A CONSTRUCTION SYSTEM & METHOD

Field of the Invention

The present invention relates to a precast construction system and a method of substantially improving such a construction system.

Background

In today's construction industry, prefabricated panels are used to build solid structures quickly and efficiently. During assembly on the construction site these panels are erected on the base slab by crainage and temporary held by shoring braces, which are later permanently fastened by steel embedded plates, and welded in order to connect at the joints. Such a joining method predisposes the panels to failure, since the welding seams can only be provided from the front. Welding implements heat while melting the welded materials and since the embedded steel plates are covered by concrete, making it brittle, the required welding process becomes inefficient. The panel joints are also prone to cracking. This results in a high failure rate of about 25% of the panels just while the newly erected structure settles In addition, for these conventional prefabricated panels, shoring tend to be costly time consuming and obstructs the access to the construction site.

Therefore, there is a need for an improved construction system to provide higher efficiency in production and erection of the structures and consequently lower costs.

Brief Description of Figures

It will be convenient to further describe the present invention with respect to the accompanying drawings that illustrate possible arrangements of the invention. Other arrangements of the invention are possible and consequently, the particularity of the accompanying drawings is not to be understood as superseding the generality of the preceding description of the invention.

Fig. 1 is a cross-sectional top view of a precast joint.

Fig. 2 is a cross-sectional side view of the precast joint.

Fig. 3 is a cross-sectional top view of a precast joint with a frame for the grouting process

Fig. 4 is a side view of a precast panel bolted to a floor.

Figs. 5A and 5B are cross-sectional top views of precast joints of different panel thickness.

Fig. 6 is a cross-sectional top view of a precast joint with a high tensile steel bar

Fig. 7 is a cross-sectional side view of the precast joint with a high tensile steel bar

Fig. 8 is a cross-sectional top view of a precast joint with a sleeve.

Fig. 9 is a cross-sectional side view of the precast joint with a sleeve.

Fig. 10 is a cross-sectional top view of a precast joint with a sleeve and half-claw.

Fig. 11 is a cross-sectional side view of the precast joint with a sleeve and half-claw.

Fig. 12 is a cross-sectional top view of a precast joint with a double joint.

Fig. 13 is a cross-sectional side view of the precast joint with a double joint.

Fig. 14 is a cross-sectional top view of four precast panels positioned around a ring screw.

Detailed Description

The present invention provides a fast, reliable and easy-to-implement system to connect the panels, and instant stability of the erected panels; only the first panel requires shoring.

As an embodiment of the invention, Fig. 1 shows a joint of two panels sitting at 90 degrees to each other. Each panel 1 may be made of concrete, such as architectural concrete, with an insulation layer 2 inside. All panels are factory produced, pouring on site is not required or necessary. . Further, said panels may be used for the assembly of prefabricated, prefinished construction modules. The insulation 2 may be made of any suitable material, such as rock wool or Styrofoam. Each panel comprises an anchor assembly 10, having an anchor 13. The anchor 13 may include an anchor screw, as shown in Fig. 1, or any other suitable shape that prevents the anchor nut from being easily removed from the panel can be used, such as a ring element, a threaded end (not shown), or a re-bar. It will be appreciated that, the anchor may also include an elongate bar, on the basis that the bar has sufficient development length to resist pulling out under the design loads. The anchor transfers a load to the concrete from the longnut, and is arranged to prevent pulling out from the concrete panel after the panel is cast.

The anchor assembly 10 further includes 13 is connected to a longnut 12 to which the anchor 13 is connected. While in this arrangement, the connection is threaded, other connections may be used including welded, if a fixed connection is desired. The longnut 12 has an adjustable length and is aligned approximately with the centre of a ring screw 20. The system can tolerate some variation in the alignment of the ring screw and longnut. The length of the longnut 12 can be adjusted using a nut 11 positioned around an exposed end of the longnut 12. The ring screw 20 is engaged with a connecting member, positioned within an interstitial void, or recess, separating the adjacent panels. The connecting member may be a pre-tensioned cable or a high tensile steel bar. In the case of a cable, the cable may be a multi-strand wire cable. It may also be a reinforced polymer cable. The interstitial void, or recess, is subsequently filled with grout, such that at least one element of the connecting member may be cast into the precast panels.

During casting of the panels, the longnuts and nuts are placed relative to the panel reinforcement, such that on pouring the panels, the anchor assembly 13 forms a unitary structure with the panel. The panels are positioned in a desired arrangement around a ring screw 20 located within the interstitial void, or recess 21. The nuts are tightened to adjust the length and position of the longnuts. The recess 21 is then sealed to lock the panels in position.

Although Fig. 1 shows two panels being connected to the ring screw 20 at an angle, it will be appreciated that any plurality of panels 1 (an example is shown in Fig. 14) may be connected to the ring screw, positioned at various angles.

