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(54) **Method for making a box and box thus obtained**

(57) A box (1) is made according to the method, including a box body (1a) defined by a bottom wall (2), several side wall (3, 4), and several angles (4a) delimited by adjacent side walls; and angular elements (5) arranged at an angle (4a). The method includes a step of folding a flat blank (16) displaying a central panel (2') which defines the bottom wall (2), at least one first side panel (4') which includes an appendix (6), and two second side panels (3'); in the step of folding, the side panels are folded to define the side walls; the appendix is folded to define a corner of a angle of the box body and to overlap a second panel; and a step of fastening in which the angular element is fixed to the box body. The main feature of the method consists in that it includes a step of affixing in which the angular element is arranged on the flat blank; the step of affixing being essentially prior to the step of folding.

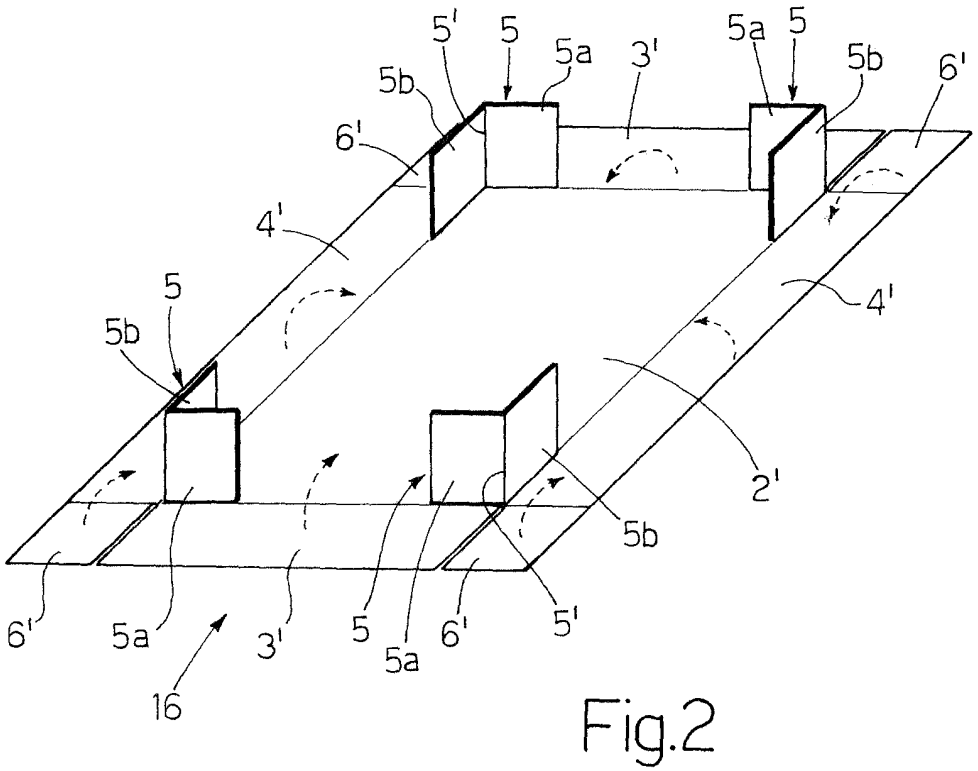

Fig.2

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Description

[0001] The present invention relates to a method for making a box and to a box thus obtained.

[0002] Specifically, the present invention is advantageously applied in the field of industrial production of packaging box for the transportation of products. The known boxes usually include a bottom wall, four side walls orthogonal to the bottom wall, four angles, each of which is delimited by two adjacent side walls, and four angular elements, each of which is arranged at each angle.

[0003] The methods currently used for making the aforesaid boxes include:

a step in which, starting from a flat blank displaying a central panel which will later define the bottom wall and four side panels which will define the side walls, two first side panels opposing to each other are folded orthogonally to the central panel;

a step in which two second side panels opposing to each other are folded orthogonally to the central panel; and

a step in which, with the preformed box, the angular elements are taken to the corners defined between two adjacent side walls, having applied a layer of glue on the angular elements before positioning the same.

[0004] The above-described method displays some drawbacks.

[0005] Specifically, the system which implements the above-mentioned method is quite complex, above all with regards to the extreme accuracy which is required for positioning the angular elements in the preformed box in order to avoid to incorrectly and inefficiently glue the angular elements to the side walls.

[0006] It is worth mentioning that the angular elements serve the function of providing stability to the box to make the boxes stackable one over the other and, therefore, an incorrect and/or ineffective gluing noticeably affects the stability of the box.

[0007] It is the object of the present invention to provide a method for making a box and a box thus obtained which allows to at least partially overcome the drawbacks of the known art while being easy and cost-effective to be implemented.

[0008] According to the present invention, a method for making a box is provided as set forth in the independent claims below and, preferably, in any one of the claims depending either directly or indirectly from the mentioned independent claims.

[0009] The present invention will now be described with reference to the accompanying drawings, which illustrate non-limitative embodiments thereof, in which:

figure 1 diagrammatically shows a first step of a method in accordance with the present invention;

figure 2 diagrammatically shows a further step of the method in figure 1;

figure 3 shows a box obtained by means of the method in figure 1;

figure 4 diagrammatically shows further steps of the method in figure 1;

figures 5 and 7 diagrammatically show alternative embodiments of the steps in figure 4;

figure 6 shows a different embodiment of an angular element for the implementation of a method in accordance with the present invention;

figure 8 diagrammatically shows a step of an alternatively embodiment of the method in accordance with the present invention;

figures 9, 10 and 11 show details of a machine for implementing a method in accordance with the present invention; and

figure 12 shows a different embodiment of the box in figure 3.

[0010] With reference to figure 3, numeral 1 indicates as a whole a box including a box body 1a, which in turn displays a bottom wall 2 with a rectangular peripheral profile, two reciprocally opposite side walls 3 laying on reciprocally parallel planes orthogonal to the bottom wall 2, two reciprocally opposite side walls 4 laying on reciprocally parallel planes orthogonal to the bottom wall 2 and to the side walls 3, and four angles 4a, each of which is delimited by a side wall 3 and by a side wall 4.

[0011] The box 1 further includes four angular elements 5 arranged inside the box 1 at the angles 4a. Each side wall 4 displays a corresponding appendix 6 at each longitudinal end thereof, each appendix is folded and glued at least onto the portion closest to the inner face of the adjacent side wall 3. The angular elements 5 are each fixed to the inner face of the corresponding side walls 3 and 4 (specifically, according to the embodiment shown in figure 3, to the inner face of the corresponding side wall 4 and of the corresponding appendix) by hot gluing. According to alternative embodiments, the fastening is obtained by cold gluing or by means of metallic staples (not shown) or other suitable means (not shown) for making the fastening.

