

Specification

[Title of the invention]Joining Device

[Technical Field]

[0001] The present invention relates to a joining device for a pillar-like body and a lateral beam body.

[Background Art]

[0002] There are disclosed technologies regarding a method of constructing various spaces for convenience when many people use the spaces in an office or the like. For example, there is disclosed a technology capable of easily designing a new space structure by flexibly keeping up with the appearance of a new information device, updating of the information device, and the like (see Patent document 1). According to the technology, in a lateral beam body and a pillar-like body constituting a space structure, the lateral beam body and the pillar-like body are fixed to each other with a screw or the like from an inner side of a coupling portion in which the lateral beam body and the pillar-like body are coupled together. Further, the following technology is also disclosed. Specifically, a groove extending in an axial direction is provided in an inside of the space structure, and coupling means capable of moving to an arbitrary position in the groove and of performing fixation at the arbitrary position is provided.

Further, there is disclosed a technology regarding a structure provided in order to simplify assembly and disassembly operations for the lateral beam body and the pillar-like body (see Patent document 2). According to the technology, a projecting or recessed locking portion is attached onto a bonding surface of the lateral beam body or the pillar-like body, and the projecting or recessed locking portion is inserted to a joint main body including a locked portion connectable to the projecting or recessed locking portion. With this configuration, it is possible to easily change a position of the lateral beam body or the pillar-like body according to a design change resulting from addition of a member, shape change, etc.

[0003]

[Patent document 1] Japanese Patent Application Laid-open No. 2007-132474

[Patent document 2] Japanese Patent Application Laid-open No. 2005-155731

[Patent document 3] Japanese Patent Application Laid-open No. 2002-223873

[Patent document 4] Japanese Patent Application Laid-open No. 2004-183248

[Patent document 5] Japanese Utility Model Application Laid-open No. Hei 6-54890

[Patent document 6] Japanese Patent No. 2797076

[Patent document 7] Japanese Patent No. 2952567

[Patent document 8] Japanese Patent No. 2998000

[Disclosure of the Invention]

[Problems to be solved by the invention]

[0004] Under a recent circumstance in which the information device is updated relatively frequently, the position of the lateral beam body or the pillar-like body constituting the space structure in an office or the like must be adjusted depending on changes in dimension and shape resulting from the appearance of the new information device or the like.

[0005] In a conventional joining device for joining the lateral beam body and the pillar-like body to each other, a position at which the lateral beam body and the pillar-like body are fixed to each other is situated on an inner side of the joining device, which contributes to a difficulty in terms of construction. Further, in particular, in a case where the pillar-like body is attached/detached under a state in which the lateral beam body is attached to a hanging ceiling, etc., the difficulty becomes more significant. Accordingly, the positions of the lateral beam body and the pillar-like body must be determined in advance, which is inconvenient when the design change is conducted to adjust the position of the lateral beam body or the pillar-like body.

[0006] The present invention has been made in view of the problems described above, and therefore it is an object of the present invention to improve efficiency of construction during adjustment of a space structure in a joining device for joining a lateral beam body and a pillar-like body to each other.

[Means for solving the Problems]

[0007] In order to achieve the object described above, according to the present invention, the joining device is divided into a beam-side coupling member to connect the lateral beam body and a pillar-side coupling member to connect the pillar-like body. The joining device has a configuration in which the beam-side coupling member and the pillar-side coupling member are fixed to each other with a fixing member from outer sides of the beam-side coupling member and the pillar-side coupling member. With this configuration, the present invention can provide the joining device capable of improving efficiency of construction in adjusting the space structure including the lateral beam body and the pillar-like body.

[0008] Specifically, according to the present invention, there is provided a joining device for joining a pillar-like body extending upward from a floor and one or a plurality of lateral beam bodies extending horizontally with respect to the floor to each other. The joining device includes: a beam-side coupling member to connect the one or plurality of lateral beam bodies; and a pillar-side coupling member allowed to be attached

to/detached from the beam-side coupling member, to connect the pillar-like body. The beam-side coupling member includes a first connection portion to connect the one or plurality of lateral beam bodies and the beam-side coupling member to each other, and a second connection portion to connect the beam-side coupling member and the pillar-side coupling member to each other from outer sides of the beam-side coupling member and the pillar-side coupling member with a first fixing member which fixes the beam-side coupling member and the pillar-side coupling member to each other. The pillar-side coupling member includes a third connection portion to connect the second connection portion of the beam-side coupling member and the pillar-side coupling member to each other, and a fourth connection portion to connect the pillar-like body and the pillar-side coupling member to each other.

