



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.07.2012 Bulletin 2012/27

(51) Int Cl.:
E04D 13/03^(2006.01) E04D 13/035^(2006.01)

(21) Application number: **10197251.1**

(22) Date of filing: **29.12.2010**

(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

• **Møller, Brent**
2820 Gentofte (DK)
• **Larsen, Niels Adelholm**
2000 Frederiksberg (DK)

(71) Applicant: **VKR Holding A/S**
2970 Hørsholm (DK)

(74) Representative: **Carlsson, Eva et al**
Awapatent A/S
Rigensgade 11
1316 Copenhagen K (DK)

(72) Inventors:
• **Lindgren, Claes**
3520 Farum (DK)

(54) **A window system having a frame and sash structure of a slender design**

(57) The window system has a frame structure including a plurality of frame members, a sash structure carrying a pane element and including a plurality of sash members, and a bracket arrangement, the sash structure

being connected to the frame structure, by means of a connection between the sash structure and the frame structure accommodated within the bracket arrangement.

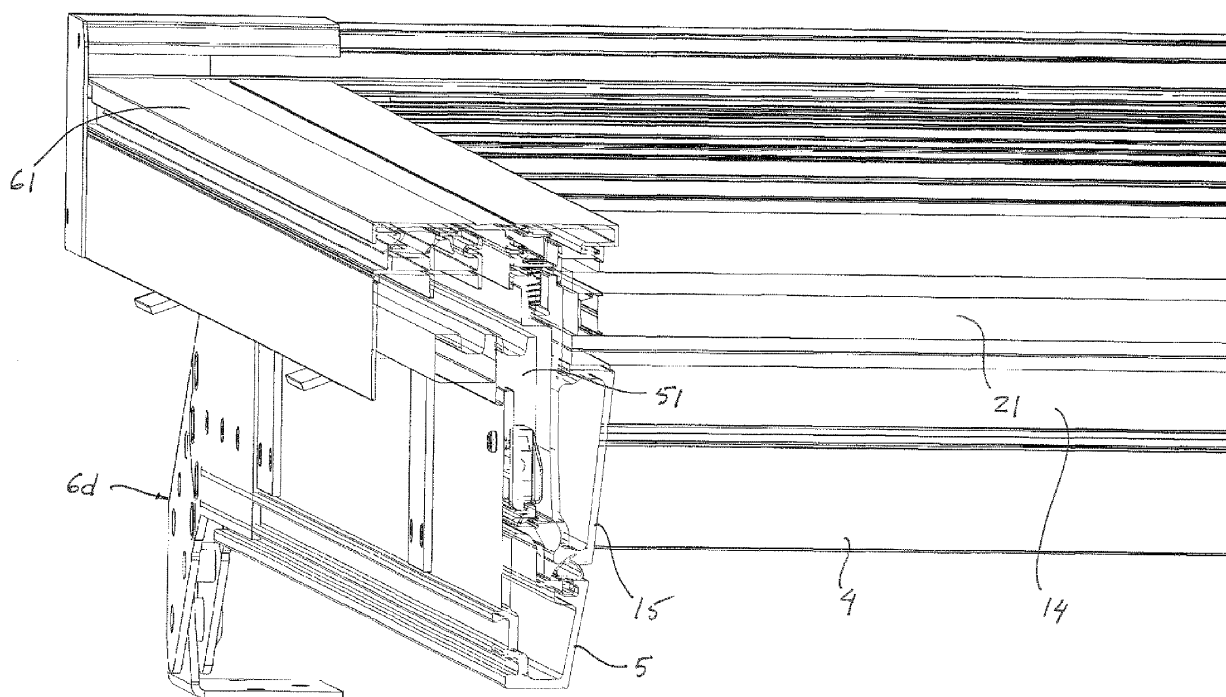


Fig. 8

Description

[0001] The invention relates to a window system comprising a frame structure including a plurality of frame members, a sash structure carrying a pane element and including a plurality of sash members, and a bracket arrangement, the sash structure being connected to the frame structure.

[0002] The weight of such a window system may be substantial. This depends partly on the materials chosen, partly on the dimensions of the window system. Most of the weight is concentrated to the sash structure due to the pane. In particular in large windows, in which the area of the pane is very large relative to the sash and frame structures, this poses particular demands to parts to the design of the sash and frame structures. This effect has increased as a result of the demands to insulating properties, meaning that there are often two or even three sheets of glass or other glazing material in one pane.

