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**(54) BALUSTRADE GLAZING SYSTEM AND MULTISTORE BUILDING**

SYSTEM ZUR VERGLASUNG VON BALUSTRADEN UND MEHRSTÖCKIGES GEBÄUDE

SYSTÈME DE VITRAGE DE BALUSTRADE ET BÂTIMENT À PLUSIEURS ÉTAGES

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**CZ-B6- 302 988 US-A- 3 358 969**  
**US-A- 4 690 383 US-A- 5 200 240**  
**US-A1- 2002 195 595**

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## Description

### Field of invention

[0001] The invention relates more generally to the field of construction, and more specifically to balustrade glazing systems or balustrade and balcony glazing systems.

[0002] CZ 302 988 B6 discloses a balustrade glazing system according to the preamble of claim 1.

### Technical background

[0003] In prior art balustrade glazing, the balustrade is made so that vertical posts placed on the spans support the handrail and receive the forces coming to the handrail. Such forces include internal loads caused by people, wind loads, and pressure and suction loads.

[0004] In prior art balustrade glazing which is supported without balustrade posts placed on the spans the balustrade glasses are fastened in a stationary manner at the bottom part to some type of profile (c.f. for example SteelPro's U-profile A60), which is anchored in a stationary manner to the base slab underneath. A corresponding solution is described for example in patent application publication US 2002/0195595 A1.

[0005] Balustrade glazing is known in international patent application publication 2013/162451 A1, international patent application 96/24739, United States patent 6,964,410, Czech patent CZ 302 988 B6, Czech patent application publication 300 485, European patent application publication 2 017 399 A1, and United States patent 4,920,717.

[0006] Balustrade glasses fastened in a stationary manner at their lower part tend to deflect by the loading caused by the forces. In this case, great shearing forces are created by the deflection in the lower part of the glass at the upper part of the stationary fastening, at the interface of the lower rail profile and the glass. Due to these great shearing forces, such balustrade glasses are subject to strict strength requirements. In practice, the strict strength requirements require the use of hardened and thicker glass, for example the use of 6+6 mm hardened glass laminated to each other.

### Objective of invention

[0007] The objective according to a first aspect of the invention is to enable a reduction in the strength requirements of balustrade glazing implemented without vertical posts placed on the span. This objective can be accomplished by means of a balustrade glazing system according to claim 1. In this way, a building according to claim 21 can be implemented by using more inexpensive balustrade glazing.

[0008] The objective according to a second aspect of the invention is to facilitate the installation of the balustrade glazing of the balustrade glazing system. This objective can be accomplished by means of a balustrade

system according to the dependent claim 15.

[0009] The objective according to a third aspect of the invention is to enable the adjustment of the straightness of the handrail of the balustrade glazing system which has been installed into place. This objective can be accomplished by means of a balustrade system according to the dependent claim 17 or 18.

[0010] The other dependent claims describe the preferred aspects of the balustrade system.

### Advantages of invention

[0011] When an essentially horizontal handrail provided with an installation groove and having a span length of at least 3.0 m and fastened in a stationary manner only at the ends to support structures by means of a support structure fastening system, an essentially horizontal lower rail provided with an installation groove, and balustrade glazing installed essentially in a floating manner on the span between the installation groove of the handrail and the installation groove of the lower rail and made of unhardened and laminated glass, whereby the lower edge of the balustrade glazing rests on the bottom of the installation groove so that the lower edge of the balustrade glazing can essentially move in the installation groove with respect to the width direction of the installation groove, and where the balustrade glazing supports the handrail at the middle area of the span so that the balustrade glazing is freely deflectable by the effect of the forces in the direction of the normal of the balustrade glazing, and where the lower rail and the handrail are arranged so that the forces in the direction of the normal of the balustrade glazing directed to the balustrade glass are transmitted to the support structures only via the essentially horizontal rails (3, 2), the balustrade glazing system can be implemented without vertical posts installed on the span by using in the balustrade glazing thinner glass which has weaker strength requirements and even unhardened glass. Unhardened glass can be worked (for example cut), unlike hardened glass. This facilitates installation considerably. As an example, possible dimensional errors (too wide or too high) can be corrected during the installation stage. Moreover, unhardened glass is usually cheaper than hardened glass, at least currently. In the balustrade glazing systems implemented so far, the use of unhardened glass has not been possible without vertical posts placed on the span.

[0012] The balustrade glazing system can also comprise balcony glazing suspended from an upper rail of an overhead support structure of the balustrade glazing system, where the balcony glazing is supported at its lower end to the handrail. In this way, it is also possible to implement the balcony glazing using a balustrade glazing system implemented without vertical posts installed on the span, where glass with weaker strength requirements can thus be used in the balcony glazing.

[0013] When the balustrade glazing system comprises a guide to be installed in the fastening groove, where the

run surface of the guide together with the run surface of the handrail constitutes an even surface along which the slide surface of the lower profile of the balcony glass can be carried so that the balcony glass is runnable against the run surface of the handrail and against the run surface of the guide from the closed position to the open position and vice versa, an even run surface is constituted on the slide surface of the balcony glasses for the opening and closing of the balcony glasses.

**[0014]** When the thickness of the balustrade glazing of the balustrade glazing system is 4+4 mm, 5+5 mm or 6+6 mm, more inexpensive glass thicknesses can be used. When the installation groove of the balcony glazing is constituted by a stationary installation strip integrated into the handrail profile, where the stationary installation strip has an installation groove for a seal to be installed, and by a removable installation strip, which has an installation groove for a seal to be installed, the upper edge of the balustrade glass can be installed in its installation groove from the inside of the balcony. This enhances occupational safety. Moreover, the falling of the balustrade glazing during installation can be prevented better in this way.

**[0015]** When a balustrade glazing system, where the lower rail is fastened to the support structure by means of fastening elements, the lower rail can receive half of the forces in the direction of the normal of the balustrade glass directed to the balustrade glazing.

**[0016]** When an installation groove of the balustrade glass is constituted between seals to be installed in the installation grooves of the lower rail profile, where the installation groove of the balustrade glass is open upwards, the balustrade glazing can be installed from above.

**[0017]** When the seals of the balustrade glazing system are made of or contain rubber-elastic mass, the seals attenuate the movement of the balustrade glass and the sharp impacts caused by the movement, reducing their risk of breakage. When seals are arranged on both sides of the balustrade glazing tightly against the balustrade glazing, the seals also serve in this case as an attenuator of the vibration of the balustrade glazing: when the lower end and/or upper end of the balustrade glazing differs from the position of balance as a result of a force in the direction of its normal, the seal causes a restoring force.

**[0018]** When there is a cavity at both ends of the handrail for the installation of a fastening piece, the fastening of the handrail to the support structures becomes stiff against deflection.

**[0019]** When the handrail is a handrail profile and when a stiffener profile which increases the section modulus has been installed or is installable inside the handrail, where the stiffener profile is fastened to the handrail profile by means of fastening elements, the section modulus of the handrail is increasable, if necessary, without changing the external appearance and/or external dimensions of the handrail and/or by means of a standard-profile handrail profile.

**[0020]** When, in addition to this or as an alternative to this, the handrail is an extrusion, the cross-section of which is constant with the exception of possible fastening lead-throughs, whereby the cavity is usable for accommodating both the fastening pieces and the stiffener profile, both the stiff fastening and the increase in the section modulus of the handrail can be implemented while the external appearance of the handrail remains the same. Moreover, the handrail can be manufactured in a relatively simple manner, for example by means of aluminium extrusion.

**[0021]** When the bottom of the installation groove of the lower rail contains material, the friction coefficient of which is smaller than what the friction coefficient of the interface of the installation of the balustrade glass and the lower rail would be, the sliding of the lower edge of the balustrade glass on the bottom of the lower rail is possible during the deflection of the balustrade glass. In this case, the lower edge of the balustrade glass can, during possible deflection, slide freely on the bottom of the installation groove, whereby the risk of the breakage of the lower edge of the glass is reduced.

**[0022]** When the bottom of the installation of the lower rail contains material, the hardness of which is smaller than the hardness of the balustrade glass, it decreases the wear of the lower part of the balustrade glass and reduces the risk of breakage of the lower edge of the balustrade glass under vertical loading as compared to a metal-glass interface.

**[0023]** When the balustrade glazing system comprises a protective profile which is installable of which has been installed to the upper edge of the balustrade glass in order to lead the vertical forces coming from the handrail to the upper edge of the balustrade glass over a larger area, the risk of breakage of the upper edge of the balustrade glazing can be reduced, because the concentrated forces coming from the handrail are distributed more evenly to the upper edge of the balustrade glazing.

**[0024]** When the balustrade glazing system is configured to use a retaining profile which has been installed or which is installable to the upper edge of the balustrade glazing in order to hold the balustrade glazing or to support the balustrade glazing during the installation of the balustrade glazing, the installation of the balustrade glazing is facilitated, and the balustrade glazing can be installed by just one installer.

**[0025]** When the protective/retaining profile has the shape of an h-profile or comprises it, its shape keeps the balustrade glass reliably in the installation groove during installation, and the installation of the balustrade glazing is facilitated, and the balustrade glazing can be installed by just one installer.

**[0026]** When the protective/retaining profile is wedgeable between the balustrade glass and the handrail in order to straighten the handrail, the straightness of the handrail can be adjusted by adjusting the height of the wedge or wedges.

**[0027]** When the balustrade glazing system comprises

a wedge-like element for straightening the handrail on a span, the straightness of the handrail on the span can be adjusted steplessly. The straightness of the handrail on a span is important for aesthetic reasons in any case, but it is especially important when the balcony glazing is installed on the handrail.

**[0028]** When the wedge-like element comprises a screw, screw thread or bolt, the distance of the handrail and the upper surface of the profile located at the upper edge of the glass can be adjusted steplessly by turning the screw or bolt. The moment required to turn a screw, screw thread or bolt is usually small in relation to the force produced by it, so the screw, screw thread or bolt facilitates the straightening of the relatively heavy handrail.

**[0029]** When the balustrade glazing is fastened at the middle area of the span using elastic adhesive both to the bottom of the material of the lower rail and to the bottom of the protective/fastening profile, which is further glued to the bottom of the installation groove of the handrail, the staying of the balustrade glass in its installation grooves is ensured when forces that tend to raise the handrail upwards are directed to the handrail. However, the elastic adhesive does not prevent the deflection of the balustrade glass.

