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(54) Roof/wall panel.

(57) There is disclosed an improved roof/wall panel. Known panels suffer from a number of problems, eg, it has been found that they may become loose in high winds. Accordingly, the invention provides a roof or wall panel (10, 10', 10'', 10a, 10'a, 10b, 10'b, 10''b) comprising a substantially rectangular planer member having an outer layer (40, 40', 40'', 40a, 40'a) characterised in that at least part of the outer layer extends beyond a side edge (51, 51a) of the panel which side edge may form a longitudinal edge, in use, so as to form a raised lip such that when the side edge of the panel is positioned adjacent to an opposing longitudinal side edge (50', 50'a) of another panel the lip of the side edge of the panel overlaps at least part of the opposing side edge of the other panel. In a preferred embodiment the outer layer (40, 40', 40'', 40a, 40'a) is a prelaminated plastics-to-metal layer.

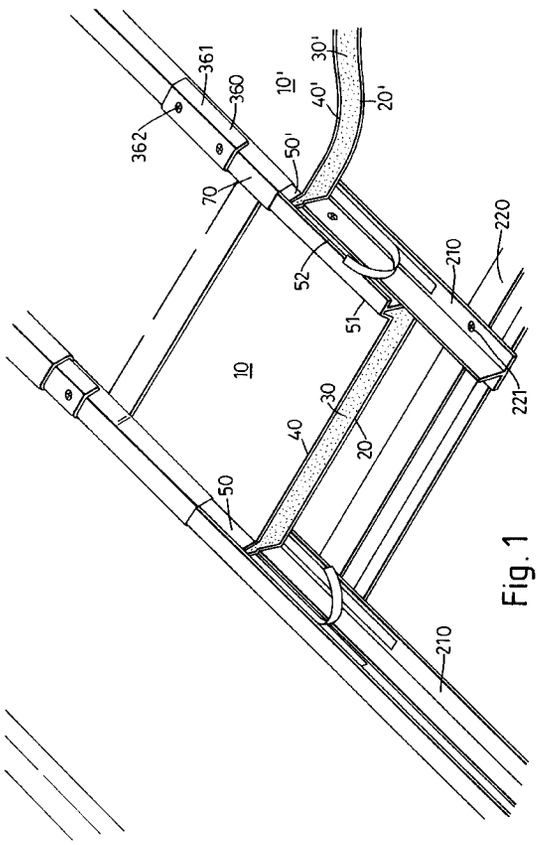

Fig. 1

EP 0 624 695 A2

This invention relates to roof or wall panels, and in particular to panels employing a prelaminated plastics-to-metal layer.

It is known to use prelaminated plastics-to-metal sheeting in various roofing applications such as in providing backing angles or counter flashing. Also, metal sheet panels are often used in preference to conventional lead or copper roofs, these panels frequently being fabricated from aluminium based alloys. Such panels are secured side by side in a waterproof joint, and are normally clinked together. In the case of metal sheeting, hidden cleat fixings are used to clip the sheets in place. A problem arises, however, in that a high degree of skill requires to be exercised by a tradesman in making the seams between these panels or sheets waterproof.

It is an object of this invention to obviate or mitigate the aforesaid disadvantages

It is also known from EP 0 409 513, to provide a panel comprising an inner layer, a middle insulating layer and an outer prelaminated plastics-to-metal layer.

A problem exists with such previously known panels in that it has on occasion been found that they become loose and/or are removed from a roof by high winds or the like.

It is, therefore, an object of the present invention to obviate or mitigate the aforementioned disadvantage.

Accordingly, one aspect of the present invention provides a roof or wall panel comprising a substantially rectangular planer member having an outer layer **characterised in that** at least part of the outer layer extends beyond a side edge of the panel which side edge may form a longitudinal edge, in use, so as to form a raised lip such that when the side edge of the panel is positioned adjacent to an opposing longitudinal side edge of another panel the lip of the side edge of the panel overlaps at least part of the opposing side edge of the other panel.

The opposing longitudinal side edge of the other panel may also be formed with a (raised) lip.

In a first embodiment panel may comprise an inner layer, a middle (insulating) layer, and an outer prelaminated plastics-to-metal layer.

In a second embodiment the panel may comprise an inner layer, an insulating layer a breather layer and an outer prelaminated plastics to metal layer, in use.

In either embodiment each layer may be adhered to an adjacent layer. Alternatively, each layer may not be adhered to an adjacent layer, but be suitably held in relation thereto.

The longitudinal edges of the panel may be suitably contoured such that when the side edge of the panel is positioned adjacent to an opposing side edge of another panel a standing seam is formed.

According to a second aspect of the present invention there is provided a roof or wall formed from a plurality of panels, wherein each panel comprises a substantially rectangular planer member having an outer layer **characterised in that** at least part of the outer layer extends beyond a side edge of the panel which side edge may form a longitudinal edge, in use, so as to form a raised lip such that when the side edge of the panel is positioned adjacent to an opposing longitudinal side edge of another panel the lip of the side edge of the panel overlaps at least part of the opposing side edge of the other panel.

In a first embodiment the roof or wall may include a plurality of fixed substantially parallel inverted T-bars spaced so as to receive at least one panel between adjacent pairs of T-bars the thickness of each panel being greater than the height of the inverted T-bars.

A panel may be fixed in position by means of suitable fixing means, such as a self tapping screw(s) which pass through and retain in abutting contact an elongated portion of an inverted T-bar and an adjacent side edge of the panel.

In a second embodiment the roof or wall may include an existing roof or wall surface.

A panel may be fixed in position by means of suitable fixing means, such as a spacer element located between adjacent (longitudinal) edges of adjacent insulating layers of adjacent panels, the spacer element being fixed to the existing surface by a screw or the like, said screw also retaining a support bar on an uppermost surface of said spacer element, rivets or the like extending through the lip and into the support bar thereby fixing the panel on the existing surface.

