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(71) Applicants *(for all designated States except US)*: **KOREA HYDRO & NUCLEAR POWER CO., LTD** [KR/KR]; 167, Samseong-dong, Gangnam-gu, Seoul 135-791 (KR). **KOREA POWER ENGINEERING COMPANY, INC.** [KR/KR]; 360-9, Mabuk-dong, Giheung-gu, Yongin-si, Gyeonggi-do 446-713 (KR).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **LEE, Han-Woo** [KR/KR]; #303-1302, Mokryeon Apt., Dunsan-dong, Seo-gu, Daejeon 302-771 (KR). **KIM, Jong-Hak** [KR/KR]; #204-1402, Expo Apt., Jeonmin-dong, Yuseong-gu, Daejeon 305-761 (KR). **SUN, Won-Sang** [KR/KR]; 1FL., 49-3, Byeoryang-dong, Gwacheon-si, Gyeonggi-do 427-802 (KR). **KIM, Keun-Kyeong** [KR/KR]; #313-301, Olympic Seonsuchon Apt., Bangi-dong, Songpa-gu, Seoul 138-050 (KR). **HWANG, Geun-Ha** [KR/KR]; #108-1004, Hyundai Apt., Pungdeokcheon 1-dong, Suji-gu, Yongin-si, Gyeonggi-do 448-783 (KR). **LEE, Kwang-Jae** [KR/KR]; #203-904, Hyundai 4-cha Apt., Pyeongchon-dong, Dongan-gu, Anyang-si, Gyeonggi-do 431-070 (KR). **PARK, Dong-Su** [KR/KR]; #107-102, Samsung Pureun Apt., Jeonmin-dong, Yuseong-gu, Daejeon 305-727 (KR).

(74) Agent: **EZ INTERNATIONAL PATENT & TRADEMARK LAW OFFICE**; 404 BYC Bldg., 648-1, Yeoksam-dong, Gangnam-gu, Seoul 135-081 (KR).

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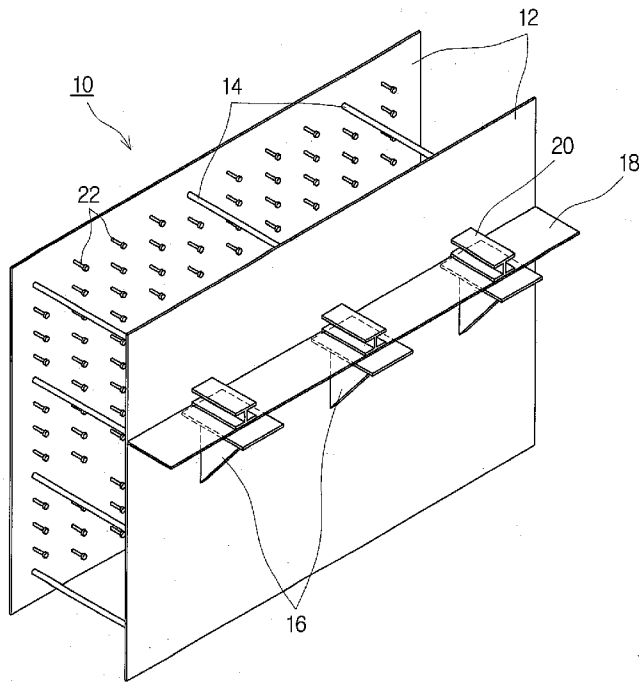
(54) Title: STEEL PLATE STRUCTURE AND CONSTRUCTION METHOD OF JOINT STRUCTURE OF WALL AND SLAB USING THE SAME

FIG. 2



(57) Abstract: A steel plate structure and a method of constructing a wall-slab joint structure are disclosed. The steel plate structure can include a pair of surface plates separated from each other with one side of one surface plate facing one side of the other surface plate, a strut maintaining a distance between the pair of surface plates, a strip panel that forms a portion of a slab plate and has one end joined to the other side of the surface plate along a width of the surface plate, and a bracket joined to the surface plate to support a lower surface of the strip panel. The steel plate structure can be used to prevent damage caused by collisions between the slab plate and the walls, and to provide a sufficient amount of work space for welding operations.

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【DESCRIPTION】

【Invention Title】

STEEL PLATE STRUCTURE AND CONSTRUCTION METHOD OF JOINT STRUCTURE OF WALL AND SLAB USING THE SAME

【Technical Field】

The present invention relates to a steel plate structure and to a method of constructing a wall-slab joint structure using the steel plate structure. More particularly, the present invention relates to a steel plate structure for forming a wall by joining a slab steel plate and casting concrete within, and to a method of constructing a wall-slab joint structure using the steel plate structure.

【Background Art】

With structures becoming taller and larger, it has become more important to provide higher strength and improved workability.

For reinforced concrete structures, steel frame structures, steel framed reinforced concrete structures, etc., which have been in common use, a structure may be constructed by assembling formwork and steel bars or steel frames, etc., and casting the concrete directly at the construction site, so that the construction duration may be increased and the quality may be made less reliable.

As an alternative to such structures, there has been more attention directed to the steel plate concrete structure, which is made by filling concrete on the inside of steel plates to provide desirable properties in terms of strength, load-bearing, strain characteristics, workability, etc.

The steel plate concrete wall is a wall made by filling in concrete between the pairs of steel plates and arranging studs, tie bars, etc., for keeping the concrete and the steel materials moving together, so that the steel plates and the concrete may move as an integrated body. In particular, the steel plate concrete wall can be utilized in the construction of large-scale structures such as nuclear power plants, etc., to reduce the construction time by using modularization.

When using a steel plate concrete wall, even if external loads cause the inside concrete to reach its failure point, the steel plates may continue to restrict the concrete, so that a greater level of load-bearing may be provided. Also, as the concrete is placed on the inside of the steel plates, the concrete can be prevented from being degraded by the external environment, so that the durability of the structure may be improved.

Joining a slab to a steel plate concrete wall may include joining a steel slab plate to the surface plate of the steel plate concrete wall, assembling reinforcing material such as steel bars, etc., over the slab plate, and casting concrete, to form a steel plate concrete wall-slab joint structure.

Figure 1 is a drawing illustrating a method of constructing a steel plate

concrete wall-slab joint structure according to the related art. In the descriptions that follow, the steel composition made from steel plates, etc., before casting the concrete to form a steel plate concrete structure wall, will be referred to as a "steel plate structure."

A steel plate concrete wall according to the related art may be constructed by assembling multiple steel plate structures, each made of a pair of surface plates 102 and struts 103 shaped as steel rods for maintaining the separation distance between the pair of surface plates 102, and then casting concrete in the space defined by the two surface plates 102. To facilitate the adhesion between the surface plates 102 and the concrete, a multiple number of studs 110 may be installed on the inner surfaces of the surface plates 102.

