

(19)



(11)

**EP 1 913 848 A1**

(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:

**23.04.2008 Bulletin 2008/17**

(51) Int Cl.:

**A47C 27/08 (2006.01)**

**A47C 27/06 (2006.01)**

(21) Application number: **06122342.6**

(22) Date of filing: **16.10.2006**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR  
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI  
SK TR**

Designated Extension States:

**AL BA HR MK RS**

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(54) **Mattress**

(57) The invention relates to a mattress for use in a bed, seat or the like, comprising a pocketed spring assembly (3) including a plurality of parallel strings of springs (5) joined to each other. Each of said strings of springs (5) comprising a row of interconnected pockets containing at least one spring (4,5) encased in fabric such that the upper ends of the springs (4,5) are substantially flush with each other in an unloaded condition of the mattress. Inflatable members (6) are located underneath select positions of strings of springs (5). Each of said inflat-

able members (6) is of a width similar to one of said string of springs (5). The springs (5) in the strings of springs (5) under which an inflatable member (6) is located and the respective inflatable members (6) are positioned such with respect to each other that in the non-inflated condition of the inflatable members (6) the springs (5) are unsupported and have a free stroke, while in the inflated condition of the inflatable members (6), the springs (5) remain substantially unloaded by the inflatable members (6) when the mattress is unloaded.

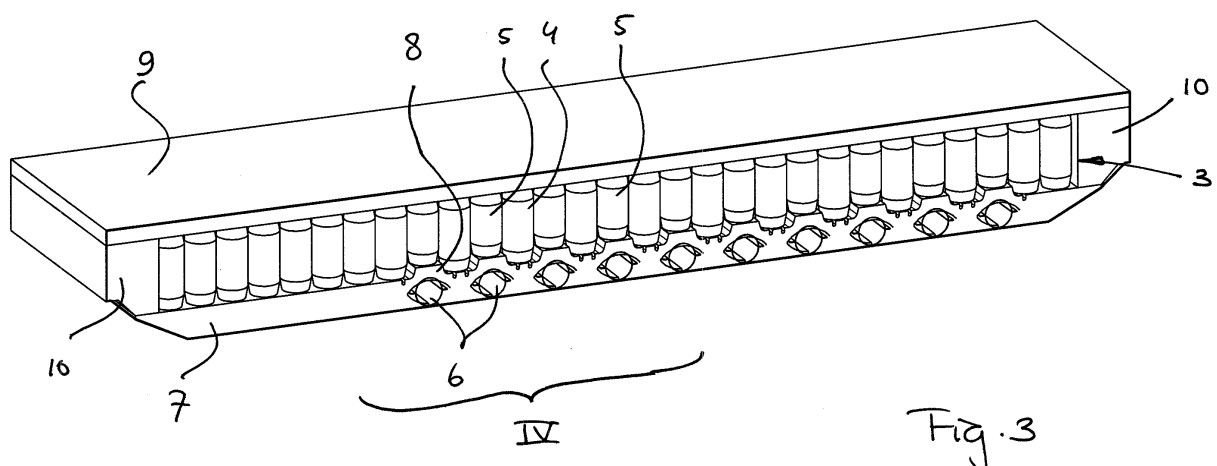


Fig. 3

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## Description

**[0001]** The present invention relates to a mattress according to the preamble of claim 1.

**[0002]** Such mattress is known from US 6,986,182 B2. This mattress comprises a number of inflatable members which extend either in transverse or longitudinal direction of the mattress in selected areas. The firmness of these selected area's can be adjusted by inflating or deflating the inflatable members. The inflatable members are sandwiched between a lower scrim sheet and some strings of springs and when inflated, the inflatable members preload select areas of the product.

**[0003]** The present invention has as one of its objects to improve the prior art mattress.

**[0004]** For this purpose the mattress according to the invention includes the features of the characterising portion of claim 1.

**[0005]** According to the invention, no or hardly no pretension of springs is effected when the inflatable members are inflated. As a result, a safer, more reliable and more comfortable mattress may be obtained, while providing the possibility of a much wider range in firmness variation. The mattress is safer as no tension within the mattress is created which could lead to springs being pushed out of the mattress. Moreover, there is a lower risk of leakages due to the tension by the springs on the inflatable members. The pretension of selected springs will also shorten the useful length of these, causing the person sitting on it to hit the bottom after already a very short compression length of the springs, and the pretension will cause an uneven tension in the upper surface of the mattress which may cause an uncomfortable feeling for a person lying in bed.

**[0006]** One embodiment of the mattress according to the invention is such that the springs in the strings of springs under which an inflatable member is located is shorter than the springs in the strings without an inflatable member.

**[0007]** Such shorter springs enable an inflatable member to vertically overlap with the longer springs, so that the total height of the mattress may be controlled and the relative positioning secured.

**[0008]** Preferably the mattress comprises an upholstered support at least below the pocket that spring assembly and the inflatable member is provided in the support.

**[0009]** The upholstered support provides the underlay of the mattress and further accommodates the inflatable member, so that the inflatable members are integrated within the mattress.

**[0010]** This upholstered support can also be used to position the inflatable members at a level below the lower end of the springs without inflatable members.

**[0011]** It is advantageous if the upholstered support has cavities for accommodating the inflatable members therein. The cavities are preferably slitted to the lower surface of the support.

**[0012]** These features facilitate introduction and removal of the inflatable members, which is for example necessary if an inflatable member has a leakage and the inflatable member should be repaired or replaced. A user might than be able to carry out the replacement.