[0009] According to the present invention, the joining device has a configuration obtained by connection between the beam-side coupling member to connect the one or plurality of lateral beam bodies and the pillar-side coupling member to connect the pillar-like body. The configuration is appropriately adjusted according to a design of the space structure. Further, an entire shape of the joining device is applicable to a variety of shapes.

[0010] Here, the beam-side coupling member constituting the joining device of the present invention includes the first connection portion and the second connection portion. The first connection portion connects the one or plurality of lateral beam bodies and the beam-side coupling member to each other. The second connection portion connects the pillar-side coupling member to the beam-side coupling member. Further, the pillar-side coupling member constituting the joining device of the present invention includes the third connection portion to connect the second connection portion of the beam-side coupling member and the fourth connection portion to connect the pillar-like body. The beam-side coupling member and the pillar-side coupling member have a configuration in which the second connection portion of the beam-side coupling member and the third connection portion of the pillar-side coupling member are fixed to each other with the first fixing member from the outer sides of the beam-side coupling member and the pillar-side coupling member. Therefore, according to the present invention, fixation is performed from the outer side of the beam-side coupling member, and thus a range where an operator can move his/her hands becomes larger, which is useful, in particular, when the one or plurality of lateral beam bodies are attached to a hanging ceiling, etc. Thus, it is possible to easily attach/detach the beam-side coupling member and the pillar-side coupling member to/from each other. As a result, it is possible to arbitrarily perform adjusting the position(s) of the one or

plurality of lateral beam bodies or the pillar-like body.

[0011] Here, according to the present invention, the second connection portion and the third connection portion may form a fitting structure which restricts horizontal movement with respect to the floor, and the first fixing member may fix the beam-side coupling member and the pillar-side coupling member to each other in a fitting state.

[0012] For example, the second connection portion of the beam-side coupling member and the third connection portion of the pillar-side coupling member form the fitting structure, and hence joining portions between the beam-side coupling member and the pillar-side coupling member are fitted to each other in a vertical direction with respect to the floor. According to the present invention, with the fitting structure, when the beam-side coupling member and the pillar-side coupling member are joined to each other, the horizontal movement with respect to the floor is restricted. In addition, the beam-side coupling member and the pillar-side coupling member are fixed to each other in the fitting state with use of the first fixing member, and hence the joining portions between the beam-side coupling member and the pillar-side coupling member contribute to provide a joining device resistant to vibration.

[0013] Here, according to the present invention, the one or plurality of lateral beam bodies and the beam-side coupling member may be fixed to each other with a second fixing member. The second fixing member may serve as a fixing member which fixes the first connection portion and the one or plurality of lateral beam bodies to each other, and include a shaft portion and a head portion having a diameter larger than a diameter of the shaft portion. The first connection portion may include a through hole into which the second fixing member is inserted, and the through hole may include a lower through hole and an upper through hole. The lower through hole may have a size large enough to allow the head portion of the second fixing member to pass through the lower through hole, and at least the shaft portion of the second fixing member may be inserted into the lower through hole. The upper through hole may be continuous with an upper side of the lower through hole, and may have a size large enough to allow the shaft portion of the second fixing member to pass through the upper through hole and small enough to keep the head portion of the second fixing member from passing through the upper through hole. The shaft portion of the second fixing member is slid into the upper through hole from the lower through hole so that the head portion of the second fixing member comes into contact with the upper through hole, to thereby perform fixation.

[0014] Specifically, the second fixing member according to the present invention fixes the one or plurality of lateral beam bodies and the first connection portion of the beam-side

coupling member to each other, and includes the head portion and the shaft portion.

[0015] Further, the through hole according to the present invention is provided in the first connection portion of the beam-side coupling member, and includes the lower through hole and the upper through hole. The lower through hole has the size large enough to allow the head portion of the second fixing member to pass therethrough. Further, the upper through hole is structured to have the size large enough to allow the shaft portion of the second fixing member to pass therethrough and small enough to keep the head portion of the second fixing member from passing therethrough. With this configuration, when the second fixing member is inserted into the lower through hole, it is possible to insert the second fixing member from any one of the head portion side and the shaft portion side.