According to a third aspect of the present invention there is provided a method of forming a roof or wall employing a plurality of panels, wherein each panel comprises a substantially rectangular planer member having an outer layer **characterised in that** at least part of the outer layer extends beyond a side edge of the panel which side edge forms a longitudinal edge, in use, so as to form a raised lip such that when the side edge of the panel is positioned adjacent to an opposing longitudinal side edge of another panel the lip of the side edge of the panel overlaps at least part of the opposing side edge of the other panel.

According to a fourth aspect of the present invention there is provided a method of fixing a panel to a roof or wall, the panel comprising a substantially rectangular planer member having an outer layer **characterised in that** at least part of the outer layer extends beyond a side edge of the panel which side edge forms a longitudinal edge, in use, so as to form a raised lip such that when the side edge of the panel is positioned adjacent to an opposing longitudinal side edge of another panel the lip of the side edge of the panel overlaps at least

part of the opposing side edge of the other panel, the roof or wall including a plurality of fixed substantially parallel inverted T-bars spaced so as to receive at least one panel between adjacent pairs of T-bars the thickness of each panel being greater than the height of the inverted T-bars, the panel being fixed in position by means of suitable fixing means, such as a self tapping screw(s), which pass through and retain in abutting contact an elongated portion of an inverted T-bar and an adjacent side edge of the panel.

According to a fifth aspect of the present invention there is provided a method of fixing a panel to a roof or wall, the panel comprising a substantially rectangular planer member having an outer layer **characterised in that** at least part of the outer layer extends beyond a side edge of the panel which side edge forms a longitudinal edge, in use, so as to form a raised lip such that when the side edge of the panel is positioned adjacent to an opposing longitudinal side edge of another panel the lip of the side edge of the panel overlaps at least part of the opposing side edge of the other panel, the roof or wall including an existing roof or wall surface, the panel being fixed in position by means of a suitable fixing means such as a spacer element located between adjacent longitudinal edges of adjacent insulating layers of adjacent panels, the spacer element being fixed to the existing surface by a screw or the like, said screw also retaining a support bar on an uppermost surface of said spacer element, rivets or the like extending through the lip and into the support bar thereby fixing the panel on the existing surface.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, which are:

Fig 1 a partial perspective view of a roof employing panels according to a first embodiment of the present invention;

Fig 2 a partial transverse cross-sectional view of two longitudinal adjacent panels on the roof of Fig 1;

Fig 3 a partial longitudinal cross-sectional view of two transversely adjacent panels on the roof of Fig 1;

Fig 4 a partial perspective view of a roof employing panels according to a second embodiment of the present invention;

Fig 5 a partial transverse cross-sectional view of two longitudinal adjacent panels on the roof of Fig 4; and

Fig 6 a partial perspective cross-sectional view of two tranversely adjacent panels illustrated as alternative transverse edge join arrangements.

Referring now to Figs 1 and 2, there are shown two substantially rectangular planar roofing panels 10,10' according to a first embodiment of the present invention. Each of these panels 10,10' comprises a substrate metal layer 20,20' fabricated from a suitable metal (approximately 1mm to 3mm thick), an extruded polystyrene foam middle insulating layer 30,30' (approximately 5cm to 10cm thick), and a topmost (outermost) prelaminated plastics-to-metal layer 40,40' (approximately 1mm to 5mm thick), the plastic laminate being on the outermost surface of the panels 10,10'.

In this embodiment the substrate metal layer 20,20' and the insulating layer 30,30', and also the insulating layer 30,30' and the topmost prelaminated layer 40,40', are adhered to one another using suitable conventional adhesives. Further, in a preferred size each panel 10,10' is approximately 0.6m wide and 2m long.

As can be seen from Figs 1 and 2, each panel 10,10' has two longitudinal edges 50,51,50',51'. The topmost layer 40,40' extends beyond the longitudinal side edge 51,51' of the panel 10,10' so as to form a raised lip 52,52'. It is, therefore, apparent that, in use, when an edge 51 of a panel 10 is positioned longitudinally adjacent to an opposing edge 50' of another panel 10' the lip 52 of the edge 51 of the panel 10 overlaps the opposing side edge 50' of the other panel 10'.

Further, the longitudinal edges 50,50', 51,51' of the panels 10,10' are shaped or contoured in such a way that when two panels 10,10' are placed with the longitudinal edges 50,50' of the panel 10 adjacent the longitudinal edge 50 of the other panel 10' then the two adjacent edges 51, 50' form a standing seam 60, the standing seam 60 running the whole length for which the panels 10,10' are adjacent.

A compatible flexible plastic membrane strip 70 is provided, the strip 70 being fixed by hot welding over, and along the length of, the standing seam 60, to provide a water-tight joint.

As shown in Fig 3 each panel 10,10" may be fabricated such that one of the transverse edges 80,80", ie, the transverse edge 80 to be placed lowermost on an inclined roof, provides a raised lip 81 (approximately 1cm to 10cm long) such that when panels are placed on a roof the join between the lowermost edge 80 of one panel 10 and the uppermost edge 80" of an adjacent panel 10" will be covered by the lip 81 thus reducing the likelihood of water leaking through transverse joints between adjacent panels 10,10". Further the upper edge of each panel 10" may be provided with a lip 82" for supporting and accepting a lowermost surface of an adjacent panel 10. The adjacent surfaces of respective lips 81,82" and panel layers 40", 20 may be adhered and sealed by, for example, tremco tape 83,83" or the like.