The invention provides a flexible system that allows users to change the size of the anchors and the distance between the connecting points as required. The users can adjust the number of ring anchor screws as per load calculation required, and use steel or stainless steel prevents the risk of rust and weakening of the connection. The production of the panels is easy and cost-effective since a standard shuttering (framing of the produced panels, been set to the casting pallets by magnetic fixturing) can be used instead of an expensive custom produced shuttering.

Fig. 2 shows the joint of Fig. 1 when viewed from the side. A panel comprises a plurality of longnuts aligned in the same orientation and spaced vertically apart along the height of the panel, for example 100 cm apart. Each ring screw 20 may be in contact with one connecting member as shown, or two or more connecting members. This enables the precast panel to have more stability and lower chance of cracking.

Fig. 3 shows a frame 22 arranged around a joint for grout shuttering. Grout is poured into a void 210 between the frame 22 and the panels, to reinforce the joint because grout is stronger than concrete.

Fig. 4 shows an anchor rod 140 inserted into a recess of a ground slab. The rod may be bolted to the ground slab. A nut 11 is used to adjust the length and position of a longnut 12 respective to a ring screw 20. The advantage of this arrangement is that such panels comprising anchor hooks areeasy to cast.

Fig. 5A shows a thinner concrete panel (thickness about 75 mm), while Fig. 5B shows a thicker concrete panel (thickness about 100 mm). In both arrangements, the panels comprising anchors 13 are arranged around the ring screw 20. Although the thickness of the panel may be limited by the size of the anchor hooks, the thickness of the panel can be very close to the diameter of the anchor hook, as shown by Fig. 5A, therefore enabling the production of thin concrete panels and a wide range of panel thickness.

Figs. 6 and 7 show another embodiment of the present invention, in which the anchor is a high tensile steel bar 132 for reinforced strength and reduced cracking in the panel. The high tensile steel bar is secured with longnuts 134 and cast into the concrete.

Figs. 8 to 11 show a joint system in which each connector comprises a sleeve 138. The sleeve can be arranged to have adjustable length. This reinforces the longnut to withstand higher load. The sleeve can be made of stainless steel to avoid corrosion through sun exposure or marine use.

Figs. 10 and 11 show a joint system in which each connector comprises a “half-claw” 139 at one end, arranged to connect the elongate member (such as a pre-tensioned cable). This enables easier and faster alignment and connection to around the elongate member, while accommodating narrower spacing and a more compact assembly.

Fig. 12 shows two panels joined at an angle apart, while one panel comprises two sets of anchors and longnuts 123 in a “triangular joint”. In this example, each anchor is a high tensile steelbar 133, but other anchors described above may be used. One set of anchors and longnuts may be positioned at an appropriate angle apart (as shown in Fig. 8) and spaced vertically apart (as shown in Fig. 13) from the other set. Since both sets of anchors and longnuts are embedded in the concrete panel, a thicker panel can accommodate such a configuration for additional strength within the panel. Although only two sets of anchors and longnuts are shown, additional sets may be used as needed in the construction project.

Fig. 14 shows how four similar concrete panels 1 can be arranged around and connected to a ring screw.

A CONSTRUCTION SYSTEM & METHOD

Abstract

The present invention relates to a construction system comprising prefabricated panels and connecting members; and a method of creating said construction system.

