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(54) STEEL PLATE STRUCTURE AND STEEL PLATE CONCRETE WALL

STAHLPLATTENSTRUKTUR UND STAHLPLATTENBETONWAND

STRUCTURE DE PLAQUE EN ACIER ET PAROI EN BÉTON AVEC PLAQUE EN ACIER

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Description

[Technical Field]

[0001] The present invention relates to a steel plate structure and a steel plate concrete wall. More particularly, the present invention relates to a steel plate structure and a steel plate concrete wall that include a load-bearing structural member, in addition to the steel plate and concrete, so as to reduce the thickness of the steel plate structure and steel plate concrete wall.

[Background Art]

[0002] As current structures are becoming taller and larger, it is becoming more important to provide higher strength and improved workability. For reinforced concrete structures, steel frame structures, and steel framed reinforced concrete structures, etc., which have been in common use until now, a structure may be constructed by assembling mold forms and steel rods or steel frames, etc., and casting the concrete directly at the construction site, so that the construction times may be increased and the quality may be made less reliable. As an alternate to such structures, the steel plate concrete structure (hereinafter referred to as "SC structure") is receiving attention, which is made by filling concrete inside steel plates so that the steel plates restrict the concrete, and which provides desirable properties in terms of strength, load-bearing, strain characteristics, and workability, etc.

[0003] A prior art system is disclosed in the British patent application published as GB2258669A which discloses a concrete-filled steel bearing earthquake resistant wall comprises connecting members, a pair of steel surface plates which are parallel and secured by connecting members so that the space between these surface steel plates is filled with the wall unit concrete, and wall unit periphery binding steel reinforcements constructed from U-shaped steel bars arranged along the peripheral part of the wall unit concrete at predetermined intervals and embedded in said concrete. In addition, slippage preventing members (stud bolts) are arranged in a staggered arrangement on the aforementioned surface steel plates. The connecting members may be bar-shaped steel members attached to one end of connecting rods which are welded to one of the steel plates, the other surface steel plate being connected by plug welding to said bar-shaped steel members.

[0004] The SC structure is a system in which concrete is filled in between two steel plates, with studs and tie bars, etc., arranged such that the concrete and the steel materials move together, so that the steel materials and the concrete may move as an integrated body. In particular, the SC structure can be utilized in the construction of large structures such as nuclear power plants, etc., to reduce construction times by way of modularization. Figure 1 illustrates a steel plate structure according to prior art, before the concrete is cast. Hereinafter, the steel structure made of steel plates, etc., before casting concrete in a SC structure wall will be referred to as a "steel plate structure."

[0005] The SC structure wall constructed using a steel plate structure according to prior art may be formed by vertically arranging steel plates 102 at both surfaces of the wall that is to be formed, installing a number of studs 104 on the inner surfaces of the steel plates 102 in order to facilitate the attachment between the steel plates 102 and the concrete, connecting the two steel plates 102 using rod-shaped struts 106 so as to secure the two steel plates 102, and then casting concrete in the space between the steel plates 102. When the inside of the steel plates 102 is filled with concrete in the SC structure wall, even if a failure occurs in the concrete, the steel plates 102 continue to restrict the concrete, to provide a greater level of load-bearing. Also, as the concrete is placed inside the steel plates 102, the concrete can be prevented from being degraded by the external environment, so that the durability of the structure can be improved.

[0006] However, when using a steel plate structure according to prior art in forming a SC structure wall for a large structure, such as a skyscraper and a nuclear power plant, etc., the thickness of the wall having a SC structure may be increased, leading to spatial limitations. Also, due to the greater amount of loads that must be supported, the steel plates and concrete may have to be increased in thickness, where the greater thickness for the steel plates may lead to increased thermal deformations when welding the steel plates, as well as to a need for thermal post-treatment. In the case of a skyscraper or a nuclear power plant structure, in particular, the axial forces applied by the weight of the structure and the lateral forces caused by earthquakes must be resisted in an efficient manner, but as the concrete inside the steel materials has a low shear strength, the remaining shear strength has to be resisted by the steel plates. In order to bear the lateral forces caused by earthquakes, the thickness of the steel plates may have to be increased.

[0007] Also, when modularizing the steel plate structure according to prior art and assembling the modules on site to form a wall, the steel plates of the unit modules may be welded together to attach the unit modules, or extra plates or couplers may be used in addition to the welding of the steel plates to enhance the adhesion strength between the unit modules. However, the extra plates or couplers may be exposed at the exterior surface to degrade the appearance, and the addition of secondary work may lead to longer construction periods. Furthermore, temporary reinforcement material may have to be additionally attached during the transporting of the unit modules to the construction site, in order to prevent deformations in the steel plate structure.

[0008] When installing a bracket used for installing an external device, such as piping, etc., to the exterior of the SC structure wall, the bracket may be welded or coupled with bolts, but when a large external device having a heavy mass is installed to the bracket, local deformations may occur in the steel plate, and the load-bearing performance may be degraded, so that the external equipment may not be installed on the outside of the wall.

[0009] Also, when casting concrete in the steel plate structure according to prior art, since the two steel plates are connected only by the rod-like struts, there is a risk that the steel plates may be deformed by the transverse pressure of the unhardened concrete.

[Disclosure]

[Technical Problem]

[0010] An aspect of the present invention is to provide a steel plate structure and a steel plate concrete wall that include load-bearing structural members, in addition to the steel plates and concrete, to reduce the thickness of the steel plate concrete wall and the thickness of the steel plates, while effectively resisting the axial forces or lateral forces acting on the wall.

[0011] Another aspect of the present invention is to provide a steel plate structure and a steel plate concrete wall that allows easy attachment between the steel plate structure unit modules, in cases where the steel plate structure is manufactured as a unit module.

[0012] Yet another aspect of the present invention is to provide a steel plate structure and a steel plate concrete wall that are capable of supporting a large external device having a heavy mass using the steel plates and structural members.

[Technical Solution]

[0013] An aspect of the present invention provides a steel plate structure according to claim 1.

[0014] The structural member can be coupled to one side of the steel plate by welding.

[0015] The structural member can include a pair of opposing structural members each coupled to one side of each of the pair of steel plates. In this case, the strut may be coupled between the pair of structural members. Here, the structural members and the strut may be H-beams.

[0016] The structural member can be an H-beam, and the H-beam can be coupled such that a flange of the H-beam is coupled to one side of the steel plate.

[0017] A fastening hole can be formed that penetrates the steel plate and the structural member. In this case, a bracket may further be included that is coupled to the other side of the steel plate through the fastening hole.

[0018] Another aspect of the present invention provides a steel plate concrete wall according to claim 8.

[0019] The steel plate concrete wall can further include studs protruding from one side of the steel plate.

[0020] The structural member can be coupled to one side of the steel plate by welding.

[0021] The structural member can include a pair of opposing structural members each coupled to one side of each of the pair of steel plates. In this case, the strut may be coupled between the pair of structural members. Here, the structural members and the strut may be H-beams.

[0022] The structural member can be an H-beam, and the H-beam can be coupled such that a flange of the H-beam is coupled to one side of the steel plate.

[0023] A fastening hole can be formed that penetrates the steel plate and the structural member. In this case, a bracket may further be included that is coupled to the other side of the steel plate through the fastening hole.

[Description of Drawings]

[0024]

Figure 1 is a perspective view of a steel plate structure according to prior art, before casting concrete.

Figure 2 is a perspective view of a steel plate structure which does not form part of the present invention.

Figure 3 is a side elevational view of a portion of a steel plate structure which does not form part of the present invention.

Figure 4 is a plan view of a portion of a steel plate structure which does not form part of the present invention.

Figure 5 is a perspective view of a steel plate structure having a bracket attached.

Figure 6 is a side elevational view of a portion of a steel plate structure having a bracket attached.

Figure 7 is a perspective view of a steel plate structure according to a disclosed embodiment of the present invention.

Figure 8 is a perspective view illustrating multiple steel plate structures coupled together according to the disclosed embodiment of the present invention.

Figure 9 is a drawing illustrating the horizontal connectors of steel plate structures coupled together according to the disclosed embodiment of the present invention.

Figure 10 is a drawing illustrating the vertical connectors of steel plate structures coupled together according to the disclosed embodiment of the present invention.

Figure 11 is a drawing illustrating the construction of a steel plate concrete wall according to a disclosed embodiment of the present invention.

