

(19)



(11)

EP 2 798 980 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.11.2014 Bulletin 2014/45

(51) Int Cl.:
A47C 27/15 (2006.01) A47C 27/14 (2006.01)

(21) Application number: **14166760.0**

(22) Date of filing: **01.05.2014**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME

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(30) Priority: **02.05.2013 NL 2010742**

(54) **Mattress**

(57) A mattress comprising an upper mattress (5), which provides a reclining surface for a person, and a lower mattress (1), wherein one or more recesses (4) are present in at least one of the upper mattress and the

lower mattress, which one or more recesses (4) are located near the boundary surface between the upper mattress (5) and the lower mattress (1).

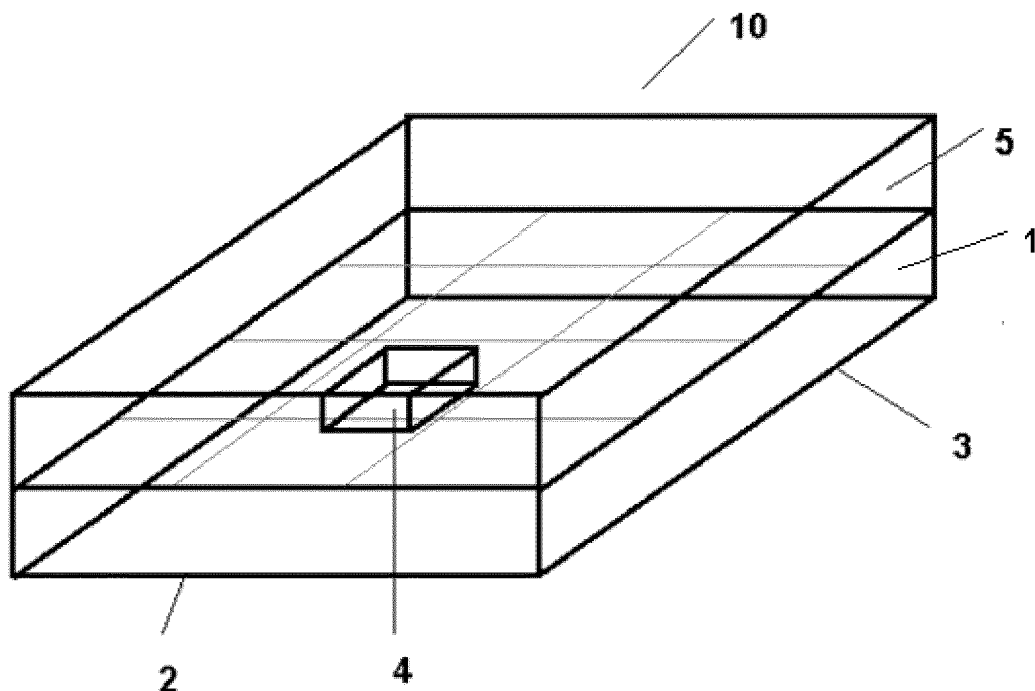


Fig. 2

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Description

[0001] The present invention relates to a mattress comprising an upper mattress, which provides a reclining surface for a person, and a lower mattress, which lower mattress and upper mattress are both made of a resilient material. The present invention further relates to a method for manufacturing such a mattress.

[0002] Mattresses are known per se, they are generally used as a reclining surface in a bed, for instance in a bedstead, on a slatted base, on a spiral base or on a boxspring, for supporting a person's body, usually in a lying position. Furthermore, so-called water mattresses are commercially available, in which a water-filled bag of synthetic material is used as a supporting surface for a person's body, to which mattress a good and even support of the body is attributed.

[0003] From European publication EP 1 719 436 there is known a mattress which comprises a mattress body as well as a cover permanently fitted on the mattress body, such as a cover impermeable to moisture, which mattress body has at least two mattress body sections.

[0004] A mattress is also known from European publication EP 1 352 597, for example, in which a covering fully surrounds the mattress body sections.

[0005] International application WO 87/06442 discloses a decubitus ulcera mattress. Such a mattress consists of two foam layers, which comprises recesses only in the "upper" foam layer, over the entire thickness thereof, providing so-called foam bodies. Thus, recesses can be formed at various positions in the upper foam layer so as to thus remedy the problem of bedsores. The lower foam layer does not have any such recesses. Such a mattress further comprises a cover that is fitted by means of a zip fastener. The upper and lower foam layers are joined together by means of an adhesive. Because of the special recesses, which are present only in the "upper" foam layer, it is apparent that the aforesaid recesses are not "confined" between the two foam layers, but are present at the surface thereof, in particular at the surface of the "upper" foam layer.