In joining a slab to such a steel plate concrete wall, a number of brackets 104 for supporting the slab plate 106 may be installed on the surface of each surface plate 102, the slab plate 106 may be installed on the brackets 104 while suspended from cables 108, and the ends of the slab plate may be welded to the surface plates 102. Afterwards, when the slab plate 106 is joined to the wall, reinforcing materials such as steel bars, etc. may be assembled over the slab plate, and concrete may be cast therein, to form a joint structure of a steel plate concrete wall-slab.

During the process of hoisting and installing the slab plate between the two walls, however, the lack of space between the slab plate and the walls, as illustrated in Figure 1, can result in collisions between the slab plate and the walls, damaging the slab

plate or walls.

In addition, the narrow work space for welding the slab plate to the surface plates of the walls may lead to a longer time for the welding operations.

Also, as the size of the slab joined to the wall is increased, so also is the load transferred to the surface plates of the steel plate concrete walls increased, whereby local deformations may occur in the surface plates to which the slab is joined.

【Disclosure】

【Technical Problem】

An aspect of the present invention is to provide a steel plate structure, and a method of constructing a wall-slab joint structure using the same, in which the slab plate is joined to the steel plate structure that has a portion of the slab plate joined beforehand. Thus, damage caused by collisions between the slab plate and the walls can be prevented, and a sufficient amount of work space for welding operations can be obtained.

Another aspect of the present invention is to provide a steel plate structure, and a method of constructing a wall-slab joint structure using the same, which includes structural members that share the load transferred from the slab to the surface plates, to prevent local buckling in the surface plates and effectively withstand axial forces or lateral forces applied on the walls.

【Technical Solution】

One aspect of the present invention provides a steel plate structure that includes a pair of surface plates separated from each other with one side of one surface plate facing one side of the other surface plate, a strut maintaining a distance between the pair of surface plates, a strip panel that forms a portion of a slab plate and has one end joined to the other side of the surface plate along a width of the surface plate, and a bracket joined to the surface plate to support a lower surface of the strip panel.

The steel plate structure can further include a deck panel that forms a remaining portion of the slab plate and has one end joined to the other end of the strip panel.

The bracket may extend longer than a width of the strip panel, and an end portion of the extended bracket may support a lower portion of one end of the deck panel.

The steel plate structure can also include a first girder, positioned on an upper surface of the strip panel and having one end joined to the surface plate, and a second girder, joined to an upper surface of the deck panel along a lengthwise direction of the first girder and having one end joined to the other end of the first girder.

A structural member can also be included that is rigidly joined in correspondence with the bracket to one side of the surface plate along a direction of

gravity.

The structural member may include a pair of a first structural member and a second structural member facing each other, with the first structural member and the second structural member joined to one side of the pair of surface plates, respectively. In such cases, the strut can be interposed and coupled between the first structural member and the second structural member.

The steel plate structure can also include a stud coupled protruding from one side of the surface plate.

Another aspect of the present invention provides a method of constructing a wall-slab joint structure using a steel plate structure comprising a pair of surface plates separated from each other and each having one side thereof facing each other, a strut maintaining a distance between the pair of surface plates, a strip panel forming a portion of a slab plate and having one end thereof joined to the other side of the surface plate along a width of the surface plate, and a bracket joined to the surface plate to support a lower surface of the strip panel. The method includes: forming a wall structure by joining a plurality of the steel plate structures such that the strip panel extends along a lengthwise direction, positioning a deck panel such that one end of the deck panel faces the other end of the strip panel, and forming a slab plate by welding one end of the deck panel with the other end of the strip panel.

The method can further include casting unhardened concrete between the pair

of surface plates. Also, the method can include casting unhardened concrete over the slab plate.

The bracket can extend longer than a width of the strip panel, and the positioning of the deck panel can include hoisting the deck panel such that an end portion of the extended bracket supports a lower portion of one end of the deck panel.

A first girder joined to the surface plate can be positioned on an upper surface of the strip panel, and a second girder can be joined to an upper surface of the deck panel along a lengthwise direction of the first girder, while the method can further include joining the first girder with the second girder, after the positioning of the deck panel.

【Description of Drawings】

Figure 1 is a drawing illustrating a method of constructing a steel plate concrete wall-slab joint structure according to the related art.

Figure 2 is a perspective view of a steel plate structure according to a first disclosed embodiment of the present invention.

Figure 3 is a side view of a portion of a steel plate structure according to the first disclosed embodiment of the present invention.

Figure 4 is a side view of a portion of a wall-slab joint structure according to the first disclosed embodiment of the present invention.

Figure 5 is a side view of a steel plate structure according to a second disclosed embodiment of the present invention.

Figure 6 is a plan view of a steel plate structure according to the second disclosed embodiment of the present invention.

Figure 7 is a flowchart illustrating a method of constructing a wall-slab joint structure according to a third disclosed embodiment of the present invention.

Figure 8 is a perspective view of a wall structure formed by joining steel plate structures according to the third disclosed embodiment of the present invention.

Figure 9 is a drawing illustrating a method of constructing a wall-slab joint structure using steel plate structures according to the third disclosed embodiment of the present invention.

<Description of Key Components>

10 : steel plate structure	12 : surface plate
14 : strut	16 : bracket
17 : reinforcing plate	18 : strip panel
19 : bolt	20, 26 : girder
22 : stud	24 : deck panel
27 : structural member	28 : cable

【Mode for Invention】

The steel plate structure, and the method of constructing a wall-slab joint structure using the steel plate structure, according to certain aspects 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 descriptions are omitted.

Figure 2 is a perspective view of a steel plate structure according to a first disclosed embodiment of the present invention, Figure 3 is a side view of a portion of a steel plate structure according to the first disclosed embodiment of the present invention, and Figure 4 is a side view of a portion of a wall-slab joint structure according to the first disclosed embodiment of the present invention. Illustrated in Figure 2 to Figure 4 are a steel plate structure 10, surface plates 12, struts 14, brackets 16, reinforcing plates 17, a strip panel 18, bolts 19, first girders 20, studs 22, a deck panel 24, and second girders 26.

A steel plate structure 10 according to the present embodiment can include a pair of surface plates 12 that are separated each with one side facing each other, struts 14 for maintaining the distance between the surface plates 12, a strip panel forming a portion of a slab plate 25 and having one end joined to the other side of a surface plate 12 along the width of the surface plate 12, and a number of brackets 16 joined to the surface plate 12 to support a lower surface of the strip panel 18. The steel plate structure 10 can be used to prevent damage caused by collisions between the slab plate and the

walls and to provide sufficient work space for welding operations.

