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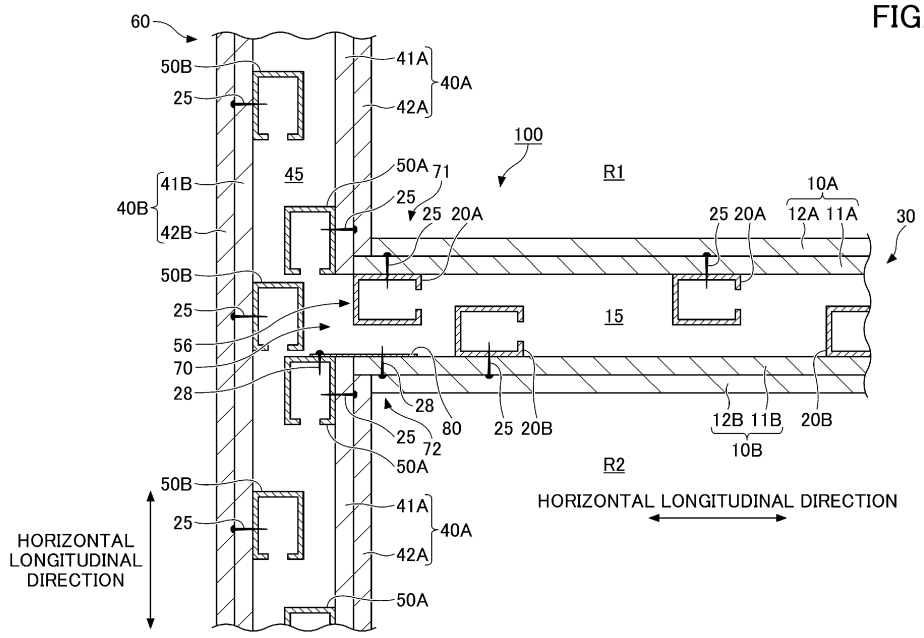
(54) **INTERSECTION-PORTION STRUCTURE OF BUILDING WALL**

(57) To provide a crossing structure of a building wall excellent in both sound insulation and seismic resistance. A crossing structure of a building wall 100 includes a crossing 70 in which a first wall 30 and a second wall 60 intersect in a T-shape in a plan view, wherein at a second corner 72 of the crossing 70, a first B stud 20B to which a second face member 10B is attached is not disposed, a second A stud 50A to which a third face member 40A is attached is disposed, and at the second corner 72, a reinforcement plate 80 straddles both an inner face of the second face member 10B and the second A stud 50A, and is fixed to both the second face member 10B and the second A stud 50A.

FIG.2



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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a crossing structure of building wall.

BACKGROUND OF THE INVENTION

[0002] A dry partition wall including a parting wall is formed by erecting a plurality of studs (intermediate pillars) at intervals in a longitudinal direction with respect to a pair of upper and lower runners and then attaching face materials such as gypsum boards on both sides of each stud. The partition wall serves as the partition between two rooms.

[0003] In a double-sided structure in which a face member is attached to both sides of each stud included in a dry partition wall, sound tends to propagate (sound is likely to leak) from one room to the other room due to the formation of what is known as a sound bridge, and this consequently results in a partition wall with low sound insulation. In order to improve sound insulation performance, a one-face structure in which adjacent studs are arranged in a staggered manner and a face member is attached to the one face of each stud may therefore be applied. An example of this is proposed in Patent Document 1. The partition wall having sound insulation disclosed in Patent Document 1 is a partition wall formed by fixing double wall boards via studs and filling a hollow area layer between the wall boards with soundproofing material. One wall board face abuts on one face of the studs, a gap is provided between the other face of the studs and the other wall board face, the studs are arranged in a staggered shape between the wall boards, and the gap between the hollow area layer, the studs, and the wall board is filled with soundproofing material.

Related Art Documents

Patent Document

[0004] [Patent document 1] Japanese Utility Model Application Publication H5-47123

SUMMARY OF THE INVENTION

Problems to be solved by the Invention

[0005] FIG. 1 illustrates an example of a partition wall described in patent document 1 featuring a structure in which face members are attached to only single faces of the studs. FIG. 1 is a cross-sectional diagram of an example of a conventional partition wall. The illustrated example prominently depicts a crossing 70 in which a first wall 30 that is a partition wall and a second wall 60 that is a partition wall or an outer wall intersect in a T-shape in a plan view.

[0006] The first wall 30 has a staggered arrangement in which a plurality of first A studs 20A and a plurality of first B studs 20B are arranged at intervals with respect to a horizontal longitudinal direction and are alternately offset with respect to each other in a direction perpendicular to the horizontal longitudinal direction. A first face member 10A is attached to respective single faces of the plurality of first A studs 20A, and a second face member 10B is attached to respective single faces of the plurality of first B studs 20B. The first face member 10A is a multi-layer structure having both an underlay 11A formed by a plurality of underlay face members and an overlay 12A formed by a plurality of overlay face members. In one of these, the face members are arranged horizontally. In the other one of these, the face members are arranged vertically. Likewise, the second face member 10B is a multi-layer structure having both an underlay 11B formed by a plurality of underlay face members and an overlay 12B formed by a plurality of overlay face members. In one of these, the face members are arranged horizontally. In the other one of these, the face members are arranged vertically. Both of the underlays 11A and 11B are fastened to the corresponding studs 20A and 20B by fasteners 25 such as screws, and both of the overlays 12A and 12B are fastened to the underlays 11A and 11B by an adhesive or staples.

[0007] Inside the first wall 30 is a hollow area 15, and sound insulation and heat insulation are ensured by the hollow area 15. There is also a form in which the hollow area 15 is filled with soundproofing material to further enhance sound insulation performance.

[0008] The second wall 60 has a staggered arrangement in which a plurality of second A studs 50A and a plurality of second B studs 50B are arranged at intervals with respect to the horizontal longitudinal direction and are alternately offset with respect to each other in the direction perpendicular to the horizontal longitudinal direction. A third face member 40A is attached to respective single faces of the plurality of second A studs 50A, and a fourth face member 40B is attached to respective single faces of the plurality of second B studs 50B. The third face member 40A is a multi-layer structure having both an underlay 41A formed by a plurality of underlay face members and an overlay 42A formed by a plurality of overlay face members. In one of these, the face members are arranged horizontally. In the other one of these, the face members

are arranged vertically. Likewise, the fourth face member 40B is a multi-layer structure having both an underlay 41B formed by a plurality of underlay face members and an overlay 42B formed by a plurality of overlay face members. In one of these, the face members are arranged horizontally. In the other one of these, the face members are arranged vertically. Both of the underlays 41A and 41B are fastened to the corresponding studs 50A and 50B by the fasteners 25 such as screws, and both of the overlays 42A and 42B are fastened to the underlays 41A and 41B by an adhesive or staples.

[0009] Inside the second wall 60 is a hollow area 45, and sound insulation and heat insulation are ensured by the hollow area 45. There is also a form in which the hollow area 45 is filled with soundproofing material to further enhance sound insulation performance.

[0010] A crossing structure 90 of the building wall is formed at the crossing 70 in which the first wall 30 and the second wall 60 intersect in a T-shape in a plan view, and a first corner 71 and a second corner 72 at inset corners of the crossing 70 face the two rooms R1 and R2, respectively. In the crossing 70 of the crossing structure 90, a slit 55 is provided in the longitudinal direction (vertical direction) in order to prevent sound from propagating through the underlay 41A of the third face member 40A included in the second wall 60.

[0011] In this way, the sound insulation performance of the partition wall 30 can be improved by having a configuration in which no face member is attached to both sides of the first A stud 20A and the first B stud 20B included in the first wall 30, and by having a longitudinal slit 55 in the crossing 70 of the underlay 41A of the third face member 40A included in the second wall 60. However, since there is no stud supporting the second face member 10B in the second corner 72, this could result in the formation of a structurally weak part W. The formation of the structurally weak part W in a portion of the crossing 70 presents a problem in that if the building is displaced by an earthquake or similar event, there is a risk of breakage, such as cracking, in and around the structurally weak part W. This results in a crossing structure with reduced seismic resistance performance.

[0012] The present disclosure provides a crossing structure of a building wall excellent in both sound insulation and seismic resistance.

Means for Solving the Problem

[0013] A crossing structure of a building wall according to an aspect of present disclosure includes a crossing in which a first wall and a second wall intersect in a T-shape in a plan view, wherein

the first wall is formed by being equipped with a plurality of first A studs and a plurality of first B studs alternately arranged at intervals in a horizontal longitudinal direction of the first wall, and by attaching a first face member to respective single faces of the first A studs and a second face member to respective single faces of the first B studs,
the second wall is formed by being equipped with a plurality of second A studs and a plurality of second B studs alternately arranged at intervals in a horizontal longitudinal direction of the second wall, and by attaching a third face member to respective single faces of the second A studs and a fourth face member to respective single faces of the second B studs,
at a first corner among four corners of the crossing, the first A stud to which the first face member is attached is disposed, and the second A stud to which the third face member is attached is not disposed,
at a second corner among the four corners of the crossing, the first B stud to which the second face member is attached is not disposed, and the second A stud to which the third face member is attached is disposed,
at a third corner among the four corners of the crossing, the second B stud to which the fourth face member is attached is disposed, and the first A stud to which the first face member is attached is not disposed,
at a fourth corner among the four corners of the crossing, the first B stud to which the second face member is attached is disposed, and the second B stud to which the fourth face member is attached is not disposed, and
at the first corner, a reinforcement plate straddles both an inner face of the third face member and the first A stud, and the reinforcement plate is fixed to both the third face member and the first A stud,
at the second corner, a reinforcement plate straddles both an inner face of the second face member and the second A stud, and is fixed to both the second face member and the second A stud,
at the third corner, a reinforcement plate straddles both an inner face of the first face member and the second B stud, and is fixed to both the first face member and the second B stud, and
at the fourth corner, a reinforcement plate straddles both an inner face of the fourth face member and the first B stud, and is fixed to both the fourth face member and the first B stud.