[0012] The box 1 or better the elements thereof may be made of plastic material, cardboard, card, plasticized cardboard, polycarbonate or other material. Preferably, the angular elements 5 are made of a material which displays a certain strength to compression, with a force orthogonally applied to its thickness, which is higher than the resistance defined by the material by which the box body 1a is formed. For example, if the box body 1a is made of corrugated cardboard, the angular elements will be formed by several layers of paper glued onto each other.

[0013] The angular elements 5 display reciprocally orthogonal portions 5a and 5b (figure 1) separated by a folding line 5'; in this case, the angular elements 5 display an "L"-shaped cross section development.

[0014] According to an alternative embodiment, shown in figure 6, the portions 5a and 5b are joined by a central portion 5c, from which they are separated by folding lines 5' and 5" ; in this case, the angular elements 5 display a polygonal development. The angular elements 5 shown in figure 11 allow to stabilize the angles 4a in a very effective manner.

[0015] With specific reference to figures 9, 10 and 11, letter M indicates as a whole a machine for making the box 1.

[0016] The machine M includes four storages 10, each containing a plurality of slats 11, four cutting devices 12, each of which is arranged at an outlet of a corresponding storage 10 and is adapted to transversally cut the slats 11 to obtain the angular elements 5, and four feeding devices 13, each feeding the angular elements 5 along a corresponding path P from the cutting device 12 to a machining device 14 arranged at a machining station S. The machining device 14 is adapted to make the box body 1a and to insert the angular elements 5 into the box body 1a itself. The path P is parallel to the folding line of the angular element 5 and is advantageously vertical.

[0017] The machining device 14 displays a forming plate 15 (figure 10), which is adapted to be vertically handled by means of actuating devices (intrinsically known and not shown) and to be coupled with a flat blank 16 and to push the flat blank 16 itself downwards and along a forming channel 17 (figure 11). A plurality of fixed guides 18 adapted to fold the flat blank 16 so as to obtain the box body 1a are arranged inside the forming channel 17.

[0018] Specifically, the flat blank 16 (figures 10 and 11) displays a central panel 2', which will define the bottom wall 2, and two side panels 3', which are opposing to each other and will define the side walls 3, and two second side panels 4', which are opposing to each other, will define the side walls 4 displaying longitudinal end segments 6' which will each define a corresponding appendix 6. The forming plate 15 displays a rectangular shape which is essentially similar to the central panel 2'.

[0019] The machine M further includes four gripping devices 19, each of which is adapted to arrange a corresponding angular element 5 at a corresponding angle of the central panel 2' and is mounted to an angular end of the forming plate 15.

[0020] Each gripping device 19 includes a corresponding gripping head 20, which displays a shape complementary to the shape of the angular element 5, and a corresponding actuator assembly 21, which is adapted to move the corresponding gripping head 19 horizontally and diagonally to the forming plate 15; the gripping head 20 being defined by a body displaying a plurality of nozzles which hold the corresponding angular element 5 on such a body by means of a suction.

[0021] Each feeding device 13 includes a chute 22, along which the angular element 5 is conveyed, in use, by gravity towards a corresponding housing 22". At this point, the angular element 5 is taken by a corresponding gripping head 20.

[0022] Each cutting device 12 includes a corresponding blade 12', the vertical position of which is adjustable so as to be able to vary the desired length of the angular elements 5, and a corresponding blocking unit 12" for preventing the downward movement of the slats 11 while being cut.

[0023] At the outlet of each storage 10, a gripping assembly 10' is arranged for taking the head slat 11 of the storage 10 to a mouth of an essentially vertical channel 22', along which the blade 12' is arranged and at the end of which the blocking device 12" and the chute 22 are arranged. In use, when an angular element 5 has been cut, the blocking unit 12" disengages a lower opening of the channel 22' so as to allow the angular element 5 to enter into the chute 22. After the angular element 5 has exited from the channel 22', the blocking device 12" engages the lower opening of the channel 22' again.

[0024] Figure 4 diagrammatically shows the angular element 5 construction and the path P.

[0025] In a different embodiment diagrammatically shown in figure 5, the angular elements 5 are fed along a path P displaying vertical segments and horizontal segments. Indeed, along the aforesaid path P a handling device (not shown) is provided, which is adapted to pick and rotate an angular element 5 by 180° and to feed the same to a conveyor system (not shown), which conveys the angular elements 5 firstly along a vertical segment, then along a segment P' of the essentially horizontal path P.

[0026] In a further embodiment diagrammatically shown in figure 7, the angular elements 5 obtained from a same slat 11 by means of appropriate cutting means are shown, exiting from a storage 10 (not shown) in a horizontal direction. Such angular elements 5 are transferred by means of conveying devices (not shown) onto several conveyor belts 23 and, subsequently, by means of further handling devices (not shown) they are taken from the aforesaid belts 23 and transferred to corresponding gripping heads 20.

[0027] The method object of the present invention for producing the box 1 includes:

- a first step in which a flat blank 16 is conveyed along a given path by means of conveying means;
- a second step during which a layer of glue is applied on the longitudinal end areas of the panels 3' and 4';
- a third step during which the gripping heads 20 carry the angular elements 5 at the corners 4a;
- a fourth step in which the first side panels 3' are folded so as to arrange them orthogonally to the central panel 2' and so that the end areas of such panels 3' displaying the layer of glue press on the portions 5a of the angular elements 5, the latter still carried by the corresponding gripping heads 20;
- a fifth step in which the second side panels 4' are folded so as to arrange them orthogonally to the central panel 2' and so that the end areas of such panels

4' displaying the layer of glue press on the portions 5a of the angular elements 5, the latter still carried by the corresponding gripping heads 20; and
a sixth step during which the segments 6' are folded on the outer face of the panels 3' adjacent to the panels 4' so as to glue such segments 6' to the panels 3'.

[0028] It is apparent that the sixth step can be simultaneously carried out with the fifth step. Furthermore, it is worth noting that the layer of glue, except for the segments 6', may be applied onto the aforesaid area of the side panels 3' and 4', on the angular elements 5 or on both such elements.

[0029] In the aforesaid third step, the angular elements 5 may be positioned either orthogonally to the central panel 2', i.e. with both portions 5a and 5b laying on corresponding planes orthogonal to the central panel 2' as shown in figures 1 and 2, or with the portion 5a being parallel to and laying on the panel 3' so as to be directly glued onto the latter and, when folding such a panel 3', to be positioned orthogonally to the central panel 2' as shown in figure 8.

