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(54) **Covering device without exposed fasteners**

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## Description

**[0001]** The present invention concerns the roofing materials and in particular relates to a covering build device made without exposed fasteners designed to achieve

**[0002]** There are known roofing structures made with shaped plates secured to an underlying structure, such as joists and beams, by means of nail or screw fittings passing through the cover plates and for sealing reasons washers and sealing elements can be applied under the nail or screw heads, in abutment with the outer face of the plates.

**[0003]** Typically, these fittings are applied at least in correspondence of the ribs made at the plate edges, where it is realized the edge overlapping of two adjacent plates.

**[0004]** A drawback of these known roofing structure consists in that the respective fittings are exposed to atmospheric agents and crosses the whole plate thickness causing the water infiltration risk due to sealing element degradation or mounting errors.

**[0005]** Another disadvantage of these known roofing structures consists in that the exposed fittings may be accumulation areas for dirt, debris, leaves, branches, snow, etc., which can facilitate the degradation of materials and infiltrations.

**[0006]** A further disadvantage of the known roofing plates consists in that, for example due to melting snow, stagnant water, rain with strong wind and adverse conditions, the roofing plates may be subject to water infiltrations which, overcoming the obstacles due to ribs, can reach areas below the cover and inside the construction work.

**[0007]** Another disadvantage of the known roofing structures consists in that dust, pollen, sand and other materials can penetrate between two adjacent plates which can expand with water or can be a support for mosses or vegetable development in time causing tension and openings between plates compromising grip and resistance of the roofing structure.

**[0008]** An object of the present invention is to propose roofing device without exposed fasteners without holes, windows or other openings through the plates, thus avoiding possible waterways. Such a device is already known from EP-A-2105549.

**[0009]** Another object is to propose a covering device whose fittings to building structure are covered by the cover plates and therefore without deterioration and wear and without receptacles or water flow decelerations.

**[0010]** Further object is to propose a device able to minimize the water infiltration and to collect and dispose any infiltrations avoiding their penetration below the same device.

**[0011]** Another object is to propose a device able to prevent entry and accumulation of dust, sand, and pollen.

**[0012]** Further object is to propose a device fit for form-

ing a wind resistant cover also with strong wind and to prevent the lifting of plates and in particular of respective edges.

**[0013]** Another object is to propose a device made of long plates, even tens meters, and equipped with lightness, stiffness and resistance.

**[0014]** These objects are achieved by a device according to claim 1, with the preamble of said claim being known from DE-B-102005 005745.

**[0015]** The characteristics of the invention are highlighted in the following with particular reference to the accompanying drawings in which:

- Figure 1 shows, along an axial view, a partial view of a cover made with the covering build device without exposed fasteners, object of the present invention, fixed to a support structure of a construction;
- Figure 2 shows an isometric view of a segment of a means plate of Figure 1;
- Figures 3 to 7 show views in orthogonal projection of a fastening means of Figure 1;
- Figure 8 shows a partial axial view of a variant of the device of Figure 1;
- Figures 9 to 13 show views in orthogonal projection of the fastening means of the variant of figure 8 of Figure 1;
- Figures 14 to 18 show axonometric views, respectively, side, rear, top and front of a fastening means of a further variant of the device;
- Figure 19 shows partial view and cross section view of another embodiment of the device;
- Figures 20 and 21 shows respectively partial, cross-section and top view of a plate means of another embodiment of the covering device.

**[0016]** With reference to Figures 1-7, numeral 1 indicates the covering device without exposed fasteners object of the present invention comprising a plurality of plate means 3 and a plurality of fastening means 8 designed, in an operating condition O of the device 1, to be fixed, using nails, screws, fasteners or clips to a support structure, for example beams and/or wood joists or metal profiles, and to block the plate means 3 to said structure.

**[0017]** The plate means can be made of synthetic material, for example of composite type, or preferably in metal material such as a ferrous material sheet, possibly galvanized and/or painted and cold bent or non-ferrous metal, pure or alloyed, such as copper or aluminium.

**[0018]** Depending on material and construction technique, size and intended application, the thickness of the plate means 3 can vary from less than one tenth of millimetres up to over twenty tenths.

**[0019]** The length and width of the plate means 3 can be respectively meters or tens of meters and decimetres.

**[0020]** Preferably, the fastening means 8 is made of steel coated with PVC or other similar insulating material; vice versa the known brackets, having similar functions to the fixing means of the present invention, are made of

polyamide or galvanized steel.

**[0021]** In particular, the fastening means 8 has the steel core (12/10), so having mechanical strength and durability of the metal brackets, and is completely covered by a PVC layer of about 110 micron, for example of coated type and subjected to "backing" at about 650° C.

**[0022]** The preferred fastening means 8, also having an excellent resistance to oxidation, provides an electrical insulating element separating metals and therefore solving the problems of electrolytic current and corrosion; besides the PVC covering gives an excellent sliding of the cover plate and with the thermic expansion effect can move without friction and wear of the metal elements.

**[0023]** Furthermore, the preferred fastening means 8 reduces the thermic losses through the cover because the heat flow, through the mantle extrados, finds such fastening means 8 whose PVC coating, having thermal resistance greater than the polyamide and bare steel, breaks the thermal bridge.

**[0024]** Alternatively the fastening means 8 may consist of plates or metal plates, with thickness ranging from two to twenty times the plate thickness, cut and shaped by folding, or may consist of metallic elements obtained by fusion or, in the further alternative, the fastening means 8 may be formed by injection moulding of plastic or resinous reinforced material.

**[0025]** The longitudinal and transverse dimensions of the fastening means 8 depend on step and/or the dimensions of beams or joists and shaped elements of plate means and, for example, may be long decimetres.

**[0026]** The first and second longitudinal edges, of each plate means 3, have respective first 5 and second 6 rib means extending longitudinally along the entire length of the plate means 3. The portion of each plate means 3 included between the respective first 5 and second 6 rib means is generally planar or nearly, for example slightly ribbed or corrugated.

**[0027]** In the operating condition in which the mounting device forms the cover, the plate means 3 are oriented with their longitudinal axes arranged along the lines of maximum slope, from top or ridge towards edge or gutter of the roofing cover and the respective first 5 and second 6 rib means protrude upward.

**[0028]** Each of the fastening means 8 is provided with an engagement portion 9, folded to form a longitudinal concavity intended to engage a rib means 5 of a respective plate means 3 and of a fastening plate portion 10 having holes or fasteners for nails, screws, clamps or clips to the cover support structure.

**[0029]** The engagement portion 9 of each fastening means 8 is complementary to the first rib means 5 and the second rib means 6 is complementary to the engagement portion 9; thus in the operating condition O of the device 1 the fastening portion 10 of a fastening means 8 is blocked, nailed or screwed to the support structure, the engaging portion 9 of the fastening means 8 contains and blocks a respective portion of the first rib means 5 of a plate means 3; a second rib means 6, of an adjacent

plate means 3, contains said first rib means 5 and the engaging portion 9 of said fastening means 8.

**[0030]** The cross sections of first 5 and second 6 rib means and of engagement portions 9 of the fastening means 8 can be inscribed into respective isosceles trapezoids or almost.

**[0031]** The longitudinal edge of the engagement portion 9 of the fastening means 8 opposite to the corresponding fixing portion 10 is outwardly shaped so forming a laterally protruding lip means 12; a side longitudinal portion of the second rib means 6 has a longitudinal housing 13 designed to accommodate the lip means 12 in the operating condition O of device 1.

**[0032]** In this operating condition O, the lip means 12 is sloped or inclined downwards; for example, the upper inclination angle, with respect to the vertical line, is between 110° and 170°.

**[0033]** The longitudinal seat 13 is formed by two folded and refolded faces or flat adjacent portions, of the second rib means 6, inclined as the lip means 12 and spaced for housing this latter. The sloping inclination of the lip means 12 and of the longitudinal seat 13 contributes, among other things, to make possible the mutual engagement and interlocking during the application of the second rib means 6 above the fastening means 8 and the first rib means blocked thereto for reaching the operating condition O.

**[0034]** The lateral face of the second rib means 6 opposite to the corresponding first rib means 5 of the same plate means 3 is shaped, for example by longitudinal folding of the sheet of the plate means 3, to achieve a lateral longitudinal recess means 15 having the concavity facing inwards the second rib means 6. Such recess means 15 is intended to accommodate a longitudinal side projecting means 16 shaped in the lateral face of the first rib means 5 facing the second rib means 6.

**[0035]** The convexity of the side projecting means 16 is facing outwards the first rib means 5 and towards the second rib means 6.

**[0036]** The shape of the projecting means 16 is complementary to the concave longitudinal seat carried out by the recess means 15; in the operative condition O, the recess means 15 is intended to accommodate a projecting means 16 of an adjacent plate means 3.

