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(54) **INSULATION PANELS FOR USE IN ROOFING AND WALLS FOR BUILDINGS.**

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Description

This invention relates to insulation panels for use in roofing and walls for buildings, and roofs and walls incorporating the insulation panels.

Pre-insulated roofing and wall panels have come into wide use for the weathering and insulation of many types of building and are commonly referred to as composite or bonded insulation panels or sheets. In the case of composite panels, such as disclosed in U.S.A. Patent Specification No. US—A—3,464,831, foam plastics material is injected between two layers of metal or membrane. A bonded insulation panel is a profiled metal sheet with a layer of foam plastics insulation material bonded to the underside.

Several forms of jointing sections, including plastics and metal sections, have been utilised to join insulation panels side-by-side. These jointing sections have normally been provided for aesthetic reasons in that they have hidden the joints between panels. There is, however, a problem associated with such joints in providing an effective vapour seal which prevents warm moist air passing through the joint and condensing on the cold surface of the outer metal or plastics weathering sheet. When condensation occurs, the resulting liquid can drip through the joint into the building. Serious problems of condensation occur when voids in the construction are reacted as is the case in bonded panels.

Virtually all known pre-insulated sheets rely on foam plastics insulating materials which are dimensionally unstable and, when applied to metal sheets, the considerable differences in coefficients of expansion of the two materials lead to breakdowns in adhesion of the insulation to the metal sheets. A major disadvantage of foam plastics insulating materials is that they are thermally decomposable to liberate toxic and noxious fumes with emission of dense smoke.

The advent of pre-insulated composite or bonded panels had its origin in the difficulties of site-assembled insulated roofing and cladding. The site-assembled methods relied entirely on the expertise of the erector or installer and were subject to prevailing weather conditions. The problems of achieving effective insulation coupled with endeavours to avoid serious condensation promoted the development of factory insulated products.

U.S.A. Patent Specification No. US—A—2,142,305 discloses gypsum panels having on each of two opposite edges complementary metallic elements. The gypsum panels are precast and may be reinforced by mineral fibres which are admixed with the liquid cementitious material prior to casting of the latter. The metallic elements are keyed to the opposite edges of the panels during the pouring of the cementitious material. The metallic elements extend the full length of the panel and are flanged at their longitudinal edges, with the flanges extending parallel to major faces of the panels and lipped at their free edges to key into the cementitious material when the latter is poured to cast the panels. The flanges are usually flush with the major faces of the panels but one or both of them may be embedded in the cementitious material so that it is not exposed on the outside of the slabs. The complementary shaping of the two metallic elements on opposite sides of a panel is intermediate the depths of the elements, i.e. at positions spaced from both flanges. In a modification of construction where one flange of each metallic element is flush with a major surface of the panel and the other is embedded, with the complementary shaping of the metallic elements intermediate the two flanges providing tongue and groove interengagement with the adjacent slabs, a flange is not provided at the embedded edge of the metallic element shaped to provide a groove, and, instead, the length of metal at the groove opening side remote from the flush flange is bent back and splayed relative to the flush flange.

The metallic elements are fast with the cast cementitious material in panels in accordance with U.S.A. Patent Specification No. US—A—2,142,305. Thus there are cold bridges between the two materials with temperature transfers between the two materials.

French Patent Specification No. FR—A—2,317,429 also discloses metallic element used with poured or cementitious materials which subsequently sets around the metal sections, adjacent metal sections of adjacent units being set apart leaving a gap into which an elastic or non-setting material may be poured to create a movement joint.

Federal German Patent Specification No. DE—A—1759915 discloses the use of a cementitious or poured material to secure metal sections and is similar in concept to U.S.A. Patent Specification No. US—A—2,142,305.

The principal object of the present invention is to provide an insulated roof and wall cladding panel of a two-stage construction which eliminates the need for bonding the panel forming high density mineral fibre material to metal sections on each of the two opposite side edges thereof.

