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(54) Compression plate

(57) The invention relates to a compression plate, which ensures a tight wrapping of continuous film on at least one compressible object during a packaging process. Prior to closing the continuous foil wrapped around the compressible object, the compression plate compresses the compressible object unevenly so as to ensure a desired shape of the packed compressible object after closing the continuous foil.

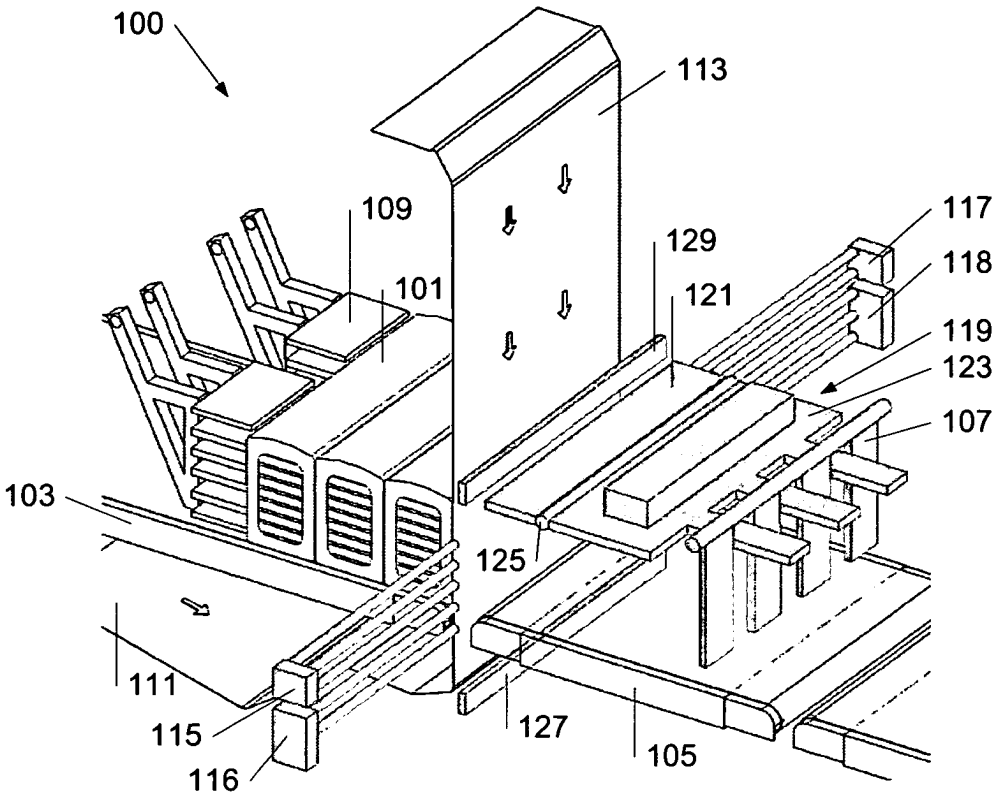

Fig. 1

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Description

[0001] The invention relates to a compression plate, which ensures a tight wrapping of one or more compressible objects.

Background

[0002] In the industry of insulation materials it is of outmost importance that the cubic content of the packets of insulation material is reduced to a minimum, enabling transportation of an increased number of packets per volume. Further, in order to simplify both the transportation of insulation material and to enhance the operability of the packages of insulation material on site, it is desired to bundle multiple packages of insulation material.

[0003] In general, compressible objects such as insulation materials are only compressible in one direction. Compression in any other direction than this will damage the properties of the insulation material. This unidirectional compression characteristic results in a number of problems described in the following.

[0004] Horizontal compression could also be performed. Here e.g. three packages of pre-compressed objects are led horizontally into a vertically oriented foil and are horizontally over-compressed. At this point three surfaces (top, bottom and one end) are covered in foil, the last and fourth surface is not yet covered. In order to maintain that over-compression before the foil is closed, spears are directed at the back of the last of the three packages - just in front of the fourth surface. The foil is hereafter closed and the spears withdrawn. Consequently, some of the potential energy of the over-compressed objects is released, whereby the objects expand and the foil is tightened. The over-compression causing the expansion of the objects is, however, undesired, as this can potentially destroy intended function of the objects. In the case of insulation material this could then lead to a reduction of the insulation properties. A solution to this could be to reduce the over-compression to a minimum. However, in the present example of three compressible objects that are bundled and packed in one, there is a risk that the centre object will fall out of the package. This is because most of the potential energy of the compressed objects will be released during expansion. The remaining potential energy is not sufficiently high to keep the centre object in place, which then risk falling out of the final package.