**[0037]** In the operating condition O, the recess means 15 of the second rib means 6 and the corresponding projecting means 16 of the first rib means 5 of an adjacent plate means, are placed under the longitudinal seat 13 of the same second rib means.

**[0038]** The recess means 15 and the corresponding projecting means 16 of a plate means 3 are each constituted by three longitudinal flat faces, of which the upper and lower are parallel and sloping with the inclination angle from the vertical equal to or higher than the faces of the longitudinal seat 13; the third side of each recess means 15 and projecting means 16, interposed between the upper and lower sides, is much sloping inclined or vertical.

**[0039]** The longitudinal face side of the engagement portion 9 adjacent to the fastening portion 10 is centrally shaped to form a longitudinal groove means 19 with its concavity facing outwardly.

**[0040]** The longitudinal side face of the second rib means 6 toward the first rib means 5 of the same plate means 3 carries a longitudinal rib means 20 complementary to said longitudinal groove means 19 and designed to engage with such longitudinal groove means 19 in the operating condition O of the device 1.

**[0041]** The cross sections of longitudinal groove means 19 and longitudinal rib means 20 are "V" or "L" shaped with bisector approximately perpendicular to the geometric plane defined by the faces of the first 5 and second 6 rib means of two adjacent plate means and at operative condition O.

**[0042]** Since the lip means 12 of the fastening means 8, the longitudinal seat 13 of the second rib means 6, the projecting means 16 of the first rib means 5, the recess means 15 of the second rib means 6 of the plate means 3, the longitudinal groove 19 of the fastening means 8 and the longitudinal rib means 20 of the second rib means 6, are sloped or otherwise inclined, have undercuts when the longitudinal sides of said undercuts are inclined according to engagement direction of the second rib means 6 with the fastening means 8 and the first rib means 5.

**[0043]** The second rib means 6 is provided with resilience to allow the interlocking engagement of the undercuts of the longitudinal seat 13 and the recess means 15 and longitudinal rib 20 of the second rib means 6 with the lip means 12, with the projecting means 16 and with the longitudinal groove means 19.

**[0044]** The shape of the second rib means 6 and in particular its longitudinal rib means 20 allow, with the same elasticity features of the plate means material, a greater elastic deformation and a greater possibility of divergence without plastic deformation, facilitating the interlocking and the achievement of the device operating condition.

**[0045]** In this operating condition O, the longitudinal free edge 23 of the first rib means 5 is turned in the opposite direction to the covering support structure or is stretched upward and abuts against a longitudinal stop element 24 of the fastening means 8 formed by the lower longitudinal wall of groove means 19. Such stop element ensures that the locking means 8 blocks the free edge 23 of the first rib means preventing the rise or vibration thereof.

**[0046]** The longitudinal central portion of the first rib means 5 of each fastening means 8 is provided with a first longitudinal channel means 27 designed to collect and evacuate eventual water infiltrations.

**[0047]** The longitudinal flap of first rib means 5 adjacent to free edge 23 is "U" folded so forming a second channel means 28 parallel and slightly lower than the first channel means 27. Such second channel means 28 cooperates with the first channel means 27 during the collection and

evacuation of the water infiltrated or condensed inside the cover.

**[0048]** The shaping folds of central and lateral outer longitudinal portion of the first rib means 5 forming first 27 and second 28 channel means have wide curvature radii conferring to first rib means 5 a wavy shape increasing the elastic deformability facilitating the coupling with the fastening means 8 and the elastic abutment of the free edge 23 with the longitudinal stop element 24.

**[0049]** The longitudinal portion of the plate means 3 adjacent to the second rib means 6 has a recess housing 29, formed by folding the plate means 3, designed to accommodate the fastening portion 10 of fastening means 8.

**[0050]** The operation of the device 1 provides that the cover is made by placing a first plate means 3 onto the support structure, fixing said first plate means 3 by a set of fastening means 8 applied to first rib means 5 of said plate means and screwed, riveted, or otherwise fixed to the structure; the installation proceeds by applying a second rib means 3 fitting the second rib means to first rib means and to fastening means already fixed.

**[0051]** The installation of the first rib means of the second plate means through additional fastening means completes the installation of the first two plate means; further repeated steps allow complete coverage.

**[0052]** More plate means can be used, relatively short, with partially overlapping ends to cover the distance between top and gutter of the roof or suitable measured plate means covering the whole distance can be used.

**[0053]** If it is needed very long plate means, for example of some tens of meters, not transportable, it is expected that these plate means are formed directly on site through a "Roll Forming" machine for progressive cold folding of a metal plate rolled down by a coil mounted on a reel, while metal plate runs through the machine matching rollers and counter-shaped rollers which progressively fold the plate so forming various elements.

**[0054]** The variant of Figures 8-13 differs from the preferred embodiment previously described by two characteristics.

**[0055]** The first different characteristic consists in that the stop element 24 comprises a set of longitudinal hook means 25 formed, for example, by die cutting and folding, in the longitudinal lower wall of groove means 19 of the fastening means 8 and folded back inwardly of the respective engagement portion 9 so that the respective cavities are directed towards the covering support structure or downwardly.

**[0056]** In the operative condition O such hook means 25 of a fastening means 8 are engaged by the free longitudinal edge 23 of first rib means 5 of a plate means locked by said fastening means 8.

**[0057]** It should be noted that the hook means 25 provide excellent joining between the free edge 23 and fastening means (8); besides the hook means 25 in cooperation with shaping folds of first 27 and second 28 channel means allow an easy assembly and secure fastening

even in case of irregularities of the support structure, assembly inaccuracies or deformations of the coverage elements prior to their assembly; besides said cooperation between hook means 25 and channel means folds 27, 28 allow to withstand stresses, for example due to subsidence, earthquakes, expansion, etc. to which cover can be subjected after its installation.

[0058] The second characteristic consists in that the portion of plate means 3, interposed between the rib means first 5 and second 6, optionally has a plurality of longitudinal stiffening corrugations or ribs 30.

[0059] The variant of Figures 14-21 differs from the previous variant because each fastening means 8 comprises a set of protruding means 35 projecting towards the concavity of the longitudinal groove means 19 and designed, in operative condition O, to abut with a longitudinal and upper portion 36 of a rib means 20, of a rib means 6, of plate means 3.

[0060] The cross section of longitudinal and upper portion 36 of the rib means 20 forms a right or preferably acute angle. The cross section of this longitudinal and upper portion 36 and the underlying middle portion of the rib means 6 is "S" shaped.

[0061] The portion of the upper fastening means 8 to the longitudinal groove 19 is flat and such fastening means 8 comprises two protruding means 35 almost coplanar with respect to that portion.

[0062] The protruding means 35 of a fastening means 8 are almost facing the hook means 25 of said fastening means 8, in fact the cut lines for forming them from the remaining portion of the fastening means 8 are common or aligned.

[0063] Each vertex of the plate means 3 has a square notch 36, each carrying a respective chamfer or radius.

[0064] An advantage of the present invention is to provide roofing device without exposed fasteners without holes, windows or other openings through the plates, thus avoiding possible waterways.

[0065] Another advantage is to provide a covering device whose fittings to building structure are covered by cover plates and therefore without deterioration and wear and without receptacles or water flow decelerations.

[0066] Further advantage is to provide a device fit to minimize the water infiltration and to collect and dispose any infiltrations avoiding their penetration below the same device.

[0067] Another advantage is to provide a device able to prevent incoming and accumulation of dust, sand, and pollen.

[0068] Another advantage is to provide a device made of long plates, even tens meters, and equipped with lightness, stiffness and resistance.

[0069] Further advantage is to provide a device fit for forming a wind resistant cover also with strong wind and to prevent the lifting of plates and in particular of respective edges.

[0070] Another advantage is to provide a device stress resistant, for example due to settling, earthquakes, ex-

pansions, etc. to which it may be subjected after its installation.