In accordance with the present invention, an insulation panel for use in the roofing and/or the cladding of walls of buildings and provided on each of its two opposite side edges with a metal section which extends the full length of the panel and is flanged at both longitudinal edges with one flange flush against a major face of the panel and the other flange penetrating the panel material, is characterized in that it is made of high density mineral fibres, is formed in each of its opposite side edge faces intermediate the depth thereof with an inwardly-directed longitudinal groove and, between the groove and the major face intended to be outermost when the

panel is in use, with a longitudinal slot also extending the full length of the panel but inclined in the direction of its depth towards the other major face of the panel, and in that the web of each metal section is shaped for endwise fitment to the respective side of the panel and has intermediate its width an inwardly-directed groove which fits in the groove in the respective side edge face of the panel with one flange then flush against said other major face of the panel and the other flange fitting into said longitudinal slot.

As the metal sections are not bonded to the mineral fibre panel, they are free to move relative to the latter on expansion or contraction of the metal sections as a result of temperature changes.

Also, according to the present invention, a roof or wall cladding comprises a plurality of similar panels as hereinbefore defined arranged end-to-end and side-by-side across purlins or rails, a vapour seal in each duct formed by adjacent and mutally-complementing, inwardly-directed grooves formed by the webs of adjacent metal sections fitted to adjacent panels, a plurality of laterally-spaced and parallel bars of trapezium cross-section and of mineral fibre of full panel length overlying and adhered through their bases to the outer faces of the panels, profiled metal sheets overlying the panels and the trapezium-section bars thereon and transversely shaped complementarily to the panels and trapezium-section bars transverse configuration, each profiled metal sheet being of length to cover end-to-end row of panels and being in overlapping relationship with the or each adjacent profiled metal sheet, rivets securing the profiled metal sheets together at the overlapping portions, and means clamping the panels between the profiled metal sheets and the purlins or rails.

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

Fig. 1 is a vertical cross-sectional view through roofing or wall according to the present invention, and Fig. 2 is a vertical cross-sectional view through a wall according to the present invention, the wall being turned through 180° for ease of illustration.

Referring to Fig. 1, roofing consists generally of a plurality of mineral fibre panels 10, and a plurality of profiled metal sheets 11 overlying the panels.

Each of the panels 10 is rectangular in plan view and in cross-section and has upper and lower parallel major faces, 12 and 13 respectively. On the upper face 12, there are located a plurality of laterally-spaced bars 14 of trapezium cross-section which are formed separately from mineral fibre and have their bases 15 adhesively secured to the upper face 12 of each panel. The upper face 16 of each bar 14 is flat and parallel to the base 15, thereof, and the side walls are convergent upwards towards the upper flat face. The bars 14 are parallel to one another and extend over the full length of each panel 10.

The lower face 13 of each panel 10 is covered by a sheet 17 of white-painted aluminium foil or of other metal, or of wood, or of plastics material, or of glass-reinforced cement, the sheet 17 being bonded to the face 13 possibly by adhesive, but preferably by heat sealing.

Each panel 10 has set into each of its side edge faces a metal section 18 extending the full length of the panel 10 and flanged at both longitudinal edges. One flange 19, the lower flange in Fig. 1, is flush against the sheet 17 covering the inner or lower face 13 of the panel 10 and the other flange 20 penetrates the panel 10 at an inclination in the direction of its depth towards said inner or lower face 13 of the panel, a slot being provided for the latter purpose in the side edge face of the panel 10. The flanged metal section 18 is fitted endwise to the panel 10 and is held against displacement laterally outwards of the latter by virtue of the inclined flange 20. As can be seen in Fig. 1, the metal section 18 may extend over about three-quarters or less of the thickness of the panel 10 from the inner or lower face 13 of the panel 10. The metal section 18 has substantially centrally intermediate its width an inwardly-directed longitudinal groove 21 which complements the groove 21 in the metal section 18 set into the opposed side edge face of the adjacent panel 10 and provides with the latter groove a duct for a vapour seal 22.