[0005] In the case of vertical compression, e.g. three packages - comprising a plurality of stacked objects - are led horizontally into a vertically oriented foil. Due to the unidirectional compressibility of the objects, they are only led into the foil without any horizontal compression. When three sides of the three packages have been covered in foil, spears are directed in front of the fourth side. Hereafter the objects are compressed, the foil is closed at the fourth side, and the spears are closed. Since the objects are directed into the foil in an uncompressed state, the length of the foil will be larger than the circumference of the compressed objects. Withdrawing the spears and removing the compression will therefore release the potential energy of the objects, which will expand. However, as there is more space left in the end of the package because of the withdrawn spears (fourth side), this expansion will be uneven. Hence, the final package that was to be rectangular will instead have an irregular shape, by e.g. having a larger height in one end, compared to the other.

Description of the invention

[0006] The present invention relates to a packaging machine for packaging at least one compressible object into foil comprising at least one compression plate, where the at least one compression plate comprises at least two segments which can be sloped individually, whereby it is obtained that the at least one compressible object can be unevenly compressed by the compression plate during the packaging process of the at least one compressible object. This is advantageous as the uneven compression of the compressible objects enables a desired uneven expansion of the compressible objects, when the compression plate no longer exerts its compression. Hereby an even final package is obtained. If the packaging machine employs spears as described above, the compression plate can advantageously compress the compressible objects more in the end of the spears. This because the foil wrapped along and around this end of the compressible objects and the spears lengthwise will correspond to the foil wrapped around the objects in the opposite and less compressed end. A further advantage is that the compression plate only compresses the compressible objects in the direction where the compressible objects are compressible. Damage to the properties of the compressible objects is thereby avoided.

[0007] In another embodiment of the packaging machine the at least two plate segments are interconnected by at least one hinge. In a further embodiment the compression plate further comprises at least one hinge connected to one of the at least two plate segments. Apart from the advantages already mentioned, this embodiment is advantageous as e.g. the number, form and size of the plate segment and hinges can be varied for example to accommodate a desired product type or product range.

[0008] In yet another embodiment of the packaging machine the compression plate comprises a flexible plate and at least one eyelet mounted on the flexible plate for separating at least two segments of said flexible plate. This embodiment is advantageous as the bending of the flexible plate can constitute a more coherent surface.

[0009] In other embodiments of the packaging machine, the compression plate compresses the at least one compressible object by pneumatic means or hydraulic means. In a further embodiment of the packaging ma-

chine the compression is employed by means of linear actuators. These different means are advantageous as they can be used to serve different purposes depending on e.g. the properties of the compressible objects and/or existing manufacturing equipment.

[0010] The present invention further relates to a method for wrapping a foil onto at least one compressible object, comprising the steps of wrapping at least one side of the at least one compressible object whereby the foil covers the at least one side and compressing the at least one compressible object unevenly. In a further embodiment the method comprises the step of closing the foil after the at least one compressible object has been unevenly compressed. Here the advantages are as described above.

Brief description of the drawings

[0011]

Figure 1 illustrates a packaging machine according to the present invention for packaging compressible objects, where the machine comprises a compression plate.

Figure 2 illustrates the packaging machine of figure 2 seen in a close up side view.

Figure 3a-d illustrate the steps by which the compression plate is utilized in the packaging process.

Figure 4 illustrates an alternative embodiment of the compression plate.

Figure 5 illustrates an alternative embodiment of the compression plate.

Description of embodiments

[0012] Figure 1 illustrates a packaging machine 100 according to the present invention for packaging compressible objects 101, where the packing machine 100 comprises a first 103 and a second transportation table 105, a fence 107 and a pushing device 109. The packed compressible objects 101 are only unidirectional compressible. The objects 101 can be directed into the packaging machine 100 side by side, in stacks, or as a plurality of stacks lying side by side or end to end. The stacks can be pre-packed in a compressed as well as in an uncompressed state. The present packaging machine 100 is embodied such that the compressible objects 101 can be compressed vertically.