[0030] The step of folding the panels 3' and 4' includes handling the blank 16 inside the channel 17 in which the guides 18 are present, on which the panels 3' and 4' abut according to the sequence shown before, and which cause the folding of such panels 3' and 4'.

[0031] Figure 12 shows a different embodiment of the box 1, which in this case includes a box body 1a, which in turn displays a bottom wall 2 with a triangular peripheral profile, two side walls 3 laying on reciprocally parallel planes orthogonal to the bottom wall 2, and a side wall 4 laying on a plane orthogonal to the bottom wall 2, and three angles 4a, one delimited between two side walls 3 and the other two delimited between the side wall 4 and the adjacent side walls 3. The box 1 further includes three angular elements 5 arranged inside the box 1 at the angles 4a. The side wall 4 displays corresponding appendixes 6 at the longitudinal ends thereof, each of which is folded and glued at least onto the portion closest to the inner face of the adjacent side wall 3. A side wall 3 also displays an appendix 6 folded and glued onto the portion closest to the inner face of the other side wall 3. The box body 1a shown in figure 12 is obtained from a flat blank (not shown) which unlike the blank 16 shown in figures 1 and 2 displays a central panel with a triangular peripheral development which will define the bottom wall 2 and three side panels which will define the side walls 3 and 4. The method for making the box 1 shown in figure 12 is similar to that shown for making the box shown in figure 3, because the only difference between such boxes consist in the peripheral development of the bottom wall 2 and thus the number of angular elements 5 fixed to the box body 1a. Obviously, both the forming plate 15 and the guides 18 installed along the channel 17 will be adapted to the peripheral development of the bottom wall 2 of the box 1 shown in the figure 12.

[0032] The advantages obtained by the implementation of the present invention are apparent from the description above.

[0033] Specifically, a method is obtained which assures the correct and effective fastening of the side walls 3 and 4 to the angular elements 5 without needing an accurate positioning of the angular elements 5 on the bottom wall 2. Furthermore, the aforesaid method allows a high simplification of the system which actuates the method and therefore a considerable reduction of production costs.

Claims

1. A method for making a box (1) including a box body (1a), which displays a bottom wall (2) with a polygonal peripheral profile, at least three side walls (3, 4) essentially orthogonal to said base wall (2), and at least three angles (4a), each of which is delimited by two adjacent side walls (3, 4); and at least one angular element (5), which is arranged inside said box body (1a) at a corresponding angle (4a); the method including:

   a step of folding a flat blank (16) displaying a central panel (2'), which is adapted to define said bottom wall (2), at least one first side panel (4'), which includes at least one corresponding appendix (6), and at least two second side panels (3') adjacent to said first side panel (4'); during the step of folding, the flat blank (16) is folded so as to obtain said box body (1a) ; the first and the second panels (4' and 3') are folded so as to be essentially orthogonal to said central panel (2') and to define said side walls (3, 4); said appendix (6) being folded so as to define a corner (4a) of an angle of said box body (1a) and at least to partially overlap one of said second panels (3'); and
   a step of fastening, during which said angular element (5) is fixed to said box body (1a) ;
   the method being **characterized in that** it includes a step of affixing, during which said angular element (5) is arranged on said flat blank (16); the step of affixing being essentially prior to the step of folding.

2. A method for making a box (1) including a box body (1a), which displays a bottom wall (2) with a polygonal peripheral profile, at least three side walls (3, 4) essentially orthogonal to said bottom wall (2), and at least three angles (4a), each of which is delimited by two adjacent side walls (3, 4); and at least one angular element (5), which is arranged inside said box body (1a) at a corresponding angle (4a) of said box body (1a) and is made of a material which displays a certain strength to compression, with a force

orthogonally applied to its thickness, which is higher than the compression resistance of the material of which said box body (1a) is made; the method includes a step of folding during which a flat blank (16) is folded to obtain said box body (1a);
and a step of fastening, during which said angular element (5) is fixed to said box body (1a) ;
the method being **characterized in that** it includes a step of affixing, during which said angular element (5) is arranged on said flat blank (16) at an applying station; the step of affixing being essentially prior to the step of folding.

3. A method according to claim 1 or 2, wherein the step of affixing is essentially prior to the step of fastening.

4. A method according to any one of the preceding claims, wherein, during the step of affixing, said angular element (5) is transversally conveyed, specifically orthogonally to the flat blank (16), specifically to said central panel (2').

5. A method according to any one of the preceding claims, wherein the angular element (5) displays at least two portions (5a and 5b) which are reciprocally separated by a folding line (5').

6. A method according to one any of the preceding claims, wherein the angular element (5) displays three portions (5a, 5b and 5c), two side portions (5a and 5b) of which are arranged on opposite sides of a central portion (5c); said side portions (5a and 5b) being separated from said central portion (5c) by corresponding folding lines (5' and 5") which are parallel to each other.

7. A method according to claim 5 or 6, wherein, during the step of affixing, said angular element (5) is conveyed parallelly to the folding line thereof.

8. A method according to any one of the preceding claims wherein during the step of affixing each gripping element (20) is coupled to a corresponding angular element (5), and arranges the corresponding angular element (5) at each angle of said central panel (2').

9. A method according to claim 8, wherein each angular element (5) is fed to the corresponding gripping element (20) by gravity from a corresponding storage (10).

10. A method according to claim 9, wherein the angular elements (5) are produced by cutting a slat (11) at the outlet of each storage (10), which is adapted to accommodate a plurality of said slats (11).

11. A method according to claim 8, wherein the angular elements (5) fed to the different angles of said central panel (2') are fed to the applying station from a single storage (10).

12. A method according to claim 11, wherein the angular elements (5) are obtained by cutting a slat (11) horizontally arranged at an outlet of said storage (10).

13. A method according to claim 11 or 12, wherein the angular elements (5) are fed along a path which displays at least one essentially horizontal segment.

14. A box obtained by means of a method according to any one of the claims from 1 to 13.

15. A machine for making a box (1) including a box body (1a), which displays a bottom wall (2) with a polygonal peripheral profile, at least three side walls (3, 4) essentially orthogonal to said bottom wall (2), and at least three angles (4a), each of which is delimited by two adjacent side walls (3, 4); and at least one angular element (5), which is arranged inside said box body (1a) at a corresponding angle (4a); the machine being **characterized in that** it includes:

at least one storage (10) in which said angular elements (5) are accommodated;
a plurality of gripping heads (20) adapted to transfer said angular elements (5) at said angles (4a); and
a machining device (14) for folding a flat blank (16) displaying a central panel (2'), which is adapted to define said bottom wall (2), at least one first side panel (4'), which includes at least one corresponding appendix (6), and at least two second side panels (3') adjacent to said first side panel (4'); said flat blank (16) being folded so as to obtain said box body (1a).