<Description of Numerals for Key Components in the Drawings>

10:	steel plate structure	12:	steel plate
14:	structural member	16:	strut
18:	stud	20:	bracket
22:	bolt	24:	horizontal connector
26:	vertical connector	28:	concrete supply part
30:	concrete		

[Mode for Invention]

[0025] As the invention allows for various changes and numerous embodiments, particular embodiments will be illustrated in the drawings and described in detail in the written description. However, this is not intended to limit the present invention to particular modes of practice, and it is to be appreciated that all changes, equivalents, and substitutes that do not depart from the technical scope of the present invention are encompassed in the present invention. In the description of the present invention, certain detailed explanations of related art are omitted when it is deemed that they may unnecessarily obscure the essence of the invention.

[0026] The terms used in the present specification are merely used to describe particular embodiments, and are not intended to limit the present invention. An expression used in the singular encompasses the expression of the plural, unless it has a clearly different meaning in the context. In the present specification, it is to be understood that the terms such as "including" or "having," etc., are intended to indicate the existence of the features, numbers, steps, actions, components, parts, or combinations thereof disclosed in the specification, and are not intended to preclude the possibility that one or more other features, numbers, steps, actions, components, parts, or combinations thereof may exist or may be added.

[0027] The steel plate structure and steel plate concrete wall according to certain embodiments of the invention will be described below in more detail with reference to the accompanying drawings. Those components that are the same or are in correspondence are rendered the same reference numeral regardless of the figure number, and redundant explanations are omitted.

[0028] Figure 2 is a perspective view of a steel plate structure, Figure 3 is a side elevational view of a portion of a steel plate structure , and Figure 4 is a plan view of a portion of a steel plate structure. In Figure 2 through Figure 4, there are illustrated a steel plate structure 10, steel plates 12, structural members 14, struts 16, and studs 18.

[0029] The present embodiment can be composed of a pair of steel plates 12 that are separated such that a predetermined space is provided, structural members 14 that are positioned in the space and are structurally rigidly joined to one side of a steel plate 12 in the direction of gravity, and struts 16 that maintain a separation distance between the pair of steel plates 12, so that the overall thickness of the steel plate concrete wall can be reduced, so as to allow efficient usage of space, and the thickness of the steel plates can be reduced, so as to reduce thermal deformations during welding attachments. Also, the axial forces or lateral forces acting on the wall can be effectively resisted.

[0030] The pair of steel plates may be installed with a distance from each other, to form a predetermined space between the steel plates 12. The predetermined space can be where the concrete may later be cast, and the separation distance between the steel plates 12 can be determined according to the load applied on the steel plate concrete wall. The steel plates 12 may be integrated with the concrete, after the forming of the steel plate concrete wall, to resist the load. Also, these steel plates 12 may restrict the concrete, so that even when the concrete inside undergoes failure, the concrete may be prevented from becoming detached, whereby the load-bearing capability of the steel plate concrete wall may be increased.

[0031] The structural members 14 may exist within the predetermined space formed by the pair of steel plates 12, and may be structurally rigidly joined to one side of a steel plate 12 in the direction of gravity. The structural members 14 may resist the load applied on the steel plate concrete wall, together with the steel plates 12 and concrete. The structural members 14 may be arranged in the direction of gravity, to resist the axial forces applied on the steel plate concrete wall, as well as the lateral forces caused by earthquakes, wind, etc. That is, the structural members 14 may

be coupled to one side of a steel plate in the longitudinal direction, to resist the load in the axial direction together with the concrete inside the steel plate structure 10 and the steel plates, and as the steel plate concrete wall is rigidly joined to the foundation, to resist shear forces in the lateral directions caused by earthquakes, etc. Also, such structural members 14 may, together with the studs 18 described later, contribute to the integrating of the steel plates 12 and the concrete. Thus, the structural members 14 may serve as structural materials together with the steel plates and the concrete to reduce the overall thickness of the steel plate concrete wall, and may thus be advantageous in forming the walls of a large structure, while the structural members 14 may also reduce the thickness of the steel plates to reduce thermal deformations during welding attachments.

[0032] The structural members 14 may be rigidly joined to the steel plate 12, so that the structural members 14 may move as an integrated body with the steel plate 12. Examples of methods for rigidly joining a steel plate 12 with a structural member 14 include rigidly joining the steel plate 12 and the structural member 14 using high-tension bolts or rivets, and welding the structural member 14 to the steel plate 12, to allow integrated movement with the steel plate 12.

[0033] According to the invention, H-beams are used for the structural members 14, with the flanges of the H-beams coupled to one side of a steel plate to form a rigid joint.

[0034] The structural members 14 can be structurally rigidly joined to the steel plate 12, in order to prevent deformations in the steel plate structure 10 due to eccentricity or contortion that may occur while transporting to the construction site after manufacture in a factory, and to prevent deformations in the steel plate structure 10 due to transverse pressure applied by unhardened concrete when casting the concrete in the steel plate structure 10.

[0035] The structural members 14 can both be rigidly joined to just one of the two steel plates 12 or can be rigidly joined to each of the two steel plates 12. In the case where the structural members 14 are rigidly joined to each of the two steel plates 12, the structural members 14 can be arranged opposite one another, as illustrated in Figure 2. The number of structural members 14 coupled to one side of a steel plate 12 may be selected in correspondence to the load applied on the steel plate concrete wall.

[0036] As the structural members 14 are structurally rigidly joined to the steel plates 12, the combined effect of the steel plates 12, concrete, and structural members 14 may increase the strength against the load, so that a thick wall for a skyscraper structure or a power plant structure, etc., may be formed without increasing the thickness of the steel plates 12. Therefore, as the strength against a large load may be increased without increasing the thickness of the steel plates 12, the thickness of the steel plates 12 can be minimized, to provide easier manufacture and installing of the steel plate structure 10, and the steel plate structure 10 can be modularized, allowing larger module sizes when performing the assembly on site.

[0037] The struts 16 may maintain the separation distance between the steel plates 12, whereby the pair of steel plates 12 may provide the predetermined space. The struts 16 can have both ends each coupled to each of the pair of steel plates 12, and in the case where the structural members 14 are coupled to two steel plates in a zigzag configuration, it is possible to couple the ends of the struts to a steel plate 12 and a structural member 14, respectively. Also, in the case where the structural members 14 are arranged opposite each other on two steel plates 12, as illustrated in Figure 2, the struts 16 can be coupled to the opposing structural members 14.

[0038] The struts 16 may maintain the distance between the steel plates 12 in consideration of the thickness of the wall, and may provide an adequate level of strength in consideration of transporting conditions, etc., of the steel plate structure 10. In the case of a wall in a large structure, the increased thickness of the wall can entail a large separation distance between two steel plates 12, and thus beams having a high strength may be used as the struts. In the present embodiment, the structural members 14 and the struts 16 are made from H-beams, where the factory manufacture of the steel plate structure 10 can first include coupling the struts 16 to the structural members 14 to form a frame and then include attaching the steel plates 12 to the structural members 14, so that the manufacturing process may be shortened.

[0039] According to the size of the wall to be formed, the steel plate structure 10 can be manufactured directly on site, or manufactured as a unit module at a factory, with the multiple unit modules assembled on site to form a wall. The case of forming the steel plate structure 10 as a unit module will be described later in more detail with reference to Figure 7.

[0040] The studs 18 may be buried inside the concrete so as to allow the steel plates 12 and the concrete to move in an integrated manner, in order that the combined effect of the steel plates 12 and the concrete may resist external loads. The studs 18 may be buried uniformly over one side of a steel plate 12, so that the concrete and the steel plate 12 may move as an integrated body over the entire surface.

[0041] As described above, in the case where the structural members 14 are rigidly joined to one side of the steel plate 12, the structural members 14 may contribute to the integrating of the concrete with the steel plate 12. If beams having a large area of contact with the concrete, such as H-beams, I-beams, C-beams, etc., are used for the structural members 14, it may be possible to integrate the steel plates 12 and the concrete with just the structural members 14, and the coupling of the studs 14 may be omitted. Of course, it is possible to reduce material costs by coupling only the required number of studs 18, in consideration of the degree by which the structural members 14 contribute to the integration between the steel plates 12 and the concrete.

[0042] In the case where the steel plate structure 10 is to be manufactured on site to form a wall, the steel plate

structure 10 can be assembled over the foundation plate for forming the wall, after which concrete can be cast in between the steel plates 12 to form a steel plate concrete wall.