[0016] Further, as described above, the through hole includes the lower through hole having the size large enough to allow the head portion of the second fixing member to pass therethrough, and the upper through hole having the size large enough to allow the shaft portion of the second fixing member to pass therethrough and small enough to keep the head portion of the second fixing member from passing therethrough. Further, the upper through hole is continuous with the upper side of the lower through hole, and hence the lower through hole and the upper through hole are continuous with each other. This configuration is suitable when the beam-side coupling member is joined to the one or plurality of lateral beam bodies that have already fixed. An operator inserts the shaft portion of the second fixing member or the head portion of the second fixing member into the lower through hole, and lowers the beam-side coupling member in an underfloor direction. As a result, the shaft portion of the second fixing member is slid into the upper through hole from the lower through hole, and hence it is possible to easily perform an operation of fixing the second fixing member.

[0017] As described above, with this structure, the present invention provides a joining device which has sufficient strength in coupling the beam-side coupling member and the one or plurality of lateral beam bodies to each other, and is capable of improving an operability in attaching the beam-side coupling member to the one or plurality of lateral beam bodies.

[0018] Further, according to the present invention, the first connection portion may include, in an underfloor direction of the upper through hole, a protrusion which restricts movement of the head portion of the second fixing member moving in the underfloor direction.

[0019] Specifically, the protrusion according to the present invention is provided in the underfloor direction of the upper through hole formed in the first connection portion of the beam-side coupling member. When the pillar-like body

is coupled to the one or plurality of lateral beam bodies, the pillar-side coupling member to which the pillar-like body is coupled is fixed to the second connection portion of the beam-side coupling member. However, a force is applied vertically toward the beam-side coupling member onto a surface of the beam-side coupling member that comes into contact with the pillar-side coupling member. Therefore, there is a risk in that the second fixing member fixed in the upper through hole is lowered toward the lower through hole so that the one or plurality of lateral beam bodies are detached. In order to prevent such a risk, it is possible to structure the following joining device. Specifically, the joining device includes the beam-side coupling member excellent in connection of the pillar-like body extending upward from the floor because the protrusion which restricts the movement of the head portion of the second fixing fixed in the upper through hole is provided in the underfloor direction of the upper through hole.

[0020] As described above, with this structure, the present invention provides the joining device which has sufficient strength in coupling the pillar-like body and the one or plurality of lateral beam bodies to each other.

[Effects of the invention]

[0021] According to the present invention, it is possible to improve efficiency of construction during adjustment of a space structure in a joining device for joining a lateral beam body and a pillar-like body to each other.

[Brief Description of the Drawings]

[0022]

[FIG.1] FIG.1 is a view illustrating a state in which lateral beam bodies, a beam-side coupling member, a pillar-like body, and a pillar-side coupling member according to an example of the present invention are coupled together.

[FIG.2] FIG.2 is a perspective view of the beam-side coupling member according to the example of the present invention as viewed from above.

[FIG.3] FIG.3 is a perspective view of the beam-side coupling member according to the example of the present invention as viewed from below.

[FIG.4] FIG.4 is a plan view of the beam-side coupling member according to the example of the present invention.

[FIG.5] FIG.5 is a side view of the beam-side coupling member according to the example of the present invention.

[FIG.6] FIG.6 is a sectional view of the beam-side coupling member according to the example of the present invention, which is taken along the line A-A of FIG. 4.

[FIG.7] FIG.7 is a perspective view of the pillar-side coupling member according to the example of the present invention as viewed from above.

[FIG.8] FIG.8 is a perspective view of the pillar-side coupling

member according to the example of the present invention as viewed from below.

[FIG.9] FIG.9 is a plan view of the pillar-side coupling member according to the example of the present invention.

[FIG.10] FIG.10 is a side view of the pillar-side coupling member according to the example of the present invention.

[FIG.11] FIG.11 is a perspective view of a coupling device according to the example of the present invention.

[FIG.12] FIG.12 is a sectional view of the coupling device according to the example of the present invention in a state in which one of the lateral beam bodies and the pillar-like body are coupled together.

[Best mode of Carrying out the Invention]

[0023] Hereinafter, a joining device according to an embodiment of the present invention is described with reference to the drawings.

[0024] An example of the present invention is described. FIG. 1 is a view illustrating a state in which four lateral beam bodies 2 and one pillar-like body 3 are connected together. As illustrated in FIG. 1, a joining device 1 according to this embodiment mainly includes a beam-side coupling member 4 to connect one or a plurality of lateral beam bodies 2, and a pillar-side coupling member 5 to connect the pillar-like body 3. Joining of the lateral beam bodies 2 and the pillar-like body 3 is performed through the beam-side coupling member 4 and the pillar-side coupling member 5. Further, the joining device 1 may be used for a space structure in which the lateral beam bodies 2 are installed, with use of a hanging fitting, to a hanging bolt fixed onto a ceiling, etc.