## 5 Claims

1. Covering device without exposed fasteners, comprising at least a plurality of plate means (3), each of which has first and second longitudinal edges that bear respective first (5) and second (6) rib means, and comprising a plurality of fastening means (8) each provided of an engagement portion (9) assigned to engage a plate means (3) and a fastening portion (10) assigned to be fixed by means of nails, screws, clamps or clips to a support structure for the cover, said engagement portion (9) of each fastening means (8) is complementary shaped in respect to the first rib means (5) and the second rib means (6) is complementary shaped in respect to the engagement portion (9), in an operative condition (O) of the device (1) in which the fastening portion (10) of the fastening means (8) is locked to the support structure, the engagement portion (9) of at least a fastening means (8) contains and blocks a respective longitudinal portion of the first rib means (5) of a plate means (3), a second rib means (6) of at least an adjacent plate means (3), contains at least partially, said first rib means (5) and the engagement portion (9) of said at least one fastening means (8); the longitudinal portion of the engagement portion (9) adjacent to the fastening portion (10) is shaped to form a longitudinal groove means (19) with concavity facing outwards and in that a longitudinal side portion of the second rib means (6) facing towards the first rib means (5) of the same plate means (3) has a longitudinal rib means (20) complementary to said longitudinal groove means (19) and assigned to engage such longitudinal groove means (19) in the device (1) operative condition (O); in said operative condition (O), the free edge (23) of the first longitudinal rib means (5) is oriented opposite to the cover support structure and abuts against a longitudinal stop element (24) of the fixing means (8); said device (1) is **characterized in that** the longitudinal stop element (24) is a longitudinal and bottom wall of the groove means (19).
2. Device according to claim 1 **characterized in that** the longitudinal edge of the engagement portion (9) opposite to the fastening portion (10) of the fastening means (8) is shaped outwards forming a lip means (12) and **in that** a longitudinal side portion of the second rib means (6) has a longitudinal seat (13) assigned to house such lip means (12) in the device (1) operative condition (O).
3. Device according to claim 1 or 2 **characterized in that** the side longitudinal flap of the second rib means

- (6) opposite to the corresponding first rib means (5) of the same plate means (3) has a longitudinal side recess means (15); the side longitudinal flap of the first rib means (5) facing the corresponding second rib means (6) of the same plate means (3) has a projecting means (16) complementary shaped with respect to the concavity of said recess means (15), the latter (15) is assigned, in the operative condition (O), to house a projecting means (16) of an adjacent plate means (3).
4. Device according to claims 1 to 3 **characterized in that** the lip means (12) of the fixing means (8), the projecting means (16) of the first rib means (5) of the plate means (3) and the longitudinal groove (19) of the fixing means, the longitudinal seat (13), the recess means (15) and the rib means (20) of the second rib means (6) have undercuts where the longitudinal sides of these undercuts are inclined according to the engagement direction of the second rib means (6) with the fastening means (8) and with the first rib means (5), this second rib means (6) have resilience value allowing interlocking engagement of undercuts of longitudinal seat (13) and recess means (15) and rib means (20) of the second rib means (6) with the lip means (12), with the projecting means (16) and with the longitudinal groove (19).
5. Device according to claim 1 **characterized in that** the longitudinal stop element (24) comprises a set of hook means (25) formed in the fixing means (8) and folded back inwards of the respective engagement portion (9) and with the respective cavities towards the direction of the cover support structure.
6. Device according to any of the preceding claims **characterized in that** the central longitudinal portion of the first rib means (5) of each fixing means (8) is provided with a first longitudinal channel means (27) assigned at least to collect and spill any water infiltration, and **in that** the longitudinal flap of the first rib means (5) adjacent to the free edge (23) is "U" shaped forming a second channel means (28).
7. Device according to any of the preceding claims **characterized in that** the longitudinal portion of the plate means (3) adjacent to the second rib means (6) has a housing (29) for the fastening portion (10) of the fixing means (8), and **in that** that the portion of the plate means (3) interposed between first (5) and second (6) rib means optionally has a plurality of longitudinal waves or stiffening ribs.
8. Device according to any one of the preceding claims **characterized in that** each of the fixing means (8) comprises a set of protruding means (35) protruding towards the concavity of the longitudinal groove (19) and intended, in the operative condition (O), to abut with a longitudinal and upper portion (36) of a rib means (20) of a rib means (6) of a plate means (3).
9. Device according to claim 8 **characterized in that** the cross section of longitudinal and upper portion (36) of rib means (20) forms right or preferably acute angle, and the cross section of longitudinal and upper portion (36) and underlying median portion of rib means (6) is "S" shaped.
10. Device according to claim 8 or 9, **characterized in that** the portion of fixing means (8) upper to longitudinal groove (19) is flat and **in that** the fixing means (8) includes two protruding means (35) almost coplanar with respect to that portion.
11. Device according to claims 5 and 10, **characterized in that** the protruding means (35) of a fixing means (8) are almost facing the hook means (25) of said fixing means (8).
12. Device according to any one of claims 8 to 11 **characterized in that** each vertex of the plate means (3) has a square notch (36), each carrying a respective chamfer or junction.

#### Patentansprüche

1. Abdeckvorrichtung ohne ungeschützte Befestiger, umfassend mindestens eine Mehrzahl von Plattenmitteln (3), von denen jedes einen ersten und zweiten länglichen Rand aufweist, die entsprechende erste (5) und zweite (6) Rippenmittel tragen, und umfassend eine Mehrzahl von Befestigungsmitteln (8), von denen jedes bereitgestellt ist mit einem Eingriffsbereich (9), der zugeordnet ist, um mit einem Plattenmittel (3) in Eingriff zu gelangen, und einem Befestigungsbereich (10), der zugeordnet ist, um durch Nägel, Schrauben, Klammern oder Clips an einer Unterstützungsstruktur der Abdeckung befestigt zu werden, wobei der Eingriffsbereich (9) jedes Befestigungsmittels (8) komplementär in Bezug auf das erste Rippenmittel (5) geformt ist und das zweite Rippenmittel (6) ist komplementär in Bezug auf den Eingriffsbereich (9) geformt, wobei in einem Arbeitszustand (O) der Vorrichtung (1), in dem der Befestigungsbereich (10) des Befestigungsmittels (8) mit der Unterstützungsstruktur verriegelt ist, der Eingriffsbereich (9) von mindestens einem Befestigungsmittel (8) einen entsprechenden länglichen Bereich des ersten Rippenmittels (5) eines Plattenmittels (3) enthält und blockiert, wobei ein zweites Rippenmittel (6) von mindestens einem benachbarten Plattenmittel (3) zumindest teilweise das erste Rippenmittel (5) und den Eingriffsbereich