[0014] A crossing structure of a building wall according to another aspect of the present disclosure includes a crossing in which a first wall and a second wall intersect in a cross-shape in a plan view, wherein,

the first wall is formed by being equipped with a plurality of first A studs and a plurality of first B studs alternately arranged at intervals in a horizontal longitudinal direction of the first wall, and by attaching a first face member to

respective single faces of the first A studs and a second face member to respective single faces of the first B studs, the second wall is formed by being equipped with a plurality of second A studs and a plurality of second B studs alternately arranged at intervals in a horizontal longitudinal direction of the second wall, and by attaching a third face member to respective single faces of the second A studs and a fourth face member to respective single faces of the second B studs,
at a first corner among four corners of the crossing, the first A stud to which the first face member is attached is disposed, and the second A stud to which the third face member is attached is not disposed,
at a second corner among the four corners of the crossing, the first B stud to which the second face member is attached is not disposed, and the second A stud to which the third face member is attached is disposed, and
at a third corner among the four corners of the crossing, the second B stud to which the fourth face member is attached is disposed, and the first A stud to which the first face member is attached is not disposed,
at the fourth corner among the four corners of the crossing, the first B stud to which the second face member is attached is disposed, and the second B stud to which the fourth face member is attached is not disposed, and
at the first corner, a reinforcement plate straddles both an inner face of the third face member and the first A stud, and the reinforcement plate is fixed to both the third face member and the first A stud,
at the second corner, a reinforcement plate straddles both an inner face of the second face member and the second A stud, and is fixed to both the second face member and the second A stud,
at the third corner, a reinforcement plate straddles both an inner face of the first face member and the second B stud, and is fixed to both the first face member and the second B stud, and
at the fourth corner, a reinforcement plate straddles both an inner face of the fourth face member and the first B stud, and is fixed to both the fourth face member and the first B stud.

Effects of the Invention

[0015] According to the present disclosure, a crossing structure of a building wall excellent in both sound insulation and seismic resistance can be provided.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

[FIG. 1] FIG. 1 is a cross-sectional diagram of an example (Comparative Example 1) of a conventional crossing structure of building wall.
[FIG. 2] FIG. 2 is a cross-sectional diagram of an example of a crossing structure of a building wall according to the first embodiment.
[FIG. 3] FIG. 3 is a cross-sectional diagram of another example of the crossing structure of the building wall according to the first embodiment.
[FIG. 4] FIG. 4 is a cross-sectional diagram of another example of a crossing structure of a building wall according to the second embodiment.
[FIG. 5] FIG. 5 is a cross-sectional diagram of another example of a crossing structure of a building wall according to a third embodiment.
[FIG. 6] FIG. 6 is a cross-sectional diagram of a modification of the crossing structure of the building wall according to the third embodiment.
[FIG. 7] FIG. 7 is a cross-sectional diagram of another example (Comparative Example 2) of a conventional crossing structure of a building wall.
[FIG. 8] FIG. 8 is a cross-sectional diagram of another example (Comparative Example 3) of a conventional crossing structure of a building wall.

DETAILED DESCRIPTION OF THE INVENTION

[0017] Below, a crossing structure of a building wall according to each embodiment is described with reference to the attached drawings. In the present specification and the drawings, components that are substantially the same are denoted by the same reference numerals, and redundant description thereof is omitted in some cases.

[Crossing Structure of Building Wall According to First Embodiment]

[0018] First, examples of a crossing structure of a building wall according to a first embodiment are described with reference to FIG. 2 and FIG. 3. Here, FIG. 2 is a cross-sectional diagram of an example of the crossing structure of the

building wall according to the first embodiment, whereas FIG. 3 is a cross-sectional diagram of another example of the crossing structure of the building wall according to the first embodiment.

[0019] Although the crossing structure of the building wall illustrated in FIG. 2 is a partition wall including on each wall thereof a multi-layer structure having two layers one being an overlay and the other being an underlay, each wall thereof may be a multi-layer structure having of three or more face members on both sides, or each wall may be a form having one (one layer) face member attached to both sides.

[0020] A crossing structure of a building wall 100 illustrated in FIG. 2 is applied to a steel-framed building, an RC (Reinforced Concrete) building, a wooden building, or the like in addition to typical detached houses and multiple dwelling complexes, such as condominiums.

[0021] The crossing structure 100 is a crossing structure having a crossing 70 in which the first wall 30 and the second wall 60 intersect in a T-shape in a plan view.

[0022] Both the first wall 30 and the second wall 60 have a lower runner (or floor runner) and an upper runner (or ceiling runner) that extend in a lateral direction (horizontal direction), and upper and lower ends of studs 20A, 20B, 50A, and 50B that extend in a longitudinal direction (vertical direction) that are attached to the upper and lower runners. Both the upper runner and the lower runner are formed of a lightweight steel frame member such as grooved steel, and the upper runner is attached to the upper floor structure (not illustrated) with the opening facing downward, and the lower runner is attached to the lower floor structure (not illustrated) with the opening facing upward.

[0023] The studs 20A, 20B, 50A, and 50B are formed of grooved steel with lips that are lightweight steel frame members, but may be formed of grooved steel or a square steel pipe. A plurality of anti-sway parts (not illustrated) extending in the horizontal direction may be provided at a predetermined pitch (e.g., 1,200 mm pitch) in the height direction of the studs 20A, 20B, 50A, and 50B.

[0024] The upper runner, the lower runner, and the studs 20A, 20B, 50A, and 50B are, for example, lightweight steel frame members having a thickness of 0.4 mm or more, and steel runners and steel studs specified in JIS A 6517 ("building steel furrings"), or their equivalent, compliant, or compatible products, may be applied. In the first wall 30 and the second wall 60, the plurality of studs 20A, 20B, 50A, and 50B are built between the lower runner and the upper runner at intervals of 606 mm or less (for example, intervals of 606 mm, 455 mm) in the horizontal longitudinal direction of the wall. The studs 20A, 20B, 50A, and 50B illustrated in the drawings can be made of Type 65 (65 mm $\times$ 45 mm $\times$ 0.8 mm), type 75 (75 mm $\times$ 45 mm $\times$ 0.8 mm), or the like, and may be made of Type 50 (50 mm $\times$ 45 mm $\times$ 0.8 mm), Type 90 (90 mm $\times$ 45 mm $\times$ 0.8 mm), or type 100 (100 mm $\times$ 45 mm $\times$ 0.8 mm).

[0025] The first wall 30 has a staggered arrangement in which the plurality of first A studs 20A and the plurality of first B studs 20B that are arranged at intervals with respect to the horizontal longitudinal direction are alternately offset with respect to each other in the direction perpendicular to the horizontal longitudinal direction, the first face member 10A is attached to respective singe faces of the plurality of the first A studs 20A, and the second face member 10B is attached to respective single faces of the plurality of first B studs 20B. The first face member 10A is a multi-layer structure of an underlay 11A formed by a plurality of underlay face members and an overlay 12A formed by a plurality of overlay face members. In one of these, the face members are arranged horizontally. In the other one of these, the face members are arranged vertically. Likewise, the second face member 10B is a multi-layer structure of an underlay 11B formed by a plurality of underlay face members and an overlay 12B formed by a plurality of overlay face members. In one of these, the face members are arranged horizontally. In the other one of these, the face members are arranged vertically. The underlays 11A and 11B are respectively fastened to the studs 20A and 20B by the fasteners 25 such as screws, and the overlays 12A and 12B are fastened to the underlays 11A and 11B by an adhesive, staples, or the like.

[0026] Inside the first wall 30 is a hollow area 15, and sound insulation and heat insulation are ensured by the hollow area 15. In order to further enhance sound insulation performance, the hollow area 15 may be filled with a soundproofing material (including sound-absorbing and soundproofing materials) such as glass wool or rock wool.

[0027] The second wall 60 has a staggered arrangement in which the plurality of second A studs 50A and the plurality of second B studs 50B that are arranged at intervals with respect to the horizontal longitudinal direction are alternately offset with respect to each other in the direction perpendicular to the horizontal longitudinal direction, the third face member 40A is attached to respective single faces of the plurality of second A studs 50A, and the fourth face member 40B is attached to respective single faces of the plurality of second B studs 50B. The third face member 40A is a multi-layer structure of the underlay 41A formed by a plurality of underlay face members and the overlay 42A formed by a plurality of overlay face member. In one of these, the face members are arranged horizontally. In the other one of these, the face members are arranged vertically. Likewise, the fourth face member 40B is a multi-layer structure of the underlay 41B formed by a plurality of underlay face members and the overlay 42B formed by a plurality of overlay face members. In one of these, the face members are arranged horizontally. In the other one of these, the face members are arranged vertically. The underlays 41A and 41B are respectively attached to the studs 50A and 50B by the fasteners 25 such as screws, and the overlays 42A and 42B are attached to the underlays 41A and 41B by an adhesive, staples, or the like.

