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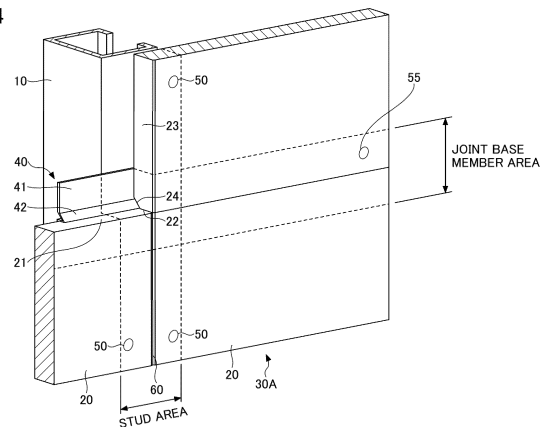
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(54) **FIREPROOF PARTITION WALL**

(57) To provide a fire-resistant partition wall that prevents leakage of heated air through lateral joints to have a good fire-resistance capability and good constructability. A fire-resistant partition wall 100 includes multiple studs 10; and a first wall 30A and a second wall 30B that are a pair of walls provided across the studs 10 from each other. The first wall 30A and the second wall 30B are respectively provided as a single-layer wall on both surfaces of the fire-resistant partition wall 100. The first wall 30A and the second wall 30B are each formed of multiple surface members 20 arranged vertically and horizontally. Vertical joints 60 and lateral joints 70 are formed in each of the first wall 30A and the second wall 30B. The studs 10 are on a back side of the vertical joints 60. A joint base member 40 having a fire blocking capability is provided at the lateral joints 70. The joint base member includes a back piece 41 and a projecting piece 42 projecting in a thickness direction of gypsum boards 20. A transverse cross section of the joint base member 40 has a T-letter shape. The surface members 20, the joint base member 40, and the studs 10 are not fastened with a common fixing member. All of the surface members 20 are fastened to the studs 10 with a first fixing member 50. One of the two surface members 20 next to each other vertically is fastened to the back piece 41 with a second fixing member 55.

FIG.4



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to fire-resistant partition walls.

BACKGROUND ART

[0002] Fire-resistant partition walls having a one-hour fire-resistance rating, being capable of preventing the temperature of a non-heated surface from increasing to or above a temperature at which a combustible contacting the non-heated surface may burn when fire heat due to a fire is applied to a heated surface for one hour, are known. Conventional fire-resistant partition walls thus having a fire-resistance capability of one hour are formed by screwing two walls to studs formed of light-gauge steel installed at predetermined intervals such that the studs are sandwiched between the two walls.

[0003] Each of the two walls has a multilayer structure of at least two base layers (which are formed of a fire-resistant covering member) and at least two top layers (which are formed of a fire-resistant covering member), such as base layer reinforced gypsum boards, top layer reinforced gypsum boards, and the like. Accordingly, the fire-resistant partition wall as a whole has a structure of four or more surface members. In each of the two walls on both surfaces of the studs, multiple fire-resistant surface members (base surface member and top surface member) are vertically and horizontally arranged to form lateral joints and vertical joints. When a room fire breaks out, the surface members are exposed to fire heat to shrink, so that gaps are formed in the joints that are formed by gaplessly abutting the surface members with each other. Therefore, in the case of a single surface member, heated air leaks out through the gaps in the joints. Accordingly, it is common to form a fire-resistant partition wall having two layers on both surfaces (four layers in total, two layers on each surface) like in the above-described fire-resistant partition wall, and offset the joint positions between the base layer and the top layer of each of the two walls, thereby preventing heated air from leaking out through gaps in the joints.

[0004] Here, consideration is given to a fire-resistant partition wall having a single layer on both surfaces (two layers in total, one layer on each surface) for better constructability. Generally, surface members are arranged such that there are studs on the back side of the vertical joints of the surface members, and accordingly, there is no risk that heated air leaks out through vertical joints when a room fire breaks out.

[0005] In contrast, there are no studs on the back side of substantially all lateral joints. Therefore, there is a risk that heated air leaks out into the partition wall through lateral joints. Such leakage of heated air through lateral joints may degrade the fire-resistance capability of the fire-resistant partition wall. Furthermore, when a fire-

resistant partition wall having a one-hour fire resistance rating is developed, normally, a one-hour fire resistance test is conducted by applying heat for one hour, and the fire-resistant partition wall will be distributed on the market after passing this fire resistance test. The leakage of heated air through lateral joints makes it difficult to pass this one-hour fire resistance test.

[0006] Here, Patent Document 1 proposes a partition wall structure that can improve fire-resistance capability and facilitate construction work. Specifically, the partition wall structure includes: studs; a pair of partition walls each including a base layer member and a coated top layer member; and an extension member extended on the outer side of at least one of the partition walls.

[0007] However, according to the partition wall structure as described in Patent Document 1, each of the paired walls provided across the studs from each other (in which a single wall is a partition wall) includes two fire-resistant covering members, which are a base layer member and a coated top layer member. In addition, one of the partition walls has the extension member. Therefore, the partition wall structure as a whole has five fire-resistant covering members and accordingly has a problem in that more construction time and effort is required. Furthermore, as described above, Patent Document 1 does not specifically describe a joint base member attached to parts corresponding to lateral joints. Therefore, it is assumed that the partition wall on each side has at least two layers of fire-resistant covering members in order to prevent heated air from leaking to the inside of the partition walls through lateral joints.

[0008] In view of the above, Patent Document 2 proposes a partition wall that includes as small a number as possible of fire-resistant covering members to have good constructability and effectively prevents leakage of heated air through lateral joints to have a good fire-resistance capability. This partition wall includes: multiple studs installed at predetermined intervals; and a first wall and a second wall that are a pair of walls provided across the multiple studs from each other, the first wall and the second wall being formed of vertically and laterally arranged multiple gypsum boards. Each of the first wall and the second wall is a single-layer wall of the multiple gypsum boards, vertical joints and lateral joints are formed in each of the first wall and the second wall, and the studs are on the back side of the vertical joints. A joint base member having a fire blocking capability is provided at the lateral joints. The joint base member includes a back piece contacting a back surface of the gypsum boards and a projecting piece projecting from the back piece in a thickness direction of the gypsum boards. A transverse cross section of the joint base member perpendicular to a longitudinal direction thereof has a T-letter shape. The gypsum boards, the joint base member, and the studs are not screwed with a common screw, and are screwed in two different screw-fastening forms. In this partition wall, one of the screw-fastening forms is such that the gypsum boards are screwed to only the

studs and are not screwed to the joint base member, and the joint base member is fixed to a position of the lateral joints by being inserted between the gypsum boards and the studs. Meanwhile, the other screw-fastening form is such that the gypsum boards are screwed to the studs and to the joint base member with different screws, and the joint base member is fixed to a position of the lateral joints by being inserted between the gypsum boards and the studs.

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0009]

Patent Document 1: Japanese Patent Application Publication No. 2009-191494

Patent Document 2: International Publication No. WO2020/070938

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0010] According to the partition wall described in Patent Document 2, it is possible to use as small a number as possible of surface members to achieve good constructability and prevent leakage of heated air through lateral joints to increase a fire-resistance capability. The partition wall described in Patent Document 2 has two different screw-fastening forms as described above. However, in the former form in which the joint base member is not screwed to the gypsum boards, there is a concern that constructability will decrease when the partition wall is constructed with the joint base member being inserted between the studs and the gypsum boards. Meanwhile, in the latter form in which the joint base member is screwed to the gypsum boards at a position offset from the intersection between the gypsum boards, the studs, and the joint base member, two back pieces, i.e., upper and lower back pieces, included in the joint base member are respectively screwed to upper and lower gypsum boards, there are many screw-fastening positions, and there is a concern that the number of parts will increase and constructability will decrease.

[0011] The present disclosure provides a fire-resistant partition wall that prevents leakage of heated air through lateral joints to have a good fire-resistance capability and good constructability.