[0043] Conversely, it is also possible to manufacture the steel plate structure 10 according to the present embodiment as a unit module at a factory, transport the unit modules to the construction site, and attaching the unit modules on site to form a wall. In this case, since the corresponding structural members 14 of the unit modules have to be connected in an integrated manner to transfer loads, the lower ends of the structural members 14 of the unit modules arranged on top and the upper ends of the structural members 14 of the unit modules arranged on the bottom may be given the same cross sections and afterwards rigidly joined, so that the forces in the structural members 14 may be efficiently transferred to the ground.

[0044] Figure 5 is a perspective view of a steel plate structure having a bracket attached and Figure 6 is a side elevational view of a portion of a steel plate structure having a bracket attached . In Figure 5 and Figure 6, there are illustrated steel plates 12, structural members 14, struts 16, studs 18, a bracket 20, and bolts 22.

[0045] For a high-rise building, a factory building, a nuclear power plant structure, etc., there are many occasions when an external device, such as an electrical facility, communication facility, piping, etc., is installed on the wall, and in order to install an external device such as piping, etc., onto the outside of a steel plate concrete wall, a bracket for supporting the external device may be welded or coupled with bolts 22 to a steel plate 12. However, when installing a large external device having a heavy mass onto the bracket 20, the mass of the external device may often cause local deformations in the steel plate 12 and degrade the load-bearing performance.

[0046] Therefore, in the present embodiment, fastening holes can be prepared, which penetrate the steel plates 12 and the structural members 14, so that the bracket 20 may be coupled to the steel plate 12 through the fastening holes using rivets or bolts 22, making it possible to support a heavy external device. That is, as illustrated in Figure 6, fastening holes for securing the bracket 20 may be formed in portions of the steel plate 12 where a structural member 14 is rigidly joined, and the bracket 20 may be coupled through the fastening holes, to allow the steel plate 12 and the structural member 14 to support the external device together.

[0047] This bracket 20 may be installed after the steel plate structure 10 is installed in the position for forming the wall but before casting the concrete, or may be installed after the concrete is cast and cured.

[0048] Of course, it is also possible to install the bracket 20, to support a small external device, by forming fastening holes in portions of the steel plate 12 where a structural member 14 is not rigidly joined.

[0049] Figure 7 is a perspective view of a steel plate structure according to a disclosed embodiment of the present invention, Figure 8 is a perspective view illustrating multiple steel plate structures coupled together according to the disclosed embodiment of the present invention, Figure 9 is a drawing illustrating the horizontal connectors of steel plate structures coupled together according to the disclosed embodiment of the present invention, and Figure 10 is a drawing illustrating the vertical connectors of steel plate structures coupled together according to the disclosed embodiment of the present invention. In Figure 7 through Figure 10, there are illustrated steel plate structures 10, steel plates 12, structural members 14, struts 16, studs 18, horizontal connectors 24, vertical connectors 26, and bolts 22.

[0050] In the present embodiment, the steel plate structures 10 may be manufactured at a factory as a unit module, after which the unit modules may be transported to the construction site, the unit modules for the steel plate structures 10 may be assembled to manufacture bigger modules, the bigger modules may be hauled and installed in the final positions, and concrete may be cast, to complete a steel plate concrete wall. That is, as illustrated in Figure 8, unit modules arranged up and down can be coupled using horizontal connectors 24, while unit modules arranged side by side can be coupled using vertical connectors 26, and with a number of unit modules coupled together in accordance to the desired size of the wall, concrete can be cast in to form a steel plate concrete wall.

[0051] Multiple structural members 14 can be coupled in the steel plate structures 10 in predetermined intervals, and horizontal connectors 24 are installed that interconnect the end portions of the multiple structural members 14, to efficiently transfer the forces in the structural members 14 and provide easier assembly between the unit modules of the steel plate structures 10.

[0052] Also, for horizontal coupling between the steel plate structures 10 implemented as unit modules, vertical connectors 26 are included that are each coupled in the direction of gravity to an end portion on one side of a steel plate. When attaching unit modules together, coupling the vertical connectors 26 to one another can increase the cross sectional area of the coupling surface, and when the attachment between unit modules is complete, the vertical connectors 26 may resist the loads applied on the steel plate concrete wall, together with the structural members 14 described above.

[0053] The horizontal connectors 24 can be for interconnecting unit modules that are arranged up and down, and the vertical connectors 26 can be for interconnecting unit modules that are arranged side by side, where the coupling between horizontal connectors 24 and the coupling between vertical connectors 26 may form structurally rigid joints.

[0054] The horizontal connectors 24 and vertical connectors 26 are attached to the end portions of the unit modules, and can perform a structural function of preventing deformations in the steel plates during the welding for attaching the steel plates of the unit modules together.

[0055] Examples of methods for coupling horizontal connectors 24 to each other or coupling vertical connectors 26

to each other include rigid joining using high-tension bolts 22 or rivets, and rigid joining by welding. In the present embodiment, high-tension bolts 22 were used in coupling the unit modules together, as illustrated in Figure 9 and Figure 10, to provide easier assembly on site.

[0056] C-beams are used for the horizontal connectors 24 and vertical connectors 26.

[0057] As illustrated in Figure 9, in the present embodiment, H-beams are used for the structural members 14, while C-beams are used for the horizontal connectors 24, with the web of the end portion of the H-beam inserted in the channel portion of the C-beam such that the flanges of the C-beam face the structural member 14, so that the attachment area between the structural member 14 and the horizontal connector 24 may be increased and the webs of the C-beams may be placed in surface contact with each other, in order that the forces in the members may readily be transferred. Fastening holes can be formed beforehand for coupling the horizontal connectors 24 using bolts 22 or rivets, when manufacturing the steel plate structures 10 implemented as unit modules at the factory.

[0058] Also, as illustrated in Figure 10, C-beams are used for the vertical connectors 26, and the flanges of the C-beam may face the structural member 14, so that the attachment area between the flange of the C-beam and the one side of the steel plate may be increased and the webs of the C-beams positioned side by side may be placed in surface contact with each other, in order that the forces in the members may readily be transferred. That is, when attaching the unit modules, coupling the vertical connectors 26 to one another can increase the cross sectional area of the coupling surface, to a form similar to an H-beam, and when the attachment between unit modules is complete, the vertical connectors 26 may resist the loads applied on the steel plate concrete wall, together with the structural members 14 described above.

[0059] Fastening holes can be formed beforehand for coupling the horizontal connectors 24 using bolts 22 or rivets, when manufacturing the steel plate structures 10, implemented as unit modules, at the factory.

[0060] As described above, fastening holes may be prepared, which penetrate the steel plate 12 and the structural member 14, so that a bracket may be coupled to the steel plate 12 through the fastening holes using rivets or bolts, whereby the steel plate 12 and the structural member 14 rigidly joined to the steel plate 12 may support an external device together, making it possible to support an external device having a heavy mass.

[0061] Figure 11 is a drawing illustrating the construction of a steel plate concrete wall according to a disclosed embodiment of the present invention. In Figure 11, there are illustrated steel plate structures 10, concrete 30, and a concrete supply part 28.

[0062] With the steel plate structures 10 implemented as a unit module, several unit modules can be assembled to form a wall of a predetermined size. That is, the steel plate structure 10 implemented as unit modules may be manufactured in a required number, after which the unit modules may be transported to the construction site, the steel plate structures 10 as unit modules may be assembled into a bigger module, the bigger modules may be hauled and installed in the final positions, and concrete 30 may be cast by way of the concrete supply part 28, to form a steel plate concrete wall.

[0063] Manufacturing the steel plate structures 10 in a factory may allow easier quality management to provide high-quality steel plate structures 10, and as the work on site may be minimized, the construction time can be reduced.

[0064] While the invention has been described in detail with reference to particular embodiments, the embodiments are for illustrative purposes only and do not limit the invention. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope of the invention.

[Industrial Applicability]

[0065] By utilizing load-bearing structural members together with the steel plates and concrete, the overall thickness of the steel plate concrete wall can be reduced, to allow a more efficient use of space.

[0066] Also, the thickness of the steel plates can be reduced, allowing better welding properties and larger unit module sizes.

[0067] Also, the axial forces or lateral forces applied on the steel plate concrete wall may be effectively resisted.

[0068] Furthermore, in the case where the steel plate structure is implemented as a unit module, horizontal connectors or vertical connectors may be arranged at the end portions of the steel plates, to facilitate the attaching between unit modules and allow the forces in the structural members to be transferred directly between unit modules, whereby the strength of the wall may be increased.