[0028] Inside the second wall 60 is a hollow area 45, and sound insulation and heat insulation are ensured by the hollow area 45. In order to further enhance sound insulation performance, the hollow area 45 may be filled with a soundproofing

material such as glass wool or rock wool.

[0029] A crossing structure 100 is formed at the crossing 70 in which the first wall 30 and the second wall 60 intersect with each other in a T-shape in a plan view, and the first corner 71 and the second corner 72 at the two inset corners of the crossing 70 face the two rooms R1 and R2, respectively. In the crossing 70 of the crossing structure 100, a wide slit 56 extending in the longitudinal direction (vertical direction) is provided in order to prevent sound from propagating through the underlay 41A of the third face member 40A included in the second wall 60.

[0030] As the underlay face member forming the underlays 11A, 11B, 41A, and 41B, a gypsum plate, a gypsum board, a calcium silicate board, a particle board, a hard board, plywood, structural plywood, and the like can be used, and among them, the gypsum plate and the gypsum board can be suitably used.

[0031] In contrast to this, as the overlay face member forming the overlays 12A, 12B, 42A, and 42B, a gypsum plate, a gypsum board, calcium silicate board, and the like can be used, and among them, the gypsum board and gypsum board can be suitably used.

[0032] In addition to a general gypsum board, the gypsum board includes a reinforced gypsum board, an ordinary hard gypsum board, a sheathing hard gypsum board, a moisture absorptive and desorptive reinforced gypsum board, a moisture absorptive and desorptive ordinary gypsum board, a moisture absorptive and desorptive sheathing hard gypsum board, a gypsum plate with a glass fiber nonwoven fabric, a glass mat gypsum board, and the like.

[0033] For example, in a case where the gypsum board is adopted, the dimensions of the short side, the long side, and the thickness thereof are 910 mm $\times$ 1,820 mm $\times$ 9.5 mm for quasi-non-combustible material or are 910 mm $\times$ 1,820 mm (2,420 mm or 2,730 mm) $\times$ 12.5 mm (15 mm, 21 mm or 25 mm) for non-combustible material or the like. The width of the gypsum board may be 606 mm, 1,000 mm, 1,220 mm, or the like, instead of 910 mm.

[0034] The first wall 30 is a partition wall serves as a partition between rooms R1 and R2. In contrast to this, the second wall 60 may be an additional partition wall that forms the rooms R1 and R2 together with the first wall 30, or may be an outer wall.

[0035] In this way, the sound insulation performance of the partition wall 30 can be improved by having a configuration in which no face member is attached to both sides of the first A stud 20A and the first B stud 20B included in the first wall 30, and by having the underlay 41A of the third face member 40A included in the second wall 60 have a slit 56 in the longitudinal direction at the crossing 70.

[0036] Further, unlike the crossing structure 90 illustrated in FIG. 1, at the second corner 72 where the second face member 10B is not supported by the first B stud 20B, a flat-shaped reinforcement plate 80 (an example of a reinforcement plate) straddles both the inner face of the second face member 10B and a second A stud 50A forming the second wall 60, and is fixed to both the second face member 10B and the second A stud 50A by a fastener 28 such as a screw, in order to prevent formation of a structurally weak part W at the second corner 72.

[0037] For the flat-shaped reinforcement plate 80 a single, elongated form is used and the flat-shaped reinforcement plate 80 has a vertical length corresponding to that of the second face member 10B and the second A stud 50A, is applied in a single, elongated form. The flat-shaped reinforcement plate 80 is fixed with a plurality of fasteners 28 at predetermined intervals in the vertical direction to both the second face member 10B and the second A stud 50A. Alternatively, multiple relatively short sheets may be used as the flat-shaped reinforcement plate 80, and in this case, the multiple flat-shaped reinforcement plates 80 are intermittently arranged and fixed to both the second face member 10B and the second A stud 50A.

[0038] Further, as illustrated in the illustrated example, the fixing positions of the flat-shaped reinforcement plate 80 to the second face member 10B and the second A stud 50A by the fasteners 28 are preferably provided as close as possible to the second corner 72 side. This shortens the distance from the second corner 72, acting as a fulcrum, to each fastener 28, thereby reducing the pulling force caused by bending moments that may act on each fastener 28. From the standpoint of ensuring a good fastenability while being as close as possible to the second corner 72, the fastening positions using the fasteners 28 can be set at locations approximately 10 mm to 15 mm away from the second corner 72.

[0039] According to the crossing structure of the building wall 100, since the second corner 72 where the second face member 10B is not supported by the first B stud 20B is reinforced by the flat-shaped reinforcement plate 80, the crossing structure is excellent in both sound insulation and seismic resistance.

[0040] Although not illustrated, the flat-shaped reinforcement plate 80 may be fixed to both the second A stud 50A and the first B stud 20B by the fastener 28. Further, a stopper may be attached to upper and lower runners (not illustrated) so as to limit movement of the flat-shaped reinforcement plate 80. Further, the flat-shaped reinforcement plate 80 may be sandwiched between the upper and lower runners (not illustrated) and spacers provided on the upper and lower runners. Further, by bringing the end face of the underlay face member 11B into contact with the second A stud 50A without interposing the underlay face member 41A therebetween, the fastening position of the fastener 28 for fastening the flat-shaped reinforcement plate 80 to the underlay face member 11B may be set closer to the second A stud 50A.

[0041] In contrast, a crossing structure of a building wall 100A illustrated in FIG. 3 differs from the crossing structure 100 in the following points. That is, in the first wall 30, the first A studs 20A and the first B studs 20B are both on the wall centerline L1, and the first face member 10A and the second face member 10B are alternately attached via bedding plates

21. In the second wall 60, the second A studs 50A and the second B studs 50B are both arranged on the wall centerline L2, and the third face member 40A and the fourth face member 40B are alternately attached via bedding plates 51.

[0042] In the crossing structure 100A, the second corner 72, at which the second face member 10B is not supported by the first B stud 20B, is reinforced by the flat-shaped reinforcement plate 80, so that the crossing structure is excellent in both sound insulation and seismic resistance.

[Crossing Structure of Building Wall According to Second Embodiment]

[0043] Next, an example of a crossing structure of a building wall according to a second embodiment is described with reference to FIG. 4. Here, FIG. 4 is a cross-sectional diagram of another example of the crossing structure of the building wall according to the second embodiment.

[0044] The crossing structure of the building wall 100B illustrated in FIG. 4 is different from the crossing structure 100 in that an L-shaped reinforcement plate 85 (another example of the reinforcement plate) is used instead of the flat-shaped reinforcement plate 80. The L-shaped reinforcement plate 85 may be used with the structure of the crossing structure 100A provided with the bedding plates 21 and 51.

[0045] The L-shaped reinforcement plate 85 is fixed by, for example, attaching part of the L-shaped reinforcement plate 85 to one face of the second A stud 50A in advance by a double-sided tape, a screw, or the like, sandwiching this part between the one face of the second A stud 50A and the third face member 40A, pressing the other part of the L-shaped reinforcement plate 85 against the inner face of the second face member 10B, and then attaching both parts to the second A stud 50A and the second face member 10B by the fasteners 28 such as screws.

[0046] For the L-shaped reinforcement plate 85 a single, elongated form is used and the flat-shaped reinforcement plate 80 has a vertical length corresponding to that of the second face member 10B and the second A stud 50A. The L-shaped reinforcement plate 85 is fixed with a plurality of fasteners 28 at predetermined intervals in the vertical direction to both the second face member 10B and the second A stud 50A. Alternatively, multiple relatively short sheets may be used as the flat-shaped reinforcement plate 80, and in this case, the multiple L-shaped reinforcement plates 85 are intermittently arranged and fixed to both the second face member 10B and the second A stud 50A.

[0047] Further, as illustrated in the illustrated example, the fixing positions of the L-shaped reinforcement plate 85 to the second face member 10B and the second A stud 50A by the fasteners 28 are preferably provided as close as possible to the second corner 72 side. This shortens the distance from the second corner 72, acting as a fulcrum, to each fastener 28, thereby reducing the pulling force caused by bending moments that may act on each fastener 28. From the standpoint of ensuring a good fastenability while being as close as possible to the second corner 72, the fastening positions using the fasteners 28 can be set at locations approximately 10 mm to 15 mm away from the second corner 72.

[0048] Also in the crossing structure of the building wall 100B, since the second corner 72 where the second face member 10B is not supported by the first B stud 20B is reinforced by the L-shaped reinforcement plate 85, the crossing structure is excellent in both sound insulation and seismic resistance.

[0049] Although not illustrated, the L-shaped reinforcement plate 85 may be fixed to both the second A stud 50A and the first B stud 20B by the fastener 28. Also, stoppers may be attached to upper and lower runners (not illustrated) so as to limit movement of the L-shaped reinforcement plate 85. The flat-shaped reinforcement plate 80 may be sandwiched between upper and lower runners (not illustrated) and spacers provided on the upper and lower runners. Further, by bringing the end face of the underlay face member 11B into contact with the second A stud 50A without interposing the underlay face member 41A therebetween, the fastening position of the fastener 28 for fastening the L-shaped reinforcement plate 85 to the underlay face member 11B may be set closer to the second A stud 50A.

[Crossing Structure of Building Wall According to Third Embodiment]

[0050] Next, examples of a crossing structure of a building wall according to a third embodiment are described with reference to FIGS. 5 and 6. Here, FIG. 5, is a cross-sectional diagram of another example of the crossing structure of the building wall according to the third embodiment, whereas FIG. 6 is a cross-sectional diagram of a modification of the crossing structure of the building wall according to the third embodiment.