MEANS FOR SOLVING THE PROBLEMS

[0012] A fire-resistant partition wall according to an embodiment of the present disclosure includes

multiple studs installed at predetermined intervals, and

a first wall and a second wall that are a pair of walls provided across the studs from each other, the first wall and the second wall being respectively provided as a single-layer wall on both surfaces of the fire-resistant partition wall, the first wall and the second wall each being formed of multiple surface members of gypsum boards next to each other horizontally and vertically, and vertical joints and lateral joints being formed in each of the first wall and the second wall, in which

the studs are on a back side of the vertical joints, a joint base member having a fire blocking capability is provided at the lateral joints, the joint base member including a back piece contacting a back surface of the surface members and a projecting piece projecting from the back piece in a thickness direction of the surface members, and a transverse cross section of the joint base member perpendicular to a longitudinal direction thereof having a T-letter shape, the surface members, the joint base member, and the studs are not fastened with a common fixing member,

all of the surface members are fastened to the studs with a first fixing member, and

one of two surface members next to each other vertically is fastened to the back piece with a second fixing member, the two surface members being of the multiple surface members.

EFFECTS OF THE INVENTION

[0013] According to the present disclosure, it is possible to provide a fire-resistant partition wall that prevents leakage of heated air through lateral joints to have a good fire-resistance capability and good constructability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014]

[FIG. 1] FIG. 1 is a perspective view of an example of a fire-resistant partition wall according to an embodiment, illustrating a part thereof in a cutaway manner.

[FIG. 2] FIG. 2 is a transverse cross-sectional view, looking at a cross section in which surface members and studs are fastened together with a first fixing member in a direction of arrows II-II of FIG. 1.

[FIG. 3] FIG. 3 is a perspective view of a joint base member.

[FIG. 4] FIG. 4 is a perspective view illustrating a first wall on which the joint base member is provided on the back side of lateral joints, where the surface members, the joint base member, and the stud are not fastened at a three-member intersecting position with a fixing member.

[FIG. 5] FIG. 5 is a longitudinal cross-sectional view, looking at a cross section in which the surface members and the stud are fastened together with the first

fixing member in the fire-resistant partition wall according to the embodiment.

[FIG. 6] FIG. 6 is a perspective view of another example of a fire-resistant partition wall according to another embodiment, illustrating a part thereof in a cutaway manner.

[FIG. 7] FIG. 7 is a perspective view of still another example of a fire-resistant partition wall according to still another embodiment, illustrating a part thereof in a cutaway manner.

DETAILED DESCRIPTION OF THE INVENTION

[0015] Hereinafter, the fire-resistant partition wall according to the embodiment will be described with reference to the attached drawings. In the present specification and drawings, substantially the same components may be designated by the same reference symbols, and thus duplicate description thereof may be omitted.

[Fire-Resistant Partition Wall according to Embodiments]

[0016] Examples of the fire-resistant partition wall according to the embodiments will be described with reference to FIG. 1 to FIG. 7. In the following, description will be given of fire-resistant partition walls in which reinforced gypsum boards are applied as gypsum boards forming the surface members. However, gypsum boards other than the reinforced gypsum boards may be applied in the fire-resistant partition walls according to the embodiments. Here, FIG. 1 is a perspective view of an example of the fire-resistant partition wall according to the embodiment, illustrating a part thereof in a cutaway manner. FIG. 2 is a transverse cross-sectional view, looking at the cross section in which the surface members and the studs are fastened together with the first fixing member in the direction of the arrows II-II of FIG. 1. FIG. 3 is a perspective view of the joint base member. FIG. 4 is a perspective view illustrating the first wall on which the joint base member is provided on the back side of lateral joints, where the surface members, the joint base member, and the stud are not fastened at the three-member intersecting position with the fixing member. FIG. 5 is a longitudinal cross-sectional view, looking at the cross section in which the surface members and the stud are fastened together with the first fixing member in the fire-resistant partition wall according to the embodiment.

[0017] The fire-resistant partition wall 100 as illustrated in FIG. 1 is applied in steel frame buildings, (RC) (Reinforced Concrete) buildings, wooden buildings, and the like, and is applied in general detached houses, apartment complexes, factories, warehouses, and the like.

[0018] The fire-resistant partition wall 100 is a fire-resistant partition wall provided with a single-layer wall on both surfaces thereof, and includes multiple studs 10 installed at predetermined intervals "u" and a pair of a first wall 30A and a second wall 30B provided across the

studs 10 from each other. The intervals "u" at which the studs 10 are installed may be constant or may change in the middle. The intervals "u" may be set to 303 mm, for example.

[0019] The studs 10 are fitted into respective grooves of an upper runner 15 and a lower runner 16, thereby forming a frame structure of the studs 10, the upper runner 15, and the lower runner 16. In the illustrated example, each of the studs 10 is formed of lip channel steel, and the upper runner 15 and the lower runner 16 are formed of channel steel. The studs 10 may be formed of rectangular steel tubes instead of channel steel. The channel steel or rectangular steel tubes applied to the studs 10 are structural steel or steel tubes having, for example, 45 mm × 45 mm × 0.4 mm or more as width × height × thickness according to the expression of dimensions defined by JIS A 6517. Furthermore, the channel steel applied to the upper and lower runners 15 and 16 is structural steel of, for example, 45 mm × 30 mm through 40 mm × 0.4 mm or more.

[0020] Each of the first wall 30A and the second wall 30B is formed by vertically and laterally providing multiple reinforced gypsum boards 20 (examples of the surface members) having a thickness "s" of 25 mm. That is, by using the reinforced gypsum boards 20 of 25 mm in thickness, each of the first wall 30A and the second wall 30B can be formed of a single layer of fire-resistant covering material, and accordingly, the fire-resistant partition wall 100 as a whole is formed of two layers of the reinforced gypsum boards 20, i.e., is formed as a fire-resistant partition wall provided with a single-layer wall on both surfaces thereof. Here, according to the fire-resistant partition wall 100 as illustrated in FIG. 1, the first wall 30A and the second wall 30B are formed by applying the rectangular reinforced gypsum boards 20 in a vertical position. However, the first wall 30A and the second wall 30B may also be formed by applying the reinforced gypsum boards 20 in a horizontal position.

[0021] The reinforced gypsum boards 20 are formed by mixing an inorganic fiber material into the core material portions of gypsum boards, and are boards higher in fire-resistance capability than normal gypsum boards. According to JIS A 6901, the thickness standard of the reinforced gypsum boards 20 is defined as 12.5 mm, 15.0 mm, 16.0 mm, 18.0 mm, 21.0 mm, and 25.0 mm (with a thickness tolerance of 0 mm to +0.5 mm).

[0022] According to the fire-resistant partition wall 100, each of the first wall 30A and the second wall 30B is formed of a single layer of the reinforced gypsum boards 20. Therefore, the reinforced gypsum boards 20 having a maximum thickness of 25 mm are preferably applied.

[0023] As these reinforced gypsum boards 20, "TIGER BOARD (registered trademark) Type Z, 25 mm in thickness" manufactured by YOSHINO GYPSUM CO., LTD. may be applied. TIGER BOARD Type Z (25 mm in thickness) has a planar size of 606 mm in width and 1,820 mm in length, and has a beveled edge.

[0024] Thus, the fire-resistant partition wall 100 as a

whole has only two layers of the reinforced gypsum boards 20, i.e., a fire-resistant partition wall provided with a single-layer wall on both surfaces thereof. Therefore, the fire-resistant partition wall 100 is significantly improved in constructability compared to fire-resistant partition walls having four or more layers of fire-resistance covering material as a whole, i.e., a fire-resistant partition wall provided with two layers on both surfaces thereof.

[0025] According to the fire-resistant partition wall 100, the reinforced gypsum boards 20 each having a width over the three studs 10 installed at the predetermined intervals "u" (e.g., 303 mm) (over the distance between the centers of the right stud 10 and the left stud 10) are applied.

[0026] Furthermore, the reinforced gypsum boards 20 are vertically and laterally provided to form multiple vertical joints 60 and lateral joints 70. The steel studs 10 are on the back side of the vertical joints 60. Accordingly, for example, when a fire breaks out from the first wall 30A side, there is no risk that heated air leaks into the fire-resistant partition wall 100 through the vertical joints 60 of the first wall 30A. Here, base members, such as studs and the like, which are illustrated as steel members in the illustrated example, may alternatively be wood members to the extent that they have a satisfactory fire-resistance capability.

[0027] In contrast, there could be cavities on the back side of the lateral joints 70 except at positions corresponding to the studs 10, so that heated air could leak into the fire-resistant partition wall 100 through the lateral joints 70. Therefore, a joint base member 40 having a fire blocking capability is provided on the back side of the lateral joints 70.

