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(54) **LIGHT STEEL KEEL CONNECTING STRUCTURE**

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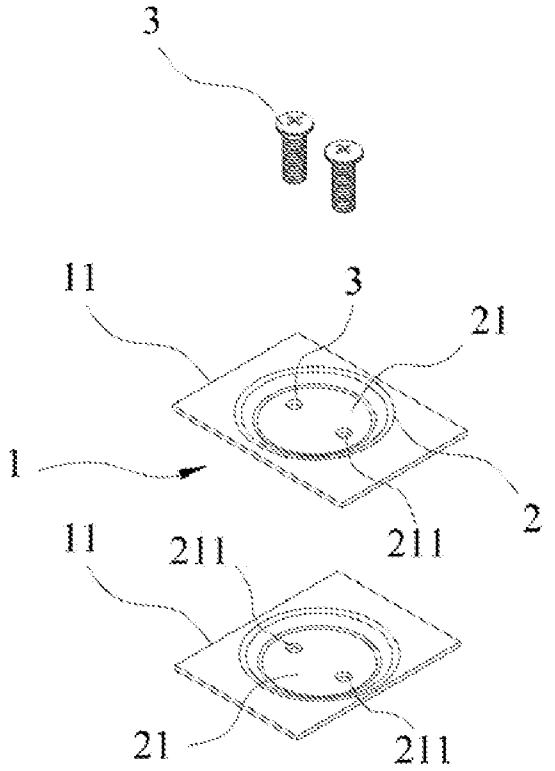
(57) **ABSTRACT**

A light steel keel connecting structure, comprising at least two light steel keels, each of which has a connecting surface connecting with the other light steel keel, and connecting pieces for connecting the light steel keels, characterized in that concaves are provided on each of the connecting surfaces respectively which are depressed toward inside of the light steel keels, and the concaves of two connecting surfaces which are connected vertically are disposed by way of embedding, and at least two connecting holes are provided at corresponding positions of two concaves that are embedded, respectively, and the connecting pieces are provided within the connecting holes in a state of connection. The terminals of the connecting pieces at one end where depression sides of the concaves are located do not go beyond outer edges of the openings of the concaves on the same side as the terminals of the connecting pieces. At the junction of the light steel keel connecting structure of the invention, there is provided, a concave structure, for which, a mechanized mass production can be implemented very easily. The positioning is extremely easy during assembling, because concave structures of upper and lower connecting surfaces are engaged with each other. Strength of connection and rigidity of light steel keels are greatly improved. Top surfaces of connecting pieces can be wholly submerged in the concave, and accordingly, they will not cause interference to other connecting components on surfaces of the light steel keels.