[0003] In the prior art, measures have been taken to increase the rigidity of the sash and frame members, one example being published international application No. WO 00/65172, in which an element accommodated in the frame member and extending over essentially the entire length thereof makes it possible to vary the moment of inertia of the frame member and thereby optimize the configuration of the panel system. However, this solution is not immediately applicable to all kinds of panel systems, in particular not those comprising both a frame and a sash, and in which particular care must be taken when transmitting the load from the sash via the frame and further to the supporting underlying roof structure.

[0004] With this background it is an object of the present invention to provide a window system of the kind stated in the introduction, in which it is possible to obtain a flexible design of the sash and frame members.

[0005] This object is achieved by a window system, in which the connection between the sash structure and the frame structure is accommodated within the bracket arrangement.

[0006] By accommodating the connection within the bracket arrangement, i.e. providing for connection of the sash structure directly to the bracket arrangement, there is no need for further structural elements for assisting in transmitting the load from the sash, i.e. essentially from the pane, into the fixed building structure to which the bracket arrangement is fastened. The frame structure is so to speak carried by the bracket arrangement, and as the sash structure is connected with the bracket arrangement, without the interposition of the frame structure, no particular demands are posed in terms of reinforcement of the frame structure. This allows for a substantially increased degree of freedom when designing the frame structure.

[0007] In a preferred embodiment the connection includes a first hinge part connected to the sash structure and a second hinge part connected to the bracket arrangement. This is a well-proven mechanical solution en-

suring a reliable connection.

[0008] Specifically, the first hinge part may include at least one arc-shaped arm and the second hinge part includes at least one arc-shaped guidance to cooperate with the arc-shaped arm of the first hinge part.

[0009] In an embodiment, which provides for a mechanically simple design and particularly reliable transfer of the load, the second hinge part comprises a folded portion connected to a base element of a bracket unit of the bracket arrangement. In this manner, a positive engagement between the second hinge part and the bracket arrangement is ensured.

[0010] The folded portion may be formed integrally with a plate-shaped element of the second hinge part or connected with the plate-shaped element by fastening means.

[0011] In an embodiment which provides for a particularly flexible design of the frame structure, the operator is mounted on the external side of a first frame member.

[0012] By providing the operator as an operator positioned externally, i.e. on the side of the frame member not visible from the inside, this provides for the flexible design of the frame structure aimed at, and at the same time, the operator is inconspicuous and concealed from a viewer standing in the room below the window system.

[0013] In a preferred embodiment the operator is connected to the bracket arrangement of the window system. This makes it possible to transfer the load of the sash directly to the bracket arrangement and further out to the supporting roof structure, without any load being absorbed by the frame itself. This increases the degree of freedom in designing the frame structure.

[0014] In an embodiment, which is particularly easy to install, after-mount and exchange, the operator is accommodated in a housing extending substantially between two adjacent bracket units of the bracket arrangement.

[0015] In a further development, the housing is rotatably and detachably connected to the bracket units. This allows for the operator to follow the movement of the sash when opening the sash relative to the frame.

[0016] In a preferred embodiment, which allows for a particularly flexible design of the sash structure, for instance as slender profiles if desired, a first end of the operator member is accommodated in the operator itself and a second end of the operator member is connected to a transverse element extending between sash members adjacent to the sash member opposite the first frame member. In this manner, the forces transmitted through the operator member to the sash are not concentrated to a single point or to a limited area which could lead to bending of the sash member in question, but instead, the forces are distributed to the adjacent sash members.

[0017] In order to render the distribution of forces from the operator member to the sash particularly inconspicuous, the transverse element may extend externally of the pane element of the sash structure, and in a mechanically simple further development, the transverse element is fastened to the sash members adjacent to the

sash member opposite the first frame member by means of a fitting.

[0018] The operator forms a contained unit positioned externally and is such hidden from the inside. In case it is desired to disguise the operator further, not only from viewing, but also from direct exposure to the weathering, the operator may in the installed position of the window system be at least partly concealed under a flashing arrangement.

[0019] In a preferred embodiment, the operator is a chain operator and the operator member a chain. This provides for a particularly compact design.

[0020] Further details are described, and further advantages stated, in the description of particular embodiments of the invention.