The pair of surface plates 12 may be separated, each with one side facing each other, to define a particular space between the surface plates 12. This space is where the concrete is to be cast in later, and the distance between the surface plates 12 can be determined in accordance with the load that will be applied on the steel plate concrete wall.

When the wall is formed, the surface plates 12 will be integrated with the concrete to withstand the load. Also, the surface plates 12 may restrict the concrete after the concrete reaches its failure point, to thereby increase the load-bearing capacity of the steel plate concrete wall.

The struts 14 may maintain a distance between the pair of surface plates 12, so that the pair of surface plates 12 may provide the space in-between. A strut 14 can have both ends coupled to the pair of surface plates 12, respectively, to maintain the separation distance.

The struts 14 may maintain the distance between the surface plates 12 in consideration of the thickness of the wall, and may provide sufficient rigidity in consideration of operations for transporting the steel plate structure 10, etc. In the case of a wall for a large-scale structure, the large thickness of the wall may require a large distance between the two surface plates 12, and thus steel beams having high rigidity may be used for the struts 14.

Various types of structural materials, such as steel rods, L-beams, C-beams, H-beams, I-beams, T-beams, etc., can be used for the struts 14. This particular embodiment presents an example in which steel rod type struts 14 are used.

The strip panel 18, which may form a part of the slab plate 25, may be joined by one end to the other side of the surface plate 12 along a widthwise direction of the surface plate 12. The strip panel 18 can be a steel plate that is longer in one direction, where one end of the strip panel 18 may be joined to the other side of the surface plate 12, along an imaginary joining line by which the slab plate 25 is joined to the surface plate.

The slab plate 25 may be formed by joining the strip panel 18 with the deck panel 24, which will be described later in more detail. The slab plate 25 may form a slab structure, when reinforcing materials such as steel bars, etc., are assembled over the slab plate 25 and concrete is cast therein. The slab plate 25 may serve as formwork when casting the concrete, and after the concrete is cured, may serve as structural elements together with the surface plates 12 without being removed.

The strip panel 18 may be a portion of the slab plate 25 and may be joined to the surface plates 12 beforehand. The deck panel 24, as the remaining portion of the slab plate 25, may be joined to the strip panel 18 to form a single slab plate 25.

The location of the joint between the strip panel 18 and the deck panel 24 can be selected as the point at which the moment has a value of 0 (zero) according to

structural analysis.

A wall may be formed by joining many steel plate structures 10, which include a strip panel 18 joined beforehand as a portion of the slab plate 25, such that the strip panel 18 extends along a lengthwise direction. Thus, collisions of the deck panel 24 can be avoided during subsequent operations of hoisting the deck panel 24 and joining the deck panel 24 to the strip panel 18 to form the slab plate 25. Moreover, a sufficient work space can be obtained for operations of welding the strip panel 18 with the deck panel 24, increasing the reliability of the joining operations and reducing the construction time.

The brackets 16 may be joined to the surface plate 12 in such a way that the brackets 16 may support the lower surface of the strip panel 18. Many brackets 16 can be joined to the surface plate 12 in particular intervals, and can support the strip panel 18 to transfer the load applied on the strip panel 18, as well as the weight of the strip panel 18, to the wall.

A steel plate structure 10 according to the present embodiment can further include a deck panel 24, which may, as a remaining portion of the slab plate 25, have one end joined with the other end of the strip panel 18. The one end of the deck panel 24 may be joined with the other end of the strip panel 18 to form a single slab plate 25.

The brackets 16 can extend to a greater length than the width of the strip panel 18, in which case the deck panel 24 can be placed such that the lower portion of one end

of the deck panel 24 is in contact with the extended end portions of the brackets 16.

The first girders 20 may be located on an upper surface of the strip panel 18 and may each have one end joined to the surface plate 12. The second girders 26 may each have one end joined to the other end of a first girder 20, and may be joined to an upper surface of the deck panel 24 along the lengthwise directions of the first girders 20.

The first girders 20 and second girders 26 may have the respective end portions joined together and may be joined onto the slab plate 25 to support the load applied on the slab, together with the slab plate 25.

Along with the strip panel 18, the first girders 20 may be joined to the steel plate structure 10 beforehand, and the second girders 26 joined to the upper surface of the deck panel 24 may be hoisted with the deck panel 24 to be joined with the first girders 20.

The joining of one end of the second girder 26 with the other end of the first girder 20 can be achieved by aligning the cross sections and welding, or by adding reinforcing plates 17 and fastening with high-tension bolts 19 or rivets.

Various types of structural materials, such as L-beams, C-beams, H-beams, I-beams, T-beams, etc., can be used for the first girders 20 and second girders 26. This particular embodiment presents an example in which H-beams having equal cross-sections are used for both the first girders 20 and second girders 26.

The steel plate structure 10 according to the present embodiment can also

include studs 22 that are coupled protruding from one side of the surface plate 12. The studs 22 may be embedded in the concrete and may allow the surface plates 12 and the concrete to move together as an integrated body, so that the combined effect of the surface plates 12 and concrete may withstand external loads.

The studs 22 may be arranged uniformly over one side of the surface plate 12 in such a way that the concrete and the surface plates 12 are integrated over the entire area.

Figure 5 is a side view of a steel plate structure according to a second disclosed embodiment of the present invention, and Figure 6 is a plan view of a steel plate structure according to the second disclosed embodiment of the present invention. Illustrated in Figure 5 and Figure 6 are surface plates 12, struts 14, brackets 16, a strip panel 18, a first girder 20, studs 22, and structural members 27.

A steel plate structure according to the present embodiment may include load-bearing structural members 27, which can bear loads together with the surface plates 12 and concrete and share the load transferred to the surface plates 12, to prevent local deformations in the surface plate 12 and effectively withstand axial or lateral forces applied on the wall.

The structural members 27 may be rigidly joined to one side of the steel plate along a direction of gravity, in correspondence with the brackets 16 joined to the other side of the surface plate 12.

The structural members 27 may share the loads transferred through the brackets 16 with the surface plate 12, and may withstand the loads applied on the steel plate concrete wall along with the surface plates 12 and the concrete. The structural members 27 and the brackets 16 joined with the surface plate 12 in-between may be structurally rigidly joined to one and the other side of the surface plate 12, respectively, to prevent local deformations in the surface plate 12 and effectively withstand the loads applied on the slab.

The structural members 27 can be arranged along a direction of gravity, to withstand axial forces, as well as lateral forces caused by earthquakes, wind, etc., applied on the steel plate concrete wall. That is, the structural members 27 may be coupled to one side of the surface plate 12 in a longitudinal direction of the steel plate concrete wall. Together with the concrete and the surface plates 12, the structural members 27 may withstand loads in the axial direction, as well as shear forces in the lateral direction caused by earthquakes, etc., when the steel plate concrete wall is rigidly joined to the foundation.

