



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**21.07.2021 Bulletin 2021/29**

(51) Int Cl.:  
**E04B 1/00 (2006.01)**

(21) Application number: **21152193.5**

(22) Date of filing: **18.01.2021**

(84) Designated Contracting States:  
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA ME KH MA MD TN**

(72) Inventors:  
• **TETTEROO, Antonius**  
**6014 CG Ittervoort (NL)**  
• **MERTENS, Robertus Henricus Antonius**  
**6014 CG Ittervoort (NL)**  
• **SMITS, Johannes Petrus Antonius**  
**6014 CG Ittervoort (NL)**

(30) Priority: **16.01.2020 NL 2024685**

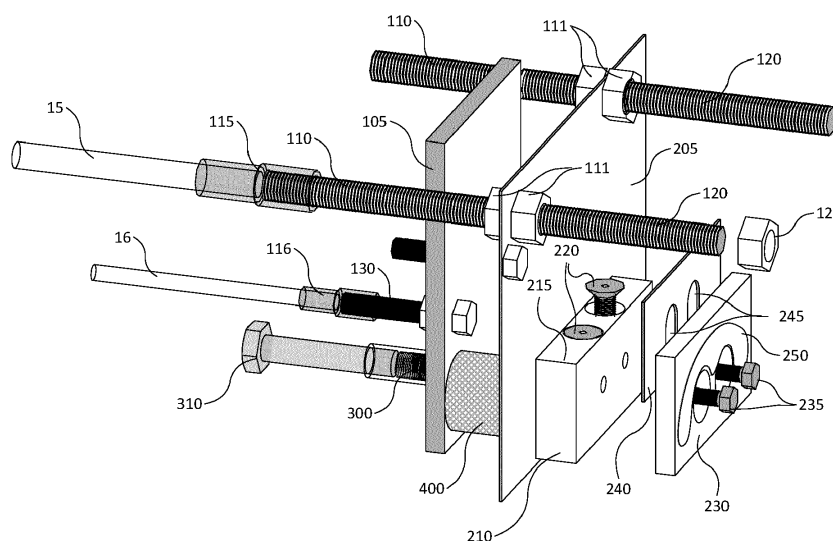
(74) Representative: **Jilderda, Anne Ayolt**  
**LIOC Patents & Trademarks**  
**Zwaanstraat 31 L**  
**5651 CA Eindhoven (NL)**

(71) Applicant: **T&R Engineering B.V.**  
**6014 CG Ittervoort (NL)**

(54) **COUPLING DEVICE AND ADJUSTING PROFILE THEREFORE**

(57) A coupling device (100) for a durable connection of an outside wall element (20) to a building (10), comprising first connecting means (110) for a durable operative connection to a floor reinforcement (15) of a storey floor (12) of the building and second connecting means (120) for a durable operative connection to the outside wall element (20). The first and second connecting means are mutually operatively coupled for force transmission. Provided on a side facing toward the outside wall element to be coupled is a support device (205, 210)

for support of the outside wall element. Provided on a side remote from the support device is a support body (105) to which the support device is connected. A rigid pressure-absorbing body (400) lies enclosed between the support device and the support body at the position of the support (210) of the support device (205) and supports on respectively the support device and the support body on either side here. An adjusting profile comprises a fixation body (600) with passages (610) for at least the first connecting means (110).



**Fig.2**

## Description

**[0001]** The present invention relates to a coupling device for a durable connection of an outside wall element to a building, comprising first connecting means for a durable operative connection to a floor reinforcement of a storey floor of the building and comprising second connecting means for a durable operative connection to the outside wall element, wherein the first and second connecting means are mutually operatively coupled for force transmission, comprising on the building side a support body which is intended and configured to support on the outside wall and comprising on an opposite side at a distance from the support body a support device which provides at least a part of a bearing suspension of the outside wall element, wherein the support device is connected to the support body by means of an elongate connecting member. The invention also relates to an adjusting profile for use with one or more coupling devices.

**[0002]** A coupling device of the type described in the preamble is known from International patent application PCT/NL2016/050779 by applicant. This coupling device is intended particularly to couple a freely protruding outside wall element, such as for instance a balcony or gallery, to an outside wall in self-supporting manner. The support device provides here for a first bearing suspension of the outside wall element, and the outside wall element can be durably connected to the outside wall more permanently by means of the (second) connecting means protruding from the second coupling body. These connecting means are operatively coupled for force transmission to the (first) connecting means, which in turn are interlaced with the floor reinforcement of a storey floor of the building. The loads by and of the outside wall element are then operatively transmitted to the floor reinforcement, which provides for a durable and reliable self-supporting construction.

**[0003]** In the known construction the floor reinforcement is placed mainly under strain of tension by the outside wall element, and can be extremely heavily loaded in that respect. The load-bearing capacity of the construction is therefore absorbed largely therein. It must however be avoided here that the coupling device used can eventually collapse under the influence of the occurring loads.

**[0004]** The present invention has for its object, among others, to provide a coupling device for coupling a freely protruding outside wall element on an outside wall which is sufficiently heavily loadable.

**[0005]** In order to achieve the stated object a coupling device of the type described in the preamble has the feature according to the invention that, at least substantially at the position of the support device, particularly adjacently of the coupling member, an at least substantially rigid pressure-absorbing body lies enclosed between the support device and the support body and connects the support device to the support body for force transmission. The invention is here based on the insight that a part of the suspension of the outside wall element is provided

for by the support device and that a pressure load may also develop hereon in practice as a result of vertically occurring shear forces of the outside wall element. The rigid pressure-absorbing body which is provided at the position of the support device, according to the invention, between the support device and the support body, is eminently able to be placed under strain of pressure, and is therefore able to accommodate this pressure load in particularly effective manner in the construction of the coupling device. The pressure-absorbing body particularly lies enclosed in clearance-free manner between the support device and the support body, at least at the position of the support, whereby it comes up against and supports on respectively the support device and the support body on either side here.

**[0006]** A particular embodiment of the coupling device is characterized according to the invention in that the support device is coupled by means of a continuous coupling member to the support body and the pressure-absorbing body preferably extends on a side of the coupling member remote from the connecting means. This is based on the insight that the coupling device undergoes the greatest moment of force on the side of the coupling member remote from the connecting means. By precisely providing the pressure-absorbing body at least there, it is optimally utilized to absorb this pressure.

**[0007]** In a preferred embodiment the coupling device has the feature according to the invention that the pressure-absorbing body comprises a rigid tubular body which is enclosed in at least substantially clearance-free manner between the support device and the support body and surrounds the coupling member, and particularly that the tubular body comprises a cylindrical metal bush. The pressure-absorbing body which thus surrounds the coupling member thus provides support on all sides to the coupling member which may be exposed to a transverse pressure during operation. Because the pressure-absorbing body at least ultimately lies enclosed seamlessly between the support device and the support body, a mechanical deformation of both the connecting member and the support device is prevented particularly effectively. From a viewpoint of absorption of forces the tubular body or bush body is here preferably applied eccentrically, such that a greater part of a diameter thereof lies on a side of the coupling member remote from the connecting means.

**[0008]** A particularly rigid construction is obtained with a further particular embodiment of the coupling device which is characterized according to the invention in that the coupling member comprises a tensioned threaded end which is received in the support device and protrudes from the support body and is connected to the support body by a fitting nut body. The threaded end with nut body provides here tensioning means for enclosing the pressure-absorbing body in clearance-free manner when the nut body is tightened, and thereby bringing about a particularly rigid, stiff construction.