Figure 1

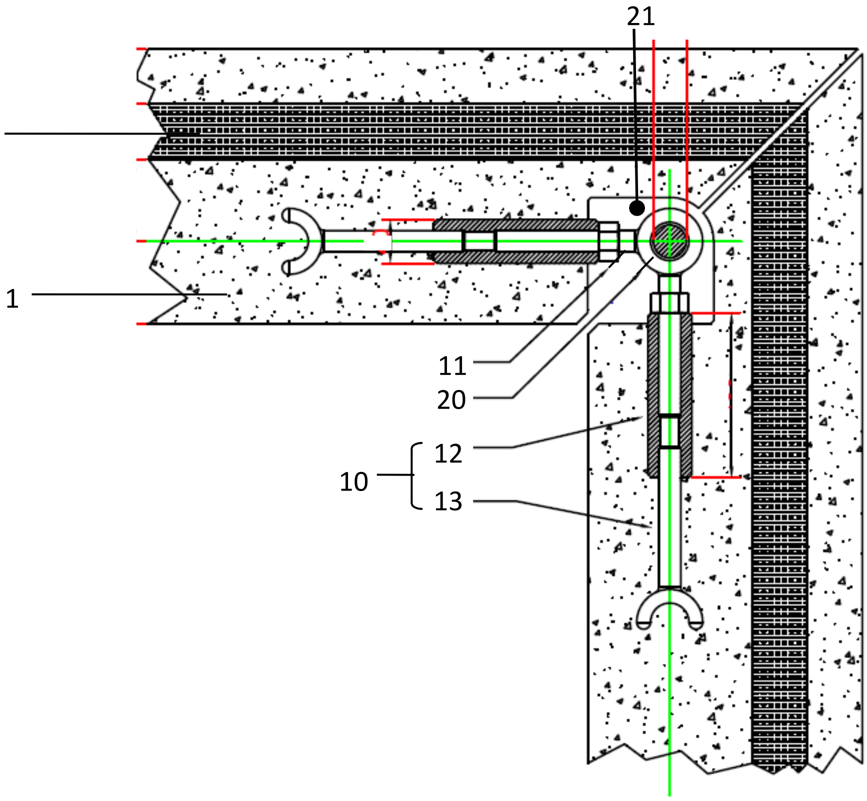


Fig. 1

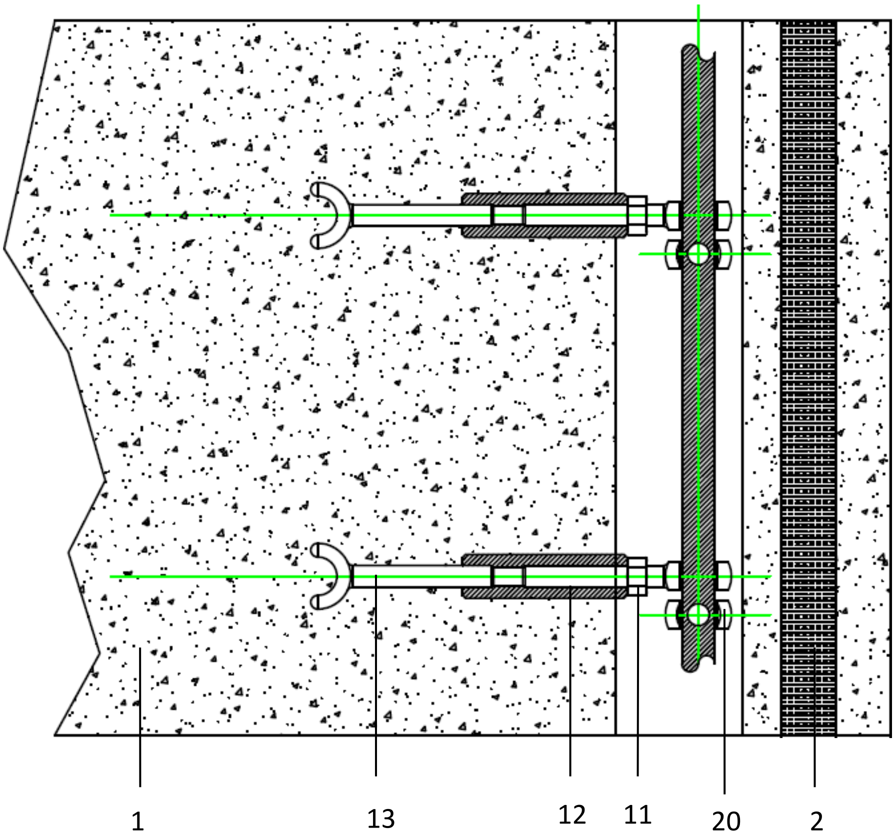


Fig. 2