Further, a thermal break 90 made, for example, from a suitable expanding filler may be inserted within the standing seam 60, the break 90 further providing means for strengthening structural support at or near

the standing seam 60.

The insulating layer 30, 30' will be tailored to meet the requirements of the statutory U value, dependent upon whether the panels 10,10' are to be used in a commercial or a domestic application.

In use, each panel 10,10' may be slidably located between two pre-fixed rails or inverted T-bars 210 which may be made from metal and at least partially plastic coated. In this embodiment, in which the panels 10,10' are roofing panels, the T-bars 210 are secured to purlins 220 of a roof structure, eg, by screws 221. The T-bars 210 may be solid or may be formed of two L-shaped steel angles welded back-to-back.

The substrate layer 20,20' of each panel 10,10' bends into two longitudinal sides 240, 240' these sides extend above the height of the T-bars 210 and are bent over at their upper ends to form lips 250, 250' which overlie the substrate layer 20,20'. The substrate layer 20,20' and sides 240,240', therefore, form a tray 251, 251'. The top most layer 40,40' of prelaminated plastics-to-metal sheeting is located over the tray 251, 251' and secured to the lips 250,250' by pop rivets 270,270' at intervals along 251,251' the length of the tray 251,251'.

The panel 10' is fixed to the T-bar 210 at side edge 240' adjacent edge 50' by one or more suitable longitudinal spaced fixings such as screws, for example, self tapping screws 271 which pass through longitudinal spaced predrilled holes in an elongated upstanding portion 272 of the inverted T-bar 210 and through the adjacent side edge 240' of the panel 10'. In this way the T-bar 210 and panel 10' are retained in abutting contact.

At one end of the panel 10,10' (the upper end in use), the plastics laminate which is bonded to the metal sheeting by adhesive may be turned back on itself to form a welt (not shown).

In this first embodiment, within the formed space between the substrate layer 20,20', the side 240,240' and the topmost layer 40,40' the foam insulation layer 30,30' is provided. The insulation 30,30' may be cut from a block and fitted during assembly of the panel 10,10', or it may be injected into the space through a rivet hole (not shown), eg provided in a side wall 240,240' which hole may be subsequently used when securing the tray 251,251' in place between two T-bars 210,210' via the predrilled holes in the T-bars 210,210'.

As illustrated in Fig 2, when two panels 10,10' are in position, there is a space above the T-bar 210,210' and between the upper ends of the tray sides 240,240'. That space is filled by the filler 90, e.g a bituminous based material such as polyisobutalane, to form a cold-bridge insulation.

The strip 70 of weatherproofing material is then laid over the open edge of the standing seam 28 and heat welded or otherwise bonded to the lips 52,52' of the adjacent panels 10,10'. The material of the weatherproofing strip 70 is compatible with the plastics membrane of the outer layer 26 of the panels 10,10', and may be the same material, eg. PVC.

Once the weatherproofing strip 70 has been laid, a contoured capping cover strip 360 of plastics-to-metal sheeting can be secured over the standing seam 280 by cleats 361 held by screws or rivets 362, the capping 360 having sides 370 which extends along the sides of the standing seam 280. The capping 360 may alternately be secured by adhesive or other means. The cleats 361 may be approximately 200mm long while the capping 360 may be approximately 2m long.

Knuckles 380 may finally be placed over joints between adjacent capping pieces 360. The knuckles 380 have welted sides, and are, therefore, held in place by friction only.

In this embodiment disclosed herein, the panels 10,10' are approximately 2m in length so several panels may be mounted between each pair of T-bars 210, the panels 10,10' being placed end to end.

Particularly, it is to be understood that the longer or shorter edges of the panels 10,10',10" may constitute the longitudinal edges 240,240' the T-bars 210 being suitably spaced accordingly.

Further, the rows of panels 10,10' between adjacent pairs of T-bars 210 are 'staggered' so that the transverse joints are located in different positions.

Also, the underside of each panel 10,10' may be finished, eg, with stove paint enamel to form a decorative surface.

Further, whilst the panels 10,10',10" have been described as roofing panels, it is to be understood that the panels may be applied as a wall or partition or as a facia.

The lip 52 provided on a longitudinal edge of a panel 10 provides particularly advantageous characteristics of the panel 10 of the present invention over those of the prior art. The lip 52 (or "overlap") provides added strength to the roof or wall made from a plurality of such panels 10,10',10". Further, in known roofs, ends of the inverted T-bars have always needed to be placed upon and attached to the purlons. It has surprisingly been found that employing panels according to the present invention the T-bars may be attached to the purlons at any point along the length of the T-bar and that the ends of the T-bars may extend beyond the purlons, in use (see Fig 1).

Referring now to Figs 4 and 5, there are shown three substantially rectangular planar roofing panels 10a,10a', 10a" according to a second embodiment of the present invention. Like integers are referred to by the same numerals as in the first embodiment but postscripted 'a'. This embodiment is particularly suited for use upon an existing roof or wall surface. In Figs 4 and 5 there is illustrated an existing (corrogated) metal

roof structure 400a. The existing roof structure could alternatively be planar and could also be made from wood.

Referring to Fig 5, each panel 10a,10a' comprises a substrate layers 20a,20a' which may be made, for example, from flexible polyethene sheet and act as a vapour barrier, an extruded polystyrene foam insulating layer 30a,30a', a breather layer 31a,31a' which may be made, for example, from polyster fleece and a topmost (outermost) prelaminated plastic-to-metal layer 40a,40a' the plastic laminate being on the outermost surface of the panels 10a,10a'.

In this embodiment both adjacent longitudinal edges 51a,51a' are provided with lips 52a,52a' such that when the panels 10a,10a' are placed together one lip 52a' sits on top of the other lip 52a.