**[0030]** When the balustrade glazing system is used in a multistorey building in the implementation of the balustrade glazing or balustrade and balcony glazing of external balconies located on different storeys or for the implementation or a roof terrace or terraces on different storeys, these can be implemented without posts installed on the spans, using weaker, unhardened glass.

**[0031]** When the building is a multistorey building, where a stiffener profile is not used in the handrails of the lower storeys and where a stiffener profile is used in the handrails of the upper storeys in the balustrade glazing system, the balustrade glazing can be implemented with optimum stiffening while the external appearance of the balustrade glazing remains the same on all storeys.

#### List of drawings

**[0032]** In what follows, the balustrade glazing system is presented in more detail by means of the exemplary embodiments of the balustrade glazing system shown in drawings FIG 1 to FIG 10. Of the drawings:

- FIG 1 shows the cross-section of the balustrade glazing system;
- FIG 2 shows cross-section II - II of the balustrade glazing system with balcony glazing shown in FIG 5;
- FIG 3a shows the cross-section of the handrail in a balustrade glazing system without balcony glazing (c.f. FIG 2, item III);
- FIG 3b shows detail III shown in FIG 2, i.e. cross-section

tion of a balustrade glazing system and balcony glazing system which also includes a balcony glass and guide;

- 5 FIG 4 shows detail IV shown in FIG 2 of the cross-section of the lower rail;
- FIG 5 shows the balustrade glazing system and balcony glazing system seen from the inside;
- 10 FIG 6 shows detail VII, i.e. concealed fastening of the balustrade glazing system to the support structure;
- 15 FIG 7 shows cross-section VII - VII of the concealed fastening shown in FIG 6;
- FIG 8 shows a detail of an alternative fastening of the concealed fastening of the balustrade glazing system to the support structure;
- 20 FIG 9 shows cross-section IX - IX of the fastening shown in FIG 8; and
- 25 FIG 10 shows a cross-section of an alternative fastening of the lower rail.

**[0033]** The same reference numbers refer to the same parts in all FIG.

#### Detailed description

**[0034]** Drawing FIG 1 shows the cross-section of a balustrade glazing system 1. The balustrade glazing system 1 is otherwise similar to the balustrade glazing system 1 shown in FIG 2, but balcony glazing 6 has also been installed in the balustrade glazing system 1 of drawing FIG 2. FIG 5 shows the balustrade glazing system and balcony glazing system seen from the inside. The quantity of the balustrade glasses 4 and balcony glasses 60 can vary.

**[0035]** The balustrade glazing system 1 comprises an essentially horizontal handrail 2 provided with an installation groove 9 and having a span length of at least 3.0 m and fastened in a stationary manner only at the ends to support structures 8 by means of a support structure fastening system 7, and an essentially horizontal lower rail 3 where an installation groove 38 has been arranged in the lower rail profile 30 of the lower rail 3. Moreover, the balustrade glazing system comprises balustrade glazing 4 installed essentially in a floating manner on the span between the installation groove 9 of the handrail and the installation groove 38 of the lower rail, which balustrade glazing 4 supports the handrail 2 at the middle area of the span so that the balustrade glazing 4 is freely deflectable by the effect of the forces in the direction of the normal F of the balustrade glazing 4, and where the lower rail 3 and the handrail 2 are arranged so that the

forces in the direction of the normal F of the balustrade glazing 4 directed to the balustrade glass 4 are transmitted to the support structures 5 and 8 only via the essentially horizontal rails 3 and 2.

**[0036]** The expression "essentially horizontal" means a horizontal direction where the deviation from the horizontal direction remains within the limits permitted by standards valid at the time of examination.

**[0037]** Free deflection here means that seals 20a, 20b at the lower end of the balustrade glass 4 and correspondingly seals 20a at the upper end serve as support lines. When the force F pulls or pushes the balustrade glass 4 outwards or inwards, the upper edge and the lower edge of the balustrade glass 4 can move somewhat in the respective installation groove 9, 38 when the balustrade glass 4 turns around the respective support line.

**[0038]** Drawing FIG 2 shows the balustrade glazing system 1 in section II - II (see FIG 5), onto which balustrade glazing system 1 balcony glazing 6 is integrated. The balcony glazing 6 comprises a number of balcony glasses 60. In this case, the balustrade glazing system 1 comprises balcony glazing 6 suspended from an upper rail 61 of an overhead support structure 62 of the balustrade glazing system 1, where the balcony glazing 6 is supported at its lower end to the handrail 2. The handrail 2 carries one half of the forces in the direction of the normal F of the balcony glazing 6 directed both to the balustrade glazing 4 and one half of these forces directed to the possible balcony glazing 6.

**[0039]** Drawing FIG 3b shows a balustrade glazing system 1 which also comprises a guide 50 to be installed in the fastening groove 17, where the run surface 25 of the guide 50 together with the run surface 27 of the handrail constitutes an even surface along which the slide surface 26 of the lower profile 63 of the balcony glass 60 can be carried so that the balcony glasses 60 are runnable against the run surface 27 of the handrail 2 and against the run surface 25 of the guide 50 from the closed position to the open position and vice versa.

**[0040]** Unhardened and laminated glass is used as the balustrade glazing 4. The thickness of the glass is 4 to 12 mm (e.g. 4+4 mm, 5+5 mm or 6+6 mm).

**[0041]** FIG 3a shows a balustrade glazing system 2 without balcony glazing 6. The installation groove 9 of the balcony glazing 4 is constituted by a stationary installation strip 22 integrated into the handrail profile 10, where the stationary installation strip 22 has an installation groove 18a for a seal 20a to be installed, and by a removable installation strip 11, which has an installation groove 18b for a seal 20a to be installed. The removable installation strip 11 is fastened to the handrail 2 by means of a fastening element 12. The seals 20a are installed into place before installation. The handrail profile 10 and the removable installation strip 11 are cut to the predetermined dimension before bringing them to the installation site. The seals 20a are usually installed at the factory after the cutting of the handrail profile 10 and the removable installation strip 11. FIG 3b shows a handrail 10,

into which balcony glazing 6 has been integrated. In this case, the possible cover 21 which has been in the handrail 10 (FIG 3a) has been removed. Moreover, guide 50 has been installed in the installation groove 17 of the handrail 2 at a location suitable to the opening of the balcony glass 60, along which guide 50 the balcony glasses can be opened and closed.

**[0042]** FIG 4 shows a cross-section of the lower rail 3. The lower rail 3 is fastened to the support structure 5 by means of fastening elements 32. Between the lower rail 3 and the support structure 5, there can be an installation bracket of metal 33 shown for example in FIG 4 for the installation or for the adjustment of the installation, to which installation bracket of metal 33 the lower rail 2 is fastened by means of fastening elements 32. The installation bracket of metal 33 is fastened to the support structure 5 by means of fastening elements 34. There can be a washer 35 between the fastening element 34 and the angle bracket of metal 33. The angle bracket of metal 33 can have oval holes for the fastening elements 34 and 32 both for fastening the lower rail 30 to the installation bracket of metal and for fastening the installation bracket of metal 33 to the support structure 5. By means of the oval holes, the balustrade glazing 4 can be adjusted both in the depth direction and height direction of the balcony. If the fastening element 34 is a concrete screw, it can have an integrated washer 35. FIG 10 shows an alternative fastening of the lower rail 3 to the support structure 5, where the lower rail 3 is fastened directly to the support structure 5 by means of a fastening element 44.

**[0043]** An installation groove 38 of the balustrade glass 4 is constituted between seals 20a and 20b to be installed in the installation grooves 36 of the lower rail profile 30, where the installation groove 38 is open upwards. The seal 20a is installed into place in the installation groove 36 after the lower rail profile 30 has been cut to the predetermined dimension before installation. The cutting of the lower rail profile 30 and the installation of the seal 20a are usually performed at the factory. The internal seal 20b of the balustrade glazing 4 is installed into place after the installation of the balustrade glazing 4. The seal 20b is used for sealing and centering the lower part of the balustrade glazing 4 in the installation groove 38 of the lower rail 3.

**[0044]** The seals 20a, 20b can be of rubber-elastic mass, for example rubber. The seals 20a, 20b are most preferably made of or contain EPDM rubber (ethylene propylene diene monomer (M-class)).

**[0045]** FIG 6 shows detail VII of the balcony glazing and balustrade glazing shown in FIG 5, and FIG 6 describes concealed fastening. A fastening plate 101 is fastened to the support structure 8 by means of a fastening element 105, after which the handrail profile 10 is lowered onto it through the opening 106 made in the profile, presented in FIG 7, and fastened to the fastening plate 101 at the side by means of a fastening element 102 and at the top by means of fastening elements 103.

**[0046]** FIG 7 shows section VII - VII of the fastening of

the handrail 2 shown in FIG 6. FIG 7 shows that there is a cavity 107 at both ends of the handrail 2 for the installation of a fastening piece 101. The fastening pieces 101 are installed in the support structures 8 by means of fastening elements 105 before the installation of the handrail 2. An opening 106 has been made in the cross-sectional surface of the handrail profile 10, through which opening 106 the handrail 2 is lowered onto the fastening pieces 101. The handrail 2 is fastened at the side and at the top by means of fastening elements 102 (e.g. hexagonal socket head screw M6x30 ST) and 103 (e.g. pop rivet 4.2x13 ST). FIG 8 and FIG 9 show an alternative fastening of the handrail 2 to the support structure 8, where a fastening bracket of metal is fastened to the support structure 8 means of fastening elements 108 and washers 109, and the handrail is fastened onto the installation bracket of metal 104 by means of fastening elements 110.

**[0047]** A stiffener profile 15 which increases the section modulus has been installed or is installable inside the handrail profile 10 of the handrail 2, which stiffener profile 15 is fastened to the cavity 107 (FIG 3a) of the handrail profile 10 by means of fastening elements 16.

**[0048]** The handrail 2 is an extrusion, the cross-section of which is constant with the exception of possible fastening lead-throughs, whereby the cavity 107 is usable for accommodating both the fastening plates 101 (see FIG 7) and the stiffener profile 15 (see FIG 3a). The stiffener profile 15 can be solid (e.g. bar-like) or open (e.g. tubular).

**[0049]** The bottom of the installation groove 38 of the lower rail 3 contains material 31 (e.g. plastic), the hardness of which is smaller than the hardness of the balustrade glass 4 and the friction coefficient of which is smaller than the friction coefficient of the balustrade glazing 4 and of the installation groove 38 of the lower rail 3. In the example, the material 31 is shaped into the shape of a U-profile. The material is installed into place to the bottom of the lower rail profile 30, where it locks under the shoulders 45 in the lower rail profile 31.