Each panel 10, at its ends, rests on top of adjacent purlins 23 of the roof-supporting structure, and once the panels 10 are assembled, the profiled metal sheets 11 are placed on top of the panels 10. Each profiled metal sheet 11 has corrugations 24 corresponding to the bars 14 on each panel so that the bars 14 fit into the corrugations 24, and each profiled metal sheet extends from top to bottom of an end-to-end row of panels 10.

The panels 10 are clamped between the metal sheets 11 and the purlins 23 by self-tapping screws 25 which pass through the sheets 11 and the panels 10 into the purlins 23, the screws 25 being fitted with sealing washers 28. Each sheet 11 extends throughout the width of the panel 10 and has a laterally projecting extension 26 which overlaps the sheet 11 overlying the adjacent panel 10 and is of partial valley formation and engages over and around the upper face 16 of the adjacent bar 14 of the adjacent panel. The overlapping portions of the metal sheets 11 may be secured together by rivets 27, or self-tapping screws.

Each panel 10 may, for example, be 600 mm to 1000 mm in width and max 3000 mm long, and may have bars spaced at 75 mm to 300 mm: the thickness of each panel may be 30 mm to 120 mm and the thickness of each bar may be 20 mm to 120 mm.

With reference to the wall shown in Fig. 2, the arrangement is basically the same as the roofing shown in and described with reference to Fig. 1 and corresponding parts are denoted by the same reference numerals increased by one hundred.

In Fig. 2 the bars 114 of trapezium cross-section are much wider than the bars 14 of Fig. 1 and the valleys between the bars are much narrower, there being indeed an interchange of dimensions between the two such that the profiled metal sheets 111 of Fig. 2 corresponds to the profiled metal sheets 11 of Fig. 1 when inverted. Also, at each side of each panel 110 there is only a vertically and longitudinally divided portion of a bar 114, each such portion complementing the portion at the adjacent side of the adjacent panel when the panels 110 are juxtaposed in the construction of a wall. In this case, of course, the panels 110 are clamped between the profiled metal sheets 111 and rails 123 by self-tapping screws 125 which pass through the sheets 111 and the panels 110 into the rails 123.

Different forms of double-flanged metal sections may be set into the side edge faces of the panels 10 and 110 instead of the metal sections 18 and 118 shown in Figs. 1 and 2. In each case there are two double-flanged metal sections to be set into adjacent side edge faces of adjacent panels in a roofing or wall construction. The flanges in each case are the same as those of the Figs. 1 and 2 metal sections, but the inwardly-directed longitudinal grooves are modified, for example, they may be V-shaped, the vapour seal accommodated in the resulting rectangular-section duct consequently being of rectangular section.

To provide for passage of day-light through a roof or wall, any panel 10 of the roofing of Fig. 1 may be replaced by a light-transmissive panel, the profiled metal sheet 11 and panel 10 being replaced by profiled translucent or transparent sheets of reinforced glass fibre or plastics material spaced apart by mineral fibre spacer units occurring at each purlin or rail and incorporating condensation drainage grooves.

An advantage of the present invention provides a two-stage panel construction which eliminates the need for bonding the mineral fibre to the metal weathering sheet.

A further advantage is that the metal sheets can expand and contract over the insulation panels without problems of delamination associated with fully bonded foam plastics.

The use of non-combustible mineral fibre obviates the disadvantages of foam plastics materials and provides high heat-insulating qualities. The integrated longitudinal metal support sections provide a novel support and vapour seal joint between panels. The construction contains no voids in which condensation can form.

The invention produces a simple installation procedure and ensures total insulation integrity.

