

(19)



(11)

**EP 4 249 701 A1**

(12)

**EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**27.09.2023 Bulletin 2023/39**

(51) International Patent Classification (IPC):  
**E04F 13/08<sup>(2006.01)</sup>**

(21) Application number: **23163646.5**

(52) Cooperative Patent Classification (CPC):  
**E04F 13/0805; E04F 13/081; E04F 13/0814;  
E04F 13/0828**

(22) Date of filing: **23.03.2023**

(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 ME MK MT NL  
NO PL PT RO RS SE SI SK SM TR**  
Designated Extension States:  
**BA**  
Designated Validation States:  
**KH MA MD TN**

(71) Applicant: **Rizza, Domenico**  
**10099 San Mauro Torinese (IT)**

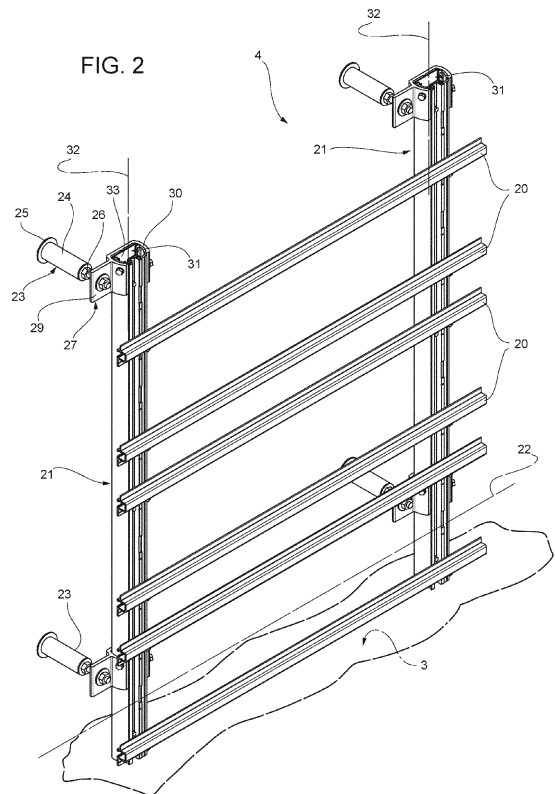
(72) Inventor: **Rizza, Domenico**  
**10099 San Mauro Torinese (IT)**

(74) Representative: **Studio Torta S.p.A.**  
**Via Viotti, 9**  
**10121 Torino (IT)**

(30) Priority: **24.03.2022 IT 202200005867**

(54) **SUPPORTING STRUCTURE AND INSTALLATION METHOD FOR MAKING A VENTILATED FACADE**

(57) A supporting structure (4) has a series of vertical uprights (21), which are spaced from one another in a horizontal direction (22), are anchored to a building and support a plurality of horizontal cross members (20), which are parallel to one another and arranged at different heights; the cross members (20) are configured so as to couple a plurality of panels (7) to the supporting structure (4) and, therefore, form a ventilated facade (1); for each upright (21), at least one vertical graduated bar (45a) is provided; the bars (45) of the different uprights (21) are fixed and aligned with each other so as to define a reference template or grid for positioning the cross members (20) when installing the supporting structure (4).



**EP 4 249 701 A1**

## Description

### CROSS-REFERENCE TO RELATED APPLICATIONS

**[0001]** This patent application claims priority from Italian patent application no. 10202200005867 filed on March 24, 2022, the entire disclosure of which is incorporated herein by reference.

### TECHNICAL FIELD

**[0002]** The present description refers, in general, to the installation of ventilated facades on buildings, and in particular to a supporting structure for such ventilated facades.

### BACKGROUND

**[0003]** As is known, a ventilated facade comprises a supporting metal structure fixed to the wall of the building by means of brackets and anchors, and a plurality of cladding plates, which are fixed to this structure in side-by-side positions, facing and spaced from the wall, in order to define an air space. This air space allows the facade to be ventilated in order to remove any possible moisture, insulate the building, protect the wall from the direct action of atmospheric agents and obtain a space for possible housing of systems and ducts.

**[0004]** To install the ventilated facade, the metal structure is first mounted on the wall, using metal elements and profiles which often have to be machined and/or positioned directly on site. In particular, solutions are known in which the supporting metal structure of the ventilated facade includes a series of uprights, which are fixed to the wall in positions horizontally spaced from one another, and a series of cross members which, in turn, are fixed to the uprights in positions vertically spaced from one another and support the cladding plates. In this type of solution, the cross members must be mounted so as to be perfectly horizontal and to observe the distances that have been previously defined, during design, in order then to obtain the correct positioning of the cladding plates.

**[0005]** Therefore, in the known solutions, each of the cross members requires careful operations in order to be "levelled", and/or to be positioned precisely at the required height at each of the uprights that have been previously fixed to the wall.

**[0006]** It is therefore clear that the installation procedure described above is quite lengthy and could in any case lead to inaccuracies in the positioning of the cross members and therefore in the final appearance of the cladding plates.

### SUMMARY

**[0007]** The object of the present invention is to provide a supporting structure for installing a ventilated facade,

which allows the above problems to be solved in a relatively simple and cost-effective way.