16. A machine according to claim 15, **characterized in that** said storage (10) includes a plurality of slats (11) and **characterized in that** it includes, between said storage (10) and said gripping heads (20), a cutting device (12) of a slat (11) so as to define said angular element (5).

17. A machine according to claim 15 and/or 16 **characterized in that** said machining device (14) includes a forming plate (15) coupled to said flat blank (16) for pressing the latter along a channel (17) within which a plurality of fixed guide (18) is arranged, which guides are adapted to fold said flat blank (16) so as to obtain said box body (1a).

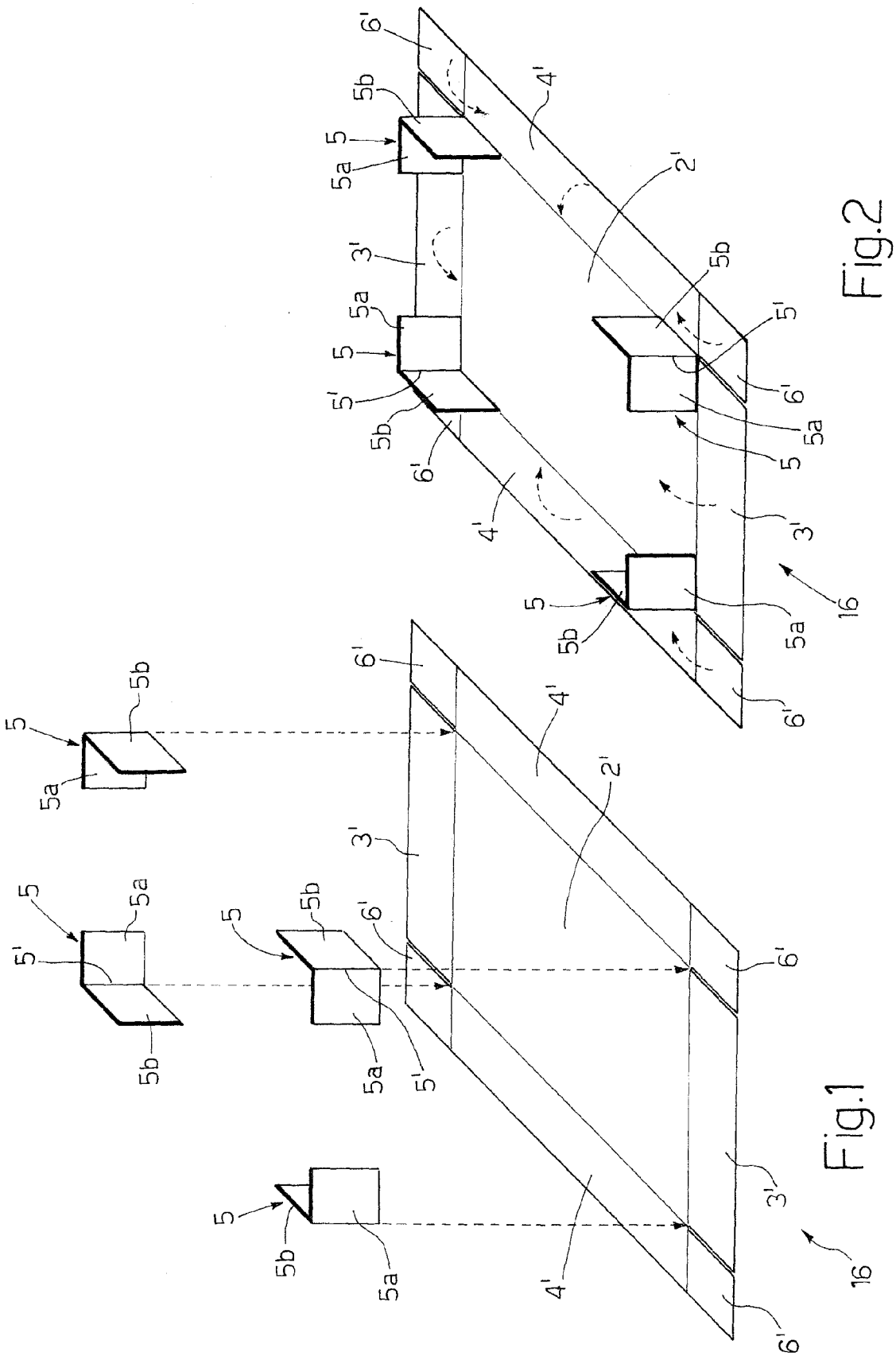

Fig.1

Fig.2