[0006] From European publication EP 0 290 674 there is known a two-layer mattress made of an elastic synthetic material. The upper part of the mattress has chambers which are hollow on one side, which extend in a matrix pattern over the entire area of the mattress. Such hollow chambers can be fitted with so-called spring elements, or magnet constructions, after which the upper mattress part is brought into contact with a closed lower mattress part, as a result of which the hollow chambers, which may or may not be provided with a spring elements, are more or less "confined" by joining the upper mattress part and the lower mattress part together by means of a Velcro closure and the mattress thus consisting of two different foam layers is closed, using a cover. Such a mattress is suitable for realising an individual adjustment of the spring behaviour of the mattress. The aforesaid European publication does not relate to a mattress that

can be used in healthcare, in particular in situations in which there is a risk of decubitus or pressure necrosis, also referred to as bedsores.

[0007] From US patent application US 2004/0098806 there is known an elastic construction which can be used in particular for furniture and car seats, wherein a gel layer is applied to a polyurethane foam provided with a number of recesses, which gel layer covers the aforesaid recesses. Said gel layer may be provided with certain "projections", which projections fit in the recesses of the underlying gel layer, wherein the recesses are completely filled with the projections, or wherein some free space is present between the projections and the recesses, by means of which the elasticity can be adjusted. Said US patent publication does not relate to a mattress that can be used in healthcare, in particular in situations in which there is a risk of decubitus or pressure necrosis, also referred to as bedsores.

[0008] The present invention in particular relates to a mattress that can be used in healthcare, in particular in situations in which there is a risk of decubitus or pressure necrosis, also referred to as bedsores. The development of decubitus is attributed to wounds that develop as a result of pressure forces, sliding forces or friction forces or combinations thereof on the tissue. It is assumed that the constant pressure causes small blood vessels to be shut off, as a consequence of which the tissue is insufficiently provided with oxygen and nutrients. A number of factors are supposed to contribute toward the development of decubitus, viz. the duration of the pressure on the tissues, the magnitude of the pressure forces or sliding forces, mobility, blood circulation, the person's weight, tissue tolerance and, among other factors, medicine usage.

[0009] Not all places on the human body are susceptible to decubitus, but in particular places where the bone tissue lies close to the surface can be considered to be additionally susceptible to decubitus. Think in this regard of the buttocks, the heels, the elbows, the shoulder blade, the hip, the ankle, but also the back of the head and the knees, in particular places where pressure is applied to the body. If a person, for example a patient in a hospital, has decubitus this means that the total nursing time will be longer. It is desirable, therefore, that preventing decubitus be given high priority, both in hospitals and nursing homes but also in domestic situations.

[0010] Special decubitus mattresses are commercially available, in which connection especially alternating pressure mattresses, gel mattresses, gel pillows, water mattresses, but also so-called air mattresses are to be considered. Said mattresses each function to reduce or eliminate the pressure in order to prevent decubitus from developing.

[0011] Another aspect concerning mattresses that are used in hospitals and nursing homes is the cleaning thereof. Such mattresses are usually provided with a cover to enable easy cleaning. In addition, it must be possible to remove bodily fluids from such covers in a simple man-

ner so as to thus prevent contamination of bodily fluids among different patients.

[0012] It is an object of the present invention to develop means, in particular mattresses, by means of which the occurrence of decubitus can be prevented or minimised.

[0013] Thus it is the object of the present invention to provide a mattress, in particular a mattress for use in situations in which decubitus can occur or has already occurred.

[0014] Another object of the present invention is to provide a mattress whose purpose is to realise a pressure reduction at positions where the risk of the development of decubitus is greatest.

[0015] Yet another object of the present invention is to provide a mattress which can be used in hospitals or nursing homes or in a domestic situation, which mattress can be cleaned in a simple manner.

[0016] The present invention as referred to in the introduction is characterised in that one or more recesses are present in at least one of the upper mattress and the lower mattress, which one or more recesses are located near the boundary surface between the upper mattress and the lower mattress, wherein said one or more recesses are present at the location of the tailbone and/or the heel part of a person lying on said mattress.

[0017] One or more of the above objects is achieved by using such a mattress. By positioning the one or more recesses near the boundary surface between the upper mattress and the lower mattress, a mattress is obtained which effects a good- pressure distribution of a person lying thereon. The one or more recesses are thus "confined" in the final mattress as a result of the aforesaid position near the boundary surface between the upper mattress and the lower mattress, which means that the one or more recesses are not accessible from "outside", so that the adherence and accumulation of dirt, or fluids, to/in the aforesaid recess(es) is minimised. Another advantageous aspect of positioning the one or more recesses near the boundary surface between the upper mattress and the lower mattress is that the final mattress does not exhibit any visible spaces, cavities of recesses or pits, on the outside thereof, which is found to be pleasant because the mattress looks like an ordinary mattress. Although mention of an upper mattress and a lower mattress has been made in the foregoing, it is possible in certain embodiments to use one or more additional layers, in particular layers of a resilient material so as to thus obtain a specific property, e.g. air permeability or resilient behaviour, of the final mattress. Such additional layers may be disposed between the upper mattress and the lower mattress, but also on a side adjacent to one of the upper mattress and the lower mattress, remote from the boundary surface between the upper mattress and the lower mattress.