**[0013]** This is particularly easy if the inflatable members are interconnected and have a common connection to an inflating means, as a result of which the inflatable members can be replaced as a unit and can be connected to the inflating means through one connection only.

**[0014]** Although it is possible to create an intermediate firmness by only partly inflating the inflatable members, it is favourable if each inflatable member has at least two superposed chambers which are inflatable independently of each other.

**[0015]** As a result thereof it is possible to create a rather firm support for the strings of springs at different levels by fully inflating one or more of the chambers. A controlled stepwise control of the firmness variation is then possible.

**[0016]** In a particular embodiment the springs having an inflatable member comprise an inner spring and outer spring of different length. As a result of this feature an additional firmness will be caused especially when the member is inflated and/or when the spring unit is compressed to a larger extent, i.e. far enough to engage the shorter inner springs for instance when a heavier person is lying on the bed. It is advantageous if the difference in length between the inner and outer spring is chosen in relation with the height of the inflatable member in such a way, that a very light person will not notice the influence of the second shorter spring in the non-inflated situation, while still having the possibility of increasing the firmness by inflating the member. Of course, such double springs can also be created in the strings of springs without an inflatable member.

**[0017]** Further features and advantages of the invention will become clear from the following description of the invention with reference to an accompanying drawings showing several embodiments of the invention.

Fig. 1 and 2 are sketches of the principles of the mattress according to the invention, in two embodiments.

Fig. 3 is a longitudinal sectional view of an embodiment of the mattress according to the invention.

Fig. 4 shows detail IV in Fig. 3 on a larger scale.

Fig. 5 is a perspective schematic view of the inflatable members in the mattress according to Fig. 3 and 4 with a scheme of the control means.

Figs. 7 and 8 very schematically show the operation of a particular spring arrangement in the situation in which the inflatable member is deflated.

Fig. 9 and 10 are views corresponding to those of Figs. 7 and 8, but with the inflatable member inflated.

**[0018]** The drawings show embodiments of a mattress according to the invention which is intended for use on a bed. However, it should be kept in mind that the mat-

tress according to the invention is useful in any bedding or sitting product.

**[0019]** The mattress according to the invention has a substantially planar top surface 1 and a parallel generally planar bottom surface 2. Within the mattress there is provided a pocketed spring assembly 3. This pocketed spring assembly 3 includes strings of interconnected springs which may either extend transversely or longitudinally, in this case transversely. Each string of springs comprises springs which may be equal or may differ from each other to obtain different spring characteristics along the length of the string, i.e. along the length or width of the mattress.

**[0020]** Fig. 1 and 2 show strings of springs 4 and adjacent strings of springs 5 having and inflatable member 6 under it. The inflatable members 6 are provided in an upholstered support 7. This support 7 supports the springs 4 with a firmness according to the desired firmness range to be covered by the mattress, so that these springs 4 will be compressed if they are loaded from above, while the support 7 will also be slightly compressed and will yield at the position of the inflatable members 6 if the springs 5 are loaded from above and the inflatable members 6 are deflated. The springs 5 will thus have a free stroke when the inflatable members 6 are deflated so that only the springs 4 will be active during the first compression of the mattress and the mattress will therefore have a soft feeling.

**[0021]** If the inflatable members 6 are inflated, the support 7 will immediately provide a firm support for the springs 5. However, the springs 5 will remain substantially unloaded when the inflatable members 6 are inflated, so that there is no or hardly no pre-compression of the springs 5. When the springs 4 and 5 are loaded with the inflatable members 6 inflated, the mattress will have a firmer spring characteristic, so that the firmness of the mattress is adjustable by means of the inflatable members. In other embodiments, springs 5 could be longer than springs 4.

**[0022]** Fig. 1 shows an embodiment of the mattress in which the springs 5 are shorter than the springs 4 and the inflatable members 6 are accommodated in portions 8 of the support which project into the spacing between two longer springs 4. By this arrangement, the total height of the mattress can be kept lower than in the situation of Fig. 2 where all springs 4, 5 are of even length and the inflatable members 6 are just provided in the support 7 having an even thickness over the whole area. Furthermore, the arrangement of Fig. 1 has the advantage that there is no risk of a mutual horizontal displacement between the springs 4, 5 and the support 7 which would lead to misalignment of the springs 5 and the inflatable members 6. The interengagement of the support 7 and the pocketed spring assembly 3 prevents such misalignment.

**[0023]** Figs. 3 and 4 schematically show a practical embodiment of the mattress according to the invention. Besides the pocketed spring assembly 3 and the uphol-

stered support 7 there is shown a covering pad 9 on top of the pocketed spring assembly 3 and a surrounding edge cover 10. The complete mattress can be covered by a cover holding all parts together and providing an attractive appearance of the mattress (not shown). The inflatable members 6 are provided in the neck to knee area of the mattress, but could also have been positioned for example in the waist area only.

**[0024]** All springs 4, 5 are individually accommodated in pockets 11 of fabric and adjacent pockets 11 are interconnected, for example by gluing. Preferably the pockets 11 are interconnected at two vertically spaced positions 11A, 11B (Fig. 4), however at a distance from the upper and lower ends of the springs 4, 5. This enables adjacent springs 4, 5 to be compressed at different rates without being hindered by the connection of their pockets 11.

**[0025]** Fig. 4 shows some details of the support 7, particular cavities 12 for accommodating the inflatable members 6 therein. The cavities 12 can be opened from the bottom surface 2 of the mattress through slits 13 enabling the inflatable members 6 to be introduced and removed into and from the cavities 12. The cavities 12 are more or less almond-shaped in cross section to facilitate removal and introduction. Furthermore, this shape will facilitate the vertical movement of the superposed portion 8 of the support 7 when the inflatable member 6 is deflated. Also grooves 14 adjacent the portions 8 will promote the vertical movement thereof, thereby allowing the springs 5 to make a free stroke when the inflatable members 6 are deflated.