**[0008]** According to the present invention, a supporting structure and a ventilated facade are provided, as defined in claims 1 and 9, respectively. The present invention also refers to a method for installing such a supporting structure, as defined in claim 10. Preferred embodiments of the present invention are then defined in the attached dependent claims.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** The invention will now be described with reference to the accompanying drawings, which illustrate a non-limiting embodiment thereof, in which:

- Figure 1 is a partial perspective view of a ventilated facade, provided with a preferred embodiment of the supporting structure according to the present invention;
- Figure 2 shows, on an enlarged scale and partially, the supporting structure in Figure 1;
- Figure 3 shows, in an exploded view, some components of the supporting structure in Figure 2;
- Figure 4 is a perspective view, in cross section and on an enlarged scale, of an upright of the supporting structure;
- Figure 5 is similar to Figure 4 and shows a variant of the present invention;
- Figure 6 is a side view of a detail of the supporting structure of the present invention; and
- Figure 7 is a perspective view of a further variant, on the type of coupling of the cladding plates to the supporting structure.

### DESCRIPTION OF EMBODIMENTS

**[0010]** In Figure 1, reference number 1 indicates, as a whole, a ventilated facade (partially illustrated), which is coupled to an external wall 2 of a building and rises from a floor or ground 3 in front of the wall 2. In this case, the wall 2 is provided with an insulating covering, not shown. The wall 2 could be made of bricks, concrete, lightweight bricks, structural uprights, structural sheet metal, wood, etc...

**[0011]** The facade 1 comprises a supporting structure 4 and a plurality of rows of panels 5 on top of one another, which are connected to the wall 2 by the structure 4. Preferably, the panels 5 are modular or homologous, meaning that they are identical to each other. In particular, each panel 5 comprises a cladding plate 7, preferably square or rectangular in shape, having a rear surface facing and spaced from the insulating covering of the wall 2, so as to form a ventilation air space 9 along the wall 2, so as to form a ventilation air space 9 along the wall 2. Each plate 7 has a lower horizontal edge 10 and an upper horizontal edge 11, which are juxtaposed in the vertical direction to corresponding edges 11 and 10 of adjacent plates 7; the plate 7 then has two lateral vertical

edges 13, which are side by side, in the horizontal direction, with corresponding edges 13 of panels 5 that are adjacent along the same row.

**[0012]** Each panel 5 is supported in a fixed position by the structure 4 according to known techniques. For example, the solution in Figure 6 relates to a concealed anchor, wherein each panel 5 has a rear frame consisting of two horizontal profiles 16, which are mechanically fixed behind the corresponding plate 7, are identical and spaced vertically from one another: each profile 16 has a fin 17 that protrudes downwards, so as to define, with the rear surface of the plate 7, a horizontal groove 18 used to hang the panel 5 from cross members 20 which form part of the structure 4. The variant in Figure 7, on the other hand, relates to a visible anchor, wherein the plates 7 are frameless and are held in a fixed position by clips 16a, 16b, 16c which are fixed to the cross members 20 and are attached to the edges 13, 10 and 11 of the plates 7.

**[0013]** With reference to Figure 2, the structure 4 comprises a plurality of vertical uprights 21, which are aligned and spaced from one another along direction 22, parallel to the wall 2, for example at a predefined constant pitch, on the floor or ground 3. The uprights 21 are fixed to the wall 2 by a plurality of anchoring devices 23 and support, in fixed positions, the cross members 20.

**[0014]** In particular, each anchoring device 23 comprises an attachment member 24 having two opposite ends 25 and 26: the end 25 is fixed in a known way (not shown) to the wall 2 (by means of a threaded rod, chemical anchoring, screw anchors, etc.), whereas the end 26 is fixed to a bracket 27 supporting a corresponding upright 21.

**[0015]** Preferably, the bracket 27 of each anchoring device 23 comprises a flange 29 fixed to the end 26 of the attachment member 24, for example by means of a screw or bolt, and a coupling portion 30, which is C-shaped so as to define a seat 31. The latter extends in a pass-through manner along a vertical axis 32 and is engaged by a rear portion 33 of the corresponding upright 21. The cross-sections of the seat 31 and of the rear portion 33 of the upright 21 do not change along the axis 32.

**[0016]** With reference to Figure 4, the seat 31 has a front opening 34 which is defined by two vertical edges of the portion 30 and has a width, along direction 22, smaller than the rear portion 33 of the upright 21: the latter cannot be inserted or removed horizontally through the opening 34, but must be inserted axially.

**[0017]** According to a preferred aspect of the present invention, the portion 30 has at least one concave surface 38 defining at least part of the seat 31 and has, in cross-section, an arc-of-a-circle profile, the centre of which coincides with the axis 32. The surface 38 is coupled to a corresponding external surface 39 of the rear portion 33, so that the upright 21 can rotate about its axis 32, so as to allow slight adjustments or settlements of its angular position during installation, as will be described below.

**[0018]** In the specific example, the surface 39 is curved convexly and has, in cross-section, the same arc-of-a-circle profile as the surface 38, i.e., it has a shape that is complementary to the concavely curved shape of the surface 38.

**[0019]** In greater detail, in the specific solution shown, two surfaces 38 are provided in each bracket 27: these two surfaces 38 face each other along direction 22, are coupled to respective surfaces 39 of the upright 21 and are joined together by a surface 40 at the back of the seat 31. The surface 40, in particular, has a protrusion 41 at the centre, which can come into contact with a rear surface 42 of the upright 21, which in turn joins the two surfaces 39. With the exception of the possible protrusion 41, the remaining part of the surface 40 of the seat 31 is spaced from the rear surface 42 of the upright 21 to leave the latter free to rotate during installation. This rotation is then stopped by at least one locking element 43, which in this case is defined by a screw or a pin, which crosses the portion 30 of the bracket 27 and the portion 33 of the upright 21, for example at the surfaces 38 and 39.