[0018] According to a special embodiment of the present mattress, the one or more recesses are present at the location of the tailbone and/or the heel part of a person lying on said mattress. The occurrence of the

decubitus, as indicated above, in particular takes place at positions where the bone tissue lies close to the surface, which applies in particular as regards the tailbone and/or the heel part. Thus it is desirable to provide a recess in the present mattress at the position where the tailbone and/or the heel part of the person lying on the mattress is located. Such a mattress is therefore characterised by two recesses, viz. a recess for the tailbone and a recess for the heel part. It is also possible, however, to provide the present mattress with a recess only for the heel part. Other positions for providing one or more recesses are for example the positions where the elbows, the shoulder blade, the hip, the ankles, the back of the head and, for example, the knees are located.

[0019] The present mattress in particular provides a construction in which one or more recesses are provided to prevent the occurrence of decubitus as much as possible. The purpose of the aforesaid recesses is to reduce the pressure load of a patient near a particular body part. The present recesses are thus provided only at positions where said decrease of the pressure load is wanted. Such recesses must not be confused with the spaces which are hollow on one side and which are arranged in a matrix pattern over the entire area of the upper part of a mattress, as discussed above with regard to European publication EP 0 290 674. The present recesses are not spaces or chambers which are hollow on one side and which are arranged in a matrix pattern over the entire area of the upper part of a mattress. The hollow spaces according to European publication EP 0 290 674 are filled with spring elements, whereas in the present application, on the contrary, recesses are formed, viz. material is removed from at least one of the upper mattress and the lower mattress. Such a construction is thus essentially different. In the present invention, there is no question of recesses which are hollow on one side and which are arranged in a matrix pattern over the entire area of at least one of the upper mattress and the lower mattress. Moreover, in the present invention there is no question of placing or positioning spring elements in one or more recesses present in at least one of the upper mattress and the lower mattress.

[0020] If the present mattress is provided with a recess at the location of the tailbone, it is desirable that said recess has a length of 10-25 cm and a width of 5-15 cm, wherein the length can be regarded as the dimension in the longitudinal direction of said mattress. Said dimensions provide a recess, in particular for the tailbone, which is capable of providing pressure relief. Although the terms length and width are used herein, it should be understood that the recess(es) may be circular, square, rectangular, triangular or elliptical in shape.

[0021] If the present mattress is provided with a recess at the location of the heel part, it is desirable that said recess has a length of at most the width of the mattress and a width of 5-40 cm, preferably 10-30 cm. The recess for the heel part may thus be located at the short end of the mattress, extending over the entire width of the mat-

tress. In another embodiment, the recess for the heel part may comprise two separate, separated recesses, so that in fact there is a recess for the left heel and a recess for the right heel. Recesses for the heel part may join the transverse edge and/or the longitudinal edge of the mattress or form an "island" in the mattress. The aforesaid dimensions provide a recess, in particular for the heel part, which is capable of providing pressure relief. Although the terms length and width are used, it should be understood that the recess(es) may be circular, square, rectangular, triangular or elliptical in shape.

[0022] The one or more recesses referred to in the present application are preferably provided in the form of a hollow cavity or codend shaped cavity. It is also possible, however, that the one or more recesses have the shape of a cylinder, a sphere, a pyramid or a block, or of a combination thereof. The one or more recesses referred to in the present application preferably do not extend over the entire thickness, or a part thereof, of the upper and/or the lower mattress.

[0023] It is desirable that the one or more recesses be present in the lower mattress. In another embodiment it is also possible, however, that the one or more recesses are present both in the upper mattress and in the lower mattress. From a production point of view it is desirable, however, that the one or more recesses be provided in the upper mattress or in the lower mattress, preferably in the lower mattress. The forming of the one or more recesses takes place by milling or cutting the resilient material of which the mattress is made out of a lower mattress or an upper mattress, or both, only at specific positions. Thus it is possible that a recess, for example for the tailbone, is made up of a recess formed in the upper mattress and the recess formed in the lower mattress, in which case it is preferable that the two recesses be "contiguous" to one another after the upper mattress has been positioned on top of the lower mattress. In a specific embodiment it is also possible, however, that the recess in the upper mattress has a dimension different from that of the recess in the lower mattress, with the two recesses in the final construction of upper mattress and lower mattress cooperating to realise a good pressure distribution.

[0024] In order to render the one or more recesses in the present mattress inaccessible to the "outside", it is desirable that the upper mattress and the lower mattress be joined together by means of an adhesive layer. In another embodiment it is also possible, however, that the upper mattress and the lower mattress are joined together by means of a Velcro closure. Once the upper mattress and the lower mattress are joined together, a mattress is obtained in which the one or more recesses are hidden from view and are therefore located in the interior of the mattress thus obtained.

[0025] In a special embodiment of the present mattress, the type of foam that is used for the upper mattress is different from the type of foam that is used for the lower mattress, in which connection it is in particular preferable

that the foam used for the upper mattress is of the viscoelastic type, also referred to as memory foam. For the lower mattress a resilient foam is preferably used. By using a viscoelastic foam for the upper mattress, as is preferable, a very good pressure distribution is realised. Moreover, it is assumed that viscoelastic foam becomes slightly softer under the influence of body heat, which can be considered to be advantageous in view of the special application of the mattress, viz. preventing decubitus.