**[0050]** The purpose of the protective/fastening profile 42 which is installable or which has been installed to the upper edge 41 of the balustrade glazing 4 is to lead the vertical forces coming from the handrail 2 to the upper edge 41 of the balustrade glazing 4 over a larger area.

**[0051]** The balustrade glazing system 1 is configured to use a protective/retaining profile 42 which has been installed or which is installable to the upper edge 41 of the balustrade glazing 4 in order to hold the balustrade glazing or to support the balustrade glazing during the installation of the balustrade glazing 4. In this case, the protective/retaining profile 42 can preferably have the shape of an h-profile.

**[0052]** The protective/retaining profile 42 can be used for straightening the handrail 2 by wedging it between the balustrade glass 4 and the handrail 2. In this case, the balustrade glazing system 1 preferably comprises a wedge-like element 13 for straightening the handrail 4 on a span.

**[0053]** The wedge-like element 13 can be a screw or bolt or comprise one.

**[0054]** The balustrade glazing system 1 is used in a multistorey building in the implementation of the balustrade glazing or balustrade and balcony glazing of external balconies located on different storeys or for the implementation or a roof terrace or terraces on different storeys. In this case it is preferably not necessary to use a stiffener profile 15 in the handrails 2 of the lower storeys of the building, and a stiffener profile 15 can be used in the handrails 2 of the upper storeys.

**[0055]** The balustrade glazing 4 is fastened at the middle area of the span using elastic adhesive 39 (e.g. silicone-type adhesives such as Sikaflex®-221 or Sikaflex®-222 UV) both to the bottom of the material 31 of the lower rail 3 and to the bottom of the protective/fastening profile 42, which is further glued to the bottom of the installation groove 9 of the handrail 2.

**[0056]** When calculating the deflection of the handrail 2, the loads are calculated in accordance with Eurocodes. Such Eurocodes include European standard 1991-1-1 Eurocode 1: Actions on structures. Part 1-1: General actions - Densities, self-weight, imposed loads for buildings, and European standard 1991-1-4 Eurocode 1: Actions on structures. Part 1-4: General actions - Wind actions.

**[0057]** According to the Eurocodes, balustrade glasses 4 and balcony glazing 6 must be dimensioned to withstand wind pressure on the basis of the height of the building in question and the terrain category in question.

**[0058]** As an example, in a building which is 20 m high and has a terrain category of 0, the wind pressure to be used in the dimensioning is 1.25 kN/m<sup>2</sup>. In a building which is 40 m high and has a terrain category of 1, the wind pressure to be used in the dimensioning is 1.01 kN/m<sup>2</sup>.

**[0059]** By means of the balustrade glazing system 1 according to the invention, manufactured as a prototype, the balustrade glazing can be implemented in a building which is 20 m high (terrain category 0) for example when the width of the balcony is 4.6 m or less. By means of the balustrade glazing system 1 according to the invention, manufactured as a prototype, the balustrade glazing can be implemented in a building which is as high as 40 m high (terrain category 1) when the width of the balcony is 6 m or less. In the cases of the numerical figures presented here, the balustrade glazing system 1 also comprises balcony glazing 6 above the handrail 2. The wind load is illustrated in the drawings by the force F in the direction of the normal of the balustrade glazing 4.

**[0060]** In some locations, for example in Helsinki, building supervision authorities give guidelines concerning the maximum permitted deflection of the handrail. When this is being written, this value in Helsinki is 25 mm. The maximum deflection of the balustrade glazing system 1 according to the invention, manufactured as a prototype, in the above-mentioned cases is smaller than or equal to the maximum permitted deflection.

**[0061]** In these cases, the handrail 2 is strengthened at least on the uppermost storeys by means of a stiffener profile 15. When implemented in this way, the balustrade and balcony glazing system can be used for implementing balustrade and balcony glazing of the types presented in the enclosed examples, conforming to the Eurocodes and building regulations.

**List of reference numbers used:**

**[0062]**

S	inner side of balustrade glazing	
U	outer side of balustrade glazing	
F	force in the direction of the normal of the balustrade glazing	
1	balustrade glazing system	
2	handrail	
3	lower rail	
4	balustrade glass	20
5	support structure	
6	balcony glazing	
7	support structure fastening system	
8	support structure (e.g. wall, facade, side edge)	
9	installation groove	
10	handrail profile	
11	removable installation strip	
12	fastening element	
13	wedge-shaped element	
15	stiffener profile	30
16	fastening element	
17	fastening groove	
18a	installation groove	
18b	installation groove	
19	locking cavity	35
20a	seal	
20b	seal	
21	cover	
22	stationary installation strip	
23	threaded hole	40
24	seal	
25	run surface	
26	slide surface	
27	run surface	
28	oval hole	45
29	oval hole	
30	lower rail profile	
31	material	
32	fastening element	
33	installation bracket of metal	50
34	fastening element	
35	washer	
36	installation groove	
37	bottom of U-profile	
38	installation groove	55
39	elastic adhesive	
40	lower edge of balustrade glass	
41	upper edge of balustrade glass	

42	protective/retaining profile	
43	covering profile	
44	fastening element	
45	shoulder	
5	50	guide
60	balcony glass	
61	upper rail	
62	support structure	
63	lower profile	
10	101	fastening plate
	102	fastening element
	103	fastening element
	104	installation bracket of metal
	105	fastening element
15	106	opening made in the profile
	107	cavity
	108	fastening element
	109	washer
	110	fastening element

**Claims**

1. A balustrade glazing system (1), comprising:

- 25
- an essentially horizontal handrail (2) provided with an installation groove (9) and having a span length of at least 3.0 m and fastened in a stationary manner only at the ends to support structures (8) by means of a support structure fastening system (7);
  - an essentially horizontal lower rail (3) provided with an installation groove (38);
  - balustrade glazing (4) made of laminated glass and installed essentially in a floating manner on the span between the installation groove (9) of the handrail and the installation groove (38) of the lower rail, whereby the lower edge (40) of the balustrade glazing (4) rests on the bottom of the installation groove (38) so that the lower edge (40) of the balustrade glazing (4) can essentially move in the installation groove (38) with respect to the width direction of the installation groove (38);

and where:

- the balustrade glazing (4) supports the handrail (2) at the middle area of the span so that the balustrade glazing (4) is freely deflectable by the effect of the forces in the direction of the normal (F) of the balustrade glazing (4);

**characterised in that**

- said balustrade glazing (4) is made of unhardened and laminated glass; and
- the lower rail (3) and the handrail (2) are ar-

- ranged so that the forces in the direction of the normal (F) of the balustrade glazing (4) directed to the balustrade glass (4) are transmitted to the support structures (5, 8) only via the essentially horizontal rails (3, 2).
2. A balustrade glazing system (1) according to claim 1, **wherein:** the support structure fastening system (7) is a concealed fastening, especially such that the support structure fastening system (7) is located within the lateral end of the handrail (2).
  3. A balustrade glazing system (1) according to claim 1 or 2, **wherein:** the support structure fastening system (7) comprises a fastening plate (101) fastened to the support structure (8) by means of a fastening element (105), after which a handrail profile (10) of the handrail (2) has been lowered onto it through an opening (106) in the handrail profile (10).
  4. A balustrade glazing system (1) according to any of the preceding claims, **wherein:** the support structure fastening system (7) leaves both lateral ends of the balustrade glazing (4) free such that the balustrade glazing (4) is freely deflectable.
  5. A balustrade glazing system (1) according to any of the preceding claims 1 to 4, which balustrade glazing system (1) also comprises balcony glazing (6) suspended from an upper rail (61) of an overhead support structure (62) of the balustrade glazing system (1), where the balcony glazing (6) is supported at its lower end to the handrail (2).
  6. A balustrade glazing system (1) according to any of the preceding claims 1 to 5, which balustrade glazing system (1) also comprises a guide (50) which has been installed or which is installable in the fastening groove (17) of the handrail (2), where the run surface (25) of the guide (50) together with the run surface (27) of the handrail (2) constitutes an even surface along which the slide surface (26) of the lower profile (63) of the balcony glass (60) can be carried so that the balcony glass (60) is runnable against the run surface (27) of the handrail (2) and against the run surface (25) of the guide (50) from the closed position to the open position and vice versa.
  7. A balustrade glazing system (1) according to any of the preceding claims 1 to 6, where the thickness of the balustrade glazing (4) is 4+4 mm, 5+5 mm or 6+6 mm.
  8. A balustrade glazing system (1) according to any of the preceding claims 1 to 7, where the installation groove (9) of the balcony glazing (4) is constituted by a stationary installation strip (22) integrated into the handrail profile (10), where the stationary installation strip (22) has an installation groove (18a) for a seal (20a), and by a removable installation strip (11), which has an installation groove (18b) for a seal (20a).
  9. A balustrade glazing system (1) according to any of the preceding claims 1 to 8, where the lower rail (3) is fastened to the support structure (5) by means of fastening elements (32).
  10. A balustrade glazing system (1) according to any of the preceding claims 1 to 9, where an installation groove (38) of the balustrade glass (4) is constituted between seals (20a, 20b) to be installed in the installation grooves (36) of the lower rail profile (30), which installation groove (38) is open upwards.
  11. A balustrade glazing system (1) according to claims 8 and 10, where the seals (20a, 20b) are made of or contain rubber-elastic mass.
  12. A balustrade glazing system (1) according to any of the preceding claims 1 to 11, where there is a cavity (107) at both ends of the handrail (2) for the installation of a fastening piece (101).
  13. A balustrade glazing system (1) according to any of the preceding claims 1 to 12, where the handrail (2) is a handrail profile (10), and a stiffener profile (15) which increases the section modulus has been installed or is installable inside the handrail (2), and which stiffener profile (15) is fastened to the cavity (107) of the handrail profile (2) by means of fastening elements (16).
  14. A balustrade glazing system (1) according to claims 12 and 13, where the handrail (2) is an extrusion, the cross-section of which is constant with the exception of possible fastening lead-throughs, whereby the cavity (107) is usable for accommodating both the fastening plates (101) and the stiffener profile (15).
  15. A balustrade glazing system (1) according to any of the preceding claims 1 to 14, where the bottom of the installation groove (38) of the lower rail (3) contains material (31), the friction coefficient of which is smaller than the friction coefficient of the balustrade glazing (4) and of the installation groove (38) of the lower rail (3).
  16. A balustrade glazing system (1) according to any of the preceding claims 1 to 15, where the bottom of the installation groove (38) of the lower rail (3) contains material (31), the hardness of which is smaller than the hardness of the balustrade glazing (4).
  17. A balustrade glazing system (1) according to any of



the preceding claims 1 to 16, which balustrade glazing system (1) also comprises a protective profile (42) which is installable or which has been installed to the upper edge (41) of the balustrade glass (4) in order to lead the vertical forces coming from the handrail (2) to the upper edge (41) of the balustrade glass (4) over a larger area.