[0051] A crossing structure of a building wall 100C illustrated in FIG. 5 is a crossing structure having a crossing 70A in which the first wall 30 and the second wall 60 intersect in a cross-shape in a plan view. The cross-shape of the crossing 70A has four corners including a third corner 73 and a fourth corner 74 in addition to the first corner 71 and the second corner 72. The crossing 70A is provided with four wide slits 56 that extend in the longitudinal direction (vertical direction).

[0052] The first wall 30 and the second wall 60 are both partition walls, and the crossing structure is centered on the crossing 70A. Around the crossing structure 100C, four rooms R1, R2, R3, and R4 are provided by the first wall 30 and the second wall 60.

[0053] In the crossing structure 100C, the first A stud 20A to which the first face member 10A is attached is disposed at the first corner 71, and the second A stud 50A to which the third face member 40A is attached is disposed. Therefore, a

structurally weak part is formed in the third face member 40A in the first corner 71.

[0054] In contrast to this, at the second corner 72, first B stud 20B to which second face member 10B is attached is not disposed, and second A stud 50A to which third face member 40A is attached is disposed. Consequently, a structurally weak part is formed in second face member 10B in second corner 72.

[0055] In contrast to this, in third corner 73, second B stud 50B to which fourth face member 40B is attached is arranged, and first A stud 20A to which first face member 10A is attached is not arranged. Consequently, a structural weakness is formed in first face member 10A in third corner 73.

[0056] Further, in fourth corner 74, first B stud 20B to which second face member 10B is attached is arranged, and second B stud 50B to which fourth face member 40B is attached is not arranged. Consequently, a structurally weak part is formed in fourth face member 40B in fourth corner 74.

[0057] Therefore, in order to prevent a structurally weak part from being formed in crossing 70A, the L-shaped reinforcement plate 85 is applied to first corner 71 to fourth corner 74, respectively, and the L-shaped reinforcement plate 85 is fixed to the corresponding stud and inner face of the face member by the fasteners 28 such as screws.

[0058] According to the crossing structure of the building wall 100C, even in the form provided with the cross-shaped crossing 70A in a plan view, the L-shaped reinforcement plate 85 reinforces the points at the four corners 71 to 74 where the studs do not support the face members, resulting in a crossing structure excellent in both sound insulation and seismic resistance.

[0059] In contrast to this, a crossing structure of a building wall 100D illustrated in FIG. 6 is a form in which the flat-shaped reinforcement plate 80 is applied in the same manner as in the crossing structures 100 and 100A, in place of the L-shaped reinforcement plate 85, in the crossing structure provided with the cross-shaped crossing 70A in a plan view.

[0060] In the case where the crossing structure of the building wall 100D, also in the form provided with the cross-shaped crossing 70A in a plan view, the flat-shaped reinforcement plate 80 reinforces the points at 4 corners 71 to 74 where the studs do not support the face members, resulting in a crossing structure excellent in both sound insulation and seismic resistance.

[A Study on Performance of Crossing Structure of Building Wall]

[0061] Next, the performance of the crossing structures of building walls (Examples) according to the embodiments are described in comparison with the conventional crossing structures of building walls (Comparative Examples). Here, the crossing structure 90 illustrated in FIG. 1 that is a conventional crossing structure is Comparative Example 1, and as the other Comparative Examples, the crossing structure 90A illustrated in FIG. 7 is Comparative Example 2, and a crossing structure 90B illustrated in FIG. 8 is Comparative Example 3. In contrast to these, the crossing structure 100 illustrated in FIG. 2 is Example 1, the crossing structure 100A illustrated in FIG. 3 is Example 2, and the crossing structure 100B illustrated in FIG. 4 is Example 3.

[0062] In the crossing structure 90A of Comparative Example 2 illustrated in FIG. 7, the first face member 10A and the second face member 10B are fixed to both sides of a common stud 20C in the crossing 70. Therefore, in the crossing structure 90A, a structurally weak part is not formed in the crossing 70. On the other hand, although longitudinal slit 55 exists, the stud 20C can cause a sound bridge to form between the rooms R1 and R2.

[0063] In contrast to this, in the crossing structure 90B of Comparative Example 3 illustrated in FIG. 8, the first face member 10A and the second face member 10B are fixed to both sides of the common stud 20C in the crossing 70. Further, the longitudinal slit 55 does not exist, and the third face member 40A and the fourth face member 40B are also fixed to a common stud 50C. Therefore, in the crossing structure 90B, a structurally weak part is not formed in crossing 70. However, the stud 20C and the underlay face member 41A can cause a sound bridge to form between the rooms R1 and R2.

[0064] In Comparative Example 3 is a conventional and commonly-known structure of a T-shaped crossing, and Comparative Example 2 is an improved structure capable of reducing sound bridging as compared to Comparative Example 3, and Comparative Example 1 is an improved structure capable of reducing sound bridging even more as compared to comparative example 2.

[0065] Sound insulation performance and seismic resistance performance for aforementioned Examples 1 to 3 and Comparative Examples 1 to 3 are indicated in Table 1 below. In Table 1, it is to be noted that "o" means good, "△" means not good but satisfactory, and "×" means not satisfactory, in terms of sound insulation performance. Further, in terms of seismic resistance performance "o", means the performance is high, whereas "×" means the performance is low.

[Table 1]

	Sound Insulation Performance	Seismic Resistance Performance (Strength at Corners of Crossing)
Example 1	○	○
Example 2	○	○

(continued)

	Sound Insulation Performance	Seismic Resistance Performance (Strength at Corners of Crossing)
Example 3	○	○
Comparative Example 1	○	×
Comparative Example 2	Δ	○
Comparative Example 3	×	○

[0066] As described above, sound insulation performance improves in the order of Comparative Example 3, Comparative Example 2, and Comparative Example 1. While sound insulation performance is good in Comparative Example 1, seismic resistance performance is low because of the structurally weak part in the crossing 70.

[0067] In contrast to Comparative Examples 1 to 3, Examples 1 to 3 provide a crossing structure excellent in both sound insulation performance and seismic resistance performance.

[0068] Note that other embodiments, such as those in which other elements are combined with the above configurations, may be used, and the present disclosure is not limited to the configurations illustrated here. The configurations of the present disclosure may be changed without departing from the purpose of the present disclosure, and the configurations can be appropriately determined according to the application form.

[0069] This international application is based upon and claims priority based on Japanese Patent Application No. 2022-138307 filed on August 31, 2022, the entire contents of which are incorporated herein by reference.

EXPLANATION OF REFERENCE NUMERALS

[0070]

10A: First face member
10B: Second face member
11A: Underlay face member
12A: Overlay face member
11B: Underlay face member
12B: Overlay face member
15: Hollow area
20A: First A stud (stud)
20B: First B stud (stud)
21: Bedding plates
25: Fastener (screw)
28: Fastener (screw)
30: First wall
40A: Third face member
40B: Fourth face member
41A: Underlay face member
42A: Overlay face member
41B: Underlay face member
42B: Overlay face member
45: Hollow area
50A: Second A stud (stud)
50B: Second B stud (stud)
56: Slit
60: Second wall
70,70A: Crossing
71: First corner (corner)
72: Second corner (corner)
73: Third corner (corner)
74: Fourth corner (corner)
80: Flat-shaped reinforcement plate (reinforcement plate)
85: L-shaped reinforcement plate (reinforcement plate)

100, 100A, 100B, 100C, 100D: Crossing structure of building wall
L1, L2: Wall centerline

Claims

1. A crossing structure of a building wall, comprising a crossing in which a first wall and a second wall intersect in a T-shape in a plan view, wherein

   the first wall is formed by being equipped with a plurality of first A studs and a plurality of first B studs alternately arranged at intervals in a horizontal longitudinal direction of the first wall, and by attaching a first face member to respective single faces of the first A studs and a second face member to respective single faces of the first B studs,
   the second wall is formed by being equipped with a plurality of second A studs and a plurality of second B studs alternately arranged at intervals in a horizontal longitudinal direction of the second wall, and by attaching a third face member to respective single faces of the second A studs and a fourth face member to respective single faces of the second B studs,
   at a first corner of two corners of the crossing, the first A stud to which the first face member is attached is disposed, and the second A stud to which the third face member is attached is disposed,
   at a second corner of the two corners of the crossing, the first B stud to which the second face member is attached is not disposed, and the second A stud to which the third face member is attached is disposed, and
   at the second corner, a reinforcement plate straddles both an inner face of the second face member and the second A stud, and is fixed to both the second face member and the second A stud.