Further, in this embodiment none of the layers of the panels 10a,10a' are adhered to one another, but are retained in association with one another when the panels 10a,10a' are fixed to the existing structure 400a.

Also in this embodiment the substrate layers 20a,20a' of adjacent panels may be formed as a single sheet. Likewise the breather layers 31a, 31a' of adjacent panels may be formed as a single sheet.

Spacer elements 405a are provided between adjacent longitudinal edges of adjacent panels 10a,10a'. The spacer elements 405a may be made from plastic and may be provided at 500mm centres along the length of the adjacent panels 10a,10a.

The spacer element 405a is fixed to the existing structure 400a by a screw 410a, which screw 410a also retains a support bar 415a within the standing seam 60a. The support bar 415a may run substantially the length of the standing seam 60a and may be of substantially square cross-section.

A rivet 420a or the like is fixed through the overlapping lips 52a,52a' of the adjacent panels 10a,10a' and into an uppermost surface of the support bar 415a. In this way the panels 10a,10a' are fixed to the existing surface 400a.

As can be seen from Fig 4 since the adjacent longitudinal edges 50a,51a,50a',51a',50a",51a" may not meet on a raised portion of the corrogated structure 400, metal plates 420a may be fixed on the structure 400a so as to present a planar fixing surface to the screws 410a.

Referring now to Fig 6 there is illustrated panels 10b, 10"b showing an alternative transverse fixing arrangement. Such panels 10b, 10"b are retained in association with one another along their adjacent transverse edges by a reinforced PVC membrane 83b (eg. approximately 0.9mm thick).

Finally, the embodiments of the invention disclosed herein provide a particularly simple and easily constructed solution to long-standing problems experienced within this art. It will, however, be appreciated that modifications may be made within the scope of the invention.

Claims

1. A roof or wall panel (10, 10', 10", 10a, 10'a, 10b, 10'b) comprising a substantially rectangular planar member having an outer layer (40, 40', 40", 40a, 40'a) **characterised in that** at least part of the outer layer extends beyond a side edge (51, 51a) of the panel which side edge may form a longitudinal edge, in use, so as to form a raised lip (52, 52a) such that when the side edge of the panel. is positioned adjacent to an opposing longitudinal side edge (50', 50'a) of another panel the lip of the side edge of the panel overlaps at least part of the opposing side edge of the other panel.

2. A panel as claimed in claim 1, **characterised in that** an opposing longitudinal side edge (52'a) of the panel (10'a) is also formed with a raised lip.

3. A panel as claimed in either claim 1 or 2, **characterised in that** the panel comprises an inner layer (20, 20', 20", 20a, 20'a), a middle layer (30, 30', 30", 30a, 30'a) and an outer prelaminated plastics-to-metal layer (40, 40', 40", 40a, 40'a).

4. A panel as claimed in either claim 1 or 2, **characterised in that** the panel comprises an inner layer (20a, 20'a), an insulating layer (30a, 30'a), a breather layer (31a, 31'a) and an outer prelaminated plastics to metal layer (40a, 40'a), in use.

5. A panel as claimed in claim 3 or 4, **characterised in that** each layer is adhered to an adjacent layer.

6. A panel as claimed in claim 3 or 4, **characterised in that** each layer is suitably held in relation to an adjacent layer.

7. A panel as claimed in any of claims 1 to 5, **characterised in that** the longitudinal edges of the panel are

suitably contoured such that when the side edge of the panel is positioned adjacent to an opposing side edge of another panel a standing seam (28, 28a) is formed.

8. A roof or wall formed from a plurality of panels (10, 10', 10", 10a, 10'a, 10b, 10'b, 10"b), wherein each panel comprises a substantially rectangular planer member having an outer layer (40, 40', 40", 40a, 40'a) **characterised in that** at least part of the outer layer extends beyond a side edge (51, 51a) of the panel which side edge may form a longitudinal edge, in use, so as to form a raised lip (52, 52a) such that when the side edge of the panel is positioned adjacent to an opposing longitudinal side edge (50', 50'a) of another panel the lip of the side edge of the panel overlaps at least part of the opposing side edge of the other panel.

9. A roof or wall as claimed in claim 8, **characterised in that** the roof or wall includes a plurality of fixed substantially parallel inverted T-bars (210) spaced so as to receive at least one panel between adjacent pairs of T-bars the thickness of each panel being greater than the height of the inverted T-bars.

10. A roof or wall as claimed in claim 9, **characterised in that** panels are fixed in position by means of suitable fixing means (271), which pass through and retain in abutting contact an elongated portion of an inverted T-bar and an adjacent side edge of the panel.

11. A roof or wall as claimed in claim 8, **characterised in that** the roof or wall is fixed over an existing roof or wall surface (400a).

12. A roof or wall as claimed in claim 11, **characterised in that** each panel is fixed in position by means of suitable fixing means, such as a spacer element (405a) located between adjacent edges of adjacent panels, the spacer element being fixed to the existing surface by a screw (410a) or the like, said screw also retaining a support bar (415a) on an uppermost surface of said spacer element, rivets (420a) or the like extending through the lip and into the support bar thereby fixing the panel on the existing surface.

13. A method of forming a roof or wall employing a plurality of panels (10, 10', 10", 10a, 10'a, 10b, 10'b), wherein each panel comprises a substantially rectangular planer member having an outer layer (40, 40', 40", 40a, 40'a) **characterised in that** at least part of the outer layer extends beyond a side edge (51, 51a) of the panel which side edge forms a longitudinal edge, in use, so as to form a raised lip (52, 52a) such that when the side edge of the panel is positioned adjacent to an opposing longitudinal side edge (50', 50'a) of another panel the lip of the side edge of the panel overlaps at least part of the opposing side edge of the other panel.

