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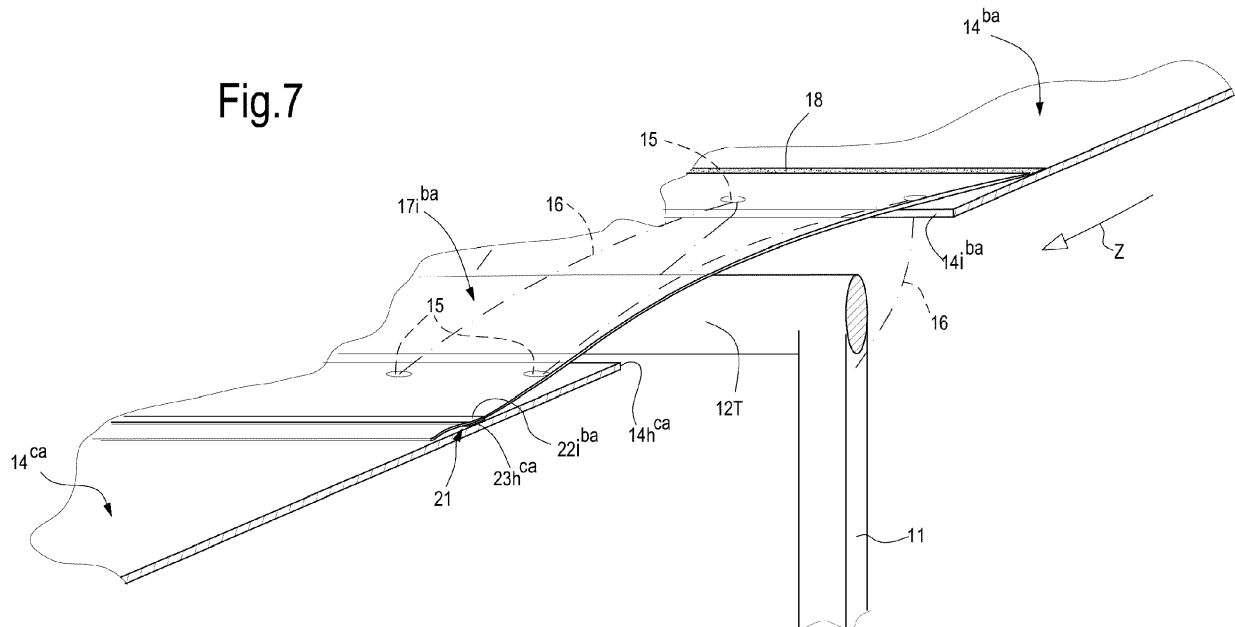
(54) **MODULAR COVERING SYSTEM**

(57) A Modular covering system (10), to associate with one or more loadbearing structures (11,12), comprises

- a plurality of covering sheets (14) quadrangular in shape, adapted to be arranged adjacent to one another and at least partially according to a matrix arrangement,

- flexibles bands (17) for covering the border areas between adjacent sheets, arranged to overlap the edge areas of said sheets in the border areas they must cover,
- connection means (21) of said bands with the respective sheets, said connection means being adapted to provide a reversible connection with at least one of said sheets.

Fig.7



Description

Technical field

[0001] The present invention relates to a modular covering system made by sheets, to be used in the building field (for example, building restoration and construction), industry (maintenance and expansion of buildings), show (stage covers and exhibition set-ups), sports facilities, agricultural sheds, dry docks, etc.

State of the art

[0002] There are different covering systems using sheets or tarpaulins. Such systems include, for example, "single-piece" sheets of adequate size to the area to be covered, supported by supporting structures, such as for example reticular structures. In the case of very large areas to be covered, the "single-piece" tarpaulin, or rather a non-interrupted tarpaulin, is also necessarily large (mostly made up of smaller sheets welded together). It is evident that a tarpaulin of such dimensions foresees high production costs, considering also the fact that it is often created "ad hoc" for a specific use and can not therefore enjoy the advantages of economies of scale.

[0003] Other examples of coverage, provide for the use of tarpaulins of smaller dimensions, placed side by side on each other. However, these covers have the disadvantage of not allowing adequate protection from the weather, since any protection elements of the contact areas between adjacent sheets are mostly improvised.

[0004] JP2006089987 illustrates a covering system according to the preamble of claim 1.

Object and summary of the invention

[0005] The object of the present invention is to solve the drawbacks claimed in cover systems of a known type.

[0006] Another important purpose of the present invention is to provide a sheet coating system which is flexible in use and which therefore allows to adequately cover both small and large areas.

[0007] Another important purpose of the present invention is to provide a covering system by sheets, which is quick and easy to install.

[0008] Another object of the present invention is to provide a covering system by sheets, which allows to obtain an optimum protection from the weather.

[0009] Last but not least important purpose of the present invention is to provide a covering system using sheets, which is versatile and can be adapted to the temporary or final covering of roofs having two or more slopes with different inclination angles.

[0010] These and other purposes, which will be clearer later, are achieved with a modular covering system, to associate with one or more loadbearing structures, comprising

- a plurality of covering sheets adapted to be arranged adjacent to one another
- bands for covering the border areas between adjacent sheets, arranged to overlap the edge areas of said sheets in the border areas they must cover,
- connection means, at least partially reversible, of said bands with the respective sheets.

[0011] Preferably, said sheets comprise, along their perimeter, close to the edge area, a plurality of eyelets for fixing to the supporting structures with which they are associated, by means of cables, hooks or the like; said bands fixed in said edge areas being arranged to overlap said eyelets.

[0012] Preferably, said sheets are quadrangular in shape.

[0013] Preferably, said sheets are arranged at least partially according to a matrix arrangement.

[0014] According to preferred embodiments, at least part of said bands are joined irreversibly along at least two contiguous sides of a respective sheet.

[0015] Preferably, a sheet comprises a first side along which, parallel thereto, there is joined, by means of a joining strip thereof, a said band; said band being arranged on the upper face of said sheet; said band protruding with respect to the edge of said first side to be able to overlap a sheet arranged adjacent to said first side; said band comprising reversible connection means to said adjacent sheet, said reversible connection means comprising an upper connection strip provided on said band and a lower strip produced on said adjacent sheet, adapted for connection with said upper strip.

[0016] Preferably, said sheet comprises a second side, contiguous to said first side, along which, parallel thereto, there is joined, by means of a joining strip thereof, a second said band; said second band being arranged on the upper face of said sheet; said second band protruding with respect to the edge of said second side to be able to overlap a sheet arranged adjacent to said second side; said second band comprising reversible connection means to said adjacent sheet, said reversible connection means comprising an upper connection strip provided on said second band and a lower strip produced on said adjacent sheet, adapted for connection with said upper strip.

[0017] Preferably, said first and said second band form a single band, preferably with a shape similar to an "L".

[0018] Preferably, said joining strip, preferably made by gluing or welding, is produced on said sheet in a position opposite the edge of the respective side with respect to the series of eyelets produced along said respective side.

[0019] Preferably, said upper connection strip provided on said band and said lower strip produced on said adjacent sheet, adapted for connection with said upper strip, comprise male-female elements of hook and loop type, preferably of waterproof type.

[0020] Preferably, said lower strip produced on said

adjacent sheet, adapted for connection with said upper strip, comprises holes with eyelets, while said upper connection strip provided on said band is provided with pins facing downwards, adapted to be inserted into respective said holes with eyelets, said pins being provided with a portion to prevent removal from said holes with eyelets, movable reversibly to a configuration that allows removal and to a configuration that prevents removal.

[0021] Preferably, said sheet is adapted to be arranged sloping and said first side is at a lower height with respect to the opposite side of the sheet, so that said band that is joined, with waterproof seal, to said sheet and that extends along said first side, overlaps the edge area of the upper side of the adjacent sheet, so that any water running on said sheet runs over said band without penetrating between band and sheet and therefore continues to run on said adjacent sheet.

[0022] Preferably, the modular covering system comprises a said sheet adapted to occupy the position close to the ridge of the covering, said ridge sheet being sloping and having an upper side adjacent to an elongated element of the supporting structure that defines the ridge of the covering system; said sheet comprising three of said bands, a first lower band, that extends along the lower side of the sheet, for covering the space between the sheet and the edge of the lower adjacent sheet, a second lateral band that extends along a lateral side of the sheet, for covering the space between the sheet and the edge of a laterally adjacent sheet, and a third upper band that extends along the upper side of the sheet, for covering the space between the sheet and the edge of the adjacent sheet on the other part of the ridge of the covering system.

[0023] According to preferred embodiments, at least a first of said bands is joined at least partially irreversibly along a side of a respective sheet, said first band being divided into three parts:

- a first part joined irreversibly, by means of its joining strip, along said side of said respective sheet; preferably said joining strip being produced on said respective sheet in a position opposite the edge of the respective side with respect to the series of eyelets produced along said respective side;
- a second part joined irreversibly, by means of its joining strip, along a side of a sheet adjacent to said respective sheet; preferably said joining strip being produced on said adjacent sheet in a position opposite the edge of the side on which it is joined with respect to the series of eyelets produced along this side of adjacent sheet;
- a third part provided with said connection means with said second part and with said respective sheet in a position below said first part of band.

[0024] Preferably, at least a second of said bands is joined at least partially irreversibly along a side said respective sheet, said second band being divided into three portions

- a first portion joined irreversibly, by means of its joining strip, along said side of said respective sheet; preferably said joining strip being produced on said respective sheet in a position opposite the edge of the respective side with respect to the series of eyelets produced along said respective side;
- a second portion joined irreversibly, by means of a joining strip thereof, along a side of a sheet adjacent to said respective sheet; preferably said joining strip being produced on said adjacent sheet in a position opposite the edge of the side on which it is joined with respect to the series of eyelets produced along this side of adjacent sheet;
- a third portion provided with said connection means with said first and said second portion, preferably in a position above said first and second portion.

[0025] Preferably, said sheet is adapted to be arranged sloping and said first side is the lower side of the sheet, or the side that is at a lower height with respect to the others.

[0026] Preferably, said connection means, at least partially reversible, of said bands with the respective sheets comprise, for each band, at least a connection strip that comprises pins facing downwards, adapted to be inserted into respective holes with eyelets produced on portions or parts of said band integral with said sheet, or on said sheet; said pins being provided with a portion to prevent removal from said holes with eyelets, movable reversibly to a configuration that allows removal and to a configuration that prevents removal.

[0027] According to another aspect, the invention also concerns a covering assembly comprising a modular covering system according to one or more of the preceding claims and a supporting structure for said sheets, with said sheets arranged adjacent to one another; preferably, said supporting structures defining supporting areas inside which respective sheets are arranged; preferably said supporting structures comprise a plurality of frames defining said areas inside which respective sheets are arranged; said frames comprising elongated elements; said elongated elements and said eyelets being connected by said cables, hooks or the like for supporting said sheets.