2. A crossing structure of a building wall, comprising a crossing in which a first wall and a second wall intersect in a cross-shape in a plan view, wherein,

   the first wall is formed by being equipped with a plurality of first A studs and a plurality of first B studs alternately arranged at intervals in a horizontal longitudinal direction of the first wall, and by attaching a first face member to respective single faces of the first A studs and a second face member to respective single faces of the first B studs,
   the second wall is formed by being equipped with a plurality of second A studs and a plurality of second B studs alternately arranged at intervals in a horizontal longitudinal direction of the second wall, and by attaching a third face member to respective single faces of the second A studs and a fourth face member to respective single faces of the second B studs,
   at a first corner among four corners of the crossing, the first A stud to which the first face member is attached is disposed, and the second A stud to which the third face member is attached is not disposed,
   at a second corner among the four corners of the crossing, the first B stud to which the second face member is attached is not disposed, and the second A stud to which the third face member is attached is disposed,
   at a third corner among the four corners of the crossing, the second B stud to which the fourth face member is attached is disposed, and the first A stud to which the first face member is attached is not disposed,
   at a fourth corner among the four corners of the crossing, the first B stud to which the second face member is attached is disposed, and the second B stud to which the fourth face member is attached is not disposed, and
   at the first corner, a reinforcement plate straddles both an inner face of the third face member and the first A stud, and the reinforcement plate is fixed to both the third face member and the first A stud,
   at the second corner, a reinforcement plate straddles both an inner face of the second face member and the second A stud, and is fixed to both the second face member and the second A stud,
   at the third corner, a reinforcement plate straddles both an inner face of the first face member and the second B stud, and is fixed to both the first face member and the second B stud, and
   at the fourth corner, a reinforcement plate straddles both an inner face of the fourth face member and the first B stud, and is fixed to both the fourth face member and the first B stud.

3. The crossing structure of a building wall according to claim 1 or 2, wherein the reinforcement plate is a flat-shaped reinforcement plate.

4. The crossing structure of a building wall according to claim 1 or 2, wherein the reinforcement plate is an L-shaped reinforcement plate.

5. The crossing structure of a building wall according to claim 1, claim 3 depending from claim 1, or claim 4 depending from claim 1, wherein the first wall is a partition wall and the second wall is either a partition wall or an outer wall.

6. The crossing structure of a building wall according to claim 2 or claim 4 depending from claim 2, wherein both the first wall and the second wall are partition walls.

7. The crossing structure of a building wall according to claim 5, wherein both the first face member and the second face member of the first wall forming the partition wall are multi-layer structures of two or more layers of face members.

8. The crossing structure of a building wall according to claim 6, wherein both the first face member and the second face member of the first wall forming the partition wall are multi-layer structures of two or more layers of face members and both the third face member and the fourth face member of the second wall are multi-layer structures of two or more layers of face members.

9. The crossing structure of a building wall according to claim 5 or 7, wherein a soundproofing material is provided between the first face member and the second face member.

10. The crossing structure of a building wall according to claim 6 or 8, wherein a soundproofing material is provided between the first face member and the second face member and between the third face member and the fourth face member.

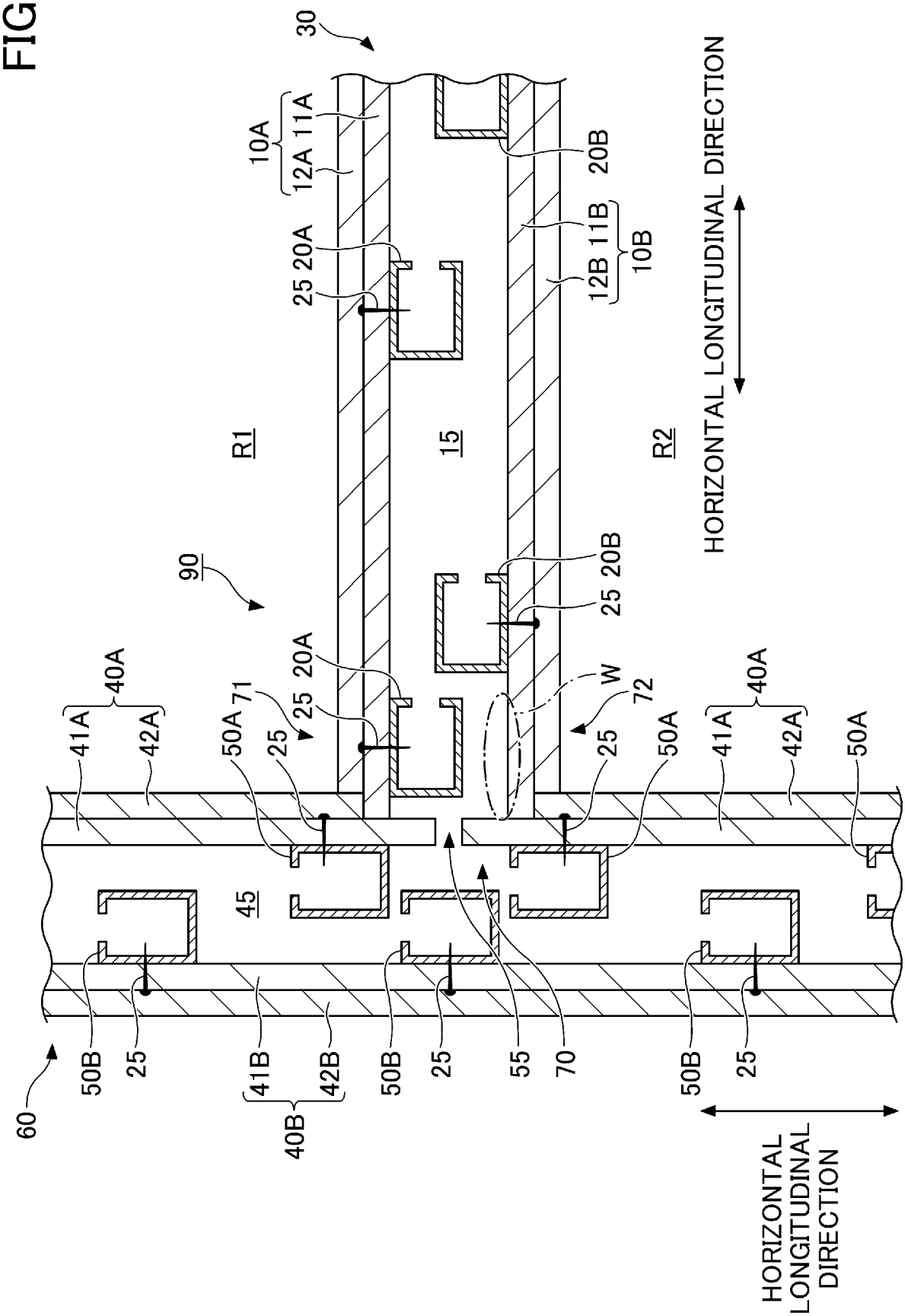
11. The crossing structure of a building wall according to any one of claims 1 to 10, wherein,

in the first wall, any first A stud of the first A studs and any first B stud of the first B studs that are adjacent to each other are alternately offset with respect to each other in a direction perpendicular to the horizontal longitudinal direction of the first wall, and
in the second wall, any second A stud of the first A studs and any second B stud of the second B studs that are adjacent to each other are alternately offset with respect to each other in a direction perpendicular to the horizontal longitudinal direction of the second wall.

12. The crossing structure of a building wall according to any one of claims 1 to 10, wherein

in the first wall, all of the first A studs and the first B studs are arranged on centerline positions of the first wall, and the first face member and the second face member are attached to each of the first A studs and the first B studs via bedding plates, and
in the second wall, all of the second A studs and the second B studs are arranged on centerline positions of the second wall, and the third face member and the fourth face member are attached to each of the second A studs and the second B studs via bedding plates.

FIG.1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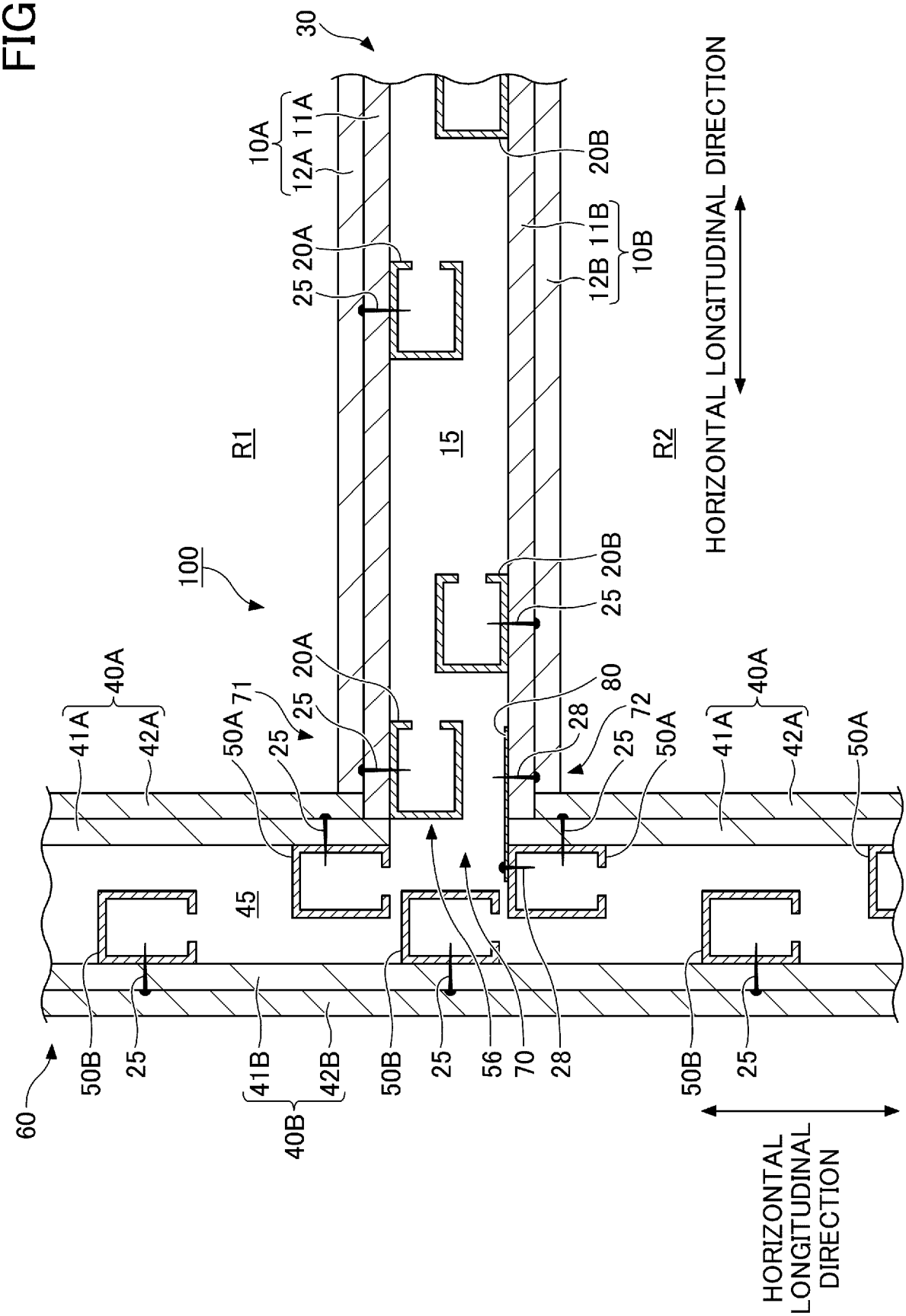
10A
12A 11A
20B
12B 11B
10B
25 20A
HORIZONTAL LONGITUDINAL DIRECTION
R1
15
R2
90
25 20B
25 20A
W
72
40A
41A
42A
50A
71
25
45
60
50B
41B
42B
40B
55
70
HORIZONTAL LONGITUDINAL DIRECTION