**[0009]** In a further preferred embodiment the coupling

device is characterized according to the invention in that the support device comprises a support on which a stop surface forming part of the outside wall element can be received. The support device is thus utilized as first support on which the outside wall element can support before connecting the connecting means. The support device is nevertheless also still partially loaded afterwards. In order to be able to fully utilize this loadability a further embodiment of the coupling device has the feature according to the invention that the support comprises a support surface base with adjusting means which enable the stop surface to be received thereon without clearance, and more particularly that the adjusting means comprise one or more adjusting bolts which protrude adjustably from the support surface. Owing to this adjustability, the support with the support surface can be brought wholly in line with the support of the other coupling devices, so that the outside wall element is actually being supported along the whole length and the load is distributed uniformly thereover.

**[0010]** It is not only in a vertical sense, but also transversely thereof that an accurate fit of the stop surface in the support of the support device is important, and the supports of different coupling devices must be mutually aligned for an outside wall element to be supported collectively. With a view hereto a further particular embodiment of the coupling device has the feature according to the invention that the support is bounded by a wall, which wall is connected adjustably to the support device and here determines a support width, and more particularly that the wall is connected to the support device via at least one fitting body. A width, i.e. depth, of the support can thus be adjusted by a corresponding adjustment of the wall, particularly by applying more or fewer fitting bodies for this purpose.

**[0011]** The outside wall element lies externally of the outside wall, while the storey floor, to which the outside wall element is operatively coupled, will usually lie internally in the building. In order to avoid a cold bridge here, a further embodiment of the coupling device has the feature according to the invention that the support device comprises a first metal plate body, that the support body comprises a second metal plate body at least substantially parallel to the first plate body, and that the first and the second plate body are mutually separated by a thermally insulating core, particularly a foam body, more particularly a polymer foam body. The thermally insulating core provides here for a limitation of the heat-exchanging capacity between the first and second metal plate bodies. Although the interposing of the pressure-absorbing body provides a physical contact, the surface thereof, and thereby the heat-transporting capacity, is relatively small, particularly if use is made for this purpose of a hollow, tubular body which provides thermal conduction over only a limited wall thickness.

**[0012]** In a particularly practical embodiment the coupling device is characterized according to the invention in that the first connecting means comprise a first outer

end of an elongate connecting body and that the second connecting means comprise an opposite, second outer end of the connecting body, which second outer end comprises a threaded end and can be anchored in the outside wall element by means of a fitting nut body. By tightening the nut body this connection can be tensioned and a clearance-free rigid construction can hereby be brought about.

**[0013]** In practice a number of coupling devices will often be required for an adequate and reliable suspension of the outside wall element, wherein the load is preferably distributed uniformly over the coupling devices. Important here is an accurate mutual alignment and positioning of the individual coupling devices, which in practice can be arranged far ahead of time and will here already be anchored to the storey floor on the building side before the outside wall element is arranged.

**[0014]** For this purpose the invention also provides an adjusting profile for one or more coupling devices for a durable connection of an outside wall element to a building, comprising first connecting means for a durable operative connection to a floor reinforcement of a storey floor of the building and comprising second connecting means for a durable operative connection to the outside wall element, wherein the first and second connecting means are mutually operatively coupled for force transmission, comprising on the building side a support body which is intended and configured to support on the outside wall and comprising on an opposite side at a distance from the support body a support device which provides at least a part of a bearing suspension of the outside wall element.

**[0015]** According to the invention, such an adjusting profile comprises an elongate fixation body, which body is provided for each of the coupling devices with a fitting passage for the second connecting means and which body can be connected by means thereof to the relevant coupling device. The second connecting means particularly comprise here a threaded end, particularly on a tie rod, which can be connected to the fixation body by means of a nut body.

**[0016]** Each of the passages for the individual second connecting means (threaded ends) is positioned accurately in the fixation body beforehand, and the positions of the coupling devices corresponding therewith are thereby fixed on site. The individual positions of the coupling devices are hereby already matched beforehand to the desired, corresponding connecting positions in the outside wall element on the outside wall element to be arranged later.

**[0017]** By connecting the coupling devices temporarily to the fixation body and thus positioning them correctly, the positions of the coupling devices are fixed relative to each other on site so that the outside wall element can only be connected without problem. In particular, the storey floor can be cast and an outer facing wall of the outside wall finished without the individual positions or alignments of the coupling devices being at risk here, as soon

as the relative positions of the coupling device are fixed by means of the adjusting profile. Because use is here made of the same (second) connecting means as applied for the coupling of the outside wall element to the coupling devices, this requires no further adjustment or modification of the coupling device.

**[0018]** A preferred embodiment of the adjusting profile has the feature here according to the invention that the fixation body also comprises a passage at the position of a threaded cavity in the support device for receiving a screw member for the purpose of fastening a releasable wall of a support of the support device, and that the support device can be connected to the fixation body by means of the same, or at least a similar, screw member after the wall has been removed. Use is here also made of the fastening options already present in the coupling device, while an extra accurate fixation of the coupling device to the adjusting profile is thus realized.

**[0019]** In a particular embodiment the adjusting profile has the feature according to the invention that the fixation body comprises a body which is at least substantially rectangular in cross-section, particularly a U-profile, L-profile, a beam body or tubular body, more particularly of wood, of plastic or of steel. The passages are here preferably provided in a flat bottom thereof, wherein one of the cheeks provides stability when placing the adjusting profile with the coupling devices thereon on a flat ground surface.

**[0020]** The invention will be further elucidated hereinbelow with reference to an exemplary embodiment and an accompanying drawing. In the drawing:

- Figure 1 shows a cross-section of an exemplary embodiment of an assembly of a building with a protruding outside wall element, which are mutually coupled via an exemplary embodiment of a coupling device according to the invention;
- Figure 2 shows a perspective view of the coupling device as applied in the assembly of figure 1;
- Figure 3 shows the coupling device of figure 2 in a first cross-section;
- Figure 4 shows the coupling device of figure 2 in a cross-section along the line IV-IV in figure 3;
- Figure 5 shows a top view of the coupling device of figure 2;
- Figure 6 shows schematically a prior art coupling device in unloaded state;
- Figure 7 shows schematically a prior art coupling device in loaded state;
- Figure 8 shows schematically a coupling device according to the invention in loaded state;
- Figure 9 shows schematically an alternative coupling device according to the invention in loaded state;
- Figure 10 shows a perspective view of an assembly of an exemplary embodiment of an adjust-

ing profile according to the invention with the coupling device of figure 2;

- Figure 11 shows the assembly of figure 10 in cross-section;
- Figure 12 shows a cross-sectional view of the coupling profile of the assembly of figure 10 after the adjusting profile was removed therefrom;
- Figure 13 shows a schematic perspective view of a storey floor with three coupling devices according to the invention thereon; and
- Figure 14 shows a schematic perspective view of the storey floor of figure 13 with an outside wall element according to the invention thereon.

**[0021]** It is otherwise noted here that the figures are purely schematic and not always drawn to (the same) scale. Some dimensions in particular may be exaggerated to greater or lesser extent for the sake of clarity. Corresponding parts are designated in the figures with the same reference numeral.

**[0022]** Figure 1 shows a typical example of an application of a coupling device according to the invention. This is an outside wall element 20 in the form of a concrete balcony which protrudes in cantilevered manner from an outside wall 11 of a building 10. The balcony comprises here a hollow concrete element with a bottom 21 and an upright edge 22 therearound. A number of console elements 23 with an elongate reinforcement 25 therein extend in the balcony transversely of outside wall 11. Placed on this bearing construction is a floor slab 24 and usually a balustrade (not drawn here). Of building 10, a storey floor 12 with a floor reinforcement 15 therein is drawn in the figure.

**[0023]** Provided between outside wall element 20 and building 10 is a number of coupling devices 100 via which the outside wall element 20 is connected immovably, reliably and durably to the storey floor 12 of building 10. For this purpose each of the coupling devices 100 comprise on the one hand on the building side first connecting means 110 for an operative and durable connection to the floor reinforcement 15 of storey floor 12 and, on the other hand, second connecting means 120 for a durable operative connection to outside wall element 20, particularly to the reinforcement 25 in the consoles of the outside wall element.