As a result of the invention, roofing can be assembled or a wall can be clad, easily, quickly and safely by skilled or semi-skilled labour. The problems associated with complex multi-component in situ assembled systems or known roof panels comprising profiled metal sheets insulated with foamed polystyrene or polyurethane are avoided, especially the danger of fire, dense smoke and toxic fumes in the event of fire. Moreover, the mineral fibre panels provide increased thermal and acoustic insulation, and they are proof against fire, moisture, rot and vermin. Furthermore, the double-flanged metal sections prevent the ingress of moisture between panels, and provide a flame barrier in the event of fire.

Claims

1. An insulation panel (10, 110) for use in the roofing and/or the cladding of walls of buildings and provided on each of its two opposite side edges with a metal section (18, 118) which extends the full length of the panel and is flanged at both longitudinal edges with one flange (19, 119) flush against a major face (13, 113) of the panel and the other flange (20, 120) penetrating the panel material, characterized in that it is made of high density mineral fibres, is formed in each of its opposite side edge faces intermediate the depth thereof with an inwardly-directed longitudinal groove and, between the groove and the major face (12, 112) intended to be outermost when the panel (10, 110) is in use, with a longitudinal slot also extending the full length of the panel but inclined in the direction of its depth towards the other major face (13, 113) of the panel, and in that the web of each metal section (18, 118) is shaped for endwise fitment to the respective side of the panel and has intermediate its width an inwardly-directed groove (21, 121) which fits in the groove in the respective side edge face of the panel with one flange (19, 119) then flush against said other major face (13, 113) of the panel (10, 110) and the other flange (20, 120) fitting into said longitudinal slot.

2. An insulation panel as claimed in Claim 1, in which the major face (13, 113) of the panel (10, 110), intended to be innermost when the panel is in use, is covered by a sheet (17, 117) of white-painted aluminium foil, or of other metal, or of wood, or of plastics material, or of glass-reinforced cement, the sheet (17, 117) being bonded to said major face (13, 113).

3. A roof or wall cladding, comprising a plurality of similar panels (10, 110), each as claimed in Claim 1 or 2, arranged end-to-end and side-by-side across purlins (23) or rails (123), a vapour seal (22, 122) in each duct formed by adjacent and mutally-complementing inwardly-directed grooves (21, 121) formed by the webs of adjacent metal sections (18, 118) fitted to adjacent panels (10, 110), a plurality of laterally-spaced and parallel bars

(14, 114) of trapezium cross-section and of mineral fibre of the full length of the panels (10, 110) overlying and adhered through their bases to the outer major faces (12, 112) of the panels (10, 110), profiled metal sheets (11, 111) overlying the panels (10, 110) and the trapezium-section bars (14, 114) thereon and transversely shaped complementarily to the panels and trapezium-section bars transverse configuration, each profiled metal sheet (11, 111) being of length to cover an end-to-end row of panels and being in overlapping relationship with the or each adjacent profiled metal sheet, rivets (27, 127) securing the profiled metal sheets (11, 111) at the overlapping portions (26, 126), and means (25, 125) clamping the panels (10, 110) between the profiled metal sheets (11, 111) and the purlins (23) or rails (123).

4. A roof or wall cladding as claimed in Claim 3, wherein said clamping means comprises self-tapping screws (25, 125) passing through the profiled metal sheets (11, 111) and the panels (10, 110) and screwed into the purlins (23) or rails (123), said screws (25, 125) being fitted with sealing washers (28, 128).