FIG.2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11B
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20A
HORIZONTAL LONGITUDINAL DIRECTION
R1
15
R2
100
40A
41A
42A
50A
71
80
72
28
45
60
50B
41B
42B
40B
56
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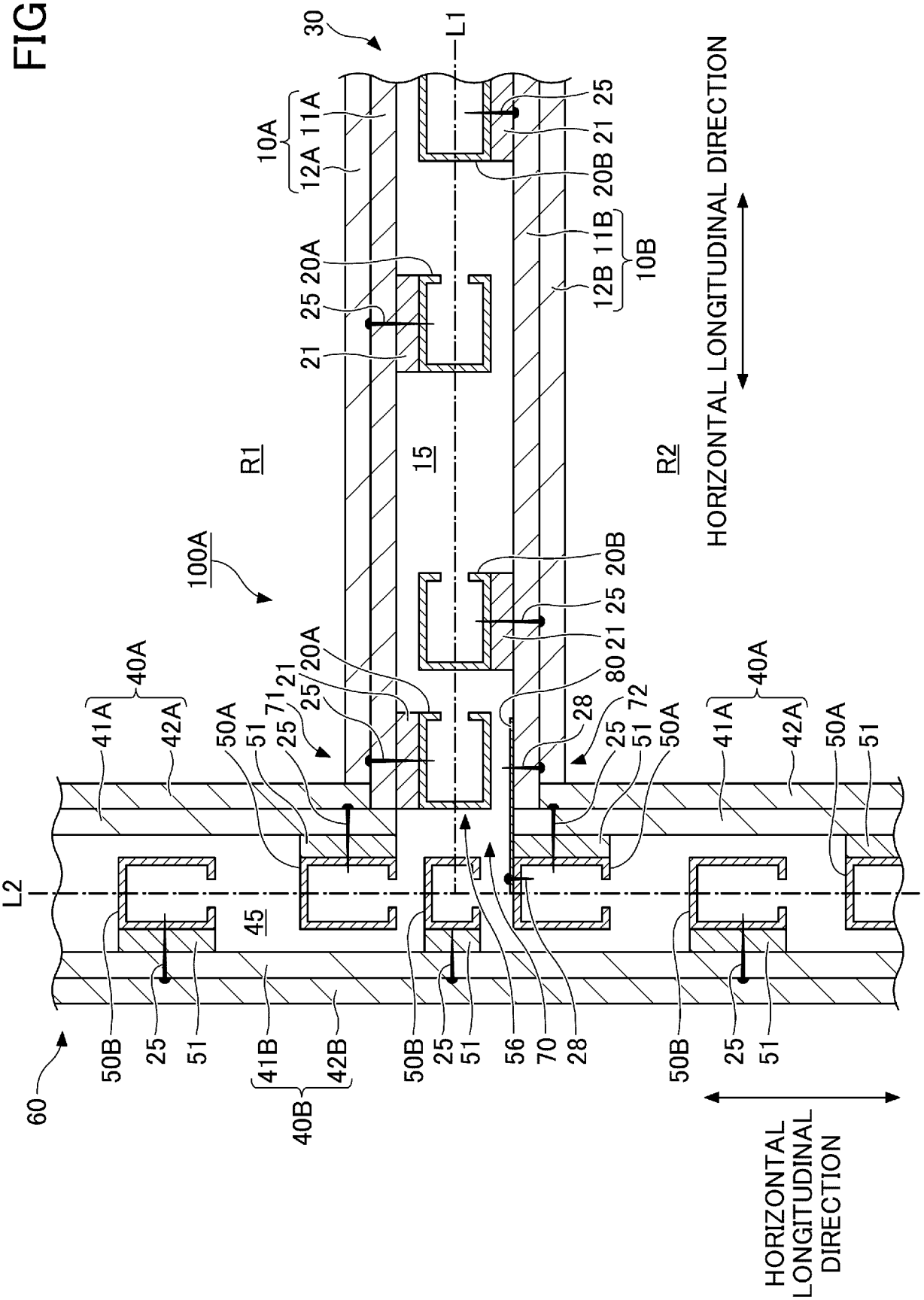
HORIZONTAL LONGITUDINAL DIRECTION

FIG.3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L1
10A
11A
12A
25
21
20B
12B
11B
10B
20A
25
21
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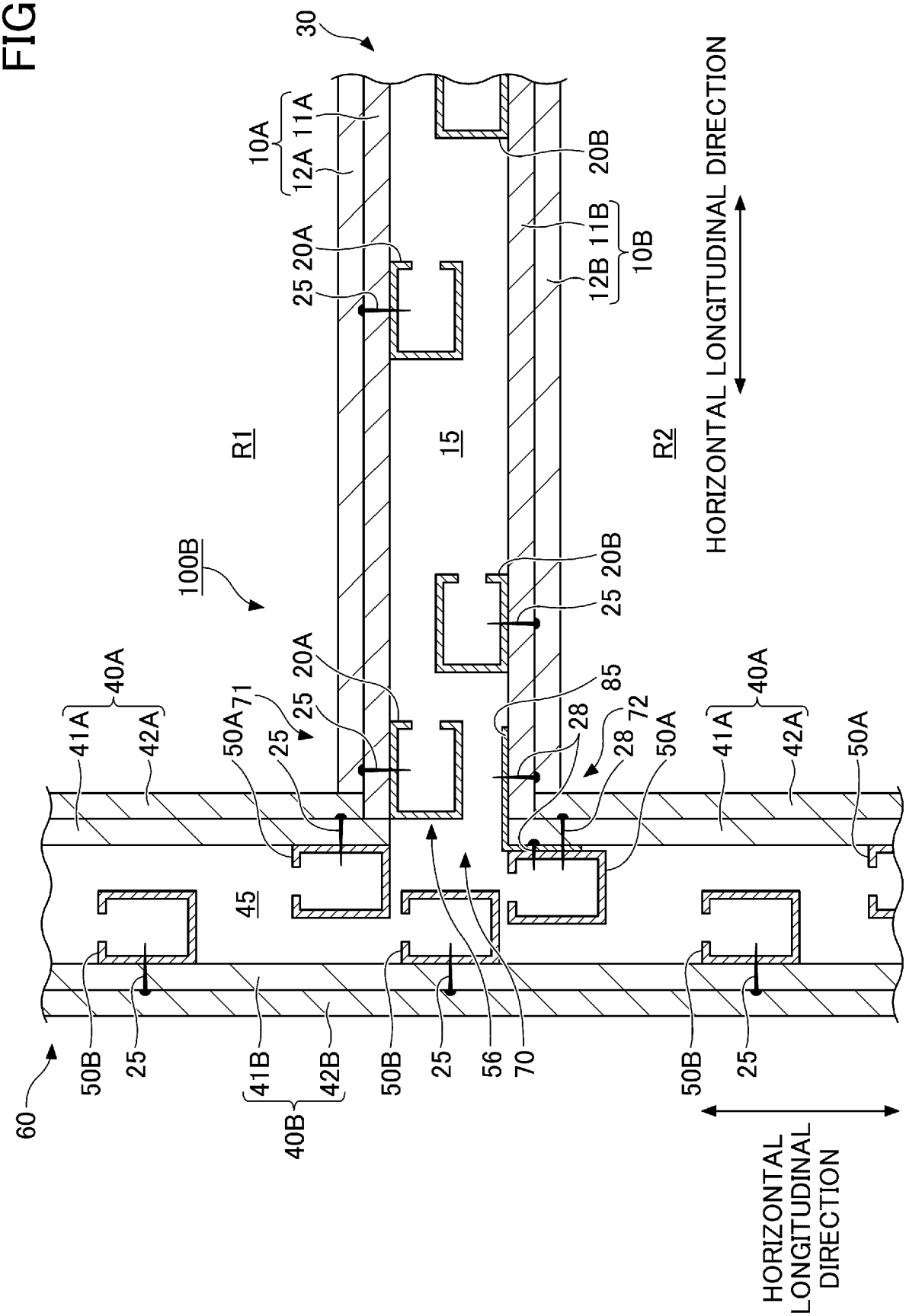
R1
15
R2
100A
20B
25
21
80
20A
21
25
71
28
72
40A
41A
42A
50A
51
25
51
50A
40A
41A
42A
50A
51
L2
45
60
50B
25
51
41B
42B
40B
50B
25
51
56
70
28
50B
25
51
HORIZONTAL LONGITUDINAL DIRECTION

