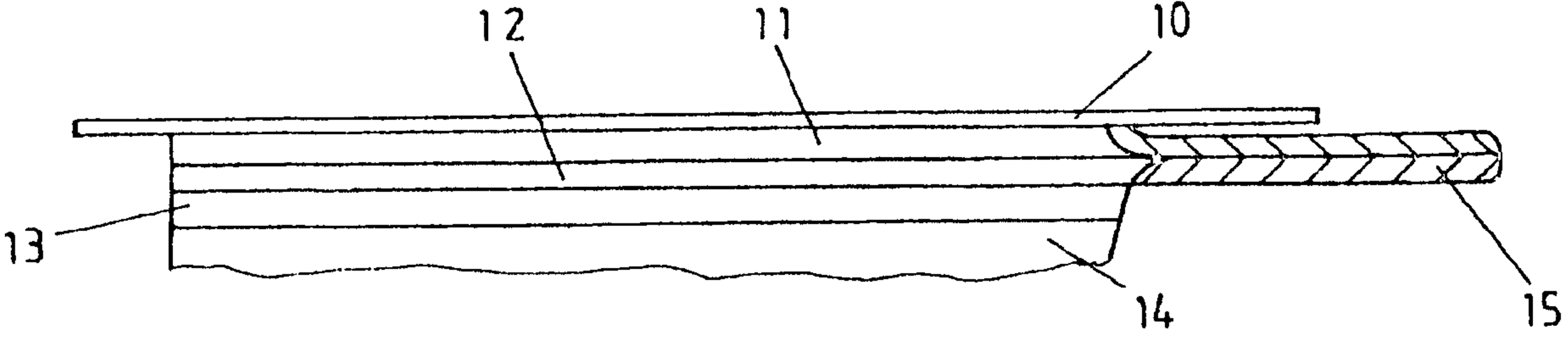


Fig. 4

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