[0028] Here, the "fire blocking capability" refers to the capability to block leakage of heated air or flame. In addition to materials having a fire-resistance capability by nature and materials that are cured by heat to have a fire-resistance capability, materials such as those that can have a fire blocking capability as a result of remaining as an incinerated mass even if the materials burn with heat are included.

[0029] Materials having a fire blocking capability as described above include metal, thermosetting resin, and wood. Metal includes steel, aluminum, SUS (stainless steel), and the like. Thermosetting resin includes phenol formaldehyde resin (PF), epoxy resin (EP), melamine formaldehyde resin (MF), urea formaldehyde resin (UF), unsaturated polyester resin (UP), alkyd resin, polyurethane resin (PUR), polyimide resin (PI), and the like. Furthermore, wood includes Japanese cedar, pine, spruce, quince, oak, beech, and the like, and may be either solid wood or engineered wood. As described above, wood burns to remain as an incinerated mass to be able to have a fire blocking capability.

[0030] The fire-resistant partition wall 100 has the fire-resistance capability of a one-hour fire-resistance rating. A fire-resistant partition wall having a one-hour fire-resistance rating is a partition wall that can pass a one-hour

fire resistance test conducted by applying heat for one hour. According to this fire resistance test, a temperature at which a combustible contacting a non-heated surface may burn is set as a reference temperature, and the temperature of the non-heated surface is required not to increase to or above this reference temperature.

[0031] More specifically, it is required that no damage that may let out fire (including heated air) be caused on the non-heated surface side by heating, that no damage that impairs structural strength be caused by heating, and that no significant smoke is produced on the non-heated surface side by heating. Furthermore, it is required that the temperature on the non-heated surface side neither exceed an initial temperature plus 140°C as an average temperature nor exceed an initial temperature plus 180°C as a maximum temperature.

[0032] As illustrated in FIG. 1, the joint base member 40 has a T-letter transverse cross-sectional shape, and the reinforced gypsum boards 20 and the studs 10 are fastened together with screws 50 (an example of the first fixing member) at positions where there are the studs 10 as illustrated in FIG. 5. The applied screws include those having a diameter of 3.5 mm or more and a length of 35 mm or more. The screws 50 may be fastened at vertical intervals of 200 mm or less. Meanwhile, as illustrated in FIG. 4, at a three-member intersecting position between the reinforced gypsum board 20, the joint base member 40, and the stud 10, these members are not fastened together with the screws 50, and at a position offset from the three-member intersecting position, the reinforced gypsum board 20 is fastened to the stud 10 with the screws 50. That is, the reinforced gypsum board 20 and the stud 10 are fastened with the screws 50 being absent in the area enclosed by a joint base member area and a stud area as illustrated in FIG. 4. At the three-member intersecting position, the joint base member 40 is held between the reinforced gypsum board 20 and the stud 10 without being fastened with the screws 50.

[0033] As illustrated in FIG. 4, when the joint base member 40 is not fastened to the stud 10 with the screws 50, as behaviors in the case of a fire, deformation due to the thermal expansion of the stud 10 and deformation due to the thermal expansion of the joint base member 40 do not interfere with each other, and thus the reinforced gypsum board 20 that is screwed to them can follow the deformations of both thereof. Therefore, it is possible to reduce stress due to the thermal expansion deformation of steel members applied to the reinforced gypsum board 20. As a result, cracks can be prevented from occurring in the reinforced gypsum boards 20.

[0034] In the fire-resistant partition wall 100, the reinforced gypsum board 20 and the joint base member 40 are not screwed at the three-member intersecting position as described above, while as described below in detail, in an area offset from the three-member intersecting position, one of the two reinforced gypsum boards 20 that are next to each other vertically is fastened to a back piece 41 of the joint base member 40 with a second fixing

member 55.

[0035] As illustrated in FIG. 3, the joint base member 40 is formed by bending a single plate material (e.g., a metal plate). According to the joint base member 40 of the illustrated example, a projecting piece 42 projects from two back pieces 41 via two first bent parts 43, and the projecting piece 42 has a U-letter shape including a second bent part 44.

[0036] Furthermore, according to the joint base member 40, the angle between the back pieces 41 and the projecting piece 42 is a predetermined angle θ that is less than 90 degrees. Here, the predetermined angle θ that is less than 90 degrees includes approximately 60 degrees through approximately 88 degrees.

[0037] As described above, the angle between the back pieces 41 and the projecting piece 42 is a predetermined angle θ that is less than 90 degrees. In this case, for example, when the joint base member 40 is installed as illustrated in FIG. 4 so that the projecting piece 42 is inserted between an upper end face 21 (smaller cross section) of the lower reinforced gypsum board 20 and a lower end face 22 (smaller cross section) of the upper reinforced gypsum board 20, the ends of the back pieces 41 can gaplessly contact the back surfaces of the reinforced gypsum boards 20.

[0038] When the reinforced gypsum boards 20 are fixed to the studs 10 in a state where the back surface of the joint base member 40 is pressed against the stud 10, the joint base member 40 ensures prevention of formation of gaps (closes gaps) in the lateral joints 70. Accordingly, the leakage of heated air into the partition wall 100 through the lateral joints 70 can be effectively eliminated.

[0039] As illustrated in FIG. 3, according to the joint base member 40, an overall width t_1 (width in a transverse cross section) of the two back pieces 41 is set to 70 mm or more. Furthermore, the projecting piece 42 is provided at the middle position of the two back pieces 41, and the projection length of the projecting piece 42 is set to be in the range of from 5 mm through 7 mm. Furthermore, a longitudinal length t_3 of the joint base member 40 may be as long as approximately 1,815 mm, which is over six spans, when the intervals "u" of the studs 10 are approximately 303 mm, for example.

[0040] Thus, the joint base member 40 has a high aspect ratio with the overall width being 70 mm or more and the overall length being approximately 1,815 mm. Therefore, the joint base member 40 is prone to be bended during transportation, construction, or the like, and may plastically deform when the joint base member 40 is made of metal. The joint base member 40, however, includes the projecting piece 42 over its entire length at its widthwise center. Therefore, this projecting piece 42 provides the joint base member 40 with flexural rigidity, thus making it possible to control or prevent its bending or plastic deformation during transportation, construction, or the like.

[0041] As illustrated in FIG. 5, the reinforced gypsum

board 20 has a chamfered part 24 at the back side corner of the lower end face 22 (smaller cross section). A length t_4 of this chamfered part 24 in the thickness direction of the reinforced gypsum board 20 is set to be in the range of from 7 mm through 9 mm.

[0042] Accordingly, when the joint base member 40 is installed on the back surface of the upper and lower reinforced gypsum boards 20, the projecting piece 42 whose projection length t_2 is set to be in the range of from 5 mm through 7 mm can be accommodated in the chamfered part 24.

[0043] Thus, when the projecting piece 42 is completely accommodated in the chamfered part 24, the lower end face 22 (smaller cross section) of the upper reinforced gypsum board 20 and the upper end face 21 (smaller cross section) of the lower reinforced gypsum board 20 can gaplessly contact each other as illustrated in FIG. 5, so that there is no gap in the lateral joints 70.

[0044] The above description is given of a chamfered part in the case of applying reinforced gypsum boards in a vertical position. In the case of applying reinforced gypsum boards in a horizontal position, the edges of boards whose sides are covered with gypsum board paper are caused to abut with each other. When the edge bent angle is less than 90 degrees, the gap may be able to be a gap that can accommodate the projecting piece of a joint base member without chamfering. In this case, it is noted that lateral joints are prevented from being open. Even in the case of horizontal position application, chamfering is performed, if necessary. Here, examples of shapes of the edges of boards include a beveled edge and a square edge. Also, the edge bent angle refers to an angle of a side surface covered with gypsum board paper at a board edge.

[0045] Again, as illustrated in FIG. 1, one of the two reinforced gypsum boards 20 next to each other vertically is fastened to the back piece 41 of the joint base member 40 with the second fixing member 55.