[0021] In the following the invention will be described in further detail by means of examples of embodiments with reference to the schematic drawings, in which

Fig. 1 is a perspective view of a window system in an embodiment of the invention;

Fig. 2 is a perspective view, on a larger scale, of a window system in an embodiment of the invention;

Fig. 3 is a view corresponding to Fig. 2, with some parts of the window system removed;

Fig. 4 is a view corresponding to Fig. 2, with some parts of the window system removed, and from a different angle;

Fig. 5 is a view corresponding to Fig. 4, with some parts of the window system removed;

Fig. 6 is a perspective cross-sectional view substantially along the line VI-VI in Fig. 1;

Fig. 7 is a cross-sectional view of an embodiment, substantially corresponding to a section along the line VII-VII of Fig. 1;

Fig. 8 is a perspective cross-sectional view substantially along the line VIII-VIII in Fig. 1, the cross-sectional view being rotated to a different angle;

Figs 9 and 10 are perspective views of an embodiment of the window system according to the invention and incorporating a flashing system;

Fig. 11 is a cross-sectional view of a window system according to the invention, showing two windows built-in side-by-side; and

Figs 12 and 13 are partial perspective views of a window system in a further embodiment.

[0022] A frame structure 1 of the window system according to the invention has four corner sections 1a, 1b, 1c and 1d and is adapted to be installed in a roof structure (not shown). In the embodiment shown, the frame structure 1 is composed by four frame members 2, 3, 4 and 5, extending between respective corner sections. The window system furthermore comprises a bracket arrangement comprising a set of bracket units 6a, 6b, 6c and 6d. In the embodiment shown, each bracket unit includes a base element 10a, 10b (only shown at the bottom of the window in the embodiment shown - base el-

ement 10d of the upper left-hand corner visible in Fig. 12) mounted at the respective corner section 1a, 1b, 1c and 1d of the frame structure 1. Additionally, each bracket unit comprises at least one supplemental element adapted to be detachably connected to the base element.

[0023] The individual configuration of each bracket unit of the embodiment shown will be described in some detail further down. In this description, terms such as "lower", "upper", "left-hand", "right-hand", "side", "top", "bottom", etc. refer to the shown position of the window system only, and is not to be interpreted as limiting the window system to use in a particular position only.

[0024] The bracket units may be provided with a number of supplemental elements such as described in Applicants' co-pending application filed on the same day as the present application and the contents of which are hereby incorporated by reference. One such supplemental element may for instance, as shown at the bottom only of the window system in the embodiment shown, comprise a leg element 20a, 20b which in the shown state is connected to the respective base element 10a, 10b in a manner which is rotatable and detachable, that is, the leg element may be connected and disconnected from the base element by suitable connection means and is able to rotate about an axis of rotation relative to the base element. Further conceivable supplemental elements include an adaptor element, a spacer element and a lifting element. The window system is fastened to the supporting structure by means of the bracket arrangement, which thus transfers the load resulting from the weight of the window system to the roof supporting structure.

[0025] The window system furthermore comprises a sash structure carrying a pane element 21 and including a plurality of sash members 12, 13, 14, 15, and an operator 31 including an operator member 32 having a first and a second end and adapted to extend between the frame structure and the sash structure. In the embodiment shown, the operator 31 is mounted on the external side of a first frame member constituted by the bottom frame member 2. As indicated, the operator in the embodiment shown is a chain operator and the operator member 32 is thus a chain which is able to transfer pressure and tension during opening and closing, respectively, of the sash structure relative to the frame structure.

[0026] In the following, the operator and its connection and positioning relative to the frame and sash structures will be described in further detail. In the embodiment shown, the operator is mounted on the external side of a first frame member.

[0027] In this context the term "external" is used for surfaces facing away from the opening defined by the window frame, while the terms "outer" and "inner" is used to indicate that a surface faces the outside or inside of the building, respectively.

[0028] This means that the operator 31 which is positioned externally, i.e. on the side of the frame member 2 not visible from the inside, is inconspicuous and con-

cealed from a viewer standing in the room below the window system.