Brief description of the drawings

[0028] Further characteristics and advantages of the invention will become clearer from the description of a preferred but not exclusive embodiment thereof, illustrated by way of non-limiting example in the accompanying drawings, wherein

Figure 1 shows a schematic axonometric view from above of a complex of a covering system according to the invention, in which the supporting structures of the sheets are visible, but the covering bands of the border areas between the sheets are omitted;

Figure 2 is a simplified top view of two adjacent sheets of a covering system according to a first embodiment of the invention, in which the support structure is not shown, and in which two bands of system coverage are shown;

Figures 3 to 6 show a simplified top view of four adjacent sheets of a covering system according to a first embodiment of the invention, in which the support structure is not shown, and in which it is shown in sequence, the arrangement of the covering bands associated with said sheets;

Figure 7 is a schematic axonometric view, in longitudinal section, or rather according to the slope direction of the covering, of a covering portion with two longitudinally adjacent sheets, according to the first embodiment of the invention;

Figure 8 is a schematic axonometric view, in cross-section, or rather orthogonal to the slope direction of the roof, of a covering portion with two laterally adjacent sheets, according to the first embodiment of the invention;

Figure 9 is a simplified top view of a covering portion relative to two adjacent sheets, on opposite sides, at the top of the covering of a covering system according to the first embodiment of the invention;

Figure 10 is a schematic axonometric view, in cross-section, or rather orthogonal to the slope direction of the covering, of the covering portion of Figure 9;

Figure 11 is a schematic, axonometric view of a portion of a covering assembly with a supporting structure and a relative covering system, according to a second embodiment of the invention, in which a single sheet is visible and, separated from them, in exploded form, parts or portions of bands covering the spaces between adjacent sheets;

Figure 12 is a schematic top view of a portion of covering compound according to the second embodiment of the invention, relative to nine structures and relative sheets as in Figure 11, with the parts or portions of bands covering the spaces between adjacent sheets, arranged in a covering position;

Figure 13 is a schematic top view of a portion of covering compound according to the second embodiment of the invention, relative to two adjacent sheets in the direction of the slope, with the only first covering band of the spaces between them highlighted;

Figure 14 is a schematic top view of a portion of covering compound according to the second embodiment of the invention, relative to two laterally adjacent sheets with only the second covering band of the spaces between them shown ;

Figure 15 is a schematic view, in longitudinal section, or rather according to the slope direction of the covering, of a covering portion with two longitudinally adjacent sheets, according to the second embodiment of the invention;

Figure 15A is a schematic view, in longitudinal section, or rather according to the direction of slope of

the covering, of a covering portion which is a variant comparing to the one of Figure 15;

Figure 16 is a schematic axonometric view, in cross-section, or rather orthogonal to the slope direction of the roof, of a covering portion with two laterally adjacent sheets or of the "ridge" configuration, according to the second embodiment of the invention; Figure 17 is a cross-sectional view of connecting means 21 between bands and sheets or between bands and bands in a system according to the invention, of the pin-type and eyelet locking hole, with a dotted highlighted pin locking position; Figure 18 is a plan view of Figure 17.

15 Detailed description of an embodiment of the invention

[0029] With reference to the aforementioned figures, a cover system is generally referred to as number 10.

[0030] The covering system 10 is associated with supporting structures formed for example by scaffolding equipped with support posts on the ground 11 (which can also be cantilevered by means of reticular structures) on which frames 12, preferably quadrangular, and more preferably rectangular, are fixed . Frames 12 are made of elongated elements, such as 12T cross members and 12L side members.

[0031] For example, these frames are inclined to provide a sloping cover which therefore has a longitudinal portion of ridge 13. Covering sheets 14, preferably rectangular, are arranged inside the areas defined by the frames 12, and fixed to the same frames, as explained below. In practice, the frames 12 define support areas for the sheets 14.

[0032] For example, the covering sheets 14 are arranged to cover an extended surface, for example an house roof in reconstruction, and are therefore impervious and arranged adjacent one to the other, above the roof, according to a matrix configuration. Figure 1 shows an example of a covering system configuration in which there are nine adjacent sheets, arranged according to a 3x3 matrix, inclined by the longitudinal portion of ridge 13 downwards. The direction of downward inclination or rather the slope is indicated by arrow Z.

[0033] It should be noted that the ground uprights 11 are not always necessary, in the sense that it is not strictly necessary that one or more uprights 11 are associated with a frame 12. In fact, in most cases, the frames 12 are connected together to form a matrix, while the supports on the ground can be present, for example only in the sides relative to the ends of the matrix (for example, in the case of one single building to be covered, the uprights can be four, placed at the corners of the matrix, and however there are nine or more frames, so it is evident that many of these will be free of uprights but will be supported by adjacent frames).

[0034] Name with a, b, c the rows and columns of the matrix, with "a" at the top and left side of the matrix and "c" the lower and right part, the sheets are also indicated

with an apex: 14^{aa} indicates the first sheet close to the ridge 13, 14^{ac} indicates the last sheet close to the ridge, 14^{ab} indicates a second sheet close to the ridge 13, included between 14^{aa} and 14^{ac}. Likewise, 14^{ba} indicates the sheet lowerly adjacent the sheet 14^{ac}, 14^{bb} indicates the sheet lowerly adjacent to the sheet 14^{ab} and so on, also for row c.

[0035] The sheets 14 preferably include, along their perimeter, close to the edge area, a plurality of eyelets 15 to allow fixing to the frames 12 by means of cables 16, hooks or the like, according to the prior art.

[0036] In practice, in this example, each side of a sheet is connected to the elongated member of the nearest frame 12. Each side of a sheet 14 is indicated with the number of the corresponding sheet (with relative quotes) followed by one of the letters i (lower), h (upper), d (right), s (left) which respectively indicate the position with reference to the orientation on the figures. Therefore 14^{abi} indicates the lower side of the sheet 14^{ab}, 14^{cbd} indicates the right side of the sheet 14^{cb} etc.

[0037] Moreover, two sides of two sheets 14 adjacent to each other are fixed, on opposite sides, to an elongated element 12T or 12L. In this configuration, the elongate element 12T or 12L is placed in the boundary zone between adjacent sheets and the edges of these are spaced from one another. For example, between the 14^{bad} side of the sheet 14^{ba} and the 14^{bh} side of the adjacent sheet 14^{bb} there is space occupied by a crosspiece 14T, to which the two sheets are connected by cables 16, passing through the eyelets 15 associated with said sides.

[0038] In other embodiments, the sheets may have dimensions that are integer multiples of the corresponding frame sizes, thus reducing the number of required eyelets and the assembly and disassembly time of the system.

[0039] The covering system comprises bands 17, which are also suitably waterproof, for covering the border areas between adjacent sheets. In particular, these bands 17 are superimposed onto the edge areas of the sheets, or rather they overlap these edge areas, in correspondence with the boundary areas which they must cover.

[0040] More in particular, the bands 17 also overlap the eyelets 15 present in the edge areas of both adjacent sheets that the bands connect.

[0041] According to a first embodiment of the invention, there are two bands 17 for each sheet 14, arranged on adjoining orthogonal sides, each one welded on the upper face of a relative sheet 14, parallel to a respective side thereof. In the following, the numbering of the bands follows the same logic of the numbering of the sides of the sheets.

[0042] For example, taking reference to the sheet 14^{ba} (see Figures 2 and 7), there is a first band 17^{bai} welded (or glued or other technology which allows liquid tight seal, or a "waterproof seal) along a joining strip 18, to the upper face of the sheet, parallel to its lower side 14^{bai} (defined hereinafter also as "first side"). Said band 17^{bai} has a width (or rather the dimension according to the

direction z) such that it protrudes from to the edge of the lower side 14^{bai} and overlap the edge area of the sheet adjacent below 14^{ca}.

[0043] It should be noted that the joining strip 18 is made on the sheet 14^{ba} in the opposite edge position of the respective side 14^{bai} in relation to the series of eyelets 15 made along said side 14^{bai}, so that the band 17^{bai} overlaps the eyelets.

[0044] Each band 17, in addition to the connecting strip to the respective sheet, also comprises reversible connecting means 21 to the respective adjacent sheet towards which the band protrudes. For example, these connecting means 21 comprise an upper connecting strip 22 provided on the lower face of the respective band and a lower connection strip 23 provided on the upper face of the adjacent sheet, with the two connecting strips which are adapted to fix each other in a reversible way. For example, the two connecting strips are male-female strips of a Velcro-type fastening system, suitably of the liquid-tight type. Considering the band 17^{bai} of the aforementioned sheet 14^{ba}, this comprises, near its lower edge, an upper female (or male) velcro connection strip 22^{bai}. On the adjacent sheet 14^{ca}, in the edge area of the upper side 14^{cah}, along this, there is a complementary lower connection male (or female) velcro strip 23^{cah}.

[0045] It should be noted that the lower connection strip with male (or female) velcro 23^{cah} is made on the adjacent sheet 14^{ca} in the opposite edge position of the respective side 14^{cah} in relation to the series of eyelets 15 made along said side 14^{cah}, therefore the band 17^{bai} overlaps the eyelets on this side too.

[0046] In this way the lower band 17^{bai} overlaps all the downwardly openings present on and between the two adjacent sheets 14^{ba} and 14^{ca} or rather the eyelets 15 and the space between the lower and upper sides of the two sheets, close to the elongated element 12T. In the event of rain, the water slides along the sheet 14^{ba}, passes over the lower band 17^{bai} sliding on the lower adjacent sheet 14^{ca}, overcoming the eyelets and the space between the sheets without slipping under the sheets.

[0047] The second band 17 associated with the sheet 14 is placed along a second contiguous and orthogonal side to the first lower side to which the first described band is associated. It is in practice a side band that covers the eyelets and the intermediate space between two laterally adjacent sheets.

[0048] Always taking the 14^{ba} sheet as an example (see Figures 2 and 8), the second band 17^{bad} is welded (or glued or other technology which allows a liquid tight seal, or a "waterproof seal) along a respective union strip 18, to the upper face of the sheet, parallel to its right side 14^{bad} (defined hereinafter also as "second side"). Said band 17^{bad} has a width (or rather, the left-right side dimension referred to the figures) such that it protrudes from the edge of the right side 14^{bad} and overlaps the edge area of the laterally adjacent sheet 14^{bb}.

[0049] It should be noted that the joining strip 18 is made on the sheet 14^{ba} in the opposite edge position of

the respective side 14^{bad} in relation to the series of eyelets 15 made along this side 14^{bad}, so that the band 17^{bad} overlaps the eyelets.

[0050] Similarly to the first band 17^{bai}, the second band 17^{bad}, or rather the side band of the sheet 14^{ba} comprises, near its right edge, a upper connection strip of female (or male) velcro 22^{bad}. On the side adjacent sheet 14^{bb}, in the edge area of the left side 14^{bb}s, along this, there is a complementary lower connection male (or female) velcro strip 23^{bb}s.

[0051] It should be noted that the lower connection male (or female) velcro strip 23^{bb}s is made on the laterally adjacent sheet 14^{bb} in the opposite edge position of the respective side 14^{bb}s in relation to the series of eyelets 15 made along said side 14^{bb}s, so that the lateral band 17^{bad} overlaps the eyelets of this side too.

[0052] In this way the side band 17^{bad} overlaps all the openings to the right present on and between the two adjacent sheets 14^{ba} and 14^{bb} or rather the eyelets 15 and the space between the side edges of the two sheets, close to the elongated element 12L. In case of rain, the water slides along the side band 17^{bad} and can slide indifferently towards the sheet 14^{ba} or the sheet 14^{bb}, without slipping under the sheets.

[0053] The first band (or lower band) and the second band (or side band) can be made separately or, in an advantageous form of embodiment, in a single "L" shaped band.

[0054] Figures 3 to 6 show an example of four adjacent sheets (according to a matrix arrangement 4x4 ba, bb, ca, cb), in which the overlapping of the sheets and their overlapping area are visible.

[0055] It should be noted that, preferably, the width of the bands, in the overlapping direction to the adjacent sheet, is such that the end edge of the band is downstream of the bottom connection male (or female) Velcro strip 23 which connected to the adjacent sheet (or rather the upper female - or male - velcro strip 22 is not placed exactly on the edge of the band, but further upstream of this).