- (9) des mindestens einen Befestigungsmittels (8) enthält, wobei  
 der längliche Bereich des Eingriffsbereichs (9) benachbart dem Befestigungsbereich (10) geformt ist, um ein längliches Rillenmittel (19) mit einer nach außen gerichteten Konkavität zu bilden, und ein länglicher Seitenbereich des zweiten Rippenmittels (6), der in Richtung des ersten Rippenmittels (5) des selben Plattenmittels (3) weist, weist ein längliches Rippenmittel (20) komplementär zum Längsrillenmittel (19) auf und ist zugeordnet, um in solche Längsrillenmittel (19) im Betriebszustand (O) der Vorrichtung (1) einzugreifen, wobei im Betriebszustand (O) der freie Rand (23) des ersten länglichen Rippenmittels (5) ausgerichtet ist entgegengesetzt der Abdeckunterstützungsstruktur und an einem länglichen Anschlagselement (24) des Befestigungsmittels (8) anliegt, und die Vorrichtung (1) ist **dadurch gekennzeichnet, dass** das längliche Anschlagselement (24) eine längliche und untere Wand des Rillenmittels (19) ist.
2. Vorrichtung gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** der Längsrand des Eingriffsbereichs (9) entgegengesetzt dem Befestigungsbereich (10) des Befestigungsmittels (8) auswärts geformt ist, um ein Lippenmittel (12) zu bilden, und dadurch, dass ein länglicher Seitenbereich des zweiten Rippenmittels (6) einen länglichen Sitz (13) aufweist, der zugeordnet ist, um solch ein Lippenmittel (12) im Betriebszustand (O) der Vorrichtung (1) aufzunehmen.
3. Vorrichtung gemäß Patentanspruch 1 oder 2, **dadurch gekennzeichnet, dass** die längliche Seitenklappe des zweiten Rippenmittels (6) entgegengesetzt dem entsprechenden ersten Rippenmittel (5) des selben Plattenmittels (3) ein längliches Seitenausparungsmittel (15) aufweist, wobei die längliche Seitenklappe des ersten Rippenmittels (5), die dem entsprechenden zweiten Rippenmittel (6) des selben Plattenmittels (3) zugewandt ist, ein Vorspringmittel (16) aufweist, das in Bezug auf die Konkavität des Aussparungsmittels (15) komplementär geformt ist, wobei das Aussparungsmittel (15) im Betriebszustand (O) zugeordnet ist, um ein Vorspringmittel (16) eines benachbarten Plattenmittels (3) aufzunehmen.
4. Vorrichtung gemäß den Patentansprüchen 1 bis 3, **dadurch gekennzeichnet, dass** das Lippenmittel (12) des Befestigungsmittels (8), das Vorspringmittel (16) des ersten Rippenmittels (5) des Plattenmittels (3) und die Längsrille (19) des Befestigungsmittels, der Längssitz (13), das Aussparungsmittel (15) und das Rippenmittel (20) des zweiten Rippenmittels (6) Hinterschnitte aufweisen, wobei die Längsseiten dieser Hinterschnitte gemäß der Eingriffsrichtung des zweiten Rippenmittels (6) mit dem Befestigungsmittel (8) und mit dem ersten Rippenmittel (5) schräg sind, wobei diese zweiten Rippenmittel (6) einen Federwert aufweisen, der einen formschlüssigen Eingriff von Hinterschnitten des Längssitzes (13) und der Aussparungsmittel (15) und Rippenmittel (20) des zweiten Rippenmittels (6) mit dem Lippenmittel (12), mit dem Vorspringmittel (16) und mit der Längsrille (19) gestattet.
5. Vorrichtung gemäß Patentanspruch 1, **dadurch gekennzeichnet, dass** das längliche Anschlagselement (24) einen Satz von Hakenmitteln (25) aufweist, die im Befestigungsmittel (8) gebildet sind und einwärts von dem entsprechenden Eingriffsbereichs (9) und mit den entsprechenden Aussparungen in Richtung der Richtung der Abdeckungsunterstützungsstruktur zurückgefaltet sind.
6. Vorrichtung gemäß einem der vorhergehenden Patentansprüche, **dadurch gekennzeichnet, dass** der mittige Längsbereich des ersten Rippenmittels (5) jedes Befestigungsmittels (8) bereitgestellt ist mit einem ersten Längskanalmittel (27), das zugeordnet ist, um zumindest jedes einströmende Wasser zu sammeln und abzuführen, und dadurch, dass die Längsklappe des ersten Rippenmittels (5) benachbart dem freien Ende (23) U-förmig ist, was ein zweites Kanalmittel (28) bildet.
7. Vorrichtung gemäß einem der vorhergehenden Patentansprüche, **dadurch gekennzeichnet, dass** der Längsbereich des Plattenmittels (3) benachbart dem zweiten Rippenmittel (6) ein Gehäuse (29) für den Befestigungsbereich (10) des Befestigungsmittels (8) aufweist, und dadurch, dass der Bereich des Plattenmittels (3), der zwischen erstem (5) und zweitem Rippenmittel (6) angeordnet ist, optional eine Mehrzahl von länglichen Wellen oder Versteifungsrippen aufweist.
8. Vorrichtung gemäß einem der vorhergehenden Patentansprüche, **dadurch gekennzeichnet, dass** jedes der Befestigungsmittel (8) einen Satz von Vorstehmitteln (35) aufweist, die in Richtung der Konkavität der Längsrille (19) vorstehen und gedacht sind, um im Betriebszustand (O) an einem länglichen und oberen Bereich (36) eines Rippenmittels (20) eines Rippenmittels (6) eines Plattenmittels (3) anzuliegen.
9. Vorrichtung gemäß Patentanspruch 8, **dadurch gekennzeichnet, dass** der Querschnitt des länglichen und oberen Bereichs (36) des Rippenmittels (20) rechte oder vorzugsweise spitze Winkel bildet und der Querschnitt des länglichen und oberen Bereichs (36) sowie des darunterliegenden Mittelbereichs der Rippenmitteln (6) S-förmig ist.

10. Vorrichtung gemäß Patentanspruch 8 oder 9, **dadurch gekennzeichnet, dass** der Bereich der Befestigungsmittel (8) oberhalb der Längsrille (19) flach ist, und dadurch, dass das Befestigungsmittel (8) zwei vorstehende Mittel (35) aufweist, die nahezu co-planar bezogen auf diesen Bereich sind. 5
11. Vorrichtung gemäß den Patentansprüchen 5 und 10, **dadurch gekennzeichnet, dass** das Vorstehmittel (35) eines Befestigungsmittels (8) nahezu dem Hakenmittel (25) des Befestigungsmittels (8) zugewandt ist. 10
12. Vorrichtung gemäß einem der Patentansprüche 8 bis 11, **dadurch gekennzeichnet, dass** jeder Scheitel des Plattenmittels (3) eine viereckige Kerbe (36) aufweist, wobei jede eine entsprechende Schräge oder einen Schnittpunkt trägt. 15

## Revendications

1. Dispositif de couverture sans attaches exposées, comprenant au moins une pluralité de moyens formant plaque (3), chacun desquels ayant des premier et second bords longitudinaux qui portent des premier (5) et second (6) moyens formant nervure respectifs, et comprenant une pluralité de moyens d'attache (8) comportant chacun une partie d'engagement (9) destinée à engager un moyen formant plaque (3) et une partie d'attache (10) destinée à être fixée au moyen de clous, de vis, de pinces ou d'agrafes à une structure de support pour la couverture, ladite partie d'engagement (9) de chaque moyen d'attache (8) est de forme complémentaire par rapport au premier moyen formant nervure (5) et le second moyen formant nervure (6) est de forme complémentaire par rapport à la partie d'engagement (9), dans un état fonctionnel (0) du dispositif (1) dans lequel la partie d'attache (10) des moyens d'attache (8) est verrouillée à la structure de support, la partie d'engagement (9) d'au moins un moyen d'attache (8) contient et bloque une partie longitudinale respective du premier moyen formant nervure (5) d'un moyen formant plaque (3), un second moyen formant nervure (6) d'au moins un moyen formant plaque adjacent (3) contient au moins partiellement ledit premier moyen formant nervure (5) et la partie d'engagement (9) dudit au moins un moyen d'attache (8) ; la partie longitudinale de la partie d'engagement (9) adjacente à la partie d'attache (10) est mise en forme pour former un moyen formant rainure longitudinale (19) avec une concavité tournée vers l'extérieur, et une partie latérale longitudinale du second moyen formant nervure (6) tournée vers le premier moyen formant nervure (5) du même moyen formant plaque (3) a un moyen formant nervure longitudinale (20) complémentaire dudit moyen formant rainure 25

longitudinale (19) et destiné à engager ledit moyen de rainure longitudinale (19) dans l'état fonctionnel (0) du dispositif (1) ; dans ledit état fonctionnel (0), le bord libre (23) du premier moyen formant nervure longitudinale (5) est orienté à l'opposé de la structure de support de couverture et vient en butée contre un élément d'arrêt longitudinal (24) des moyens d'attache (8); ledit dispositif (1) est **caractérisé par le fait que** l'élément d'arrêt longitudinal (24) est une paroi longitudinale et inférieure du moyen formant rainure (19).

2. Dispositif selon la revendication 1, **caractérisé par le fait que** le bord longitudinal de la partie d'engagement (9) à l'opposé de la partie d'attache (10) des moyens d'attache (8) est mis en forme vers l'extérieur, formant un moyen formant lèvre (12), et **par le fait qu'une** partie latérale longitudinale du second moyen formant nervure (6) a un siège longitudinal (13) destiné à recevoir ledit moyen formant lèvre (12) dans l'état fonctionnel (0) du dispositif (1). 20

3. Dispositif selon la revendication 1 ou 2, **caractérisé par le fait que** l'aile longitudinale latérale du second moyen formant nervure (6) à l'opposé du premier moyen formant nervure correspondant (5) du même moyen formant plaque (3) a un moyen formant creux latéral longitudinal (15) ; l'aile longitudinale latérale du premier moyen formant nervure (5) tournée vers le second moyen formant nervure correspondant (6) du même moyen formant plaque (3) a un moyen en saillie (16) de forme complémentaire par rapport à la concavité dudit moyen formant creux (15), ce dernier (15) est destiné, dans l'état fonctionnel (0), à recevoir un moyen en saillie (16) d'un moyen formant plaque adjacent (3). 30

4. Dispositif selon les revendication 1 à 3, **caractérisé par le fait que** le moyen formant lèvre (12) des moyens d'attache (8), le moyen en saillie (16) du premier moyen formant nervure (5) du moyen formant plaque (3) et la rainure longitudinale (19) des moyens d'attache, le siège longitudinal (13), le moyen formant creux (15) et le moyen formant nervure (20) du second moyen formant nervure (6) ont des encoches, les côtés longitudinaux de ces encoches étant inclinés selon la direction d'engagement du second moyen formant nervure (6) avec les moyens d'attache (8) et avec le premier moyen formant nervure (5), ledit second moyen de nervure (6) ayant une valeur d'élasticité autorisant l'engagement à verrouillage réciproque d'encoches du siège longitudinal (13) et du moyen formant creux (15) et du moyen formant nervure (20) du second moyen formant nervure (6) avec le moyen formant rebord (12), avec le moyen en saillie (16) et avec la rainure longitudinale (19). 40 45 50 55