FIG.4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20A
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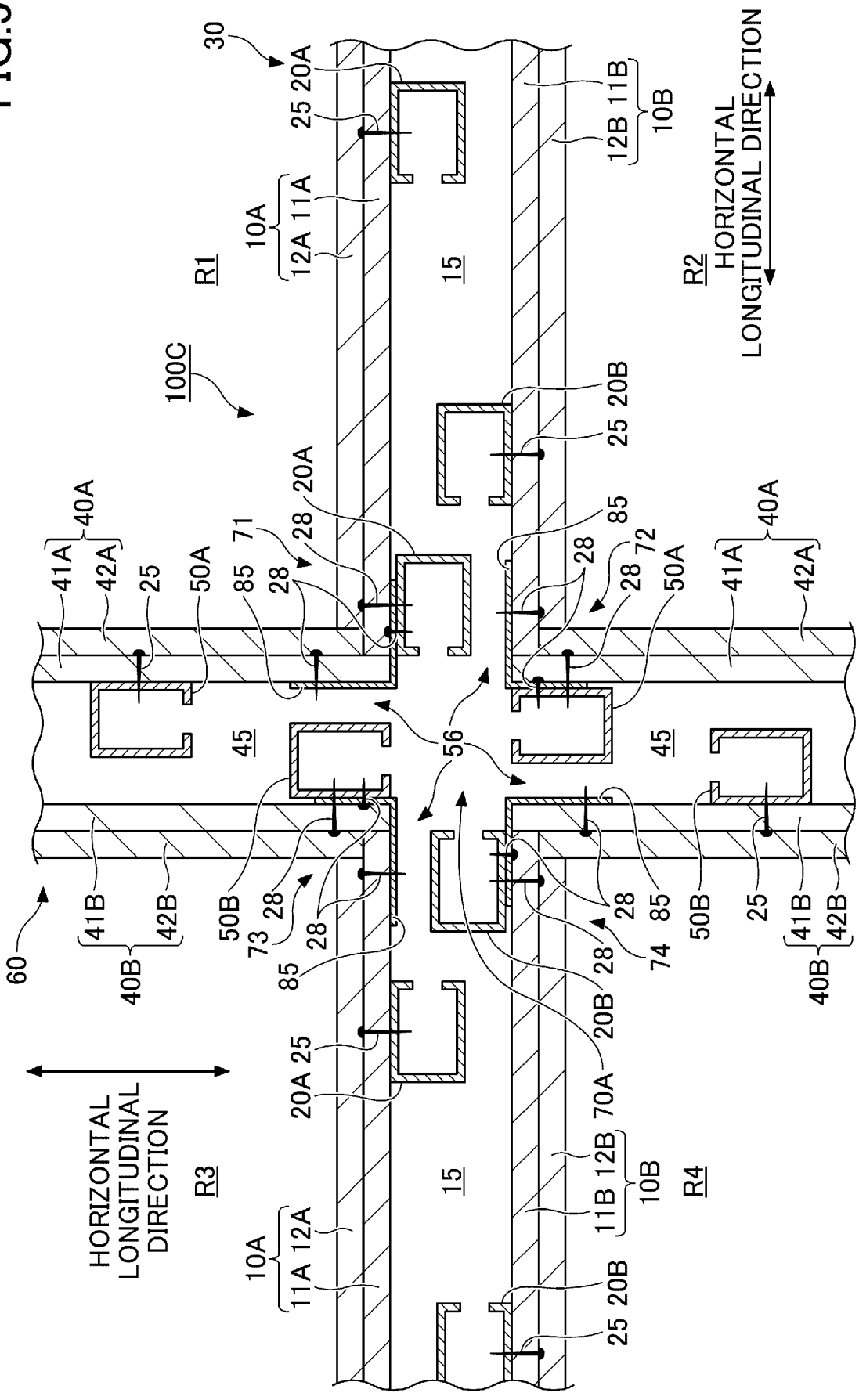
HORIZONTAL LONGITUDINAL DIRECTION
R1
15
R2
100B
40A
41A
42A
50A
71
85
72
28
45
60
50B
41B
42B
40B
56
70
HORIZONTAL LONGITUDINAL DIRECTION

FIG.5


30
100C
R1
R2
R3
R4
HORIZONTAL LONGITUDINAL DIRECTION
HORIZONTAL LONGITUDINAL DIRECTION
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11A
12A
10B
11B
12B
15
20A
20B
25
28
40A
40B
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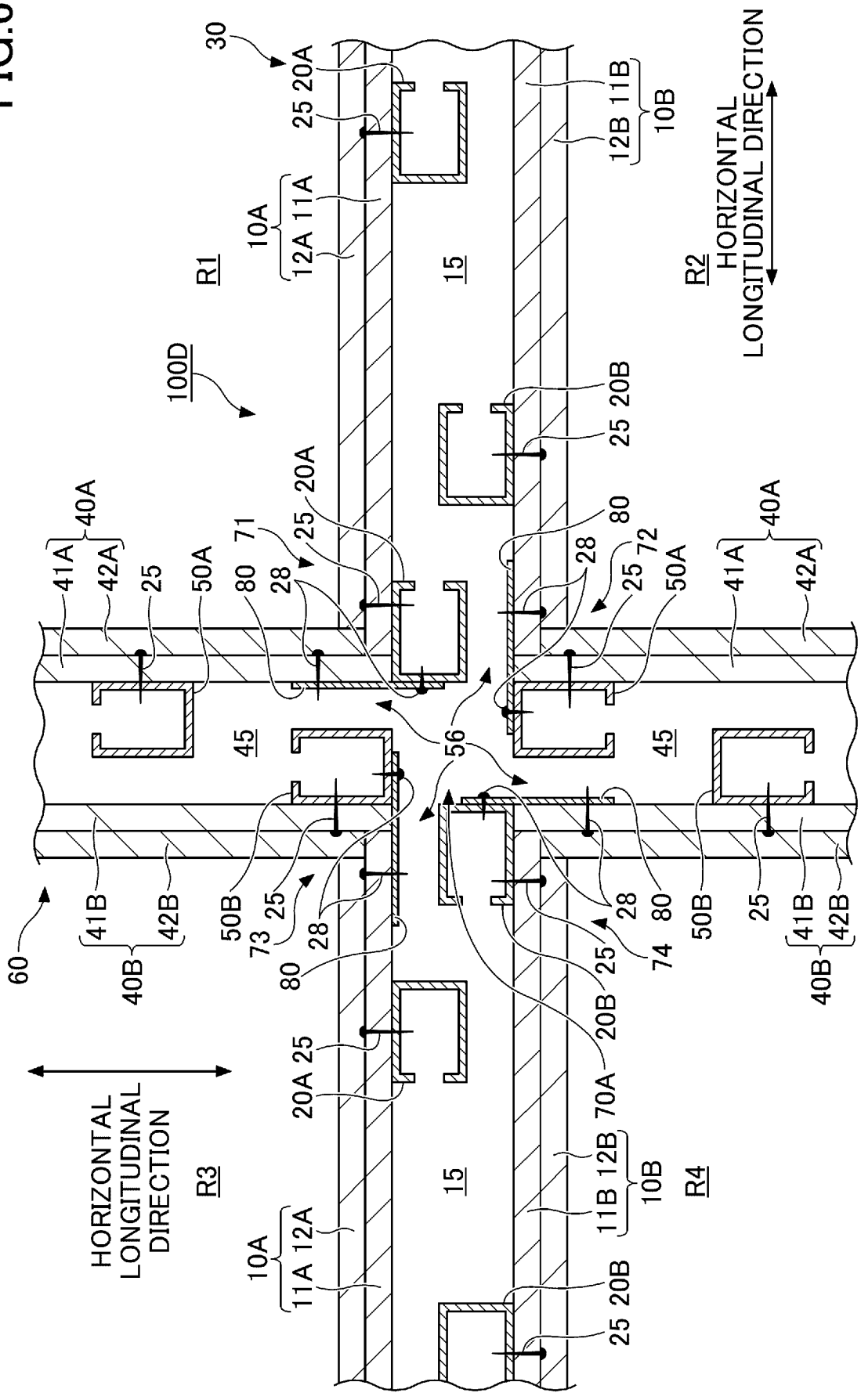
56
60
70A
71
72
73
74
85