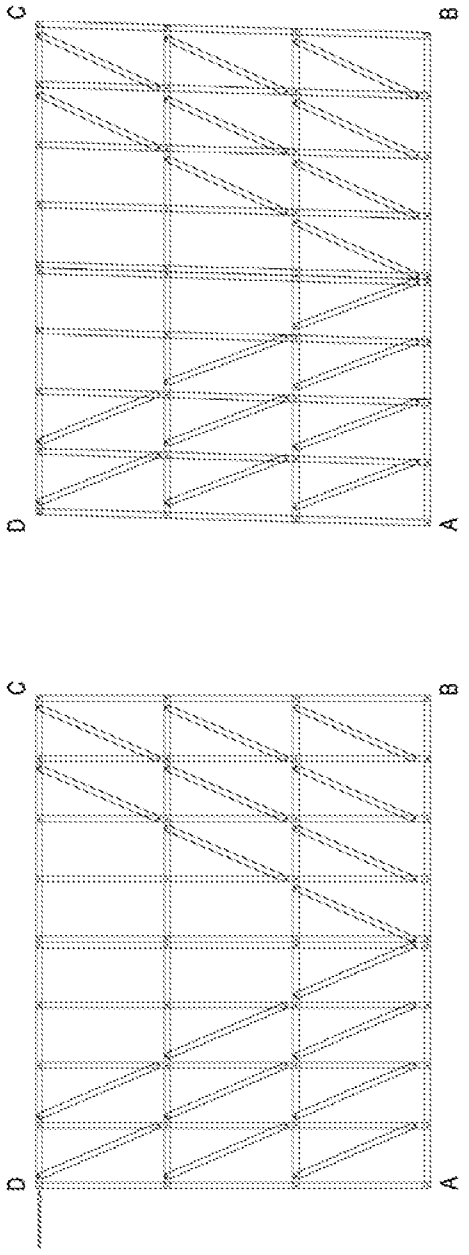


FIG.1

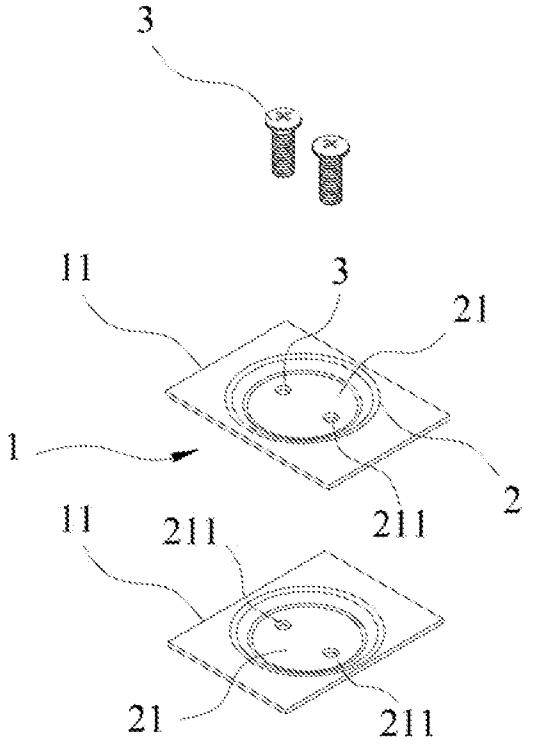


FIG.2

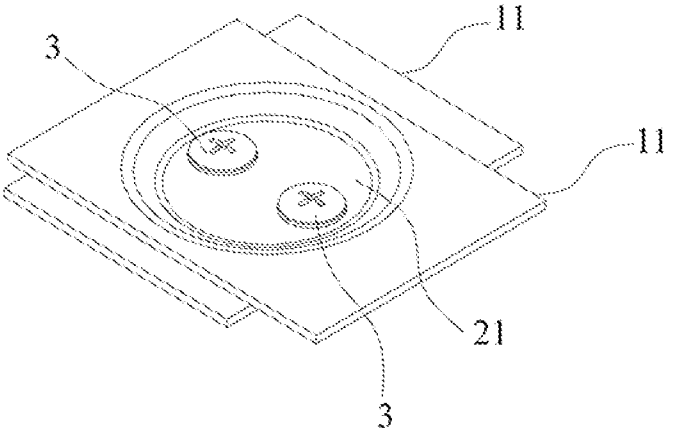


FIG.2A

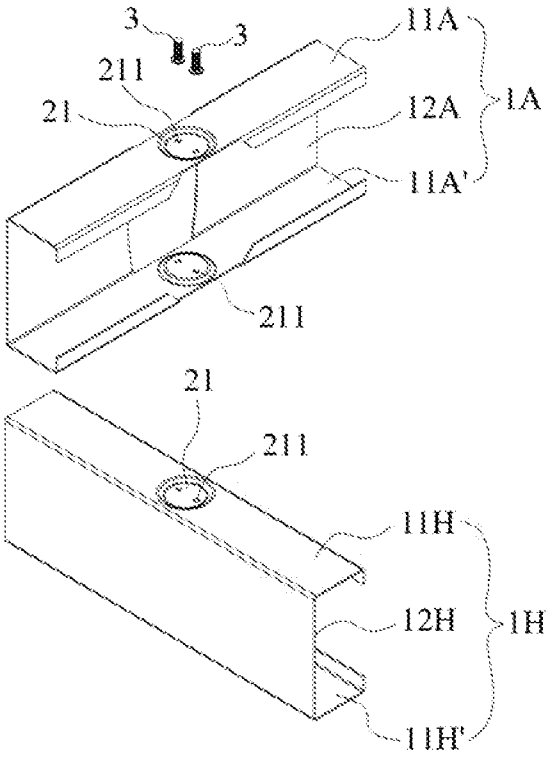

3
3
11A
211
21
12A
1A
11A'
211
21
211
11H
12H
1H
11H'

FIG.3

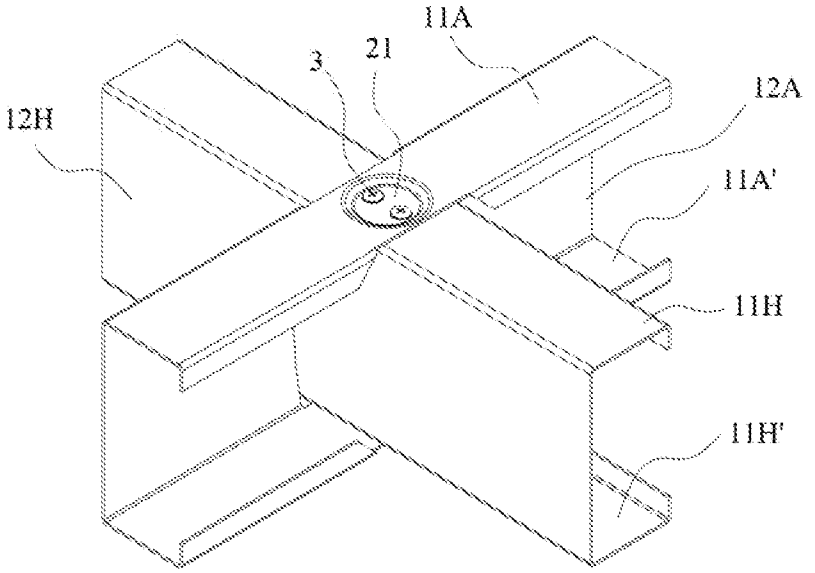

11A
3
21
12A
12H
11A'
11H
11H'

FIG.3A

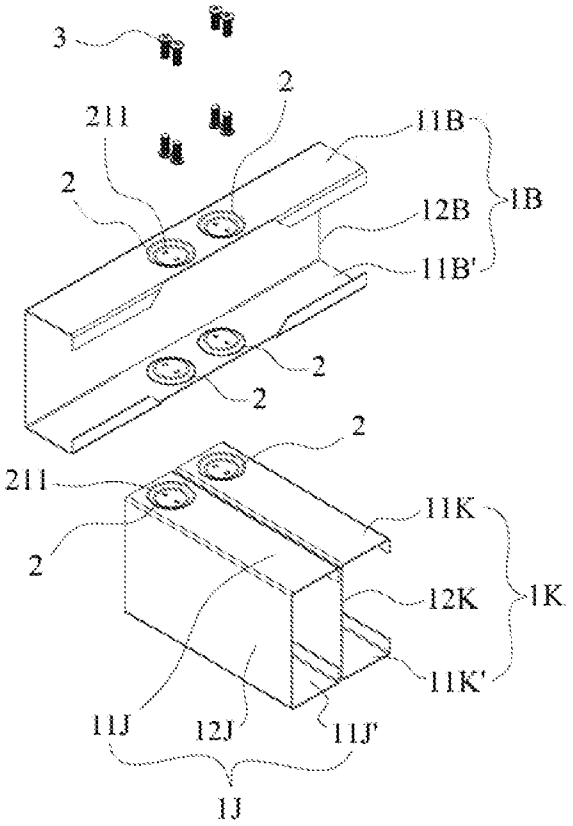

3
2
211
11B
2
12B
1B
11B'
2
2
2
211
11K
2
12K
1K
11K'
11J
12J
11J'
1J

FIG.4

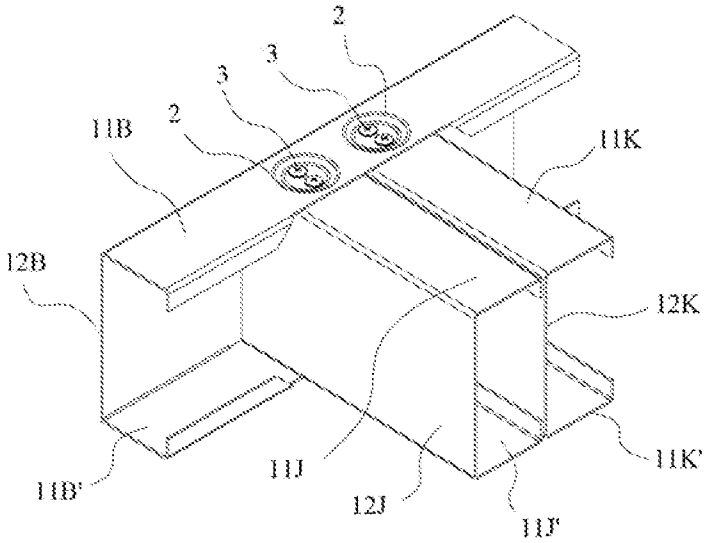

2
3
3
2
11B
11K
12B
12K
11B'
11J
12J
11K'
11J'