**[0024]** First connecting means 110 and second connecting means 120 are formed by opposite threaded ends on a continuous tie rod, for instance of stainless steel with M16 threaded ends. Connecting means 110, 120 are thus mutually operatively coupled for force transmission so that a load of and/or by outside wall element 20 is transmitted at least substantially linearly to the floor reinforcement 15 and is absorbed therein. By means of a tensioning nut 29 fitting thereon, the second threaded end 120 can be anchored firmly and immovably behind a metal slot plate 27 in outside wall element 20 and tie rod 110, 120 can be tensioned by tightening tensioning

nut 29. This washer plate 28, see figure 14, provides a combined anchor/transverse force plate externally of the outside wall element (balcony), approximately straight above the support of the support device 200 to be described hereinbelow, and is important for a simple production of the prefabricated outside wall element.

**[0025]** An example of the applied coupling device 100 is shown in more detail in figure 2. The coupling device 100 comprises on a side facing toward outside wall element 20 a support device 200 which provides a support by means of a metal anchor plate 210 which is able and configured to absorb together with the supports of the further collectively applied coupling devices a vertical transverse load of and by outside wall element 20. Anchor plate 210 is connected durably to a metal plate body 205 of support device 200. Plate body 205 for instance has a thickness in the order of several millimetres to centimetres, while a thickness in the order of 10 to 15 millimetres is used for the anchor plate 210. Both are formed from preserved (for instance galvanized) steel or, as in this case, from stainless steel.

**[0026]** Anchor plate 210 forms a support with a support surface 215 comprising a set of adjusting bolts 220. With adjusting bolts 220 a level of the support can be set in line with the correspondingly set levels of adjacent coupling devices, so that the outside wall element will be received thereon in substantially clearance-free and uniform manner for an optimal distribution of forces. Plate body 205 provides a passage for the tie rods 110, 120 whereby outside wall element 20 can be joined durably to building 10. Each of the tie rods 110, 120 is connected to plate body 205 in the distal threaded end 120 by means of a set of fixation nuts 111. For this purpose oversized slotted holes are applied in plate body 205 in order to allow a thermal action and positional tolerance between the two components.

**[0027]** A width of support (base) 215 can be adjusted by a removable wall 230 which is connected releasably to anchor plate 210 with a set of bolts 235. If desired, one or more fitting bodies 240 can be provided between anchor plate 210 and wall 230 in order to bring a width of the support (base) 215 formed therebehind in line with that of the adjacent coupling devices and to adjust it to a stop wall 30 for receiving therein, for instance of a hook or protrusion, on outside wall element 20. Plate body 205, anchor plate 210, bolts 235 and wall 230 are manufactured from stainless or preserved steel. For fitting body 240 use can be made of a thin plastic plate of nylon, for instance one or several millimetres thick, with recesses 245 for the bolts 235.

**[0028]** On the building side coupling device 100 comprises a support body 105, likewise in the form of a steel plate body, whereby the coupling device supports directly or indirectly on the outside wall or the storey floor. Once in mounted position, coupling device 100 thus rests with support body 105 against the fixed construction of the building, particularly against the storey floor 12 cast therebehind. This plate body 105 is also formed from stain-

less or preserved steel, wherein a material thickness in the order of several millimetres to one or several centimetres is suitable. In this respect use is made here of a plate thickness of about 5 millimetres. Support body 105 has passages, or leaves space, for the tie rods 110, 120 which can be connected by means of an interconnecting anchor 115 to the floor reinforcement 15 for transmission of horizontal tensile forces. Tie rods 110, 120 thus provide for a linear, uninterrupted force transmission from outside wall element 20 to floor reinforcement 15. A set of screw bolts 130 further extends from plate body 105, which bolts can be connected by corresponding interconnecting anchors 116 to lower reinforcing bars 16 of the floor reinforcement with a view to an additional anchoring and force transmission.

**[0029]** Anchor plate 210 is connected directly to support body 105 by means of connecting members provided for this purpose. These connecting members comprise here a set of coupling rods 300 which are blind-anchored in threaded cavities provided for this purpose in anchor plate 210 and are able and configured to absorb transverse forces (shear forces) in particular. On the building side coupling rods 300 extend from anchor plate 210 and run through the two plate bodies 105, 205 to a position behind support body 105. The relevant coupling rod 300 can be tensioned by means of a nut (see figure 3) or, as in figure 2, a tensioning bolt 310 so that a clearance-free, rigid whole is created.

**[0030]** In the sections of figures 3 and 4 and in the top view of figure 5 the construction of coupling device 100 is shown in detail once again. The two plate bodies 105, 205 extend substantially parallel to each other but, with the exception of the connecting means 110, 120, 300, are separated from each other both spatially and thermally. A thermally insulating core 500 is advantageously applied therebetween, see figure 3, in order to thus avoid a cold bridge between storey floor 12 and the outside wall element as far as possible. For core 500 use can for instance be made of a heat-insulating polymer foam body, particularly of PIR (polyisocyanurate), PUR (polyurethane) or PS (polystyrene).

**[0031]** Figure 6 shows schematically the coupling element in unloaded state. When the outside wall element is initially placed on the initial support on anchor plate 210, the coupling member 300 between support device 205, 210 on one hand and support plate 105 on the other is not only placed axially under strain of tension, but particularly also placed transversely under strain of pressure. Figure 7 shows the deformation which could result therefrom. In order to prevent this a rigid pressure-absorbing body 400 is placed according to the invention at the position of the support device, between support devices 205, 210 and support body 105, see figures 2-5 and 8. In the shown embodiment this pressure-absorbing body comprises a steel tubular body 400 which is arranged round each coupling rod 300 and comes up against respectively support body 105 and support device 205, 210 at respective outer ends.

**[0032]** Tightening tensioning bolt 310, or nut body 310, not only tensions coupling rod 300 but also locks tubular body 400 without clearance between the two plate bodies 105, 205 to form a rigid, completely stiff whole. Tubular body 400 is eminently able to absorb a pressure and therefore does not allow the deformation shown in figure 6 to occur from a geometric viewpoint. Figure 8 shows the same load as in figure 7, wherein pressure-absorbing body 400 now absorbs the pressure and prevents coupling rod 300 from being exposed thereto. In the figure use is made for tubular body 400 of a metal bush with a cylindrical form but, if desired, a different geometrical outline can also be opted for.

**[0033]** Tubular body 400 is preferably applied eccentrically, as shown in the figure, wherein the greater part of a diameter thereof lies on a side of coupling member 300 remote from connecting means 110, 120. This is where the greatest moment of force will be experienced and where the tubular body is thus better able to absorb this moment. Instead of a hollow tubular body 400 around coupling member 300, it is otherwise also possible to apply a solid or hollow support body 410 adjacently of the coupling member, as shown in the alternative exemplary embodiment of figure 9.

**[0034]** For a reliable connection of an outside wall element, such as the shown balcony, to a building just a single coupling device will usually not suffice, but a number of coupling devices will usually be applied, optionally equidistantly, in a row in order to distribute the load by the outside wall element thereover as uniformly as possible. It is of great importance here that the coupling devices to be placed beforehand are accurately positioned and mutually aligned, matched to the connecting positions in the balcony. With a view thereto, the invention also provides an adjusting profile, an embodiment of which is shown in figures 10 and 11. This adjusting profile comprises an elongate fixation body 600, more specifically a U-beam or L-profile of steel. At each position where a coupling device must be provided, matched to the corresponding positions of the receiving connecting means of the outside wall element, passages 610 are arranged in the flat bottom of the fixation body for the tie rods 110, 120 which form the (second) connecting means whereby outside wall element 20 will be coupled permanently and durably to the floor reinforcement of the building.