[0026] In a special embodiment of the present mattress, it is possible for the upper mattress to comprise one or more detachable parts at a short end thereof, in particular it is possible for the lower mattress to comprise one or more detachable parts at a short end thereof. The use of such detachable parts makes it possible to take additional pressure-distributing measures, for example by enabling the heels "to lie unsupported".

[0027] From the viewpoint of hygiene and manageability it is desirable that both the upper mattress and the lower mattress be enclosed in a cover, which cover is detachable, in which case it is in particular preferable that the cover is provided with a closure, in particular selected from zip closure and/or Velcro closure, so as to be able to completely enclose the aforesaid mattress in the cover.

[0028] The present invention will now be explained in more detail with reference to a number of figures, in which connection it should be noted, however, that the present invention is by no means limited to such a special embodiment. Although a recess is only present at the location of the tailbone in the appended figures 1 and 2, it should be understood that, based on the above introduction, it is also possible to provide recesses at other positions, for example at the location of the shoulder blades or the heels. It is also possible to provide the present mattress with one or more detachable parts, in particular at a short end of the lower mattress or the upper mattress, in order to thus realise an additional pressure reduction. The recesses formed may be present partially or entirely in the upper mattress and/or the lower mattress.

Figure 1 is a top plan view of a lower mattress, in which a cavity is present at the location of the tailbone.

Figure 2 is a perspective view of the present mattress according to figure 1.

Figure 3 is a top plan view of a lower mattress, in which recesses are present at the location of the tailbone and the heel part.

Figure 4 is a perspective view of the present mattress according to figure 3.

Figure 5 is a top plan view of a special embodiment of the present mattress.

Figure 6 is a side view of a special embodiment of the present mattress.

[0029] In figure 1, the lower mattress is schematically indicated at 1. The lower mattress 1 has a width 2 and a

length 3 wherein in the mattress 1, a cavity 4 has been formed, for example by milling. The cavity 4 does not extend over the entire thickness of the lower mattress 1, but only over a specific part of the thickness thereof. After the lower mattress 1 has been subjected to a milling operation to form the cavity 4, an upper mattress (not shown) is placed on top of the lower mattress 1, which lower mattress 1 and upper mattress can be joined together by using an adhesive layer (not shown), for example. It is also possible, however, to join the lower mattress 1 and an upper mattress together by means of a Velcro construction (not shown).

[0030] Figure 2 shows an embodiment of a mattress 10 according to the present invention, comprising an upper mattress 5 and a lower mattress 1 joined thereto, with a recess 4 being located near the boundary surface between the upper mattress 5 and the lower mattress 1.

[0031] In figure 3, an embodiment of a lower mattress according to the present invention is schematically indicated at 11. The lower mattress 11 has a width 12 and a length 13 wherein in the mattress 11, a cavity 14 for the tailbone and a cavity 16 for the heel part have been formed, for example by milling. Neither the cavity 14 nor the cavity 16 extends over the entire thickness of the lower mattress 11; they only extend over a specific part of the thickness thereof. In figure 3, the cavity 16 is represented as an "island" in the lower mattress 11, but in another embodiment the short side 17 may also coincide with the length 13. It is also possible for the long side 18 to coincide with the width 12, so that the cavity 16 is adjacent to the width 12. It is also possible, however, for both the short side 17 and the long side 18 to coincide with the length 13 and the width 12, respectively. Furthermore, an embodiment is conceivable in which the cavity 16 can be regarded as two separate, separated cavities, each for a specific heel part, viz. the left heel part and the right heel part.

[0032] After the lower mattress 11 has been subjected to a milling operation to form the cavity 14 and the cavity 16, an upper mattress (not shown) is placed on top of the lower mattress 11, an upper mattress (not shown) is placed on top of the lower mattress 11, which lower mattress 11 and upper mattress can be joined together by using an adhesive layer (not shown), for example. It is also possible, however, to join the lower mattress 11 and an upper mattress together by means of a Velcro construction (not shown).

[0033] In figure 4 there is shown an embodiment of a mattress 110 according to the present invention, comprising an upper mattress 15 and a lower mattress 11 joined thereto, in which a cavity 14 and the cavity 16 are present near the boundary surface between the upper mattress 15 and the lower mattress 11.

[0034] Although in figure 2 the mattress 10 has only one recess 4, it is possible in a special embodiment to provide several recesses, in particular at those positions where a person lying on the upper mattress 5 experiences pressure, for example at the location of the shoulder

blade or the hip. It is also possible to provide the mattress 10 with a detachable part at the short end thereof, for example at the location of the heel part, which detachable part may extend over the entire width of the upper mattress 5.

[0035] Examples of a resilient foam for the lower mattress 1, 11 include foam materials of the HDS55H/M/W types (marketed by Kabelwerk Eupen), also referred to as high-resilience PU foam. Examples of the foam for the upper mattress 5, 15 include foams of the viscoelastic type, such as TCS50M/W or also CMTC65W (marketed by Kabelwerk Eupen), also referred to as viscoelastic PU foam. The present invention is by no means limited to such special foam types, however, nor to the number of cavities or recesses in the present mattress.