[0069] Also, a bracket may be installed utilizing the strengths of the steel plate and the structural member, so that heavy external devices, such as piping or electrical facilities, etc., may be supported effectively.

Claims

1. A steel plate structure (10) comprising:

a pair of steel plates (12) separated such that a predetermined space is provided;
a plurality of structural members (14), each being positioned in the predetermined space and structurally rigidly joined to one side of the steel plates in a direction of gravity; and
Struts (16) coupled between the structural members (14), said struts and said structural members being H-beams and maintaining a separation distance between the pair of steel plates (12),
and
further comprising a horizontal connector (24) interconnecting end portions of the plurality of structural members (14),
wherein the horizontal connector (24) is a C-beam and coupled to end portions of one side of the steel plate, and the C-beam is coupled such that a flange of the C-beam faces the structural member,
further comprising:

a vertical connector (26) coupled to end portions of one side of the steel plate in a direction of gravity, wherein the vertical connector (26) is a C-beam, and
the C-beam is coupled such that a flange of the C-beam faces the structural member.

2. The steel plate structure (10) according to claim 1, further comprising studs (18) protruding from one side of the steel plate (12).

3. The steel plate structure (10) according to claim 1, wherein the structural member (14) is coupled to one side of the steel plate (12) by welding.

4. The steel plate structure (10) according to claim 1, wherein the structural member (14) includes a pair of opposing structural members (14) each coupled to one side of each of the pair of steel plates (12).

5. The steel plate structure (10) according to claim 1, wherein the structural member (14) is an H-beam, and the H-beam is coupled such that a flange of the H-beam is coupled to one side of the steel plate (12).

6. The steel plate structure (10) according to claim 1, further comprising:

a fastening hole penetrating the steel plate (12) and the structural member (14).

7. The steel plate structure (10) according to claim 6, further comprising:

a bracket (20) coupled to the other side of the steel plate (12) through the fastening hole.

8. A steel plate (12) concrete wall comprising:

a pair of steel plates (12) separated such that a predetermined space is provided;
a plurality of structural members (14), each being positioned in the predetermined space and structurally rigidly joined to one side of each of the steel plates (12) in a direction of gravity;
a strut (16) coupled between the structural members (14), said strut and structural members being H-beams and maintaining a separation distance between the pair of steel plates (12); and
concrete (30) interposed inside the predetermined space, and
further comprising a horizontal connector (24) interconnecting end portions of the plurality of structural members, wherein the horizontal connector (24) is a C-beam and coupled to end portions of one side of the steel plate, and the C-beam is coupled such that a flange of the C-beam faces the structural member (14),
further comprising:

a vertical connector (26) coupled to one side of the steel plate (12) in a direction of gravity, wherein the vertical connector (26) is a C-beam, and
the C-beam is coupled such that a flange of the C-beam faces the structural member (14).

9. The steel plate (12) concrete wall according to claim 8, further comprising studs (18) protruding from one side of the steel plate (12).

10. The steel plate (12) concrete wall according to claim 8, wherein the structural member (14) is coupled to one side of the steel plate (12) by welding.

11. The steel plate (12) concrete wall according to claim 8, wherein the structural member (14) includes a pair of opposing structural members (14) each coupled to one side of each of the pair of steel plates (12).

12. The steel plate (12) concrete wall according to claim 8, wherein the structural member (14) is an H-beam, and the H-beam is coupled such that a flange of the H-beam is coupled to one side of the steel plate (12).

13. The steel plate (12) concrete wall according to claim 8, further comprising:

a fastening hole penetrating the steel plate (12) and the structural member (14).

14. The steel plate (12) concrete wall according to claim 13, wherein further comprising:

a bracket (20) coupled to the other side of the steel plate (12) through the fastening hole.

Patentansprüche

1. Stahlplattenstruktur (10), die Folgendes umfasst:

ein Paar Stahlplatten (12), die voneinander so getrennt sind, dass ein vorgegebener Abstand geschaffen wird;
mehrere Strukturelemente (14), die jeweils in dem vorgegebenen Abstand positioniert sind und mit einer Seite der Stahlplatten in Richtung der Schwerkraft strukturell starr verbunden sind; und
Streben (16), die zwischen die Strukturelemente (14) gekoppelt sind, wobei die Streben und die Strukturelemente Doppel-T-Träger sind und einen Trennungsabstand zwischen dem Paar Stahlplatten (12) aufrechterhalten, und
wobei sie ferner ein horizontales Verbindungsteil (24) umfasst, das Endabschnitte der mehreren Strukturelemente (14) miteinander verbindet,
wobei das horizontale Verbindungsteil (24) ein U-Profil-Träger ist und an Endabschnitte einer Seite der Stahlplatte gekoppelt ist und
der U-Profil-Träger so gekoppelt ist, dass ein Flansch des U-Profil-Trägers dem Strukturelement zugewandt ist,
wobei sie ferner Folgendes umfasst:

ein vertikales Verbindungsteil (26), das in Richtung der Schwerkraft an Endabschnitte einer Seite der Stahlplatte gekoppelt ist,
wobei das vertikale Verbindungsteil (26) ein U-Profil-Träger ist und
der U-Profil-Träger so gekoppelt ist, dass ein Flansch des U-Profil-Trägers dem Strukturelement zugewandt ist.

2. Stahlplattenstruktur (10) nach Anspruch 1, die ferner Stifte (18) umfasst, die von einer Seite der Stahlplatte (12) vorstehen.

3. Stahlplattenstruktur (10) nach Anspruch 1, wobei das Strukturelement (14) durch Schweißen an eine Seite der Stahlplatte (12) gekoppelt ist.

4. Stahlplattenstruktur (10) nach Anspruch 1, wobei das Strukturelement (14) ein Paar gegenüberliegender Strukturelemente (14), die jeweils an eine Seite jedes Paars von Stahlplatten (12) gekoppelt sind, enthält.

5. Stahlplattenstruktur (10) nach Anspruch 1, wobei das Strukturelement (14) ein Doppel-T-Träger ist und
der Doppel-T-Träger so gekoppelt ist, dass ein Flansch des Doppel-T-Trägers an eine Seite der Stahlplatte (12) gekoppelt ist.

6. Stahlplattenstruktur (10) nach Anspruch 1, die ferner Folgendes umfasst:

ein Befestigungsloch, das in die Stahlplatte (12) und das Strukturelement (14) eindringt.

7. Stahlplattenstruktur (10) nach Anspruch 6, die ferner Folgendes umfasst:

einen Träger (20), der durch das Befestigungsloch an die andere Seite der Stahlplatte (12) gekoppelt ist.

8. Betonwand mit Stahlplatte (12), die Folgendes umfasst:

ein Paar Stahlplatten (12), die voneinander so getrennt sind, dass ein vorgegebener Abstand geschaffen wird;
mehrere Strukturelemente (14), die jeweils in dem vorgegebenen Abstand positioniert sind und mit einer Seite jeder Stahlplatte (12) in einer Richtung der Schwerkraft strukturell starr verbunden sind;
eine Strebe (16), die zwischen die Strukturelemente (14) gekoppelt ist, wobei die Strebe und die Strukturelemente Doppel-T-Träger sind und einen Trennungsabstand zwischen dem Paar Stahlplatten (12) erhalten; und
Beton (30), der in den vorgegebenen Abstand eingefügt ist und
wobei sie ferner ein horizontales Verbindungsteil (24) umfasst, das Endabschnitte der mehreren Strukturelemente miteinander verbindet,
wobei das horizontale Verbindungsteil (24) ein U-Profil-Träger ist und an Endabschnitte einer Seite der Stahlplatte gekoppelt ist und
der U-Profil-Träger so gekoppelt ist, dass ein Flansch des U-Profil-Trägers dem Strukturelement (14) zugewandt ist,
wobei sie ferner Folgendes umfasst:

ein vertikales Verbindungsteil (26), das in einer Richtung der Schwerkraft an eine Seite der Stahlplatte (12) gekoppelt ist,
wobei das vertikale Verbindungsteil (26) ein U-Profil-Träger ist und
der U-Profil-Träger so gekoppelt ist, dass ein Flansch des U-Profil-Trägers dem Strukturelement (14) zugewandt ist.

9. Betonwand mit Stahlplatte (12) nach Anspruch 8, die ferner Stifte (18) umfasst, die von einer Seite der Stahlplatte (12) hervorstehen.