**[0020]** Each upright 21 also comprises a front portion 44 which emerges through the front openings 34 of the seats 31 and supports at least one vertical graduated bar 45. In particular, with reference to Figure 3, each upright 21 supports a series of graduated bars 45a, 45b, 45c, etc. stacked on top of one another (i.e., vertically aligned and resting on top of one another).

**[0021]** The term "graduated" means that each bar 45a, 45b, 45c has a series of marks 46 on its own front portion 47, which faces the cross members 20 and the panels 5. The marks 46 are vertically spaced from one another in a predefined manner, for example, spaced from one another with a constant pitch, to depict different possible height positions. In general, these marks 46 can be defined by notches, dents, lines, protrusions, colourings, etc..., which can also be combined with each other.

**[0022]** With reference to the preferred embodiment in Figure 6, the front portion 47 of the bars 45 protrudes horizontally towards the cross members 20 and the panels 5, with respect to the front portion 44 of the uprights 21. At the same time, the marks 46 include a series of recesses or notches 46a having a predefined height, equal to the vertical size of a rear portion 48 of the cross members 20, and define respective seats engaged by said rear portion 48, and the latter rests against the front portion 44 of the uprights 21. Thus, in addition to obtaining precise positioning, the recesses 46a hold the cross members 20 in a fixed vertical position while the cross members 20 are fixed to the uprights 21. The vertical distance between the recesses 46a is established at the design stage on the basis of the distance at which the cross members 20 can/must be mounted.

**[0023]** Preferably, the marks 46 comprise additional notches 46b, between pairs of consecutive recesses 46a: the notches 46b are arranged so that they are horizontally aligned with the edges 10 of the plates 7, whereby they are used for a visual check of the correct assembly of

the cross members 20 and the panels 5 at the end of the installation.

**[0024]** In particular, the graduated bars, with their marks 46, are standardized and identical to each other. With reference to Figure 3, the graduated bars 45a are the bottommost ones on the respective uprights 21 and are aligned and arranged at the same height; consequently, the bars 45b of the different uprights 21 are also arranged at the same height (since they rest on the bars 45a), and so on for the bars 45c, etc.

**[0025]** In the example shown, each graduated bar consists of a single piece, defined by a metal profile. Alternatively, it may include a covering element, e.g., made of plastic material.

**[0026]** Figure 5 shows a variant, with different cross-sections for the bar 45 and the upright 21. For each upright 21, in general, the bars 45 engage a seat 55 formed in the front portion 44 and defined by a vertical groove: in the example in Figure 5, preferably, the seat 55 has a cross-section shaped so as to guide the bars 45 vertically and hold them in a fixed position along the direction 22, during installation. In particular, the seat 55 and the bars 45 have a U-shaped cross-section.

**[0027]** Each bar 45 has a base 56 resting against a back wall 57 of the seat 55. During installation, the bars 45 are arranged on the walls 57 in a vertical reference position and then fixed by means of one or more locking elements 58, visible in Figure 3 (e.g., screws, passing through the base 56 and the wall 57).

**[0028]** To install the structure 4 and therefore the ventilated facade 1, the following procedure, already mentioned above in some respects, is followed.

**[0029]** After arranging the uprights 21 in front of the wall 2, vertically and at predefined distances from one another along the direction 22, the same uprights 21 are connected to the wall 2 by means of the anchoring devices 23 to make the positioning stable. Preferably, at this stage, the uprights 21 have freedom of rotation in the seats 31, about the respective axes 32, not yet being locked with respect to the brackets 27.

**[0030]** The bars 45 are then arranged on the uprights 21: their vertical position is adjusted so that the marks 46 provided on the different uprights 21 are aligned horizontally. For this purpose, for each upright 21, the bottommost bar 45a is positioned first: the vertical positions of all the bars 45a are accurately adjusted and set, for example with levels or other common construction equipment, so that they are all at the same height.

**[0031]** With this positioning, the bars 45a are fixed to the respective uprights 21 and are then used as a fixed reference to stack the graduated bars 45b, 45c, etc.... At this stage, it is no longer necessary to adjust the position of the bars 45b, 45c, etc.... as this position is automatically defined by the latter bars 45b, 45c, etc.... being vertically resting on the bars 45a, which are arranged below and have already been fixed to the uprights 21 (the latter already having a fixed and stable vertical position).

**[0032]** After also fixing the bars 45b, 45c, etc.... to the uprights, the marks 46 visible on the different uprights 21 are all accurately aligned horizontally and therefore define a predefined and stable grid for positioning, aligning and assembling the subsequent components of the structure 4. In detail, the grid consisting of the set of marks 46 represents a template which is available for positioning the cross members 20 at the desired heights and with a precise parallel orientation, without the need to use any other tool to measure the distances and/or to level the same cross members 20. In other words, it is possible to exclusively refer to the marks 46 to mount the cross members 20 in the designed position.

**[0033]** In particular, as mentioned above, it is sufficient to insert the rear portions 48 of the cross members 20 in the recesses 46a to automatically obtain the horizontal orientation and the positioning of the cross members 20 at the correct height. Having calibrated the height of the recesses 46a according to the plan, the cross members 20 remain stationary in this position while they are fixed to the uprights 21 by means of one or more locking elements 59, visible in Figure 6 (e.g., screws).