14. A method of fixing a panel (10, 10', 10") to a roof or wall, the panel comprising a substantially rectangular planer member having an outer layer (40, 40', 40") **characterised in that** at least part of the outer layer extends beyond a side edge (51) of the panel which side edge forms a longitudinal edge, in use, so as to form a raised lip (52) such that when the side edge of the panel is positioned adjacent to an opposing longitudinal side edge (50') of another panel the lip of the side edge of the panel overlaps at least part of the opposing side edge of the other panel, the roof or wall including a plurality of fixed substantially parallel inverted T-bars (220) spaced so as to receive at least one panel between adjacent pairs of T-bars the thickness of each panel being greater than the height of the inverted T-bars, the panel being fixed in position by means of suitable fixing means (271), which pass through and retain in abutting contact an elongated portion of an inverted T-bar and an adjacent side edge of the panel.

15. A method of fixing a panel (10a, 10'a) to a roof or wall, the panel comprising a substantially rectangular planer member having an outer layer (40a, 40'a) **characterised in that** at least part of the outer layer extends beyond a side edge (51, 51a) of the panel which side edge forms a longitudinal edge, in use, so as to form a raised lip (52a) such that when the side edge of the panel is positioned adjacent to an opposing longitudinal side edge (50'a) of another panel the lip of the side edge of the panel overlaps at least part of the opposing side edge of the other panel, the roof or wall including an existing roof or wall surface (400a), the panel being fixed in position by means of suitable fixing means such as a spacer element (405a) located between adjacent longitudinal edges of adjacent panels, the spacer element being fixed to the existing surface by a screw (410a) or the like, said screw also retaining a support bar (415a) on an uppermost surface of said spacer element, rivets (420a) or the like extending through the lip and into the support bar thereby fixing the panel on the existing surface.