**[0035]** Adjusting profile 600 further comprises a set of bores at the position of a set of threaded cavities in anchor plate 210 in which are received the screw bolts 235 with which the removable wall of support 210 is mounted or at least can be coupled. By temporarily removing wall 230, or at least dispensing therewith for the time being, each of the coupling devices can thus be connected to the adjusting profile 600 using connecting means 120, 235 which are present and already provided in the coupling device. By accurately arranging said bores 610, 620 in fixation body 600 and positioning them correctly the adjusting profile 600 will thus fix the individual coupling

devices in such a way that they are already correctly positioned and accurately aligned relative to each other with a view to their later connection to outside wall element 20.

**[0036]** In practice adjusting profile 600 is arranged together with the coupling devices connected thereto before casting storey floor 12 and arranging outside wall element 20. After casting of storey floor 12, each of the coupling devices 100 is durably coupled to the floor reinforcement 15 and has thereby become a permanent component of the construction. Coupling devices 100 are now per se also fixed, and fixation body 600 can now be safely removed. Wall 230 of anchor plate 210 is then (re)placed, see figure 12. After optionally also bringing the bases 215 of the successive anchor plates 210 in one line with the adjusting bolts, the outside wall element 20 can now be received and coupled.

**[0037]** Figure 13 shows a perspective view of the storey floor 12 with three coupling devices 100 according to an embodiment of the invention thereon. Coupling devices 100 are coupled linearly to the floor reinforcement in storey floor 12 with their first connecting means in the form of the above described tie rods 110, 120. Their position was accurately fixed and matched by means of the above described adjusting profile 600 to the positions of the outside wall element to be connected.

**[0038]** Besides a vertical adjustability of the support by means of the adjusting bolts 220 in the support surface 215 of support device 205, 210, a width of the support is in this embodiment also adjustable in horizontal direction and can thereby be matched with a complementary stop surface of the outside wall element which will be received thereon. Other than in the preceding example, wherein the removable wall 230 forms with anchor plate 210 a recessed cavity as support, this example relates to a flat support wherein removable wall 230 ends roughly in a common plane 215 with the anchor plate.

**[0039]** For the purpose of a continuous adjustability of the support the removable wall 230 also comprises a set of adjusting bolts 245 which will come with their outer end up against the relevant anchor plate 210, this in addition to the above described connecting bolts 235 for mounting of the removable wall. By tightening adjusting bolts 245 an intermediate space toward anchor plate 210 is increased over a free bolt length and, vice versa, this distance can be reduced to zero by loosening adjusting bolts 245. The width of the support can hereby be adjusted and adapted continuously.

**[0040]** An excess of pressure-resistant two-component paste 250 provides for an adequate transmission of a pressure on the removable wall to the anchor plate 210 and construction lying therebehind. This pressure-resistant two-component paste 250 is likewise applied to the visible side of removable wall 230 in order to fill any clearance between a bumper or buffer plate of the outside wall element and removable wall 230 and so also realize an optimal pressure transmission here.

**[0041]** In order to enhance a fire resistance of the whole and particularly the coupling devices, the foam-filled

space between support device 205 and support plate 105 is surrounded in the example shown here by a steel casing or sleeve 150, here formed from stainless steel. Such a sleeve 150 can optionally not be arranged and clamped until afterwards. A fire-resistant coating can optionally also already be or be applied thereto, and the intermediate space behind sleeve 150 can optionally be filled with a fire-resistant foam 500.

**[0042]** Figure 14 shows that an outside wall element 20 is coupled via the coupling devices to the storey floor in the intended manner, and is joined thereto for force transmission. Threaded ends 120 protrude through a steel slot plate 27 which is anchored durably and firmly in outside wall element 20 and is for this purpose coupled at several locations for force transmission to a reinforcement in the outside wall element. This slot plate 27 provides for the suspension of the outside wall element and provides for this purpose on an underside a stop surface with which slot plate 27 comes up against the anchor plate 210 of the support and thereby rests on the support device 205, 210 of the coupling device. By means of a set of washer plates 28 and tensioning nuts 29 the outside wall element 20 can be connected to the tie rods 120 of the coupling device and the whole tensioned, so that a clearance-free, stiff and particularly rigid permanent whole with the building is created.

**[0043]** For this purpose cavities in the outside wall element provide access to the tensioning nuts after the outside wall element has been positioned and already supports on anchor plate 210. These cavities are filled with concrete mortar 525 afterwards. Any remaining intermediate space toward the coupling element can be filled with a suitable insulating foam 500, wherein a fire-resistant polymer foam is opted for in this case.

**[0044]** Although the invention has been further elucidated above with reference to only several exemplary embodiments, it will be apparent that the invention is by no means limited thereto. On the contrary, many variations and embodiments are still possible within the scope of the invention for a person with ordinary skill in the art.

## Claims

1. Coupling device for a durable connection of an outside wall element to a building, comprising first connecting means for a durable operative connection to a floor reinforcement of a storey floor of the building and comprising second connecting means for a durable operative connection to the outside wall element, wherein the first and second connecting means are mutually operatively coupled for force transmission, comprising on the building side a support body which is intended and configured to support on the building and comprising on an opposite side at a distance from the support body a support device which provides at least a part of a bearing suspension of the outside wall element, wherein the

support device is connected to the support body by means of an elongate connecting member, **characterized in that**, at least substantially at the position of the support device, particularly adjacently of the coupling member, an at least substantially rigid pressure-absorbing body lies enclosed between the support device and the support body and connects the support device to the support body for force transmission.

2. Coupling device according to claim 1, **characterized in that** the pressure-absorbing body extends on a side of the coupling member remote from the connecting means.
3. Coupling device according to claim 2, **characterized in that** the pressure-absorbing body comprises a rigid tubular body which is enclosed in at least substantially clearance-free manner between the support device and the support body and surrounds the coupling member.
4. Coupling device according to claim 3, **characterized in that** the tubular body comprises a cylindrical metal bush.
5. Coupling device according to claim 2, 3 or 4, **characterized in that** the coupling member comprises a tensioned threaded end which is received in the support device and protrudes from the support body and is connected to the support body by a fitting nut body.
6. Coupling device according to one or more of the preceding claims, **characterized in that** the support device comprises a support on which a stop surface forming part of the outside wall element can be received.
7. Coupling device according to claim 6, **characterized in that** the support comprises a support surface with adjusting means which enable the stop surface to be received thereon without clearance.
8. Coupling device according to claim 7, **characterized in that** the adjusting means comprise one or more adjusting bolts which protrude adjustably from the support surface.
9. Coupling device according to claim 6, 7 or 8, **characterized in that** the support is bounded by a wall, which wall is connected adjustably to the support device and here determines a support width.
10. Coupling device according to claim 9, **characterized in that** the wall is connected to the support device via at least one fitting body.
11. Coupling device according to claim 9, **characterized**