18. A balustrade glazing system (1) according to any of the preceding claims 1 to 17, where the balustrade glazing system (1) is configured to use a protective/retaining profile (42) which has been installed or which is installable to the upper edge (41) of the balustrade glazing (4) in order to hold the balustrade glazing or to support the balustrade glazing during the installation of the balustrade glazing (4).
19. A balustrade glazing system (1) according to claim 17 or 18, where the protective/retaining profile (42) has the shape of an h-profile or comprises it.
20. A balustrade glazing system (1) according to any of the preceding claims 17 to 19, where the protective/retaining profile (42) is wedgeable between the balustrade glass (4) and the handrail (2) in order to straighten the handrail (2).
21. A balustrade glazing system (1) according to any of the preceding claims 1 to 20, which balustrade glazing system (1) comprises a wedge-like element (13) for straightening the handrail (2) on a span, most preferably by wedging the handrail (2) upwards against the balustrade glass (4) or against the protective/retaining profile (42) on the balustrade glass (4).
22. A balustrade glazing system (1) according to claims 20 and 21, where the wedge-like element (13) comprises a screw, screw thread or bolt.
23. A balustrade glazing system (1) according to any of the preceding claims 1 to 22, where the balustrade glazing (4) is fastened at the middle area of the span using elastic adhesive (39) both to the bottom of the material (31) of the lower rail (3) and to the bottom of the protective/fastening profile (42), which is further glued to the bottom of the installation groove (9) of the handrail (2).
24. A multistorey building, where the balustrade glazing system (1) according to any of the preceding claims 1 to 23 is used in the implementation of the balustrade glazing or balustrade and balcony glazing of external balconies located on different storeys or for the implementation of a roof terrace or terraces on different storeys.
25. A multistorey building according to claim 24, where

the balustrade glazing system (1) used is according to claim 12 or 13 and where a stiffener profile (15) is not used in the handrails (2) of the lower storeys and where a stiffener profile (15) is used in the handrails (2) of the upper storeys.

### Patentansprüche

1. Balustradenverglasungssystem (1), das folgendes umfasst:
- eine im Wesentlichen horizontale Handleiste (2), die mit einer Montagenut (9) versehen ist und eine Spannweite von mindestens 3,0 m aufweist und nur an den Enden in stationärer Weise mittels eines Stützkonstruktions-Befestigungssystems (7) an Stützkonstruktionen (8) befestigt ist;
  - eine im Wesentlichen horizontale untere Leiste (3) die mit einer Montagenut (38) versehen ist;
  - Balustradenverglasung (4), die aus laminiertem Glas besteht und im Wesentlichen in schwimmender Weise in der Spanne zwischen der Montagenut (9) der Handleiste und der Montagenut (38) der unteren Leiste montiert ist, wodurch die untere Kante (40) der Balustradenverglasung (4) auf dem Boden der Montagenut (38) aufliegt, so dass die untere Kante (40) der Balustradenverglasung (4) im Wesentlichen in der Montagenut (38) bezogen auf die Richtung der Breite der Montagenut (38) beweglich ist; und wo:
  - die Balustradenverglasung (4) die Handleiste (2) im mittleren Bereich der Spanne so stützt, dass die Balustradenverglasung (4) durch die Wirkung der Kräfte in Richtung der Normale (F) der Balustradenverglasung (4) frei schwingen kann;
- dadurch gekennzeichnet, dass**
- die Balustradenverglasung (4) aus ungehärtetem und laminiertem Glas besteht; und
  - die untere Leiste (3) und die Handleiste (2) so angeordnet sind, dass die Übertragung der auf das Balustradenglas (4) gerichteten Kräfte in Richtung der Normale (F) der Balustradenverglasung (4) auf die Stützkonstruktionen (5, 8) nur über die im Wesentlichen horizontalen Leisten (3, 2) stattfindet.
2. Balustradenverglasungssystem (1) nach Anspruch 1, **in dem:** das Stützkonstruktions-Befestigungssystem (7) eine versteckte Befestigung ist, insbesondere derart, dass das Stützkonstruktions-Befestigungssystem (7) innerhalb des lateralen Endes der Handleiste(2) sitzt.

3. Balustradenverglasungssystem (1) nach Anspruch 1 oder 2, **in dem**: das Stützkonstruktions-Befestigungssystem (7) eine Befestigungsplatte (101) umfasst, die an der Stützkonstruktion (8) befestigt ist mittels eines Befestigungselements (105), nach dem ein Handleistenprofil (10) der Handleiste (2) durch eine Öffnung (106) im Handleistenprofil (10) darauf abgesenkt worden ist.
4. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche, **in dem**: das Stützkonstruktions-Befestigungssystem (7) beide lateralen Enden der Balustradenverglasung (4) so frei lässt, dass die Balustradenverglasung (4) frei schwingen kann.
5. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 4, wobei das Balustradenverglasungssystem (1) auch Balkonverglasung (6) umfasst, die von einer oberen Leiste (61) einer obenliegenden Stützkonstruktion (62) des Balustradenverglasungssystems (1) abgehängt ist, wo die Balkonverglasung (6) an ihrem unteren Ende auf die Handleiste (2) gestützt ist.
6. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 5, wobei das Balustradenverglasungssystem (1) auch eine Führung (50) umfasst, die in der Befestigungsnut (17) der Handleiste (2) montiert worden ist oder montiert werden kann, wo die Lauffläche (25) der Führung (50) zusammen mit der Lauffläche (27) der Handleiste (2) eine gleichmäßige Fläche bildet, entlang der die Gleitfläche (26) des unteren Profils (63) des Balkonglases (60) so getragen werden kann, dass das Balkonglas (60) gegenüber der Lauffläche (27) der Handleiste (2) und gegenüber der Lauffläche (25) der Führung (50) aus der geschlossenen Position in die offene Position und umgekehrt laufen kann.
7. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 6, wo die Stärke der Balustradenverglasung (4) 4+4 mm, 5+5 mm oder 6+6 mm beträgt.
8. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 7, wo die Montagenut (9) der Balkonverglasung (4) von einem stationären Montagestreifen (22) gebildet ist, der in das Handleistenprofil (10) integriert ist, wo der stationäre Montagestreifen (22) eine Montagenut (18a) für eine Dichtung (20a) aufweist, und durch einen entfernbaren Montagestreifen (11), der eine Montagenut (18b) für eine Dichtung (20a) aufweist.
9. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 8, wo die untere Leiste (3) an der Stützkonstruktion (5) mittels Befestigungselementen (32) befestigt ist.
10. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 9, wo eine Montagenut (38) des Balustradenglases (4) gebildet ist zwischen Dichtungen (20a, 20b) zur Montage in den Montagenuten (36) des unteren Leistenprofils (30), wobei die Montagenut (38) nach oben offen ist.
11. Balustradenverglasungssystem (1) nach den Ansprüchen 8 und 10, wo die Dichtungen (20a, 20b) aus gummielastischer Masse gefertigt sind oder diese enthalten.
12. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 11, wo sich ein Hohlraum (107) an beiden Enden der Handleiste (2) zur Montage eines Befestigungsstücks (101) befindet.
13. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 12, wo die Handleiste (2) ein Handleistenprofil (10) und ein Versteifungsprofil (15) ist, das das Widerstandsmoment erhöht, innerhalb der Handleiste (2) montiert worden ist oder montiert werden kann, und wobei das Versteifungsprofil (15) in dem Hohlraum (107) des Handleistenprofils (2) mittels Befestigungselementen (16) befestigt ist.
14. Balustradenverglasungssystem (1) nach den Ansprüchen 12 und 13, wo die Handleiste (2) ein Fließpressstück ist, dessen Querschnitt - mit der Ausnahme möglicher Durchführungen für Befestigungen - konstant ist, wodurch der Hohlraum (107) für die Aufnahme sowohl der Befestigungsplatten (101) als auch des Versteifungsprofils (15) verwendbar ist.
15. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 14, wo der Boden der Montagenut (38) der unteren Leiste (3) Material (31) enthält, dessen Reibungskoeffizient kleiner ist als der Reibungskoeffizient der Balustradenverglasung (4) und der Montagenut (38) der unteren Leiste (3).
16. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 15, wo der Boden der Montagenut (38) der unteren Leiste (3) Material (31) enthält, dessen Härte geringer ist als die Härte der Balustradenverglasung (4).
17. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 16, wobei das Balustradenverglasungssystem (1) auch ein Schutzprofil (42) umfasst, das an der oberen Kante (41) des Balustradenglases (4) montiert werden kann

oder montiert worden ist, um die von der Handleiste (2) an die obere Kante (41) des Balustradenglases (4) gelangenden vertikalen Kräfte über einen größeren Bereich zu leiten.

18. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 17, wo das Balustradenverglasungssystem (1) zur Verwendung eines Schutz-/Halteprofils (42) ausgelegt ist, das an der oberen Kante (41) der Balustradenverglasung (4) montiert worden ist oder montiert werden kann, um die Balustradenverglasung zu halten oder die Balustradenverglasung während der Montage der Balustradenverglasung (4) zu stützen.

19. Balustradenverglasungssystem (1) nach Anspruch 17 oder 18, wo das Schutz-/Halteprofil (42) die Form eines h-Profiles aufweist oder umfasst.

20. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 17 bis 19, wo das Schutz-/Halteprofil (42) zwischen dem Balustradenglas (4) und der Handleiste (2) verkeilbar ist, um die Handleiste (2) gerade auszurichten.

21. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 20, wobei das Balustradenverglasungssystem (1) ein keilähnliches Element (13) umfasst, um die Handleiste (2) auf einer Spanne gerade auszurichten, am liebsten durch Verkeilen der Handleiste (2) nach oben gegen das Balustradenglas (4) oder gegen das Schutz-/Halteprofil (42) auf dem Balustradenglas (4).

22. Balustradenverglasungssystem (1) nach den Ansprüchen 20 und 21, wo das keilähnliche Element (13) eine Schraube, ein Schraubgewinde oder einen Bolzen umfasst.

23. Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 22, wo die Balustradenverglasung (4) im mittleren Bereich der Spanne mittels elastischem Klebstoff (39) sowohl am Boden des Materials (31) der unteren Leiste (3) und am Boden des Schutz-/Befestigungsprofils (42) befestigt ist, das weiterhin am Boden der Montagenumgebung (9) der Handleiste (2) festgeklebt ist.

24. Mehrstöckiges Gebäude, wo das Balustradenverglasungssystem (1) nach einem der vorhergehenden Ansprüche 1 bis 23 beim Einbau der Balustradenverglasung oder Balustraden- und Balkonverglasung von Außenbalkonen verwendet wird, die auf verschiedenen Stockwerken liegen oder beim Einbau einer Dachterrasse oder von -terrassen auf verschiedenen Stockwerken.

25. Mehrstöckiges Gebäude nach Anspruch 24, wo das

verwendete Balustradenverglasungssystem (1) das gemäß Anspruch 12 oder 13 ist und wo ein Versteifungsprofil (15) nicht in den Handleisten (2) der unteren Stockwerke verwendet wird und wo ein Versteifungsprofil (15) in den Handleisten (2) der oberen Stockwerke verwendet wird.

## Revendications

1. Dispositif de vitrage de balustrade (1), comprenant :

- une main courante (2) essentiellement horizontale présentant une rainure de montage (9) et une longueur de travée d'au moins 3,0 m et uniquement fixée de manière inamovible à l'extrémité de la structure de soutien (8) au moyen d'une fixation de structure de soutien (7) ;
- une rampe inférieure (3) essentiellement horizontale présentant une rainure de montage (38) ;
- un vitrage de balustrade (4) en verre laminé essentiellement monté de façon flottante sur la travée entre la rainure de montage (9) de la main courante et la rainure de montage (38) de la rampe inférieure, le coin inférieur (40) du vitrage de balustrade (4) étant appuyé sur le bas de la rainure de montage de sorte que le coin inférieur (40) du vitrage de balustrade (4) peut essentiellement se déplacer dans la rainure de montage (38) dans le sens de la largeur de ladite rainure de montage (38) ;

et dans lequel :

- le vitrage de balustrade (4) soutient la main courante (2) au milieu de la travée de sorte que ledit vitrage de balustrade (4) peut être librement déformé sous l'effet des forces s'exerçant dans le sens de la normale (F) du vitrage de balustrade (4) ;

## caractérisé en ce que

- ledit vitrage de balustrade (4) est fait de verre laminé non trempé ; et
- la rampe inférieure (3) et la main courante (2) sont disposées de sorte que les forces dirigées vers le vitrage de balustrade (4) s'exerçant dans le sens de la normale (F) du vitrage de balustrade (4) sont transmises aux structures de soutien (5, 8) uniquement au moyen de rails essentiellement horizontaux (3, 2).

2. Dispositif de vitrage de balustrade (1) selon la revendication 1, dans lequel : le dispositif de fixation de la structure de soutien (7) est une fixation cachée, en particulier de sorte que ledit dispositif de fixation

- de la structure de soutien (7) est disposé à l'extrémité latérale de la main courante (2).
3. Dispositif de vitrage de balustrade (1) selon la revendication 1 ou la revendication 2, dans lequel : le dispositif de fixation de la structure de soutien (7) comprend une plaque de fixation (101) fixée à la structure de soutien (8) au moyen d'un élément de fixation (105), derrière lequel un profil de main courante (10) de la main courante (2) a été abaissé par une ouverture (106) dans le profil de main courante (10). 5
  4. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications précédentes, dans lequel : le dispositif de fixation de la structure de soutien (7) laisse les deux extrémités latérales du vitrage de balustrade (4) libres de sorte que le vitrage de balustrade (4) peut être librement déformé. 10 15
  5. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 4, dans lequel ledit dispositif de vitrage de balustrade (1) comprend également un vitrage de balcon (6) suspendu au rail supérieur (61) d'une structure de soutien aérienne (62) du dispositif de vitrage de balustrade, dans lequel le vitrage de balcon (6) est appuyé à son extrémité inférieure sur la main courante (2). 20 25
  6. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 5, comprenant également un guide (50) ayant été monté ou pouvant être monté dans la rainure de fixation (17) de la main courante (2), dans lequel la surface de roulement (25) dudit guide (50) forme avec la surface de roulement (27) de la main courante (2) une surface plane au long de laquelle la surface de glissement (26) du profil inférieur (63) du vitrage de balcon peut être réalisée de sorte que le vitrage de balcon (60) peut passer de la position fermée à la position ouverte et inversement par rapport à la surface de roulement (27) de la main courante (2) et par rapport à la surface de roulement (25) du guide (50). 30 35 40
  7. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 6, dans lequel l'épaisseur du vitrage de balustrade (4) est de 4+4 mm, 5+5 mm ou 6+6 mm. 45
  8. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 7, dans lequel la rainure de montage (9) dudit vitrage de balustrade (4) est constituée d'une baguette de montage fixe (22) intégrée au profil de main courante (10), ladite baguette de montage fixe (22) présentant une rainure de montage (18a) servant de joint (20a), et d'une baguette de montage amovible (11) présentant une rainure de montage (18b) servant de joint (20b). 50 55
  9. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 8, dans lequel la rampe inférieure (3) est fixée à la structure de soutien (5) au moyen d'éléments de fixation (32).
  10. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 9, dans lequel la rainure de montage (38) du vitrage de balustrade (4) est réalisée entre les joints (20a, 20b) destinés à être installés dans la rainure de montage (36) du profil de la rampe inférieure (30), ladite rainure de montage (38) étant ouverte vers le haut.
  11. Dispositif de vitrage de balustrade (1) selon la revendication 8 et la revendication 10, dans lequel les joints (20a, 20b) sont faits de ou contiennent une masse de caoutchouc élastique.
  12. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 11, présentant une cavité (107) à chaque extrémité de la main courante (2) destinée à l'installation d'une pièce de fixation (101).
  13. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 12, dans lequel la main courante (2) est un profil de main courante (10) et dans lequel un profil de raidisseur (15) augmentant le module d'inertie a été installé ou peut être installé à l'intérieur de la main courante (2), ledit profil de raidisseur (15) étant fixé à la cavité (107) du profil de main courante (2) au moyen d'éléments de fixation (16).
  14. Dispositif de vitrage de balustrade (1) selon la revendication 12 et la revendication 13, dans lequel la main courante (2) est une extrusion dont la coupe transversale est constante à l'exception d'éventuels passages de câbles, la cavité (107) pouvant être utilisée pour installer les plaques de fixation (101) et le profil de raidisseur (15).
  15. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 14, dans lequel le fond de la rainure de montage (38) de la rampe inférieure (3) contient un matériau (31) dont le coefficient de friction est inférieur au coefficient de friction du vitrage de balustrade (4) et de la rainure de montage (38) de la rampe inférieure.
  16. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 15, dans lequel le fond de la rainure de montage (38) de la rampe inférieure (3) contient un matériau (31) dont la dureté est inférieure à la dureté du vitrage de balustrade (4).

17. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 2 à 16, comprenant également un profil de protection (42) pouvant être monté ou ayant été monté sur le coin supérieur (41) du vitrage de balustrade (4) afin de diriger les forces verticales exercées par la main courante (2) sur le coin supérieur (41) du vitrage de balustrade (4) sur une plus grande surface.
18. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 17, dans lequel ledit dispositif de vitrage de balustrade (1) est configuré pour utiliser un profil de protection/maintien (42) ayant été monté ou pouvant être monté sur le coin supérieur (41) du vitrage de balustrade (4) afin de maintenir ou de soutenir le vitrage de balustrade (4) pendant le montage dudit vitrage de balustrade (4).
19. Dispositif de vitrage de balustrade (1) selon la revendication 17 ou la revendication 18, dans lequel le profil de protection/maintien (42) a la forme d'un H ou la comprend.
20. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 17 à 19, dans lequel le profil de protection/maintien (42) peut être calé entre le vitrage de balustrade (4) et la main courante (2) afin de redresser la main courante (2).
21. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 20, comprenant un élément en forme de coin (13) permettant de redresser la main courante (2) sur une travée, de préférence en calant la main courante (2) vers le haut contre le vitrage de balustrade (4) ou contre le profil de protection/maintien (42) placé sur le vitrage de balustrade (4).
22. Dispositif de vitrage de balustrade (1) selon la revendication 20 et la revendication 21, dans lequel l'élément en forme de coin (13) comprend une vis, un filet de vis ou un boulon.
23. Dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 22, dans lequel le vitrage de balustrade (4) est fixé au milieu de la travée au moyen d'un adhésif élastique (39) au bas du matériau (31) du rail inférieur (3) et au bas du profil de protection/fixation (42), qui est également collé au bas de la rainure de montage (9) de la main courante (2).
24. Immeuble de plusieurs étages, dans lequel le dispositif de vitrage de balustrade (1) selon l'une quelconque des revendications 1 à 23 est utilisé dans la mise en oeuvre d'un vitrage de balustrade ou d'un vitrage de balustrade et de balcon sur des balcons externes situés sur des étages différents ou dans la mise en oeuvre d'une terrasse tropézienne ou de terrasses installées à différents étages.
25. Immeuble de plusieurs étages selon la revendication 24, dans lequel le dispositif de vitrage de balustrade (1) est utilisé selon la revendication 12 ou la revendication 13 et dans lequel un profil de raidisseur (15) n'est pas utilisé dans les mains courantes (2) des étages inférieurs et dans lequel un profil de raidisseur (15) est utilisé dans les mains courantes (2) des étages supérieurs.