**[0026]** Fig. 5 separately shows the assembly of the inflatable members 6 and the connected equipment. The drawing shows that all inflatable members 6 are constructed as hoses connected on both ends to connection lines 15, 16. All inflatable members are connected, through connection line 16, to a fluid pump, in particular an air pump 17, with interposition of a valve 18. The pump 17 is connected to energising means, such as a 12 Volt accumulator or a mains transformer/converter. The pump 17 and valve 18 are also connected to a control box having buttons or the like in order to enable a person lying in bed to inflate or deflate the inflatable members 6 in the mattress. This makes it very easy for a user to adjust the mattress such that a comfortable resting position is obtained.

**[0027]** Figs. 7-10 show details of a spring arrangement in which the springs 5 comprises an additional inner spring. This inner spring 21 may be individually pocketed and is known in the industry as a "Joey"-spring, normally used to create a very firm mattress without having to increase the wire diameter of the main springs. By means of this Joey-spring 21 the variable spring characteristic in this invention can be further adapted, because the inflatable member enables to practically switch the inner springs on and off. Generally, this inner spring 21 will be provided in a firm spring 5, while the springs 4 will be softer. When a mattress contains such spring assembly

the following operation will take place.

**[0028]** When the inflatable members 6 are deflated and a light person will occupy the bed, only the soft springs 4 will take up the load as the springs 5 and 21 will find no support and will make a free stroke as long as the inflatable member is not fully compressed. Only after that position is reached the spring 5 will join the springs 4 in building up spring force and generally the Joey-spring 21 will not come into action, for very light persons.

**[0029]** In the situation according to Figs. 9 and 10, the inflatable members 6 are inflated so that the springs 5 and 21 will be substantially rigidly supported. In that case, the springs 4 and 5 will be compressed simultaneously from the start, so that the mattress will have a firmer characteristic. The Joey-springs 21 will remain inactive until the upper end of the springs 5 has reached the upper end of the springs 21 and upon a further downward movement, both springs 5 and 21 will be active, so that there will be an increased firmness during a further stroke. Therefore, the Joey-spring 21 will create a progressive spring characteristic in the selected portions of the mattress. This effect can be influenced by increasing or decreasing the amount of inflation.

**[0030]** The invention is not limited to the embodiments shown in the drawings and described above which may be varied within the scope of the appended claims and their technical equivalents. For example, it is possible to connect the inflatable members in horizontal or vertical groups of similar or different volumes, so that different firmness adjustments may be obtained in different sections of the mattress. The springs will normally be diabolical helical springs but other springs are conceivable, while also different springs may be used in different sections of the mattress. The inflatable members will preferably be inflated with air but every fluid, either liquid or gas, might be used depending on the requirements. The support will generally be formed from a foam material, but other supports can be used with similar or different characteristics. The inflatable members may be shaped and constructed in different ways such that they allow vertical compression when they are deflated. They should be fluid tight and allow fluid to enter and exit in a suitable manner.

## Claims

1. Mattress for use in a bed, seat or the like, comprising:

a pocketed spring assembly (3) including a plurality of parallel strings of springs joined to each other, each of said strings of springs comprising a row of interconnected pockets, each of said pockets containing at least one spring (4, 5) such that the upper ends of the springs are substantially flush with each other in an unloaded condition of the mattress;  
inflatable members (6) located underneath se-

lect positions of strings of springs (5), each of said inflatable members being of a width similar to one of said string of springs (5),

**characterized in that** the springs (5) in the strings of springs under which an inflatable member (6) is located and the respective inflatable members are positioned such with respect to each other that in the non-inflated condition of the inflatable members (6) the springs (5) are unsupported and have a free stroke, while in the inflated condition of the inflatable members (6), the springs (5) remain substantially unloaded by the inflatable members when the mattress is unloaded.

2. Mattress according to claim 1, wherein the springs (5) in the strings of springs under which an inflatable member (6) is located are shorter than the springs (4) in the strings without an inflatable member, and the inflatable member (6) may overlap with the springs (4) without inflatable member.
3. Mattress according to claim 1 or 2, wherein the mattress comprises an upholstered support (7) at least below the pocketed spring assembly (3) and the inflatable members (6) being provided in the support.
4. Mattress according to any of the preceding claims, wherein adjacent spring pockets (11) are interconnected at a distance from their upper and lower ends.
5. Mattress according to one of the preceding claims, wherein the upholstered support (7) has cavities (12) for accommodating the inflatable members (6) therein, the cavities being slitted to the bottom surface (2) of the support (7).
6. Mattress according to one of the preceding claims wherein the inflatable members (6) are interconnected and have a common connection to an inflating means (17).
7. Mattress according to claim 6, wherein the inflatable members (6) are elongate hoses having two opposite ends, the hoses being interconnected and communicate at both of their ends.
8. Mattress according to one of the preceding claims, wherein each inflatable member (6) has at least two superposed chambers which are inflatable independently of each other.
9. Mattress according to one of the preceding claims wherein the springs (5) having an inflatable member (6) below comprise an inner spring (21) and an outer spring of different lengths.
10. Mattress according to one of the preceding claims,

wherein the inflatable members (6) extend in transverse direction of the mattress preferably over substantially the whole width of the mattress.