[0056] The system 10 provides, for each sheet present on a first side close to the ridge 13, a band welded also on the upper side of the sheet, (or rather a three-band configuration) such as to cover the space between the upper edges of the sheets along the ridge 13. Each sheet present on the opposite side of the ridge has instead a configuration with two bands, as described above.

[0057] Figures 9 and 10 show a cross section relative to the ridge 13. Here is shown the ridge crosspiece 12T which divides the support structure of the sheets into two slopes. On the left side of the ridge, in relation to the figure, the sheet 14^{ab} is shown, with the side 14^{abh} parallel to the ridge 13 and spaced from it. On the right side of the ridge the sheet 14^{AB} is shown, similar, for example, to the sheet 14^{ba} described above.

[0058] This ridge sheet 14^{ab} advantageously comprises three covering bands 17, a first lower band (not shown in these figures), which extends along the lower side of

the sheet 14^{abi}, to close the gap between the sheet 14^{ab} and the edge of the adjacent lower sheet 14^{bb}, a second side band 17^{abd}, which extends along a lateral side of the sheet, to close the gap between the sheet 14^{ab} and the edge of the adjacent lateral sheet 17^{ac}, and a third upper band 17^{abh} which extends along the upper side 14^{abh} of the sheet 14^{ab}, to close the gap between the ridge sheet 14^{ab} and the edge of the adjacent sheet 14^{AB} on the other side of the ridge itself. As for the previous cases, the third upper band 17^{abh} is welded (or glued or other technology that allows a liquid tight seal, or a "waterproof seal) along a union strip 18, to the upper face of the sheet, parallel to its upper side 14^{abh}. The third band 17^{abh} has a width (or rather the dimension along the slant from bottom to top) such that it protrudes from the upper edge side 14^{abh} and crosses the ridge and overlaps the edge area of the adjacent sheet 14^{AB} on the other side of the ridge itself.

[0059] It should be noted that the joining strip 18 is made on the sheet 14^{ab} in the opposite edge position of the respective side 14^{abh} in relation to the series of eyelets 15 made along said side 14^{abh}, so that the band 17^{abh} overlaps the eyelets.

[0060] Also in this case, the band-sheet connecting means 21 include, in proximity of the upper edge, a upper female (or male) velcro connection strip 22^{abh}. On the adjacent sheet 14^{AB}, in the edge area of its upper side 14^{ABh}, along this, there is a complementary lower male (or female) velcro connection strip 23^{ABh}.

[0061] It should be noted that the lower male (or female) velcro connection strip 23^{ABh} is made on the adjacent sheet 14^{AB} in the opposite edge position of the respective side 14^{ABh} in relation to the series of eyelets 15 made along said side, so that the band 17^{abh} overlaps the eyelets of this side too.

[0062] In this way the upper band 17^{abh} overlaps all the openings downwards present on and between the two adjacent ridge sheets on opposite sides 14^{ab} and 14^{AB}, or rather the eyelets 15 and the space between the upper sides of the two sheets, close to the elongated ridge element 12T. In case of rain, the water falls on the upper band 17^{abh} and slides along the sheet 14^{ab} or 14^{AB}, passing over the eyelets and the space between the sheets without slipping under the sheets.

[0063] Figures 17 and 18 show alternative connection means 21 in relation to the velcro. For example, the lower strip made on the adjacent sheet 14', suitable for connection with said upper strip, comprises eyelet holes 25, slotted, while the upper connection strip on the band 17 provides pins 26 facing downwards (fixed with fluid seal to the band), suitable to be inserted into respective eyelet holes 25. The pins 26 are equipped with an anti-slip portion 26A from these eyelet holes 25, movable in a reversible manner to assume an extraction configuration and an anti-slip configuration. In this example, the portion 26A has a complementary shape to the respective eyelet hole, or rather an elongated shape in one direction. This portion 26A rotates on an axis k coinciding with the in-

section axis in the eyelets (or rather the axis of the pin), in order to be able to assume two configurations; a first configuration of insertion in the eyelet hole, in which the portion of the pin is rotated so as to be aligned with the development of the eyelet hole (to allow insertion), and a second configuration orthogonal to the first, with the portion 26A transversal to the development of the eyelet hole, which prevents the extraction movement of the pin 26 from the eyelet hole 25.

[0064] In some embodiments, in place of the welded zones (or glued or other irreversible liquid-tight connection form), connection regions may be present as shown in Figures 17 and 18 and described above, with coupling between pins and eyelets holes of the liquid-tight type, for example for the presence of gaskets between pins and holes.

[0065] Figures 11 to 16 show a preferred embodiment of the covering system according to the invention.

[0066] In this case, the covering system, globally indicated with 100, shows coverage bands for the spaces between the sheets 14 which are composed of several elements, as explained below. The sheets 14 are arranged inclined according to the slope Z, as in the previous example. In particular, there are two types of bands, a first band 117 and a second band 217.

[0067] The first band 117 relates to the covering of the spaces between the sides of the orthogonal sheets to the direction of the slope Z, or rather those occupied by the crosspieces 12T, while the type of the second band 217 relates to the covering of the spaces between the sides of the parallel sheets to the direction of the slope Z, or rather those occupied by the longitudinal members 12L.

[0068] Figure 12 shows nine sheets arranged in a matrix and numbered according to the previous example, and referring to the sheets of the columns "a" and "b", and the rows "b" and "c".

[0069] Taking the 14^{bb} sheet as a reference, the first band 117 is divided into three parts.

[0070] A first part 117^{bbi} is joined irreversibly, by means of its own joining strip 18 (for example welding or sealing with liquid tightness) along the lower side 14^{bbi} of the sheet 14^{bb}, made in an opposite edge position of the respective lower side 14^{bbi} in relation to the series of eyelets 15 made along this side.

[0071] A second part 117^{cbh} is irreversibly joined, by means of its own joining strip 18, along the upper side 14^{cbh} of the sheet 14^{cb} lower adjacent to the sheet 14^{bb}, made on the sheet 14^{cb} in an opposite edge position of the side 14^{cbh} on which it is joined in relation to the series of eyelets 15 made along this side.

[0072] A third part 117^x of band 117, has a rectangular shape and is a part released from the sheets before assembly, which is fixed to these by means of connection 121, visible in Figure 15. In particular, such connection means allow connection of this third part 117^x to the second part 117^{cbh} (above that second part) and with the part of the sheet 14^{bb} in a position underlying the first

part of the band 117^{bbi}, that is the part between the eyelets 15 and the joining strip 18 of the lower side 14^{bbi}.

[0073] In this example, these connecting means are the same as those described above with reference to figures 17 and 18 and the numbers relating to this example are indicated in parentheses.

[0074] In particular, this third part 117^x comprises, along its opposite sides, two parallel strips of pins 126 facing downwards (fixed with liquid tightness to the third part of the band 117), adapted to be inserted in respective eyelet holes 125 made both along the second part 117^{cbh} of the first band 117, and along the position below the first part of the band 117^{bbi}, or rather, as said the part comprised between the eyelets 15 and the joining strip 18 of the lower side 14^{bbi}.

[0075] Analogously to the example already described, the pins 126 are provided with a portion 126A anti-slip-ping from these eyelet holes 125, movable in a reversible manner to assume a slip-off configuration and an anti-slip configuration. It should be noted that in Figure 5, the anti-extraction portion 126A is rotated into a sealing position and can not be removed.

[0076] Therefore, the first band 117 joins, with liquid tightness, in the direction of the slope, two adjacent sheets, preventing the water that slides on such sheets, to fall between the spaces around the crosspieces 12L and relative to the eyelets 15. The first part of the band 117^{bbi}, preferably free above the third part, prevents the water from infiltrating under the third part of the band 117^x.

[0077] In an embodiment variant, shown in Figure 15A, the first band 117 is subdivided into only two parts.

[0078] A first part 117^{bbi} is joined irreversibly, by means of its own joining strip 18 (for example welding or liquid-tight gluing) along the lower side 14^{bbi} of the sheet 14^{bb}, made in an opposite edge position of the respective lower side 14^{bbi} in relation to the series of eyelets 15 made along this side.

[0079] A second part 117^{xk} (which in practice is the combination of the second and third parts of the band 117 described above), has a rectangular shape and is a part released from the sheets before assembly, which is fixed thereto by connecting means 121, visible in Figures 15, 17 and 18. In particular, these connecting means allow the connection of this second part 117^{xk} with the part of the sheet 14^{bb} in a position below the first part 117^{bbi}, and with the part of the sheet 14^{cb} along its upper side 14^{cbh} of the sheet 14^{cb}, in an opposite edge position of the side 14^{cbh} on which it is joined in relation to the series of eyelets 15 made along this side.

[0080] For example, the connection means 121 are the pins and the eyelet holes described above, which however have a liquid tight coupling, for example due to the presence of gaskets between pins and holes.

[0081] The second band 217 can also be divided into three portions (see in particular Figure 14). A first portion 217^{bbd} is joined in an irreversible manner, by means of its own joining strip 18 (for example welding or liquid-tight

gluing) along the side 14^{bbd} of the sheet 14^{bb}, made in an opposite edge position of the respective side 14^{bb} with respect to series of eyelets 15 made along this side.

[0082] A second portion 217^{bc}s is irreversibly connected, by means of its own joining strip 18, along the side 14^{bcS} of the sheet 14^{bc} laterally adjacent to the sheet 14^{bb}, made on the sheet 14^{bc} in an opposite edge position of the side 14^{bcS} on which it is joined to the series of eyelets 15 made along this side.

[0083] A third portion of band 217^x, has a rectangular shape and is a portion released from the sheets before assembly, which is fixed to these by means of the same connection means 121 described above. In particular, said connecting means allow the connection of such third portion 217^x with the second portion 217^{bc} and with the first portion 217^{bbd}, with the third portion which is arranged above them.

[0084] In particular, this third portion 217^x comprises (see Figure 16), along its opposite sides, two parallel strips of pins 126 facing downward (fixed with liquids seal to the third portion of the band 217), adapted to be inserted into respective eyelet holes 125 made both along the second portion 217^{bcS} of the second band 217, and along the first portion of band 217^{bbd}.

[0085] All the third parties 117^x or portions 217^x are connected to the sheets on their respective long side and to each other in contiguity on the short side.

[0086] It should be noted that the sheet 14^{bb} (as well as all the other sheets adjacent thereto) of this second embodiment, advantageously presents four rectangular flaps, of the same material of the sheet, welded along the four sides; the flap along the lower side 14^{bbi} corresponds to the first part of band 117^{bbi} of a first band 117^x placed lowerly, the flap along the upper side 14^{bbh} corresponds to the second part 117^{abh} of a first band 117^x placed above. The flaps along the lateral edges of the sheet 14^{bb} correspond respectively to the first portion of band 217^{bbd} and to a second portion of band 217^{bbs} for the connection to corresponding opposite second side bands 217^x.

[0087] It should be noted that in this second embodiment, there are no special sheets relative to the ridge 13, since the covering of the ridge zone is left to the first band 117^x, which connects the upper sides of two adjacent sheets from opposite sides of the ridge .

[0088] It is understood that what is illustrated represents only possible non-limiting embodiments of the invention, which may vary in the forms and arrangements without departing from the scope of the concept underlying the invention. The presence of reference numbers in the appended claims has the sole purpose of facilitating reading thereof in the light of the foregoing description and of the attached drawings and does not in any way limit the scope of protection.