[0025] The beam-side coupling member 4 constituting the joining device 1 according to the example of the present invention is described. FIG. 2 is a perspective view of the beam-side coupling member 4 as viewed from above. FIG. 3 is a perspective view of the beam-side coupling member 4 as viewed from below. FIG. 4 is a plan view of the beam-side coupling member 4. FIG. 5 is a side view of the beam-side coupling member 4. FIG. 6 is a sectional view of the beam-side coupling member 4 taken along the line A-A of FIG. 4.

[0026] Specifically, as illustrated in FIG. 2 and FIG. 3, the beam-side coupling member 4 has substantially square side surfaces, and a horizontal side of each of the side surfaces with respect to a floor is recessed in an axial direction. As illustrated in FIG. 4, the beam-side coupling member 4 has a cross-shaped structure when viewed from above. A first connection portion 6 is provided to each of the side surfaces of the beam-side coupling member 4. As illustrated in FIG. 5 and FIG. 6, the first connection portion 6 includes a cutout portion in a lower portion thereof, and includes a through hole 12 formed near a center thereof. The through hole 12 is divided

into a lower through hole 17 and an upper through hole 16. The lower through hole 17 has a size allowing a head portion of a second fixing member 20 to pass therethrough. The upper through hole 16 has a size allowing a shaft portion of the second fixing member 20 to pass therethrough and keeping the head portion of the second fixing member 20 from passing therethrough. Further, as illustrated in FIG. 6, two protrusions 18 are provided at an edge of the lower through hole 17 of the through hole 12 on an inner side of the beam-side coupling member 4. In addition, as illustrated in FIG. 3, the beam-side coupling member 4 includes a second connection portion 7 in a bottom surface of the beam-side coupling member 4. The second connection portion 7 includes four screw holes 10 formed therein. Further, the second connection portion 7 includes a cross-shaped hole opened toward the four screw holes 10 from the axial direction, and thus a recess 22 is formed. Note that, the screw holes 10 and the recess 22 are out of contact with each other. Further, the second fixing member 20 has a shape with the shaft portion and the head portion having a diameter larger than that of the shaft portion. For example, a screw is used as the second fixing member 20.

[0027] Next, the pillar-side coupling member 5 constituting the joining device 1 according to the example of the present invention is described. FIG. 7 is a perspective view of the pillar-side coupling member 5 as viewed from above. FIG. 8 is a perspective view of the pillar-side coupling member 5 as viewed from below. FIG. 9 is a plan view of the pillar-side coupling member 5. FIG. 10 is a side view of the pillar-side coupling member 5.

[0028] Specifically, the pillar-side coupling member 5 includes a fourth connection portion 9 on a bottom surface thereof. As illustrated in FIG. 8 and FIG. 9, a screw hole 13 is formed in a center of the fourth connection portion 9. Further, the pillar-side coupling member 5 includes a third connection portion 8 on an upper surface thereof. As illustrated in FIG. 9, four screw holes 11 are formed in the third connection portion 8. The screw holes 11 are formed at positions corresponding to the screw holes 10 formed in the beam-side coupling member 4. Further, the third connection portion 8 includes four protrusions 23 at positions directed in the axial direction with respect to the screw holes 11. Note that, the screw holes 11 and the protrusions 23 are out of contact with each other.

[0029] Next, FIG. 11 is a view in which the beam-side coupling member 4 and the pillar-side coupling member 5 are joined together. The second connection portion 7 situated on the bottom surface of the beam-side coupling member 4 and the third connection portion 8 situated on the upper surface of the pillar-side coupling member 5 are fitted to each other. Further, FIG. 12 is a sectional view illustrating a state in which one of the lateral beam bodies 2 and the one pillar-like body 3 are

coupled to each other.

[0030] Specifically, as illustrated in FIG. 12, the beam-side coupling member 4 includes, on the bottom surface of the beam-side coupling member 4, the second connection portion 7 to connect the third connection portion 8 of the pillar-side coupling member 5. The second connection portion 7 includes the screw holes 10 for coupling the pillar-side coupling member 5. When being placed on the third connection portion 8 provided on the upper surface of the pillar-side coupling member 5, the screw holes 10 are situated at positions corresponding to the screw holes 11 that are provided in the third connection portion 8, to connect the beam-side coupling member 4. The screw holes 10 and the screw holes 11 aligned with each other are fixed with first fixing members 19. The first fixing members 19 are directed upward with respect to the floor, are inserted from a side of the third connection portion 8 of the pillar-side coupling member 5, and are fixed from outer sides of the beam-side coupling member 4 and the pillar-side coupling member 5.