11. Mattress according to claim 10, wherein the inflatable members (6) are provided in only selected parts of the mattress, in particular the waist area or the neck to knee area. 5
12. Mattress according to one of the preceding claims wherein the inflatable members (6) are inflatable by inflation means (17) having a control member (20) which is controllable by a person lying in bed. 10

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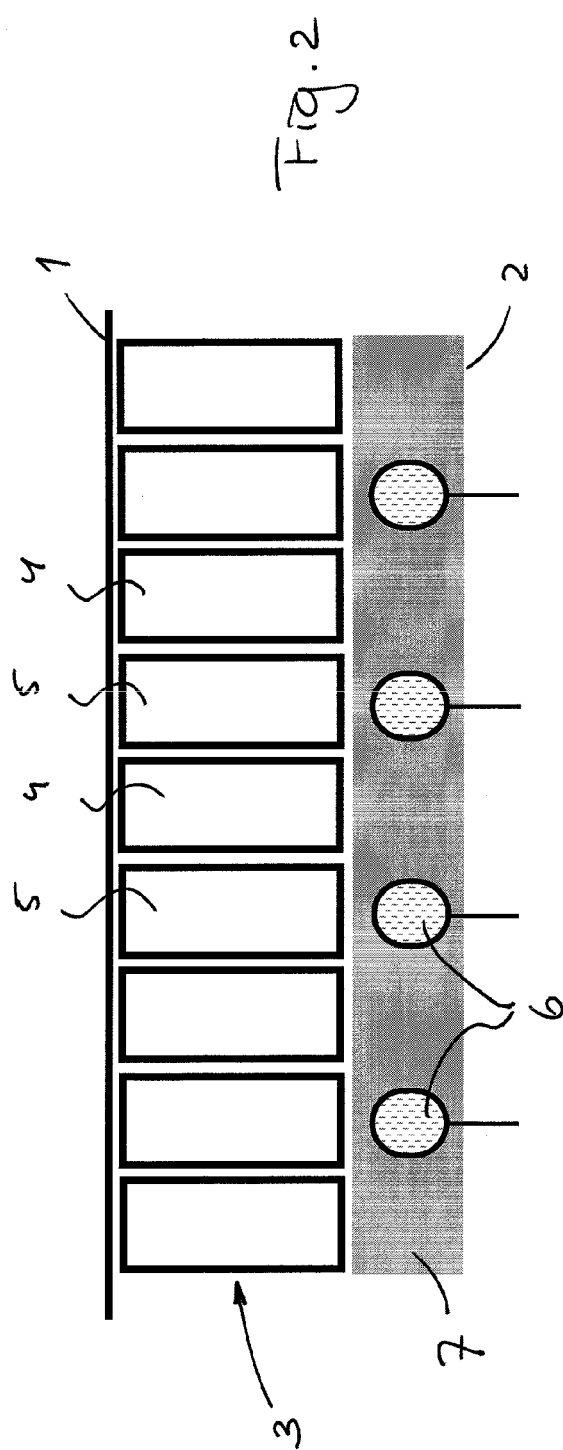
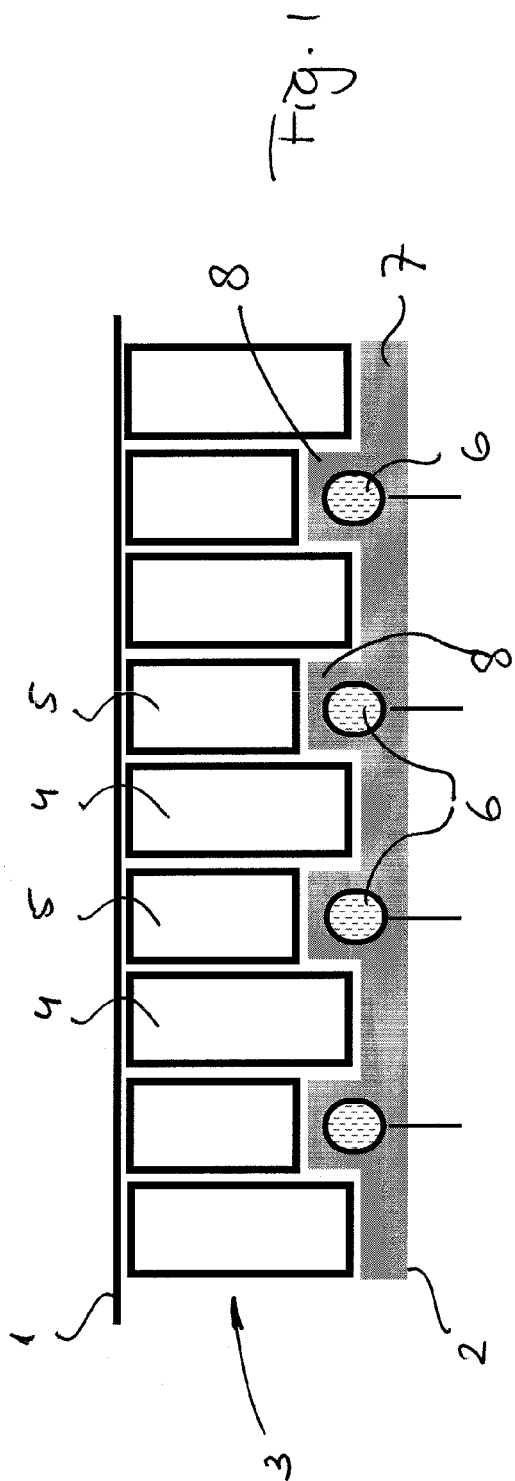
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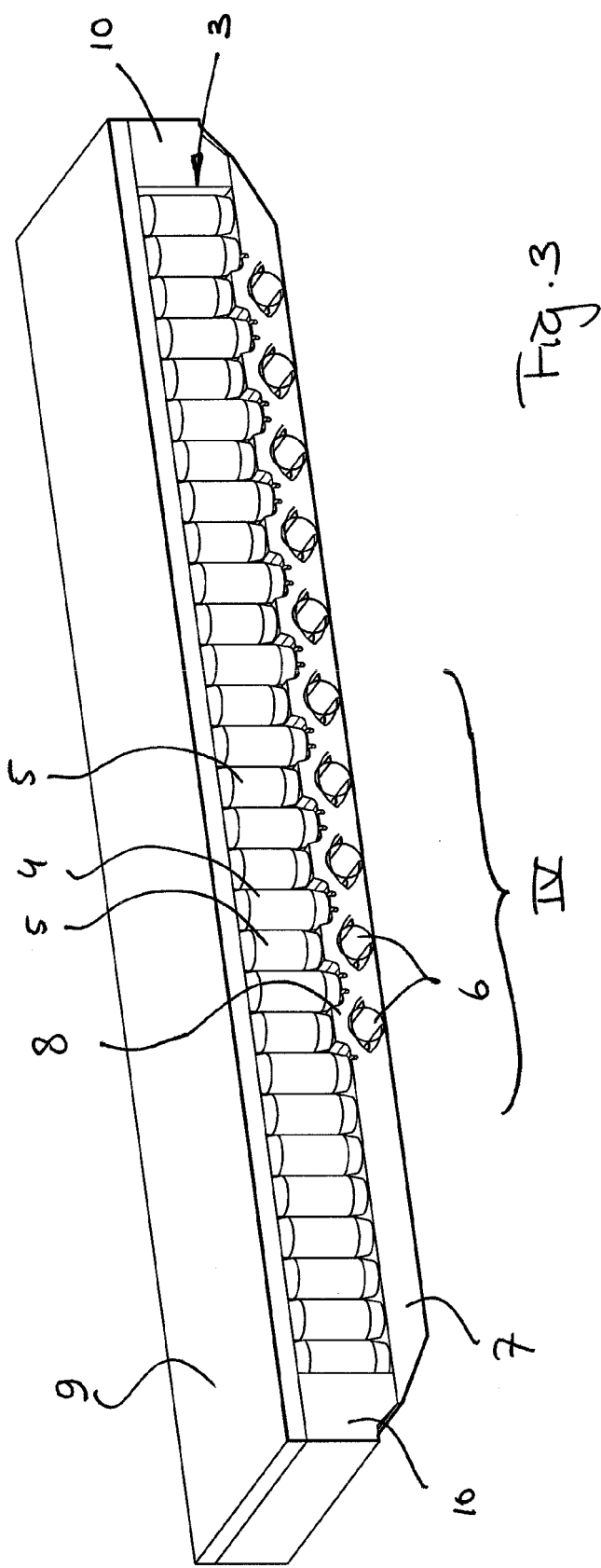
