



(11) **EP 3 626 910 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
25.03.2020 Bulletin 2020/13

(51) Int Cl.:
E04G 9/02 (2006.01) E04G 17/04 (2006.01)

(21) Application number: **17910110.0**

(86) International application number:
PCT/ES2017/070312

(22) Date of filing: **15.05.2017**

(87) International publication number:
WO 2018/211152 (22.11.2018 Gazette 2018/47)

(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
Designated Validation States:
MA MD

(71) Applicant: **Sistemas Técnicos De Encofrados, S.A.**
08150 Parets Del Valles (Barcelona) (ES)

(72) Inventor: **UBINANA FELIX, Jose Luis**
08100 Mollet del Vallès (Barcelona) (ES)

(74) Representative: **Durán-Corretjer, S.L.P.**
Còrsega, 329
(Paseo de Gracia/Diagonal)
08037 Barcelona (ES)

(54) **FORMWORK PANEL AND FORMWORK SYSTEM COMPRISING SUCH A PANEL**

(57) Formwork panel that comprises: a formwork element that comprises a formwork surface; a series of structural reinforcement ribs; and a frame that surrounds the formwork element at least along two parallel sides, the frame comprising a hollow profile that comprises a zone for receiving the formwork element and a face that comprises two rib-connection zones and a support zone for panel-connection means, in which the support zone protrudes relative to at least one of the rib-connection zones.

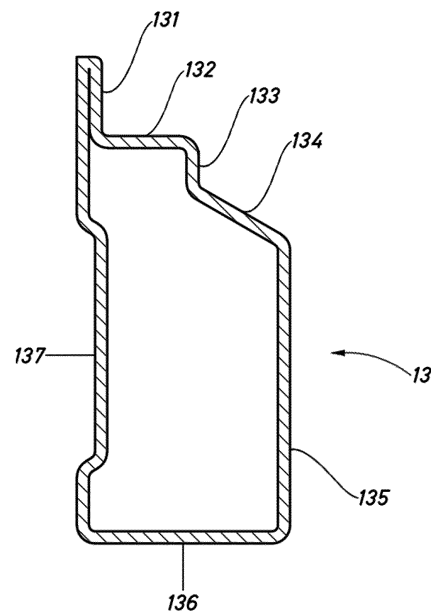


Fig.2

Description

[0001] The present invention relates to formwork systems and, more particularly, to a formwork panel. More specifically, the present invention relates to innovations in panels which are especially useful in the field of light or 'hand-portable' panels, that is, formwork panels that are designed to be moved manually, without the intervention of machinery, such as cranes.

[0002] Said panels are characterised with respect to non-hand-portable panels in being lighter. However, it should be borne in mind that the reduction in weight of the panel must not be achieved at the cost of the necessary rigidity of the panel and, in general, of the entire formwork system.

[0003] Formwork panels usually comprise:

- a moulding element which comprises the moulding surface; said element is usually a panel or set of panels made of timber,
- a series of structural reinforcement ribs (usually made with a rectangular or open U- or C-shaped profile), and
- a frame which surrounds the formwork element at least along two parallel sides.

[0004] In ultra-light panels, and with the object of reducing weight, it is usual for the frame to be formed by a hollow profile, usually made of sheet metal. The profile has a projection or fin and an adjacent surface for receiving the formwork element with the formwork surface. In addition, the profile has a face with two zones to which the rib is connected by welding and a recess between said zones, the object of which is to receive panel-connection means. In ultra-light panels, it is usual for the wall of said face to come in contact with the wall of the opposite face of the profile in the recess zone. The edge of the ribs is flush with that of the profile less the thickness of the moulding element, or in other words, flush with the edge of said face with the zone or zones to which the rib and the recess are connected. Thus, rib and frame are level, and neither projects relative to the other.

[0005] An object of the present invention is to disclose means that allow a reduction in the weight of these types of systems and panels without a reduction in strength, obtaining an excellent compromise between strength and weight.

[0006] More particularly, the present invention discloses a formwork panel which comprises:

- a moulding element which comprises the moulding surface; said element is usually a panel or set of panels made of timber
- a series of structural reinforcement ribs, and
- a frame which surrounds the formwork element at least along two parallel sides

the frame comprising a hollow profile which comprises a

zone for receiving the moulding element and a face which comprises two rib-connection zones and a support zone for panel-connection means, in which

5 the support zone projects relative to at least one of the rib-connection zones.

[0007] Preferably, the two rib-connection zones are not aligned. More preferably, the support zone is a straight length of wall which forms an oblique angle with the rib-connection zones.

[0008] According to another aspect of the present invention, the edge of the rib may be lower than that of the face of the profile which comprises said connection and support zones, so that the profile projects relative to the rib.

[0009] According to the present invention, the ribs may be connected to the profile by welding and the profile may be made of sheet metal.

[0010] More preferably, the support zone is neither parallel nor perpendicular to any of the other faces of the profile.

[0011] Preferably, both connection zones are parallel, with the outermost connection zone positioned closer to the centre of the panel than the innermost connection zone.

[0012] The present invention also comprises a formwork system which comprises panels according to the present invention. Advantageously, the formwork system comprises at least one panel in which the rib is set back relative to the profile and one panel in which the rib is set back relative to the profile. Preferably, the system will also comprise at least one clamp for connecting adjacent panels in which the shape of the clamp matches that of the support zone of the panels.

[0013] According to the present invention, the support zone is formed as a projection and not as a recess. This signifies a reduction in weight for the following reasons:

- It allows the ribs to be cut to match the shape of the profile. As the support zone projects, the amount of material of the ribs is reduced.
- With regard to the profile with a recess, the profile gains rigidity without an increase in the surface area of sheet metal required to produce said profile. Because said profile has greater rigidity, the thickness thereof can be reduced and, hence, the weight thereof.

[0014] Because the support zone is formed as a face which is neither parallel nor perpendicular to any of the other faces of the profile, errors in placing the connection clamps are avoided.

[0015] The fact that the outermost connection zone is positioned closer to the centre of the panel than the innermost connection zone helps ensure the viability of the ribs which are set back relative to the profile.

[0016] Moreover, the configuration of the present invention helps ensure that the outermost support zone is

larger than the innermost, further enhancing the possibility of using ribs that are set back relative to the profile.

[0017] For a better understanding, the accompanying drawings show an embodiment of the present invention given as an explanatory but non-limiting example.

Fig. 1 is a transverse cross section along a horizontal plane of an ultra-light formwork panel according to the prior art, in which can be seen the moulding element, the profile that forms the frame and the rib.

Fig. 2 is a view in transverse cross section of an embodiment of a profile for a formwork panel according to the present invention.

Fig. 3 is a transverse cross section along a horizontal plane of an embodiment of an ultra-light formwork panel according to the invention, in which can be seen the moulding element, the profile of Fig. 2 and a rib.

Fig. 4 is a variant of the panel of Fig. 3.

Fig. 5 shows two panels according to the present invention connected by a clamp belonging to a formwork system according to the present invention.

Fig. 6 is a perspective view of a clamp according to the present invention.

Fig. 7 is a view in cross section along a horizontal plane of a formwork system according to the present invention, with sets of parallel panels which leave a moulding space internally.

Fig. 8 is a variant of the embodiment of Fig. 7.

Fig. 9 is another variant of the embodiment of Fig. 7.

Fig. 10 is yet another variant of the embodiment of Fig. 7.