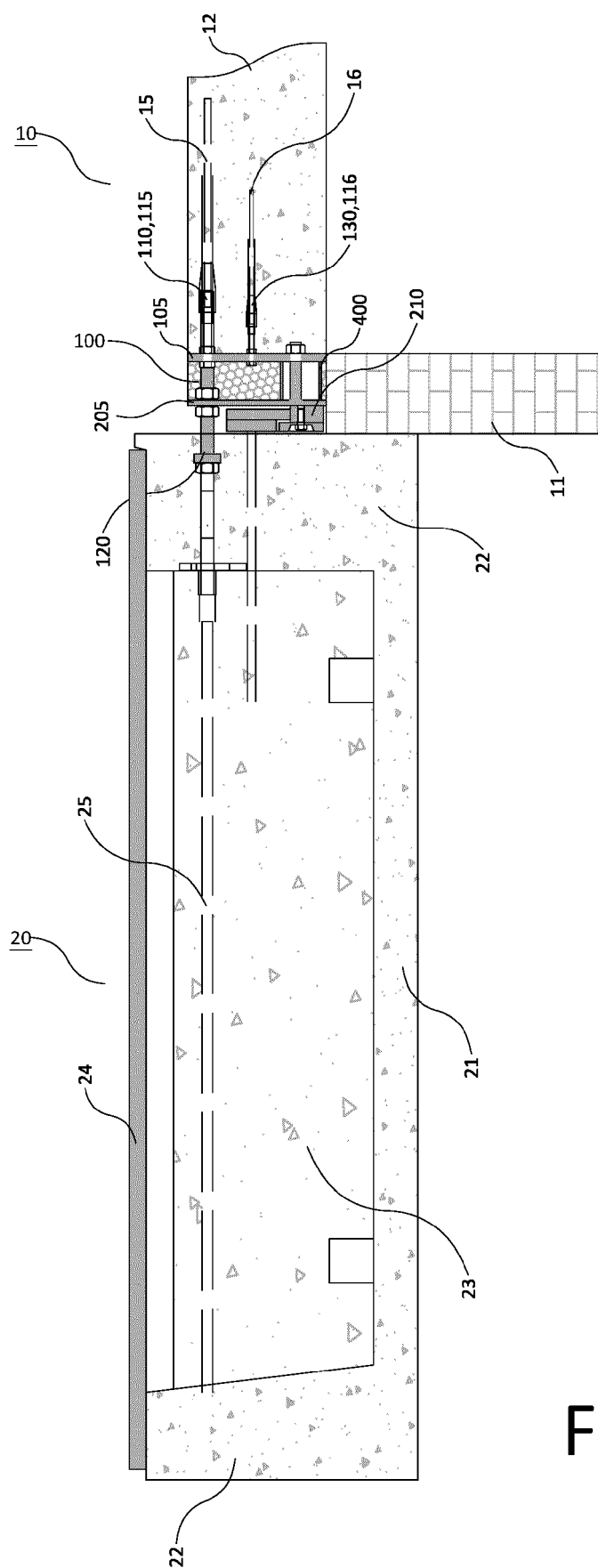
in that the wall is connected to the support device in continuously adjustable manner via at least one adjusting bolt.

12. Coupling device according to claim 9, **characterized in that** a pressure-resistant paste is applied on at least one of a frontal side and a rear side of the wall, particularly a pressure-resistant two-component paste. 5
13. Coupling device according to one or more of the preceding claims, **characterized in that** the support device comprises a first metal plate body, that the support body comprises a second metal plate body at least substantially parallel to the first plate body, and that the first and the second plate body are mutually separated by a thermally insulating core, particularly by a foam body, more particularly by a polymer foam body. 10
14. Coupling device according to claim 13, **characterized in that** the thermally insulating core is surrounded at least partly, preferably at least largely, by a fire-resistant casing, particularly a metal sleeve, more particularly a sleeve of stainless steel which is optionally provided with a fire-resistant coating. 15
15. Coupling device according to one or more of the preceding claims, **characterized in that** the first connecting means comprise a first outer end of an elongate connecting body and that the second connecting means comprise an opposite, second outer end of the connecting body, which second outer end comprises a threaded end and can be anchored in the outside wall element by means of a fitting nut body. 20
16. Coupling device for a durable connection of an outside wall element to a building, comprising first connecting means for a durable operative connection to a floor reinforcement of a storey floor of the building and comprising second connecting means for a durable operative connection to the outside wall element, wherein the first and second connecting means are mutually operatively coupled for force transmission, comprising on the building side a support body which is intended and configured to support on the building and comprising on an opposite side at a distance from the support body a support device which provides at least a part of a bearing suspension of the outside wall element. 25
17. Adjusting profile for at least temporary fixation of a number of coupling devices according to one or more of the preceding claims, comprising an elongate fixation body, which body is provided for each of the coupling devices with a fitting passage for the second connecting means and which body can be connected 30

by means thereof to the relevant coupling device.

18. Adjusting profile according to claim 17, **characterized in that** the fixation body also comprises a passage at the position of a threaded cavity in the support device for receiving a screw member for the purpose of fastening a releasable wall of a cavity of the support device, and that the support device can be connected to the fixation body by means of the same, or at least a similar, screw member after the wall has been removed. 35
19. Adjusting profile according to claim 17 or 18, **characterized in that** the fixation body comprises a body which is at least substantially rectangular in cross-section, particularly a U-profile, L-profile, a beam body or tubular body, more particularly of wood, of plastic or of steel. 40