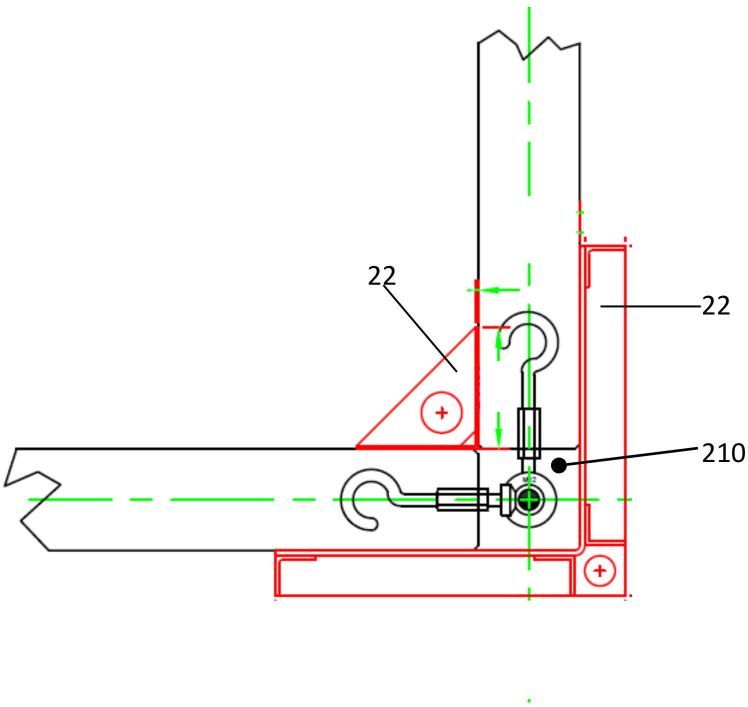


Fig. 3

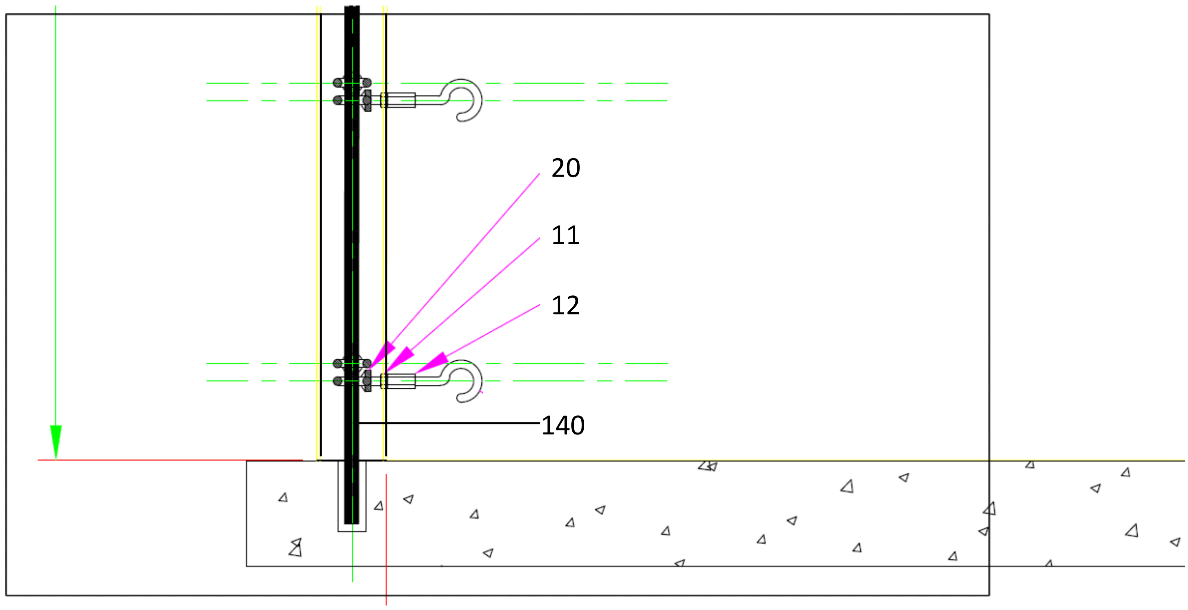
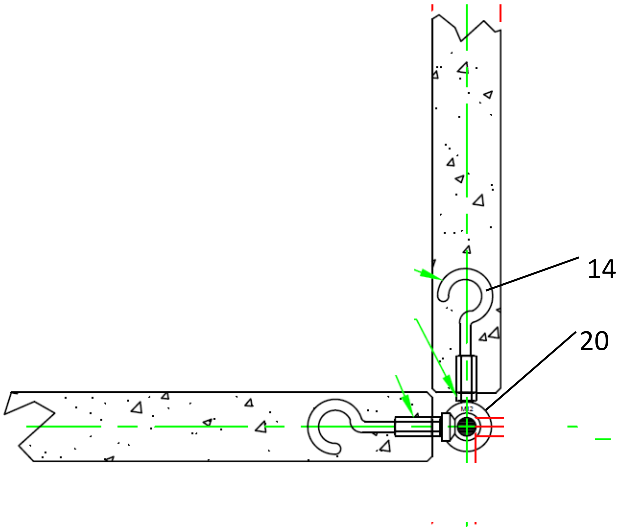