[0013] The packaging machine 100 also comprises a first roll of foil 111 situated below the first transportation table 103 and a second roll of foil 113 placed above the first transportation table 103. The arrows seen on the two rolls of foil indicate the direction of movement of the foil. Tightening devices (not shown) ensure that the two rolls of foil 111, 113 are kept stretched for tight wrapping of the compressible object(s).

[0014] The packaging machine 100 additionally comprises two sets of spears; a first set comprising upper 115 and lower spears 116 and a second set likewise comprising upper 117 and lower spears 118.

[0015] The packing machine 100 further comprises a compression plate 119, where the compression area of the compression plate 119 substantially corresponds to the area of the compression surface of the objects facing the compression plate 119. The compression plate 119 is employed so as to vertically compress the compressible objects 101. The compression plate 119 comprises a first 121 and a second segment 123 connected by a hinge 125, which is placed perpendicularly to the conveying direction of the two transportation tables 103, 105. This means that the two segments 121, 123 of the compression plate 119 can be sloped individually. The compression plate can be embodied in a number of ways, e.g. by varying the number of segments and hinges.

[0016] The packaging machine 100 additionally comprises a first 127 and a second welding bar 129, which are placed such that when pushed together, the wrapping foil 111, 113 is situated in between the two. Hence, when not in use, the welding bars 127, 129 are placed on each side of the foil 111, 113. The two welding bars 127, 129 can be brought together by moving either both of the welding bars vertically or by moving only one of the welding bars 127, 129.

[0017] Figure 2 illustrates a side view of the packaging machine of figure 1. The compressible objects 101 are partly situated on the first 103 and partly on the second transport table 105. Hereby the compressible objects 101 or the part thereof closest to the compression plate 119 are wrapped in foil 111, 113. The first set of upper 115 and lower spears 116 can be seen in this side view.

[0018] The second segment 123 of the compression plate 119 is oriented horizontally and the first segment 121 is sloping downwards relative to the conveying direction. That is, the end of the first segment 121 facing the second foil 113 is positioned higher relative to the end of the first segment 121 facing the second segment 123 of the compression plate 119.

[0019] Figure 3a-d illustrate the steps by which the compression plate 119 is utilized in the packaging process.

[0020] In figure 3a, a number of bundled and packed compressible objects 101 are placed and gathered on the first transportation table 103. When gathered, the pushing device 109 pushes the objects 101 from the first transportation table 103, through the foil 111,113 and into the space defined by the second transportation table 105, the fence 107 and the compression plate 119. At this point of time in the process, the second segment 123 of the compression plate 119 is oriented horizontally and the first segment 121 is sloping downwards relative to the conveying direction. That is the end of the first segment 121 facing the second foil 113 is positioned higher

relative to the end of the first segment 121 facing the second segment 123. Due to the slope of first segment 121, the second segment 123 can be positioned such that the distance between the second segment 123 and the transportation table 105 is less than the height of the objects 101 led in between these two surfaces, whereby the foil 111, 113 is wrapped tightly around the objects 101.

[0021] As illustrated in figure 3b, when the movement of the compressible objects 101 is stopped by the fence 107, the sides of the compressible objects 101 facing the compression plate 119, the fence 107 and the second transportation table 105 are covered with the foil 111, 113. Hereafter the sloped first segment 121 is pivoted to a horizontal position, whereby the first segment 121 and the second segment 123 constitute one plane. Next, the lower set of spears 116, 118 are moved towards each other, so that they block the open end of the compressible objects 101 not yet covered by foil 111, 113. The compression plate 119 is then moved downwards, so that all compressible objects 101 are compressed uniformly.

[0022] Depending on the height of the compressible objects 101, the upper set of spears 115, 117 may be moved towards each other simultaneously with the lower set of spears 116, 118, so that the former block the upper part of the compressible objects 101 not yet covered by foil 111, 113.

[0023] As illustrated in figure 3c, the first segment 121 of the compression plate 119 is then pivoted such that the end of segment 121 facing the foil 111, 113 is moved downwards, whereby the parts of the compressible objects 101 placed under first segment 121 are further compressed. Hereafter the welding bars 127, 129 are moved together and the foil 111, 113 welded and cut.

[0024] In one embodiment of the invention, 127 is a knife and 129 is an opening, into which the knife 127 can slide. In another embodiment of the invention, the reverse is valid, and in yet another embodiment of the invention, both 127 and 129 are knifes.