Fig. 11 is a view in elevation of an assembly of a formwork system according to the present invention, in which four panels define the moulding space of a column.

Fig. 12 is a plan view from above which corresponds to the plane XII-XII of Fig. 11.

Fig. 13 is a detail of Fig. 12 which shows the support of the head of a threaded connection bolt in the connection zone of the profile of the frame of the panel.

[0018] Fig. 1 shows an ultra-light formwork panel according to the prior art. More specifically, said figure shows a transverse cross section of one of the side edges of a panel, in order to show clearly the elements that

make up said panel.

[0019] The panel is made up of a moulding element -11- which comprises a moulding surface -111-. The moulding surface -111- has the function of limiting the space occupied by the concrete, while possibly remaining in contact therewith. On the rear portion, that is to say, on the portion opposite the moulding portion a series of ribs -12- runs over the panel from side to side. The panel also has a frame which runs round said panel at the perimeter thereof. The frame is formed by a hollow profile -13-, made of folded sheet metal. The profile has a seat formed by the moulding element -11- which is formed by a projection -131- or fin which protects the side of the moulding element and a seat surface -132- formed by an adjacent wall of the profile. Immediately adjacent to the seat is a first zone -133- for connection by welding to the rib. Following the first connection zone -133- is a support zone -134- for connection means which is formed as a recess in the profile. The most set back wall of the support zone, in this case, comes in contact with the opposite wall of the profile -137-. An edge wall -136- is situated between the two opposite walls which defines the point of the profile -13- that projects most relative to the moulding element -11-. The rib -12- is flush with the profile at the height of said edgewise wall -136-. The opposite wall -137- in turn has a slight recess to facilitate handling the panel.

[0020] Fig. 2 shows a profile -13- which corresponds to a formwork panel according to the present invention. Elements that are the same or similar to those shown in the previous figure have been identified with identical reference numerals and will therefore not be explained in detail. Compared with the profile -13- of Fig. 1, it can be seen that one difference is that the support zone -134- is not formed as a recess in the profile -13-, but rather is a zone which projects relative to the first connection zone -133-. In particular, the support zone -134- is formed as an oblique wall zone relative to the first and second support zones -133-, -135-. More particularly, it will be seen that the support zone is neither parallel nor perpendicular to any of the walls -131-, -132-, -133-, -135-, -136-, -137- of the profile -13-. In this profile it can be seen that the first support zone -133- and the second support zone -135- are not aligned, although, in this case, said zones are parallel. Furthermore, it can be seen that in this case, the length (and consequently the area) of the second connection zone -135- is greater than that of the first connection zone -133-. This facilitates the use of ribs that are not flush with the profile. This effect is also enhanced by the fact that the second connection zone -135-, which is the outermost connection zone, is positioned closer to the centre of the panel than the first connection zone -133-. This makes it more difficult for the rib to come out of position and consequently limits the connection requirements, for example, by welding. This will allow, if required, the rib to be connected effectively only to one of said connection zones, if desired.

[0021] As can be seen, unlike in the prior art, the

present invention may use stepped profiles. In particular, there may be no depressed zones in the contact face with the rib.

[0022] A comparison of the profiles -13- of Fig. 1 and 2 shows that the production of the profile -13- in the example shown in Fig. 2 requires the same amount of sheet metal as that in Fig. 1, but has greater rigidity relative to the forces to which said profile is exposed inside the formwork panel. This means that, if required, the profile of Fig. 2 can be produced, for the same strength, with a smaller thickness, producing a panel with less weight. In addition, and given that the width of the profile is greater, smaller ribs are required with the profile of Fig. 2, resulting in an additional loss of weight.

[0023] Fig. 3 and 4 show two embodiments of a formwork panel -1- according to the present invention. Elements that are the same or similar to those shown in the previous figures have been identified with identical reference numerals and will therefore not be described in detail. The panels -1- of Fig. 3 and 4 have a similar outline to that described in Fig. 2, and have a frame that uses a profile -13-, with the consequent saving of material in profile -13- and rib -12- compared to the case in Fig. 1. In Fig. 4, both the profile and the rib are flush, as can be seen by comparing the positions of the end wall -136- of the profile -13- and the free end -126- of the rib. In Fig. 3, on the contrary, it can be seen that the rib -12- has smaller dimensions and the free end -126- thereof is set back, or closer to the moulding element -11- than the end wall -136- of the profile -13- which forms the frame, with the consequent saving in weight. This configuration is particularly suitable for frames with small dimensions, that is, with a smaller rib length, or distance between supports, or with lower functional requirements, that is, designed for a lower pressure of formed concrete, or in panels with a small distance between ribs. This allows the weight of the panels to be optimised still further, by adjusting said panels to the dimensions and/or mechanical requirements thereof.

[0024] In both cases, the ribs are cut according to a profile that matches the profile that forms the frame. The shape of the profile of the panel according to the present invention permits welding even though the edge of the rib is smaller than the usual edge and/or, in particular, than that of the frame.

[0025] Fig. 5 shows an embodiment of a portion of a formwork system according to the present invention, in which two formwork panels -1-, -1'- positioned next to each other are connected by a clamp -2-. The clamp -2- is adapted to the shape of the support zone -134- of the profile -13-, each of the arms -21-, -21'- of the clamp having a matching support surface -211-, -211'- . Fig. 6 shows an embodiment of the clamp in detail.

[0026] Fig. 7 to 10 show other embodiments of formwork systems according to the present invention. In particular, said figures show configurations in which different adjacent panels, with the profiles thereof -13-, -13'- in contact and others parallel thereto, form the formwork

space of, for example, a wall. Accordingly, both sides of the formwork are connected, as is known, by tie bars -4- and the corresponding nuts -5- which act on distribution plates -3-. In the case of systems according to the present invention, the distribution plates -3- provide for the existence of panels with different types of rib -12-, -12'-.

[0027] In Fig. 7 the distribution plate -3- must act on two panels that have ribs -12-, -12'- that are set back relative to the profiles -13-, -13'- at different heights. Accordingly, two projections -31-, -32- are arranged on the distribution plate -3-, the length of each of the projections corresponding to the difference between the edge of the profile -13-, -13'- of one type of panel and the edge of the profile -12-, -12'- of said type of profile. This allows the same distribution plate to be used in the configurations of Fig. 7 and 8. In the example shown, the projections -31- and -32- are arranged on opposite faces of the distribution plate -3-. Fig. 9 and 10 show two more configurations obtained with a distribution plate -3- which varies with respect to that shown in Fig. 7 and 8 in that said plate has only one projection -32'- at one end, and the other end -31'- has no projection. As can be seen in Fig. 9, the length of the projection -32'- coincides with the difference between the edges of rib and profile. In Fig. 10, the absence of an edge at one of the ends is used for configurations in which the rib -12"- and the profile -13"- have the same edge and are therefore flush.

[0028] It has been possible in the previous figures to see how the provision of projections on the distribution plate allows a single type of distribution plate to be used for two different panel types.

[0029] Fig. 11 to 13 shown another example of a configuration of a system according to the present invention, in which a formwork for square or rectangular columns is produced. Elements that are the same or similar to those shown in the previous figures have been designated with identical reference numerals and will therefore not be described in detail. For this type of connection, a partly threaded bar -3- is used with a head -61- shaped as an asymmetrical T which has a projection -611- with a shape that matches the support zone -134- of the profile -13- of the panels, so as to ensure good contact between said surfaces.