10. Betonwand mit Stahlplatte (12) nach Anspruch 8, wobei das Strukturelement (14) durch Schweißen an eine Seite der Stahlplatte (12) gekoppelt ist.

11. Betonwand mit Stahlplatte (12) nach Anspruch 8, , wobei das Strukturelement (14) ein Paar gegenüberliegende Strukturelemente (14), die jeweils an eine Seite jedes Paars von Stahlplatten (12) gekoppelt sind, enthält.

12. Betonwand mit Stahlplatte (12) nach Anspruch 8, wobei das Strukturelement (14) ein Doppel-T-Träger ist und der Doppel-T-Träger so gekoppelt ist, dass ein Flansch des Doppel-T-Trägers an eine Seite der Stahlplatte (12) gekoppelt ist.

13. Betonwand mit Stahlplatte (12) nach Anspruch 8, die ferner Folgendes umfasst:

ein Befestigungsloch, das in die Stahlplatte (12) und das Strukturelement (14) eindringt.

14. Betonwand mit Stahlplatte (12) nach Anspruch 13, wobei sie ferner Folgendes umfasst:

einen Träger (20), der durch das Befestigungsloch an die andere Seite der Stahlplatte (12) gekoppelt ist.

Revendications

1. Structure de plaque d'acier (10) comprenant :

une paire de plaques d'acier (12) séparées de sorte qu'un espace prédéterminé soit fourni ;
une pluralité d'éléments structurels (14), chacun étant positionné dans l'espace prédéterminé et joint de manière structurellement rigide à un côté des plaques d'acier dans une direction de gravité ; et
des entretoises (16) couplées entre les éléments structurels (14), lesdites entretoises et lesdits éléments structurels étant des poutres en H et maintenant une distance de séparation entre la paire de plaques d'acier (12) et
comprenant en outre un connecteur horizontal (24) reliant des parties d'extrémité de la pluralité d'éléments structurels (14),
dans laquelle le connecteur horizontal (24) est une poutre en C et couplé à des parties d'extrémité d'un côté de la plaque d'acier et

la poutre en C est couplée de sorte qu'une bride de la poutre en C fasse face à l'élément structurel, comprenant en outre :

un connecteur vertical (26) couplé à des parties d'extrémité d'un côté de la plaque d'acier dans une direction de gravité,
dans lequel le connecteur vertical (26) est une poutre en C et
la poutre en C est couplée de sorte qu'une bride de la poutre en C fasse face à l'élément structurel.

2. Structure de plaque d'acier (10) selon la revendication 1, comprenant en outre des montants (18) faisant saillie d'un côté de la plaque d'acier (12).

3. Structure de plaque d'acier (10) selon la revendication 1, dans laquelle l'élément structurel (14) est couplé à un côté de la plaque d'acier (12) par soudage.

4. Structure de plaque d'acier (10) selon la revendication 1, dans laquelle l'élément structurel (14) comporte une paire d'éléments structurels en regard (14) couplés chacun à un côté de chacune de la paire de plaques d'acier (12).

5. Structure de plaque d'acier (10) selon la revendication 1, dans laquelle l'élément structurel (14) est une poutre en H et la poutre en H est couplée de sorte qu'une bride de la poutre en H soit couplée à un côté de la plaque d'acier (12).

6. Structure de plaque d'acier (10) selon la revendication 1, comprenant en outre :

un trou de fixation pénétrant la plaque d'acier (12) et l'élément structurel (14).

7. Structure de plaque d'acier (10) selon la revendication 6, comprenant en outre :

un support (20) couplé à l'autre côté de la plaque d'acier (12) par le trou de fixation.

8. Paroi de béton avec plaque d'acier (12) comprenant :

une paire de plaques d'acier (12) séparées de sorte qu'un espace prédéterminé soit fourni ;
une pluralité d'éléments structurels (14), chacun étant positionné dans l'espace prédéterminé et joint de manière structurellement rigide à un côté de chacune des plaques d'acier (12) dans une direction de gravité ;
une entretoise (16) couplée entre les éléments structurels (14), ladite entretoise et les éléments structurels étant des poutres en H et maintenant une distance de séparation entre la paire de plaques d'acier (12) ; et
du béton (30) interposé dans l'espace prédéterminé et
comprenant en outre un connecteur horizontal (24) reliant des parties d'extrémité de la pluralité d'éléments structurels,
dans lequel le connecteur horizontal (24) est une poutre en C et couplé à des parties d'extrémité d'un côté de la plaque d'acier et
la poutre en C est couplée de sorte qu'une bride de la poutre en C fasse face à l'élément structurel (14), comprenant en outre :

un connecteur vertical (26) couplé à un côté de la plaque d'acier (12) dans une direction de gravité,
dans lequel le connecteur vertical (26) est une poutre en C et
la poutre en C est couplée de sorte qu'une bride de la poutre en C fasse face à l'élément structurel (14).

9. Paroi de béton avec plaque d'acier (12) selon la revendication 8, comprenant en outre des montants (18) faisant saillie d'un côté de la plaque d'acier (12).

10. Paroi de béton avec plaque d'acier (12) selon la revendication 8, dans laquelle l'élément structurel (14) est couplé à un côté de la plaque d'acier (12) par soudage.

11. Paroi de béton avec plaque d'acier (12) selon la revendication 8, dans laquelle l'élément structurel (14) comporte une paire d'éléments structurels en regard (14) couplés chacun à un côté de chacune de la paire de plaques d'acier (12).

12. Paroi de béton avec plaque d'acier (12) selon la revendication 8, dans laquelle l'élément structurel (14) est une

poutre en H et
la poutre en H est couplée de sorte qu'une bride de la poutre en H soit couplée à un côté de la plaque d'acier (12).

13. Paroi de béton avec plaque d'acier (12) selon la revendication 8, comprenant en outre :

un trou de fixation pénétrant la plaque d'acier (12) et l'élément structurel (14).

14. Paroi de béton avec plaque d'acier (12) selon la revendication 13, comprenant en outre :

un support (20) couplé à l'autre côté de la plaque d'acier (12) par le trou de fixation.