5. Dispositif selon la revendication 1, **caractérisé par le fait que** l'élément d'arrêt longitudinal (24) comprend un ensemble de moyens formant crochet (25) formés dans les moyens d'attache (8) et repliés vers l'intérieur de la partie d'engagement respective (9) et avec les cavités respectives dans la direction de la structure de support de couverture.
6. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** la partie longitudinale centrale du premier moyen formant nervure (5) de chaque moyen d'attache (8) comporte un premier moyen formant canal longitudinal (27) destiné au moins à collecter et répandre toute infiltration d'eau, et **par le fait que** l'aile longitudinale du premier moyen formant nervure (5) adjacent au bord libre (23) a une forme de « U » formant un second moyen formant canal (28).
7. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** la partie longitudinale des moyens formant plaque (3) adjacente au second moyen formant nervure (6) a un logement (29) pour la partie d'attache (10) des moyens d'attache (8), et **par le fait que** la partie des moyens formant plaque (3) interposée entre les premier (5) et second (6) moyens formant nervure a éventuellement une pluralité d'ondes longitudinales ou de nervures de raidissement.
8. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** chacun des moyens d'attache (8) comprend un ensemble de moyens en saillie (35) faisant saillie vers la concavité de la rainure longitudinale (19) et destinées, dans l'état fonctionnel (0), à venir en butée avec une partie longitudinale et supérieure (36) d'un moyen formant nervure (20) d'un moyen formant nervure (6) d'un moyen formant plaque (3).
9. Dispositif selon la revendication 8, **caractérisé par le fait que** la section transversale de la partie longitudinale et supérieure (36) du moyen formant nervure (20) forme un angle droit ou de préférence aigu, et la section transversale de la partie longitudinale et supérieure (36) et la partie médiane sous-jacente du moyen formant nervure (6) est en forme de « S ».
10. Dispositif selon la revendication 8 ou 9, **caractérisé par le fait que** la partie des moyens d'attache (8) supérieure à la rainure longitudinale (19) est plate, et **par le fait que** le moyen d'attache (8) comprend deux moyens en saillie (35) quasiment coplanaires par rapport à cette partie.
11. Dispositif selon les revendications 5 et 10, **caractérisé par le fait que** les moyens en saillie (35) d'un moyen d'attache (8) sont quasiment tournés vers les moyens formant crochet (25) desdits moyens d'attache (8).
12. Dispositif selon l'une quelconque des revendications 8 à 11, **caractérisé par le fait que** chaque sommet des moyens formant plaque (3) a une encoche carrée (36), chacune portant une jonction ou chanfrein respectif.