[0030] Although the invention has been presented and described with reference to embodiments thereof, it will be understood that said embodiments do not limit the invention, and therefore many structural or other details which may be evident to persons skilled in the art after interpreting the subject matter disclosed in the present description, claims and drawings, may vary. Thus, all variants and equivalents will be included within the scope of the present invention if said variants and equivalents may be considered to fall within the most extensive scope of the following claims.

Claims**1.** Formwork panel which comprises:

- a moulding element which comprises a moulding surface; 5
- a series of structural reinforcement ribs, and
- a frame which surrounds the formwork element at least along two parallel sides 10

the frame comprising a hollow profile which comprises a zone for receiving the moulding element and a face which comprises two rib-connection zones and a support zone for panel-connection means, in which 15

the support zone projects relative to at least one of the rib-connection zones.

2. Panel, according to the preceding claim, in which the rib-connection zones are not aligned. 20**3.** Panel, according to the preceding claim, in which both connection zones are parallel, with the outermost connection zone positioned closer to the centre of the panel than the innermost connection zone. 25**4.** Panel, according to any one of the preceding claims, in which the support zone is a straight length of wall which forms an oblique angle with the rib-connection zones. 30**5.** Panel, according to the preceding claim, in which the support zone is neither parallel nor perpendicular to any of the other faces of the profile. 35**6.** Panel, according to any one of the preceding claims, in which the edge of the rib is lower than that of the face of the profile which comprises said connection and support zones, so that the profile projects relative to the rib. 40**7.** Panel, according to any one of claims 1 to 5, in which the edge of the rib is such that rib and profile are flush, and do not project relative to one another. 45**8.** Panel, according to any one of the preceding claims, in which the profile is made of sheet metal.**9.** Panel, according to any one of the preceding claims, in which the ribs are connected to the profile by welding. 50**10.** Formwork system which comprises panels according to any one of the preceding claims. 55**11.** System, according to the preceding claim which comprises a panel according to claim 6 and a panel according to claim 7.**12.** System, according to either claim 10 or claim 11, which comprises at least one clamp for connecting adjacent panels in which the shape of the clamp matches that of the support zone of the panels.