FIG.4A

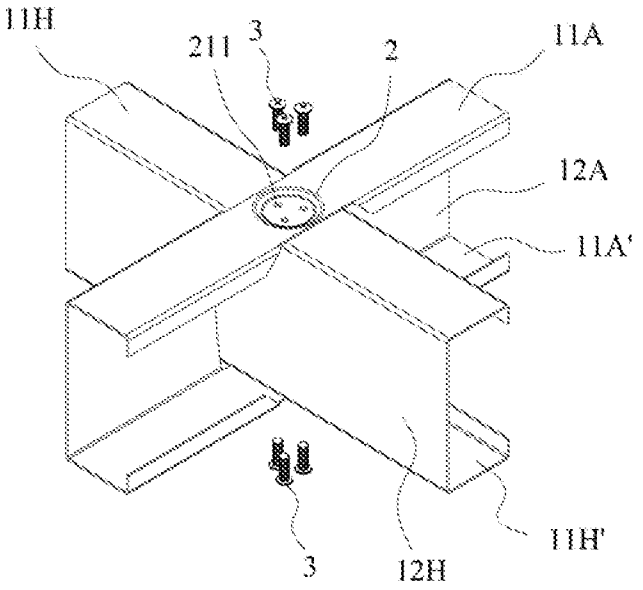


FIG.5

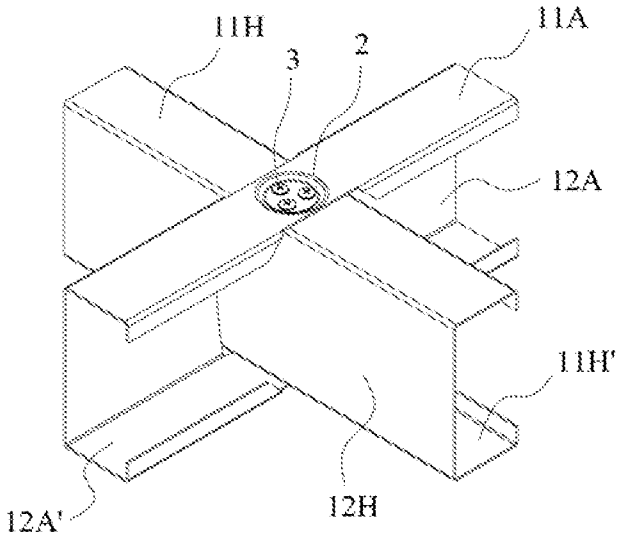


FIG.5A

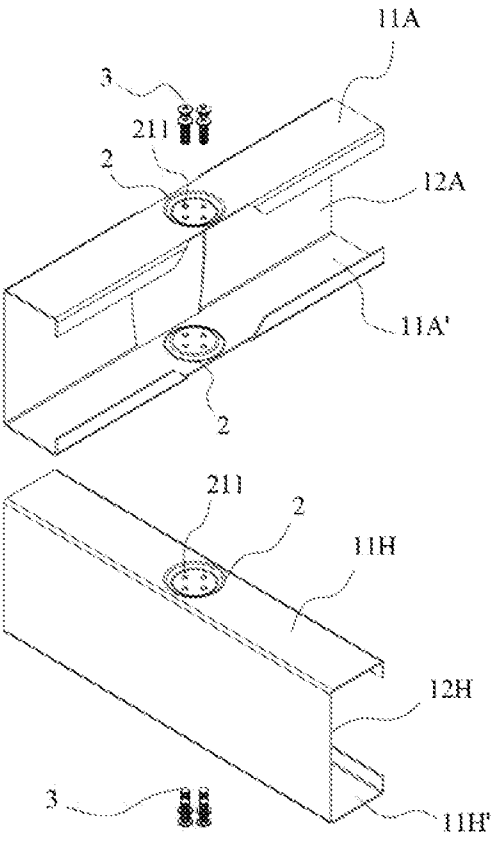


FIG.6

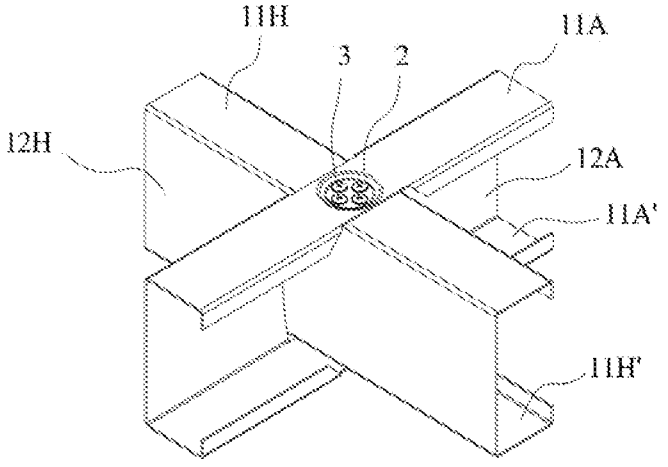


FIG.6A

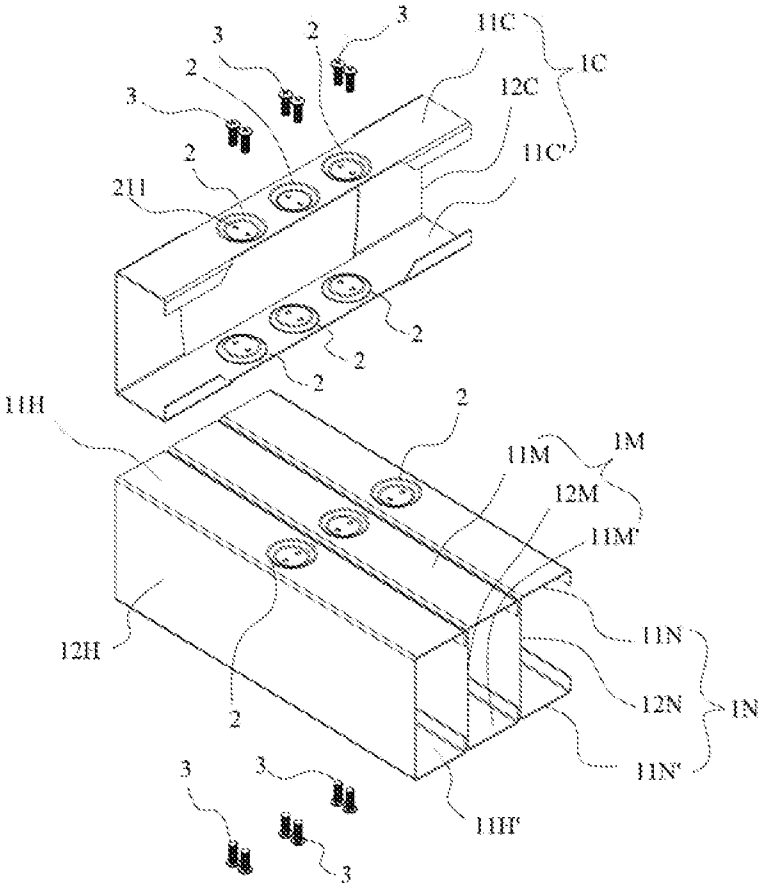

11C
1C
12C
11C'
2
3
2U
11H
11M
1M
12M
11M'
11N
12N
1N
11N'
12H
11H'

FIG.7

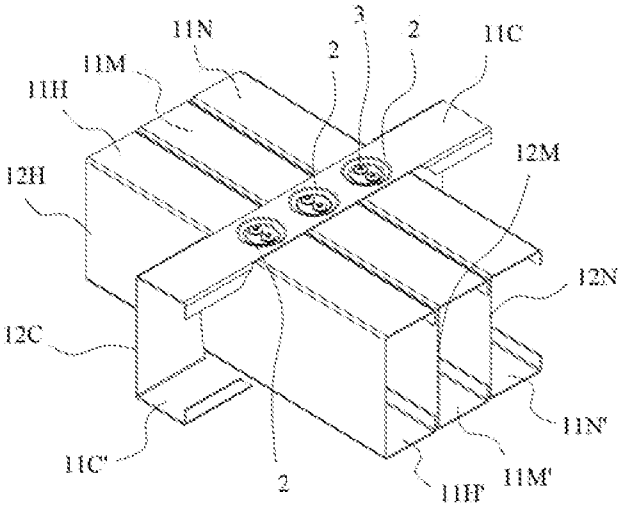

11N
3
2
11C
11M
11H
12M
12H
12N
12C
11N'
11C'
11M'
11H'

FIG.7A

LIGHT STEEL KEEL CONNECTING STRUCTURE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a steel structure for construction use, and particularly, to a connecting structure of light steel keels.

[0003] 2. Description of the Related Art

[0004] With the rapid development of building industry, new construction materials continue to emerge, and light steel keel as a new construction material has been more and more widely used in various building structures because of its excellent properties of light weight, high strength, waterproof, fireproof, earthquake-proof installation and use convenience, and so on. In the course of constructing a structure with light steel keel, different light steel keels generally need to be connected with one another, and what is usually used for the connection is such a manner as welding, bolt connection or riveting.

[0005] Considering the current situation of light steel application, it is necessary that a connecting structure for connection of the light steel keels meet certain requirements: ① requirements on strength, such as, as static strength, a fatigue strength, etc.; ② size requirements, such as, requirements on the center distance between screws, bolts or rivets and the distance from a single center to any side; ③ stiffness requirements, for example, requirements on rigidity of the structure which should be strong enough so that a deformation upon resistance to an external load should be small enough not to cause cracking and breakage of a construction material attached thereto, such as a gypsum board; ④ process requirements, such as easy and simple processing, reliable operation and stable quality; ⑤ and furthermore, from the perspective of structural design, requirements on material cost advantages such as reduced material weight and lowered material cost, resulted from the design of such a connecting structure.