FIG 1

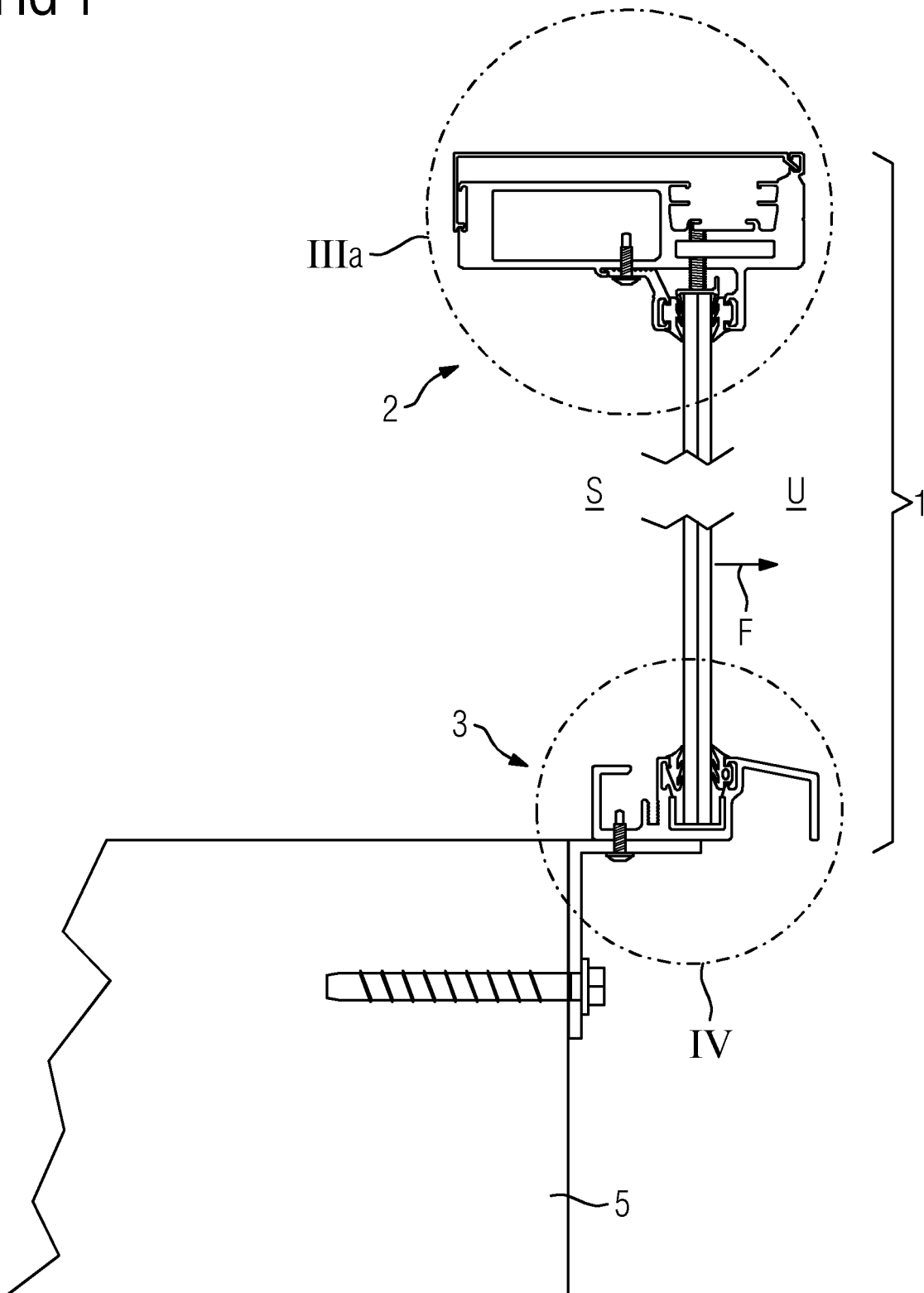


FIG 2

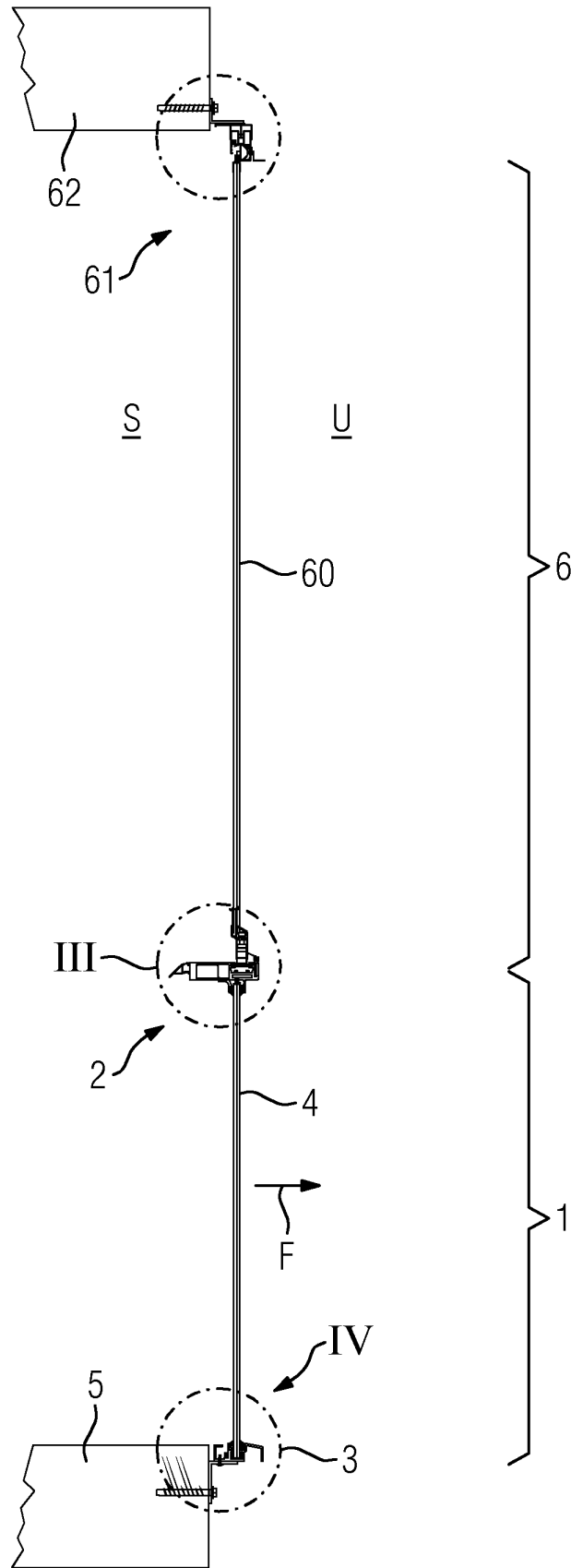


FIG 3a

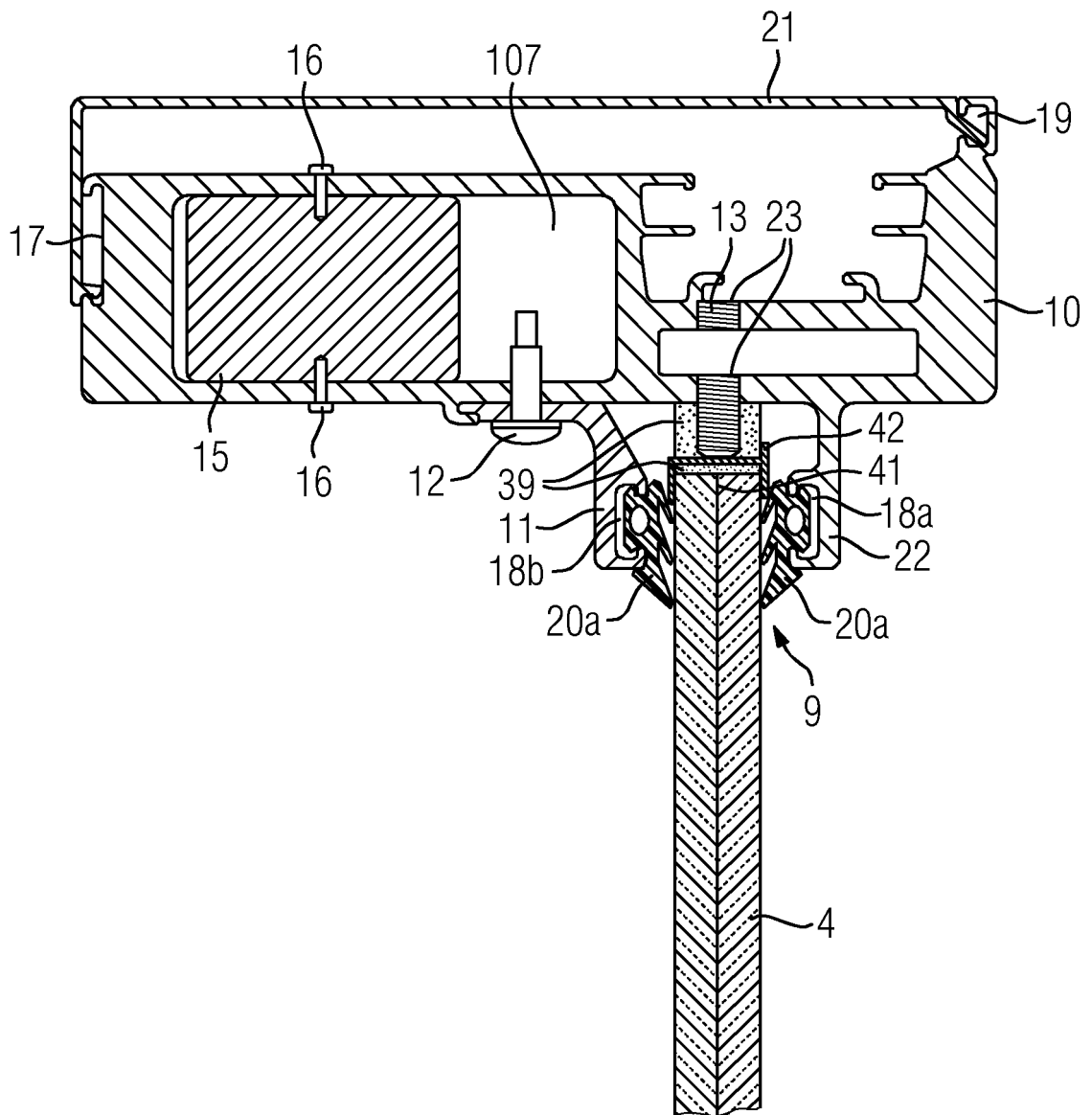




FIG 3b

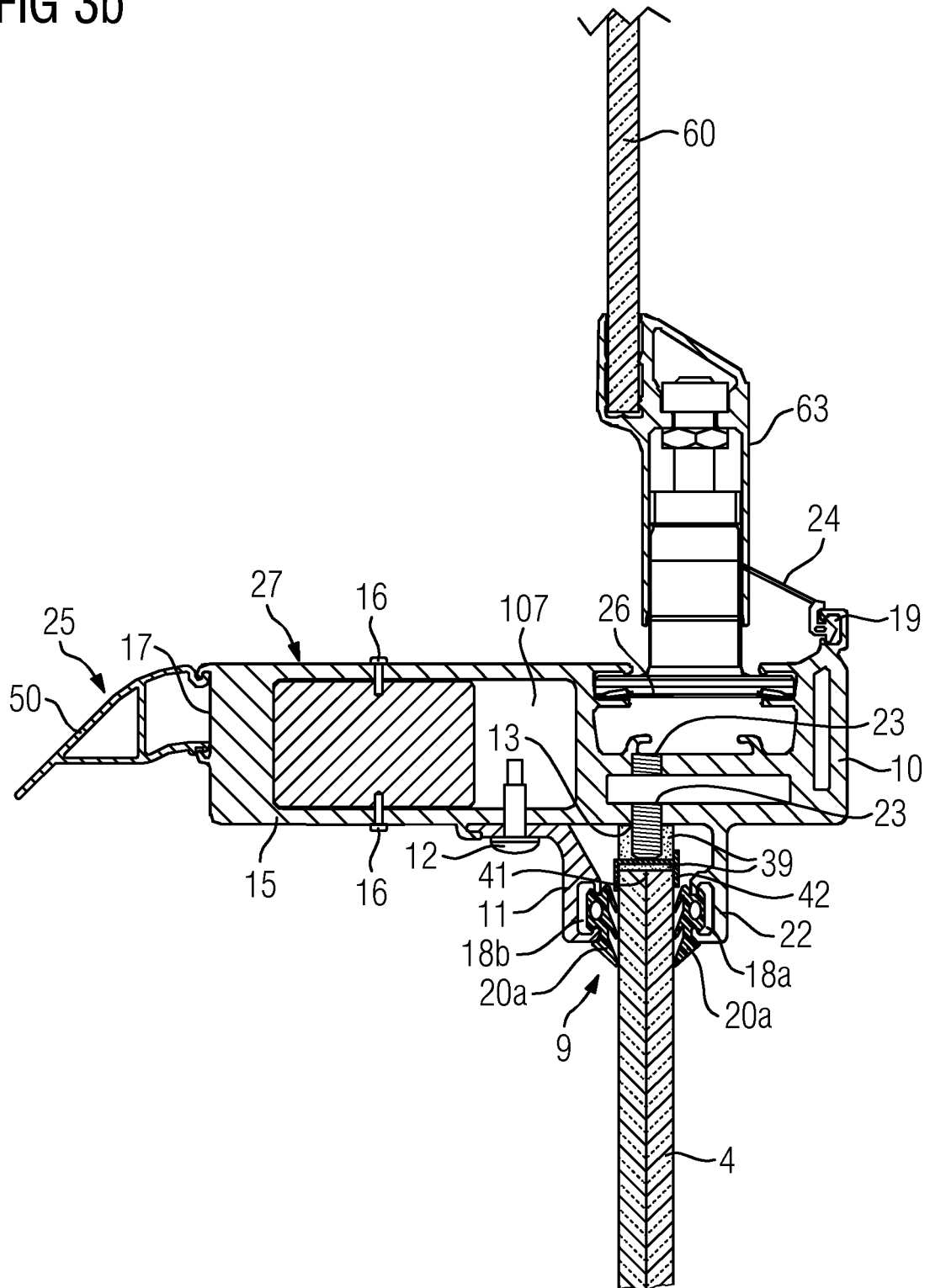


FIG 4