Fig. 4



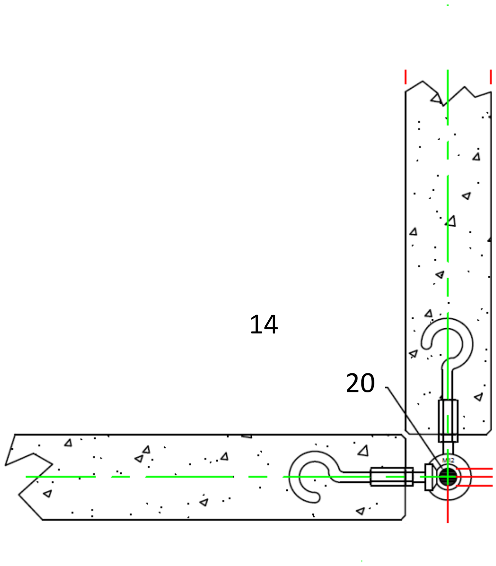


Fig. 5A **Fig. 5B**

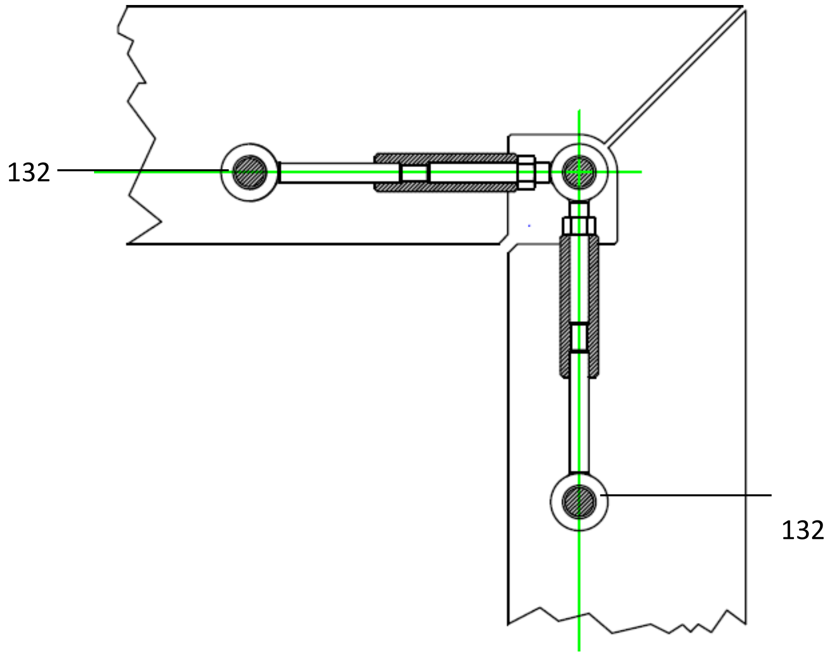


Fig. 6