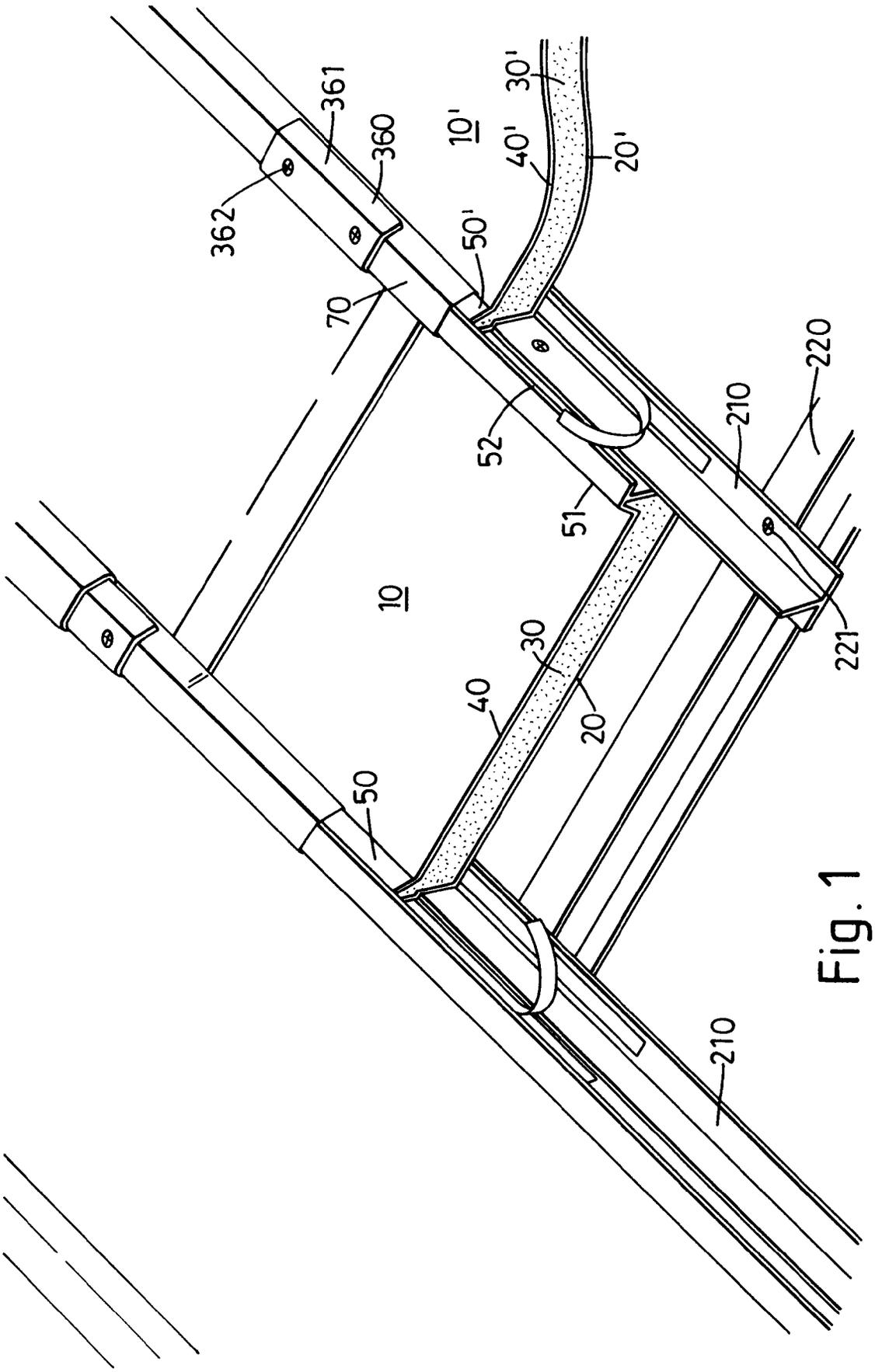

Fig. 1

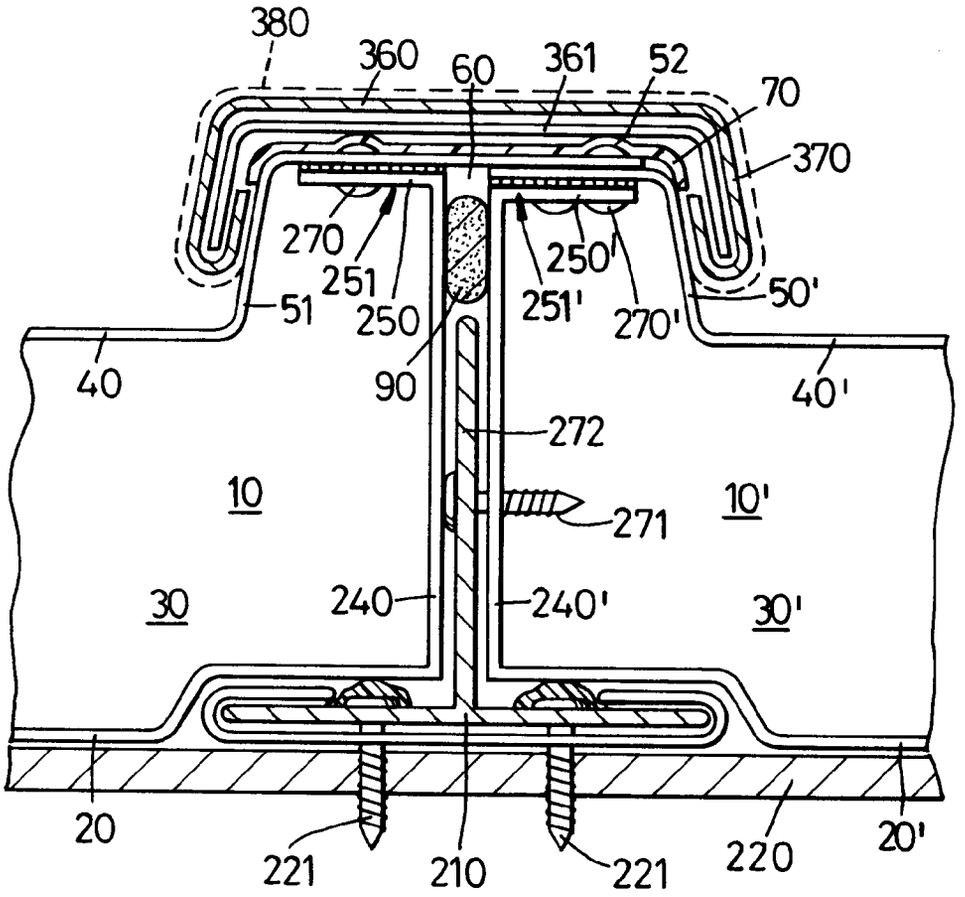
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Fig. 2

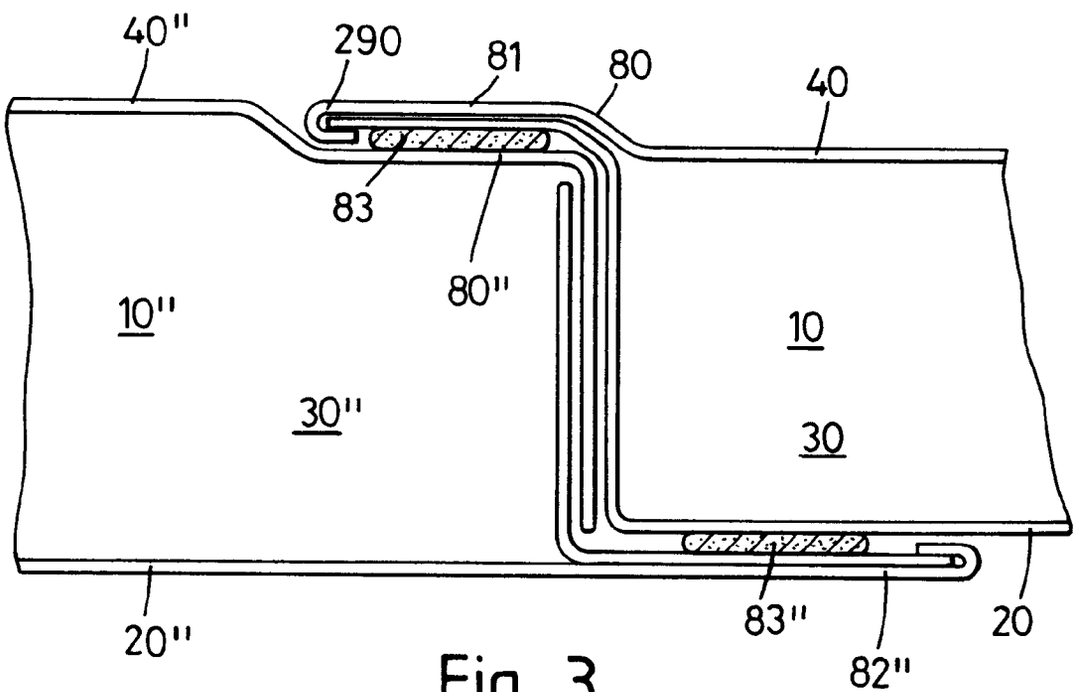
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Fig. 3