Claims

1. Modular covering system (10), to associate with one or more loadbearing structures (11,12), comprising

- a plurality of covering sheets (14) quadrangular in shape, adapted to be arranged adjacent to one another and at least partially according to a matrix arrangement,
- flexibles bands (17) for covering the border areas between adjacent sheets, arranged to overlap the edge areas of said sheets in the border areas they must cover,
- connection means (21) of said bands with the respective sheets, said connection means being adapted to provide a reversible connection with at least one of said sheets,

wherein said sheets comprise, along their perimeter, close to the edge area, a plurality of eyelets (15) for fixing to the supporting structures with which they are associated, by means of cables (16), hooks or the like; said covering bands (17) being arranged to overlap said eyelets,

wherein a sheet (14^{ba}) comprises a first side (14^{bai}) along which, parallel thereto, there is joined, by means of a joining strip (18) thereof, a said band (17^{bai}), said band being arranged on the upper face of said sheet and protruding with respect to the edge of said first side to be able to overlap a sheet (14^{ca}) arranged adjacent to said first side; said band comprising reversible connection means (21) to said adjacent sheet, said reversible connection means comprising an upper connection strip (22) provided on said band and a lower strip (23) produced on said adjacent sheet, adapted for connection with said upper strip, **characterized in that** said sheet comprises a second side (14^{bad}), contiguous to said first side (14^{bai}), along which, parallel thereto, there is joined, by means of a joining strip (18) thereof, a second said band (17^{bad}), said second band being arranged on the upper face of said sheet and protruding with respect to the edge of said second side to be able to overlap a sheet (14^{bb}) arranged adjacent to said second side; said second band comprising reversible connection means to said adjacent sheet, said reversible connection means comprising an upper connection strip (22^{bad}) provided on said second band and a lower strip (23^{bbs}) produced on said adjacent sheet, adapted for connection with said upper strip.

2. Modular covering system according to claim 1, wherein said first and said second band form a single band, preferably with a shape similar to an "L".
3. Modular covering system according to claim 1 or 2, wherein said joining strip (18), preferably made by

gluing or welding, is produced on said sheet in a position opposite the edge of the respective side with respect to the series of eyelets (15) produced along said respective side.

4. Modular covering system according to any one of the preceding claims, wherein said upper connection strip provided on said band and said lower strip produced on said adjacent sheet, adapted for connection with said upper strip, comprise male-female elements of hook and loop type, preferably of waterproof type.

5. Modular covering system according to anyone of claims 1 to 3, wherein said lower strip produced on said adjacent sheet (14'), adapted for connection with said upper strip, comprises holes with eyelets (25), while said upper connection strip provided on said band is provided with pins (26) facing downwards, adapted to be inserted into respective said holes with eyelets, said pins being provided with a portion (26A) to prevent removal from said holes with eyelets, movable reversibly to a configuration that allows removal and to a configuration that prevents removal.

6. Modular covering system according to any one of the preceding claims, wherein said sheet is adapted to be arranged sloping and said first side (14^{bai}) is at a lower height with respect to the opposite side of the sheet, so that said band (17^{bai}) that is joined, with waterproof seal, to said sheet and that extends along said first side, overlaps the edge area of the upper side of the adjacent sheet (14^{ca}), so that any water running on said sheet runs over said band without penetrating between band and sheet and therefore continues to run on said adjacent sheet.

7. Modular covering system according to claim 6, comprising a said sheet (14^{ab}) adapted to occupy the position close to the ridge (13) of the covering, said ridge sheet being sloping and having an upper side (14^{abh}) adjacent to an elongated element (12T) of the supporting structure that defines the ridge of the covering system; said sheet comprising a third upper band (17^{abh}) that extends along the upper side (14^{abh}) of the sheet, for covering the space between the sheet and the edge of the adjacent sheet (14^{AB}) on the other part of the ridge of the covering system.

8. Modular covering system according to any one of the preceding claims, wherein at least a first of said bands (117) is divided into three portions:

- a first portion (117^{bbi}) joined irreversibly, by means of its joining strip, along said side of said respective sheet (14^{bb}); preferably said joining strip being produced on said respective sheet in

a position opposite the edge of the respective side with respect to the series of eyelets (125) produced along said respective side;

- a second portion (117^{cbh}) joined irreversibly, by means of its joining strip, along a side of a sheet (14^{cb}) adjacent to said respective sheet; preferably said joining strip being produced on said adjacent sheet in a position opposite the edge of the side on which it is joined with respect to the series of eyelets produced along this side of adjacent sheet;

- a third portion (117^x) provided with said connection means with said second part and with said respective sheet in a position below said first part of band.

9. Modular covering system according to any one of claims 1 to 7, wherein at least a first of said bands (117) is divided into two portions:

- a first portion (117^{bbi}) joined irreversibly, by means of its own joining strip, along said side of the respective sheet (14^{bb}); preferably said joining strip being produced on said respective sheet in a position opposite the edge of the respective side with respect to the series of eyelets (125) produced along said respective side;

- a second portion (117^{xk}) provided with said connection means with a sheet (14^{cb}) adjacent to said respective sheet and with said respective sheet in a position below said first part of band.

10. Modular covering system according to claim 8 or 9, wherein at least a second (217) of said bands is divided into three portions:

- a first portion (217^{bcs}) joined irreversibly, by means of its joining strip, along said side of said respective sheet (14^{bc}); preferably said joining strip being produced on said respective sheet in a position opposite the edge of the respective side with respect to the series of eyelets produced along said respective side;

- a second portion (217^{bbd}) joined irreversibly, by means of a joining strip thereof, along a side of a sheet (14^{bb}) adjacent to said respective sheet; preferably said joining strip being produced on said adjacent sheet in a position opposite the edge of the side on which it is joined with respect to the series of eyelets produced along this side of adjacent sheet;

- a third portion (217^x) provided with said connection means with said first and said second portion, preferably in a position above said first and second portion.

11. Modular covering system according to any one of the preceding claims, wherein said connection

means of said bands with the respective sheets comprise, for each band, at least a connection strip that comprises pins (126) facing downwards, adapted to be inserted into respective holes with eyelets (125) produced on portions of said band integral with said sheet, or on said sheet; said pins being provided with a portion (126A) to prevent removal from said holes with eyelets, movable reversibly to a configuration that allows removal and to a configuration that prevents removal.

12. Covering assembly comprising a modular covering system according to one or more of the preceding claims and a supporting structure for said sheets, with said sheets arranged adjacent to one another; preferably, said supporting structures defining supporting areas inside which respective sheets are arranged; preferably said supporting structures comprise a plurality of frames defining said areas inside which respective sheets are arranged; said frames comprising elongated elements; said elongated elements and said eyelets being connected by said cables, hooks or the like for supporting said sheets.