FIG. 1

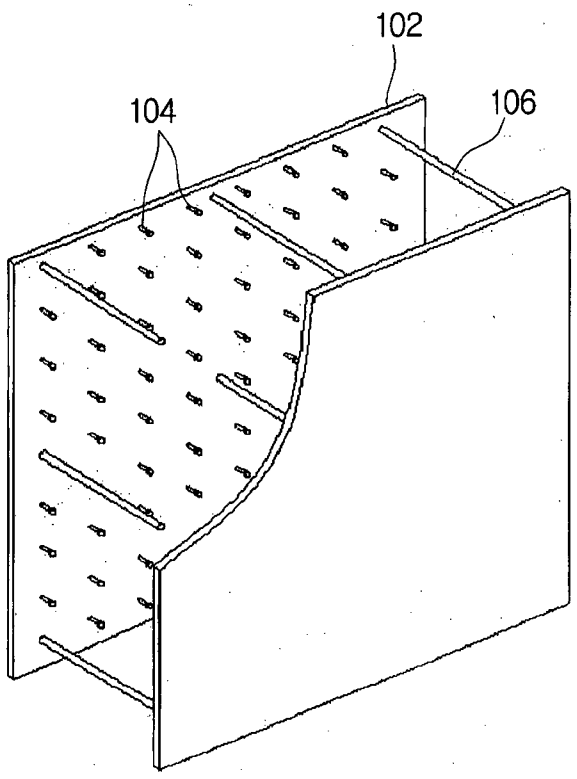


FIG. 2

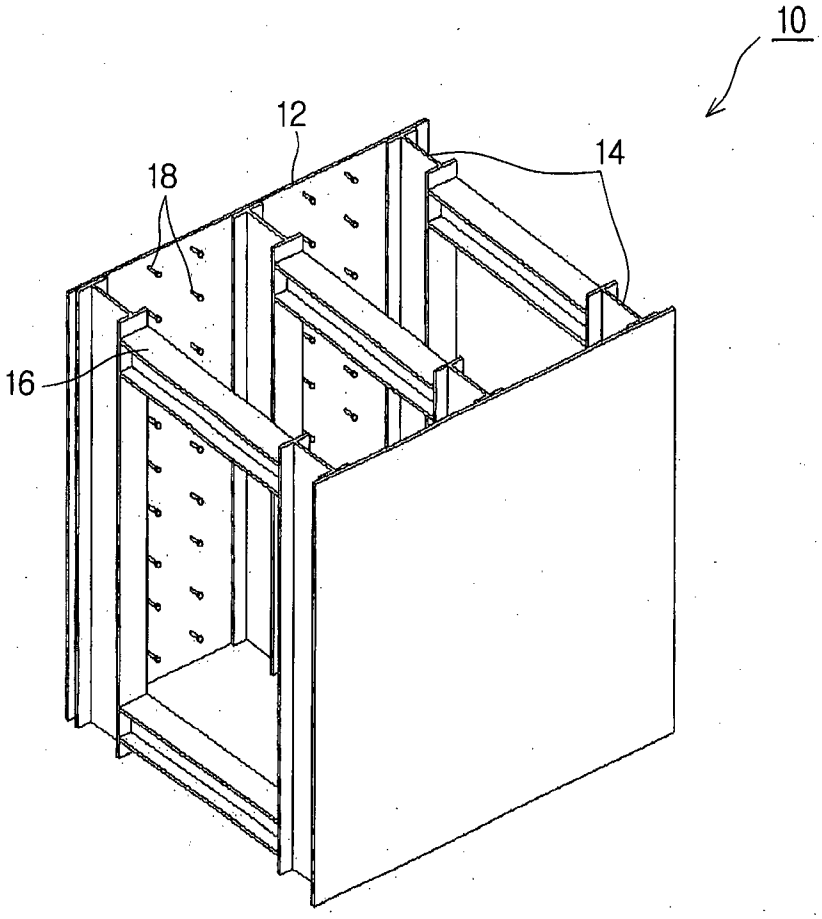


FIG. 3

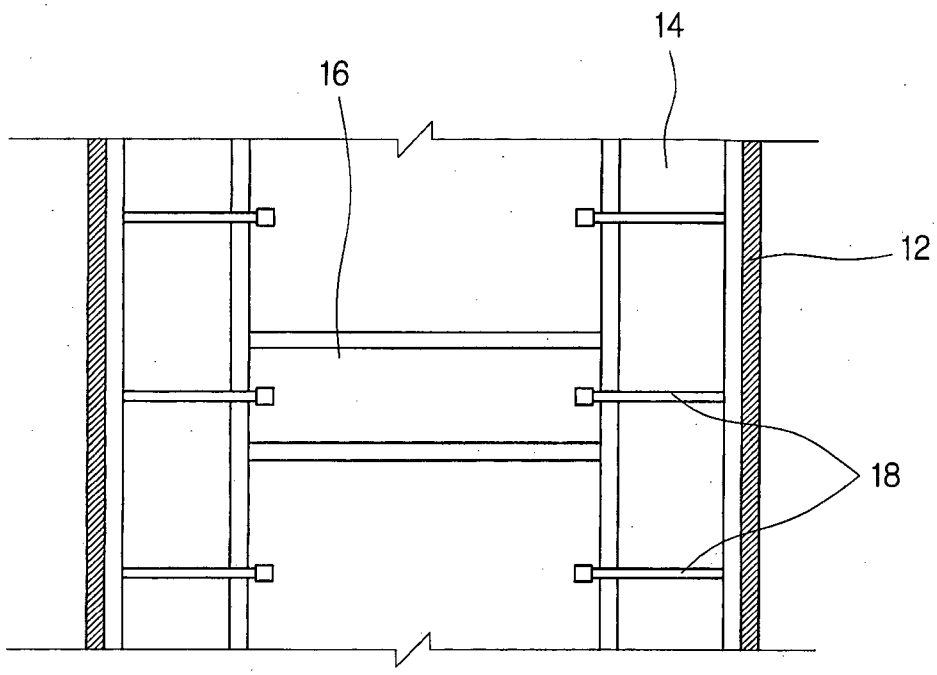


FIG. 4

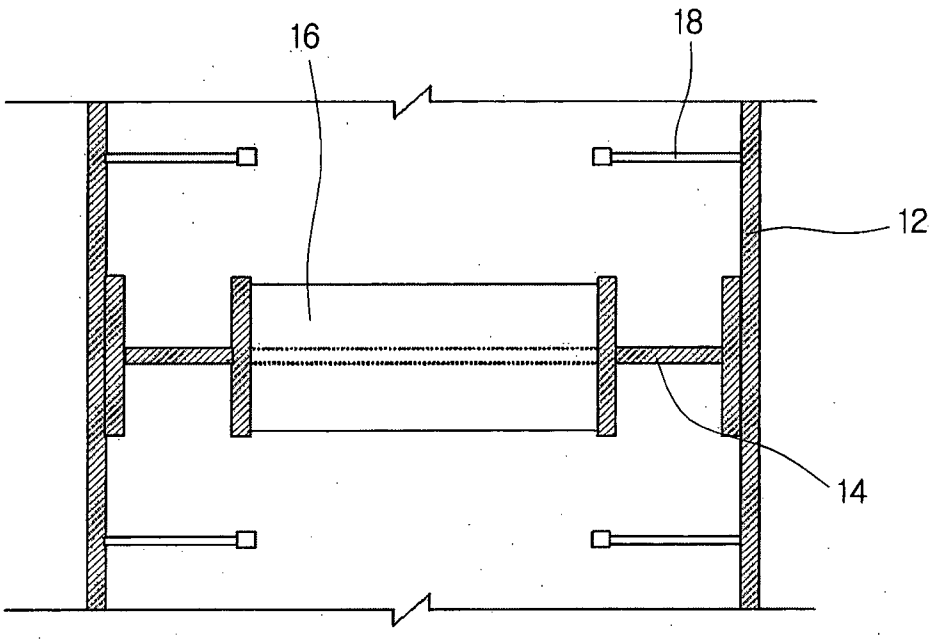


FIG. 5

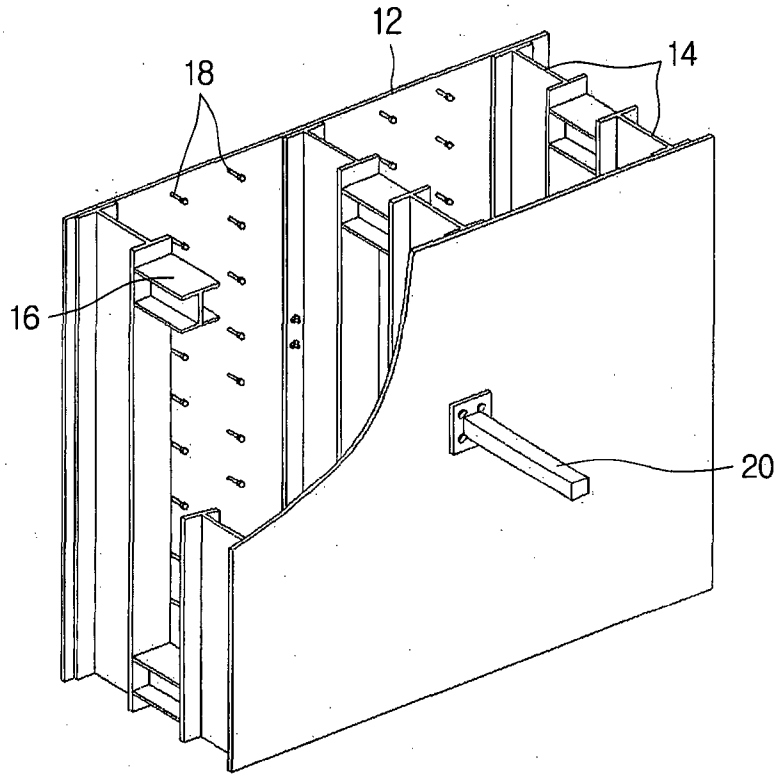


FIG. 6

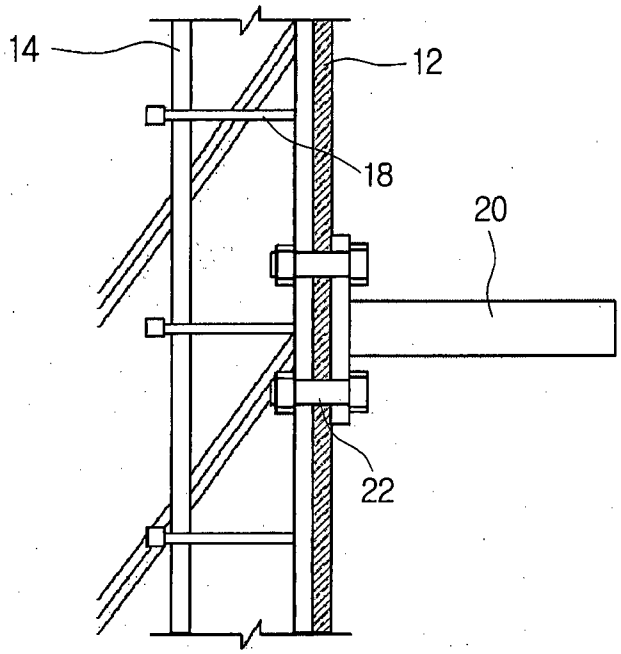


FIG. 7

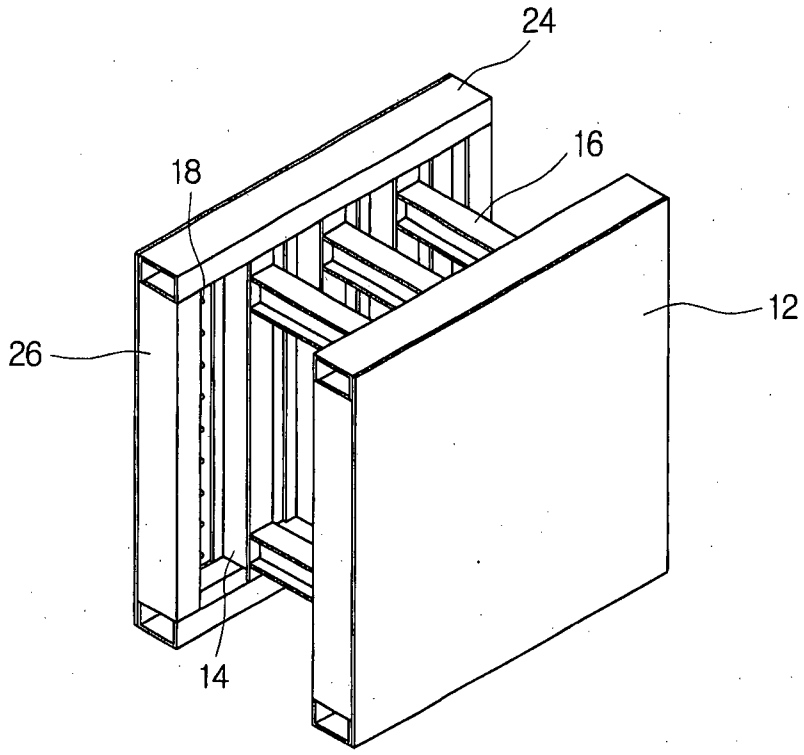


FIG. 8

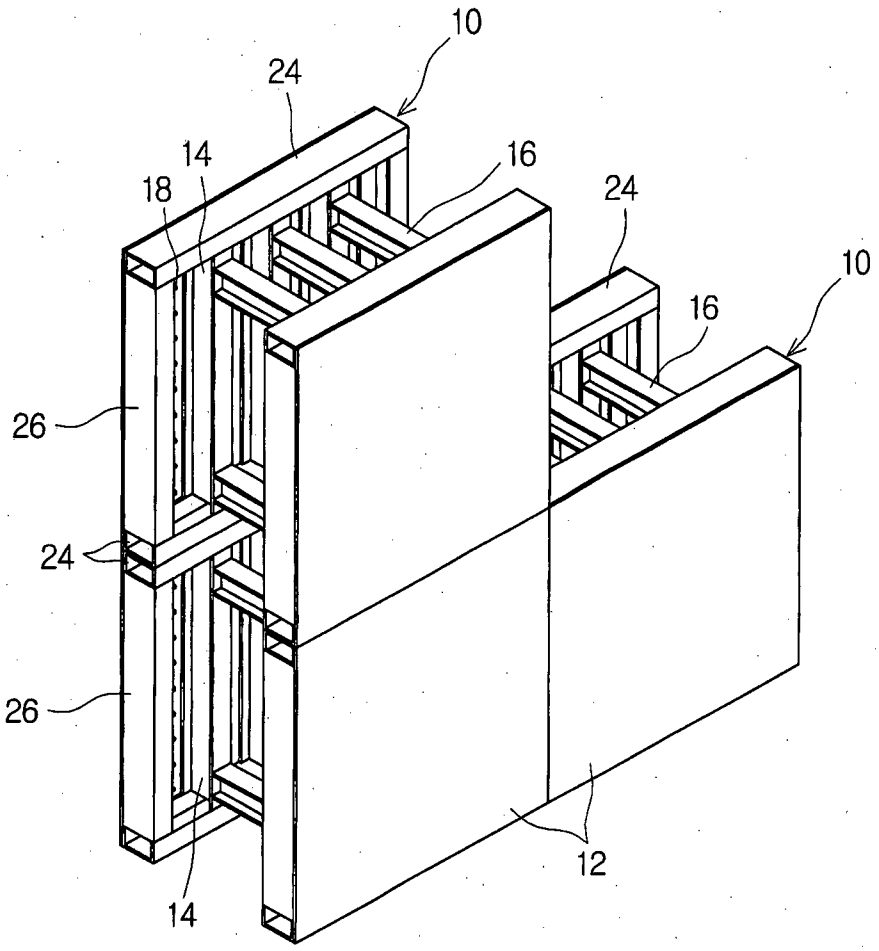


FIG. 9

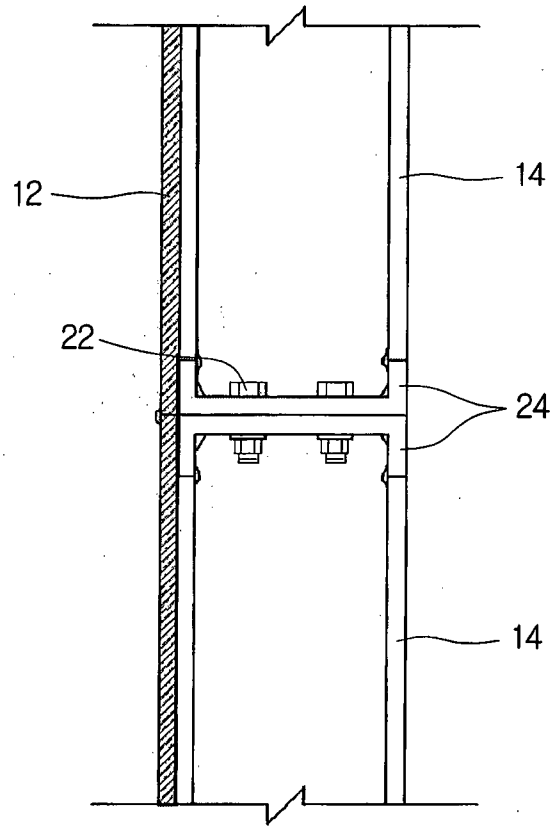


FIG. 10

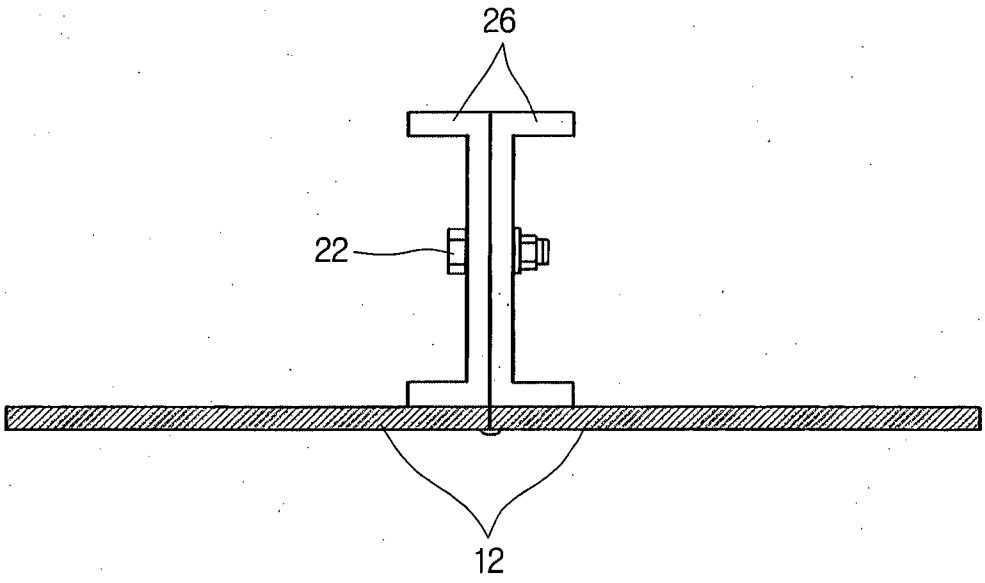
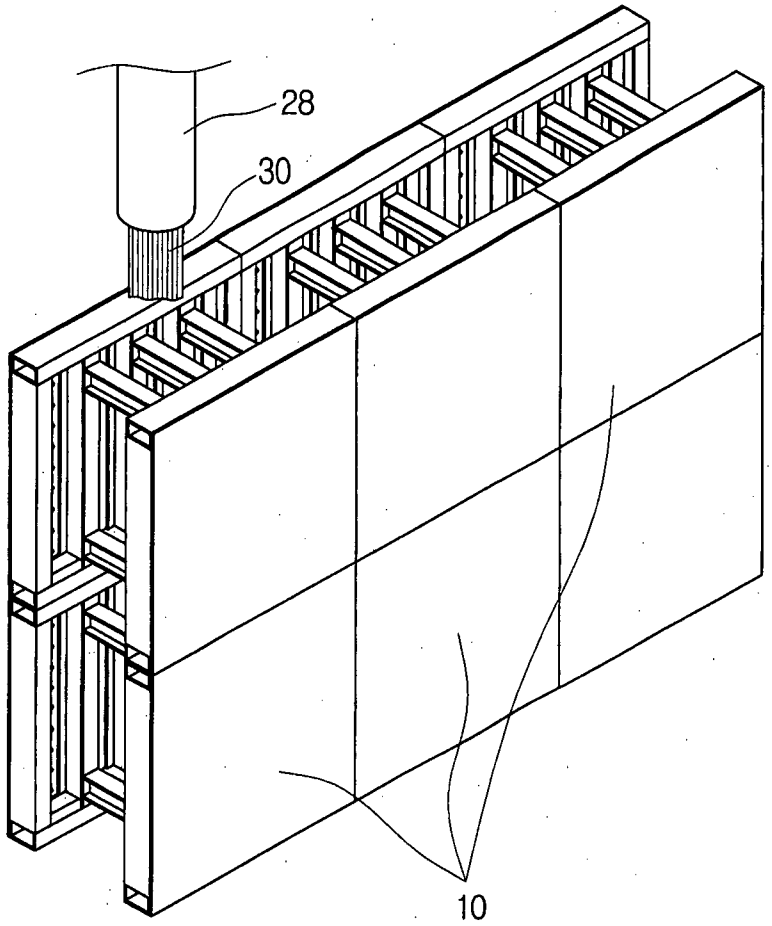


FIG. 11



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- GB 2258669 A **[0003]**

Szabadalmi igénypontok

1. Acéllemez szerkezet (10), amely tartalmaz

acéllemez (12) párt, amelynek acéllemezei úgy vannak elválasztva, hogy előre meghatározott térköz adódjék;
több szerkezeti elemet (14), amelyek mindegyike el van helyezve az előre meghatározott térközben, és gravitációs irányban szerkezetileg mereven csatlakoztatva van az acéllemezek egyik oldalához; és
merevítő tartókat (16), amelyek a szerkezeti elemek (14) közé vannak csatlakoztatva, a merevítő tartók és a szerkezeti elemek H-szelvényű tartók, és fenntartják az acéllemez (12) pár acéllemezei közötti elválasztó távolságot, és
tartalmaz továbbá vízszintes összekötőt (24), amely összekapcsolja a több szerkezeti elem (14) vég részeit,
ahol a vízszintes összekötő (24) C-szelvényű tartó és csatlakoztatva van az acéllemez egyik oldalának vég részeihez, és a C-szelvényű tartó úgy van csatlakoztatva, hogy a C-szelvényű tartó pereme szemben van a szerkezeti elemmel,
tartalmaz továbbá

függőleges összekötőt (26), amely gravitációs irányban csatlakoztatva van az acéllemez egyik oldalának vég részeihez,
ahol a függőleges összekötő (26) C-szelvényű tartó, és