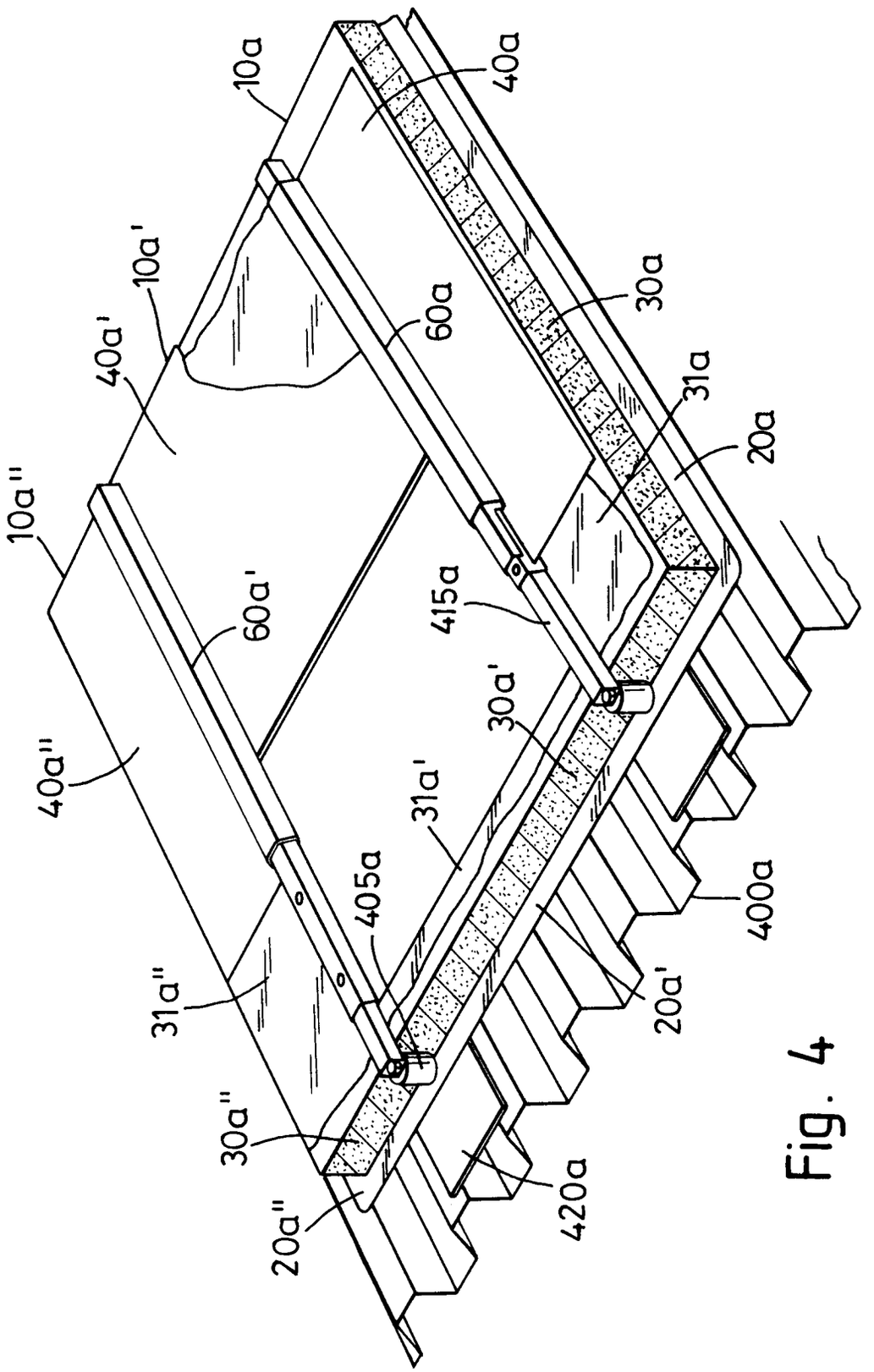
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Fig. 4

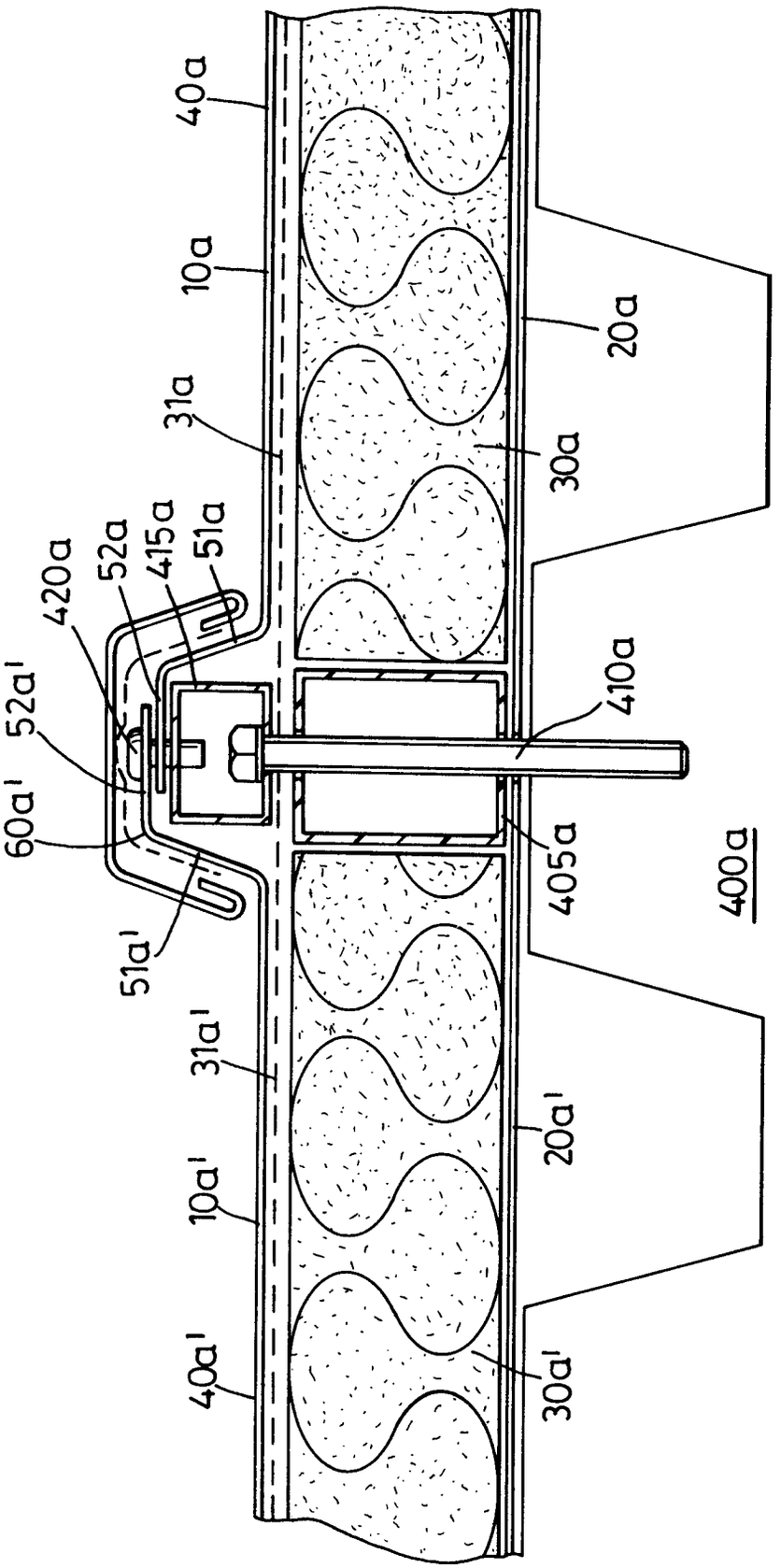
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Fig. 5