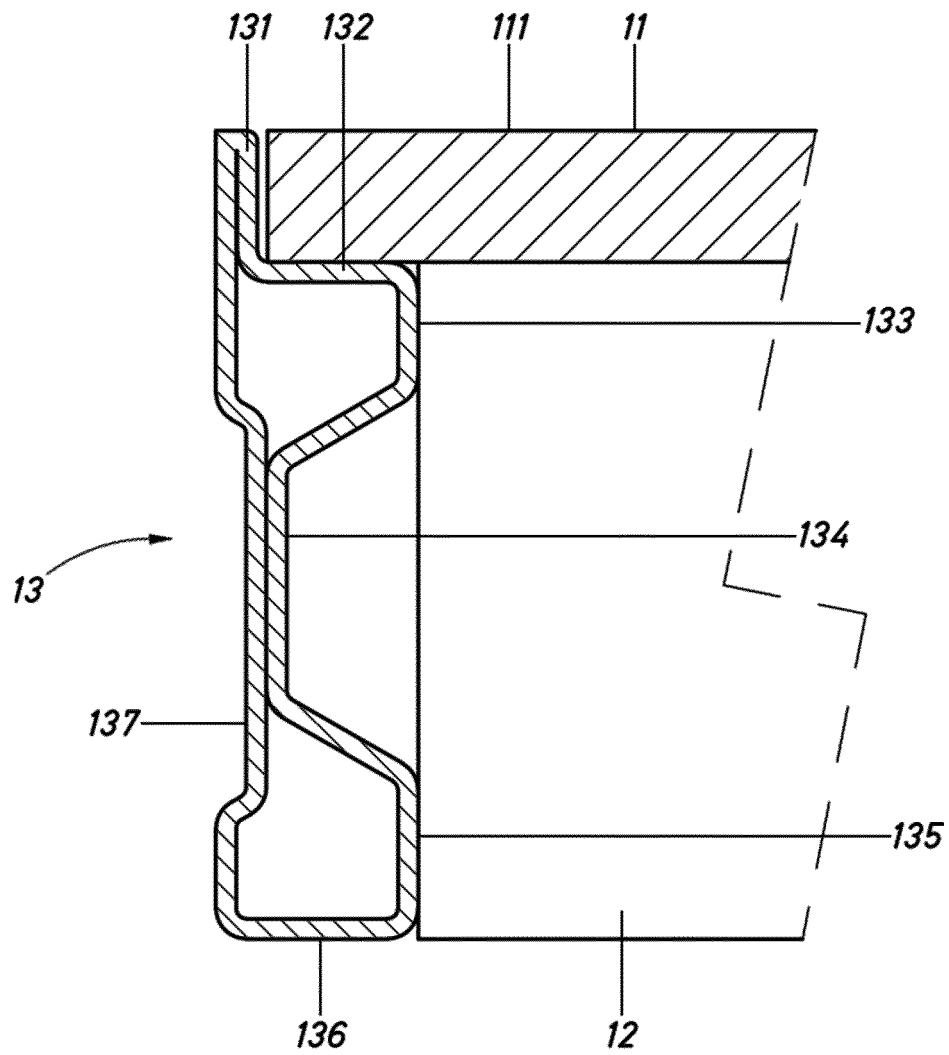


Fig.1

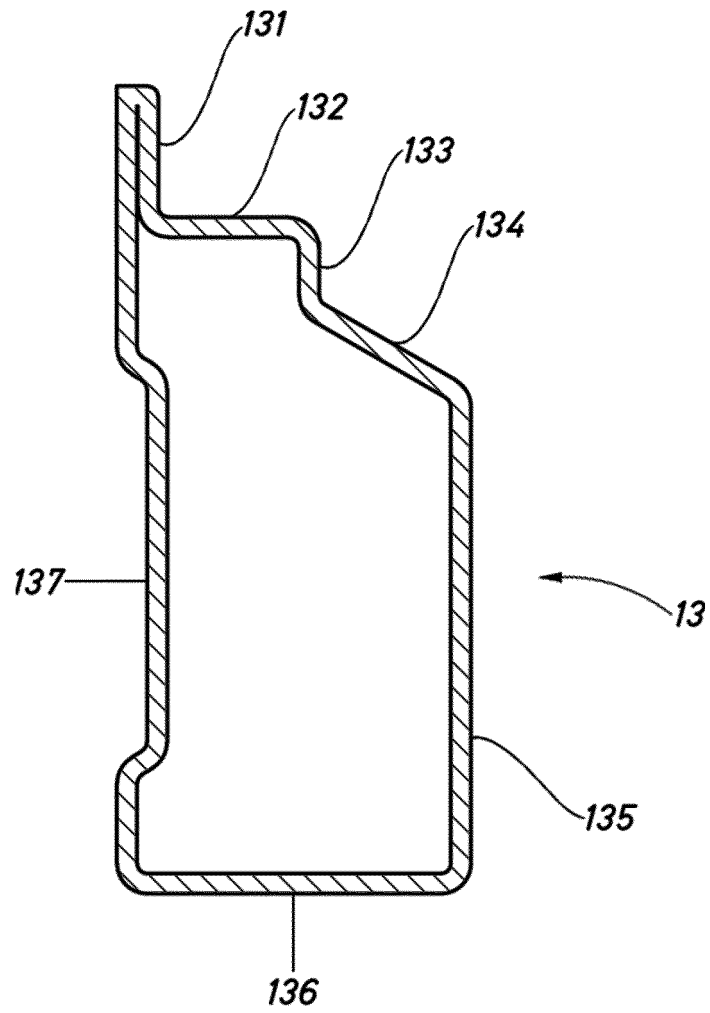


Fig.2

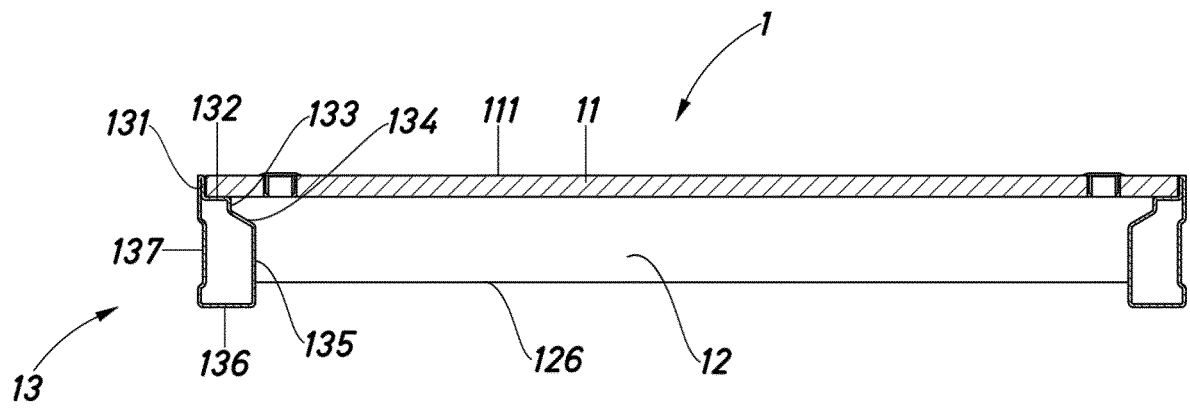


Fig.3

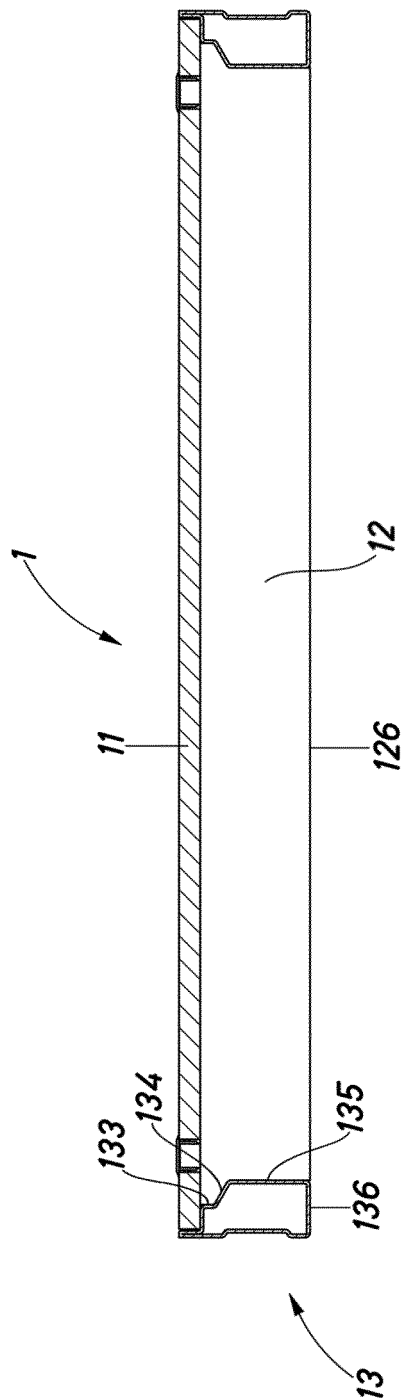


Fig.4

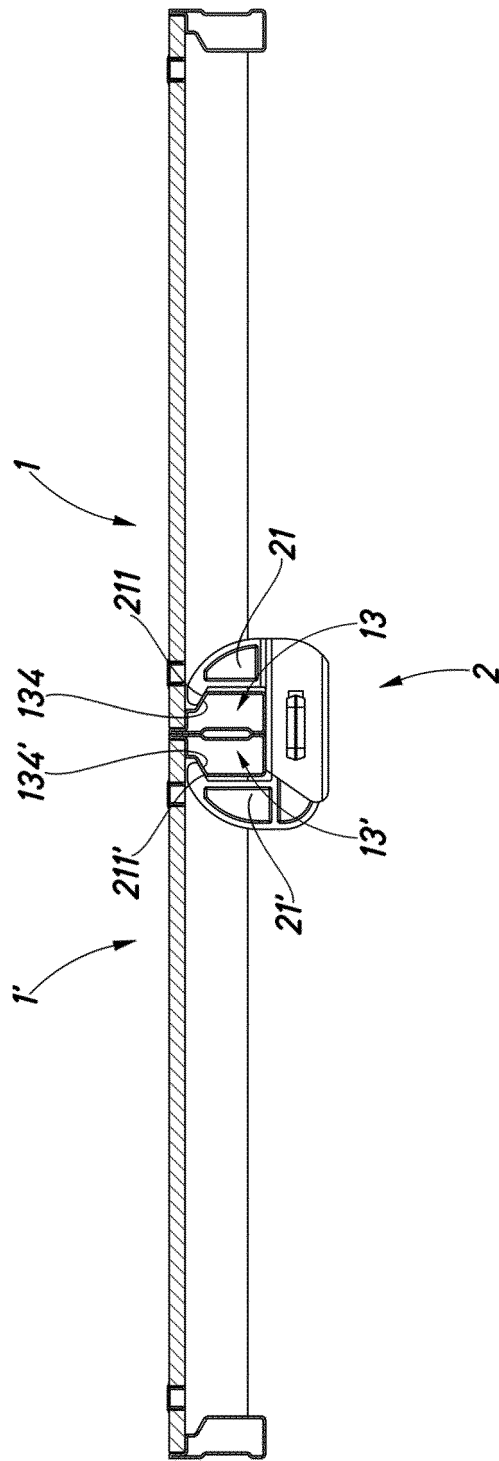


Fig.5

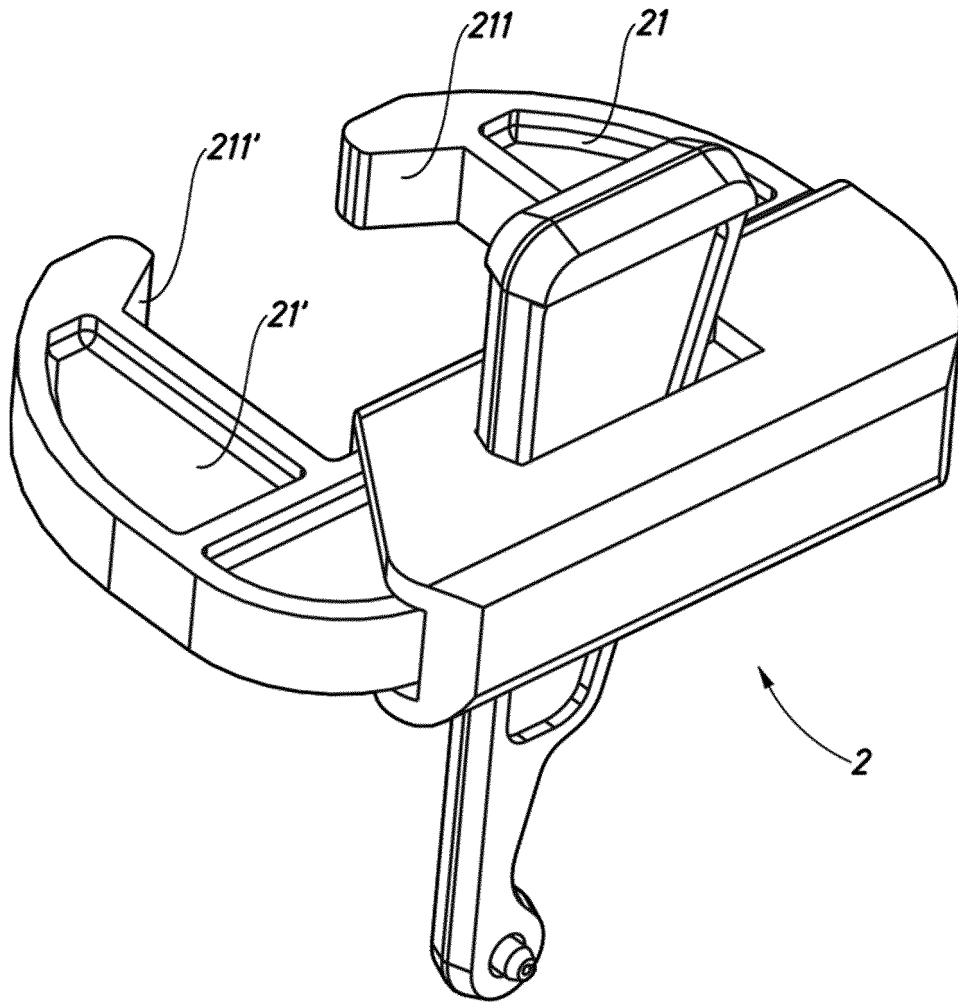


Fig.6

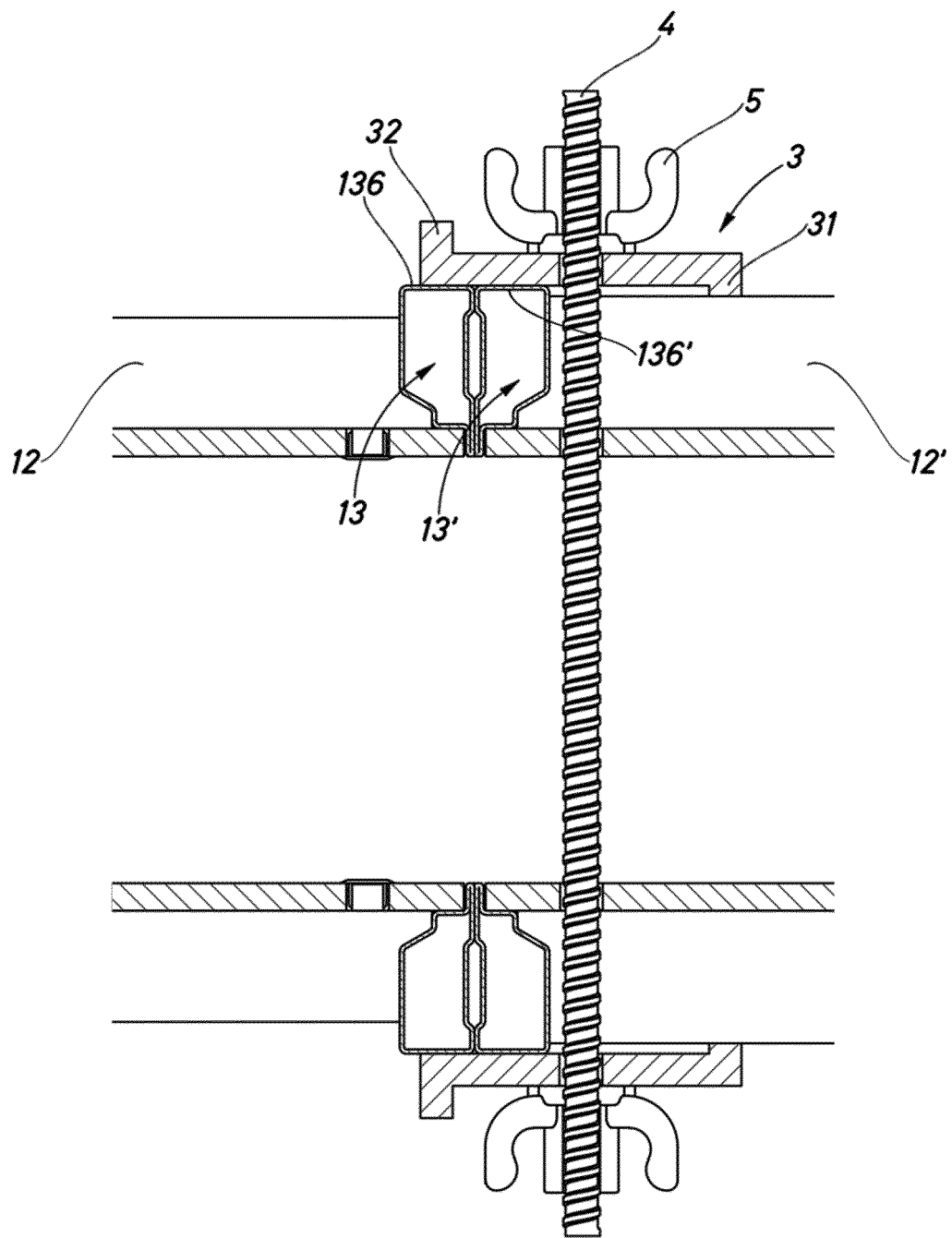


Fig.7

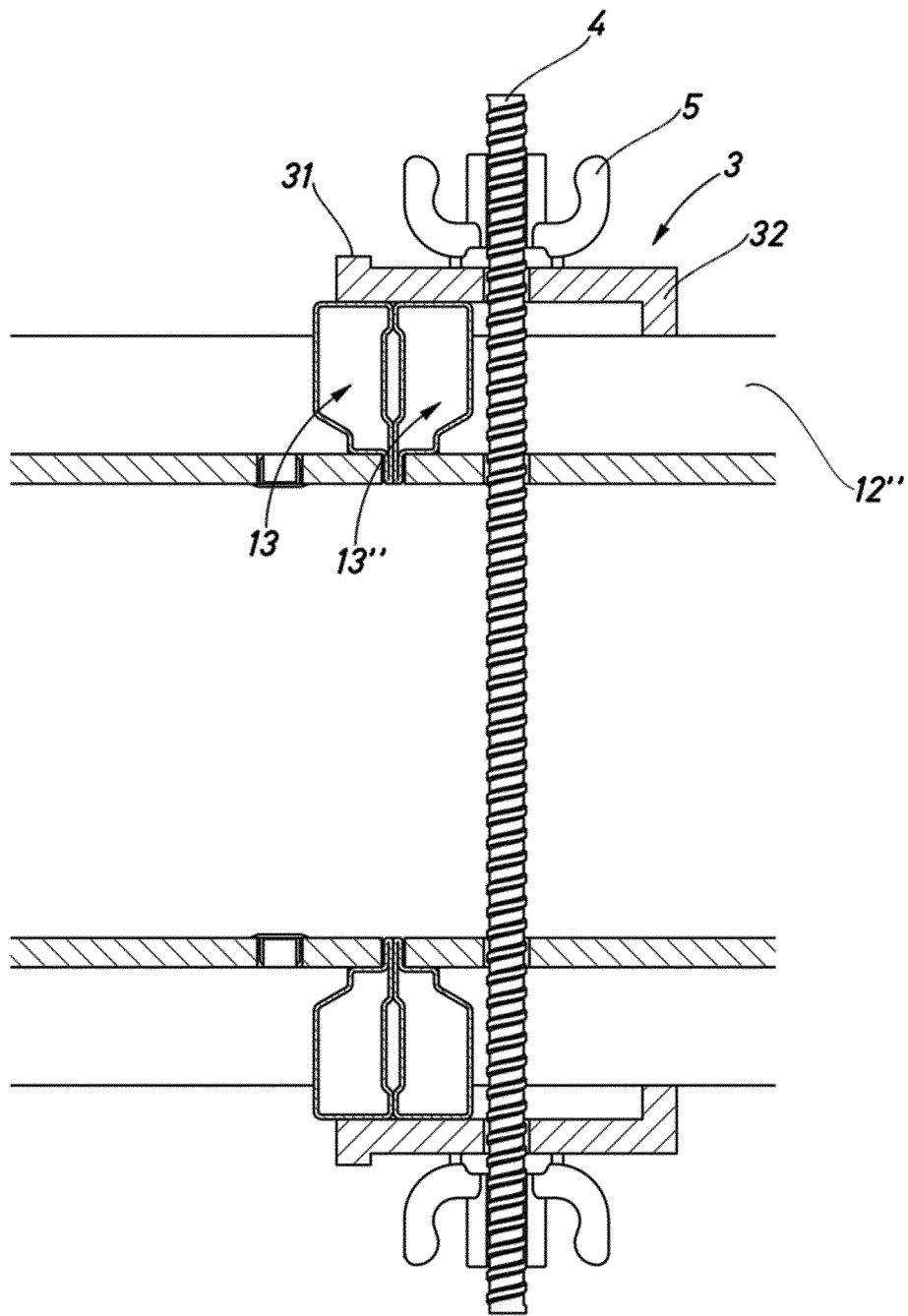


Fig.8

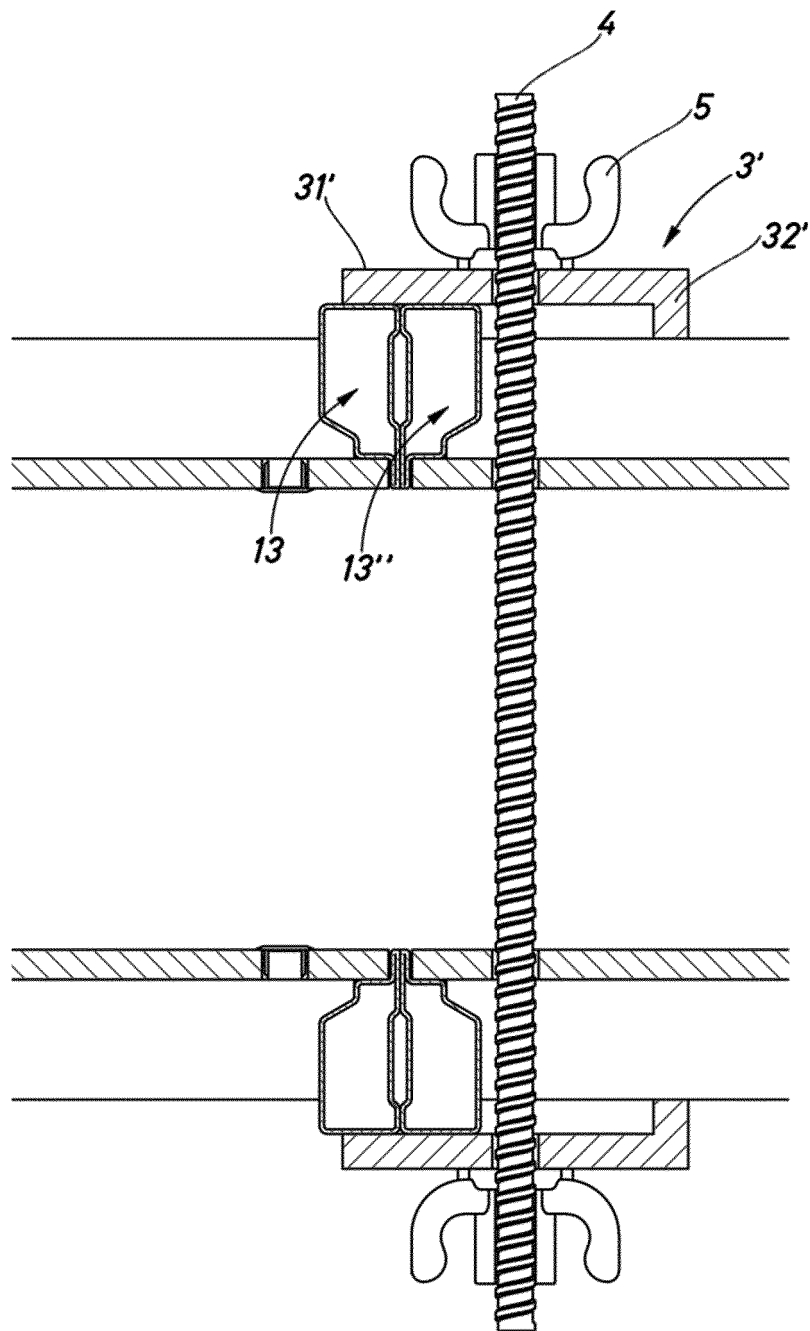


Fig.9

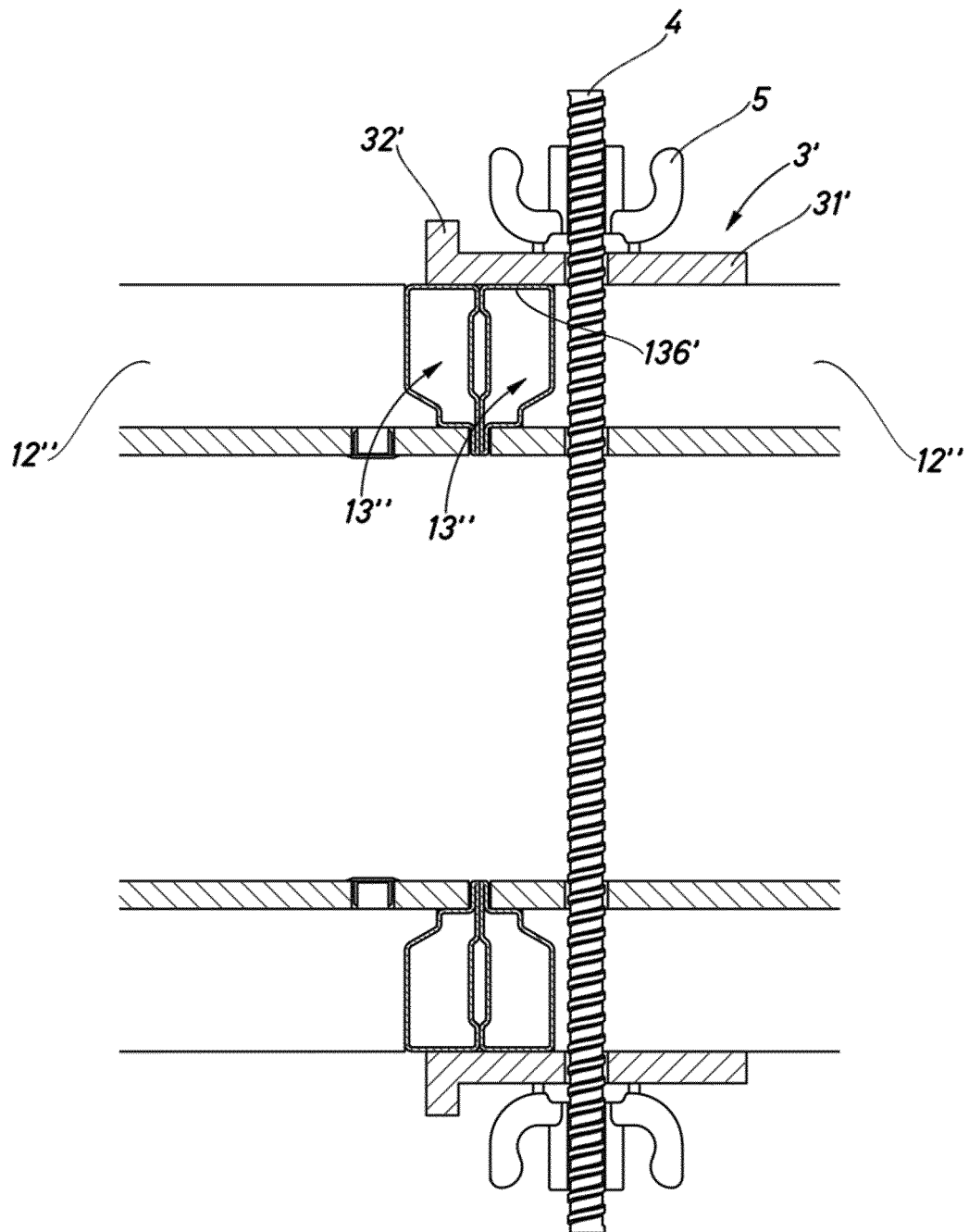


Fig.10

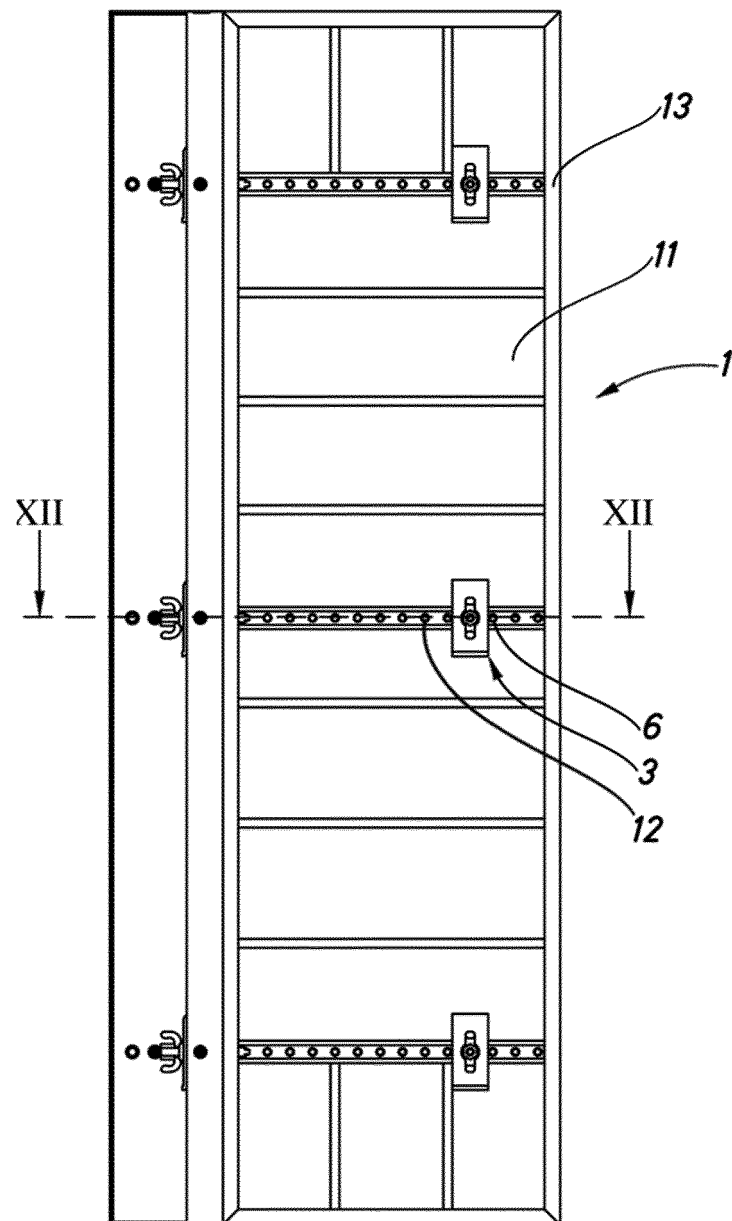


Fig.11

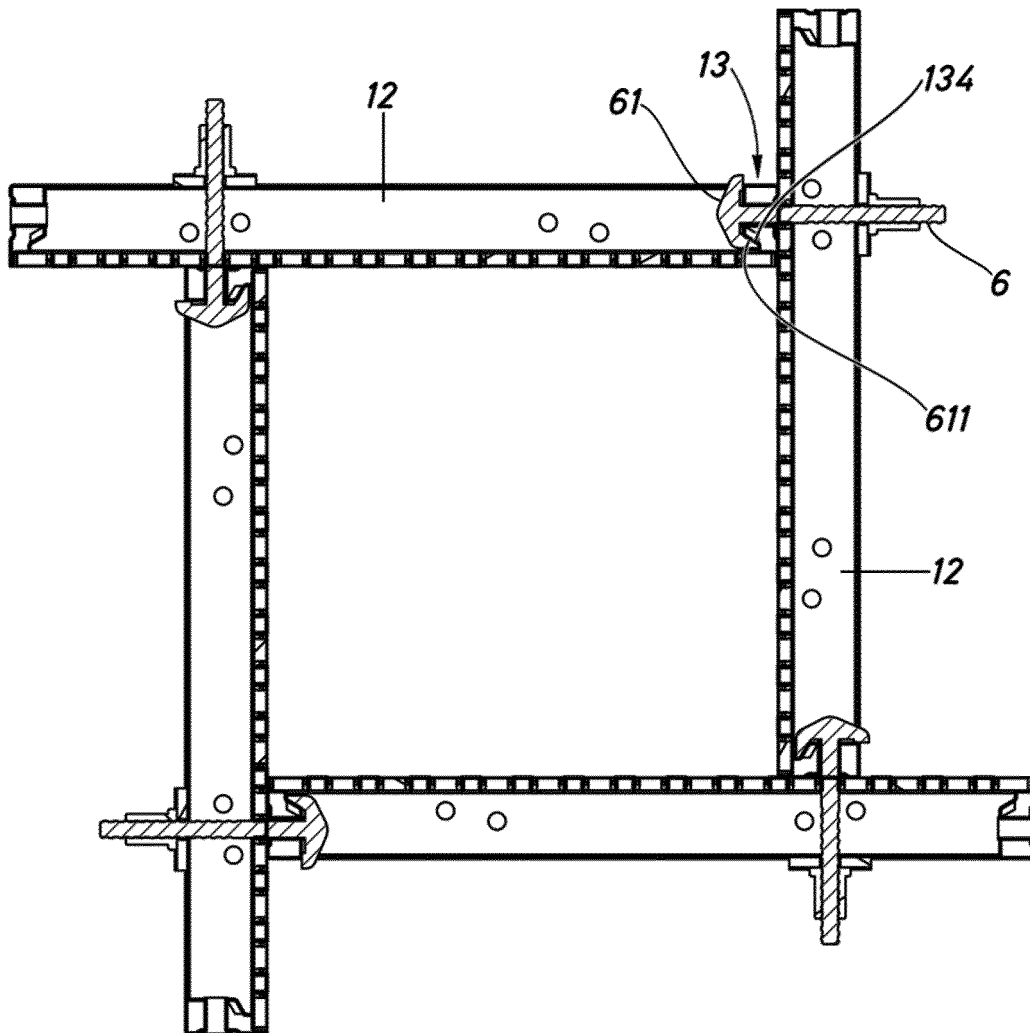


Fig.12

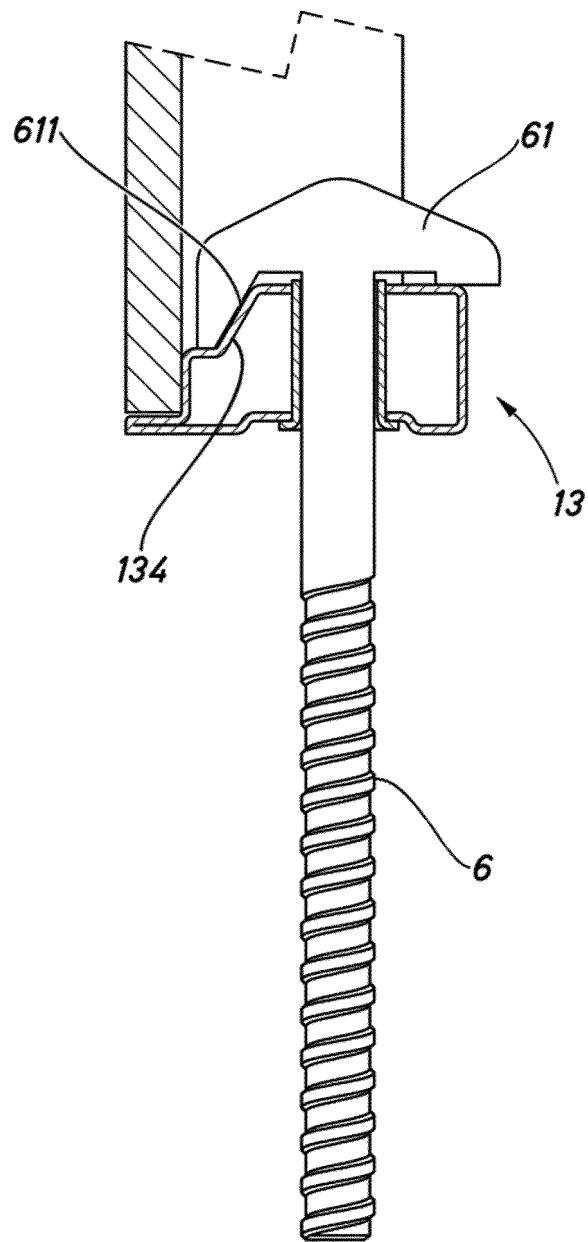


Fig.13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2017/070312

A. CLASSIFICATION OF SUBJECT MATTER

E04G9/02 (2006.01)