[0006] By adopting a welding connection, although the above requirements in strength, size and stiffness can be met, this connecting manner is an undetachable connection, such that the recyclability of material is poor, the operation is relatively complex and the pollution to environment is relatively large. Therefore, what is comparatively common is that a detachable connecting manner of bolt connection or riveting is adopted all the same.

[0007] In order to allow the connecting structure of light steel keels, which adopts a detachable connecting manner, to meet the above strength requirements of connection, increasing the diameter of connecting pieces will generally be taken into consideration. However, because the thickness of steel products used for the light steel keels is thin, and the connecting structure has to meet the above size requirements as well, the diameter of the connecting pieces used such as screws, bolts, rivets or the like may not be made too large. Thus, it is impossible that very high requirements on strength are met by the connecting structure with the use of this method.

[0008] And, an existing light steel keel connecting structure that adopts a detachable connecting manner cannot reach very good stiffness requirements, either, and detailed explanation is as follows. A typical structure of light steel wall is shown in FIG. **1**, in which, a figure on the left side shows the structure of light steel wall in a normal condition where no force acts on it, and a figure on the right side shows the structure of light steel wall after it is deformed by a force. As can he seen from FIG. **1**, in the event that an existing connecting structure is employed, although there is also a diagonal bracing structure for reinforcing the rigidity of the structure, the structure will be deformed along a diagonal direction in the plane as well, and this kind of deformation will be very obvious upon assembling of the structure. That is, in the figure on the left side, if a fixed constraint is applied to a point B, and a lateral thrust is applied to a point D, then as can be seen from the figure on the right side, deformation of the structure is very obvious in this case. Taking a light steel wall with a size of 2800 (height)×3800 mm (width) as an example, when a load of 40 KG is applied to the point D, the difference in length between diagonal lines AC and BD will reach 60 mm (while the difference between the diagonal lines in case of no deformation is 0), and this deformation tends to bring about damage to the structure itself and to the decoration materials attached to light steel, such as a gypsum board.