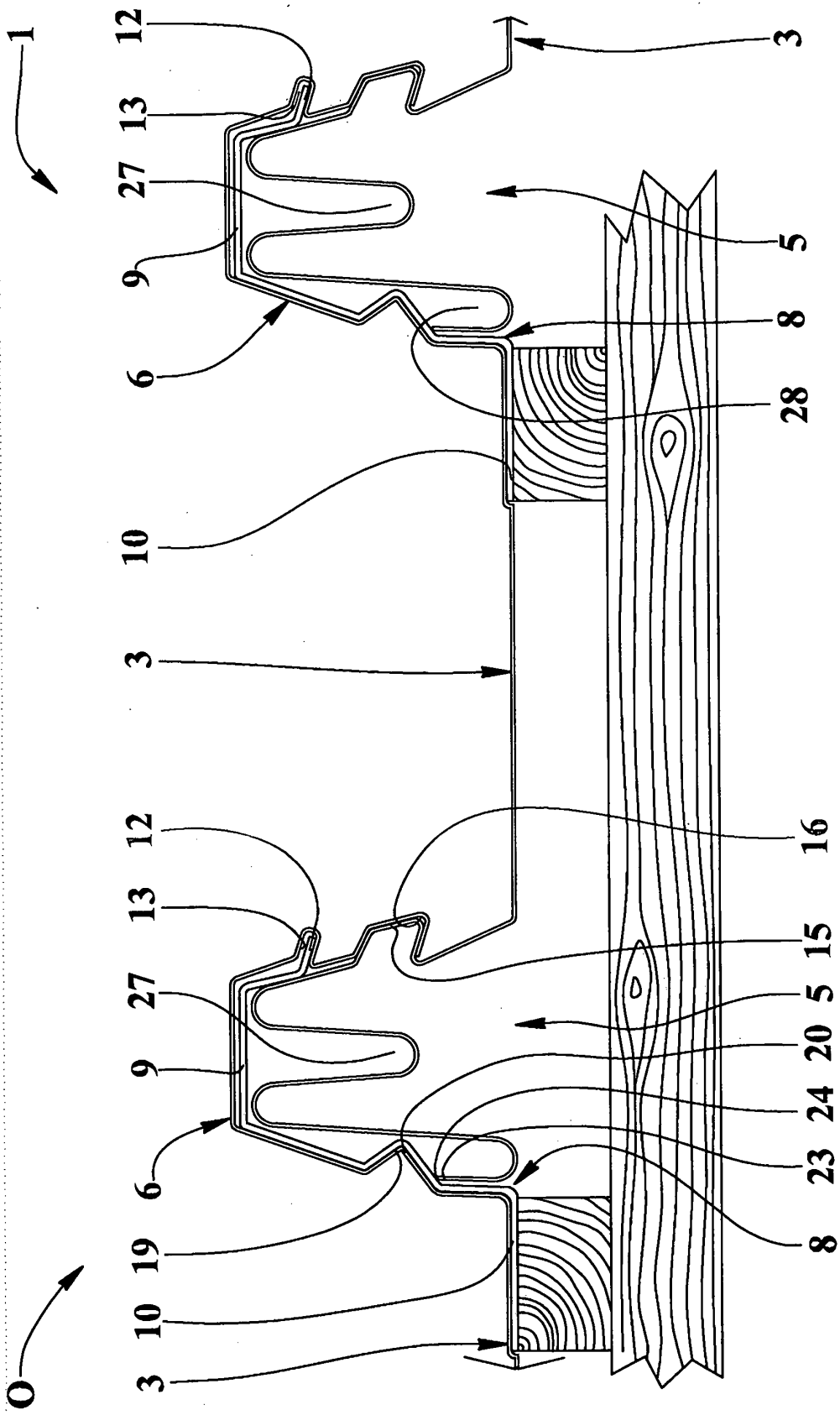
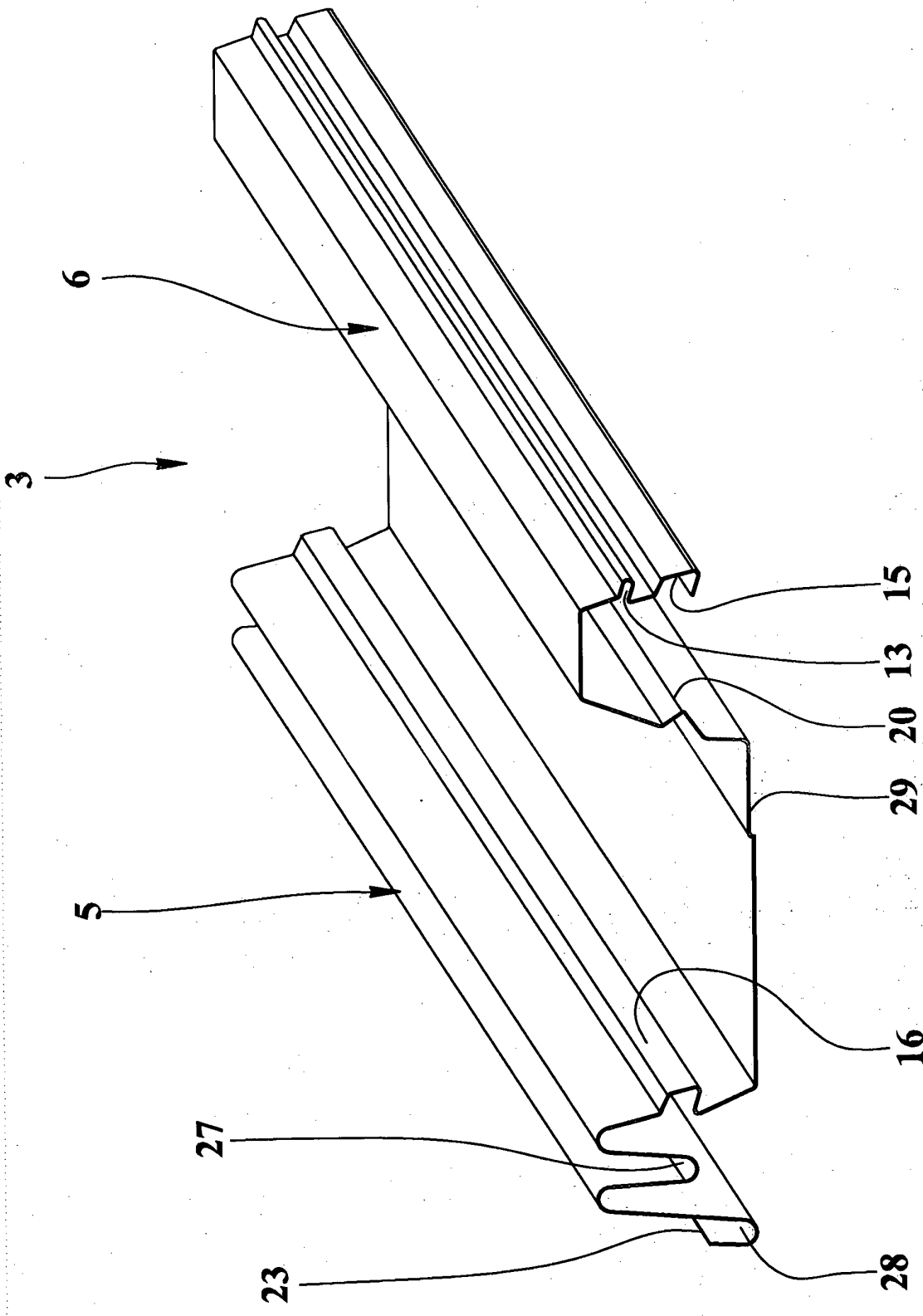
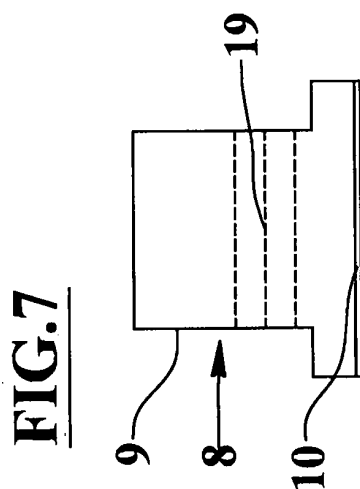
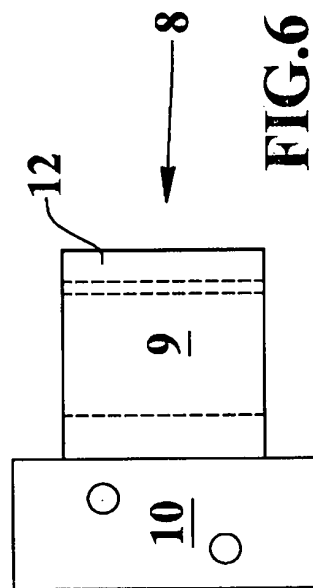
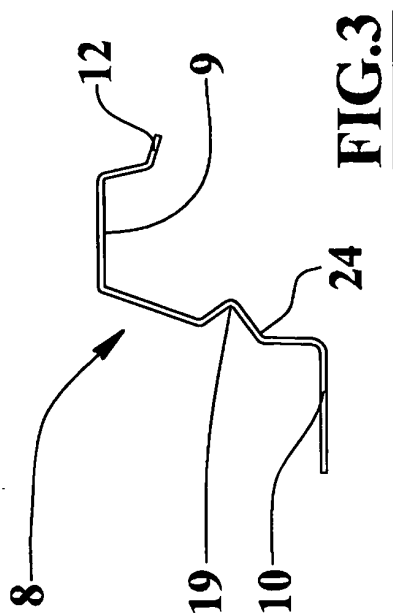
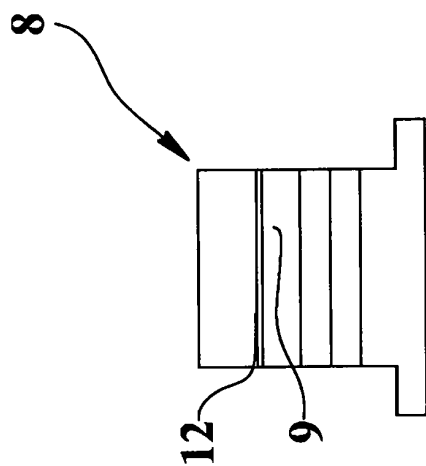
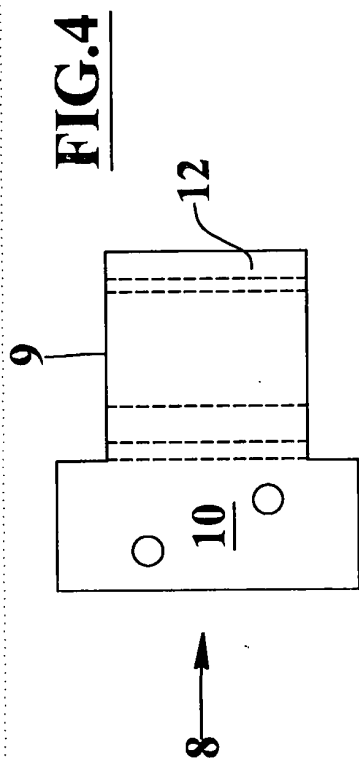
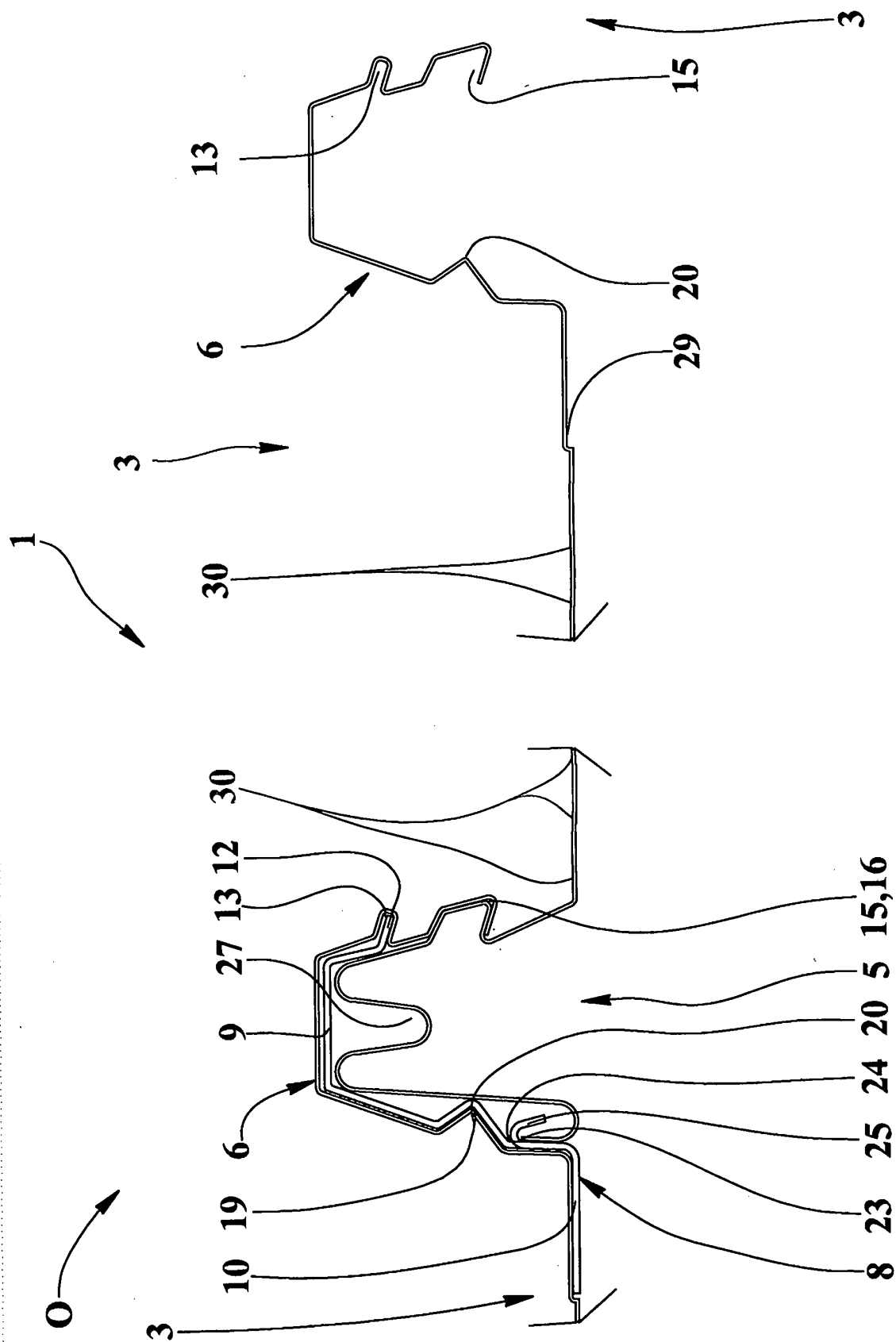