[0046] When the two reinforced gypsum boards 20 next to each other vertically are regarded as a surface members' set 20A, multiple surface members' sets 20A are next to each other horizontally. One of the two surface members' sets next to each other is such that a lower portion of the upper reinforced gypsum board 20 is fastened to the upper back piece 41 included in the joint base member 40 present on the back side. Meanwhile, the other of the two surface members' sets next to each other is such that an upper portion of the lower reinforced gypsum board 20 is fastened to the lower back piece 41 included in the joint base member 40 present on the back side.

[0047] In the illustrated example, the two second fixing members 55 are applied in the upper portion or the lower portion of the reinforced gypsum board 20.

[0048] Here, as the second fixing member 55, a nail, a screw thread, or the like is applied in addition to the screw. The second fixing member 55 is driven from a wider-surface side of the reinforced gypsum board 20, so that

the reinforced gypsum board 20 is fastened to the back piece 41 present on the back side.

[0049] In the fire-resistant partition wall 100, as described above, at the three-member intersecting position between the reinforced gypsum board 20, the back piece 41 of the joint base member 40, and the stud 10, these members are not fastened together into a single piece with a common fixing member (e.g., a nail, a screw, or the like; the same applies hereinafter). Meanwhile, in the area offset from the three-member intersecting position, one of the two reinforced gypsum boards 20 next to each other vertically is fastened to the back piece 41 of the joint base member 40 with the second fixing member 55.

[0050] In actual construction, the multiple studs 10 are installed between the upper and lower runners 15 and 16 at the predetermined intervals "u", and then the lower reinforced gypsum boards 20 are fastened to the studs 10 with the screws 50.

[0051] Next, the lower back piece 41 of the joint base member 40 is inserted on the back side (the stud 10 side) of the upper end face 21 (smaller cross section) of the lower reinforced gypsum board 20, and the projecting piece 42 is hung on the upper end face 21 (smaller cross section) and is locked. Subsequently, the screws 55 are alternately driven into upper portions of the horizontally arranged multiple reinforced gypsum boards 20, thereby fixing the back piece 41 to the upper portions of the reinforced gypsum boards 20.

[0052] Next, the lower end face 22 (smaller cross section) of the upper reinforced gypsum board 20 is installed on the upper end face 21 (smaller cross section) of the lower reinforced gypsum board 20 so as to sandwich the projecting piece 42, and the upper reinforced gypsum board 20 is fastened to the stud 10 with the screws 50. Then, among the upper reinforced gypsum boards 20 forming the multiple surface members' sets 20A, the screws 55 are driven into the lower portions of the upper reinforced gypsum boards 20 forming the surface members' sets 20A with the lower reinforced gypsum boards 20 into which the screws 55 are not driven, thereby fixing the back piece 41 to the lower portions of the reinforced gypsum boards 20.

[0053] In this manner, one of the two surface members' sets 20A next to each other is such that the upper portion of the lower reinforced gypsum board 20 is fastened to the lower back piece 41 included in the joint base member 40 with the second fixing member 55. Meanwhile, the other surface members' set 20A is such that the lower portion of the upper reinforced gypsum board 20 is fastened to the upper back piece 41 included in the joint base member 40 with the second fixing member 55, and the upper and lower reinforced gypsum boards 20 are fastened to the stud 10 with the first fixing member 50. This construction method can prevent detachment or displacement of the joint base member 40 from the smaller cross section of the reinforced gypsum board 20 upon attachment, and improve constructability of the fire-resistant partition wall 100. Also, for example, compared to

when both of the upper and lower back pieces 41 of the joint base member 40 are fastened with screws to the upper and lower reinforced gypsum boards 20, it is possible to significantly reduce the number of screws and the number of sites for fastening. This can reduce a construction cost and further improve constructability.

[0054] Meanwhile, the example as illustrated in FIG. 6 is an example in which only the upper reinforced gypsum boards 20 of all of the surface members' sets 20A are fastened to the back piece 41 with the second fixing member 55.

[0055] Also, the example as illustrated in FIG. 7 is an example in which only the lower reinforced gypsum boards 20 of all of the surface members' sets 20A are fastened to the back piece 41 with the second fixing member 55.

[0056] In both of the above examples, similar to the example as illustrated in FIG. 1, it is possible to prevent detachment or displacement of the joint base member 40 from the smaller cross section of the reinforced gypsum board 20 upon attachment. Also, compared to when both of the upper and lower back pieces 41 of the joint base member 40 are fastened with screws to the upper and lower reinforced gypsum boards 20, it is possible to significantly reduce the number of screws and the number of sites for fastening. This can reduce a construction cost and further improve constructability.

[0057] The illustrated fire-resistant partition wall 100 is formed of as small a number as possible of the surface members 20 to achieve good constructability. Furthermore, one of the two surface members 20 next to each other vertically is fastened to the back piece 41 of the joint base member 40 with the second fixing member 55, thereby preventing detachment or displacement of the joint base member 40 and further improving constructability. In addition, the joint base member 40 effectively prevents leakage of heated air through the lateral joints 70 in the fire-resistant partition wall 100, and a fire-resistant partition wall having a good fire-resistance capability is obtained.

[0058] Furthermore, one of the two surface members 20 next to each other vertically is fastened to the back piece 41 of the joint base member 40 with the second fixing member 55. With this structure, when the first wall 30A and the second wall 30B of the fire-resistant partition wall 100 are deformed in the case of an earthquake, the multiple surface members 20 forming each of the walls are integrally deformed, for example, into a parallelogram. This can prevent formation of wrinkles in an unillustrated cloth or the like that is provided on indoor surfaces of the first wall 30A and the second wall 30B.

[0059] Also, the stud 10, the reinforced gypsum board 20, and the back piece 41 of the joint base member 40 are not fastened together into a single piece with a common fixing member at the three-member intersecting position. More specifically, the back piece 41 of the joint base member 40 is retained between the stud 10 and the reinforced gypsum board 20, and is not integrally fixed.

With this structure, it is possible to reduce the effect of strain-derived stress received by the reinforced gypsum board 20 from deformation due to the thermal expansion of the stud 10 and deformation due to the thermal expansion of the joint base member 40, in the case of a fire. This can effectively prevent cracks that can occur in the reinforced gypsum boards 20 in the case of a fire.

[Interlayer deformation followability test and the results thereof]

[0060] The present inventors conducted an interlayer deformation followability test according to "JIS A 1414-2 Performance test methods of panel components for building construction 5.9 Interlayer deformation followability test". This test measured a deformation angle at which cracks would occur at joints between reinforced gypsum boards of test samples in relation to four types of fire-resistant partition walls, i.e., a comparative example and Examples 1 to 3.

[0061] The comparative example is a test sample obtained by using EASYWALL (registered trademark, obtained from YOSHINO GYPSUM CO., LTD.), which is a partition wall using reinforced gypsum boards as surface members, and sandwiching a joint base member between the reinforced gypsum boards and studs with the joint base member not being fastened to both of the reinforced gypsum boards and the studs.

[0062] Example 1 is a test sample obtained by using EASYWALL, which is a partition wall using reinforced gypsum boards as surface members, and fastening a joint base member only to the lower reinforced gypsum boards as illustrated in FIG. 7. In Example 1, as illustrated in FIG. 7, the joint base member is fastened to one reinforced gypsum board with screws at two sites between the studs next to each other.

[0063] Example 2 is a test sample obtained by using EASYWALL, which is a partition wall using reinforced gypsum boards as surface members, and alternately fastening a joint base member to the upper reinforced gypsum board and the lower reinforced gypsum board as illustrated in FIG. 1. In Example 2, as illustrated in FIG. 1, the joint base member is fastened to one reinforced gypsum board with screws at two sites between the studs next to each other.

[0064] Example 3 is a test sample in which the joint base member is fastened only to the lower reinforced gypsum boards like in Example 1, but is different from Example 1 in that the joint base member is fastened to one reinforced gypsum board with a screw at one site between the studs next to each other.

[0065] Common specifications of the test samples of the comparative example and Examples 1 to 3 are as follows: the applied reinforced gypsum board is 25 mm in thickness and 606 mm in board width; the pitch of the studs is 303 mm; and the fire-resistant partition wall is provided with a single-layer wall on both surfaces thereof. Also, a sealing treatment of the lateral joint into which the

joint base member is inserted is only a putty treatment, and glass fiber tape is not used. Furthermore, only right- or left-half of each of the test samples is cloth-finished, and the remaining half is only subjected to a putty treatment without cloth finishing. As a supplementary note, a sealing treatment with paint finishing readily causes cracks, and thus use of glass fiber tape is indispensable. Meanwhile, cloth finishing does not readily cause cracks, wrinkles, and twists compared to paint finishing. Therefore, in consideration of reduction in material cost, it is often the case that glass fiber tape is not used in a sealing treatment, and only a putty treatment is performed, followed by cloth finishing. Such an actual situation is reflected in the above test samples.