[0025] Figure 3d illustrates the final steps in the wrapping process subsequent to the welding of the foil 111, 113, where the two welding knifes 127, 129 are moved away from one another and the lower spears 116, 118 withdrawn. Concurrently, the compression plate 119 is moved upwards again, whereby the potential energy of the compressed objects 101 is released, leading to an expansion of the compressible objects 101. This expansion will continue to the extent allowed by the length of the foil 111, 113 and e.g. the elastic properties thereof.

[0026] Since the compressible objects 101 have been led in an uncompressed state into the foil 111, 113 and afterwards compressed, the length of the foil 111, 113 around the compressible objects 101 is greater than the circumference of the compressible objects 101. The extra compression of the compressible objects 101 performed when turning the first segment 121 downwards ensures that the foil 111, 113 used to cover the fourth end of the compressible objects 101 corresponds to the foil 111, 113 used to cover the end of the compressible objects facing the fence 107.

[0027] When the wrapping process is completed, the compressible objects 101 are transported along the second table 105 for further transportation/storage. A new set of compressible objects 301 to be wrapped enters the first transport table 103.

[0028] Figure 4 illustrates an alternative embodiment of the compression plate 400 comprising three segments 438, 440, 442 and four hinges 430, 432, 434, 436. The compression plate 400 could be made of metal or a flexible material, such as a polymer-based material.

[0029] Figure 5 illustrates yet another embodiment of the compression plate 500, comprising only one flexible plate 552 and a number of eyelets 550. The eyelets could be connected to pneumatic actuators (not shown), which would cause the flexible plate 552 to bend as illustrated in figure 5. This bend of the flexible plate 500 resembles and essentially fulfils the same purpose as the compression plate 119, 400. The flexible plate 552 could be made of a flexible material such as spring steel, metal sheet of a polymer-based material.

[0030] The compression plates 119, 400, 500 can exert their compression by means of e.g. pneumatic, hydraulic or linear actuators.

[0031] In the above examples the packaging machine is used for wrapping square packs of compressible material, but a similar technique could of course also be used for wrapping rolls of compressible material or other shapes and resulting in similar advantages.

References

[0032]

100 Packaging machine
101 One or more compressible objects to be packed
103 First transportation table
105 Second transportation table
107 Fence
109 Pushing device
111 First roll of foil
113 Second roll of foil
115 First set of upper spears
116 First set of lower spears
117 Second set of upper spears
118 Second set of lower spears
119 Compression plate
121 Second segment of the compression plate 119
123 First segment of the compression plate 119
125 Hinge
127 Lower welding bar
129 Upper welding bar
301 New set of at least one compressible object to be packed
400 Compression plate
430 Hinge
432 Hinge

434 Hinge
436 Hinge
438 Plate segment
440 Plate segment
442 Plate segment
500 Compression plate
550 Eyelet
552 Flexible plate

Claims

1. A packaging machine (100) for packaging at least one compressible object (101) into foil (111, 113) comprising at least one compression plate (119), where said at least one compression plate (119) comprises at least two segments (121, 123) which can be sloped individually, whereby it is obtained that said at least one compressible object (101) can be unevenly compressed by said compression plate (119) during the packaging process of said at least one compressible object (101).

2. A packaging machine (100) according to claim 1, where said at least two plate segments (121, 123) are interconnected by at least one hinge (125).

3. A packaging machine (100) according to claims 1-2, where said compression plate (119) further comprises at least one hinge (430,436) connected to one of said at least two plate segments (121, 123).

4. A packaging machine (100) according to claims 1-3, where said compression plate (119) comprises a flexible plate (552) and at least one eyelet (550) mounted on said flexible plate (552) for separating said at least two segments of said flexible plate.

5. A packaging machine (100) according to claims 1-4, where said compression plate (119) compresses said at least one compressible object (101) by pneumatic means.

6. A packaging machine (100) according to claims 1-5, where said compression plate (119) compresses said at least one compressible object (101) by hydraulic means.

7. A packaging machine (100) according to claims 1-6, where said compression plate (119) compresses said at least one compressible object (101) by means of linear actuators.

8. A method for wrapping a foil (111, 113) onto at least one compressible object (101), comprising the steps of

   - wrapping at least one side of said at least one compressible object (101) whereby said foil (111, 113) covers said at least one side
   - compressing said at least one compressible object (101) unevenly

9. A method according to claim 8, further comprising the step of

   - closing said foil (111, 113) after said at least one compressible object (101) has been unevenly compressed.