E04G17/04 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04G

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

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

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0537403 A1 (UBINANA FELIX JOSE LUIS) 21/04/1993, column 3, line 37 - column 4, line 34; figures 1 - 4, 10, 12 - 16.	1 - 12
X	DE 102007000721 A1 (HUENNEBECK GROUP GMBH) 12/03/2009, paragraph [0026]; figures 1, 4, 5.	1, 2, 4, 5, 7, 8, 10
A	US 4881716 A (DINGLER GERHARD) 21/11/1989, column 7, line 59 - column 8, line 57; figure 2.	1, 4, 5, 7 - 10, 12
A	US 4301990 A (SCHWOERER ARTUR) 24/11/1981, column 4, lines 43 - 54; figures 1, 3.	1, 6, 10, 11
A	US 5509635 A (JARUZEL KURT) 23/04/1996, column 1, lines 6 - 19; figure 2.	1 - 3, 8, 10, 12

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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

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

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

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

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

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

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

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
02/11/2017Date of mailing of the international search report
(06/11/2017)

Name and mailing address of the ISA/

Authorized officer
S. Fernández de MiguelOFICINA ESPAÑOLA DE PATENTES Y MARCAS
Paseo de la Castellana, 75 - 28071 Madrid (España)
Facsimile No.: 91 349 53 04

Telephone No. 91 3495437

Form PCT/ISA/210 (second sheet) (January 2015)

EP 3 626 910 A1