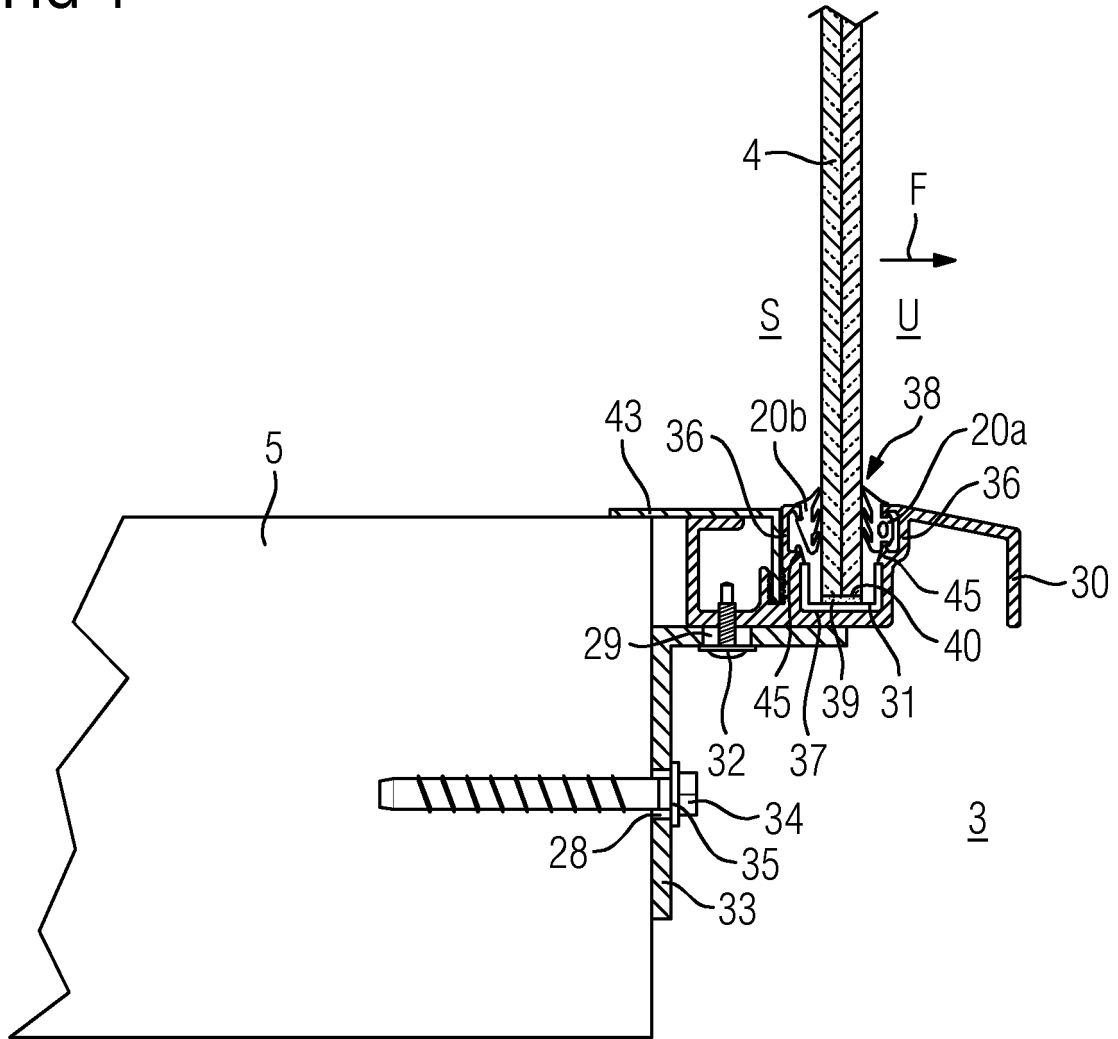


FIG 5

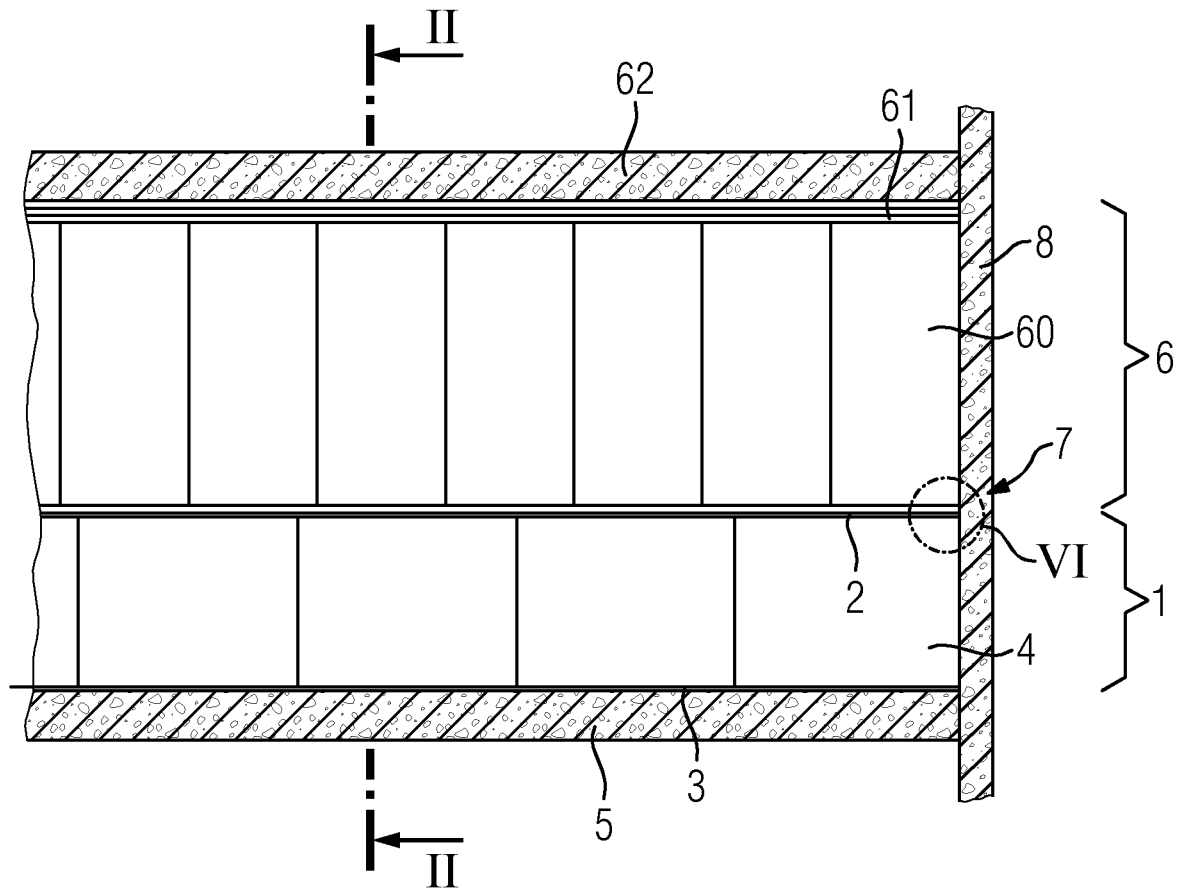


FIG 6

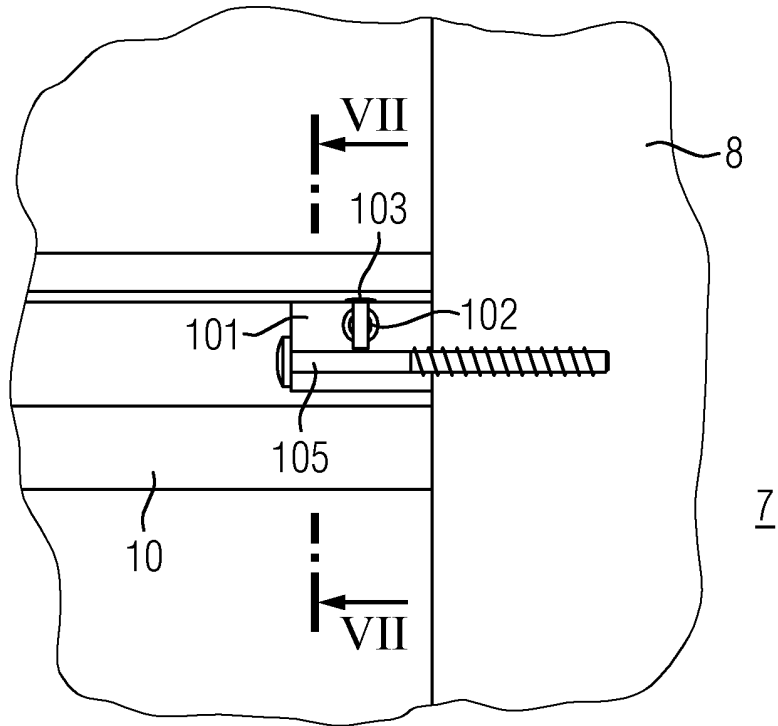


FIG 7

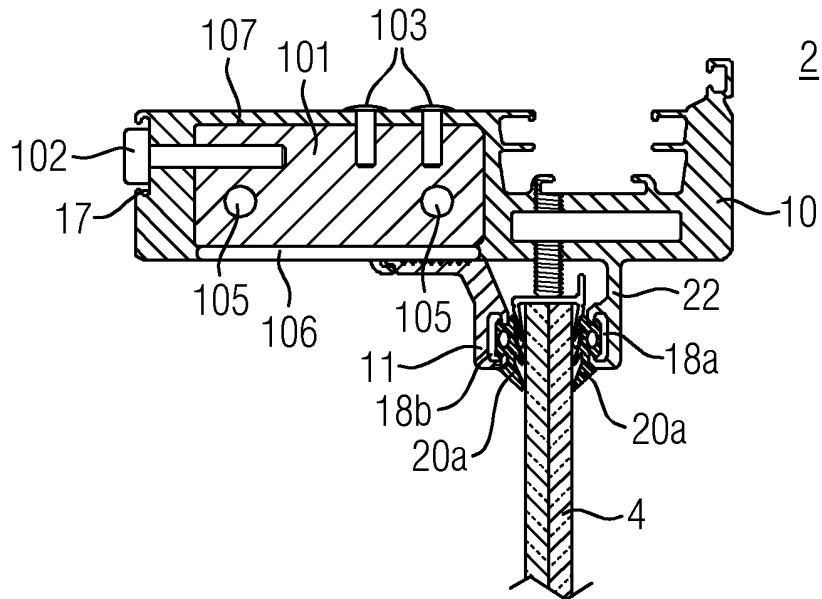


FIG 8

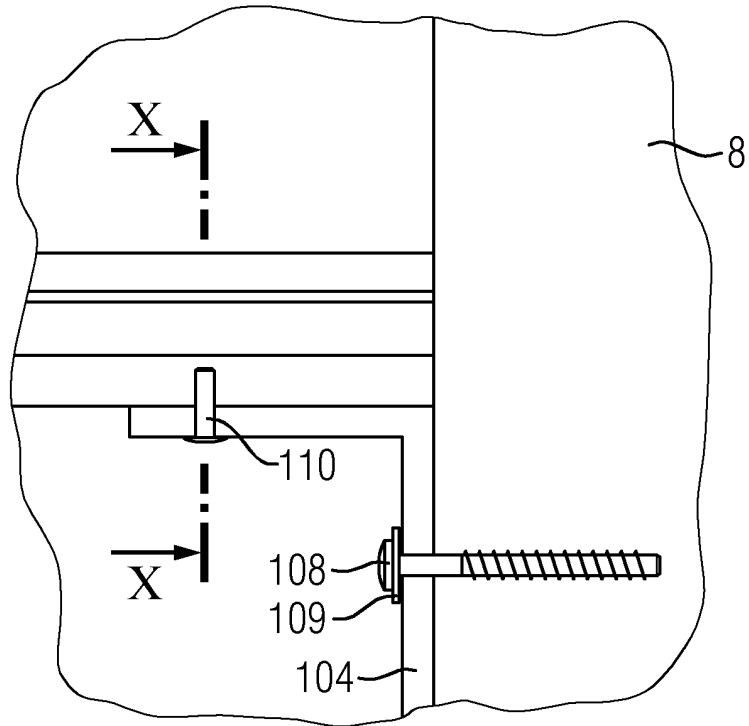