FIG.1

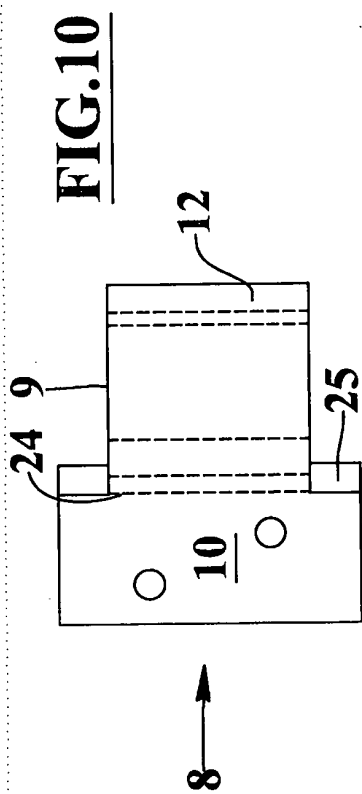


**FIG.2**

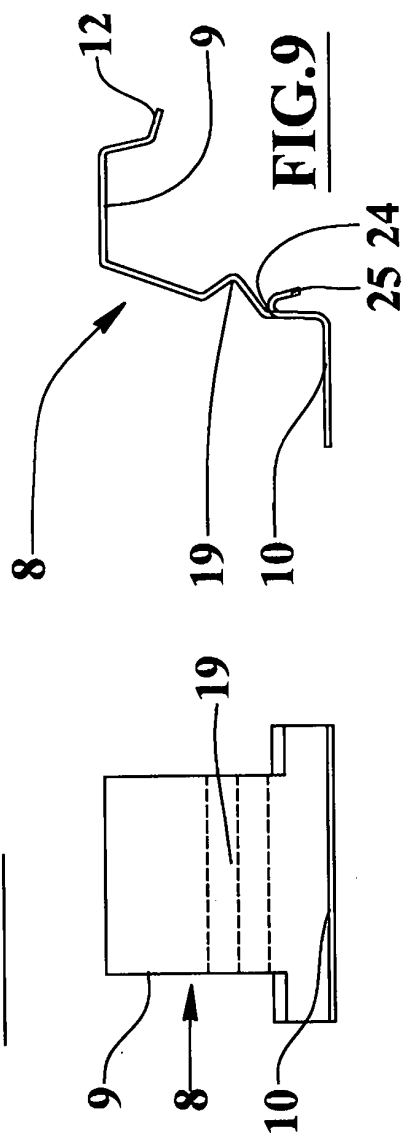




**FIG. 8**

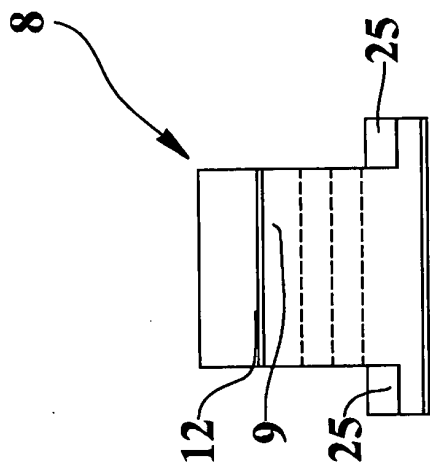
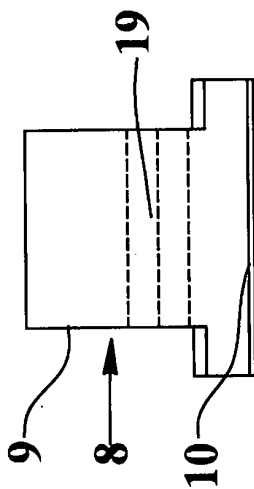