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2017/070312

Information on patent family members

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
EP0537403 A1	21.04.1993	ES2084137T T3 DE69115698T T2 AT131898T T	01.05.1996 01.08.1996 15.01.1996
DE102007000721 A1	12.03.2009	PL2037057T T3 EP2037057 A2 EP2037057 A3	30.12.2016 18.03.2009 05.06.2013
US4881716 A	21.11.1989	NO884488 A NO173253B B GB2210920 A GB2210920 B EP0311876 A2 EP0311876 A3 DE3734390 A1 DE3734390 C2 CA1302722 C AT104393T T	11.04.1989 09.08.1993 21.06.1989 18.09.1991 19.04.1989 28.03.1990 20.04.1989 28.10.1993 09.06.1992 15.04.1994
US4301990 A	24.11.1981	IT1150087 B FR2450926 A1 FR2450926 B1 ES488305 A1 DE2924777 A1 DE2924777 C2 DE2908339 A1 DE2908339 C2 CH650306 A5 CH648892 A5	10.12.1986 03.10.1980 13.05.1983 01.09.1980 15.01.1981 11.09.1986 04.09.1980 16.02.1984 15.07.1985 15.04.1985
US5509635 A	23.04.1996	TR28006 A SK77694 A3 RU94023247 A RU2122087 C1 LV11356 A LV11356 B LTIP1985 A LT3413 B HK217096 A ES2094013T T3 EP0633367 A1 EP0633367 B1 DK0633367T T3 DE4322253 A1 CZ9401510 A3 CZ286171 B6 CN1105089 A CN1051352C C CA2127319 A1 BR9402625 A	16.11.1995 08.02.1995 20.05.1996 20.11.1998 20.06.1996 20.10.1996 31.01.1995 25.09.1995 27.12.1996 01.01.1997 11.01.1995 04.09.1996 09.12.1996 19.01.1995 18.01.1995 16.02.2000 12.07.1995 12.04.2000 06.01.1995 04.04.1995

Form PCT/ISA/210 (patent family annex) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES2017/070312

Information on patent family members

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
		AT142302T T	15.09.1996

Form PCT/ISA/210 (patent family annex) (January 2015)