[0066] The interlayer deformation followability test was performed, and in each of the test samples, the lateral joint into which the joint base member was inserted, was observed. As a result, cracks were formed at a deformation angle of 1/100 in the comparative example. Meanwhile, in Examples 1, 2, and 3, cracks were formed at a deformation angle of 1/75.

[0067] From the results of this experiment, it is demonstrated that the amount of deformation (deformation angle) at the time of formation of cracks is larger and cracks at the time of deformation are less likely to form in the examples in which the joint base material is fastened to the upper or lower gypsum board than in the comparative example in which the joint base material is not fastened to both of the gypsum board and the stud and is only sandwiched between the gypsum board and the stud.

[0068] It should be noted that other embodiments made, for example, by combining other constituent elements with the configuration and the like described in the above embodiments are possible, and the present disclosure is not limited to the configuration described herein in any way. In this regard, changes are possible to the extent of not deviating from the purpose of the present disclosure, and appropriate determinations can be made in accordance with application forms thereof.

[0069] The present international application claims priority to Japanese Patent Application No. 2022-094924 filed on June 13, 2022, and the entire contents of this application are incorporated into the present international application by reference.

Reference Signs List

[0070]

- 10: Stud
- 15: Upper runner (runner)
- 16: Lower runner (runner)
- 20: Surface member (Reinforced gypsum board, gypsum board)
- 20A: Set (Surface members' set)
- 21: Upper end face
- 22: Lower end face
- 23: Side end face

24: Chamfered part
 30A: First wall
 30B: Second wall
 40: Joint base member
 41: Back piece
 42: Projecting piece
 43: First bent part
 44: Second bent part
 50: Screw (First fixing member)
 55: Screw (Second fixing member)
 60: Vertical joint
 70: Lateral joint
 100: Fire-resistant partition wall

only a lower surface member of the two surface members in each of the sets is fastened to the back piece.

5 3. The fire-resistant partition wall according to claim 1, wherein

multiple sets each being a set of the two surface members next to each other vertically are next to each other horizontally, and only an upper surface member of the two surface members in each of the sets is fastened to the back piece.

15 4. The fire-resistant partition wall according to claim 1, wherein

Claims

1. A fire-resistant partition wall, comprising:

multiple studs installed at predetermined intervals; and
 a first wall and a second wall that are a pair of walls provided across the studs from each other, the first wall and the second wall being respectively provided as a single-layer wall on both surfaces of the fire-resistant partition wall, the first wall and the second wall each being formed of multiple surface members of gypsum boards next to each other horizontally and vertically, and vertical joints and lateral joints being formed in each of the first wall and the second wall, wherein
 the studs are on a back side of the vertical joints, a joint base member having a fire blocking capability is provided at the lateral joints, the joint base member including a back piece contacting a back surface of the surface members and a projecting piece projecting from the back piece in a thickness direction of the surface members, and a transverse cross section of the joint base member perpendicular to a longitudinal direction thereof having a T-letter shape, the surface members, the joint base member, and the studs are not fastened with a common fixing member,
 all of the surface members are fastened to the studs with a first fixing member, and one of two surface members next to each other vertically is fastened to the back piece with a second fixing member, the two surface members being of the multiple surface members.

multiple sets each being a set of the two surface members next to each other vertically are next to each other horizontally, and one of two sets next to each other, the two sets being of the multiple sets, is such that an upper surface member of the two surface members is fastened to the back piece, and another of the two sets is such that a lower surface member of the two surface members is fastened to the back piece.

30 5. The fire-resistant partition wall according to any one of claims 1 to 4, wherein the second fixing member is a member driven from a wider-surface side of the surface members.

35 6. The fire-resistant partition wall according to any one of claims 1 to 4, wherein the surface members are reinforced gypsum boards, and have a thickness of 25 mm.

2. The fire-resistant partition wall according to claim 1, wherein

multiple sets each being a set of the two surface members next to each other vertically are next to each other horizontally, and