**[0034]** During this fixing, the position of the uprights 21 in the seats 31 adapts automatically, due to the freedom of rotation described above. After fixing all the cross members 20, the uprights 21 can be locked with respect to the brackets 27 by means of the elements 43.

**[0035]** Lastly, once these operations for installing the structure 4 have been completed, the panels 5 are mounted on cross members 20 (for example, according to the technique shown in Figure 6).

**[0036]** From the foregoing, therefore, it appears that the bars 45 make it possible to greatly simplify installation operations and reduce operating time: in fact, after arranging the bars 45a at the same height, using the common techniques and tools available on the site, the latter no longer need to be used to position subsequent components (the bars 45b, 45c, the cross members 20, etc.) due to the presence of the reference grid defined by the marks 46, which is visible directly at the front portions 44 of the uprights 21.

**[0037]** This results in high accuracy in the positioning of the cross members 20, and therefore of the panels 5. In this respect, the recesses 46a are particularly effective.

**[0038]** Furthermore, compared to the known solutions, the freedom of rotation of the uprights 21 in the seats 31, due to the shape of the seats, makes the fixing of the cross members 20 easier and more precise.

**[0039]** Other advantages also appear to the people skilled in the art from the preferred features described above.

**[0040]** Lastly, it is clear that modifications and variations may be made to the structure 4 and facade 1 described with reference to the attached figures without departing from the scope of protection of the present invention.

**[0041]** In particular, the various components may be fixed using different methods and/or connecting ele-

ments other than the screws shown herein.

**[0042]** In addition, the system for adapting the angular position of the uprights 21 in the seats 31 around the axes 32 could also be provided for solutions without bars 45 (even if this variant does not fall within the scope defined by the attached claims).

## Claims

1. - A supporting structure (4) for a ventilated facade (1), comprising:

- a plurality of uprights (21) which are vertical and are spaced from one another in a horizontal direction (22);
- anchoring means (23) for fixing said uprights (21) to a building;
- a plurality of cross members (20), which are parallel to one another, are arranged at different heights, are fixed to said uprights (21) and are configured so as to couple a plurality of panels (5) to said supporting structure (4) and, therefore, form said ventilated facade (1);

**characterized by** further comprising, for each upright (21):

- at least one graduated bar (45a), which is vertical and arranged on said upright (21), and
- fixing means (58) which lock said graduated bar (45) with respect to said upright (21).

2. - The supporting structure according to claim 1, wherein said graduated bars (45a) are identical to one another and are aligned in said horizontal direction (22) so as to be at the same height.

3. - The supporting structure according to claim 1 or 2, wherein each said upright (21) carries a plurality of said graduated bars (45a, 45b, 45c), stacked on top of one another.

4. - The supporting structure according to any one of the preceding claims, wherein said uprights (21) comprise respective vertical seats (55) engaged by said graduated bars (45).

5. - The supporting structure according to any one of the preceding claims, wherein said graduated bars (45) comprise a front portion (47), which protrudes horizontally towards said cross members (20) with respect to the corresponding upright (21) and defines a series of recesses (46a) vertically spaced from one another and having a predefined height, equal to the vertical size of a rear portion (48) of the cross members (20); and wherein said recesses (46a) are engaged by the rear portions (48) of the cross members

(20).

6. - The supporting structure according to any one of the preceding claims, wherein said anchoring means (23) comprise a plurality of brackets (27) defining respective seats (31) engaged by the uprights (21); said seats (31) being shaped so as to leave freedom of rotation to said uprights (21) about respective vertical axes (32) in said seats (31); further fixing means (43) being provided to lock said uprights with respect to said brackets (27).

7. - The supporting structure according to claim 6, wherein said seats (31) have respective concave surfaces (38) with cross sections shaped like an arc of a circle.

8. - The supporting structure according to claim 6 or 7, wherein said seats (31) have respective front openings (34) with a width, in said horizontal direction (22), smaller than that of the uprights (21).

9. - A ventilated facade (1) comprising a supporting structure (4), designed to be fixed to a building, and a plurality of panels (7) coupled to said supporting structure (4); **characterized in that** the supporting structure (4) is according to any one of the preceding claims.

10. - A method for installing a supporting structure (4) according to any one of the claims from 1 to 8, the method comprising the steps of:

- arranging said uprights (21) vertically, in front of a building, in positions aligned and spaced from one another in a horizontal direction (22);
- anchoring said uprights (21) to said building;
- arranging said cross members (20) on said uprights (21), at different heights and in horizontal positions, parallel to one another;
- fixing said cross members (20) to said uprights (21); **characterized by** further comprising the following steps:
  - providing, on each said upright (21), at least one graduated bar (45a);
  - before arranging and fixing said cross members (20), adjusting the vertical position of the graduated bar (45a) for each upright (21) and fixing the graduated bars to the corresponding uprights (21);
  - referring to said graduated bars to arrange said cross members (20).

11. - The method according to claim 10, comprising the step of stacking a plurality of graduated bars (45a, 45b, 45c), for each said upright (21), before arranging and fixing said cross members (20).

12. - The method according to claim 10 or 11, wherein said graduated bars (45) comprise a front portion (47), which protrudes horizontally with respect to the corresponding upright (21) after the fixing step; said front portion (47) defining a series of recesses (46a) 5 vertically spaced from one another and having a pre-defined height, equal to the vertical size of a rear portion (48) of the cross members (20); and wherein the step of arranging said cross members (20) comprises inserting the rear portions (48) of the cross 10 members (20) in said recesses (46a).