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Fig.1

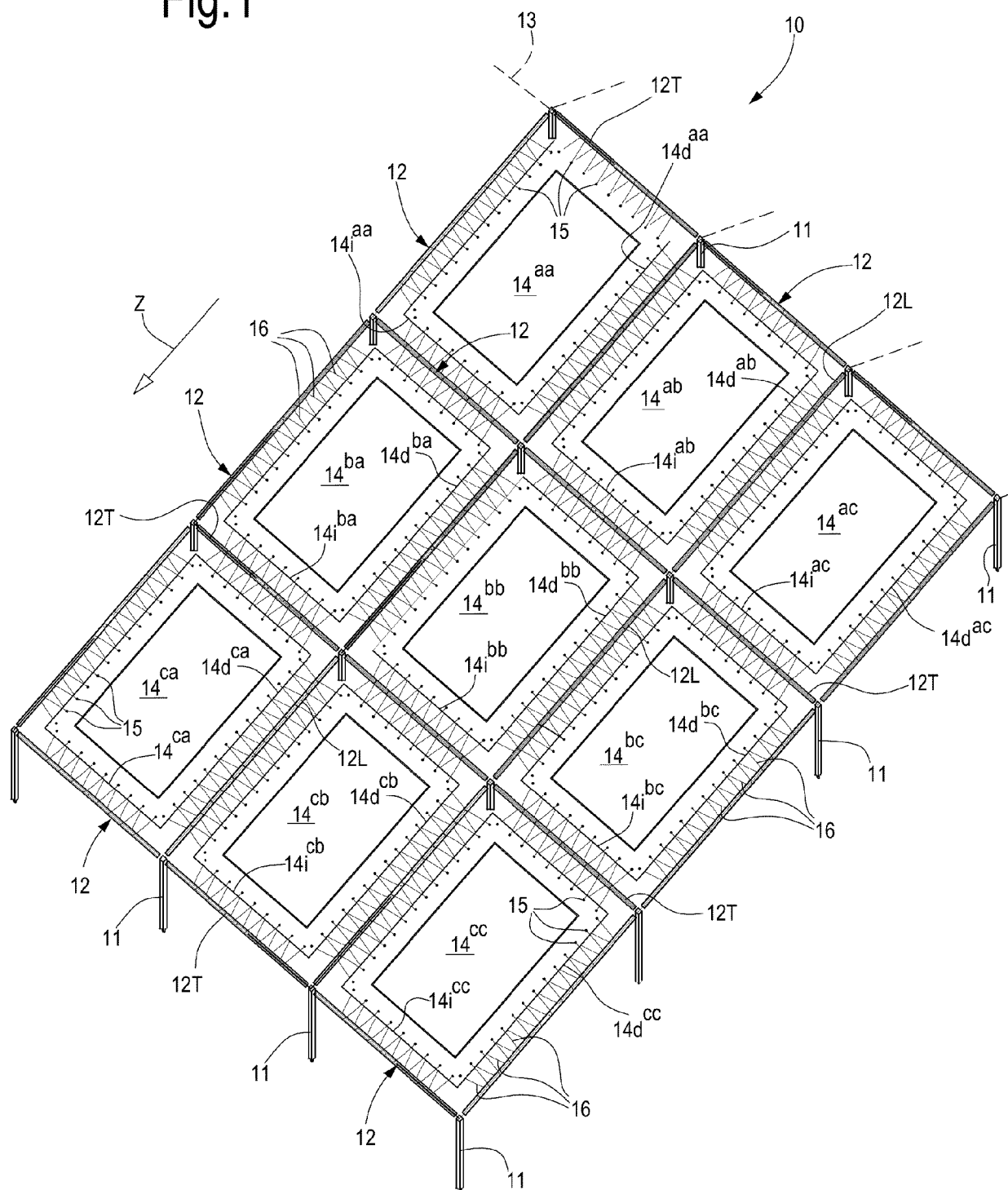
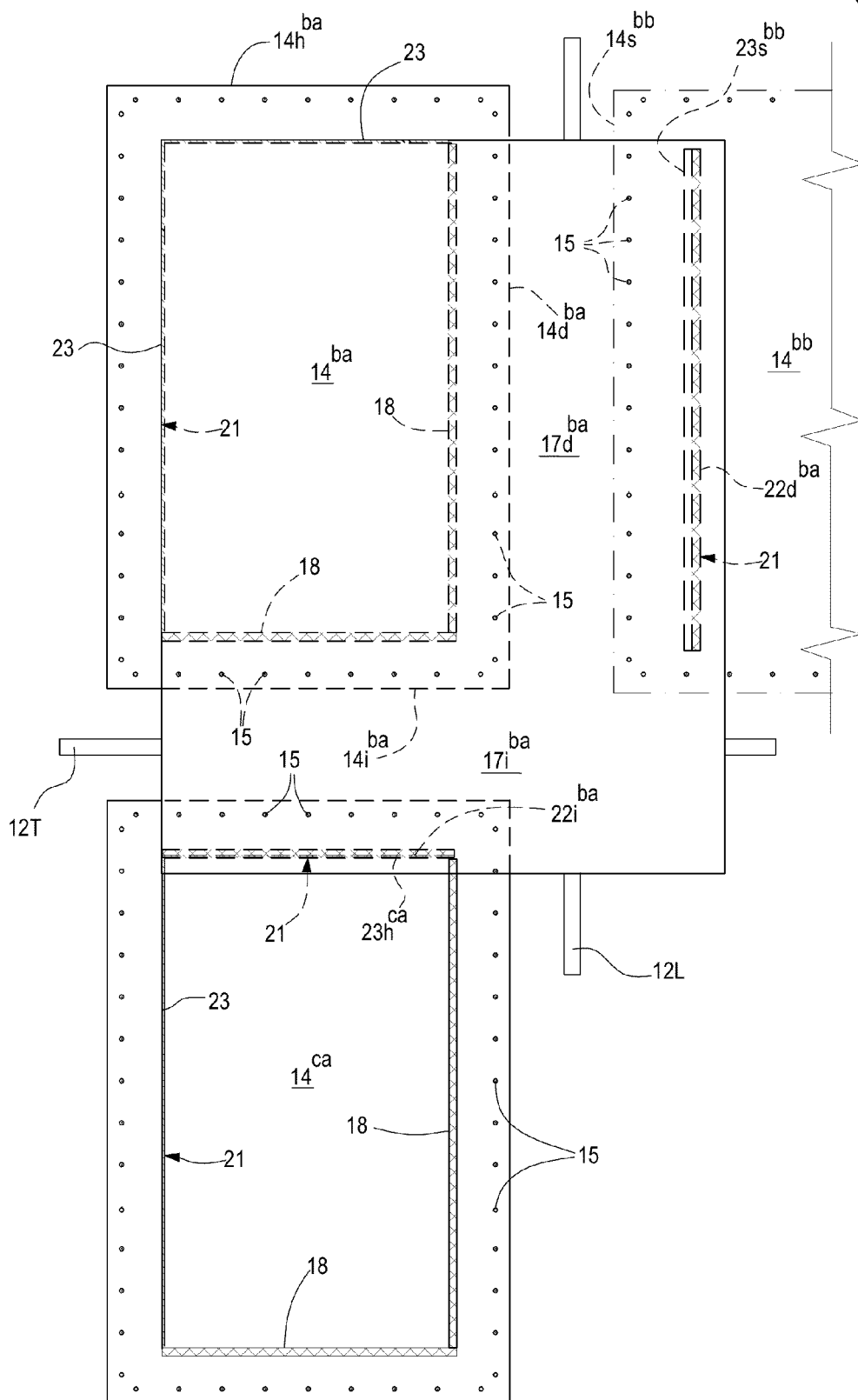
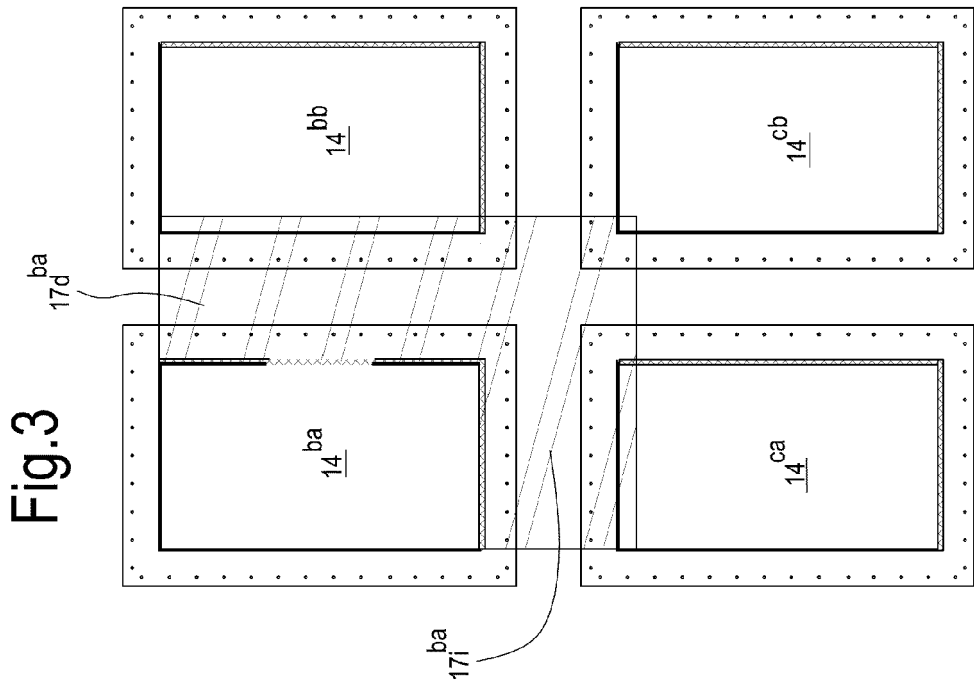
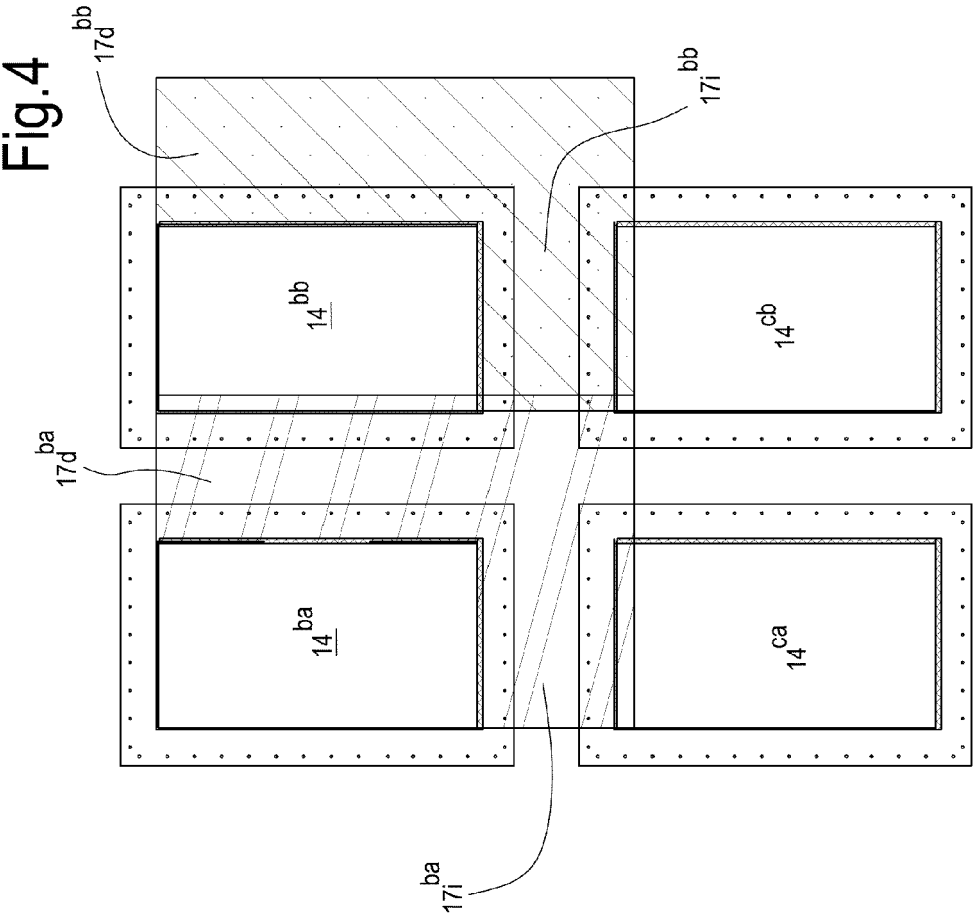
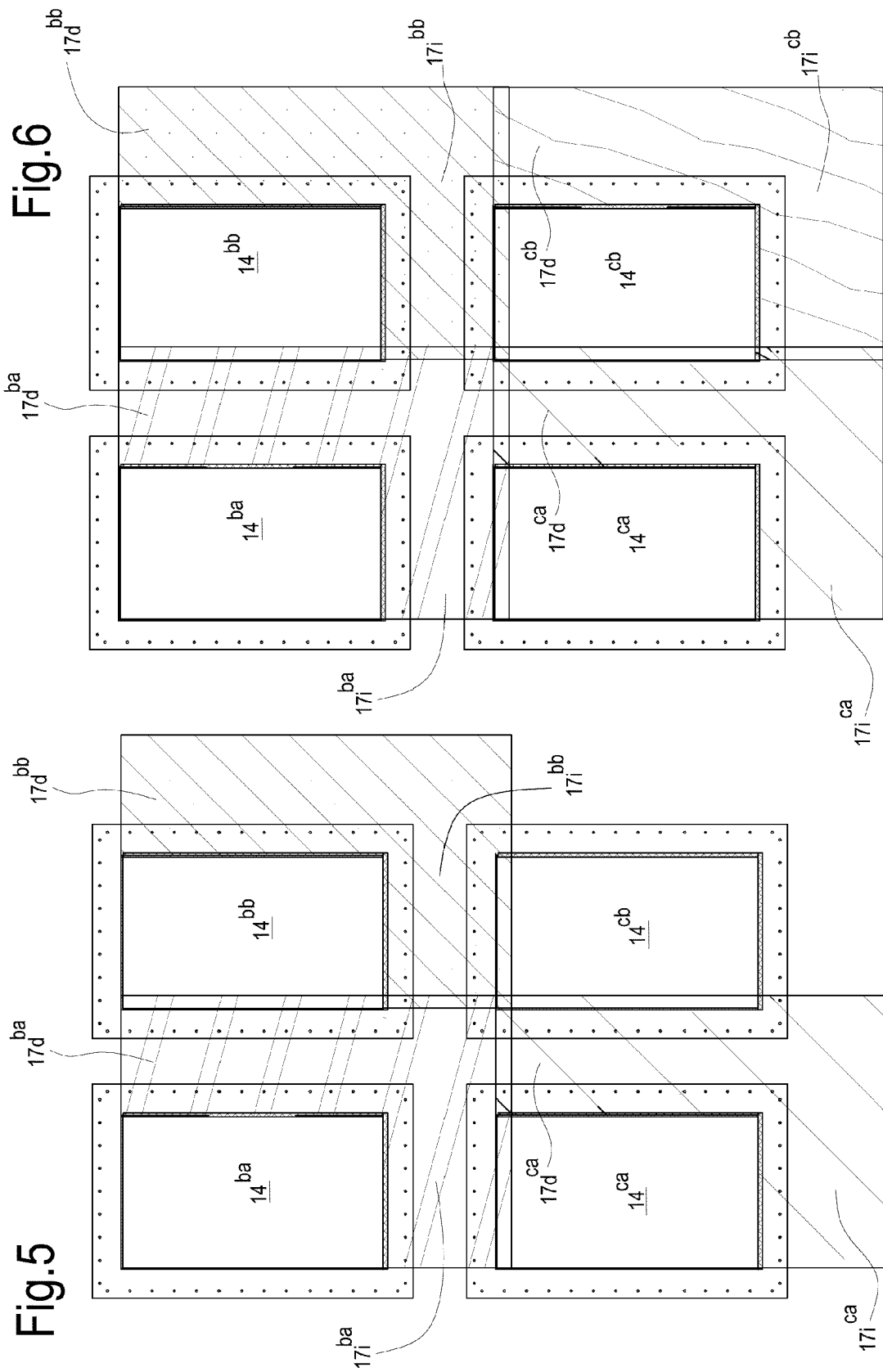