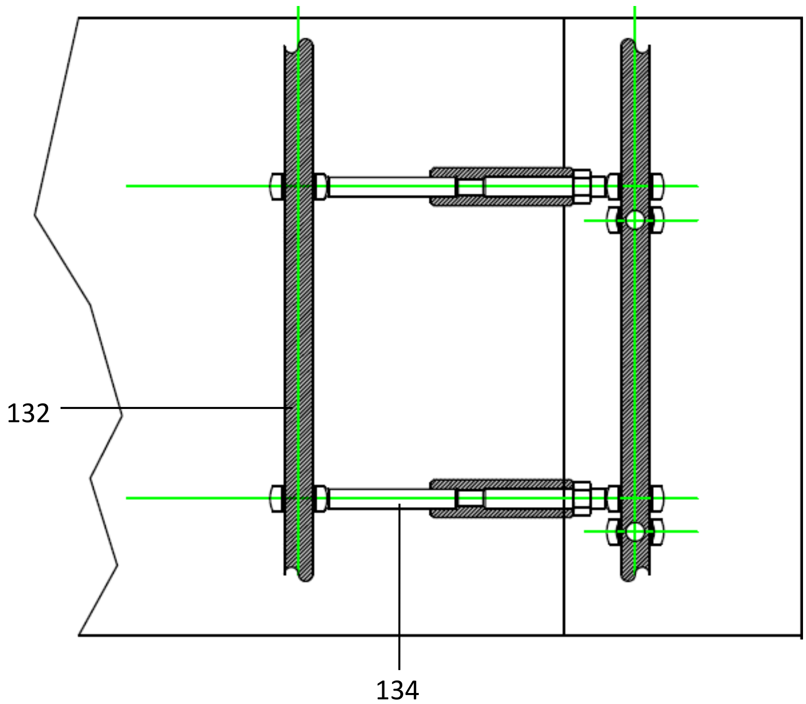


Fig. 7

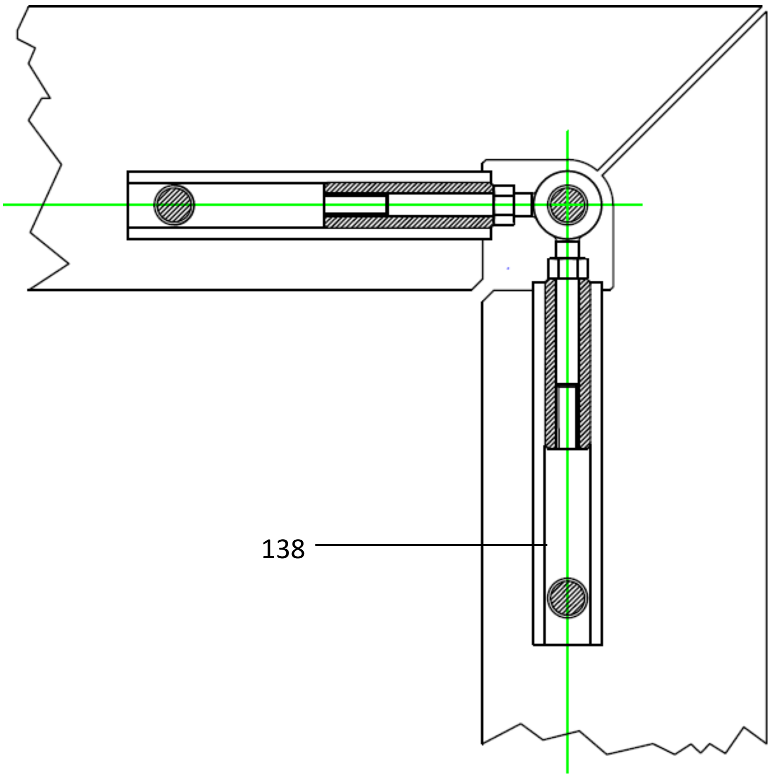


Fig. 8

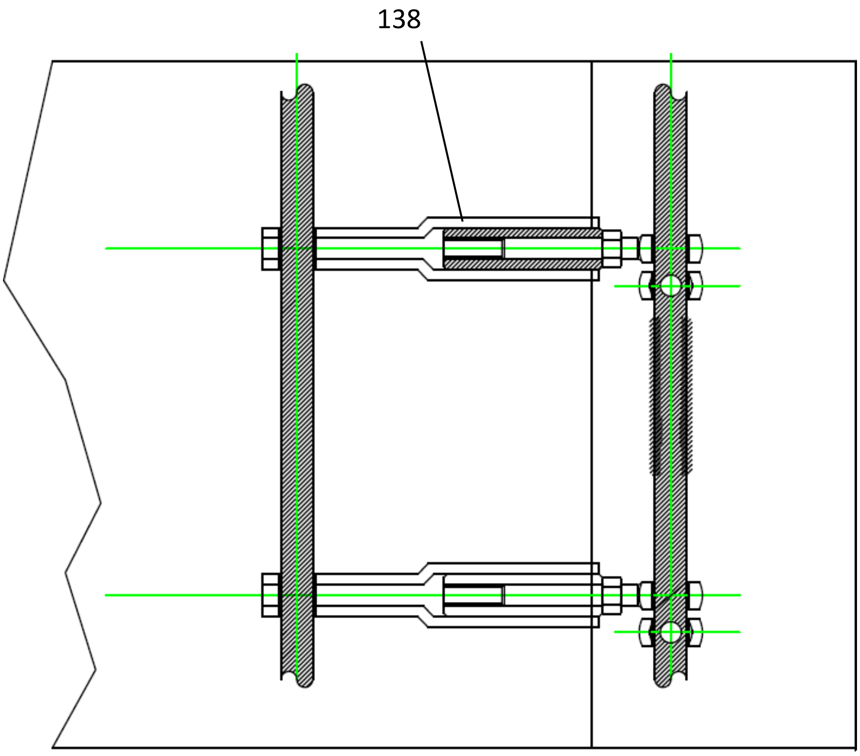