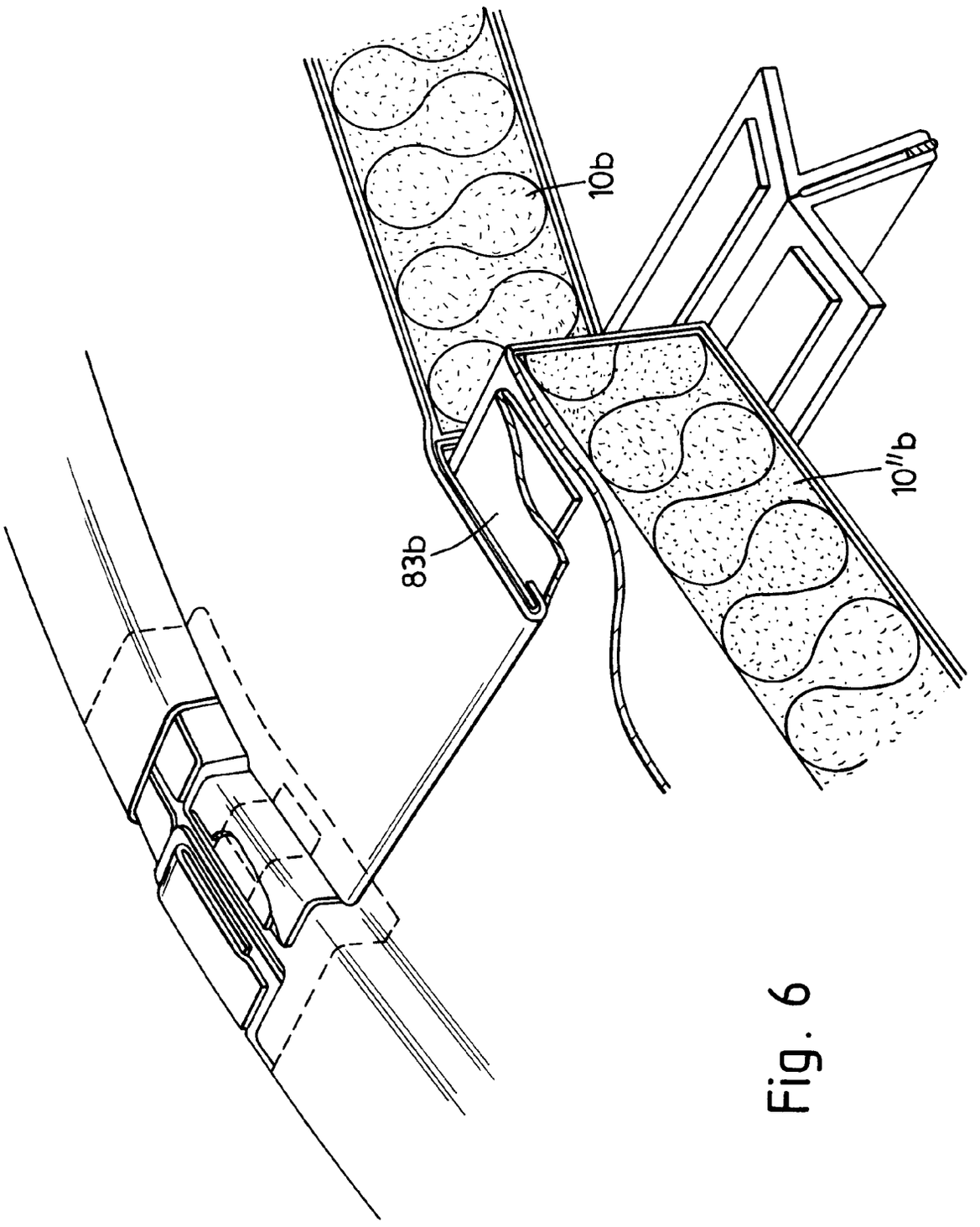

Fig. 6