[0009] Also, because an existing light steel keel connecting structure cannot reach very high strength and stillness requirements, it is usually necessary to increase the arranging density of light steel keels of a light steel assembly so as to ensure stability of the assembly when the connecting structure is in use. In such a way, the above requirements of decreasing, the material weight and reducing the material cost, which needs to be met by the connecting structure, may not be met favorably.

SUMMARY OF THE INVENTION

[0010] The main purpose of the invention is to solve such a technical problem suffered by a light steel keel connecting structure in prior art that, strength of connection and rigidity of the structure are not high and the material weight of an assembly that employs the connecting structure is hard to decrease to reduce the material cost.

[0011] For solving the above technical problem, the invention provides a light steel keel connecting structure comprising at least two light steel keels, each of which has a connecting surface connecting with the other light steel keel, and connecting pieces for connecting the light steel keels, characterized in that concaves are provided on each of the connecting surfaces respectively which are depressed toward inside of the light steel keels, and the concaves of two connecting surfaces which are connected vertically are disposed by way of embedding, and at least two connecting holes are provided at corresponding positions of two concaves that are embedded, respectively, and the connecting pieces are provided within the connecting holes in a state of connection.

[0012] In the light steel keel connecting structure, the terminals of the connecting pieces at one end where depression sides of the concaves are located do not go beyond outer edges of the openings of the concaves on the same side as the terminals of the connecting pieces.

[0013] In the light steel keel connecting structure, the center distance between any two adjacent connecting pieces is not smaller than three times of the diameter of the connecting pieces, and the distance from the center of any of the connecting pieces to any of the outer edges of the light steel keels is not smaller than one and half times of the diameter of the connecting pieces.

[0014] In the light steel keel connecting structure, the openings of the concaves are slightly larger than bottom surfaces, and the connecting holes are provided on the bottom surfaces of the concaves.

[0015] In the light steel keel connecting structure, the shapes of bottom surfaces of the two concaves that are embedded vertically are shapes of circle, cross, square, rectangle, or ring, which match to each other vertically.

[0016] In the light steel keel connecting structure, the light steel keels comprise a main light steel keel and at least one abutting light steel keel, which are connected to each other, each of the main light steel keel and the abutting light steel keel comprises an upper wing plate and a lower wing plate that are disposed horizontally and in parallel, and a web connected vertically between one side of the upper wing plate and one side of the lower wing plate, the concaves are disposed at location where the upper wing plate of the main light steel keel and the upper wing plate of the abutting light steel keel are connected and at location where the lower wing plate of the main light steel keel and the lower wing plate of the abutting light steel keel are connected, and concaves on the upper and lower wing plates of the main light steel keel are embedded inside concaves on the upper and lower wing plates of the abutting light steel keel, respectively.

[0017] In the light steel keel connecting structure, the number of the abutting light steel keel is one, the upper and lower wing plates of the main light steel keel are provided one said concave in symmetric positions of the upper and lower wing plates of the main light steel keel ,respectively, the upper and lower wing plates of the abutting light steel keel are also provided one said concave in symmetric positions of the upper and lower wing plates of the abutting light steel keel, respectively.

[0018] In the light steel keel connecting structure, the number of the abutting light steel keel is two or more, and the upper and lower wing plates of the main light steel keel are provided with concaves arranged in a line in symmetric positions of the upper and lower wing plates of the main light steel keel, respectively, the number of cavities is equal to the number of the abutting light steel keel, and the upper and lower wing plates of each abutting light steel keel is provided with one of said concave in symmetric positions of the upper and lower wing plates of each abutting light steel keel, respectively.

[0019] In the light steel keel connecting structure, the concaves are disposed in the middle part of the upper and lower wing plates of the main light steel keel, one end of the upper wing plate of the abutting light steel keel and one end of the lower wing plate of the abutting light steel keel, and the main light steel keel is connected to one end of the abutting light steel keel.

[0020] In the light steel keel connecting structure, the concaves are disposed in the middle part of the upper and lower wing plates of the main light steel keel and in the middle part of the upper and lower wing plates of the abutting light steel keel, the abutting light steel keel penetrates through the web of the main light steel keel vertically, and the middle part of the main light steel keel and the middle part of the abutting light steel keel are connected in the state of penetrating through vertically.

[0021] The present invention possesses the following beneficial effects. At the junction of the light steel keel connecting structure of the invention, there is provided a concave structure, for which, a mechanized mass production can he implemented very easily.

[0022] The positioning is extremely easy during assembling because concave structures of upper and lower connecting surfaces are engaged with each other. Besides, two connecting pieces or more can be accommodated within the concave structure, so that strength of connection and rigidity of light steel keels are greatly improved as well. A load will be shared by connecting pieces because two connecting pieces or more are used for connection at one connecting point, thus enhancing the strength of connection. And also, it will not be easy for relative rotation of the connected light steel keels to occur at the connecting point any longer owing to constraint of the two connecting pieces or more, thus rigidity of the structure is greatly enhanced.

[0023] Furthermore, the light steel keel connecting structure can reach very high requirements on strength and stiffness, so that arranging density of light steel keels of a light steel assembly that employs the connecting structure can be decreased appropriately, and accordingly, the weight of material is decreased, and the cost of material is reduced. Also, the concave structure has a certain depth so that top surfaces of connecting pieces can he wholly submerged in the concave, and accordingly, they will not cause interference to other connecting components on surfaces of the light steel keels.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024] FIG. **1** is a schematic view showing deformation of a light steel wall under force that employs a light steel, keel connecting structure in prior art (a figure on the left side in FIG. **1** shows the structure of the light steel wall in a normal condition where no force acts on it, and a figure on the right side shows the structure of the light steel structure after it is deformed by a force);

[0025] FIG. **2** is a schematic view showing the exploded structure of the joint of the light steel keel connecting structure according to the invention;

[0026] FIG. **2**A is a structurally schematic view showing the joint of the light steel keel connecting structure according to the invention;