[0036] As schematically indicated in figure 5 and figure 6, in a special embodiment of the present invention a different type of foam 22 may be used for the part at the foot of the upper mattress 5, 15, in particular over the entire width of the upper mattress, than for the remaining part 25 of the upper mattress 5, 15. It is desirable that the part at the foot of the upper mattress be provided with foam of a different hardness than the rest of the upper mattress, for example over a length of 30 cm. To produce such a part, the upper mattress is preferably cut off obliquely at one end, and the part 26 thus cut off obliquely is substituted for a foam part 22 of a different hardness, preferably a foam part of a hardness lower than that of the remaining part 25 of the upper mattress, which foam part 22 closely abuts the oblique part. The oblique part of the foam part 22 extends over a distance 23; the "new foam part" thus to be provided preferably covers the cavity 16 present in the lower mattress. The upper mattress obtained with such a foam part that closely abuts the oblique part has a thickness which is uniform over substantially the entire area of the upper mattress. The foam part that closely abuts the oblique part is joined to the upper mattress by means of an adhesive, for example. Cutting the part off obliquely is preferable so as to effect a more or less even transition of hardness and/or resilience.

[0037] Although it is indicated in the appended figures that the cavity 4, 14, 16 is provided in the lower mattress 1, 11, it is possible in another embodiment to form the recess 4, 14, 16, or several recesses, entirely in the upper mattress 5, 15 or, according to another embodiment, partially in the lower mattress 1, 11 and partially in the upper mattress 5, 15. For the sake of simplicity, the cover has been left out in all the above-discussed embodiments.

Claims

1. A mattress comprising an upper mattress, which provides a reclining surface for a person, and a lower mattress, which lower mattress and upper mattress are both made of a resilient material, **characterised in that** one or more recesses are present in at least

one of the upper mattress and the lower mattress, which one or more recesses are located near the boundary surface between the upper mattress and the lower mattress, wherein said one or more recesses are present at the location of the tailbone and/or the heel part of a person lying on said mattress.

2. A mattress according to claim 1, **characterised in that** the recess for the tailbone has a length of 10-25 cm and a width of 5-15 cm, wherein the length can be regarded as the dimension in the longitudinal direction of said mattress. 5
3. A mattress according to one or both of the preceding claims, **characterised in that** the recess for the heel part has a length of at most the width of the mattress and a width of 5-40 cm. 10
4. A mattress according to any one or more of the preceding claims, **characterised in that** the one or more recesses are provided in the form of a hollow cavity. 15
5. A mattress according to any one or more of the preceding claims, **characterised in that** the one or more recesses are present in the lower mattress. 20
6. A mattress according to any one or more of the preceding claims, **characterised in that** the type of foam used for the upper mattress is different from the type of foam used for the lower mattress, with the upper mattress preferably comprising a viscoelastic foam type and the lower mattress preferably comprising a resilient foam type. 25
7. A mattress according to any one or more of the preceding claims, **characterised in that** the upper mattress and/or the lower mattress comprise one or more detachable parts at a short end thereof. 30
8. A mattress according to any one or more of the preceding claims, **characterised in that** the upper mattress has a part at the foot thereof which has a different hardness than the remaining part of the upper mattress. 35
9. A mattress according to claim 8, **characterised in that** the part having a hardness different from that of the remaining part of the mattress has a downwardly sloping configuration. 40
10. A mattress according to one or both of claims 8 - 9, **characterised in that** the hardness of the part at the foot is lower than the hardness of the remaining part of the upper mattress. 45
11. A mattress according to any one or more of the preceding claims, **characterised in that** the recesses 50

are not spaces which are hollow on one side and which are arranged in a matrix pattern over the entire area of at least one of the upper mattress and the lower mattress.

12. A mattress according to any one or more of the preceding claims, **characterised in that** both the upper mattress and the lower mattress are enclosed in a cover, which cover is detachable and which is preferably provided with a closure, in particular selected from zip closure and/or Velcro closure, so as to be able to completely enclose the aforesaid mattress in said cover. 55