[0029] In the embodiment shown and described the operator 31 is connected to the bracket arrangement of the window system, namely to the bracket units 6a and 6b at the bottom of the window system. This makes it possible to transfer the load resulting from the weight of the sash, friction in hinges etc., directly to the bracket arrangement and further out to the supporting structure, without any load being absorbed by the frame itself. This increases the degree of freedom in designing the frame structure. In particular, it is noted that the operator in the embodiment shown is accommodated in a housing 33 extending substantially between two adjacent bracket units 6a, 6b of the bracket arrangement. The housing is rotatably and detachably connected to the bracket units 6a, 6b in any suitable manner, for instance by a hinge pin connected to the base element of each bracket unit. This allows for the operator to follow the movement of the sash when opening the sash relative to the frame.

[0030] A first end of the operator member 32 is accommodated in the operator itself and a second end of the operator member is connected to a transverse element 41 extending between sash members adjacent to the sash member opposite the first frame member, i.e. in the embodiment shown to the sash member 15 and 13 adjacent the bottom sash member 12. In this manner, the forces transmitted through the operator member to the sash are not concentrated to a single point or to a limited area which could lead to bending of the sash member in question, but instead, the forces are distributed to the adjacent sash members. The transverse element 41 is arranged to extend externally of the pane element 21 of the sash structure, and in a mechanically simple further development, the transverse element 41 is fastened to the sash members adjacent to the sash member opposite the first frame member by means of a fitting 41a (only the left-hand fitting visible in Figs 4 and 5).

[0031] The operator forms a contained unit positioned externally and is as such hidden from the inside. In case it is desired to disguise the operator further, partly from viewing, but also from direct exposure to the weathering, the operator may in the installed position of the window system be at least partly concealed under cover plate 35 and a flashing arrangement 72 mounted on the frame structure 1, i.a. by means of a connector element 71. The flashing arrangement and the connector element are described in further detail in Applicants' applications filed on the same day as the present application.

[0032] In the shown embodiment, the operator is a chain operator and the operator member a chain. This provides for a particularly compact design, but other kinds of operators are conceivable as well, such as a scissors operator and a pressure medium operated opener/closer.

[0033] The window system according to the invention may be used for many different geometrical configurations, e.g. an array of long lights forming a light band and

ridges.

[0034] One conceivable installation situation is shown in Fig. 11, in which two window systems according to the invention are built-in side-by-side. Thus the left-hand window system may be as described in the above, thus showing the right-hand frame member 3, the right-hand sash member 13 and the pane element 21. To the right of the window system, there is a further window system, of which the left-hand frame member 105 and sash member 115 are shown. The sash member 115 carries the pane element 121 together with other sash members. A drain element 51, 151 is positioned in connection with the respective frame member 3, 105 such that they form two drain grooves positioned side-by-side. A common cover element 61 spans the gap between the adjacent sash members 13 and 115 and extends somewhat into the border portion of the respective pane element 21, 121.

[0035] The members of the frame and sash structures may in principle be formed in any suitable manner, but may preferably be formed as thin-walled profiles, such as fibre glass reinforced profiles made by pultrusion. Details of such profiles and in particular the fastening of the pane elements 21, 121 by means of glazing lists are described in further detail in Applicants' co-pending application filed on the same day as the present application.

[0036] The hinge connection between the sash structure and the frame structure may in principle be formed in any suitable manner to provide a hinge axis at the top of the window system or at another location between the top and bottom, or between the sides. However, a hinge axis located at the top of the window system is preferred. The hinge connection may for instance include a hinge pin connected with the sash structure and a journal connected with the frame structure. According to the present invention, the connection between the sash structure and the frame structure is accommodated within the bracket arrangement. This is shown in detail in Figs 12 and 13.

[0037] The load resulting from the weight of the sash structure, thus primarily of that of the pane element, is transferred into the supporting structure, i.e. the fixed building structure to which the bracket arrangement is fastened. In the embodiment shown, a first hinge part 91 is connected to the sash structure and a second hinge part 81 is connected to the bracket arrangement, i.e. in the embodiment shown to the bracket units 6c and 6d at the top of the window system. In the embodiment of Fig. 12 showing the upper left-hand corner 1d of the frame structure, the second hinge part 81 comprises a first guidance 82 formed as an arc-shaped recess and a second guidance 83 formed as an arc-shaped track in a plate-shaped element 84. The plate-shaped element 84 of the second hinge part 81 is connected to the bracket unit 6d in that a folded portion 85 of the second hinge part 81 is connected to the base element 10d of the bracket unit 6d. The folded portion 85 may either be formed integrally with the plate-shaped element 84 or connected in any

suitable manner, for instance by means of rivets or screws.