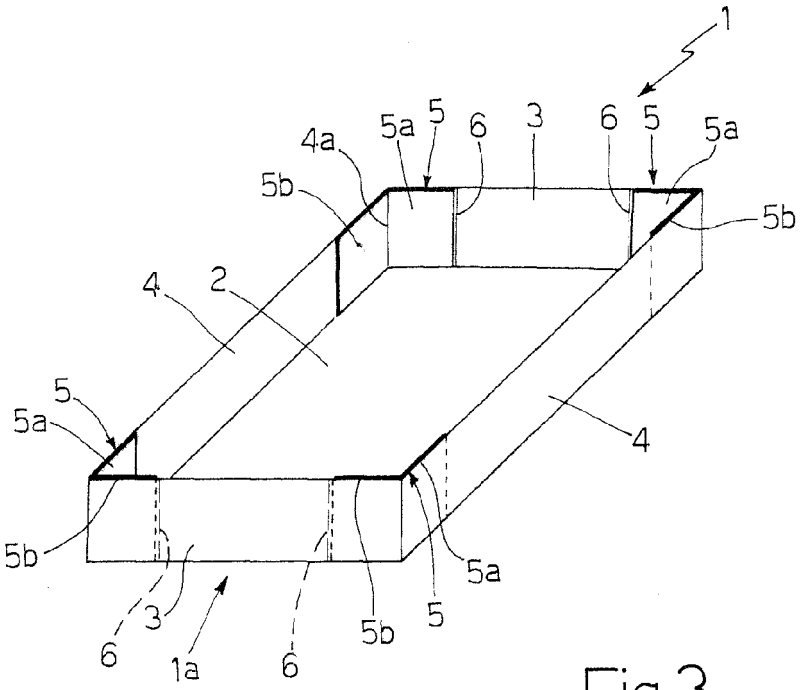

Fig.3

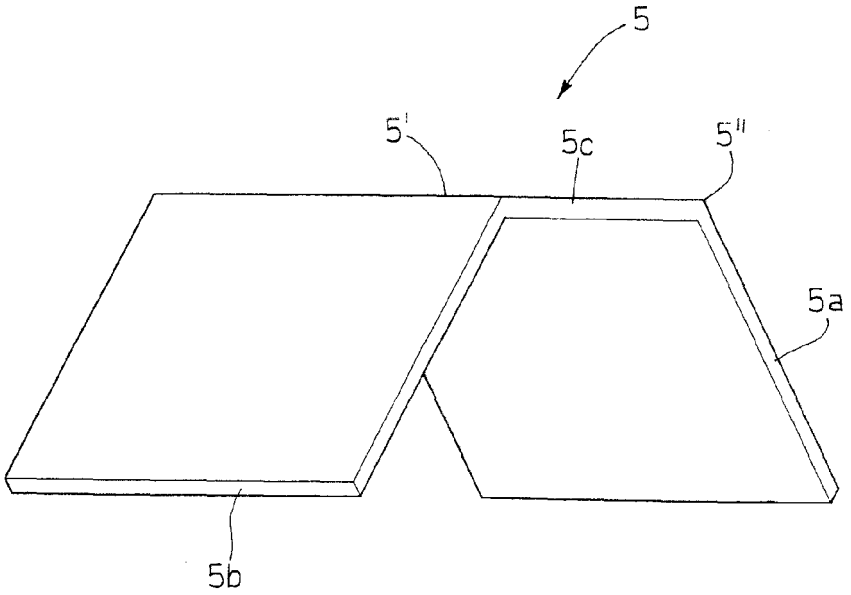

Fig.6

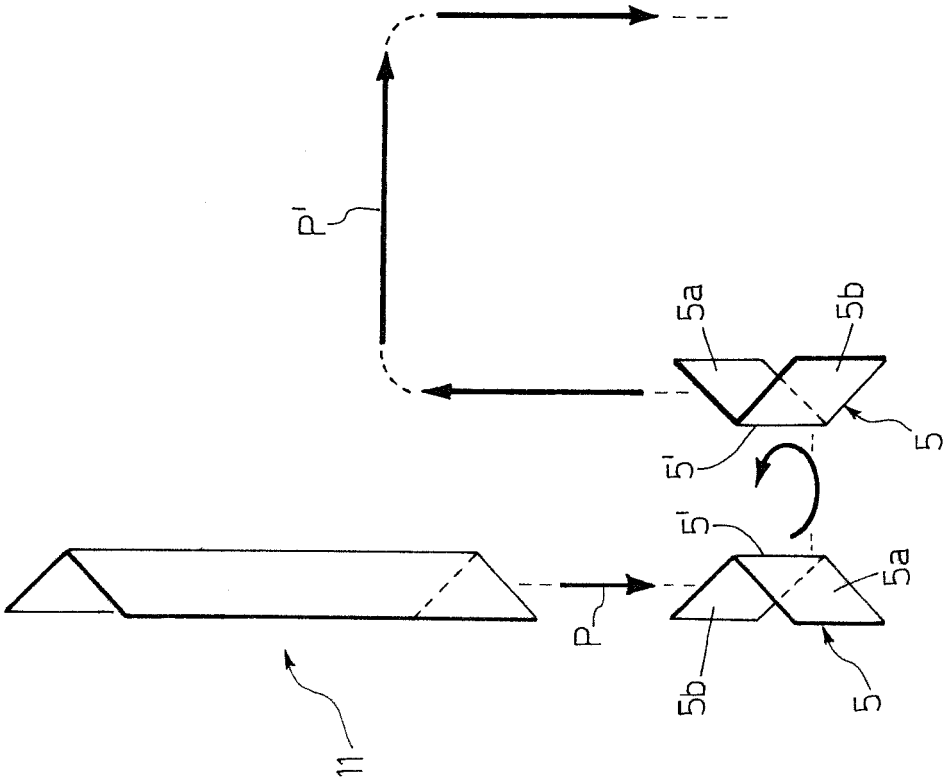

Fig.5

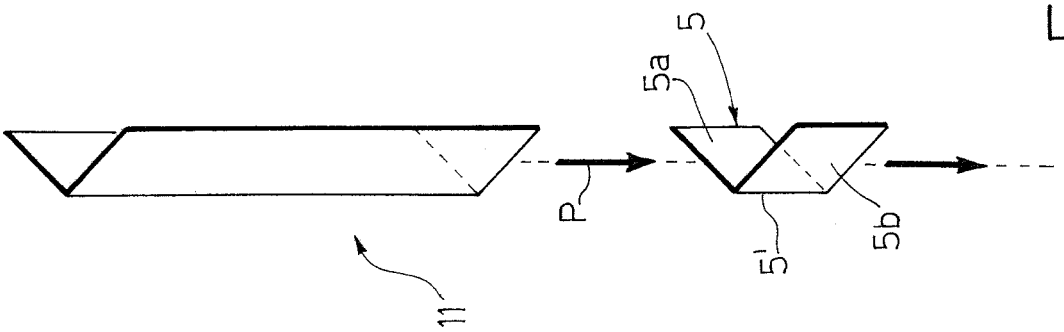

Fig.4

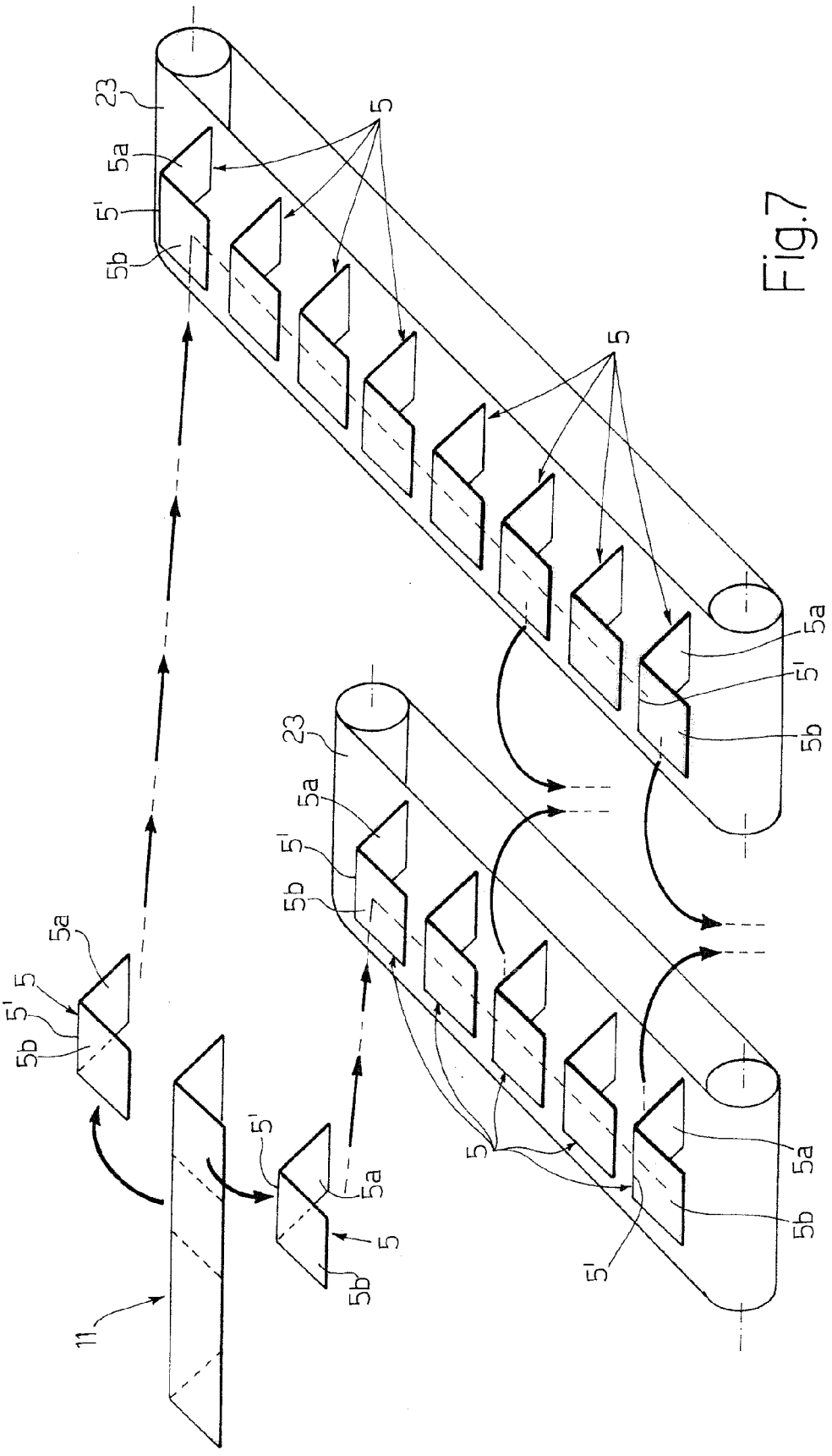

Fig.7