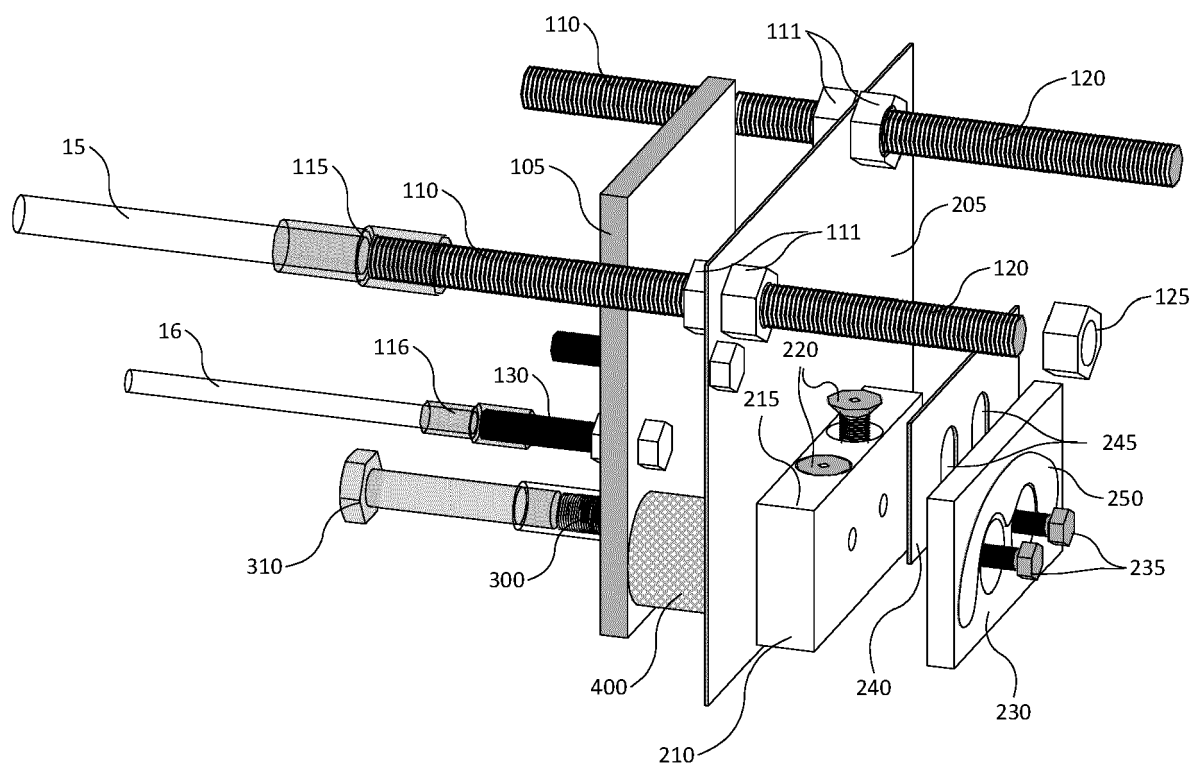


Fig.2

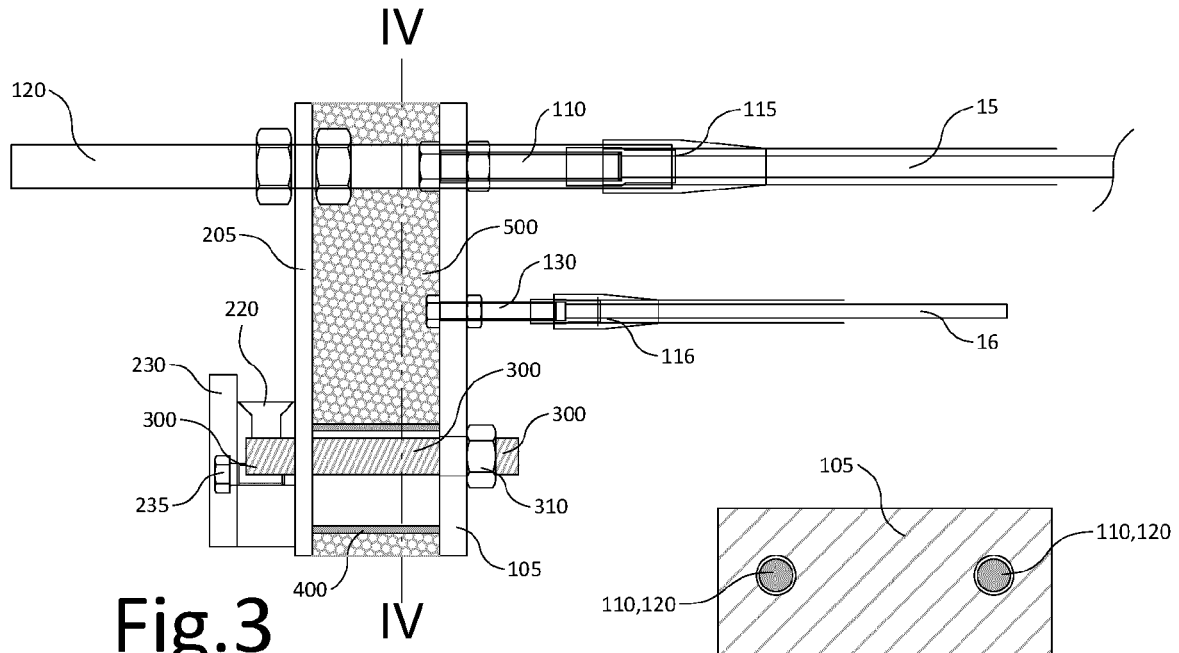
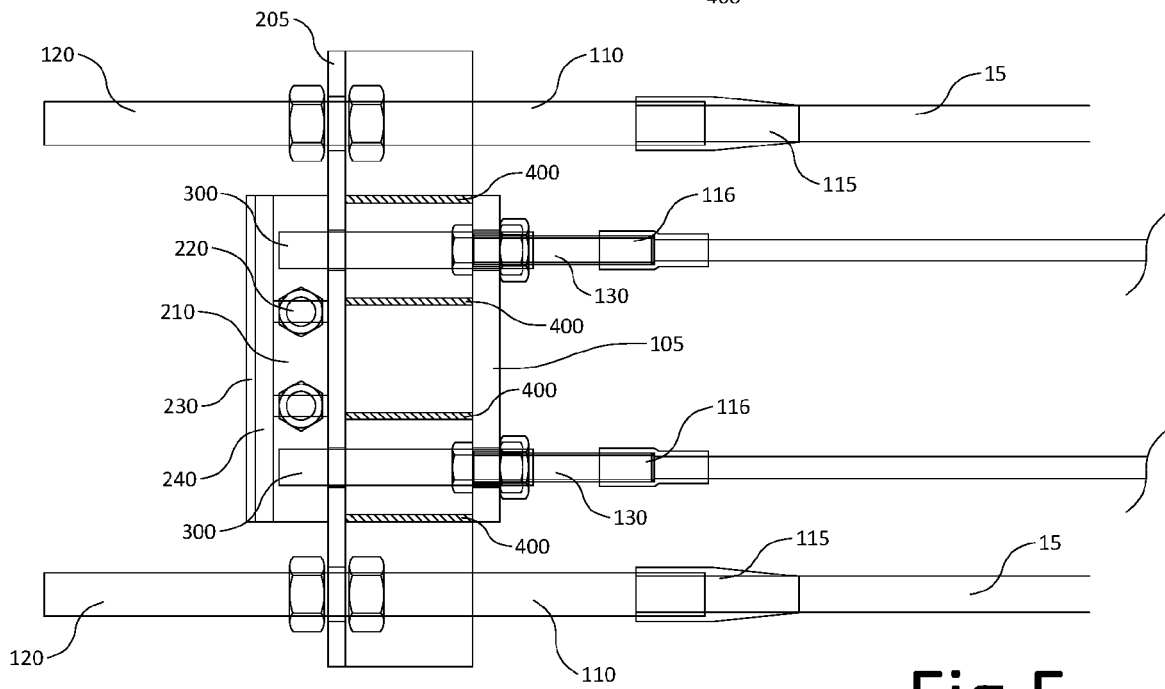
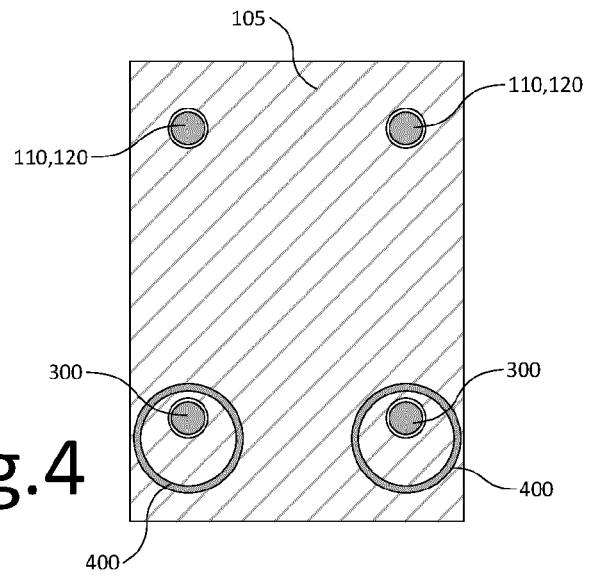