Fig. 9

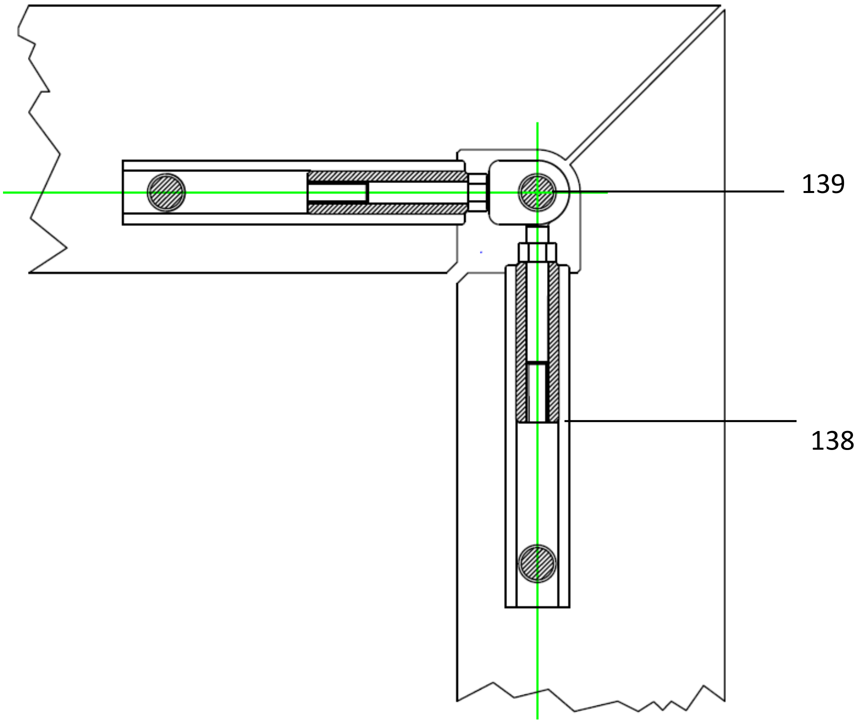


Fig. 10

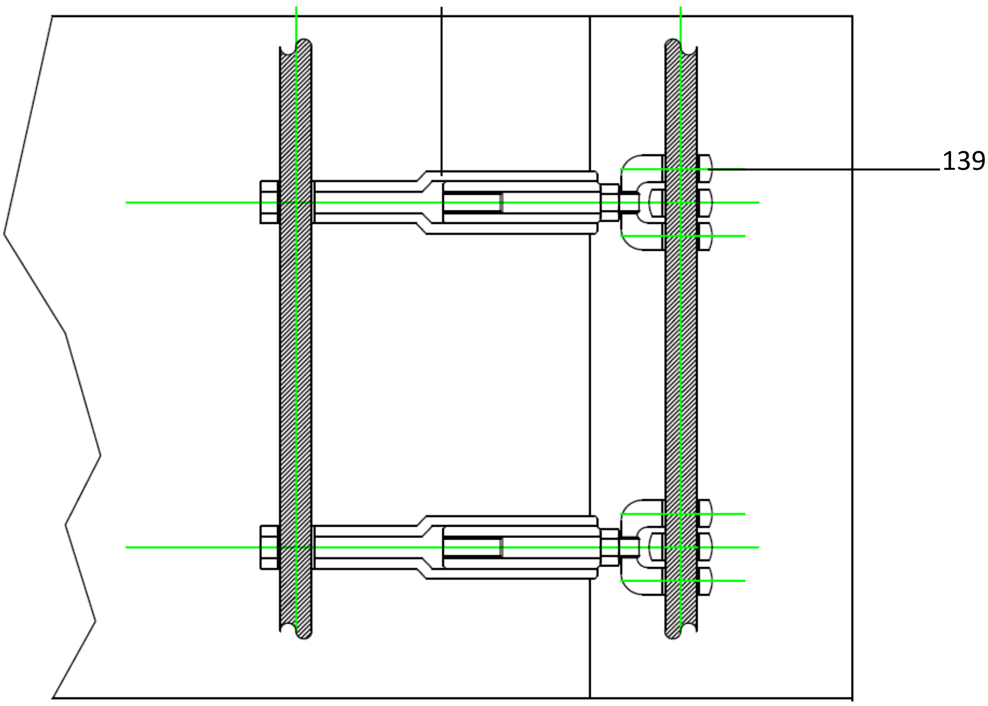


Fig. 11