Revendications

1. Panneau isolant (10, 110) destiné à être utilisé dans la toiture et les parois de bâtiments et qui est pourvu sur chacun de ses bords latéraux opposés d'un profilé de métal (18, 118) qui s'étend sur toute la longueur du panneau et comporte des bordures à ses deux bords longitudinaux, l'une des bordures (19, 119) venant se placer dans le plan d'une grande face (13, 113) du panneau, tandis que l'autre bordure (20, 120) pénètre dans la matière du panneau caractérisé en ce qu'il est fait de fibres minérales à haute densité, en ce qu'il présente, sur la tranche de chacun de ses bords latéraux opposés, en un point intermédiaire de son épaisseur, une rainure longitudinale orientée vers l'intérieur et en ce que, entre la rainure de la grande face (12, 112) qui est destinée à être à l'extérieur quand le panneau (10, 110) est utilisé, s'étend une fente longitudinale s'étendant, elle aussi, sur toute la longueur du panneau mais qui est inclinée vers l'autre grande face (13, 113) du panneau, et en ce que l'âme de chaque profilé métallique (18, 118) est profilée pour s'ajuster bout à bout avec le côté correspondant du panneau et comporte en un point intermédiaire de sa largeur, une rainure orientée vers l'intérieur (21, 121) qui s'ajuste dans la rainure de la tranche correspondante du panneau, de sorte que l'une des bordures (19, 119) vient se placer dans le plan de ladite autre grande face (13, 113) du panneau (10, 110), tandis que l'autre bordure (20, 120) s'ajuste dans ladite fente longitudinale.

2. Panneau isolant selon la revendication 1, dans lequel la face (13, 113) du panneau (10, 110), destinée à être située à l'intérieur quand le panneau est utilisé, est recouverte d'une feuille (17, 117) d'aluminium peinte en blanc, ou d'un autre métal ou de bois, ou de matière plastique ou de ciment renforcé de verre, la feuille (17, 117) étant collée à ladite face (13, 113).

3. Habillage de toit ou de paroi qui comprend un certain nombre de panneaux similaires (10, 110) selon l'une quelconque des revendications 1 ou 2, disposés bout à bout et côte à côte sur des pannes (23) ou des rails (123), un joint de vapeur (22, 122) dans chaque conduit formé par des rainures adjacentes et mutuellement complémentaires orientées vers l'intérieur (21, 121) formées par les âmes des profilés métalliques adjacents (18, 118) fixées aux panneaux adjacents (10, 110) et un certain nombre de barres parallèles et latéralement espacées (14, 114) ayant une section en forme de trapèze et constituées par des fibres minérales, s'étendant sur toute la longueur des panneaux (10, 110) en couvrant et en étant collées par leurs bases aux faces extérieures (12, 112) des panneaux (10, 110), des feuilles métalliques profilées (11, 111) couvrant les panneaux (10, 110) et les barres trapézoïdales (14, 114) de celle-ci et ayant des formes transversalement complémentaires aux panneaux et aux barres à section trapézoïdale, chaque feuille de métal profilée (11, 111) étant assez longue pour couvrir une rangée de panneaux disposés bout à bout et étant en relation de recouvrement avec la ou chacune des feuilles métalliques profilées adjacentes, des rivets (27, 127) fixant les feuilles métalliques profilées (11, 111) à leurs parties recouvrantes (26, 126), et des moyens (25, 125) étant prévus pour serrer les panneaux (10, 110) entre les feuilles métalliques profilées (11, 111) et les pannes (23) ou les rails (123).

4. Habillage de toit ou de paroi selon la revendication 3, où lesdits moyens de serrage comprennent des vis auto-taraudantes (25, 125) traversant les feuilles de métal profilées (11, 111) et les panneaux (10, 110) pour se visser dans les pannes (23) ou les rails (123), lesdites vis (25, 125) étant pourvues de rondelles d'étanchéité (28, 128).

Patentansprüche

1. Isolierplatte (10, 110) zur Verwendung als Dachabdeckung und/oder zur Verkleidung von Wänden von Gebäuden, welche an zwei gegenüberliegenden Seitenrändern mit einem Metallabschnitt (18, 118) versehen ist, der sich über die gesamte Länge der Platte erstreckt und an seinen Längsrändern gebördelt ist, wobei sich eine Bördelung (19, 119) mit einer Hauptfläche (13, 113) der Platte deckt und die andere Bördelung (20, 120) das Plattenmaterial durchdringt, dadurch gekennzeichnet, daß die Isolierplatte aus hoch verdichteten Mineralfasern hergestellt ist, daß in der Mitte der Breite jeder der gegenüberliegenden Seitenrandflächen eine nach einwärts gerichtete Längsnut ausgebildet