Fig. 4



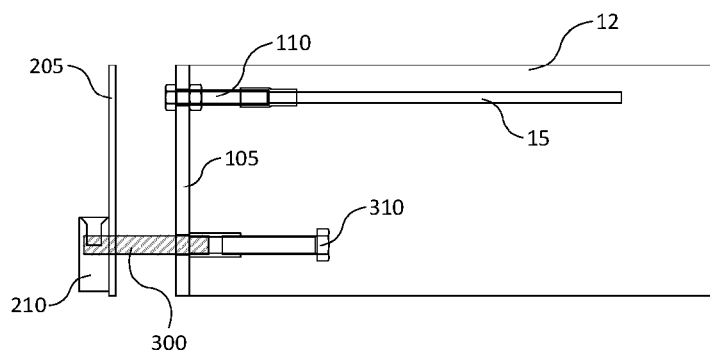


Fig.6

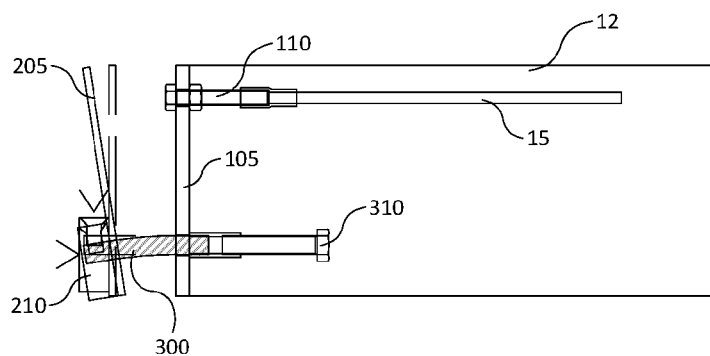


Fig.7

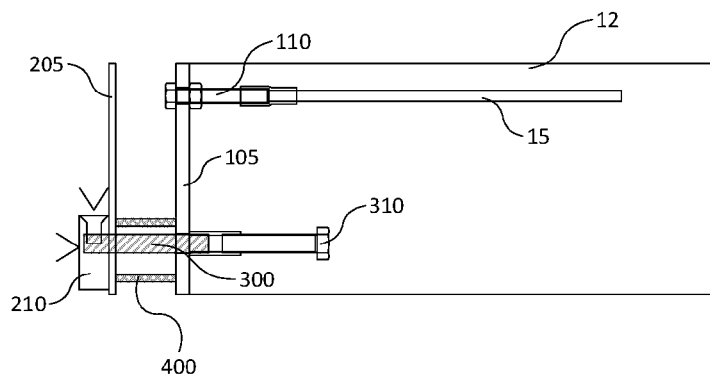


Fig.8

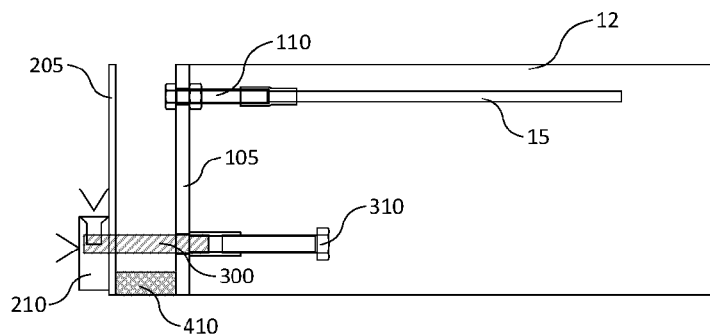
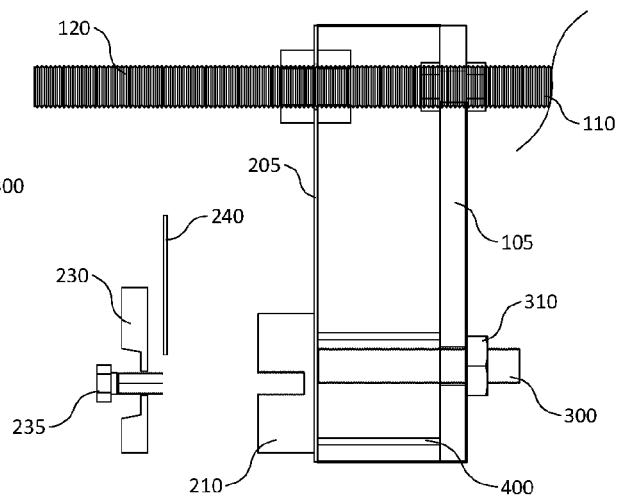
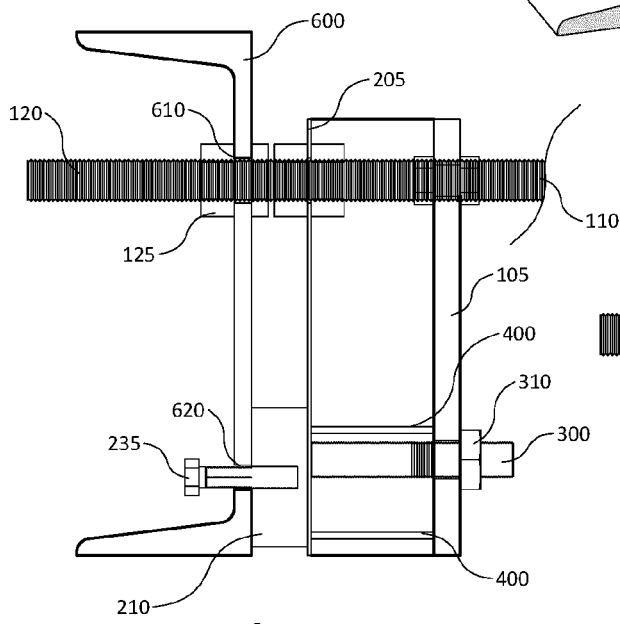
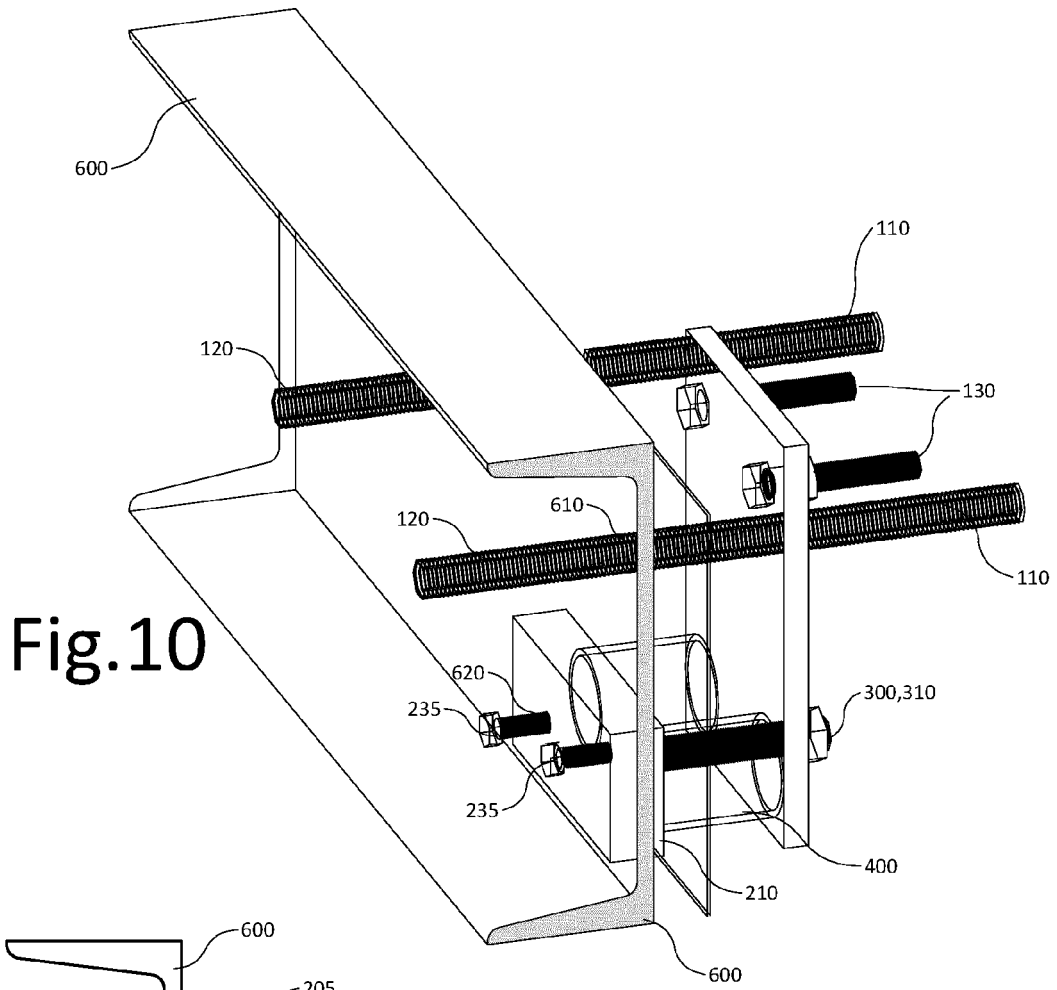