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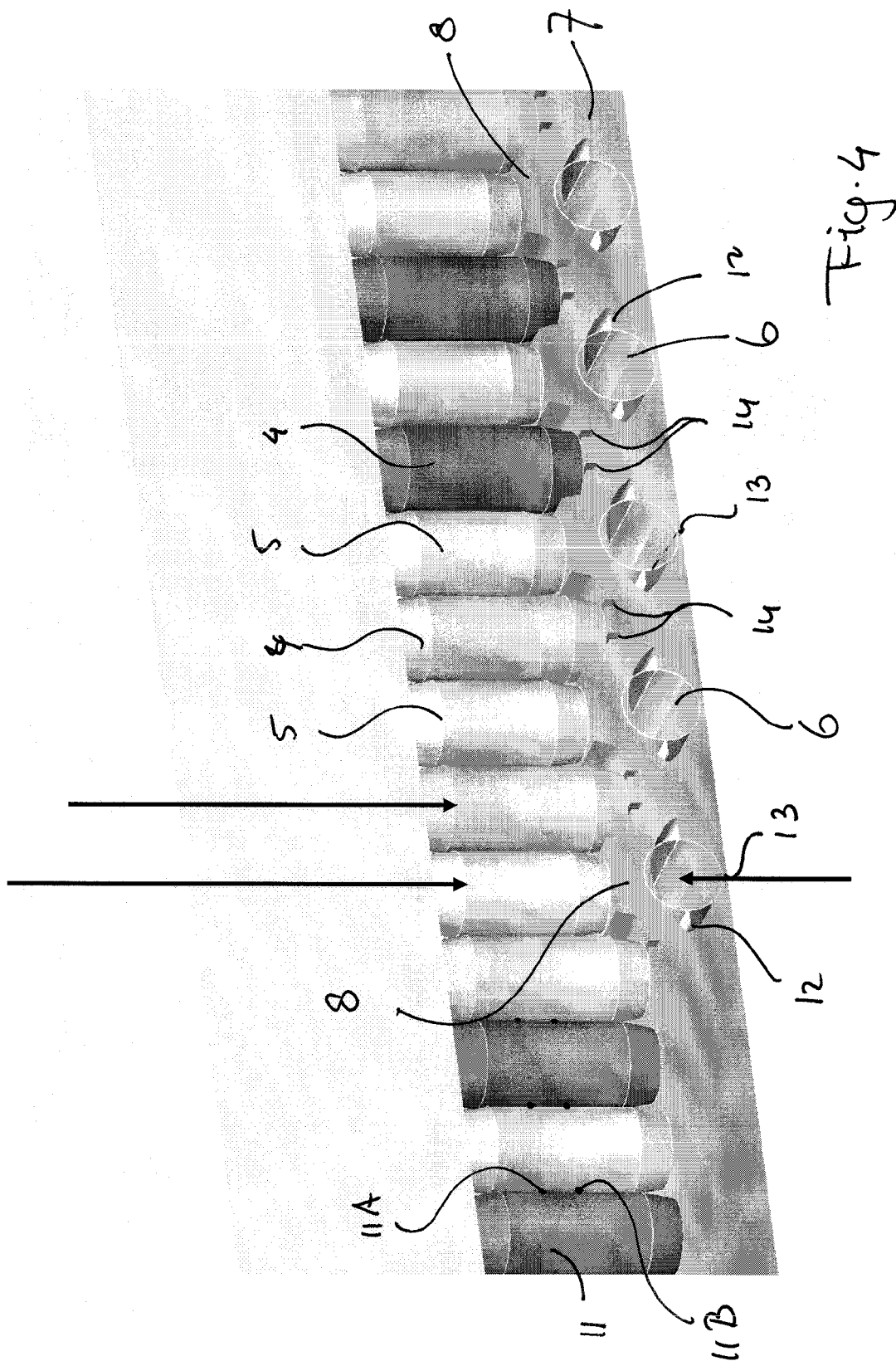
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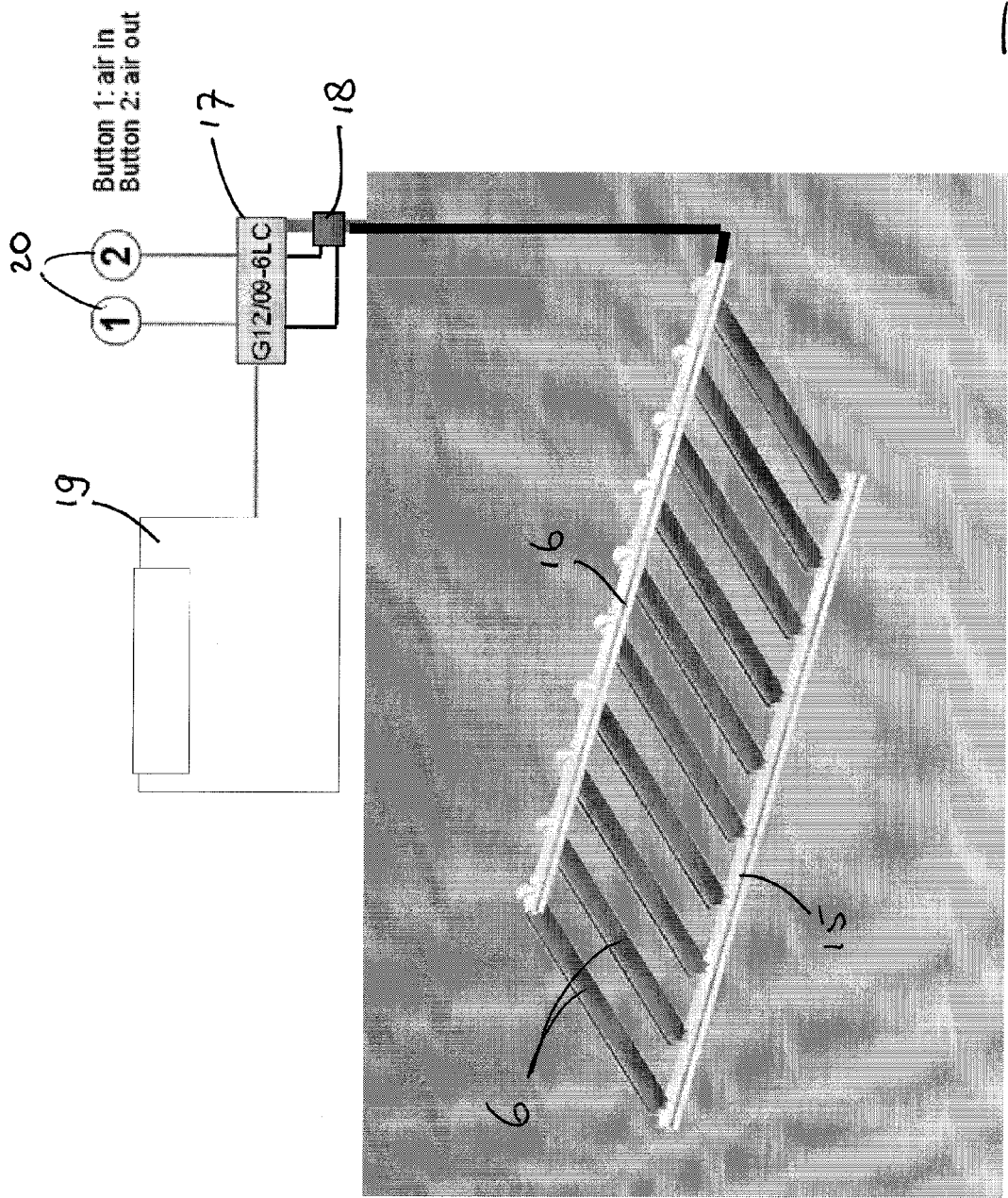
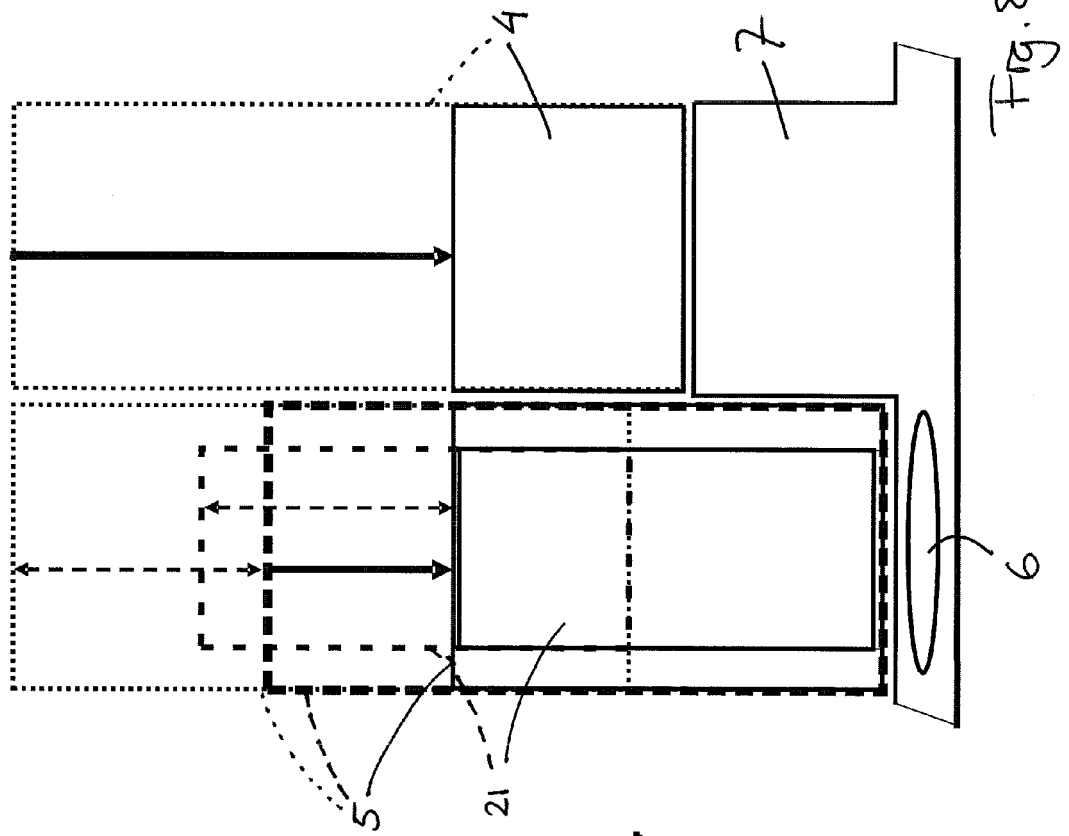
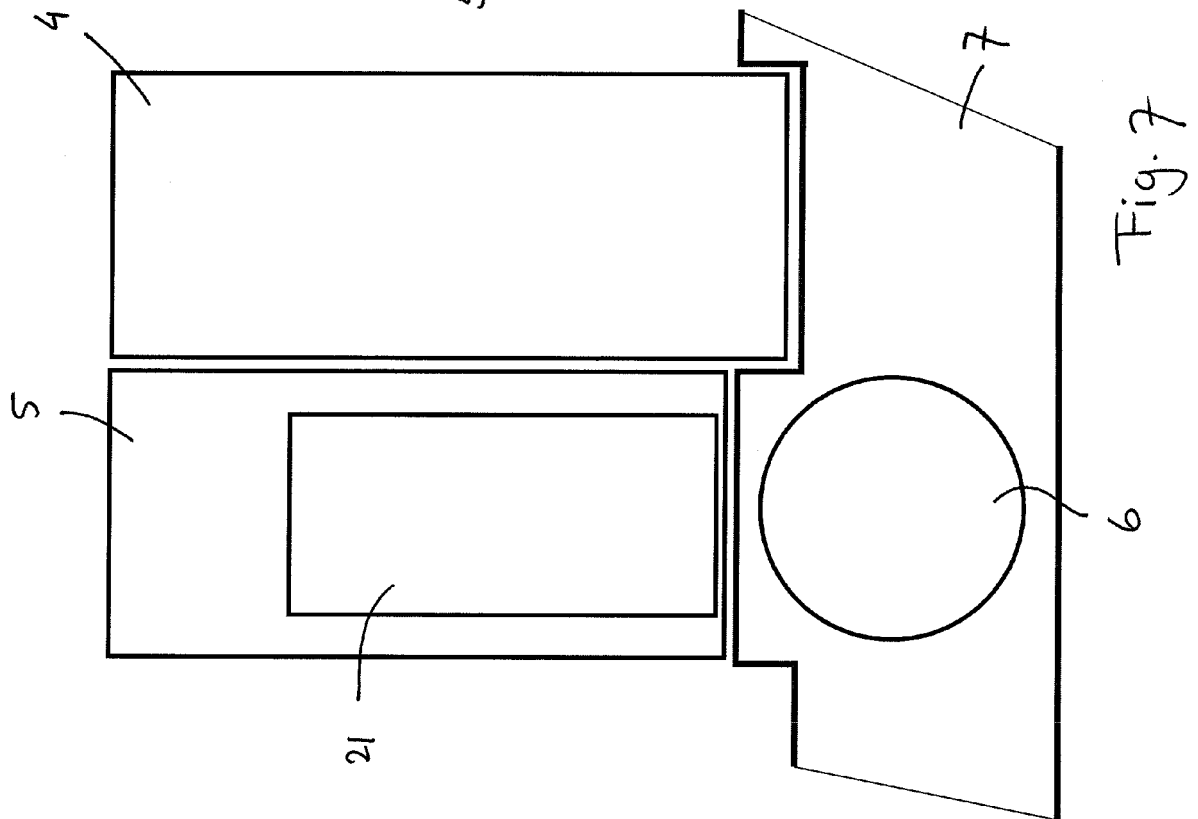
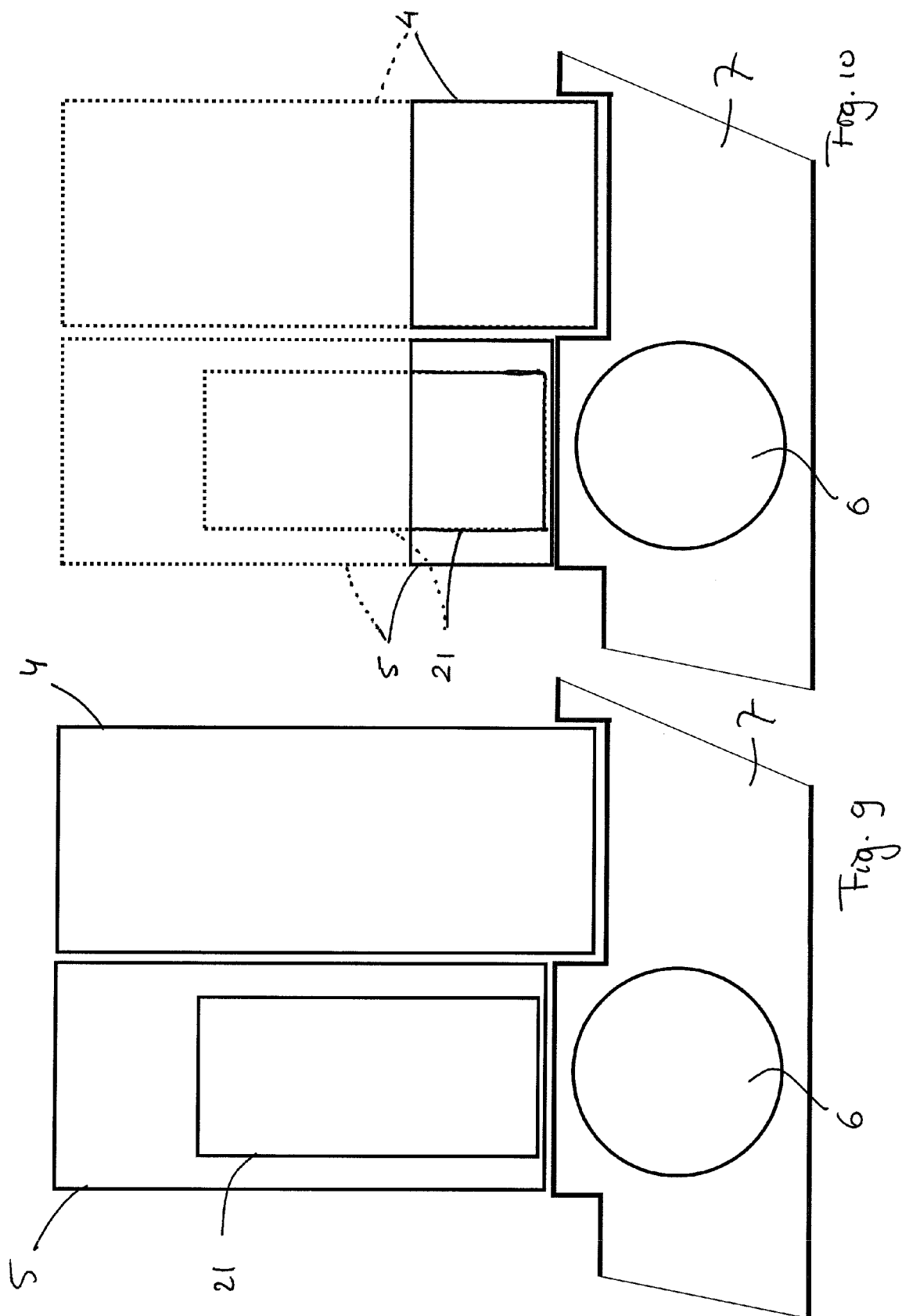


Fig. 5







European Patent  
Office

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Application Number  
EP 06 12 2342

| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | WO 2005/053466 A (HARRISON BEDDING LTD [GB]; SPINKS SIMON PAUL [GB])<br>16 June 2005 (2005-06-16)<br>* page 5, line 10 - page 16, line 16;<br>figures 1-14 *                            | 1-4,9,<br>11,12                                    | INV.<br>A47C27/08<br>A47C27/06          |
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| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | US 3 919 730 A (REGAN JOHN J)<br>18 November 1975 (1975-11-18)<br>* column 3, line 24 - column 5, line 42;<br>figures 1-4 *                                                             | 1,3,6-8,<br>11,12                                  |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | EP 0 611 010 A1 (SIMMONS CO [US])<br>17 August 1994 (1994-08-17)<br>* column 7, line 23 - column 9, line 3;<br>figures 5-8 *                                                            | 1-3                                                |                                         |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                         |                                                    |                                         |
| Place of search<br>The Hague                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                         | Date of completion of the search<br>31 August 2007 | Examiner<br>Kus, Slawomir               |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                                                         |                                                    |                                         |

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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**REFERENCES CITED IN THE DESCRIPTION**

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