[0038] Correspondingly, as shown in Fig. 13 showing the upper left-hand corner of the sash structure, the first hinge part 91 includes a first arc-shaped arm 92 for co-operation with the first guidance 82 of the second hinge part 81. A further connection between the first and second hinge parts is provided by a stop pin 93 which in the mounted position cooperates with track 83. The arm 92 and the stop pin 93 are formed on a plate-shaped element 94 connected to the sash side member 15 by means of suitable fastening means 95 which may be screws or rivets. During opening and closing of the sash structure relative to the frame structure, the arm and stop pin of the first hinge part slide in the guidances of the second hinge part.

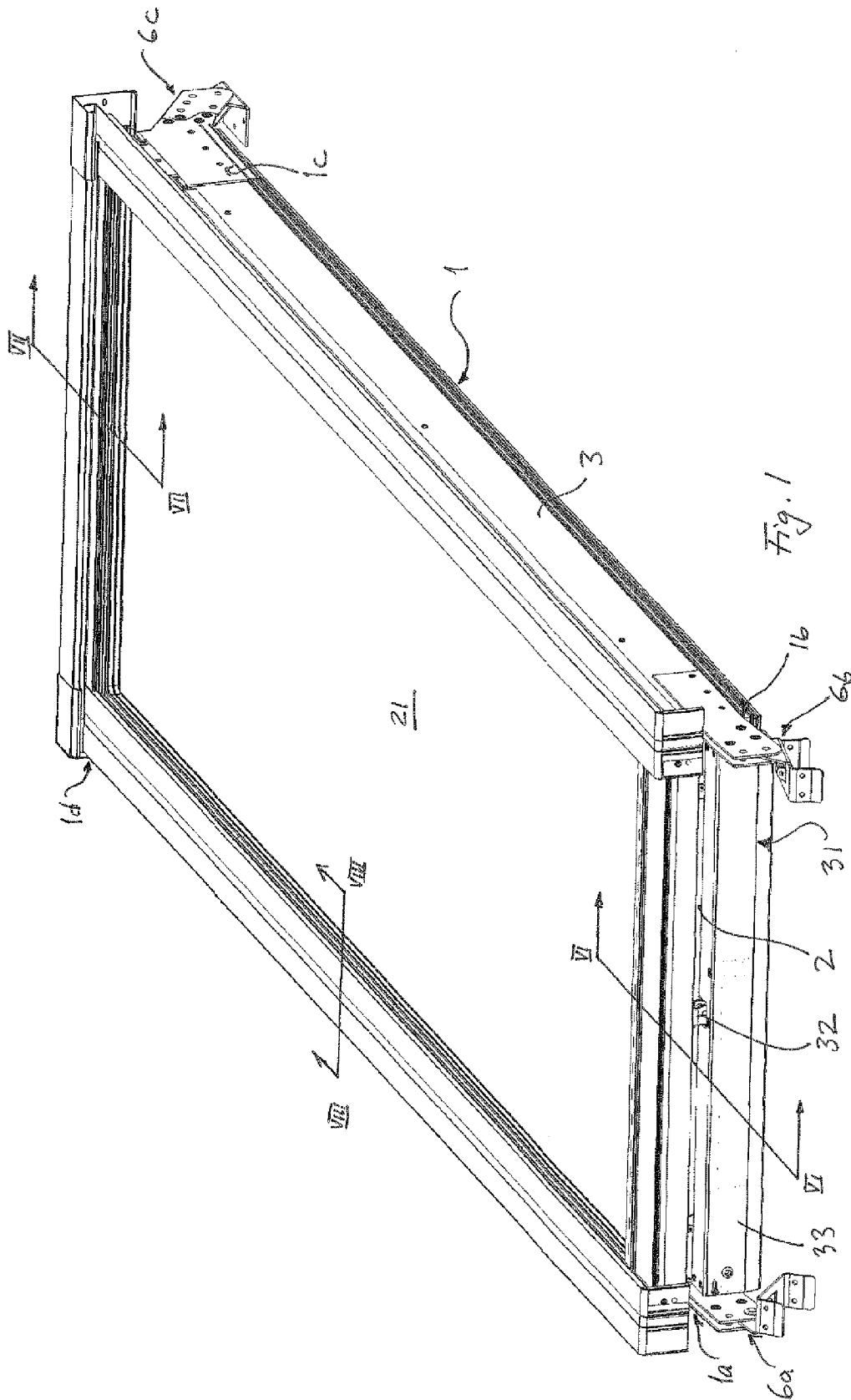
[0039] The invention should not be regarded as being limited to the embodiments shown in the drawings and described in the above. Various modifications and combinations may be carried out within the scope of the appended claims.