**FIG. 10**

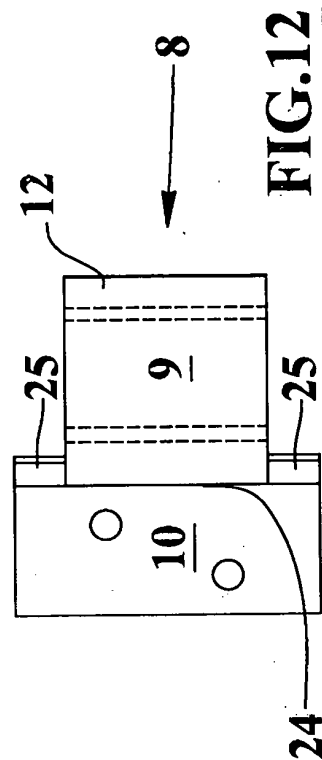


**FIG. 9**

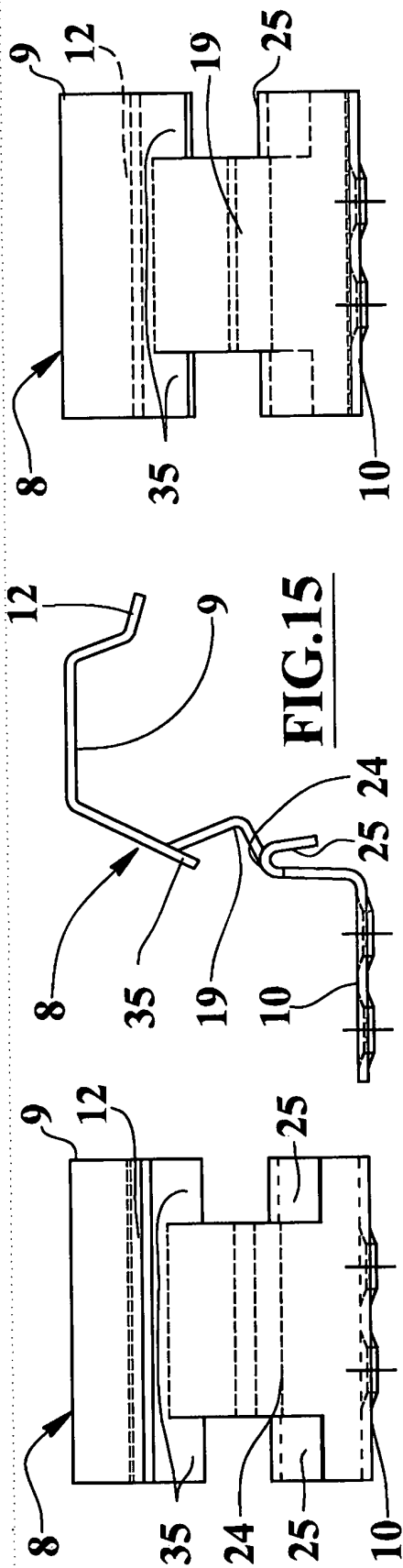
**FIG. 13**



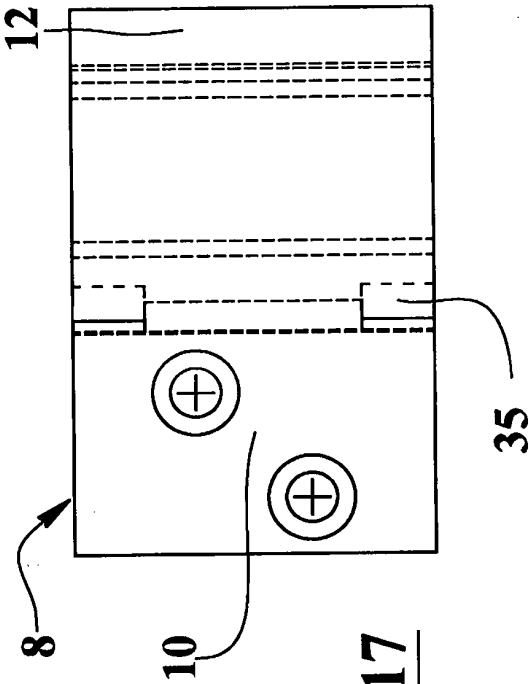
**FIG. 11**



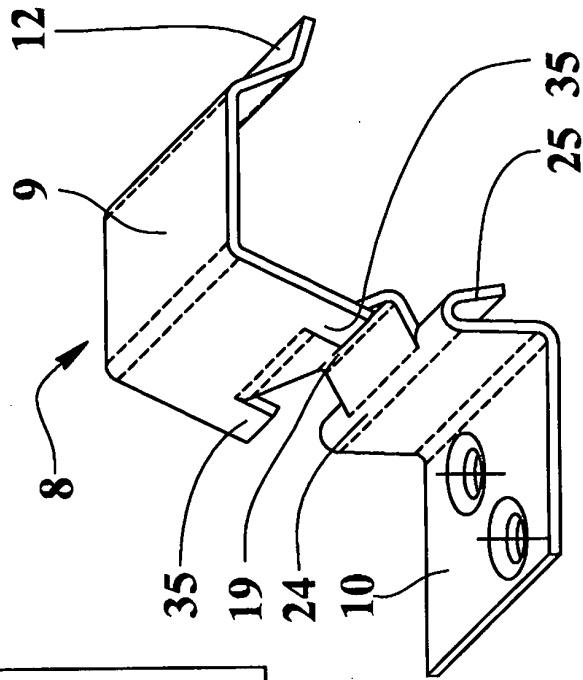
**FIG. 12**



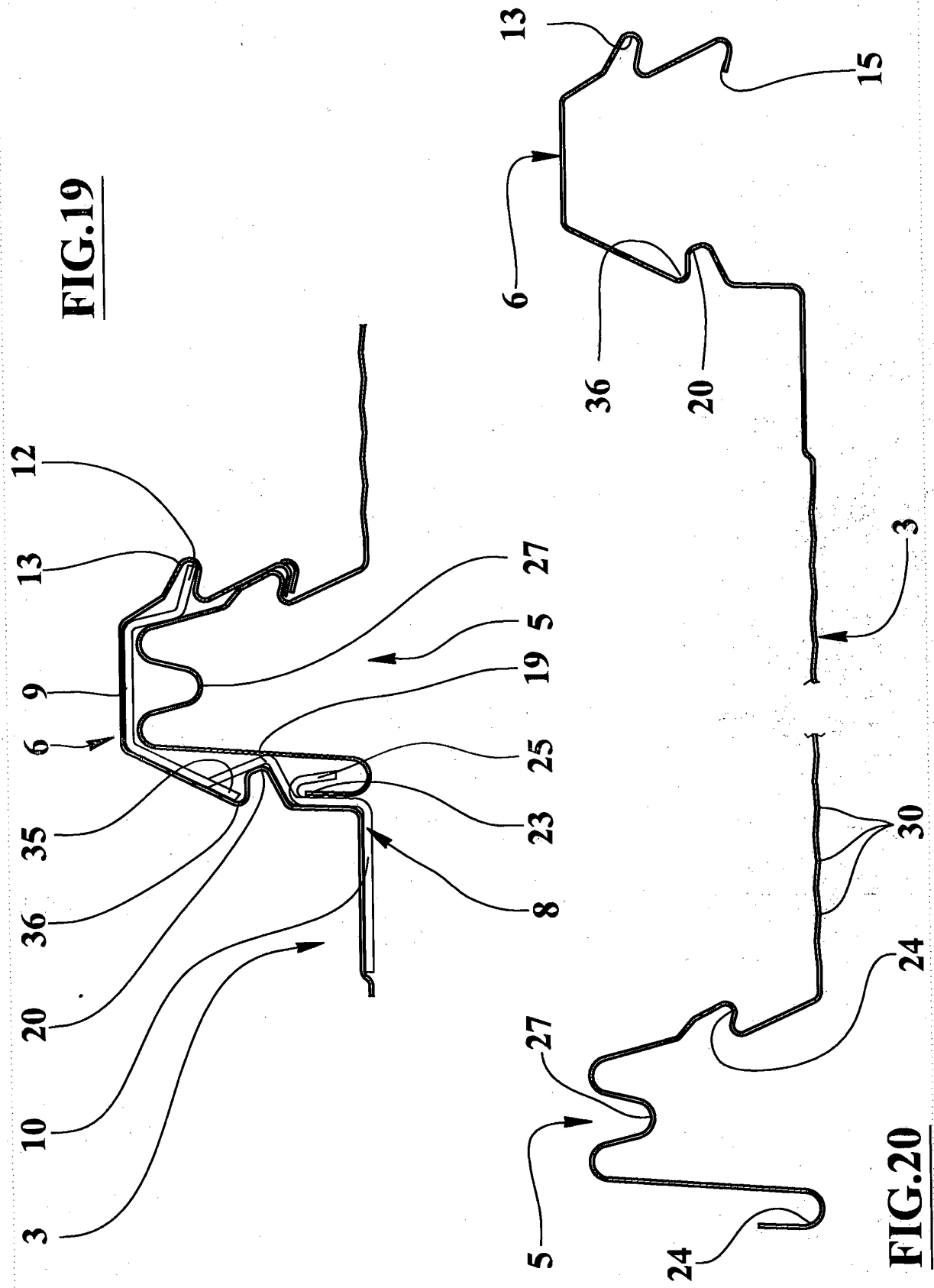
**FIG. 16**



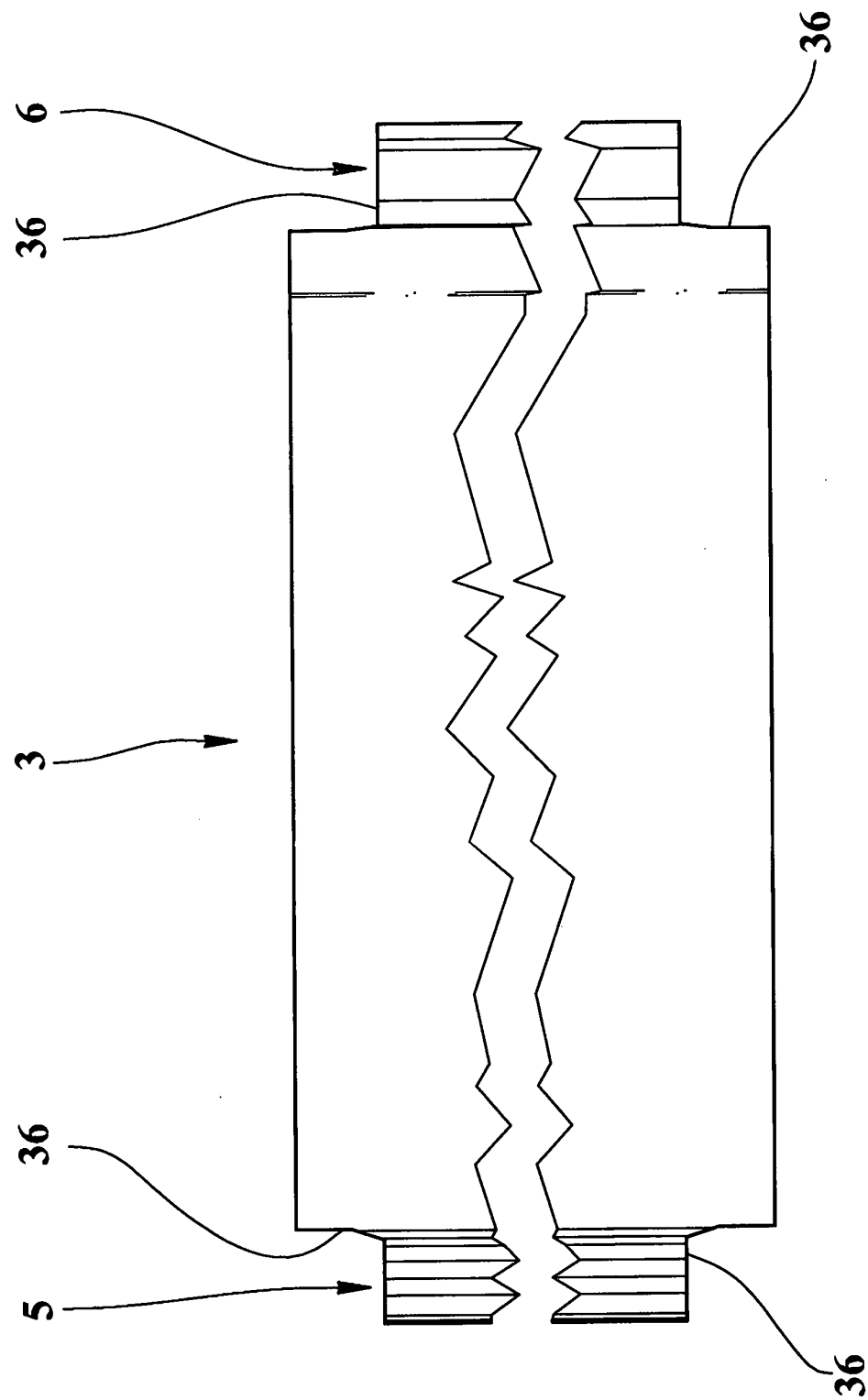
**FIG. 17**



**FIG. 14**







**FIG. 21**

**REFERENCES CITED IN THE DESCRIPTION**

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