ist, und daß zwischen dieser Nut und einer Hauptfläche (12, 112), die beim Gebrauch der Platte außen liegt, ein Längsschlitz vorgesehen ist, der sich gleichfalls über die gesamte Länge der Platte erstreckt und in der Tiefe in Richtung zur anderen Hauptfläche (13, 113) der Platte hin schräg ausgerichtet ist, und daß jeder Metallabschnitt (18, 118) zur Einführung in Längsrichtung an der entsprechenden Seite der Platte ausgebildet ist und in der Mitte seiner Breite eine nach einwärts gerichtete Nut (21, 121) aufweist, welche die Nut in der entsprechenden Seitenrandfläche der Platte überdeckt, wobei eine Bördelung (19, 119) des Metallabschnittes mit der anderen Hauptfläche (13, 113) der Platte (10, 110) fluchtet und die andere Bördelung (20, 120) in den Längsschlitz eingreift.

2. Isolierplatte nach Anspruch 1, dadurch gekennzeichnet, daß die Hauptfläche (13, 113), welche beim Gebrauch der Platte (10, 110) innen liegt, mit einer Schichte (17, 117) aus weißgestrichener Aluminiumfolie oder anderem Metall, oder Holz, oder Kunststoffmaterial, oder glasfaserverstärktem Zement überzogen ist, wobei die Schichte (17, 117) mit der genannten Hauptfläche (13, 113) verbunden ist.

3. Dach- oder Wandüberzug, bestehend aus einer Mehrzahl von ähnlichen Platten (10, 110) nach den Ansprüchen 1 und 2, dadurch gekennzeichnet, daß diese end- und seitenweise auf Dachrahmen (23) oder Schienen (123) angeordnet sind, daß eine Dampfdichtung (22, 122) in jedem Kanal vorgesehen ist, der durch benachbarte und gegegenseitig nach innen gerichtete Nuten (21, 121) durch die Bahnen der benachbarten Metallabschnitte (18, 118) ausgebildet ist, die an benachbarten Platten (10, 110) angebracht sind, sowie einer Mehrzahl von querliegenden parallelen Stangen (14, 114) mit trapezförmigem Querschnitt, bestehend aus Mineralfasern die sich über die gesamte Länge der Platten (10, 110) erstrecken und deren Basisflächen mit den äußeren Hauptflächen (12, 112) der Platten (10, 110) verklebt sind, und mit profilierten Metallblechen (11, 111), welche die Platten (10, 110) und die trapezförmigen Stangen (14, 114) überdecken und komplementär zu den Platten und den trapezförmigen Stangen ausgebildet sind, wobei jedes profilierte Metallblech (11, 111) eine Länge aufweist, um eine Reihe von Platten vom Anfang bis zum Ende zu bedecken und um das benachbarte profilierte Metallblech zu überlappen, wobei Nieten (27, 127) die Metallbleche (11, 111) in den Überlappungsbereichen (26, 126) zusammenhalten, und Einrichtungen (25, 125) die Platten (10, 110) zwischen den profilierten Metallblechen (11, 111) und den Dachrahmen (23) oder Schienen (123) einklemmen.

4. Dach- oder Wandüberzug nach Anspruch 3, dadurch gekennzeichnet, daß die Klemmeinrichtungen selbstschneidende Schrauben (25, 125) sind, die über die profilierten Metallbleche (11, 111) und die Platten (10, 110) in die Dachrahmen (23) oder Schienen (123) eindringen, wobei die Schrauben (25, 125) mit Dichtscheiben (28, 128) versehen sind.

FIG. 1.