[0031] Further, the second connection portion 7 of the beam-side coupling member 4 to be connected to the pillar-side coupling member 5 forms a fitting structure together with the third connection portion 8 of the pillar-side coupling member 5 to be connected to the beam-side coupling member 4. The cutout portions formed in the lower portions of the first connection portions 6 of the beam-side coupling member 4 as illustrated in FIG. 2 and FIG. 3 are fitted to the third connection portion 8 of the pillar-side coupling member 5 as illustrated in FIG. 7. In addition, the recess 22 of the second connection portion 7 of the beam-side coupling member 4 as illustrated in FIG. 4 is fitted to the protrusions 23 provided on the third connection portion 8 of the pillar-side coupling member 5 as illustrated in FIG. 9.

[0032] Further, as illustrated in FIG. 1, in a case where the lateral beam bodies 2 are placed, with use of the hanging fitting, to the hanging bolt fixed onto the ceiling, etc. and the beam-side coupling member 4 is connected to the lateral beam bodies 2, a range where an operator can move his/her hands is narrow, and hence a difficulty in terms of efficiency of construction arises. When the beam-side coupling member 4 is connected to the lateral beam bodies 2 that have already been attached to a hanging ceiling, etc., as illustrated in FIG. 12, the second fixing member 20 is inserted into the lower through hole 17, and the beam-side coupling member 4 is lowered in an underfloor direction. As a result, the second fixing member 20 is slid into the upper through hole 16, and hence it is possible to easily perform an operation of fixing the second fixing member 20 into the upper through hole 16.

[0033] As illustrated in FIG. 6 and FIG. 12, the through hole 12 formed in each of the first connection portions 6 is

provided with two protrusions 18 at the edge of the lower through hole 17. When the pillar-like body 3 is connected to the lateral beam bodies 2 that have already been placed to the hanging ceiling, etc., the pillar-side coupling member 5 to which the pillar-like body 3 is connected is fixed to the second connection portion 7 situated on the bottom surface of the beam-side coupling member 4. With this configuration, a force is applied vertically toward the beam-side coupling member 4 onto a surface of the beam-side coupling member 4 that comes into contact with the pillar-side coupling member 5. There is a fear in that the second fixing member 20 fixed in the upper through hole 16 is lowered toward the lower through hole 17, and hence the protrusions 18 which restrict movement of the head portion of the second fixing member 20 are provided to the through hole 12.

[0034] Next, each lateral beam body 2 according to this example includes, in a center portion of an end surface of the lateral beam body 2, a screw hole 14 through which the lateral beam body 2 is fixed to the beam-side coupling member 4. When the lateral beam body 2 and the beam-side coupling member 4 are fixed to each other, the second fixing member 20 is partially inserted into the screw hole 14 of the lateral beam body 2 through which the lateral beam body 2 is fixed to the beam-side coupling member 4. The partially-inserted second fixing member 20 is inserted in such a manner that the head portion of the second fixing member 20 is inserted into the lower through hole 17 of the first connection portion 6 of the beam-side coupling member 4 from an outer side of the beam-side coupling member 4. The end surface of the lateral beam body 2 and the first connection portion 6 of the beam-side coupling member 4 are fitted to each other, and the second fixing member 20 is slid into the upper through hole 16. The second fixing member 20 is inserted from an inner side of the beam-side coupling member 4 until the head portion of the second fixing member 20 comes into contact with the upper through hole 16 of the beam-side coupling member 4, to thereby fix the lateral beam body 2 and the beam-side coupling member 4 to each other.

[0035] Another method of inserting the second fixing member 20 into the beam-side coupling member 4 is performed as follows. The second fixing member 20 is inserted in such a manner that the shaft portion of the second fixing member 20 is inserted into the lower through hole 17 of the opposite first connection portion 6 facing the first connection portion 6 connected to one of the lateral beam bodies 2 and then the head portion of the second fixing member 20 is caused to pass through the lower through hole 17. After being inserted into the lower through hole 17 of the first connection portion 6 connected to the one of the lateral beam bodies 2, the shaft portion of the second fixing member 20 is connected to the one of the lateral beam bodies 2, and is slid into the upper through hole 16. The second

fixing member 20 is inserted until the head portion of the second fixing member 20 comes into contact with the upper through hole 16, and then the one of the lateral beam bodies 2 and the beam-side coupling member 4 are fixed to each other.