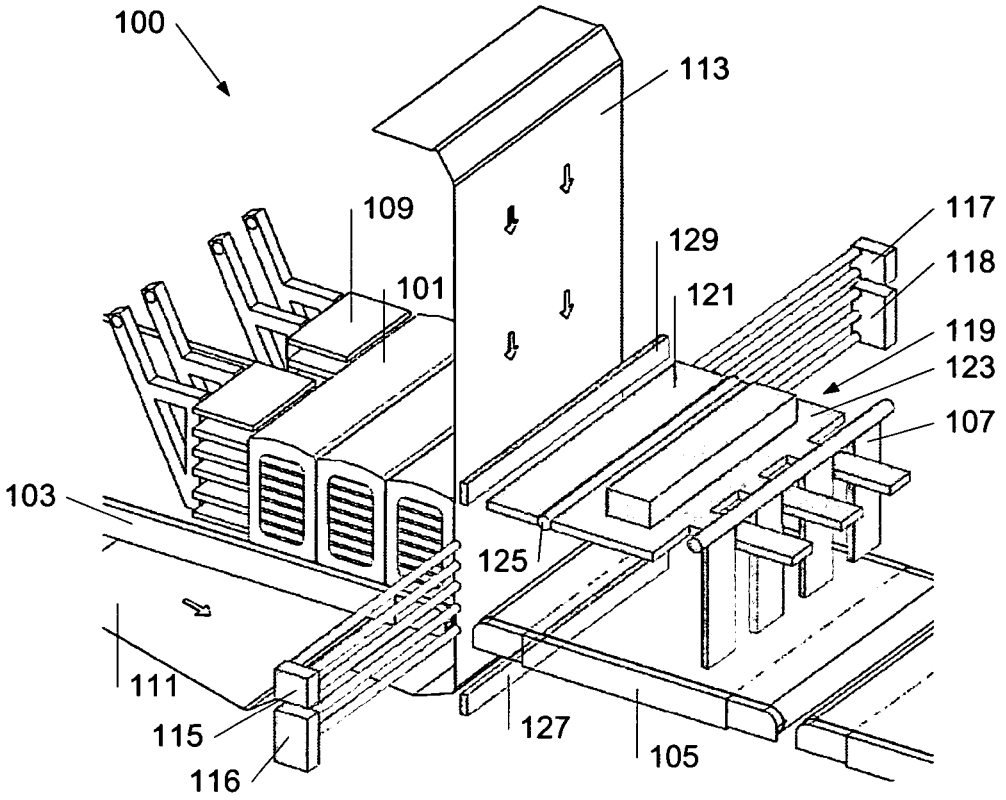
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Fig. 1

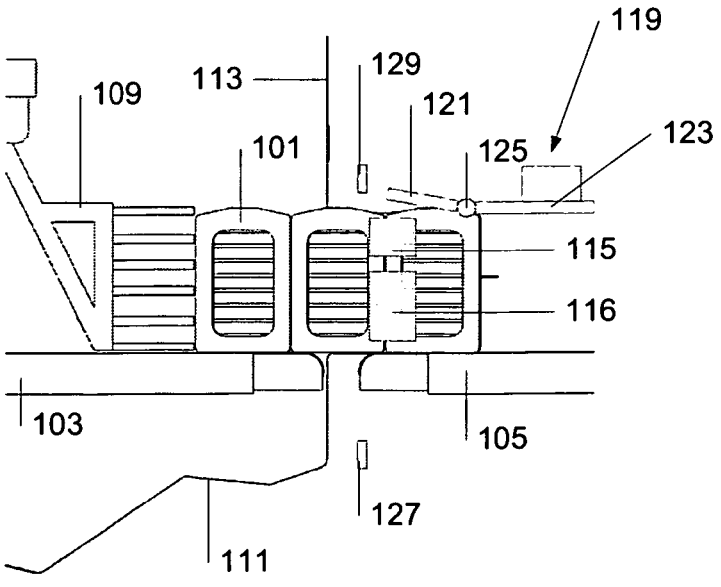
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Fig. 2