55

FIG. 1

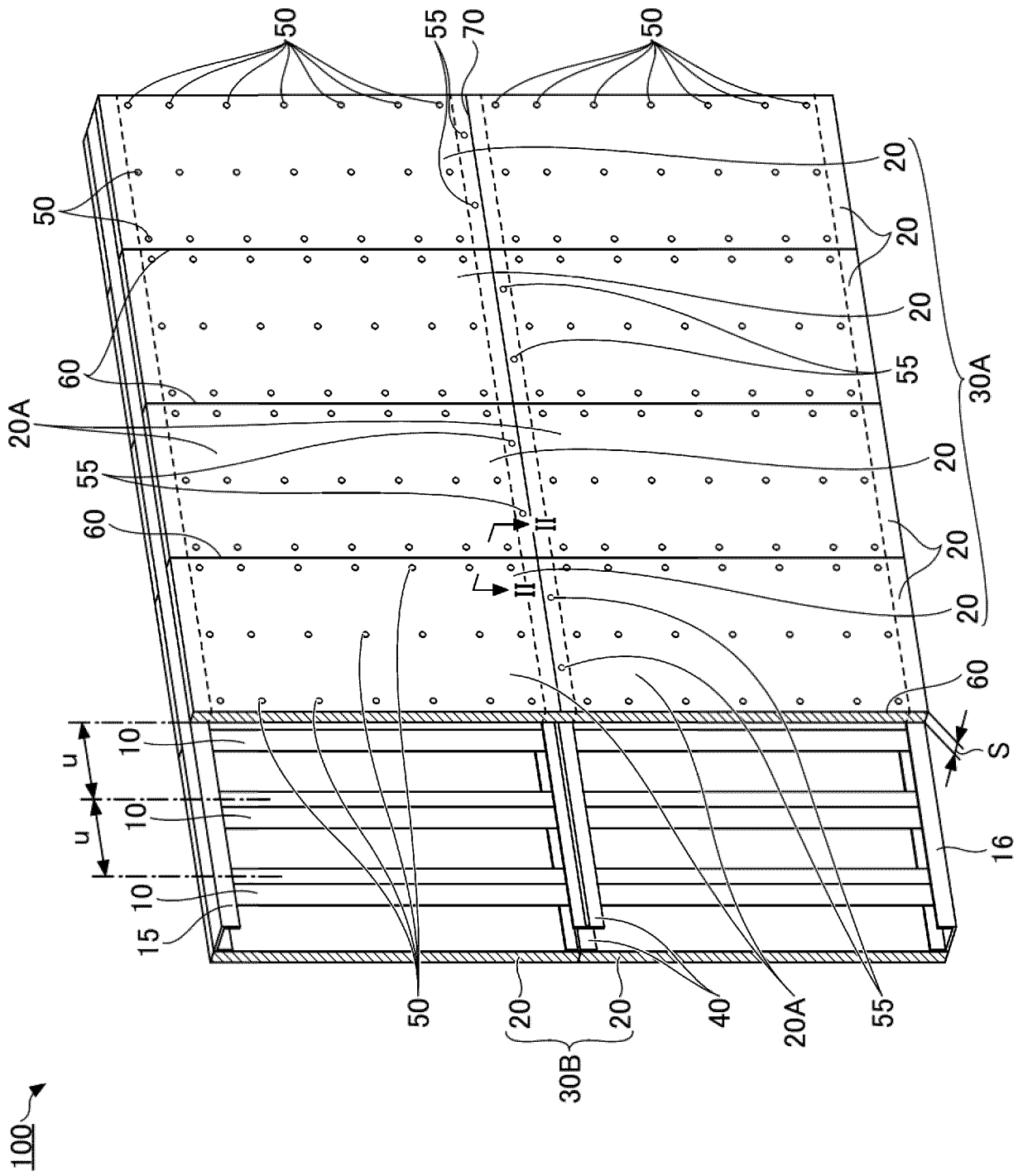
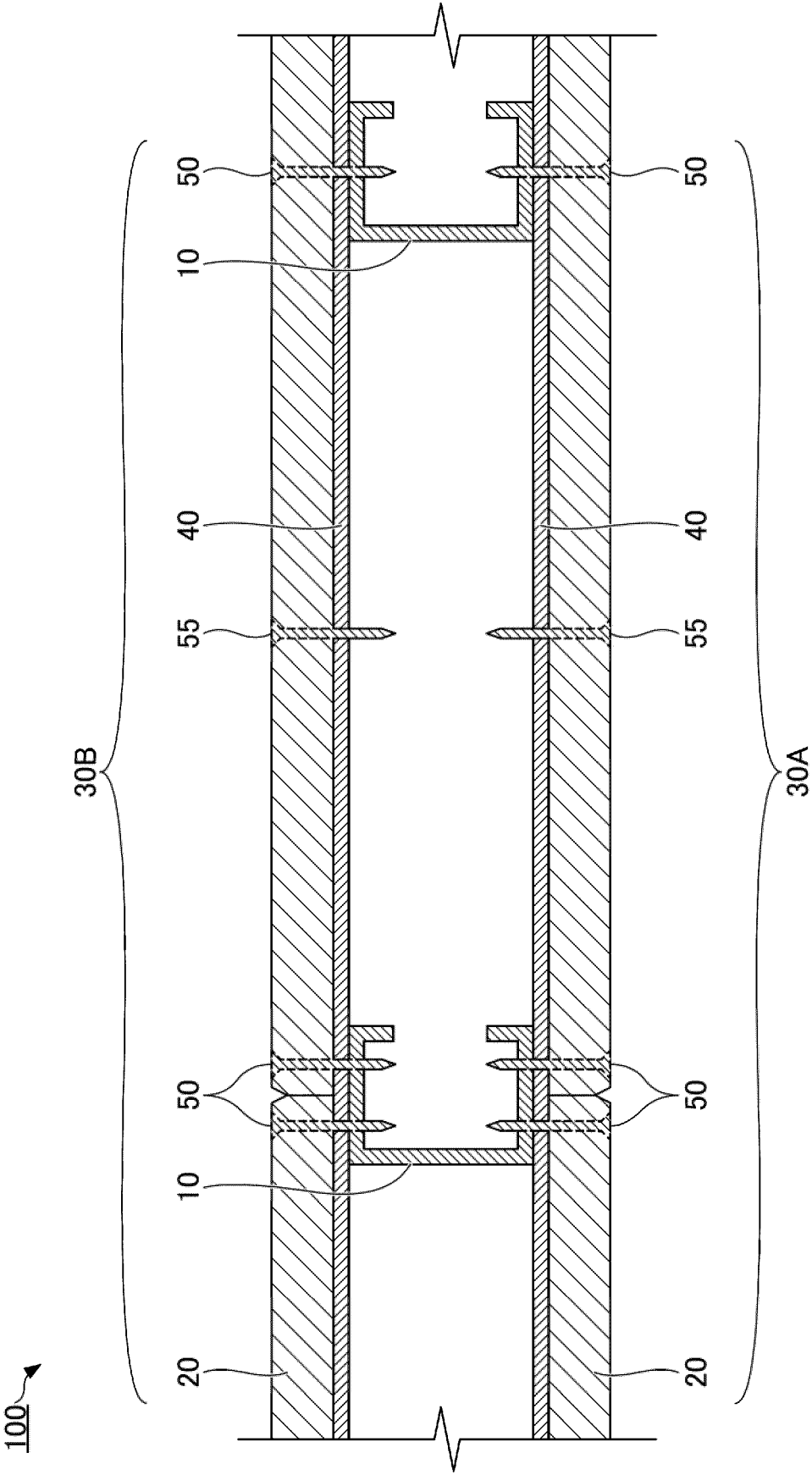
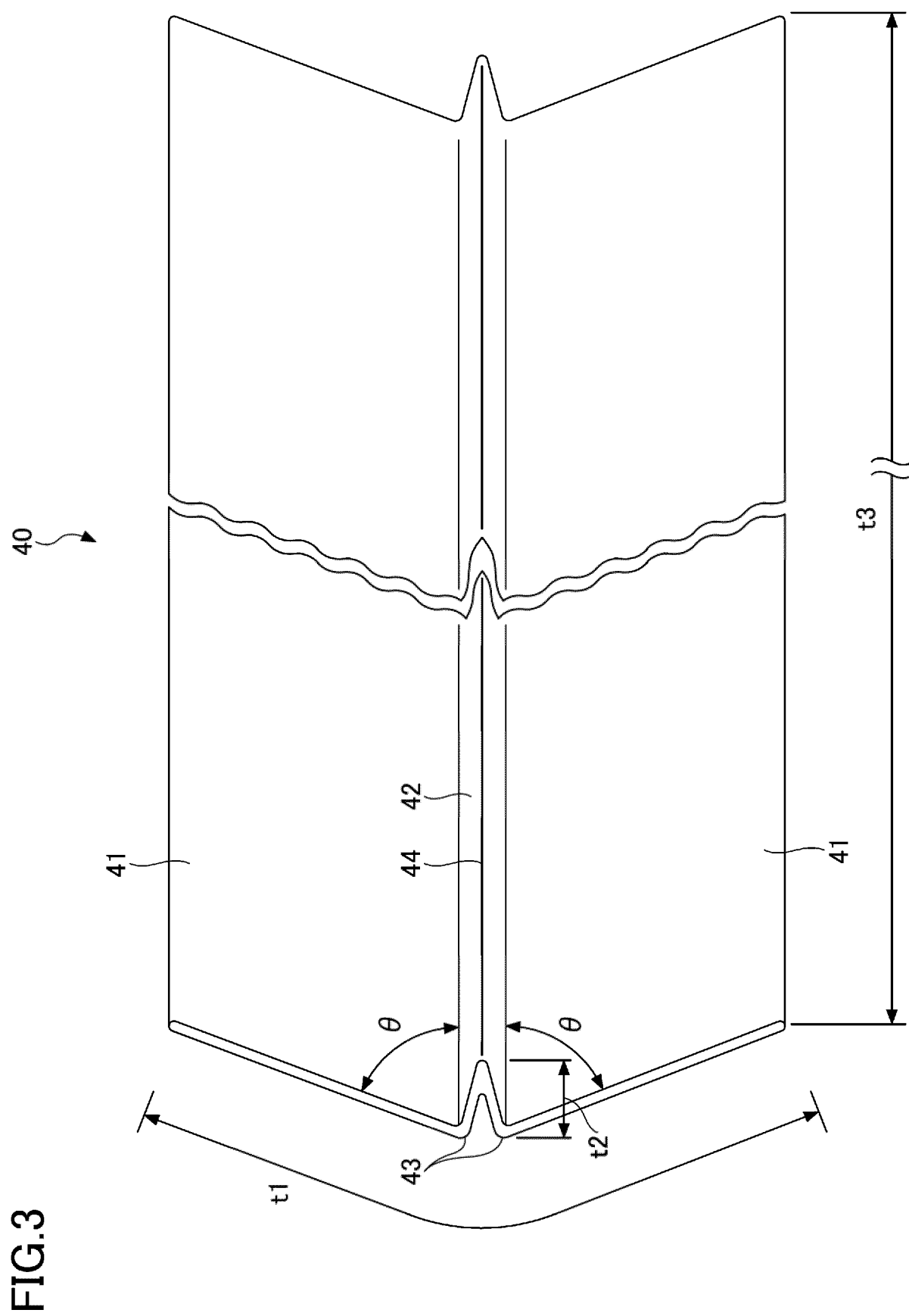