As the structural members 27 may serve as structural elements in addition to the surface plates 12 and the concrete, the overall thickness of the steel plate concrete wall can be reduced, to be useful in forming a wall in a large-scale structure, and the thickness of the surface plates 12 can be reduced, to reduce the amount of thermal deformations during welding operations.

Furthermore, the structural members 27 can prevent deformations in the steel plate structure 10 due to eccentricity or twisting while the steel plate structure 10 are transported after manufacture at the factory, and can also prevent deformations in the steel plate structure 10 due to the lateral pressure applied by uncured concrete while casting the concrete in the steel plate structure 10.

Methods of rigidly joining the surface plates 12 and the structural members 27 can include rigidly joining the surface plates 12 with the structural members 27 using high-tension bolts or rivets, and welding the structural members 27 to the surface plates 12, so that the structural members 27 may move as an integrated body with the surface plates 12.

Various types of structural materials, such as L-beams, H-beams, I-beams, T-beams, etc., can be used for the structural members 27. This particular embodiment presents an example in which H-beams are used for the structural members 27 with the flanges of the H-beams rigidly joined to one side of the surface plate 12.

The structural members 27 can be joined to one side of each of the pair of surface plates 12, in pairs of a first structural member and a second structural member that face each other. When rigidly joining the structural members 27 to a pair of surface plates 12, the structural members 27 can be arranged facing each other, as illustrated in Figure 5. In such cases, the struts 14 maintaining the distance between the pair of surface plates 12 can be interposed and coupled between pairs of opposing structural

members 27. In this way, the surface plates 12, structural members 27, and struts 14 can be joined as an integrated body, to efficiently bear the load transferred from the brackets 16.

The combined effect of the surface plates 12, concrete, and structural members 27 can increase the load-bearing strength, so that a thick wall, for skyscrapers, power plants, etc., can be formed without increasing the thickness of the surface plates 12. Thus, since the load-bearing strength can be increased without increasing the thickness of the surface plates 12, the minimized thicknesses for the surface plates 12 allow easy manufacture and installation of the steel plate structure 10. Moreover, in cases where the steel plate structure 10 is modularized and assembled on site, the module sizes may be increased.

Figure 7 is a flowchart illustrating a method of constructing a wall-slab joint structure according to a third disclosed embodiment of the present invention. Figure 8 is a perspective view of a wall structure formed by joining steel plate structures according to the third disclosed embodiment of the present invention, and Figure 9 is a drawing illustrating a method of constructing a wall-slab joint structure using steel plate structures according to the third disclosed embodiment of the present invention. Illustrated in Figure 8 and Figure 9 are steel plate structures 10, surface plates 12, struts 14, brackets 16, a strip panel 18, first girders 20, studs 22, a deck panel 24, second girders 26, and cables 28.

The construction method for a wall-slab joint structure according to the present embodiment can utilize steel plate structures 10 that each include a pair of surface plates 12 separated from each other and each having one side facing each other, one or more struts 14 maintaining a distance between the pair of surface plates 12, a strip panel 18 forming a portion of a slab plate and having one end joined to the other side of a surface plate 12 along a width of the surface plate 12, and one or more brackets 16 joined to the surface plate 12 to support a lower surface of the strip panel 18. The method may include forming a wall structure by joining the steel plate structures 10 such that the strip panel 18 extends along a lengthwise direction, positioning a deck panel 24 such that one end of the deck panel 24 faces the other end of the strip panel 18, and forming a slab plate by welding one end of the deck panel 24 with the other end of the strip panel 18. Thus, the method can be used to prevent damage caused by collisions between the slab plate and the walls, and to provide a sufficient work space for welding operations.

As the components of the steel plate structure 10 have already been described in detail for the embodiment presented above, the descriptions for the components of the steel plate structure 10 will not be repeated.

The method of constructing a wall-slab joint structure will be described as follows with reference to Figure 8 and Figure 9. First, as illustrated in Figure 8, a wall structure may first be formed by joining a multiple number of steel plate structures 10 such that the strip panel 18 extends along a lengthwise direction (S100). Several steel

plate structures 10, to which a strip panel 18 has been joined beforehand to form a portion of the slab plate, may be joined together with the strip panel 18 extending along the lengthwise direction, to form the wall structure.

While Figure 8 illustrates a wall structure in which two steel plate structures 10 are joined horizontally such that the strip panel 18 extends in one direction, it is obvious that the wall structure can be formed in a variety of configurations by joining any number of steel plate structures 10.

It is possible to join the steel plate structures 10 for forming the wall structure by welding the end portions together or by adding reinforcing plates and fastening with high-tension bolts or rivets, etc. The strip panel 18 joined to the steel plate structures 10 may extend along the lengthwise direction, and the end portions may be welded together.

Next, as illustrated in Figure 9, the deck panel 24 may be positioned such that one end of the deck panel 24 faces the other end of the strip panel 18 (S200). With the deck panel 24 suspended on the cables 28 of a crane, the deck panel 24 may be hoisted and arranged such that the end portion of the deck panel 24 and the other end of the strip panel 18 face each other. In the present embodiment, the brackets 16 may extend longer than the width of the strip panel 18, so that the deck panel 24 may be placed on the end portions of the extended brackets 16.

Next, a slab plate may be formed by welding one end of the deck panel 24 with

the other end of the strip panel 18 (S300).

The slab plate can be formed by joining the strip panel 18 and the deck panel 24 together. The slab plate may form a slab structure, when reinforcing materials such as steel bars, etc., are assembled over the slab plate and concrete is cast therein. The slab plate formed by joining the strip panel 18 with the deck panel 24 may serve as formwork when casting the concrete, and after the concrete is cured, may serve as structural elements together with the surface plates 12 without being removed.

The strip panel 18 may be a portion of the slab plate and may be joined to the surface plates 12 beforehand. The deck panel 24, as the remaining portion of the slab plate, may be joined to the strip panel 18 to form a single slab plate.

When the slab plate is formed, unhardened concrete can be cast and cured in the spaces defined by the surface plates 12 and above the slab plate, whereby a wall-slab joint structure can be constructed.

Of course, it is also possible to construct the wall-slab joint structure by forming wall structures, immediately casting and curing unhardened concrete between the surface plates 12 to form steel plate concrete walls, and afterwards arranging and welding the deck panel 24 to form the slab plate and casting concrete over the slab plate.

The first girders 20 joined to the surface plate 12 may be located on an upper surface of the strip panel 18, while the second girders 26 may be joined to an upper

surface of the deck panel 24 along a lengthwise direction of the first girders 20. In such cases, a process of joining the first girders 20 with the second girders 26 may be included, after the process of positioning the deck panel 24.