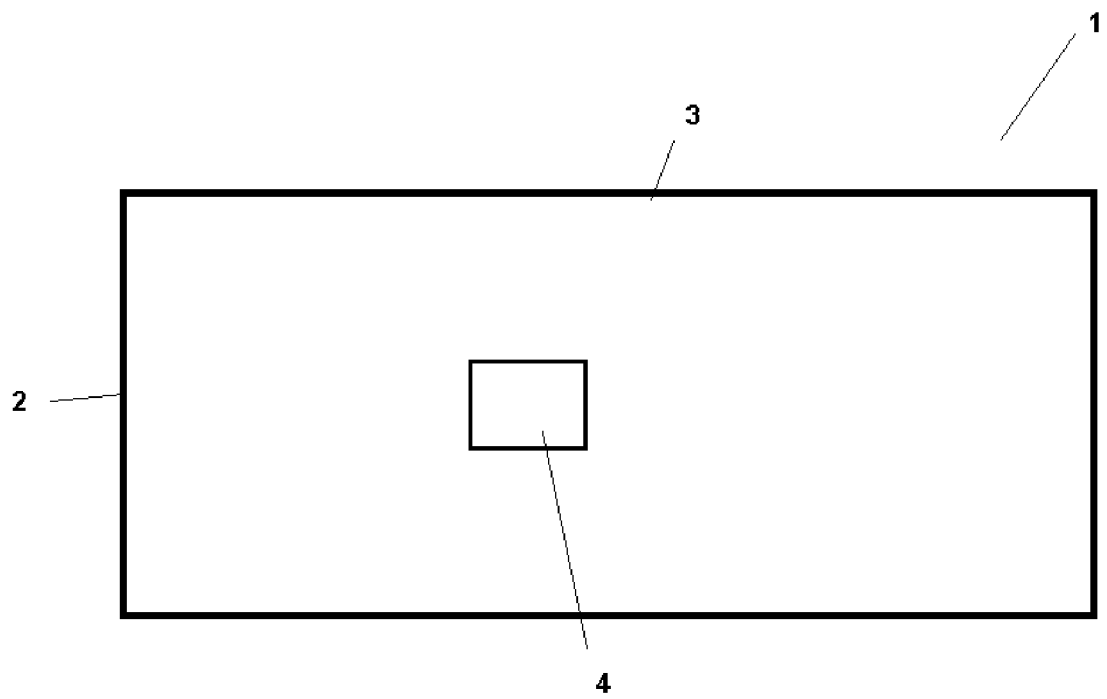


Fig. 1

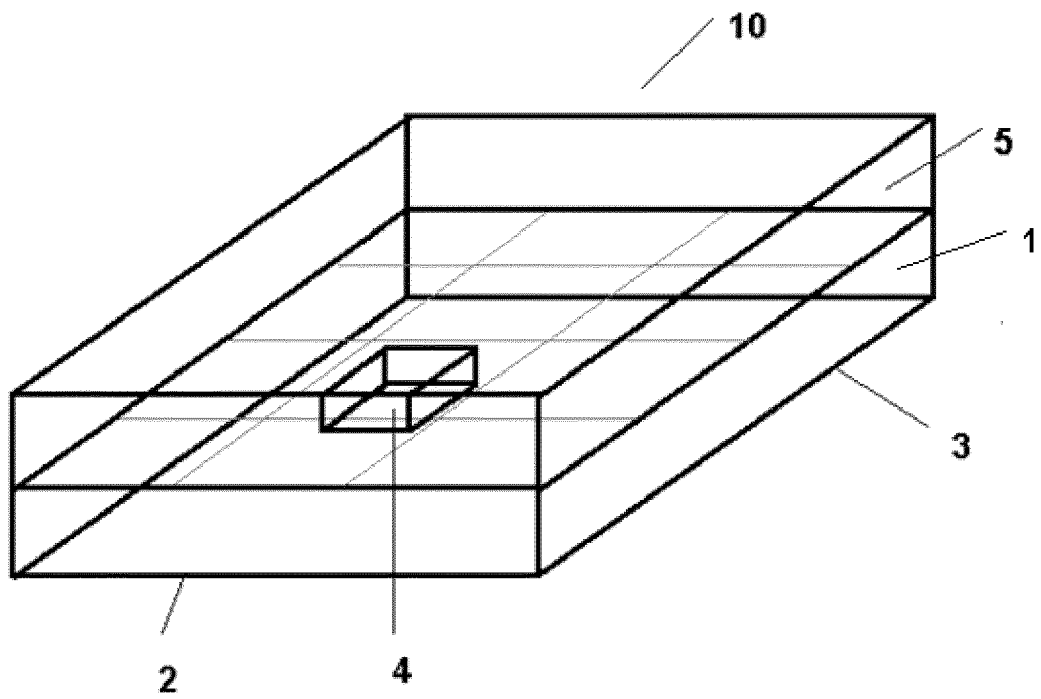


Fig. 2

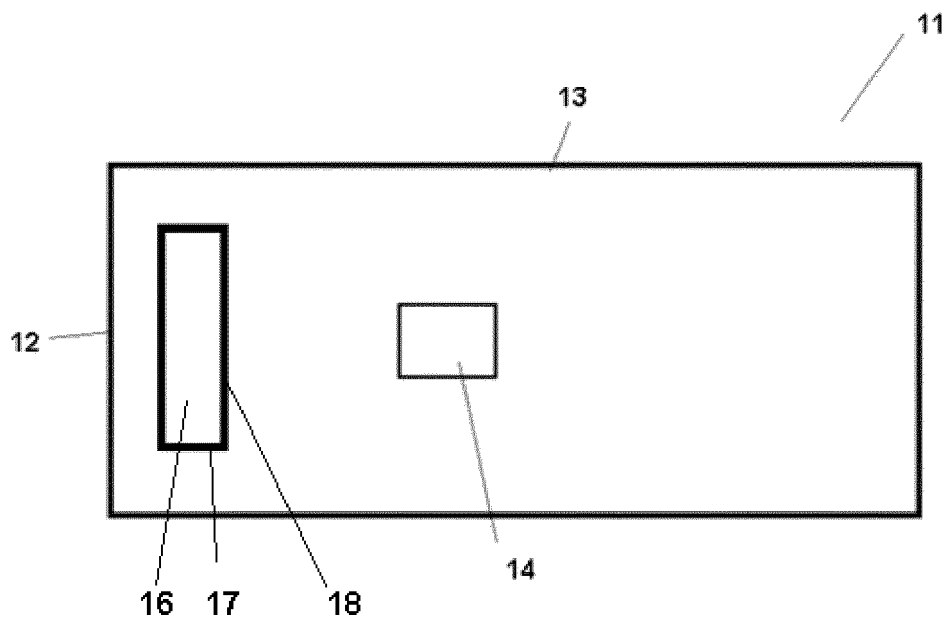


Fig. 3

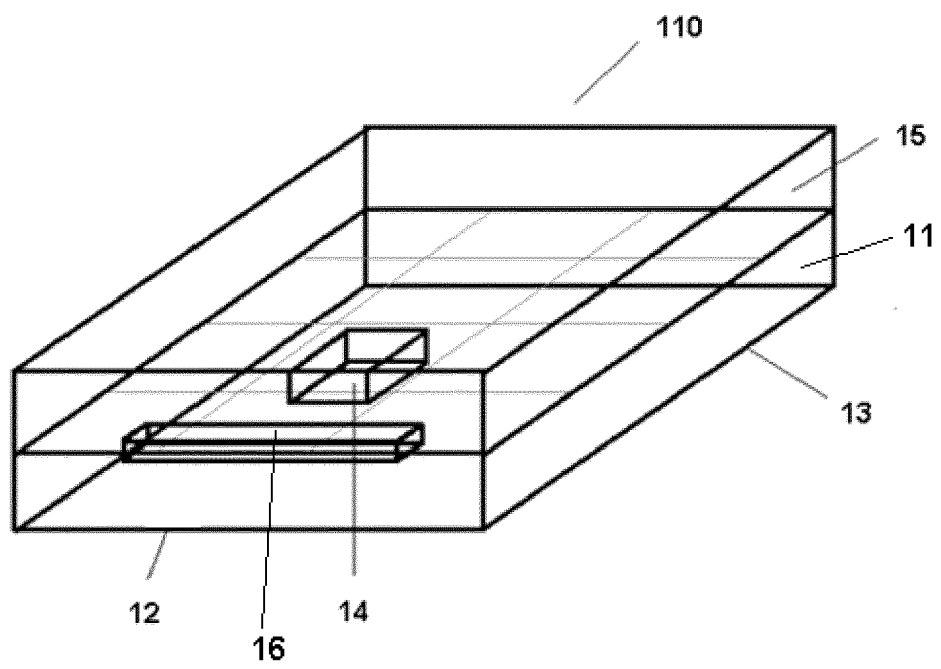


Fig. 4

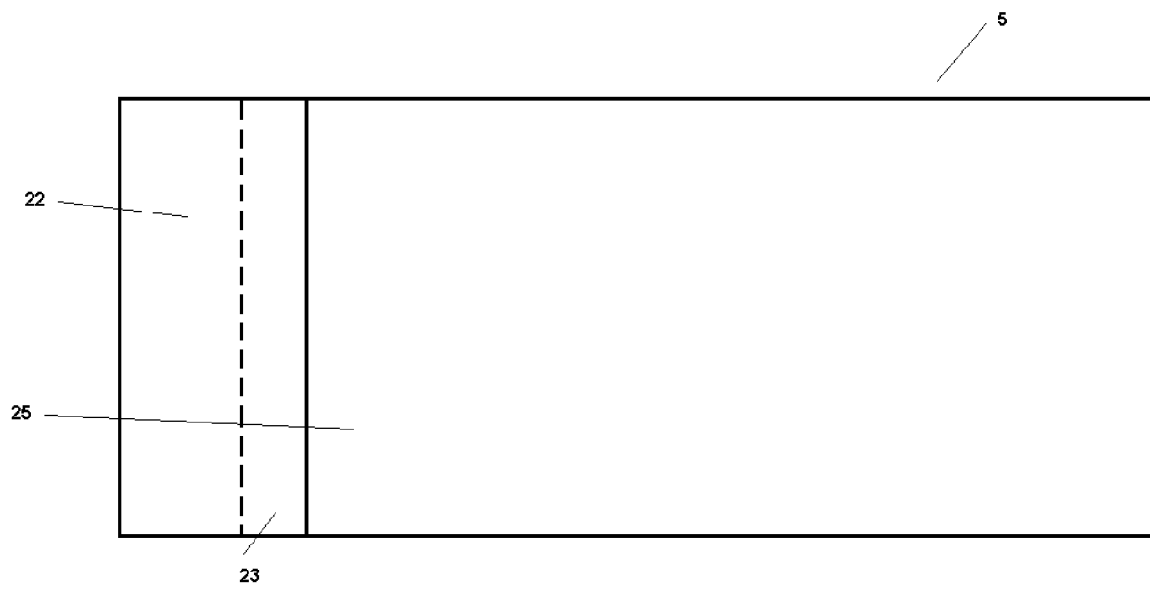


Fig. 5

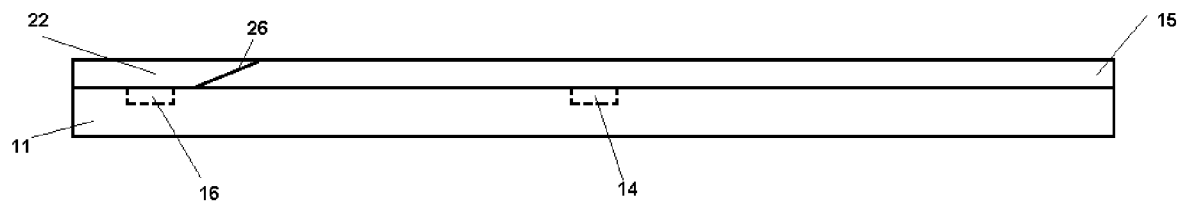


Fig. 6



EUROPEAN SEARCH REPORT

Application Number
EP 14 16 6760

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	W0 87/06442 A1 (COMFORTEX INC [US]) 5 November 1987 (1987-11-05)	1-6,11, 12	INV. A47C27/15
Y	* figure 1 * * page 4, lines 13-21 * * page 8, lines 13-18 * * page 9, lines 18-23 *	8,10	A47C27/14
X	W0 2007/092243 A2 (BG IND LLC [US]; BALONICK ARNOLD [US]; WYATT CURTIS [US]) 16 August 2007 (2007-08-16)	1,3-10, 12	
A	* figures 12,3a * * paragraphs [0017] - [0019] *	11	
X	US 2011/059830 A1 (REESE MATTHEW G [US]) 10 March 2011 (2011-03-10)	1,2,5,6, 11	
	* figures 2,4 * * paragraphs [0012], [0013], [0017] *		
X	US 2011/154576 A1 (WARREN STEPHEN C [US] ET AL) 30 June 2011 (2011-06-30)	1,4-6	
A	* figures 4,5 * * paragraph [0061] *	11	TECHNICAL FIELDS SEARCHED (IPC)