FIG.2





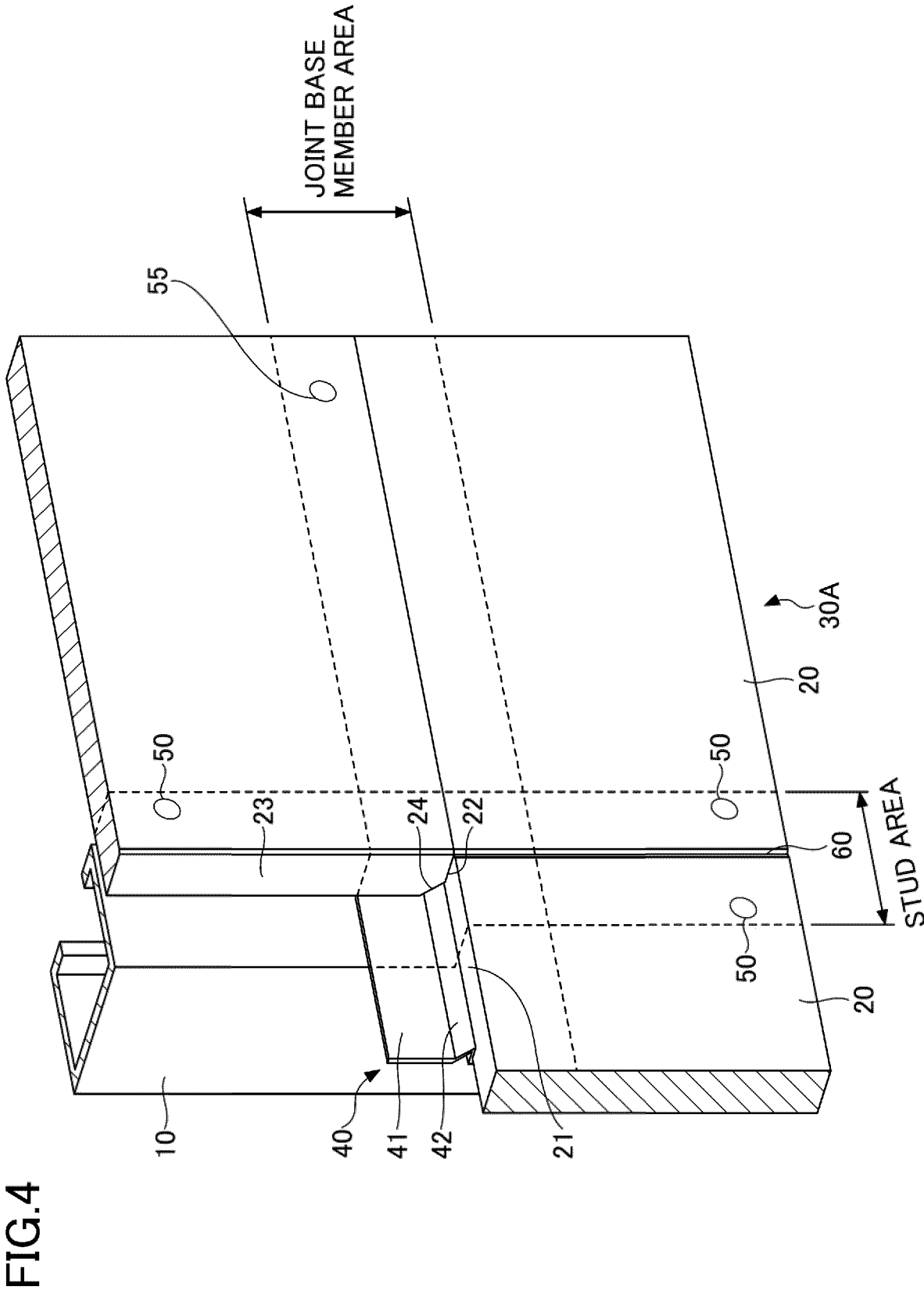


FIG.5

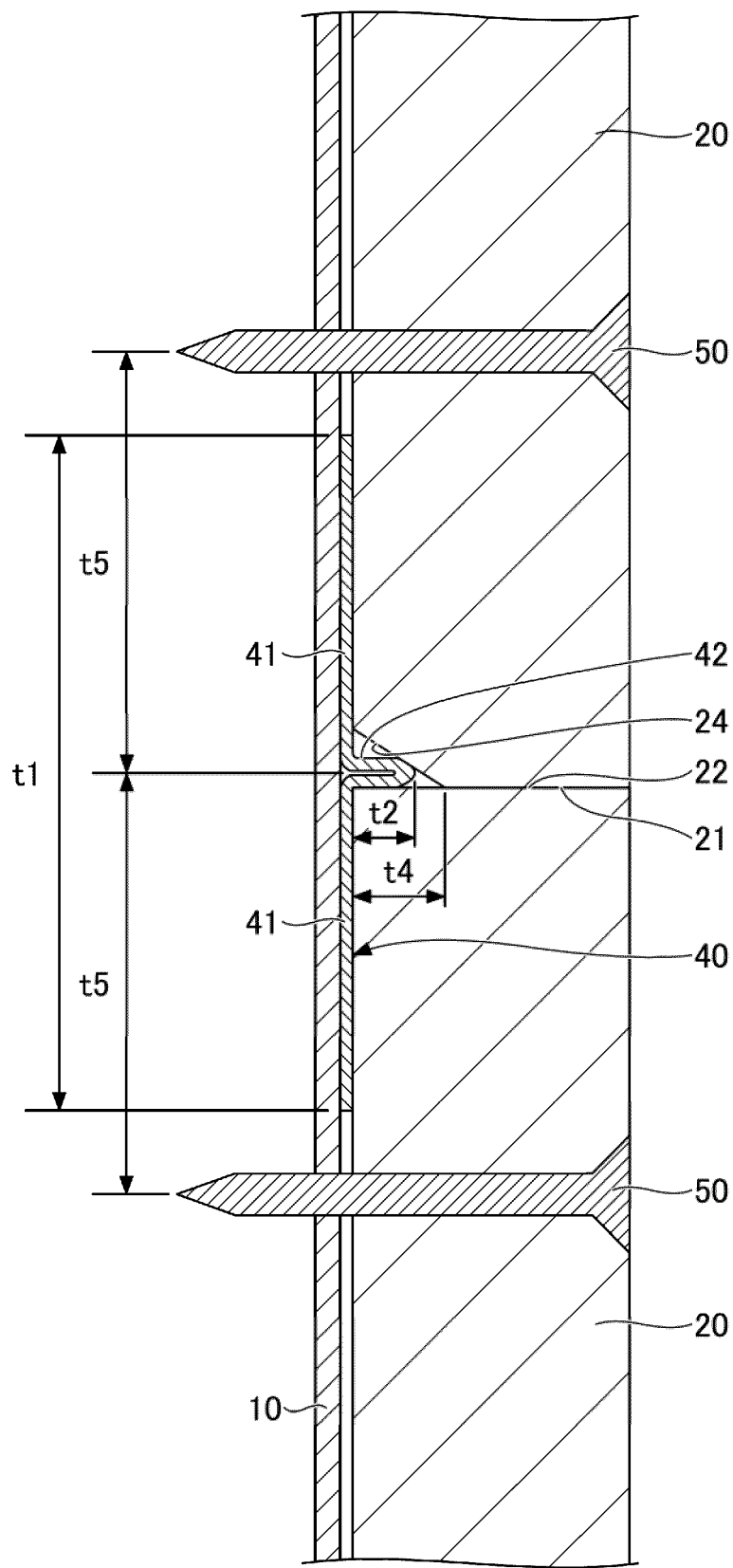


FIG. 6

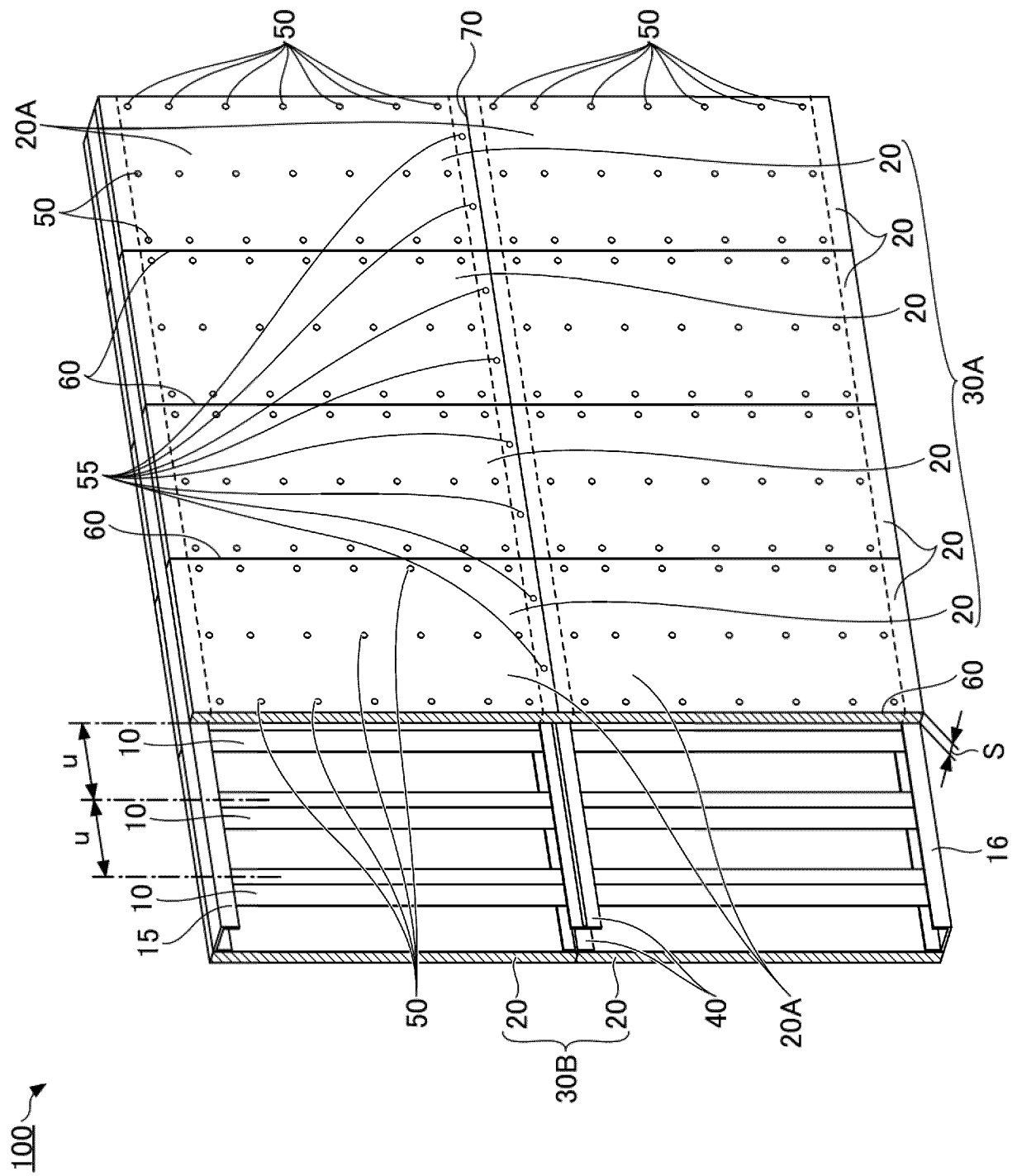
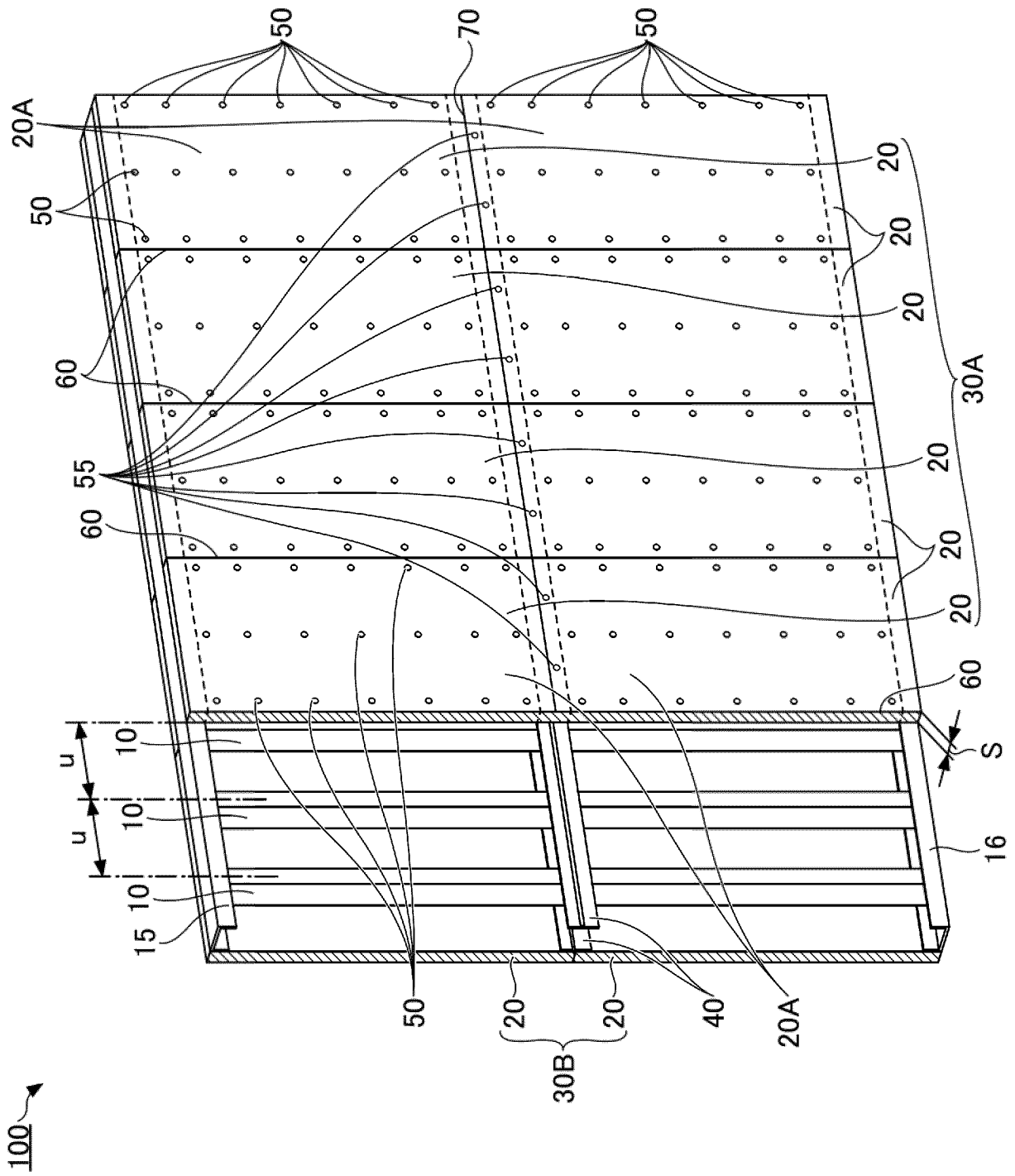


FIG. 7



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2023/006382

A. CLASSIFICATION OF SUBJECT MATTER

E04B 1/94(2006.01)i; **E04B 2/74**(2006.01)i
FI: E04B1/94 K; E04B1/94 L; E04B2/74 551Z

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04B1/94; E04B2/74; E04F13/08; E04F19/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2023
Registered utility model specifications of Japan 1996-2023
Published registered utility model applications of Japan 1994-2023

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2020/070938 A1 (YOSHINO GYPSUM CO., LTD.) 09 April 2020 (2020-04-09) paragraphs [0016]-[0067], fig. 1-6	1, 5-6
Y		2-3
A		4
Y	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 096291/1991 (Laid-open No. 038121/1993) (NITTO BOSEKI CO LTD) 25 May 1993 (1993-05-25), paragraph [0014], fig. 6	2-3
A		4
A	JP 2018-091123 A (CHIYODA UTE CO LTD) 14 June 2018 (2018-06-14)	1-6
A	JP 2012-052333 A (JAPAN INSULATION CO LTD) 15 March 2012 (2012-03-15)	1-6
A	US 5950385 A (HERREN, Thomas R.) 14 September 1999 (1999-09-14)	1-6

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search

12 April 2023

Date of mailing of the international search report

25 April 2023

Name and mailing address of the ISA/JP

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Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2023/006382

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
WO	2020/070938	A1	09 April 2020	US 2021/0396003 A1 paragraphs [0035]-[0086], fig. 1-6	
JP	05-038121	U1	25 May 1993	(Family: none)	
JP	2018-091123	A	14 June 2018	(Family: none)	
JP	2012-052333	A	15 March 2012	(Family: none)	
US	5950385	A	14 September 1999	(Family: none)	

REFERENCES CITED IN THE DESCRIPTION

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- WO 2020070938 A [0009]
- JP 2022094924 A [0069]