The first girders 20 and second girders 26 may thus be joined together at the ends, and also joined onto the slab plate, so as to support the load applied on the slab along with the slab plate.

The first girders 20 may be joined beforehand, together with the strip panel 18, to the steel plate structure 10, and the second girders 26 joined to an upper surface of the deck panel 24 may be hoisted together with the deck panel 24 and joined to the first girders 20. The joining of one end of a second girder 26 with the other end of a first girder 20 can be implemented by providing matching cross sections and welding, or adding reinforcing plates and fastening with high-tension bolts or rivets.

The other components of the present embodiment are substantially the same as those described above, and thus will not be described again.

While the present invention has been described with reference to particular embodiments, it is to be appreciated that various changes and modifications may be made by those skilled in the art without departing from the spirit and scope of the present invention, as defined by the appended claims below.

【Industrial Applicability】

Certain aspects of the present invention can be used to prevent damage incurred by collisions between the slab plate and the walls during the hoisting of the slab plate, and to provide a sufficient amount of work space for welding operations, so that construction times may be reduced.

In addition, structural members may be included, which share the load transferred from the slab to the surface plates, to prevent local deformations in the surface plates.

【CLAIMS】

【Claim 1】

A steel plate structure comprising:

a pair of surface plates separated from each other, each of the surface plates having one side thereof facing each other;

a strut maintaining a distance between the pair of surface plates;

a strip panel having one end thereof joined to the other side of the surface plate along a width of the surface plate, the strip panel forming a portion of a slab plate; and

a bracket joined to the surface plate to support a lower surface of the strip panel.

【Claim 2】

The steel plate structure according to claim 1, further comprising a deck panel having one end thereof joined to the other end of the strip panel, the deck panel forming a remaining portion of the slab plate.

【Claim 3】

The steel plate structure according to claim 2, wherein the bracket extends longer than a width of the strip panel, and an end portion of the extended bracket supports a lower portion of one end of the deck panel.

【Claim 4】

The steel plate structure according to any one of claim 1 through claim 3, further comprising:

a first girder positioned on an upper surface of the strip panel and having one end thereof joined to the surface plate; and

a second girder having one end thereof joined to the other end of the first girder, the second girder joined to an upper surface of the deck panel along a lengthwise direction of the first girder.

【Claim 5】

The steel plate structure according to any one of claim 1 through claim 4, further comprising a structural member rigidly joined in correspondence with the bracket to one side of the surface plate along a direction of gravity.

【Claim 6】

The steel plate structure according to claim 5, wherein the structural member comprises a pair of a first structural member and a second structural member facing each other, the first structural member and the second structural member joined to one side of the pair of surface plates, respectively.

【Claim 7】

The steel plate structure according to claim 6, wherein the strut is interposed and coupled between the first structural member and the second structural member.

【Claim 8】

The steel plate structure according to any one of claim 1 through claim 7, further comprising a stud coupled protruding from one side of the surface plate.

【Claim 9】

A method of constructing a wall-slab joint structure using a steel plate structure, the steel plate structure comprising a pair of surface plates separated from each other and each having one side thereof facing each other, a strut maintaining a distance between the pair of surface plates, a strip panel forming a portion of a slab plate and having one end thereof joined to the other side of the surface plate along a width of the surface plate, and a bracket joined to the surface plate to support a lower surface of the strip panel, the method comprising:

forming a wall structure by joining a plurality of the steel plate structures such that the strip panel extends along a lengthwise direction;

positioning a deck panel such that one end of the deck panel faces the other end

of the strip panel; and

forming a slab plate by welding one end of the deck panel with the other end of the strip panel.

【Claim 10】

The method according to claim 9, further comprising casting unhardened concrete between the pair of surface plates.

【Claim 11】

The method according to claim 9 or claim 10, further comprising casting unhardened concrete over the slab plate.

【Claim 12】

The method according to any one of claim 9 through claim 11, wherein the bracket extends longer than a width of the strip panel, and the positioning of the deck panel comprises hoisting the deck panel such that an end portion of the extended bracket supports a lower portion of one end of the deck panel.

【Claim 13】

The method according to any one of claim 9 through claim 12, wherein:

a first girder joined to the surface plate is positioned on an upper surface of the strip panel, and a second girder is joined to an upper surface of the deck panel along a lengthwise direction of the first girder; and

the method further comprises, after the positioning of the deck panel, joining the first girder with the second girder.