[0027] FIG. **3** is a schematic view showing an exploded structure of embodiment 1 of the light steel keel connecting structure according to the invention;

[0028] FIG. **3**A is a schematic view showing as connecting structure of embodiment 1 of the light steel keel connecting structure according to the invention;

[0029] FIG. **4** is a schematic view showing an exploded structure of embodiment 2 of the light steel keel connecting structure according to the invention;

[0030] FIG. **4**A is a schematic view showing a connecting structure of embodiment 2 of the light steel keel connecting structure according to the invention;

[0031] FIG. **5** is a schematic view showing an exploded structure of embodiment 3 of the light steel keel connecting structure according to the invention;

[0032] FIG. **5**A is a schematic view showing a connecting structure of embodiment 3 of the light steel keel connecting structure according to the invention;

[0033] FIG. **6** is a schematic view showing an exploded structure of embodiment 4 of the light steel keel connecting structure according to the invention;

[0034] FIG. **6**A is a schematic view showing a connecting structure of embodiment 4 of the light steel keel connecting structure according to the invention;

[0035] FIG. **7** is a schematic view showing an exploded structure of embodiment 5 of the light steel keel connecting structure according to the invention;

[0036] FIG. **7**A is a schematic view showing a connecting structure of embodiment 5 of the light steel keel connecting structure according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0037] In order to further illustrate the principle and structure of the invention, preferred embodiments of the invention will now be described in detail in conjunction with accompanied drawings.

[0038] Referring to those shown in FIG. **2** to FIG. **7**A, a light steel keel connecting structure according to the invention comprises at least two light steel keels **1**, at least two concaves and at least two connecting pieces **3**.

[0039] Each of the light steel keels **1** has a connecting surface **11** connected with other light steel keel.

[0040] The concaves **2** are provided on connecting surfaces **11**, respectively, and are depressed toward inside of the light steel keels **1** so as to form a bottom surface **21**, and concaves **2** on two connecting surfaces **11** that are connected vertically are disposed by way of engagement. The opening of the concave **2** is slightly larger than the bottom surface **21**. The shapes of bottom surfaces of two concaves **2** that are embedded vertically may be shapes of circle, cross, square, rectangle, or ring, which match with each other vertically. When the bottom surface **21** is circle, it is unnecessary to consider an issue about direction setting, and if it has other shape, then the direction along which up-down embedding is conducted has to be considered, and other aspects are the same as in the case of circular shape. For the sake of illustrative convenience, the description will be given below only to an example in which the bottom surface **21** is circle. A connecting hole **211** is provided on the bottom surface **21** and the number of the connecting hole **211** within each of the concaves **2** is at least two. Regarding connecting holes **211**, they are arranged at corresponding locations of two concaves **2** that are embedded vertically, so that two connecting holes **211** (i.e. upper and lower connecting holes **211**) overlap upon connection.

[0041] The connecting pieces **3** may be screws, bolts or rivets, and the connecting pieces **3** are provided within the connecting holes **211** that overlap with each other vertically in the state of connection. Upon setting of the connecting holes **211** it is to be noted that the following dimensions are ensured: after the connecting pieces **3** are inserted into the connecting holes **211**, the center distance between any two adjacent connecting pieces **3** is not smaller than three times of the diameter of the connecting pieces **3**, and the distance from the center of any connecting piece **3** to any outer edge of the light steel keel **1** is not smaller than one and half times of the diameter of the connecting piece **3**. And, the set depth of the concaves **2** may be taken into account, and when the connecting pieces **3** are inserted, terminals (such as screw heads, bolt heads, rivet heads or the like) of the connecting pieces **3** at one end where depression sides of the concaves **2** are located do not go beyond outer edges of openings of the concaves **2** on the same side as the terminals of the connecting pieces **3**.

[0042] Embodiment 1: please refer to those shown in FIG. **3** and FIG. **3**A.

[0043] In the present embodiment, the light steel keel **1** comprises a main light steel keel **1**A and an abutting light steel keel **1**H, which are connected to each other perpendicularly.

[0044] The main light steel keel **1**A comprises an upper wing plate **11**A and a lower wing plate **11**A', which are disposed horizontally and in parallel, and it further comprises a web **12**A connected vertically between one side of the upper wing plate **11**A and one side of the lower wing plate **11**A'. The upper wing plate **11**A and the lower wing plate **11**' are provided with a concave **2** in symmetric positions thereof, respectively. The concave **2** may be provided in the middle part of the upper wing plate **11**A and the lower wing, plate **11**A'.

[0045] The abutting light steel keel **1**H comprises an upper wing plate **11**H and a lower wing plate **11**H' that are disposed horizontally and in parallel, and further comprises a web **12**H connected vertically between one side of the upper wing plate **11**H and one side of the lower wing plate **11**H'. In central, symmetric positions, The upper wing plate **11**A and the lower wing plate **11**A' are provided with a concave **2** in symmetric positions of middle part of upper wing plate **11**A and the lower wing plate **11**' respectively. The abutting light steel keel **1**H passes through the web **12**A of the main light steel keel **1**A vertically, and moreover, the upper wing plate **11**H' is connected to an inner side of the upper wing plate **11**A, and the lower wing plate **11**H' is connected to an inner side of the lower wing plate **11**A'. A concave **2** on the upper wing plate **11**A is embedded inside a concave **2** on the upper wing plate **11**H, and a concave **2** on the lower wing plate **11**N is embedded inside a concave **2** on the lower wing plate **11**H'.

[0046] Two connecting holes **211** are provided on a bottom surface **21** of each concave **2**.

[0047] The connecting holes **211** on two concaves **2**, which are embedded vertically overlap so that two fixing hole-sites are formed on each of upper and lower wing plates.

[0048] The number of the connecting pieces **3** is four. The four connecting pieces **3** are located within the fixing hole-sites in the state of connection, respectively. Top surfaces of the connecting pieces **3** do not go beyond outer surfaces of the upper wing plate **11**A and the lower wing plate **11**A'.

[0049] Embodiment 2: please refer to those shown in FIG. **4** and FIG. **4**A.

[0050] In the present embodiment, the light steel keel **1** comprises a main light steel keel **1**B and two abutting light steel keels **1**J and **1**K, which are connected to each other perpendicularly.