Fig.9



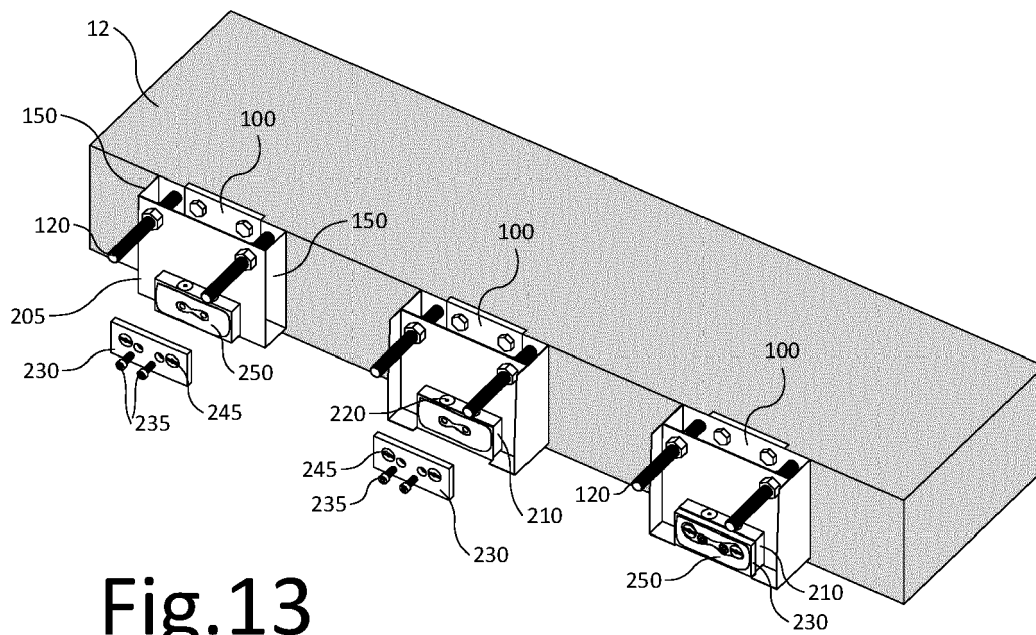


Fig.13

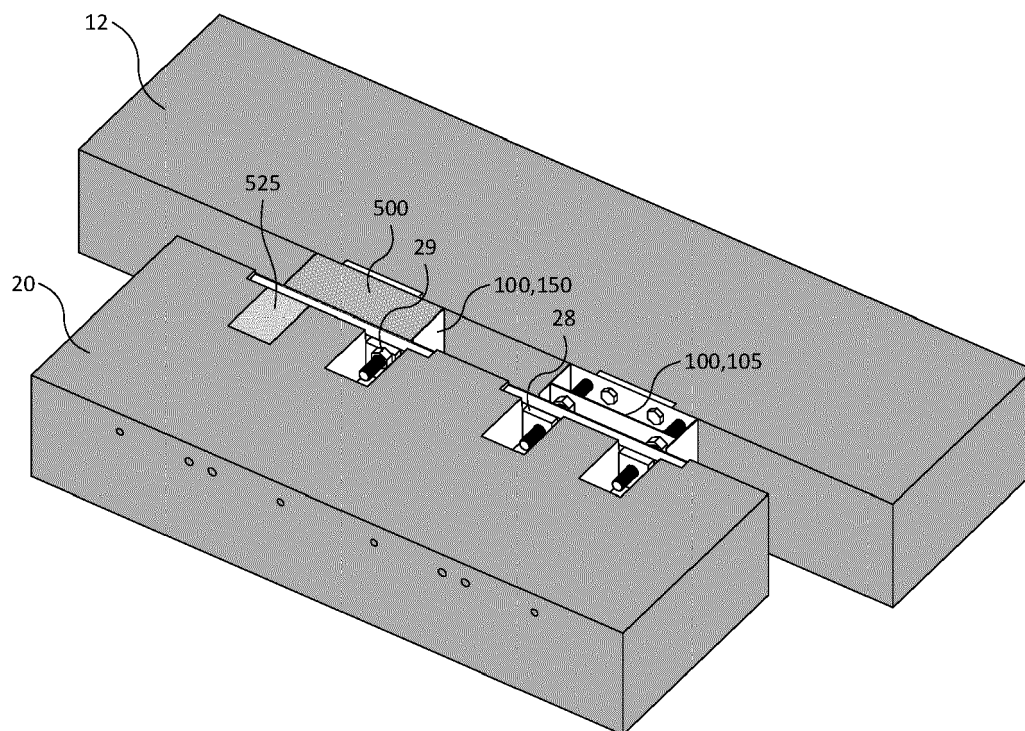


Fig.14



## EUROPEAN SEARCH REPORT

Application Number  
EP 21 15 2193

5

10

15

20

25

30

35

40

45

50

55

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                   |                                                        |                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                                     | Relevant to claim                                      | CLASSIFICATION OF THE APPLICATION (IPC)    |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE 10 2008 061009 A1 (SCHOECK BAUTEILE GMBH [DE]) 10 June 2010 (2010-06-10)<br>* paragraph [0001] - paragraph [0072];<br>figure 5 *                               | 1-16                                                   | INV.<br>E04B1/00                           |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE 10 2005 012862 A1 (HEGGER JOSEF [DE]; ROESER WOLFGANG [DE] ET AL.)<br>12 January 2006 (2006-01-12)<br>* paragraph [0004] - paragraph [0094];<br>figures 1, 6 * | 16                                                     |                                            |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | WO 2017/086777 A1 (T&R ENG B V [NL])<br>26 May 2017 (2017-05-26)<br>* page 16, line 11 - line 29; figures<br>15A-16 *                                             | 16                                                     |                                            |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | DE 28 42 584 A1 (CSONGRAD MEGYEI TANACSI EPITOE) 3 April 1980 (1980-04-03)<br>* page 18, line 26 - page 20, line 10;<br>figures 6,7 *                             | 17-19                                                  |                                            |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | WO 2016/162607 A1 (AQUALIFT [FR])<br>13 October 2016 (2016-10-13)<br>* paragraph [0025] - paragraph [0040];<br>figures 1-7 *                                      | 17-19                                                  | TECHNICAL FIELDS<br>SEARCHED (IPC)<br>E04B |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                   |                                                        |                                            |
| Place of search<br><b>The Hague</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                   | Date of completion of the search<br><b>31 May 2021</b> | Examiner<br><b>Dieterle, Sibille</b>       |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document<br>T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                                                                                                                                                   |                                                        |                                            |

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 21 15 2193

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

31-05-2021

10

15

20

25

30

35

40

45

50

55

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| DE 102008061009 A1                        | 10-06-2010          | NONE                       |                     |
| DE 102005012862 A1                        | 12-01-2006          | NONE                       |                     |
| WO 2017086777 A1                          | 26-05-2017          | EP 3377709 A1              | 26-09-2018          |
|                                           |                     | NL 2015800 A               | 17-05-2017          |
|                                           |                     | NL 2017754 A               | 02-06-2017          |
|                                           |                     | NL 2018910 A               | 23-05-2018          |
|                                           |                     | WO 2017086777 A1           | 26-05-2017          |
| DE 2842584 A1                             | 03-04-1980          | NONE                       |                     |
| WO 2016162607 A1                          | 13-10-2016          | CN 107532430 A             | 02-01-2018          |
|                                           |                     | EP 3280852 A1              | 14-02-2018          |
|                                           |                     | ES 2725700 T3              | 26-09-2019          |
|                                           |                     | IL 254931 A                | 28-11-2019          |
|                                           |                     | RU 2677511 C1              | 17-01-2019          |
|                                           |                     | US 2018112428 A1           | 26-04-2018          |
|                                           |                     | WO 2016162607 A1           | 13-10-2016          |



**REFERENCES CITED IN THE DESCRIPTION**

*This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.*

**Patent documents cited in the description**

- NL 2016050779 W [0002]