FIG. 1

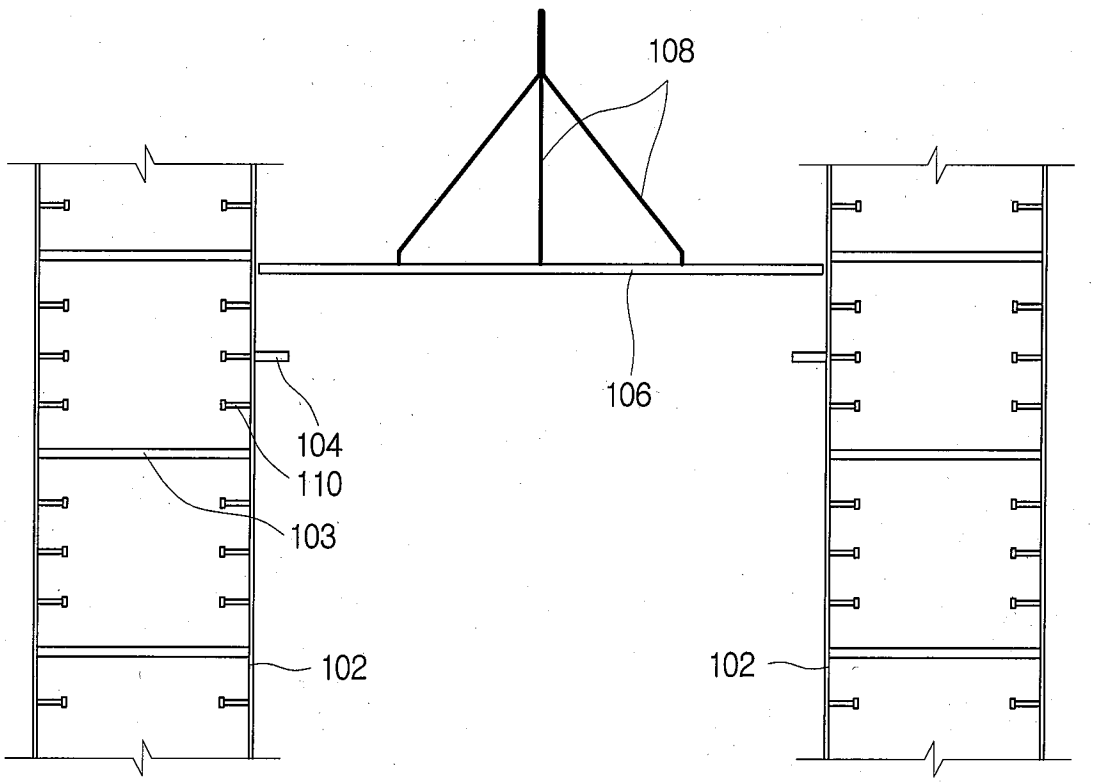

FIG. 2

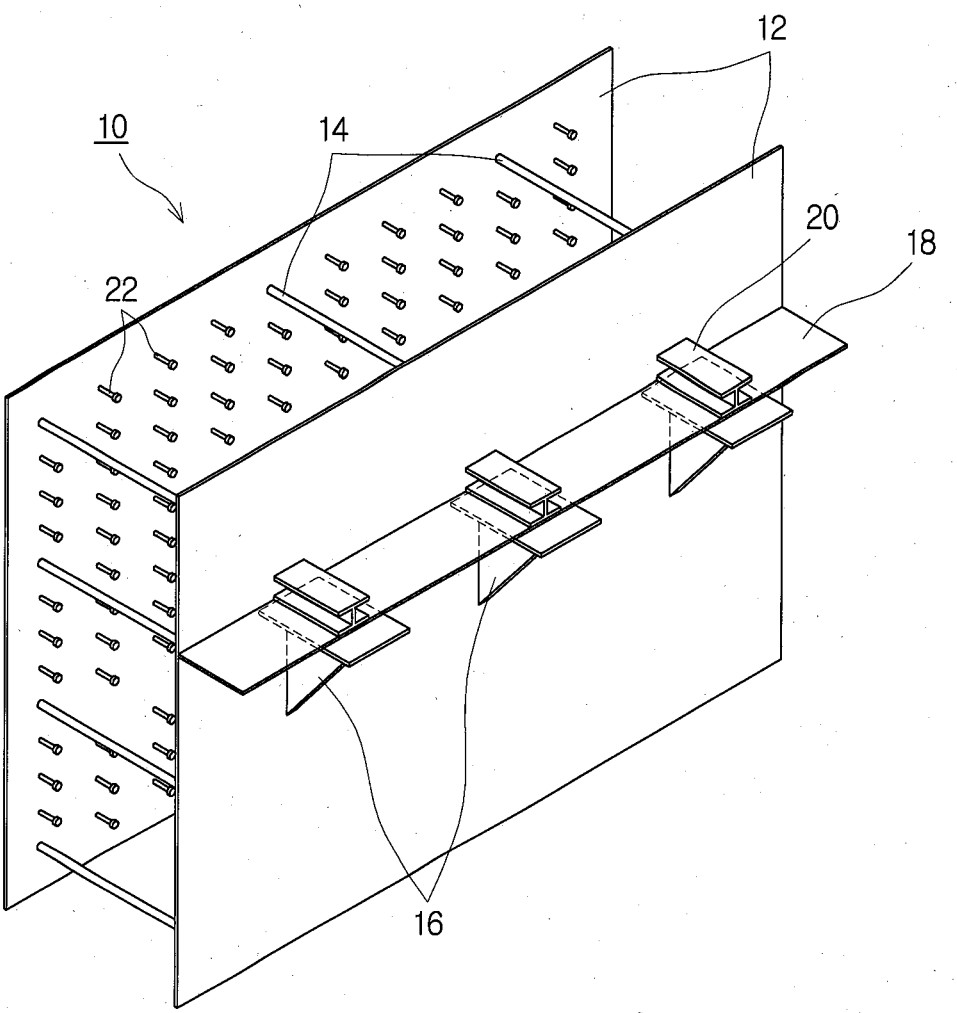

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FIG. 3

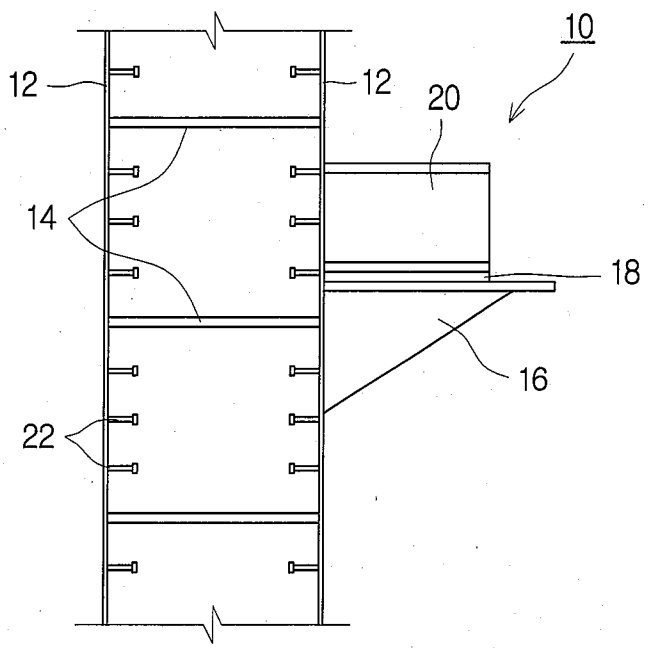
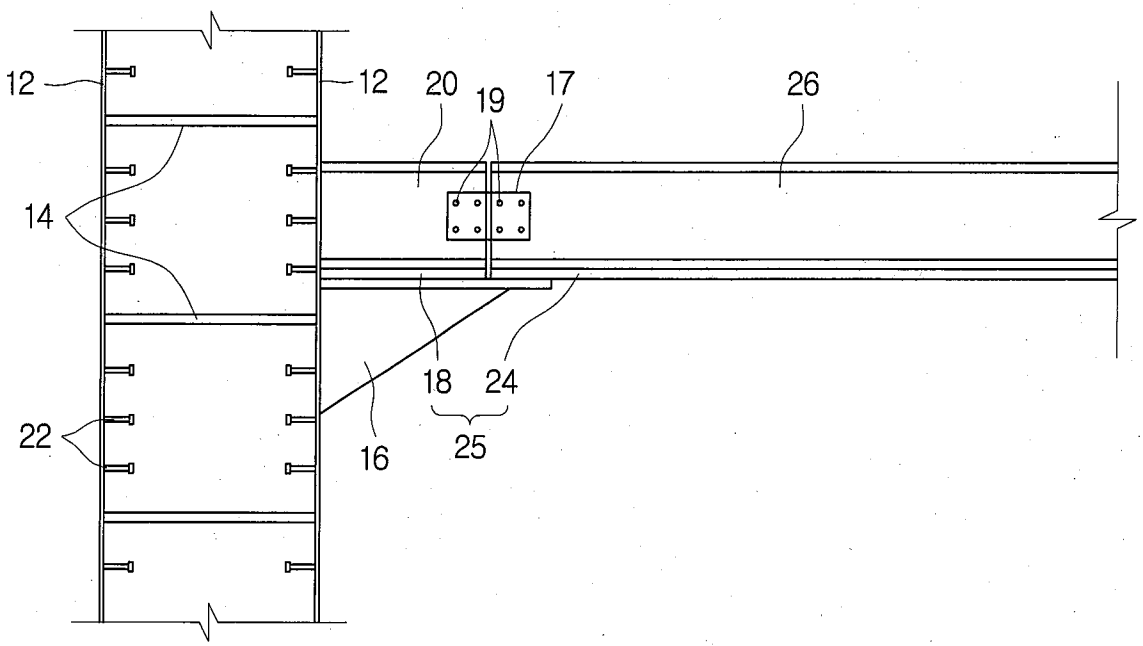