Fig.2







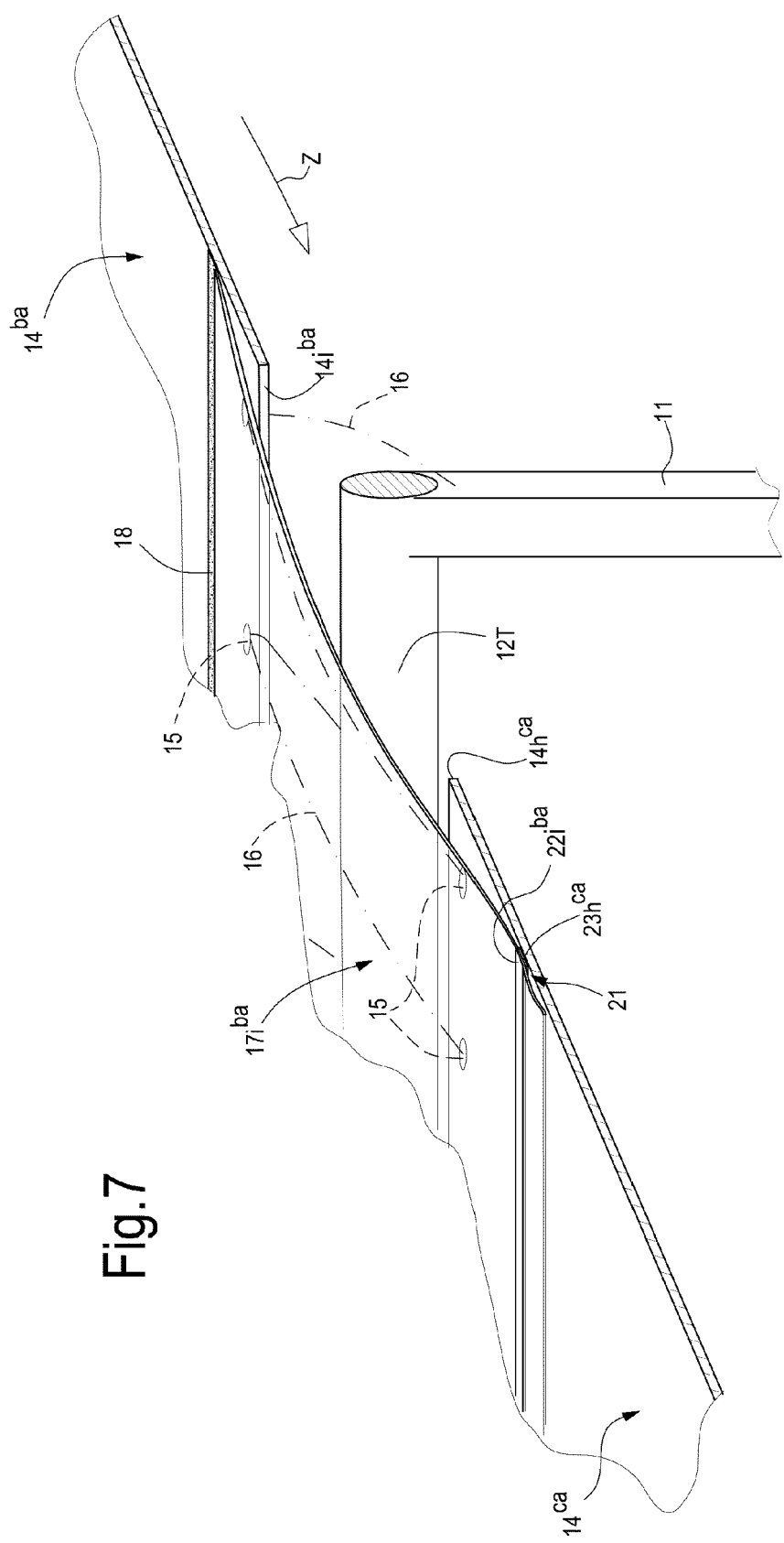


Fig.7

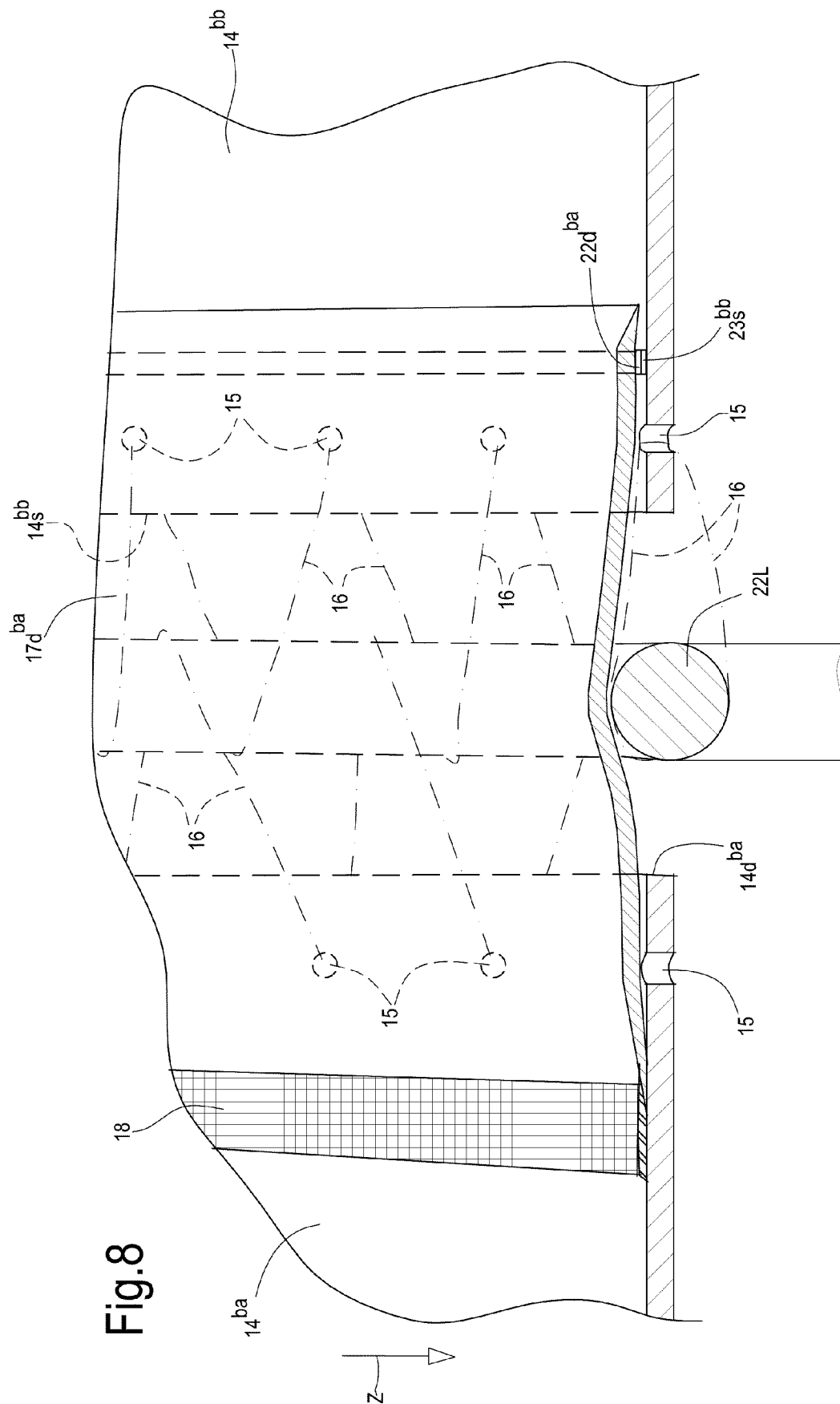


Fig.9

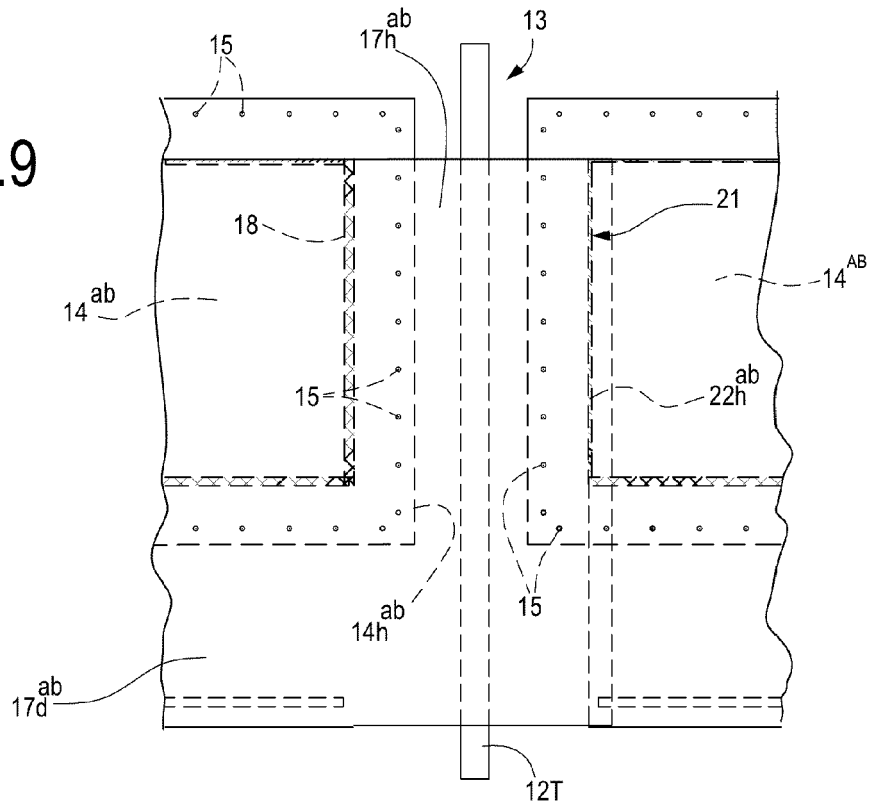


Fig.10

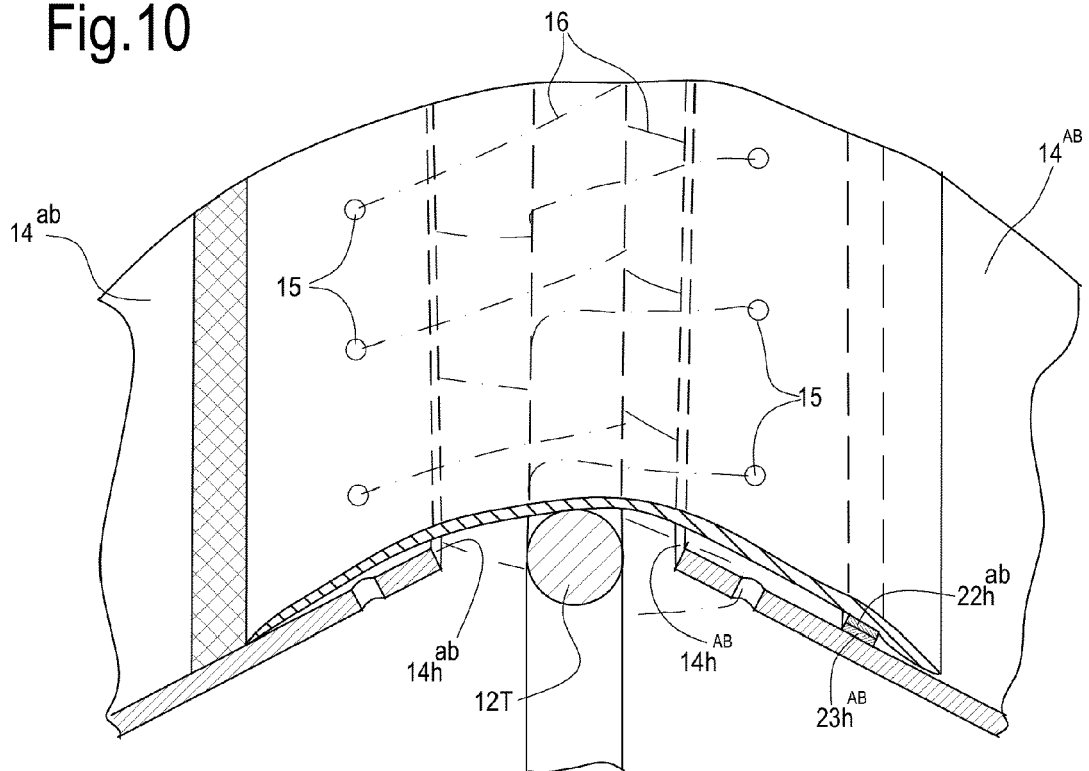