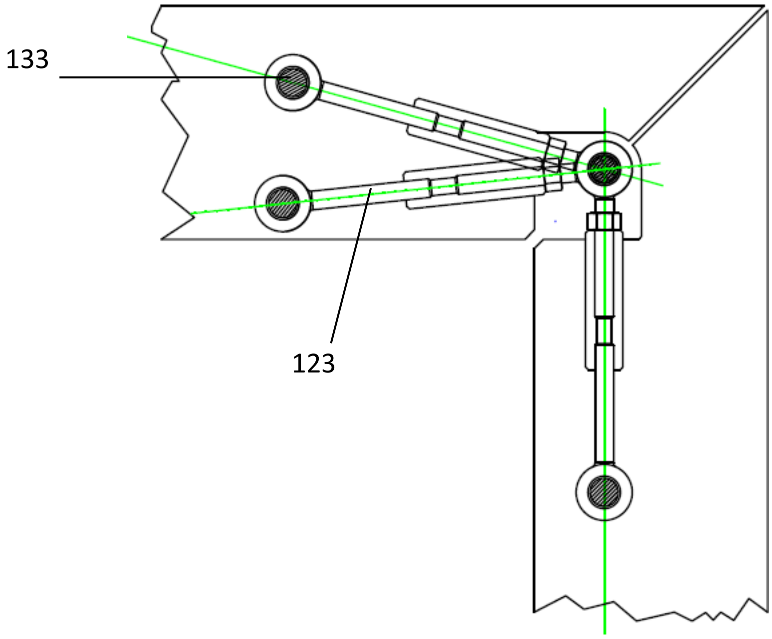


Fig. 12

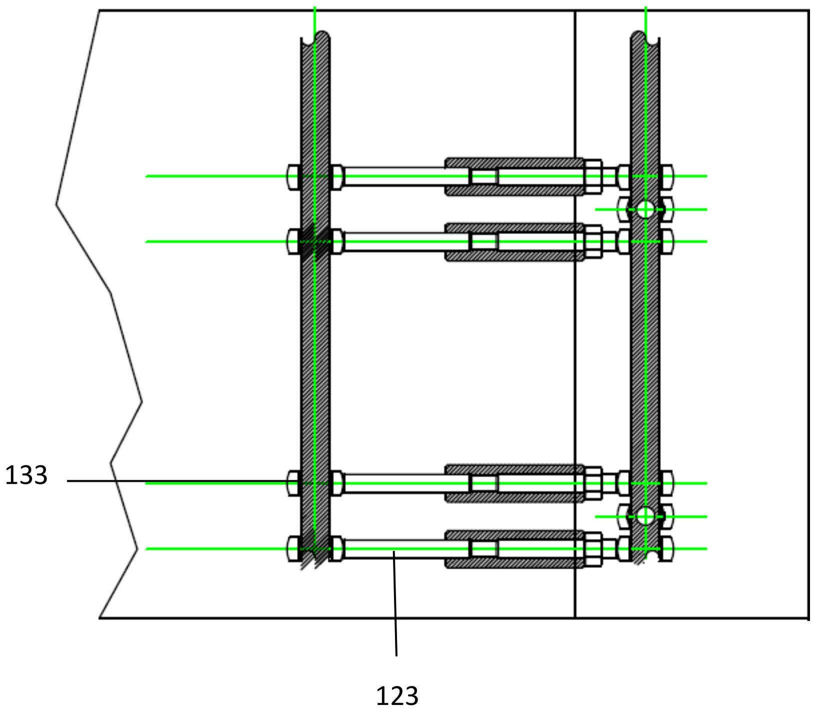


Fig. 13

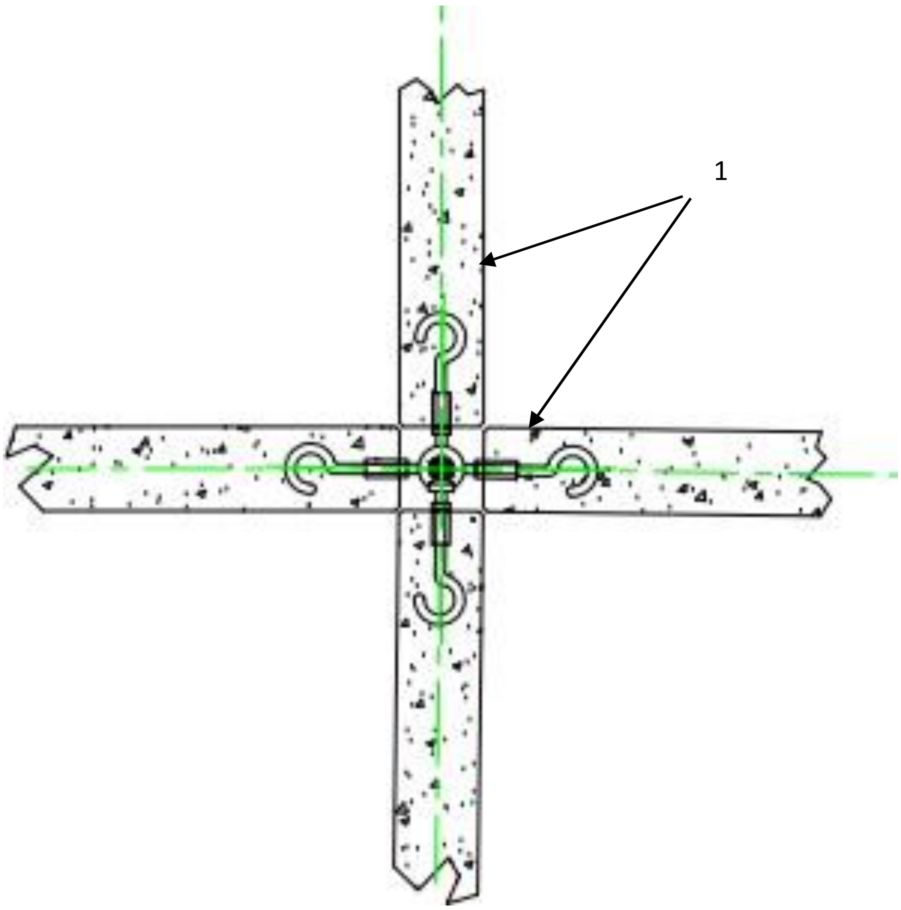


Fig. 14