15

20

25

30

35

40

45

50

55

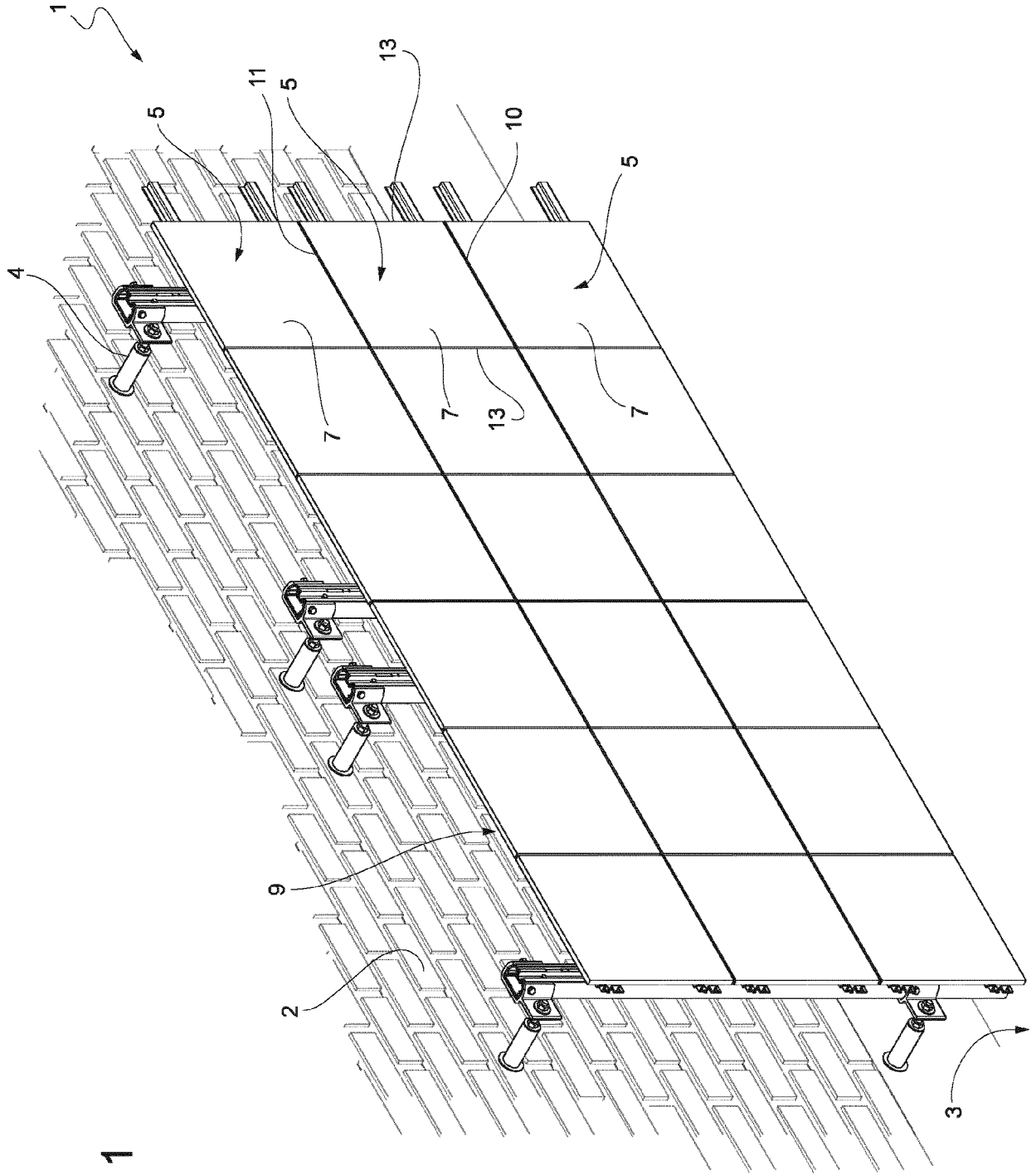


FIG. 1

FIG. 2

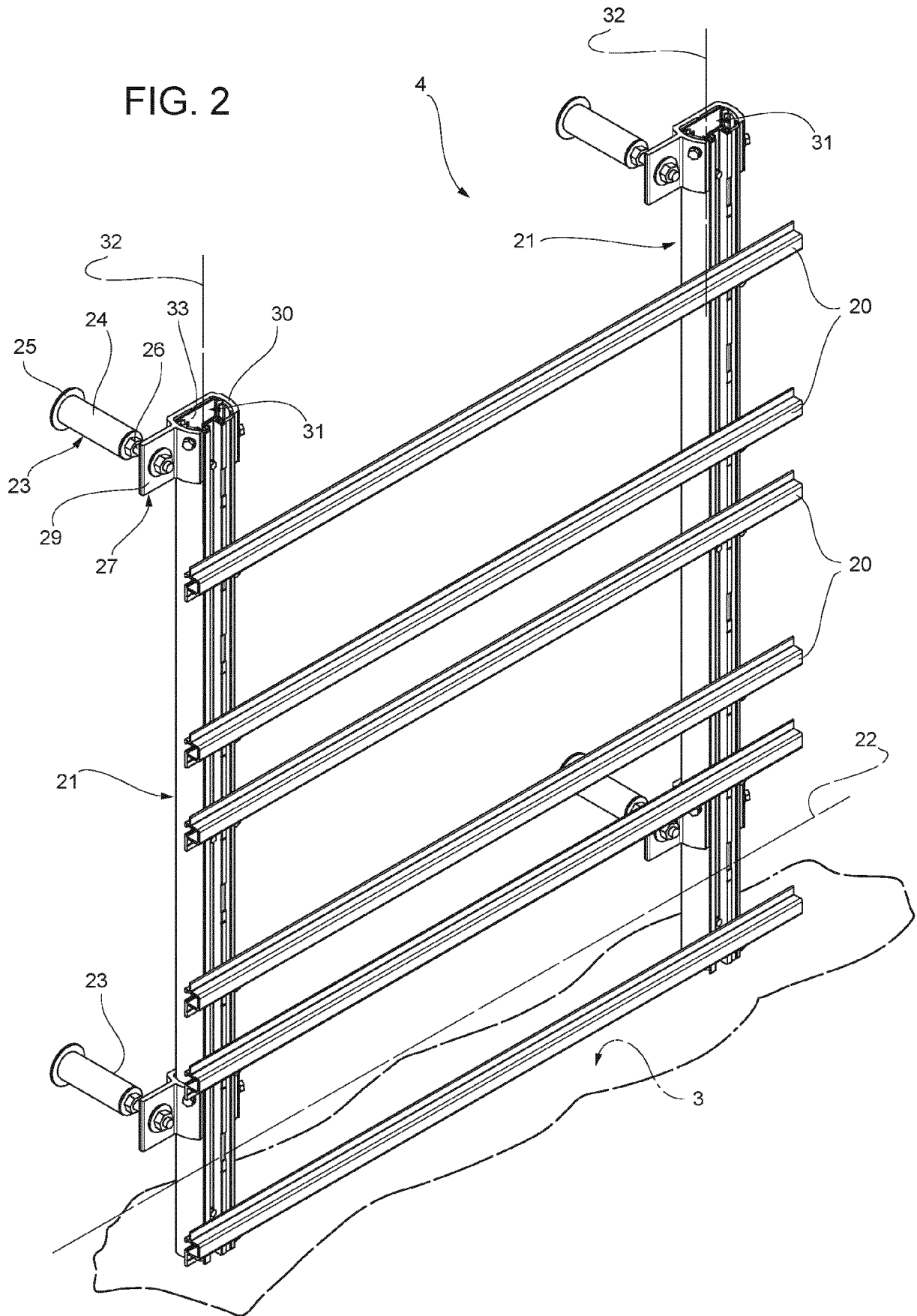




FIG. 4

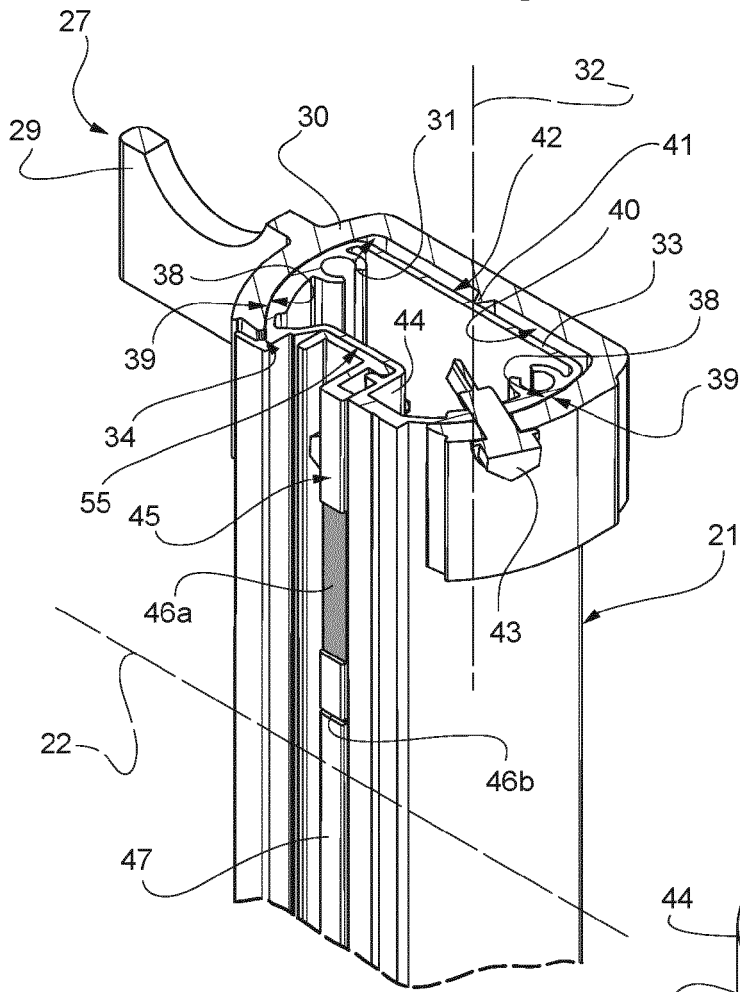


FIG. 5

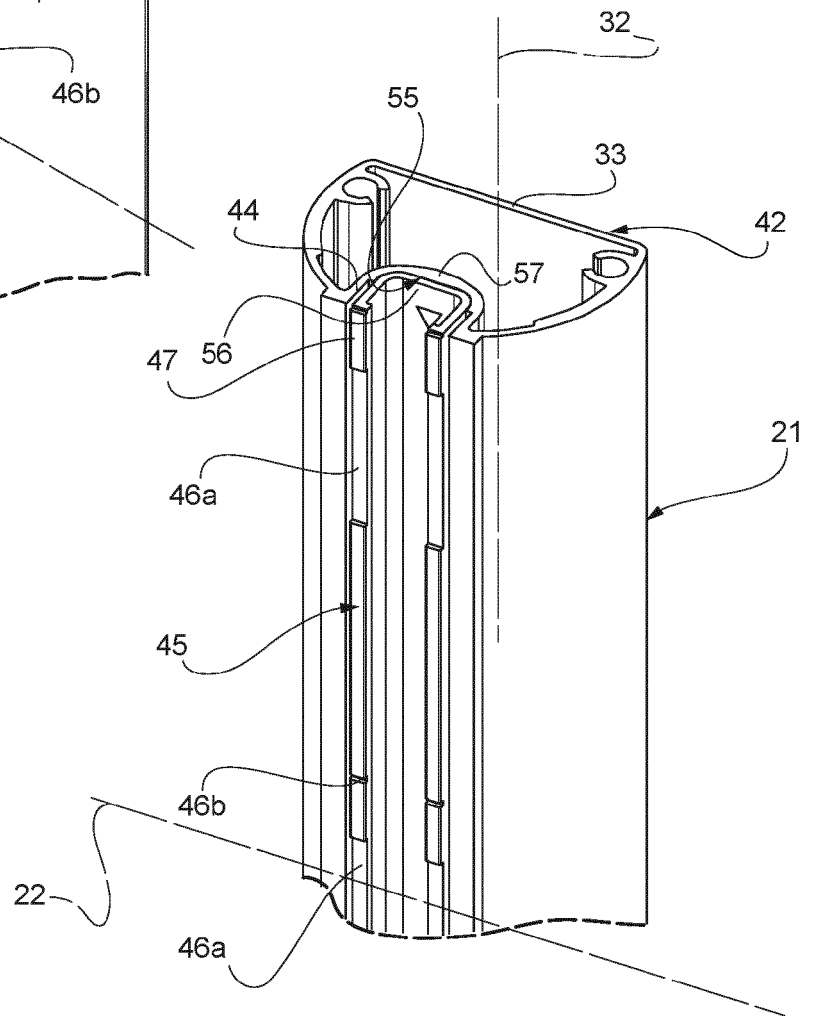


FIG. 6

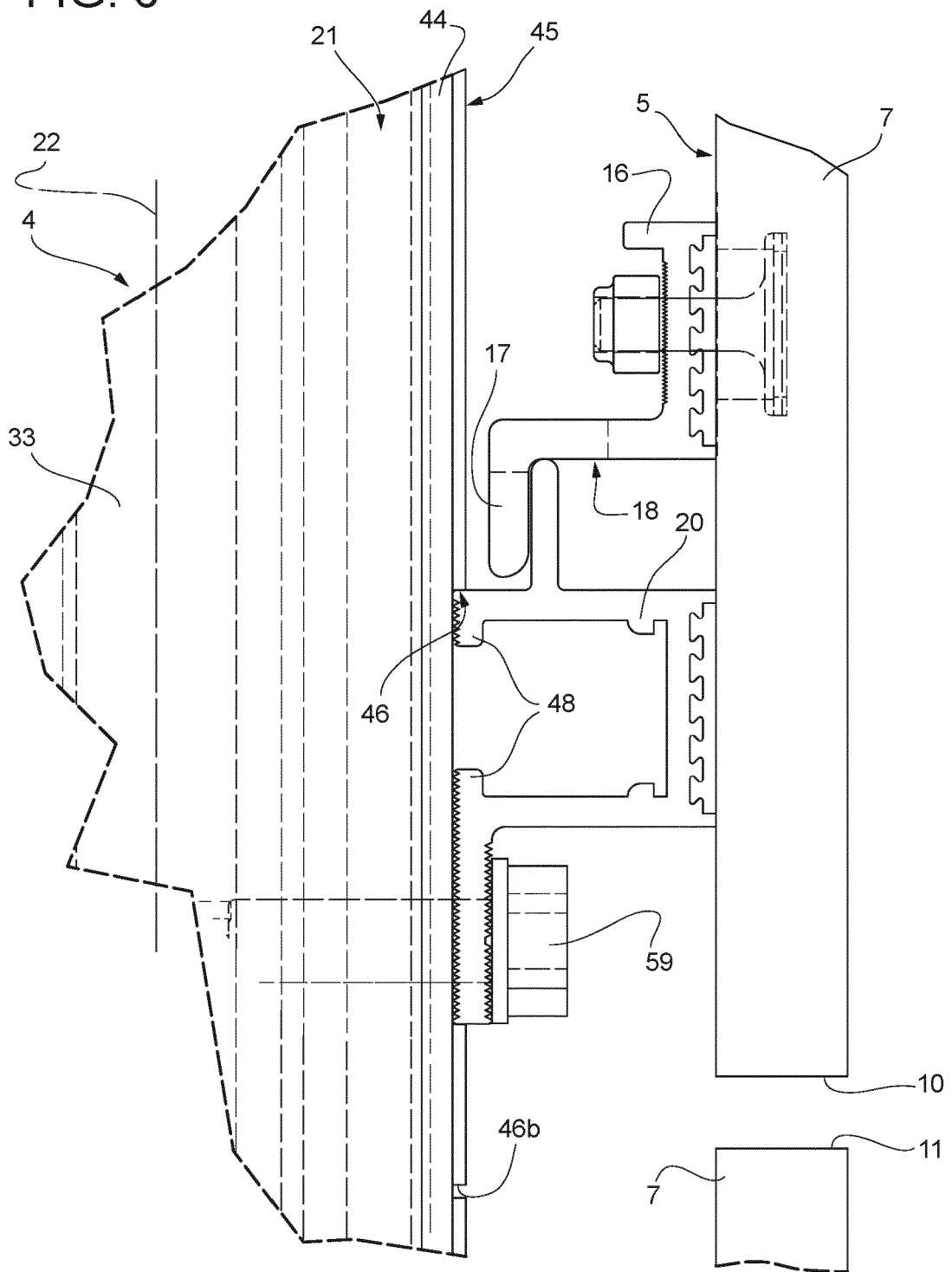
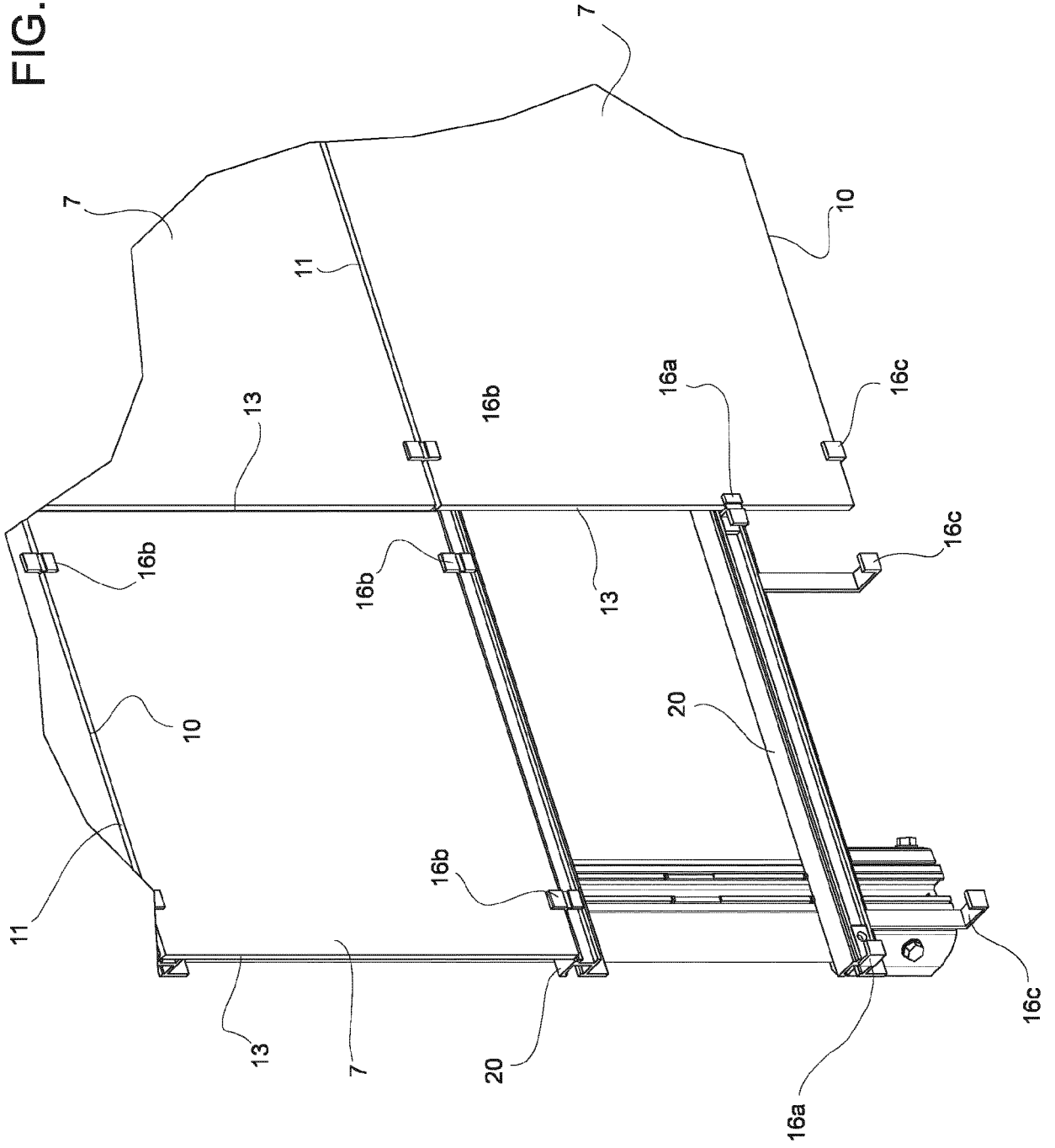


FIG. 7





EUROPEAN SEARCH REPORT

Application Number  
EP 23 16 3646

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)
A	<p>KR 2018 0016697 A (POSCO [KR]) 19 February 2018 (2018-02-19) * figure 5 *</p> <p style="text-align: center;">-----</p>	1-12	<p>INV. E04F13/08</p>
			<p>TECHNICAL FIELDS SEARCHED (IPC)</p>
			<p>E04F</p>
<p>The present search report has been drawn up for all claims</p>			
<p>Place of search <b>Munich</b></p>		<p>Date of completion of the search <b>8 May 2023</b></p>	<p>Examiner <b>Topcuoglu, Sadik Cem</b></p>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p>		<p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... &amp; : member of the same patent family, corresponding document</p>	

1  
EPO FORM 1503 03:82 (P04C01)

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

EP 23 16 3646

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.

08-05-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
<b>KR 20180016697 A</b>	<b>19-02-2018</b>	<b>NONE</b>	
-----			

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**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**

- IT 102022000005867 [0001]