Fig.11

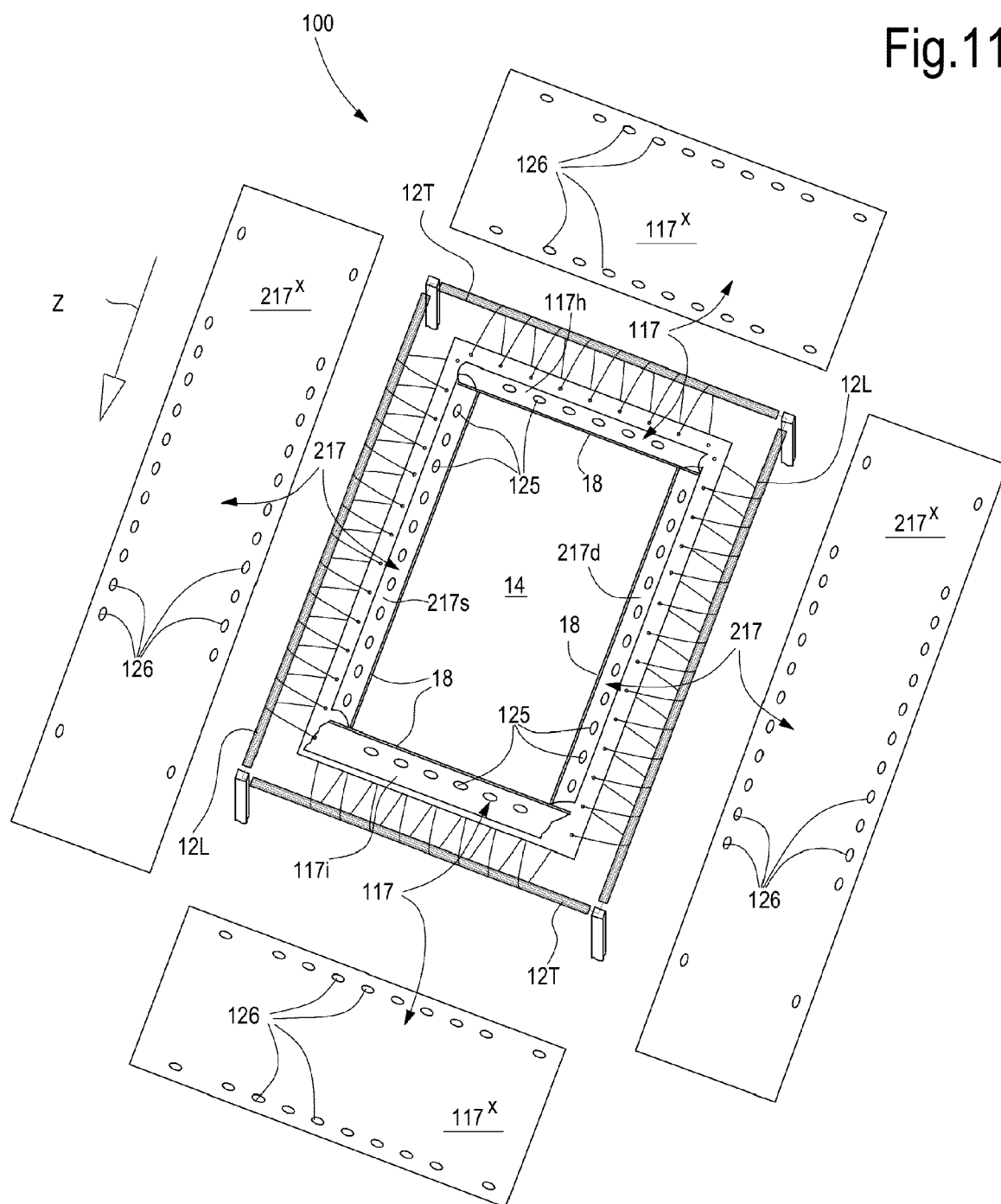
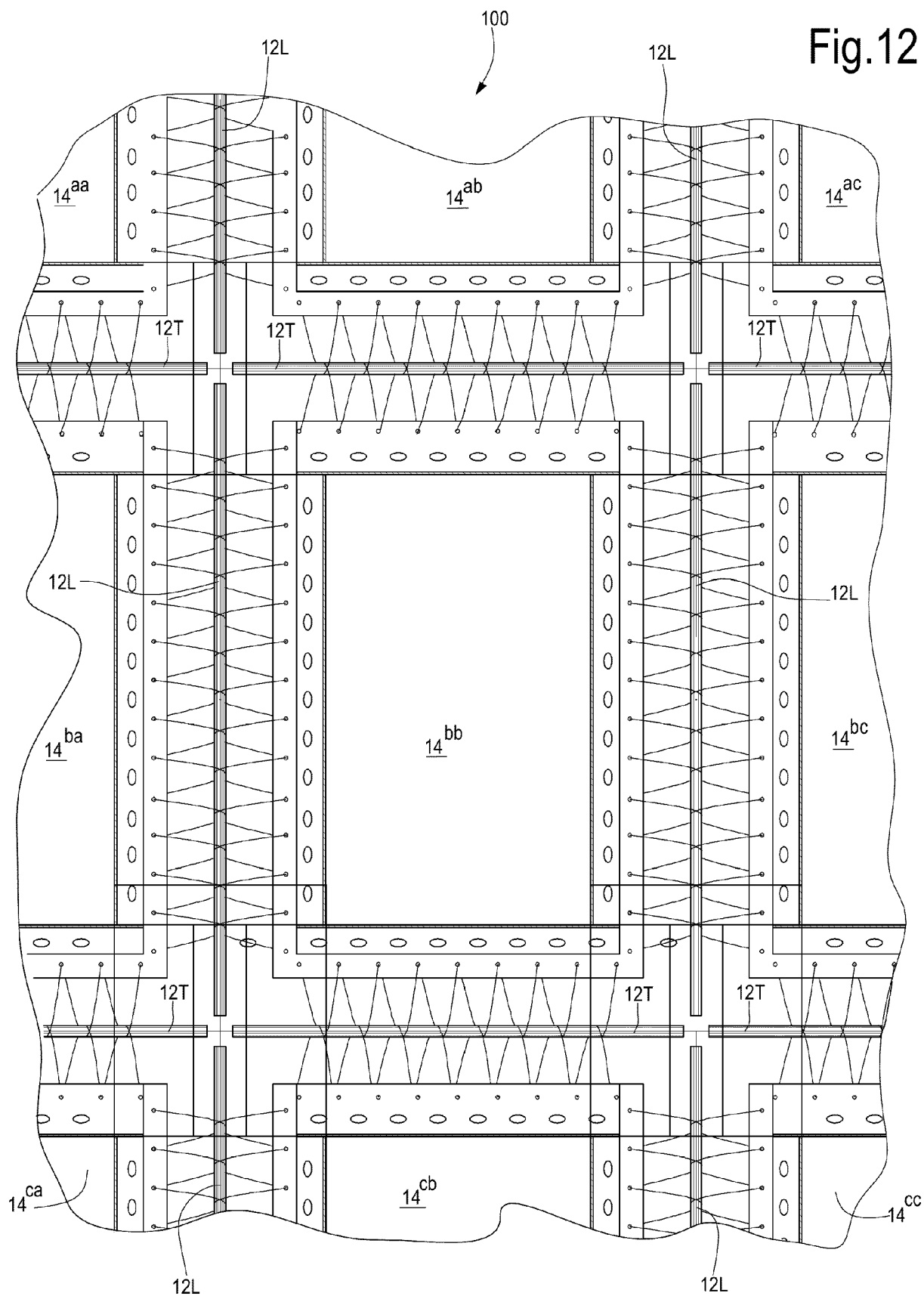
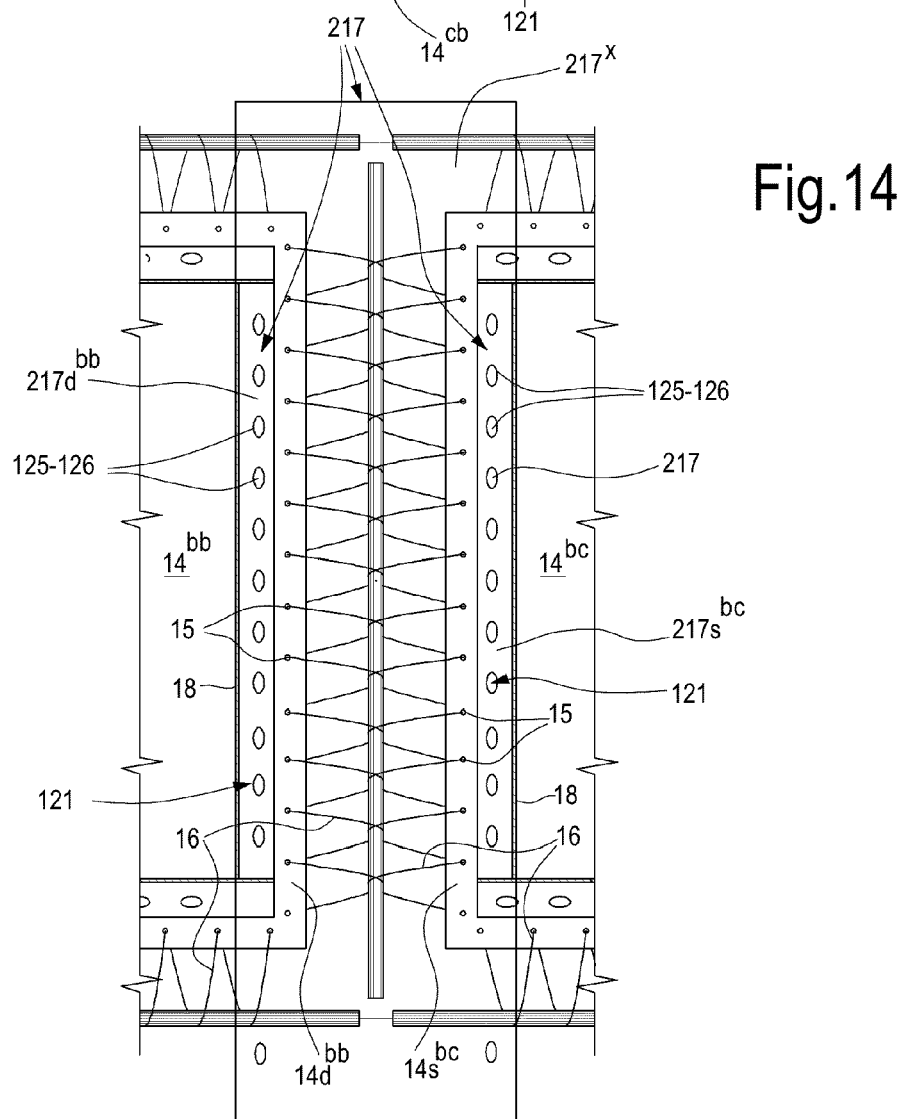
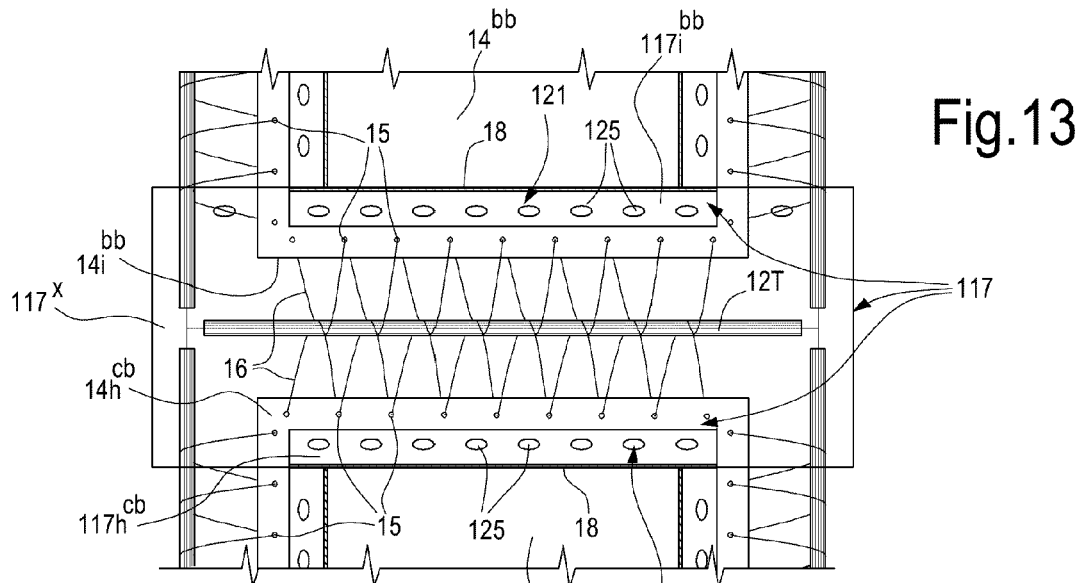