FIG.6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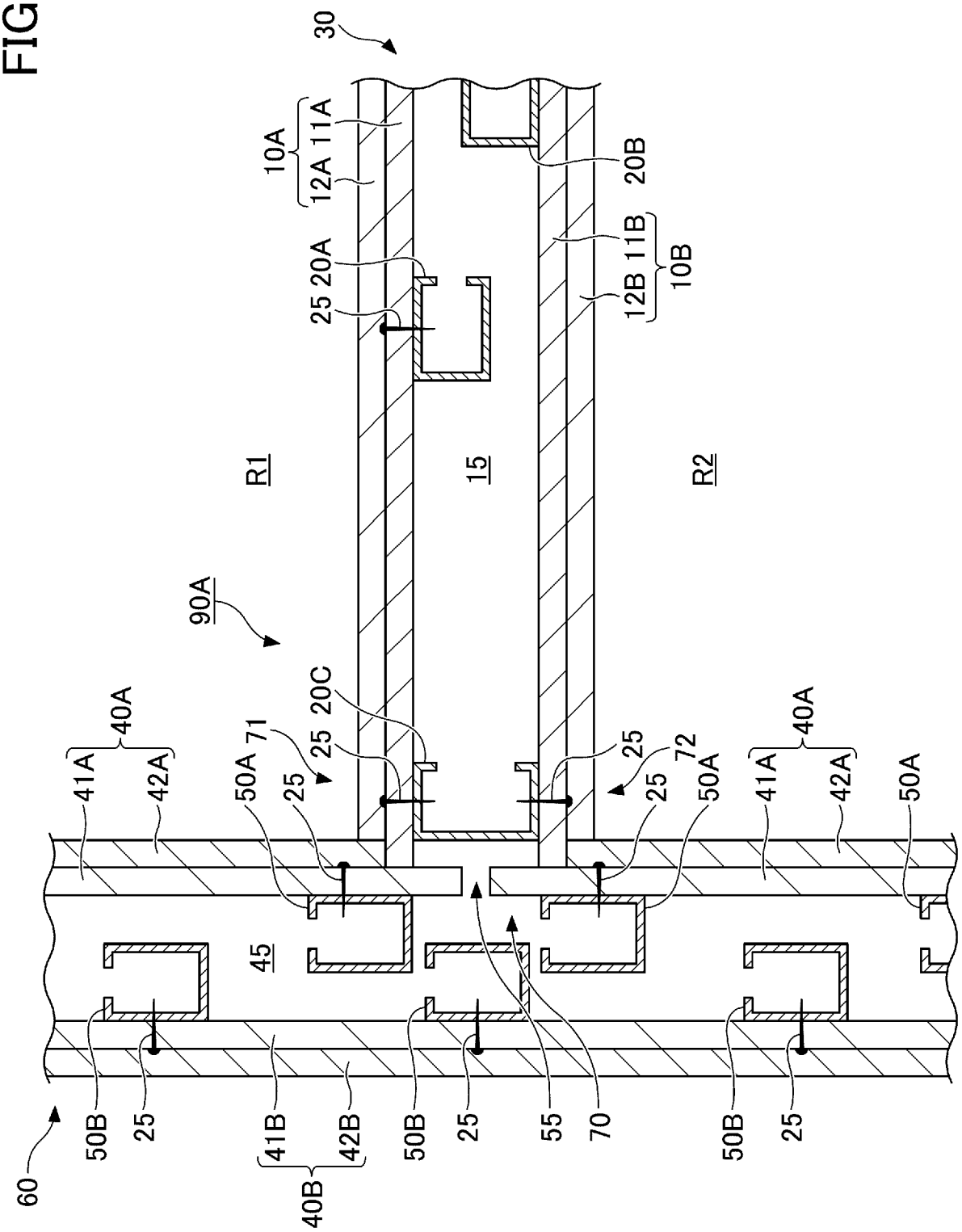
12B 11B
10B
10A
12A 11A
R1
15
R2
HORIZONTAL
LONGITUDINAL DIRECTION
100D
25 20B
40A
41A
42A
25
50A
80
71
28
72
56
45
60
41B
42B
40B
50B
73
74
70A
HORIZONTAL
LONGITUDINAL
DIRECTION
R3
R4
11B 12B
11A 12A

FIG.7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10A
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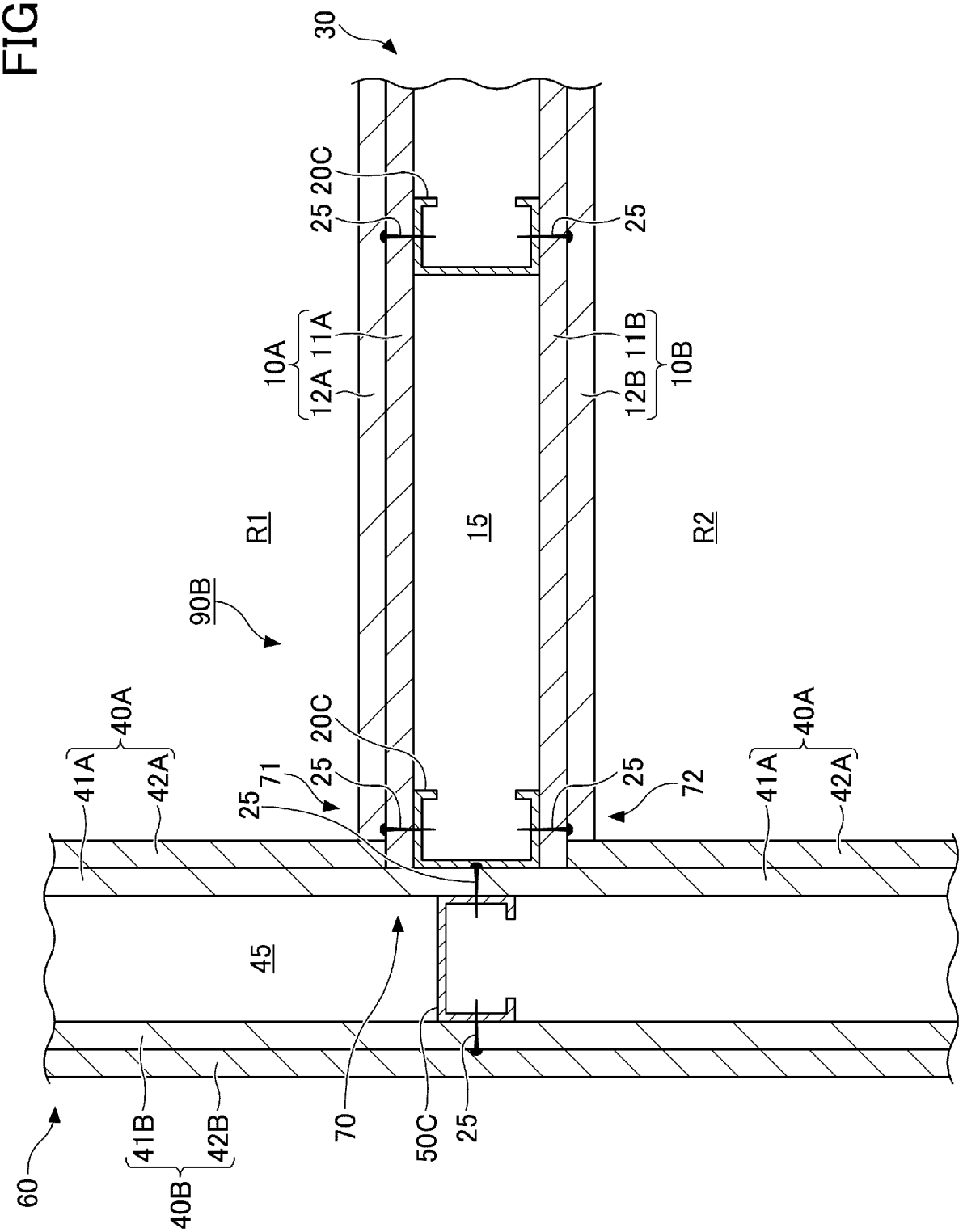
12A
20B
25
20A
11B
12B
10B
R1
15
R2
90A
40A
41A
42A
50A
71
25
20C
72
45
50B
41B
42B
40B
55
70
60

FIG.8


30
25 20C
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10A
12A 11A
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25 20C
25
72
25
40A
41A
42A
45
60
41B
42B
40B
70
50C
25

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2023/016807

A. CLASSIFICATION OF SUBJECT MATTER

E04B 2/74(2006.01)i; ***E04B 2/76***(2006.01)i
FI: E04B2/76; E04B2/74 501J; E04B2/74 511A

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)

E04B2/74; E04B2/76

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.
A	JP 2012-017644 A (YOSHINO GYPSUM CO LTD) 26 January 2012 (2012-01-26) entire text, all drawings	1-12
A	WO 2019/172040 A1 (YOSHINO GYPSUM CO LTD) 12 September 2019 (2019-09-12) entire text, all drawings	1-12
A	JP 2002-348984 A (DAIWA HOUSE IND CO LTD) 04 December 2002 (2002-12-04) entire text, all drawings	1-12
A	JP 2021-017712 A (ITOKI CORP) 15 February 2021 (2021-02-15) entire text, all drawings	1-12
A	JP 2000-144980 A (OKUMURA CORP) 26 May 2000 (2000-05-26) entire text, all drawings	1-12
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 035097/1986 (Laid-open No. 146807/1987) (SEKISUI HOUSE KK) 17 September 1987 (1987-09-17), entire text, all drawings	1-12

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

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 July 2023	**25 July 2023**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2023/016807

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2012-017644 A	26 January 2012	(Family: none)	
WO 2019/172040 A1	12 September 2019	US 2021/0040735 A1 entire text, all drawings EP 3763893 A1 CA 3093103 A SG 11202008445V A TW 201938888 A	
JP 2002-348984 A	04 December 2002	(Family: none)	
JP 2021-017712 A	15 February 2021	(Family: none)	
JP 2000-144980 A	26 May 2000	(Family: none)	
JP 62-146807 U1	17 September 1987	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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- JP H547123 U **[0004]**
- JP 2022138307 A **[0069]**