[0036] Further, the pillar-like body 3 according to this example includes, in a center portion of an end surface of the pillar-like body 3, a screw hole 15 through which the pillar-like body 3 is coupled to the pillar-side coupling member 5. When the pillar-like body 3 and the pillar-side coupling member 5 are coupled to each other, a third fixing member 21 is inserted into the screw hole 13 of the fourth connection portion 9 from an inner side of the pillar-side coupling member 5, and fixes the pillar-side coupling member 5 to the pillar-like body 3.

[0037] As described above, according to this example, the beam-side coupling member 4 and the pillar-side coupling member 5 are fixed to each other with the first fixing members 19 from the outer sides thereof, and thus it is possible to attach/detach the beam-side coupling member 4 and the pillar-side coupling member 5 to/from each other. Accordingly, it is possible to easily perform adjusting the space structure constituted by the lateral beam bodies 2 and the pillar-like body 3. In addition, the beam-side coupling member 4 and the pillar-side coupling member 5 are connected to each other with a fitting structure, and hence a structure resistant to horizontal vibration with respect to the floor is obtained. Further, according to this example, the second fixing member 20 is inserted into the lower through hole 17 of the beam-side coupling member 4 and is slid into the upper through hole 16, and thus the second fixing member 20 is fixed. Therefore, it is possible to improve an operability when the beam-side coupling member 4 is attached to each of the lateral beam bodies 2. Moreover, the protrusions 18 which restricts movement of the head portion of the second fixing member 20 fixed in the upper through hole 16 are provided in the underfloor direction of the upper through hole 16, and hence it is possible to structure the joining device 1 including the beam-side coupling member 4 excellent in connection of the pillar-like body 3 extending upward with respect to the floor.

Claims

[1] A joining device for joining a pillar-like body extending upward from a floor and one or a plurality of lateral beam bodies extending horizontally with respect to the floor to each other, the joining device comprising:

- a beam-side coupling member to connect the one or plurality of lateral beam bodies; and

- a pillar-side coupling member allowed to be attached to/detached from the beam-side coupling member, to connect the pillar-like body,

 - the beam-side coupling member comprises

 - a first connection portion to connect the one or plurality of lateral beam bodies and the beam-side coupling member to each other, and

 - a second connection portion to connect the beam-side coupling member and the pillar-side coupling member to each other from outer sides of the beam-side coupling member and the pillar-side coupling member with a first fixing member which fixes the beam-side coupling member and the pillar-side coupling member to each other; and

 - the pillar-side coupling member comprises

 - a third connection portion to connect the second connection portion of the beam-side coupling member and the pillar-side coupling member to each other, and

 - a fourth connection portion to connect the pillar-like body and the pillar-side coupling member to each other,

wherein the beam-side coupling member includes a cutout portion in a lower portion of the first connection, the third connection portion of the pillar-side coupling member is fitted to the cutout portion.

[2] The joining device according to claim 1, wherein:

- the second connection portion and the third connection portion form a fitting structure which restricts horizontal movement with respect to the floor; and

- the first fixing member fixes the beam-side coupling member and the pillar-side coupling member to each other in a fitting state.

[3] The joining device according to claim 1, wherein:

- the one or plurality of lateral beam bodies and the beam-side coupling member are fixed to each other with a second fixing member;

- the second fixing member serves as a fixing member which fixes the first connection portion and the one or plurality of lateral beam bodies to each other, and comprises a shaft portion and a head portion having a diameter larger than a diameter of the shaft portion;

- the first connection portion comprises a through hole into which the second fixing member is inserted;

 - the through hole comprises a lower through hole and an

upper through hole;

the lower through hole has a size large enough to allow the head portion of the second fixing member to pass through the lower through hole, and at least the shaft portion of the second fixing member is inserted into the lower through hole;

the upper through hole is continuous with an upper side of the lower through hole, and has a size large enough to allow the shaft portion of the second fixing member to pass through the upper through hole and small enough to keep the head portion of the second fixing member from passing through the upper through hole; and

the shaft portion of the second fixing member is slid into the upper through hole from the lower through hole so that the head portion of the second fixing member comes into contact with the upper through hole, to thereby perform fixation.

[4] The joining device according to claim 3, wherein the first connection portion comprises, in an underfloor direction of the upper through hole, a protrusion which restricts movement of the head portion of the second fixing member moving in the underfloor direction.