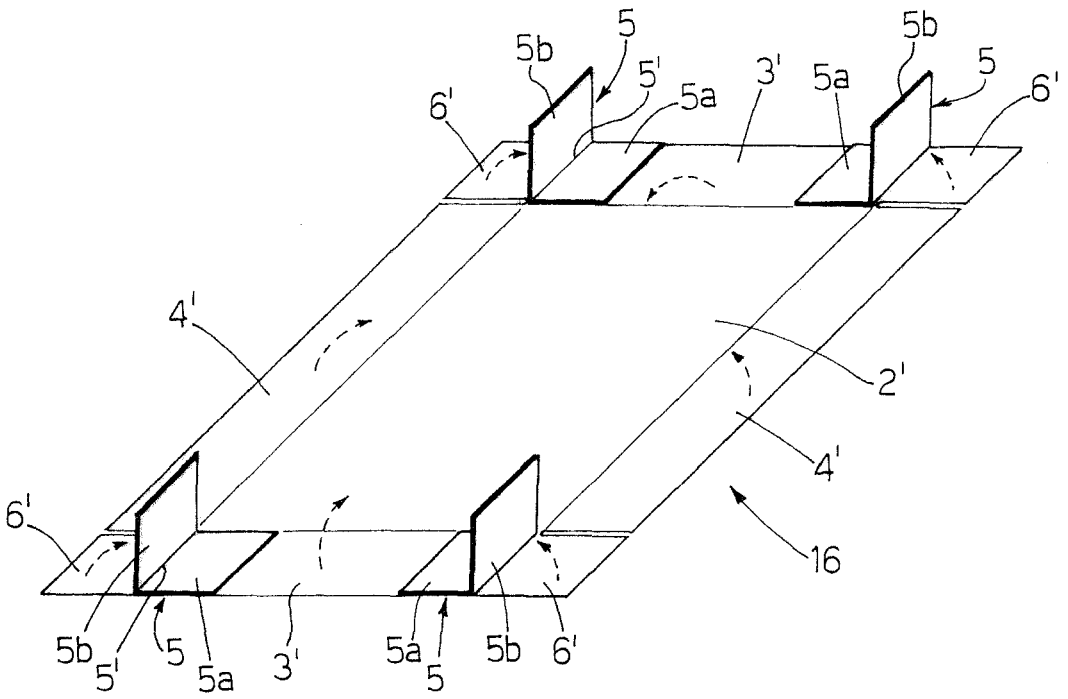

Fig.8

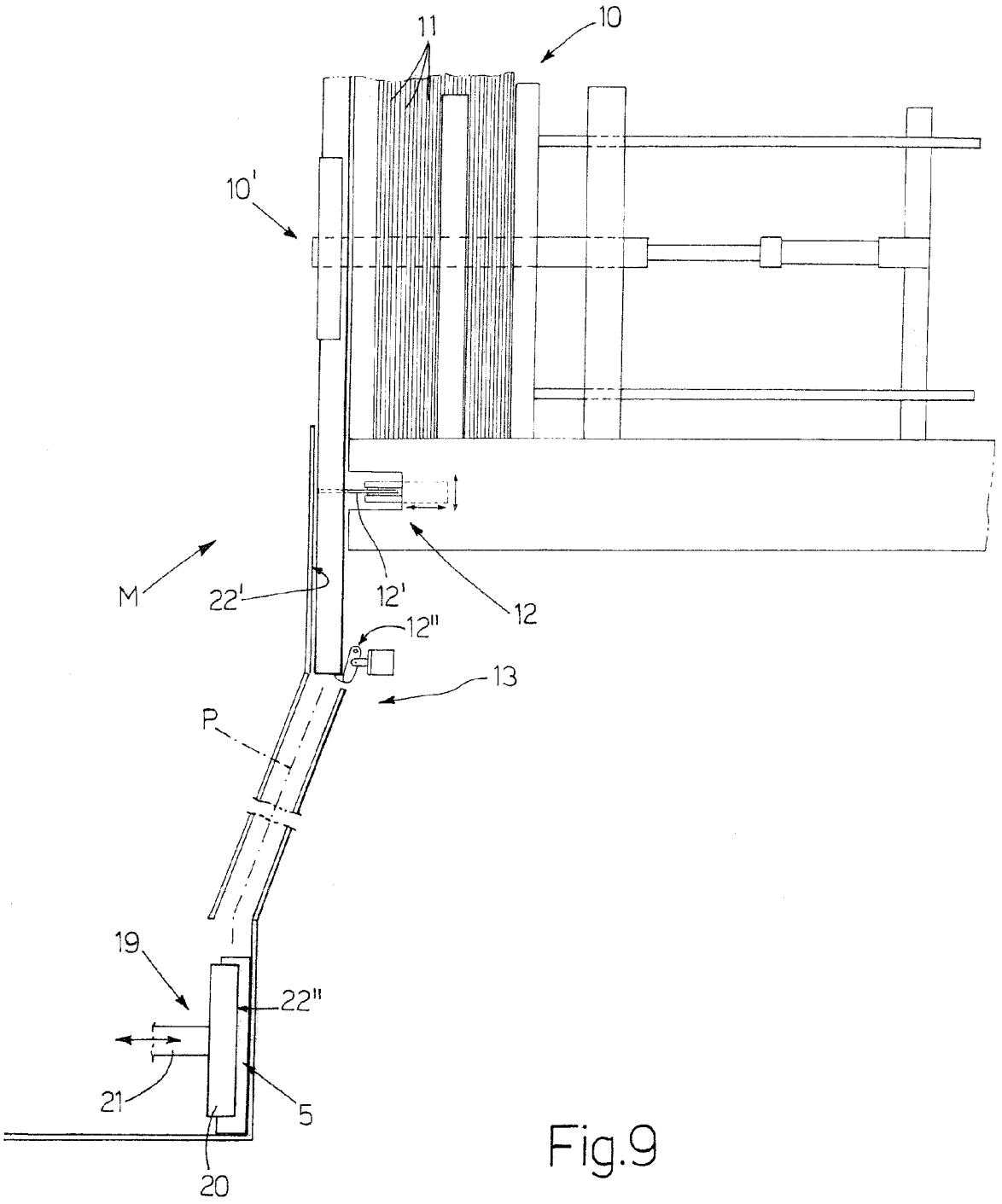

Fig.9

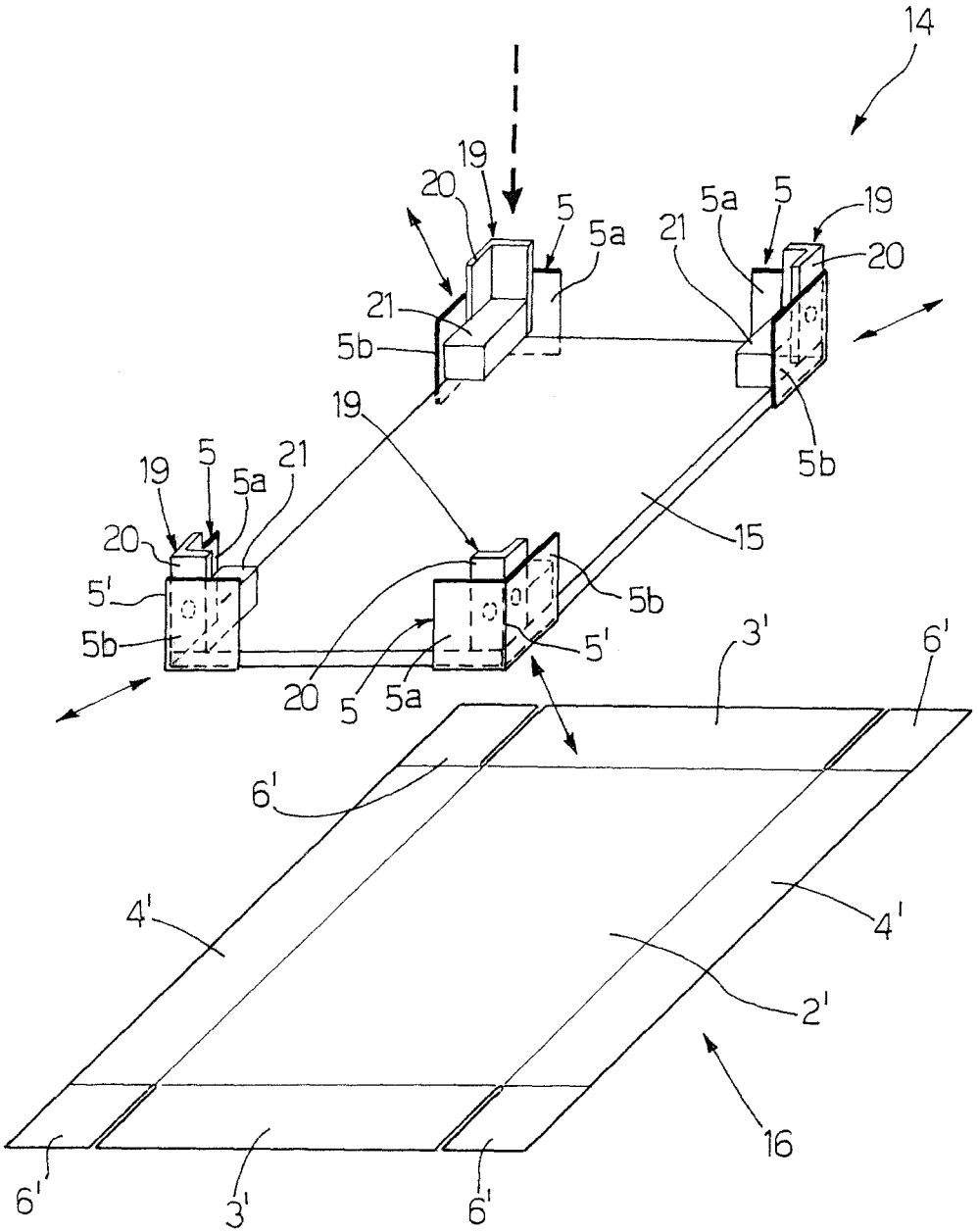

Fig.10

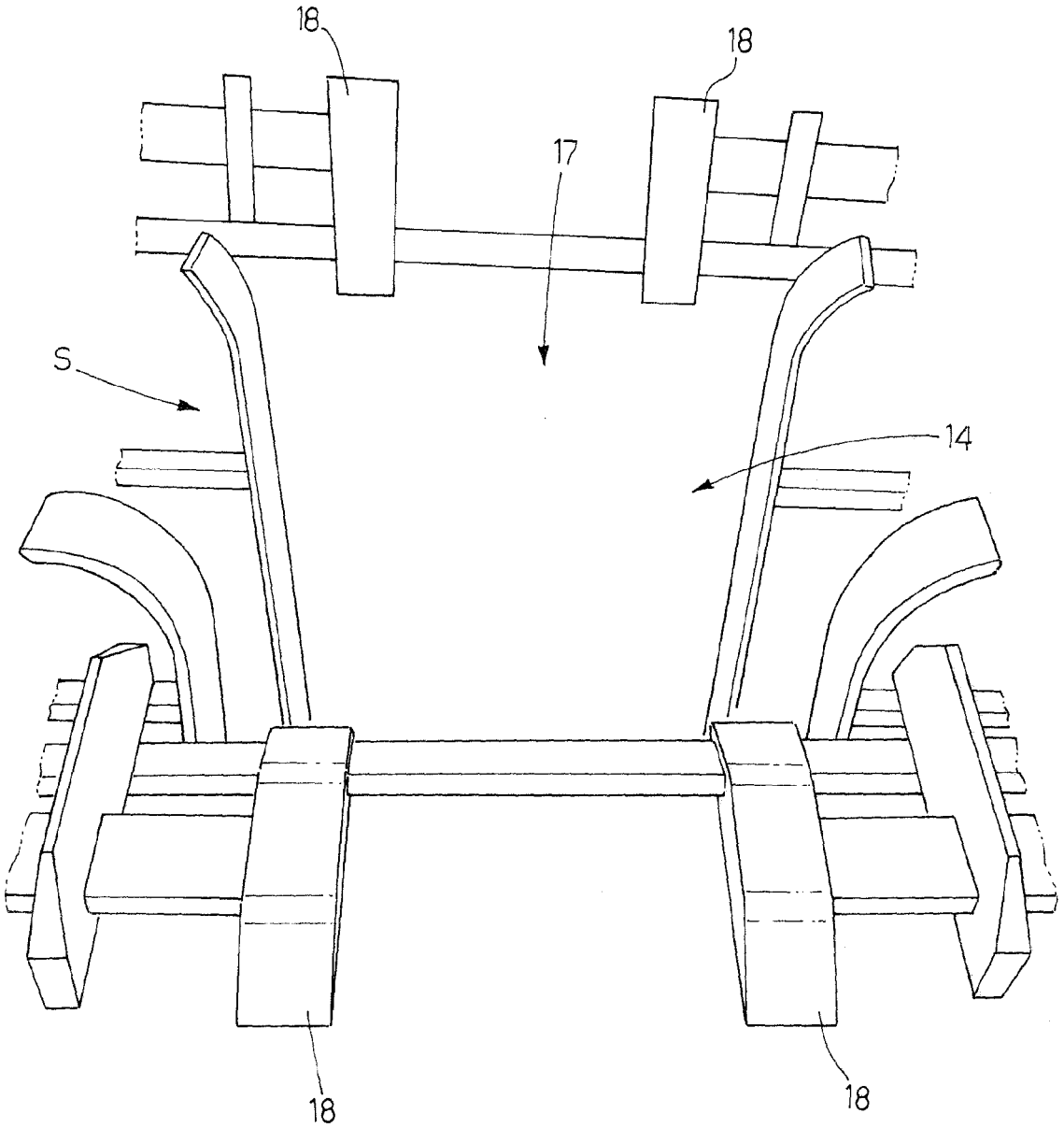

Fig.11

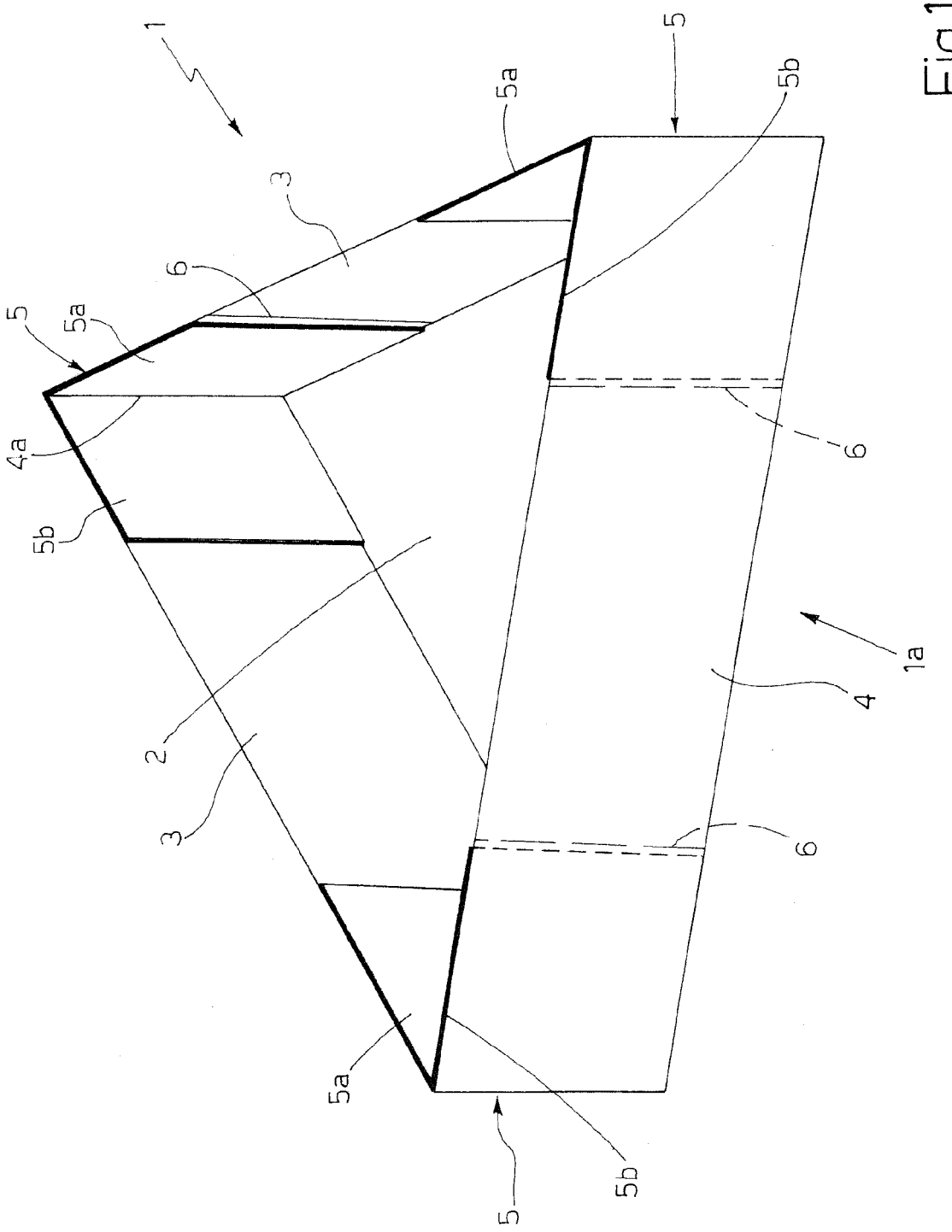

Fig.12