[0051] The main light steel keel **1**B comprises an upper wing plate **11**B and a lower wing plate **11**B' that are disposed horizontally and in parallel, and it further comprises a web **12**B connected vertically between one side of the upper wing plate **11**B and one side of the lower wing plate **11**B'. The upper wing plate **11**B and the lower wing plate **11**B' are provided with two concaves **2** arranged in a line in symmetric positions thereof, respectively. The concaves **2** may be set in the middle part of the upper wing plate **11**B and the lower wing plate **11**B'.

[0052] The abutting light steel keel **1**J comprises an upper wing plate **11**J and a lower wing plate **11**J' that are disposed horizontally and in parallel, and it further comprises a web **12**J connected vertically between one side of the upper wing plate **11**J and one side of the lower wing plate **11**J'. The upper wing plate **11**J and the lower wing plate **11**J' at one end are provided with a concave **2** in symmetric positions thereof respectively.

[0053] The abutting light steel keel **1**K comprises an upper wing plate **11**K and a lower wing plate **11**K' that are disposed horizontally and in parallel, and it further comprises a web **12**K connected vertically between one side of the upper wing plate **11**K and one side of the lower wing plate **11**K'. The

upper wing plate **11**K and the lower wing plate **11**K' at one end are also provided with a concave **2** in symmetric positions thereof respectively.

[0054] One end of the abutting light, steel keel **1**J and one end of the abutting light steel keel **1**K are connected vertically to an inner side of the main light steel keel **1**B, and moreover, the upper wing plate **11**J and the upper wing plate **11**K are connected to an inner side of the upper wing plate **11**B, and the lower wing plate **11**J' and the lower wing plate **11**K' are connected to an inner side of the lower wing plate **11**B". Two concaves **2** on the upper wing plate **11**B are embedded inside concaves **2** on the upper wing plate **11**J and the upper wing plate **11**K, respectively, and two concaves **2** on the lower wing plate **11**B' are embedded inside concaves **2** on the lower wing plate **11**J' and the lower wing plate **11**K', respectively.

[0055] In the present embodiment, the structure of a single concave **2** is the same as that in Embodiment 1, and repetitive descriptions are omitted here. The number of the connecting pieces **3** is four-pair, connecting pieces **3** in each pair are disposed within two fixing hole-sites that are formed through two overlapped connecting holes **211** on two concaves, which are embedded vertically. Top surfaces of the connecting pieces **3** do not go beyond outer surfaces of the upper wing plate **11**B and the lower wing plate **11**B'.

[0056] Embodiment 3: please refer to those shown in FIG. **5** and FIG. **5**A.

[0057] The light steel keel connecting structure in the present embodiment differs from Embodiment 1 in that, three connecting holes **211** are provided on the bottom surface **21** of the concave **2**, and connecting holes **211** on two concaves **2** that are embedded vertically overlap so as to form three fixing hole-sites on each of upper and lower wing plates, but other parts have the same structure as that in Embodiment 1. The number of the connecting pieces **3** is six, and the six connecting pieces **3** are provided within the fixing hole-sites in the state of connection, respectively.

[0058] Embodiment 4: please refer to those shown in FIG. **6** and FIG. **6**A.

[0059] The light steel keel connecting structure in the present embodiment differs from Embodiment 1 in that, four connecting holes **211** are provided on the bottom surface **21** of the concave **2**, and connecting holes **211** on two concaves **2** that are embedded vertically overlap so as to form four fixing hole-sites on each of upper and lower wing plates, but other parts have the same structure as that in Embodiment 1. The number of the connecting pieces **3** is eight, and the eight connecting pieces **3** provided within the fixing hole-sites in the state of connection, respectively.

[0060] Embodiment 5: please refer to those shown in FIG. **7** and FIG. **7**A.

[0061] In the present embodiment, the light steel keel **1** comprises one main light steel keel **1**C and three abutting light steel keels, which are connected to each other perpendicularly. The three abutting light steel keels are an abutting light steel keel **1**H, an abutting light steel keel **1**M and an abutting light steel keel **1**N.

[0062] The main light steel keel **1**C comprises an upper wing plate **11**C and a lower wing plate **11**C' that are disposed horizontally and in parallel, and it further comprises a web **12**C connected vertically between one side of the upper wing plate **11**C and one side of the lower wing plate **11**C'. The upper wing plate **11**C and the lower wing plate **11**C' are provided with three concaves **2** arranged in a line, respectively, and the concaves **2** may be provided in the middle part of the upper wing plate **11**C and the lower wing plate **11**C'.

[0063] The abutting light steel keel **1**H has the same structure as that in embodiment 1, and repetitive descriptions are omitted here.

[0064] The abutting light steel keel 1M comprises an upper wing plate **11**M and a lower wing plate **11**M' that are disposed horizontally and in parallel, and it further comprises a web **12**M connected vertically between one side of the upper wing plate **11**M and one side of the lower wing plate **11**M'. The upper wing plate **11**M and the lower wing plate **11**M' are provided with a concave **2** in symmetric positions of middle part of the upper wing plate **11**M and the lower wing plate **11**M', respectively.

[0065] The abutting light steel keel **1**N comprises an upper wing plate **11**N and a lower wing plate **11**N' that are disposed horizontally and in parallel, and it further comprises a web **12**N connected vertically between one side of the upper wing plate **11**N and one side of the lower wing plate **11**N'. The upper wing plate **11**N and the lower wing plate **11**N' are also provided with a concave **2** in symmetric positions of middle part of the upper wing plate **11**N and the lower wing plate **11**N', respectively.

[0066] The abutting light steel keel **1**H, the abutting light steel keel **1**M and the abutting light steel keel **1**N pass through the web **12**C of the main light steel keel **1**C vertically, respectively, and moreover, the upper wing plate **11**H, the tipper wing plate **11**M and the upper wing plate **11**N are connected to an inner side of the upper wing plate **11**C, respectively, and the lower wing plate **11**H', the lower wing plate **11**M' and the lower wing plate **11**N' are connected to an inner side of the lower wing plate **11**C, respectively. Three concaves **3** on the upper wing plate **11**C are embedded inside concaves **2** on the upper wing plate **11**H, the upper wing plate **11**M and the upper wing plate **11**N, respectively, and three concaves **2** on the lower wing plate **11**C' are embedded inside concaves **2** on the lower wing plate **11**H', the lower wing plate **11**M' and the lower wing plate **11**N', respectively.