a C-szelvényű tartó úgy van csatlakoztatva, hogy a C-szelvényű tartó pereme szemben van a szerkezeti elemmel.

2. Az 1. igénypont szerinti acéllemez szerkezet (10), amely tartalmaz továbbá csapokat (18), amelyek kinyúlnak az acéllemez (12) egyik oldalából.

3. Az 1. igénypont szerinti acéllemez szerkezet (10), amelyben a szerkezeti elem (14) az acéllemez (12) egyik oldalához hegesztéssel van csatlakoztatva.

4. Az 1. igénypont szerinti acéllemez szerkezet (10), amelyben a szerkezeti elem (14) magában foglal szemben lévő szerkezeti elemekből álló (14) párt, amelyek mindegyike csatlakoztatva van az acéllemez (12) pár mindegyikének egyik oldalához.

5. Az 1. igénypont szerinti acéllemez szerkezet (10), amelyben a szerkezeti elem (14) H-szelvényű tartó, és a H-szelvényű tartó úgy van csatlakoztatva, hogy a H-szelvényű tartó pereme csatlakoztatva van az acéllemez (12) egyik oldalához.

6. Az 1. igénypont szerinti acéllemez szerkezet (10), amely tartalmaz továbbá

   rögzítő furatot, amely bemegy az acéllemezbe (12) és a szerkezeti elembe (14).

7. A 6. igénypont szerinti acéllemez szerkezet (10), amely tartalmaz továbbá

   tartót (20), amely a rögzítő furaton keresztül az acéllemeznek (12) a másik oldalához van csatlakoztatva.

8. Acéllemezes (12) beton fal, amely tartalmaz

   acéllemez (12) párt, amelyek acéllemezei úgy vannak elválasztva, hogy előre meghatározott térköz adódjék;
   több szerkezeti elemet (14), amelyek mindegyike el van helyezve az előre meghatározott térközben, és gravitációs irányban szerkezetileg mereven csatlakoztatva van az acéllemezek (12) egyik oldalához; és
   merevítő tartót (16), amely a szerkezeti elemek (14) közé van csatlakoztatva, a merevítő tartó és a szerkezeti elemek H-szelvényű tartók és fenntartják az acéllemez (12) pár acéllemezei közötti elválasztó távolságot; és