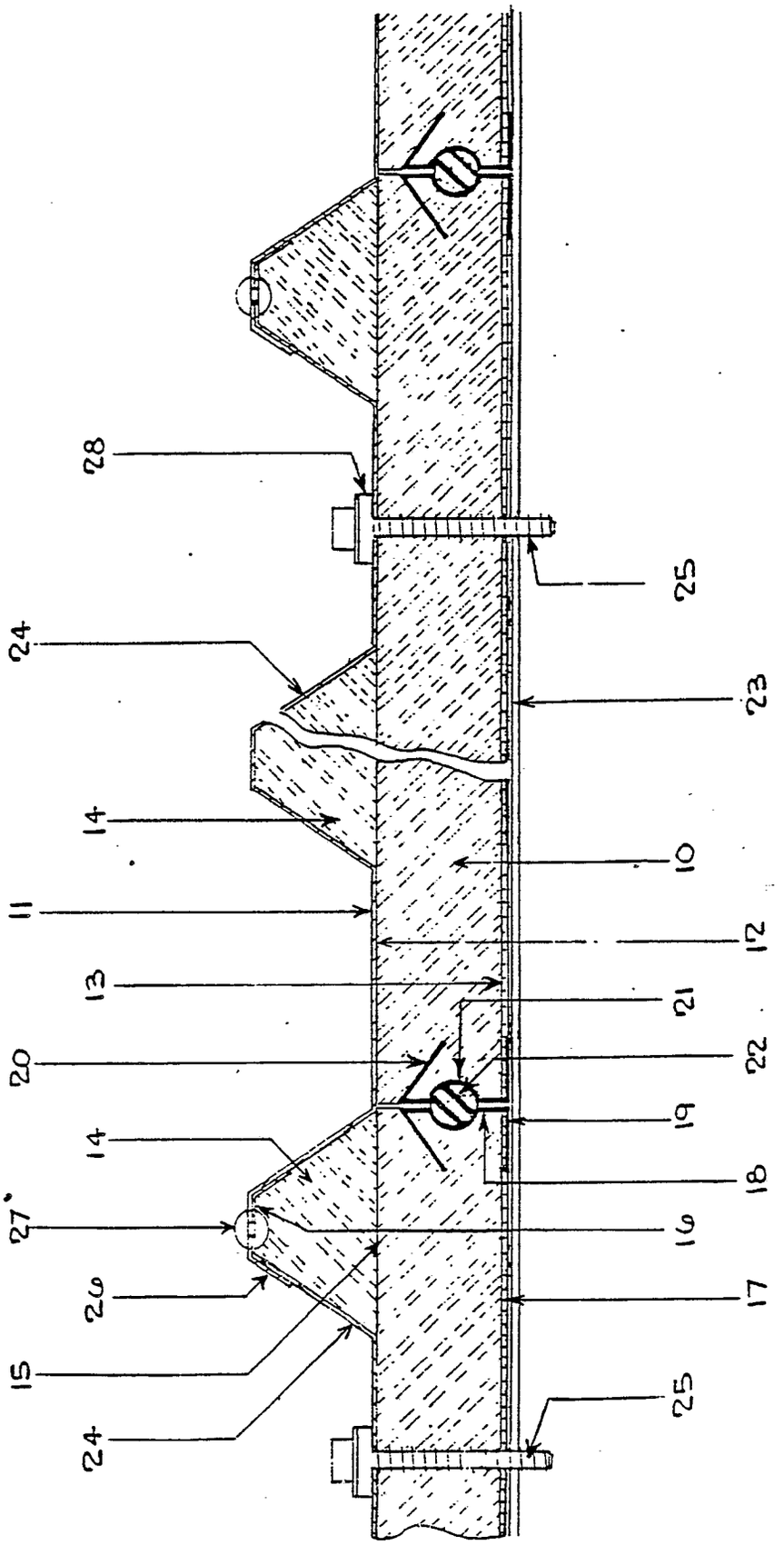
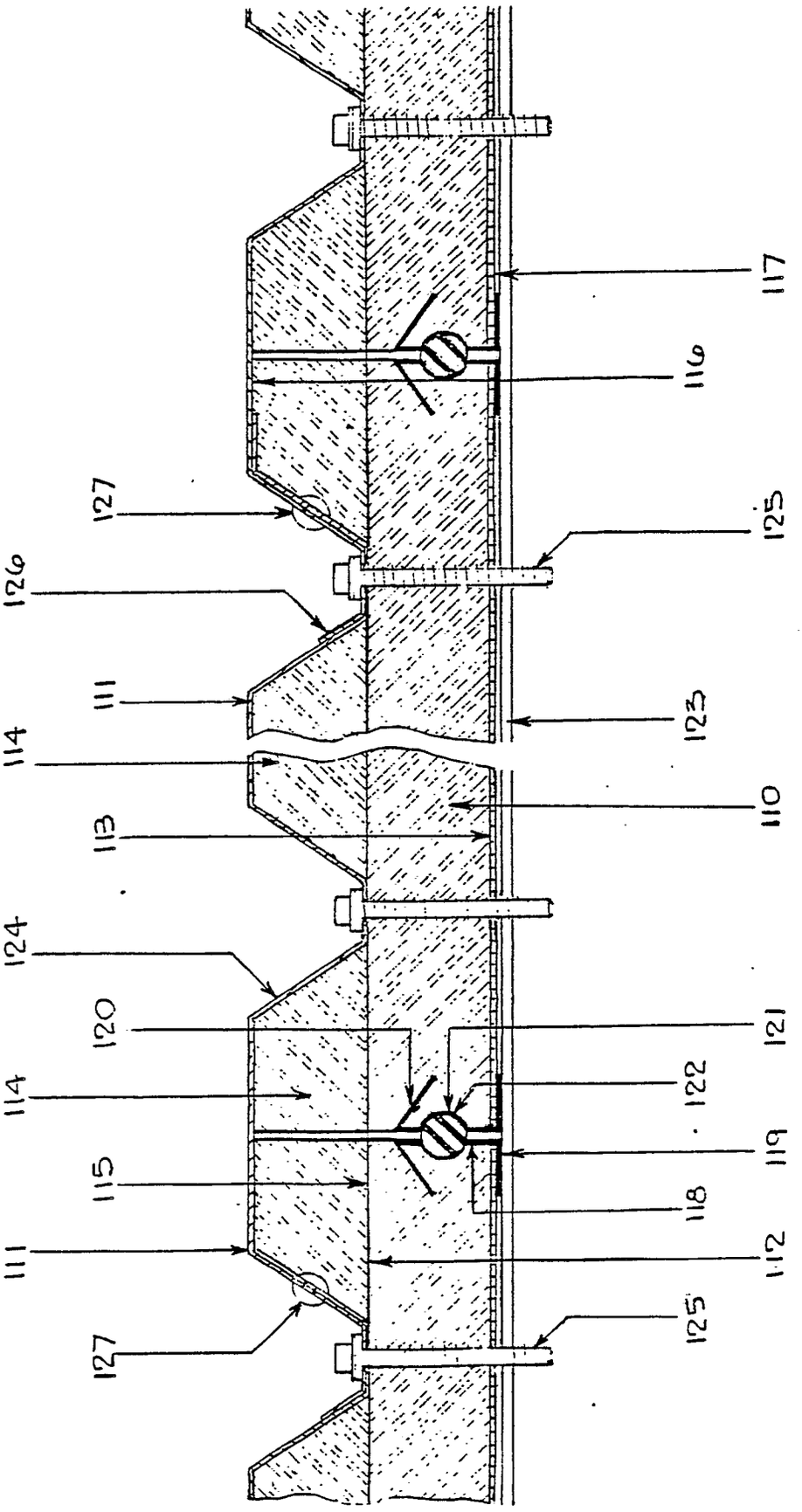


FIG. 2.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