FIG 9

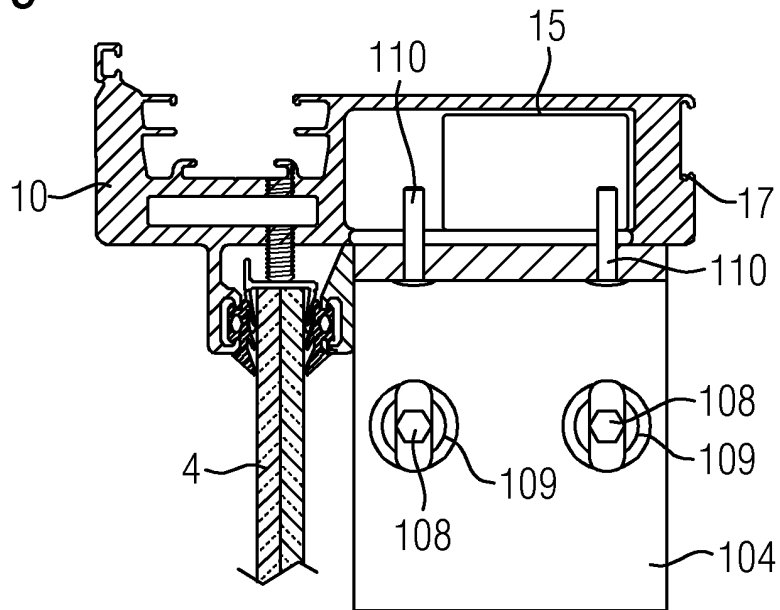
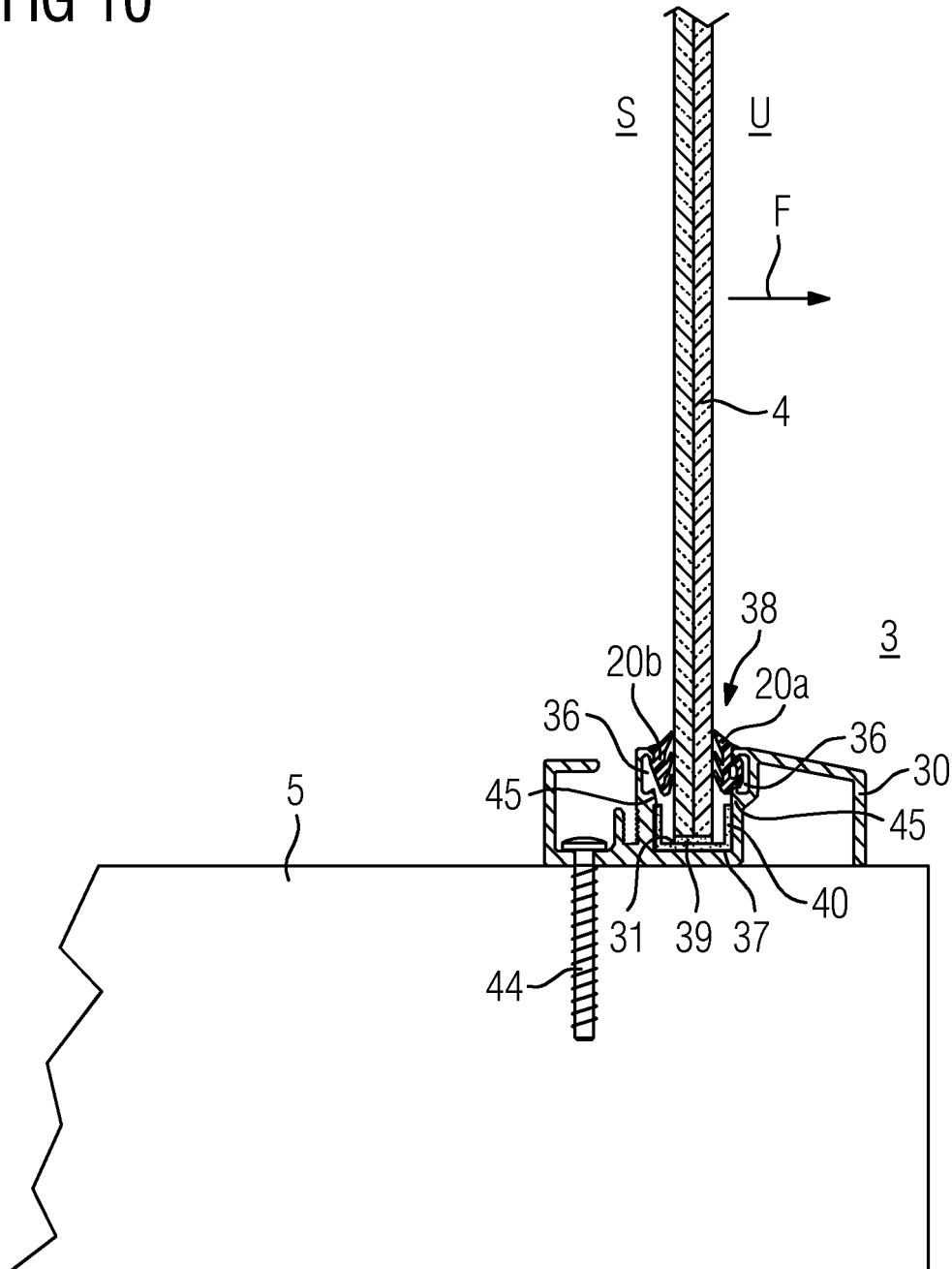


FIG 10



**REFERENCES CITED IN THE DESCRIPTION**

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