[0067] In the present embodiment, the structure of a single concave **2** is the same as that in embodiment 1, and repetitive descriptions are omitted here. The number of the connecting pieces **3** is six-pair, connecting pieces **3** in each pair are provided within two fixing hole-sites that are formed through overlapped connecting holes **211** on two concaves, which are embedded vertically, and top surfaces of the connecting pieces **3** do not go beyond outer surfaces of the upper wing plate **11**C and the lower wing plate **11**C'.

[0068] Here, one point should be noted, namely, the number of connecting holes **211** on each concave **2** in each of above embodiments can be adjusted accordingly in accordance with desired strength and stillness upon a practical connection and degree of size of connecting pieces **3**, and is not limited to the situations listed in the above embodiments.

[0069] At the junction of the light steel keel connecting structure of the invention, there is provided a concave structure, for which, mechanized mass production is implemented very easily. Positioning is extremely easy during assembling because concave structures of upper and lower connecting surfaces are embedded to each other.

[0070] Besides, two connecting pieces or more can he accommodated within the concave structure simultaneously so that strength of connection and rigidity of light steel keels are greatly improved as well. A load will be shared by connecting pieces because two connecting pieces or more are

used for connection at one connecting junction, thus enhancing the strength of connection, it will not be easy for relative rotation of the connected light steel keels to occur at the connecting point any longer owing to constraint of the two connecting pieces or more, thus greatly enhancing rigidity of the structure. Furthermore, the light steel keel connecting structure can reach very high requirements in strength and stillness so that arranging density of light steel keels on a light steel assembly that employs the connecting structure can be decreased appropriately (as seen from resultant analytical data of a design example, the consumption of material saved by using this connecting structure can reach 15% or more), and accordingly, the weight of material is decreased, and the cost of material is reduced. Also, the concave structure has a certain depth so that top surfaces of connecting pieces can be wholly submerged in the concave, and accordingly, they will not cause interference to other connecting components on surfaces of the light steel keels.

[0071] However, descriptions made above are merely preferred, feasible embodiments, and are not construed as limiting of protection scope of the invention. Therefore, every equivalent change in structure, which is made by using contents in the specification and drawings of the invention, is embraced within the protection scope of the invention.

What is claimed is:

1. A light steel keel connecting structure, comprising at least two light steel keels, each of which has a connecting surface connecting with the other light steel keel, and connecting pieces for connecting, the light steel keels, characterized in that, concaves are provided on each of the connecting surfaces respectively which are depressed toward inside of the light steel keels, and the concaves of two connecting surfaces which are connected vertically are disposed by way of embedding, and at least two connecting holes are provided at corresponding positions of two concaves that are embedded, respectively, and the connecting pieces are provided within the connecting holes in as state of connection.

2. The light steel keel connecting structure according to the claim **1**, characterized in that, the terminals of the connecting pieces at one end where depression sides of the concaves are located do not go beyond outer edges of the openings of the concaves on the same side as the terminals of the connecting pieces.

3. The light steel keel connecting structure according to the claim **1**, characterized in that, the center distance between any two adjacent connecting pieces is not smaller than three times of the diameter of the connecting pieces, and the distance from the center of any of the connecting pieces to any of the outer edges of the light steel keels is not smaller than one and half times of the diameter of the connecting pieces.

4. The light steel keel connecting structure according to the claim **1** characterized in that, the openings of the concaves are slightly larger than bottom surfaces, and the connecting holes are provided on the bottom surfaces of the concaves.

5. The light steel keel connecting structure according to the claim **1**, characterized in that, the shapes of bottom surfaces of the two concaves that are embedded vertically are shapes of circle, cross, square, rectangle, or ring, which match to each other vertically.

6. The light steel keel connecting structure according to the claim **1**, characterized in that, the light steel keels comprise a main light steel keel and at least one abutting light steel keel, which are connected to each other, each of the main light steel keel and the abutting light steel keel comprises an upper wing plate and a lower wing plate that are disposed horizontally and in parallel, and a web connected vertically between one side of the upper wing plate and one side of the lower wing plate, the concaves are disposed at location where the upper wing, plate of the main light steel keel and the upper wing plate of the abutting light steel keel are connected and at location where the lower wing plate of the main light steel keel and the lower wing plate of the abutting light steel keel are connected, and concaves on the upper and lower wing plates of the main light steel keel are embedded inside concaves on the upper and lower wing plates of the abutting light steel keel, respectively.

7. The light steel keel connecting structure according to the claim **6**, characterized in that, the number of the abutting, light steel keel is one, the upper and lower wing plates of the main light steel keel are provided one said concave in symmetric positions of the upper and lower wing plates of the main light steel keel, respectively, the upper and lower wing plates of the abutting light steel keel are also provided one said concave in symmetric positions of the upper and lower wing plates of the abutting light steel keel, respectively.

8. The light steel keel connecting structure according to the claim **6**, characterized in that, the number of the abutting light steel keel is two or more, and the upper and lower wing plates of the main light steel keel are provided with concaves arranged in a line in symmetric positions of the upper and lower wing plates of the main light steel keel, respectively, the number of cavities is equal to the number of the abutting light steel keel, and the upper and lower wing plates of each abutting light steel keel is provided with one of said concave in symmetric positions of the upper and lower wing plates of each abutting light steel keel, respectively.

9. The light steel keel connecting structure according to the claim **6**, characterized in that, the concaves are disposed in the middle part of the upper and lower wing plates of the main light steel keel, one end of the upper wing plate of the abutting light steel keel and one end of the lower wing plate of the abutting light steel keel, and the main light steel keel is connected to one end of the abutting light steel keel.

10. The light steel keel connecting structure according to the claim **6**, characterized in that, the concaves are disposed in the middle part of the upper and lower wing plates of the main light steel keel and in the middle part of the upper and lower wing plates of the abutting light steel keel, the abutting light steel keel penetrates through the web of the main light steel keel vertically, and the middle part of the main light steel keel and the middle part of the abutting light steel keel are connected in the state of penetrating through vertically.

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