Fig.12





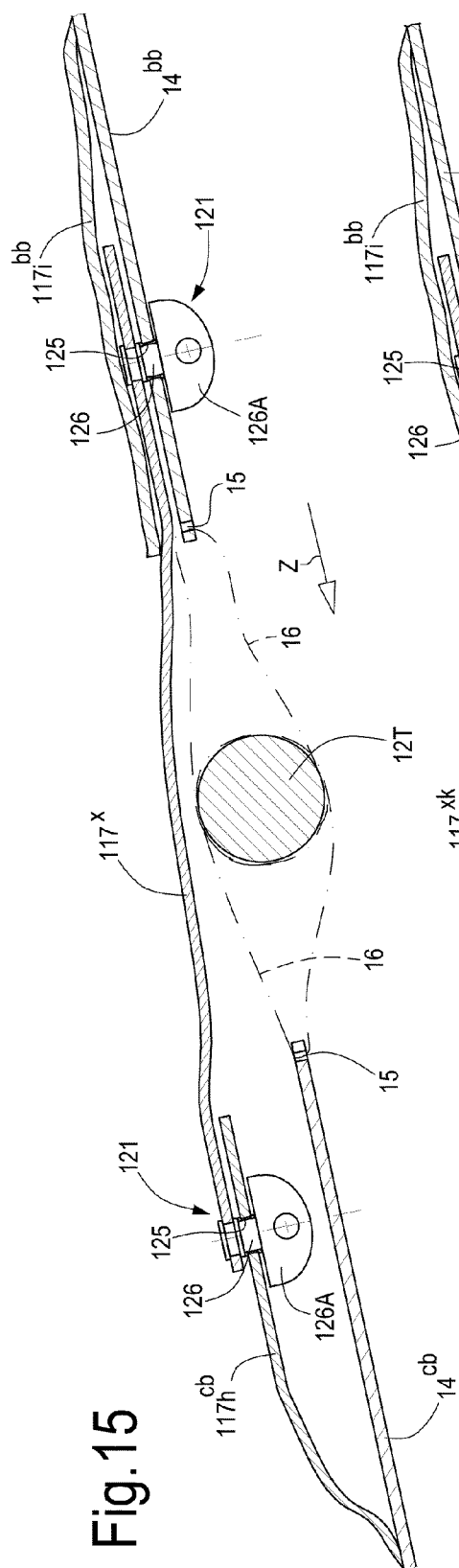


Fig. 15

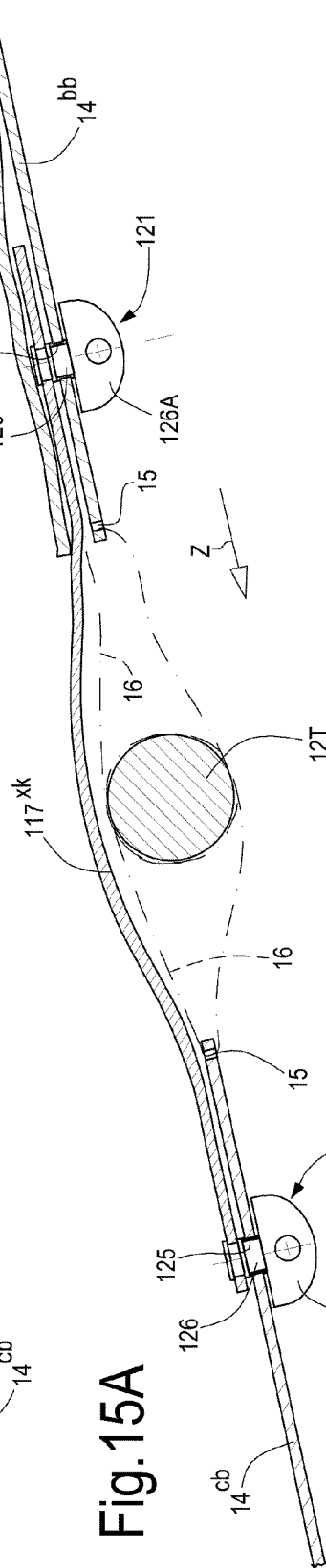


Fig. 15A

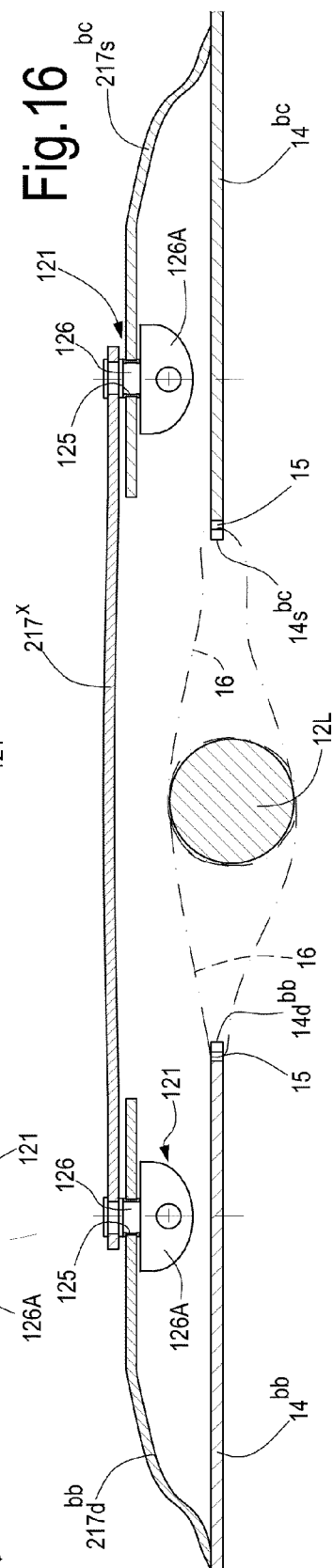


Fig. 16

Fig.17

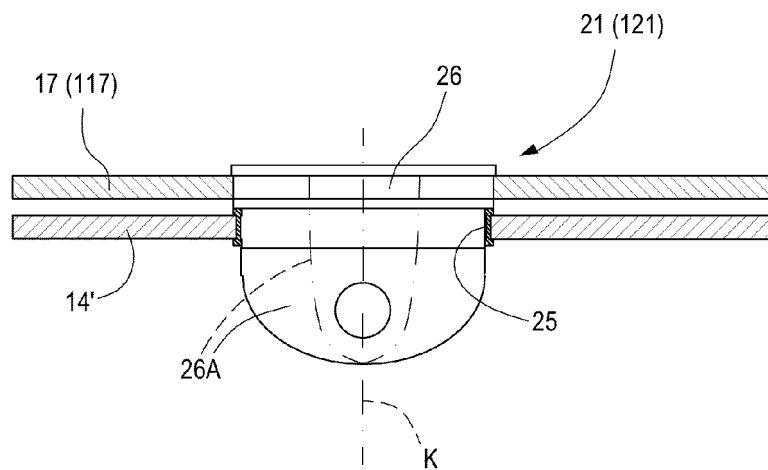
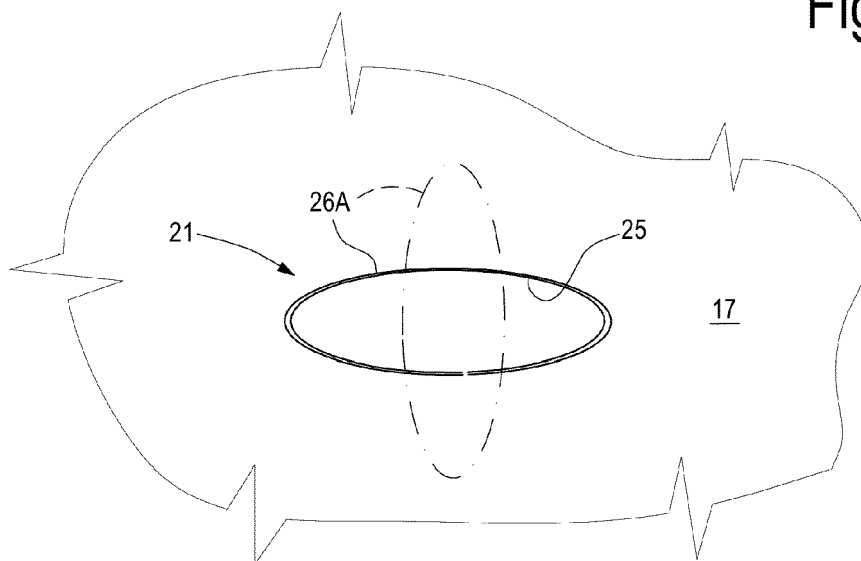


Fig.18





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Place of search The Hague		Date of completion of the search 14 March 2018	Examiner Leroux, Corentine
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