FIG. 4



5/9
FIG. 5

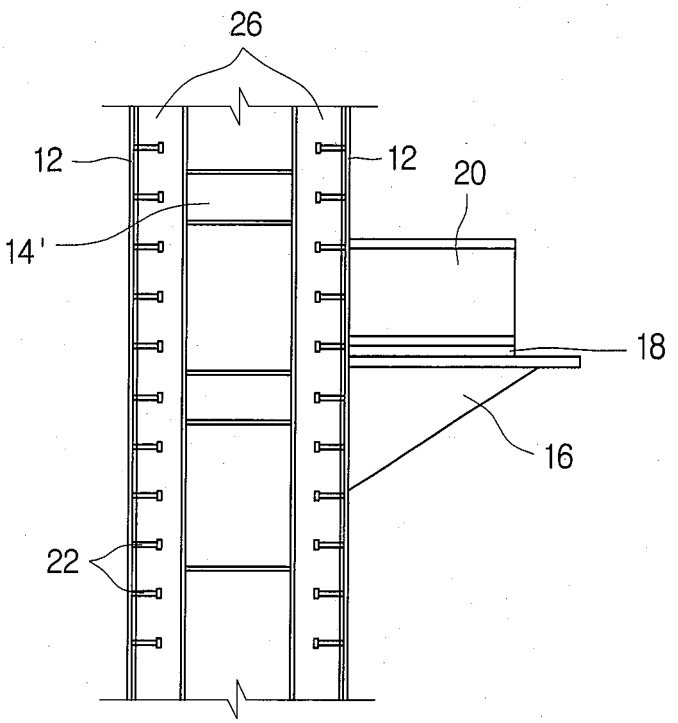


FIG. 6

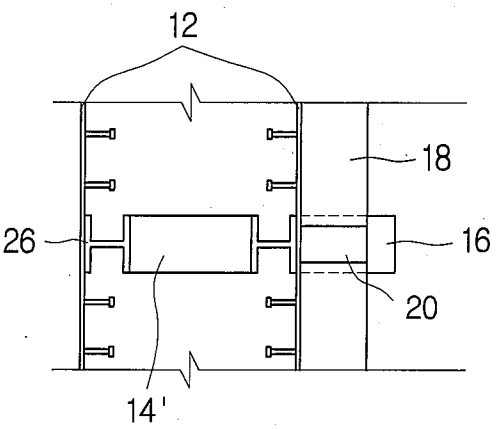


FIG. 7

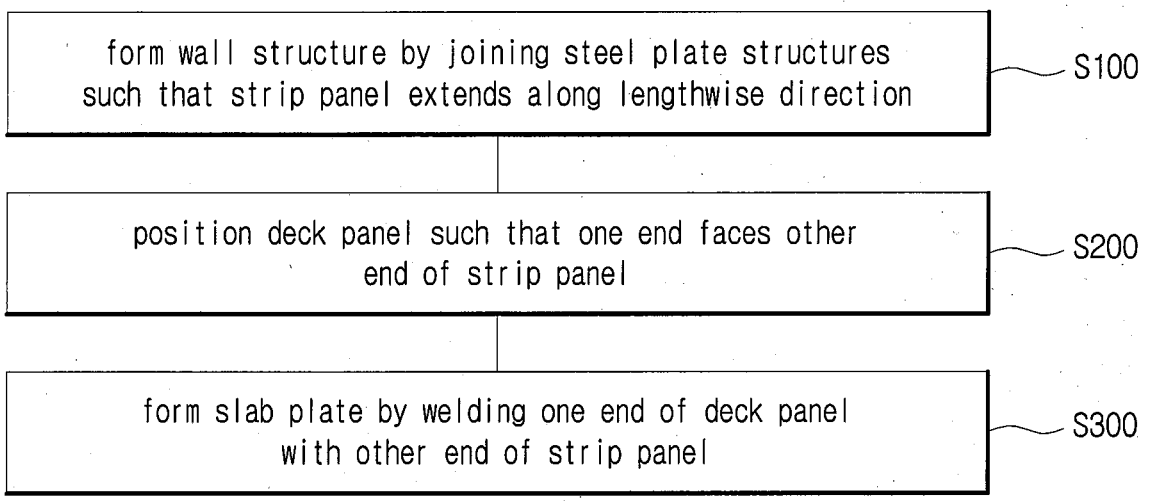

form wall structure by joining steel plate structures such that strip panel extends along lengthwise direction
S100
position deck panel such that one end faces other end of strip panel
S200
form slab plate by welding one end of deck panel with other end of strip panel
S300