X	US 6 223 371 B1 (ANTINORI STEVEN J [US] ET AL) 1 May 2001 (2001-05-01)	1,3,5,6, 11,12	A47C
	* figures 3,4 * * column 3, lines 1-18 *		
X	US 4 631 768 A (FERRALL PETER J [AU]) 30 December 1986 (1986-12-30)	1,2,5,6, 11	
	* figure 1 * * column 1, lines 48-58 *		
X	US 2013/081208 A1 (DYEVIK MICHAEL [US] ET AL) 4 April 2013 (2013-04-04)	1-3,5-11	
	* table 1 * * paragraph [0039] * * figures 1,4,7 *		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 3 July 2014	Examiner Sainz Martínez, M
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPO FORM 1503.03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 14 16 6760

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	GB 2 301 529 A (TORPEY MICHAEL [GB]) 11 December 1996 (1996-12-11) * figure 1 * * page 3, line 29 - page 4, line 2 * -----	1,3,5,7, 11	
Y	US 3 846 857 A (WEINSTOCK C) 12 November 1974 (1974-11-12) * figure 2 * * column 3, lines 2-10 * -----	8,10	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 3 July 2014	Examiner Sainz Martínez, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03.92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 14 16 6760

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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03-07-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 8706442 A1	05-11-1987	CA 1271571 A1	10-07-1990
		EP 0264439 A1	27-04-1988
		JP H0655214 B2	27-07-1994
		JP H01500488 A	23-02-1989
		US 4706313 A	17-11-1987
		WO 8706442 A1	05-11-1987
WO 2007092243 A2	16-08-2007	AU 2007212590 A1	16-08-2007
		CA 2641330 A1	16-08-2007
		CN 101370411 A	18-02-2009
		EP 1978847 A2	15-10-2008
		JP 5166289 B2	21-03-2013
		JP 2009525133 A	09-07-2009
		US 2009222996 A1	10-09-2009
		WO 2007092243 A2	16-08-2007
US 2011059830 A1	10-03-2011	NONE	
US 2011154576 A1	30-06-2011	NONE	
US 6223371 B1	01-05-2001	NONE	
US 4631768 A	30-12-1986	NONE	
US 2013081208 A1	04-04-2013	CA 2850220 A1	04-04-2013
		US 2013081208 A1	04-04-2013
		WO 2013049647 A1	04-04-2013
GB 2301529 A	11-12-1996	NONE	
US 3846857 A	12-11-1974	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1719436 A [0003]
- EP 1352597 A [0004]
- WO 8706442 A [0005]
- EP 0290674 A [0006] [0019]
- US 20040098806 A [0007]