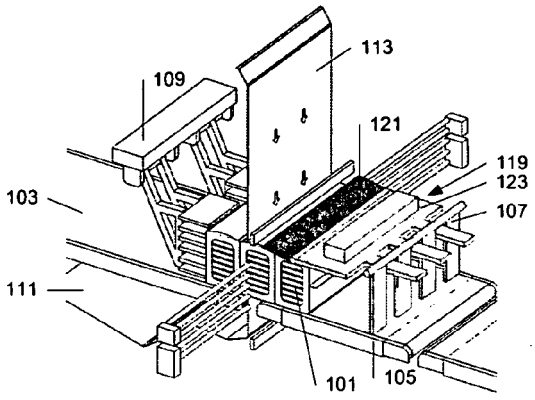

Fig. 3a

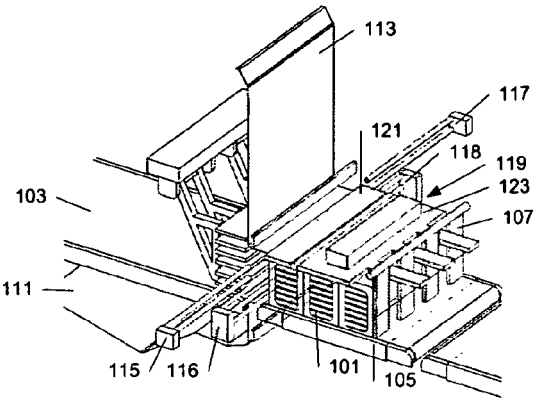

Fig. 3b

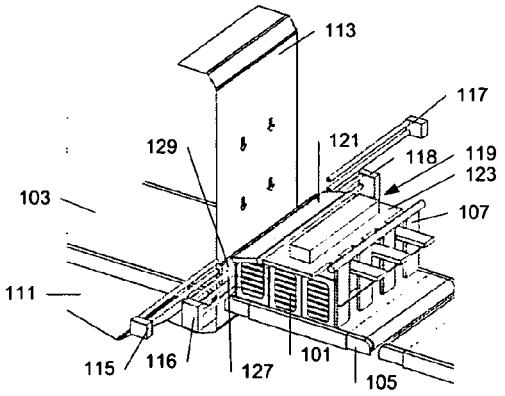

Fig. 3c

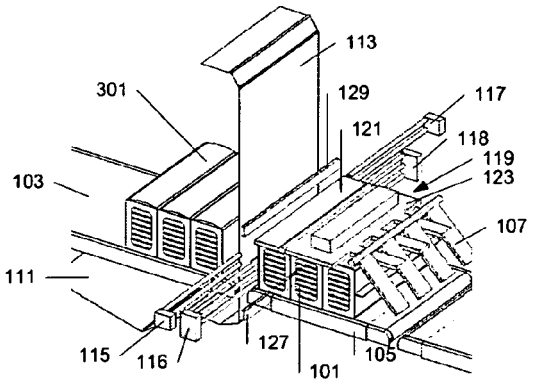

Fig. 3d

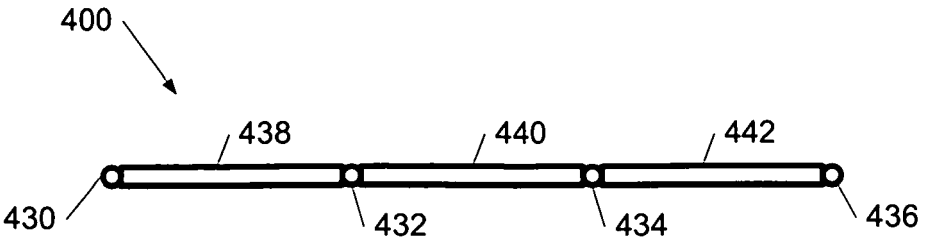

Fig. 4

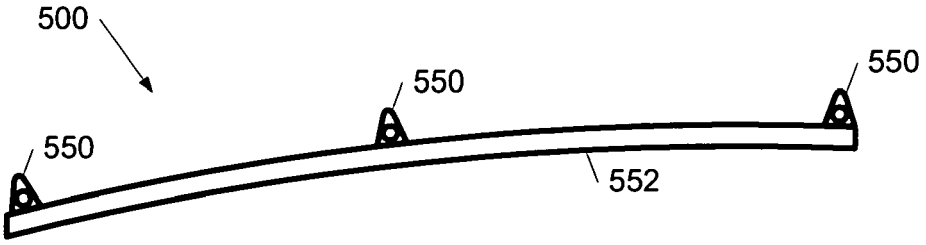

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 09 00 7192

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	27 October 2009	Philippon, Daniel

CATEGORY OF CITED DOCUMENTS

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