   a meghatározott térközbe helyezett betont (30), és
   tartalmaz továbbá vízszintes összekötőt (24), amely összekapcsolja a több szerkezeti elem vég részeit,
   ahol a vízszintes összekötő (24) C-szelvényű tartó és csatlakoztatva van az acéllemez egyik oldalának vég részeihez, és a C-szelvényű tartó úgy van

csatlakoztatva, hogy a C-szelvényű tartó pereme szemben van a szerkezeti elemmel (14),
tartalmaz továbbá

függőleges összekötőt (26), amely gravitációs irányban csatlakoztatva van az acéllemez (12) egyik oldalához,
ahol a függőleges összekötő (26) C-szelvényű tartó, és
a C-szelvényű tartó úgy van csatlakoztatva, hogy a C-szelvényű tartó pereme szemben van a szerkezeti elemmel (14).

9. A 8. igénypont szerinti acéllemezes (12) beton fal, amely tartalmaz továbbá csapokat (18), amelyek kinyúlnak az acéllemez (12) egyik oldalából.

10. A 8. igénypont szerinti acéllemezes (12) beton fal, amelyben a szerkezeti elem (14) az acéllemez (12) egyik oldalához hegesztéssel van csatlakoztatva.

11. A 8. igénypont szerinti acéllemezes (12) beton fal, amelyben a szerkezeti elem (14) magában foglal szemben lévő szerkezeti elemekből álló (14) párt, amelyek mindegyike csatlakoztatva van az acéllemez (12) pár mindegyikének egyik oldalához.

12. A 8. igénypont szerinti acéllemezes (12) beton fal, amelyben a szerkezeti elem (14) H-szelvényű tartó, és a H-szelvényű tartó úgy van csatlakoztatva, hogy a H-szelvényű tartó pereme csatlakoztatva van az acéllemez (12) egyik oldalához.

13. A 8. igénypont szerinti acéllemezes (12) beton fal, amely tartalmaz továbbá

rögzítő furatot, amely bemegy az acéllemezbe (12) és a szerkezeti elembe (14).

14. A 13. igénypont szerinti acéllemezes (12) beton fal, amely tartalmaz továbbá

tartót (20), amely a rögzítő furaton keresztül az acéllemeznek (12) a másik oldalához van csatlakoztatva.