FIG. 8

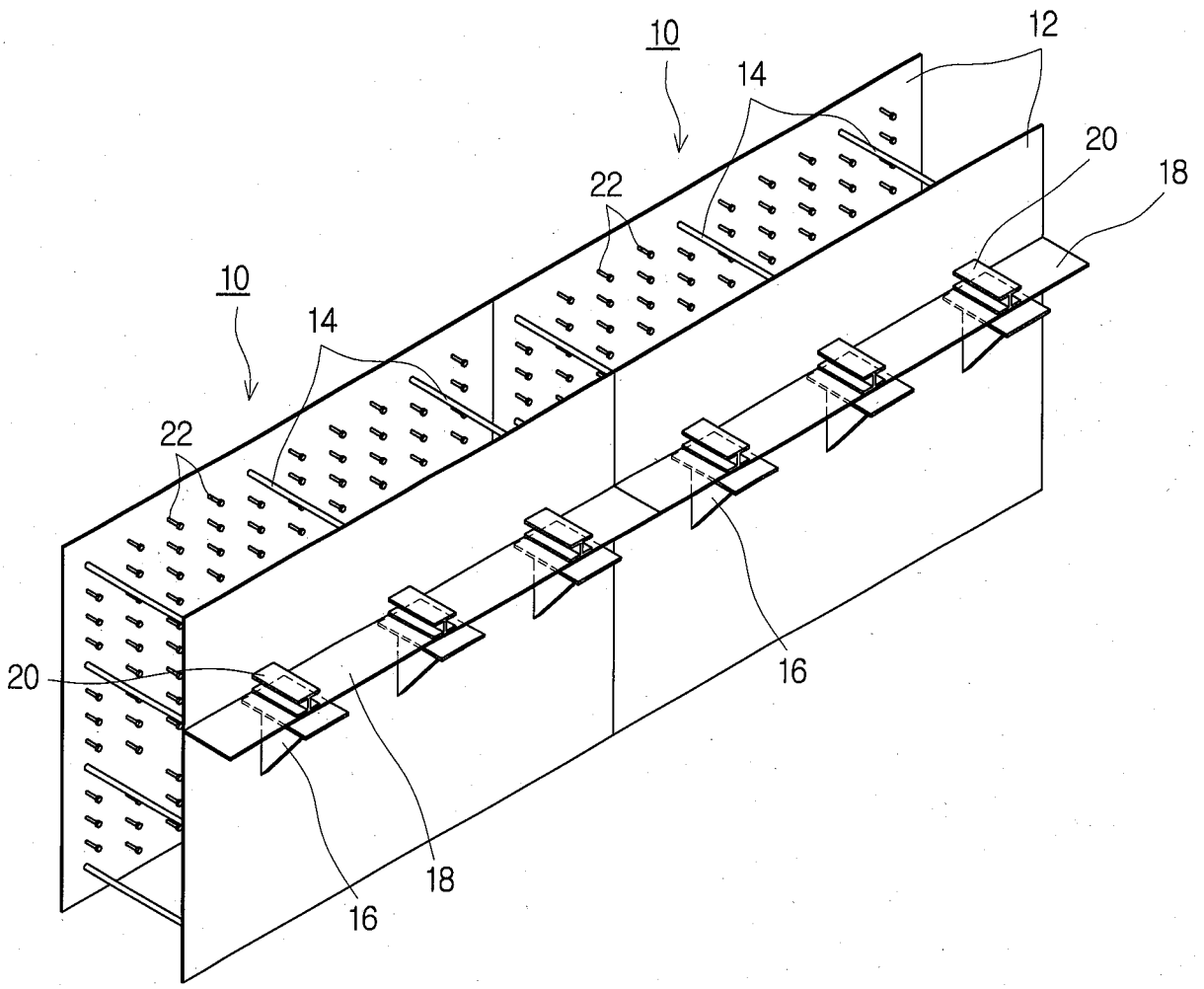
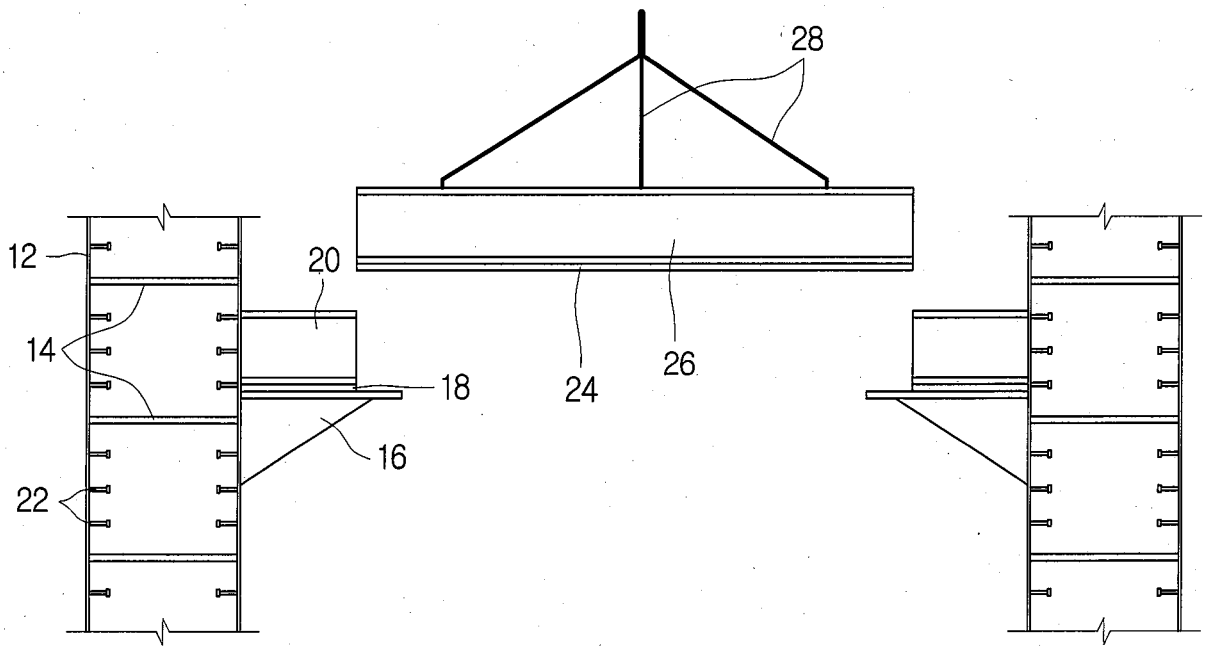


FIG. 9



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2008/007141

A. CLASSIFICATION OF SUBJECT MATTER

E04B 1/02(2006.01)i

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)

IPC 8 : E04B 1/02

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

Korean Utility Models and applications for Utility Models since1975

Japanese Utility Models and applications for Utility Models since1975

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

eKIPASS(KIPO internal) & Keyword : "strut", "concrete", and "steel plate"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005-189043 A (TOSHIBA INC.) 14 July 2005 See figure 1.	1-13
A	KR 10-2003-0036380 A (KIM, TAE HAN) 09 May 2003 See abstract and figure 1.	1-13
A	KR 20-0202713 Y1 (KIM, EUL HEI) 15 November 2000 See figure 2.	1-13
A	US 6,250,033 B1 (RONALD D. ZELINSKY) 26 June 2001 See figures 1 and 7.	1-13
A	US 4,178,729 A (RALPH L. JENNINGS) 18 December 1979 See abstract and figure 1.	1-13

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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
28 AUGUST 2009 (28.08.2009)	**31 AUGUST 2009 (31.08.2009)**

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon, 139 Seonsa-ro, Seo-gu, Daejeon 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

LEE, Won Jae

Telephone No. 82-42-481-8449

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2008/007141

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required addtional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2008/007141

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2005-189043 A	14.07.2005	None	
KR 102003036380 A	09.05.2003	None	
KR 200202713 Y1	15.11.2000	None	
US 6250033 B1	26.06.2001	None	
US 4178729 A	18.12.1979	None	