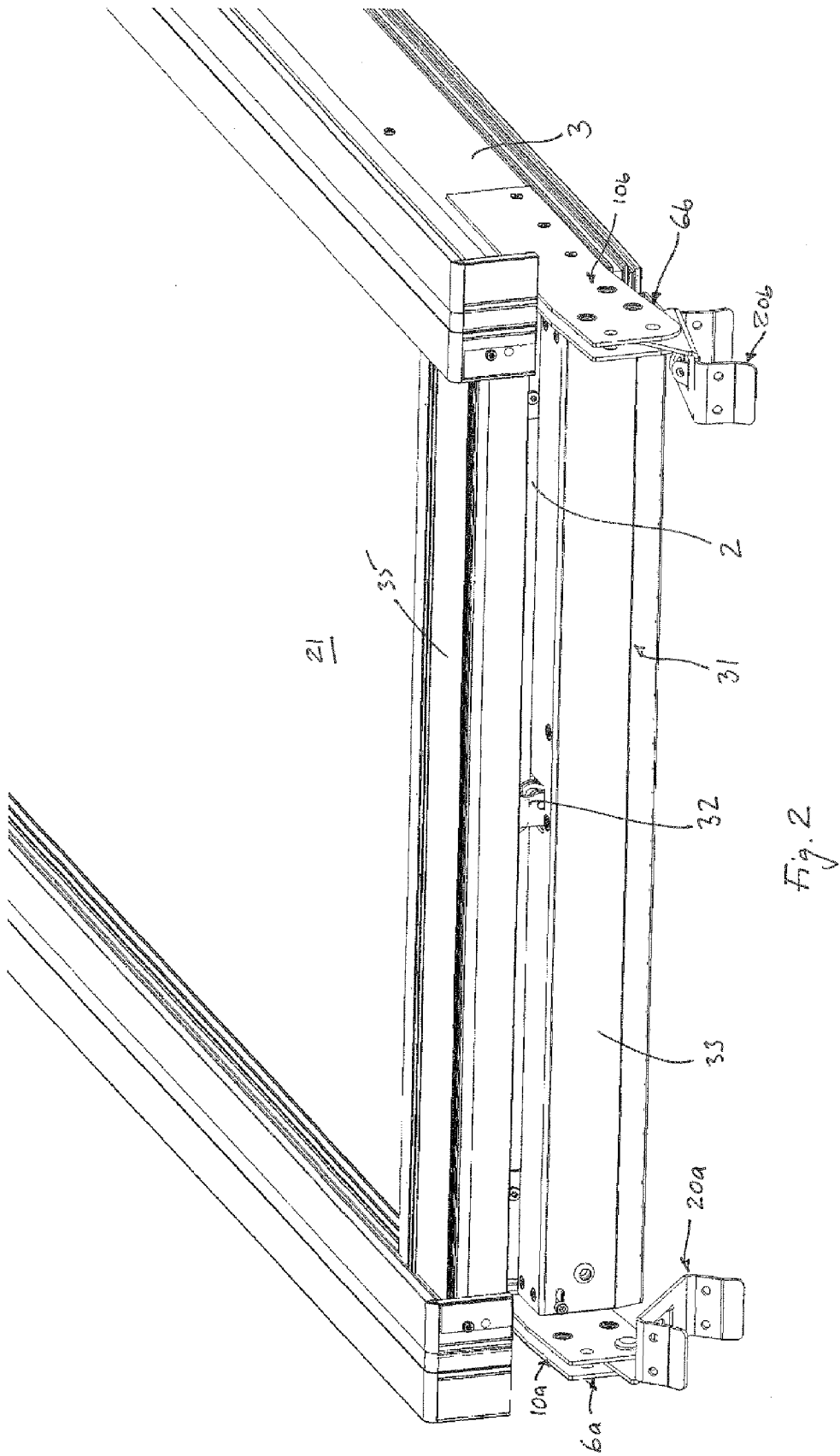
Claims

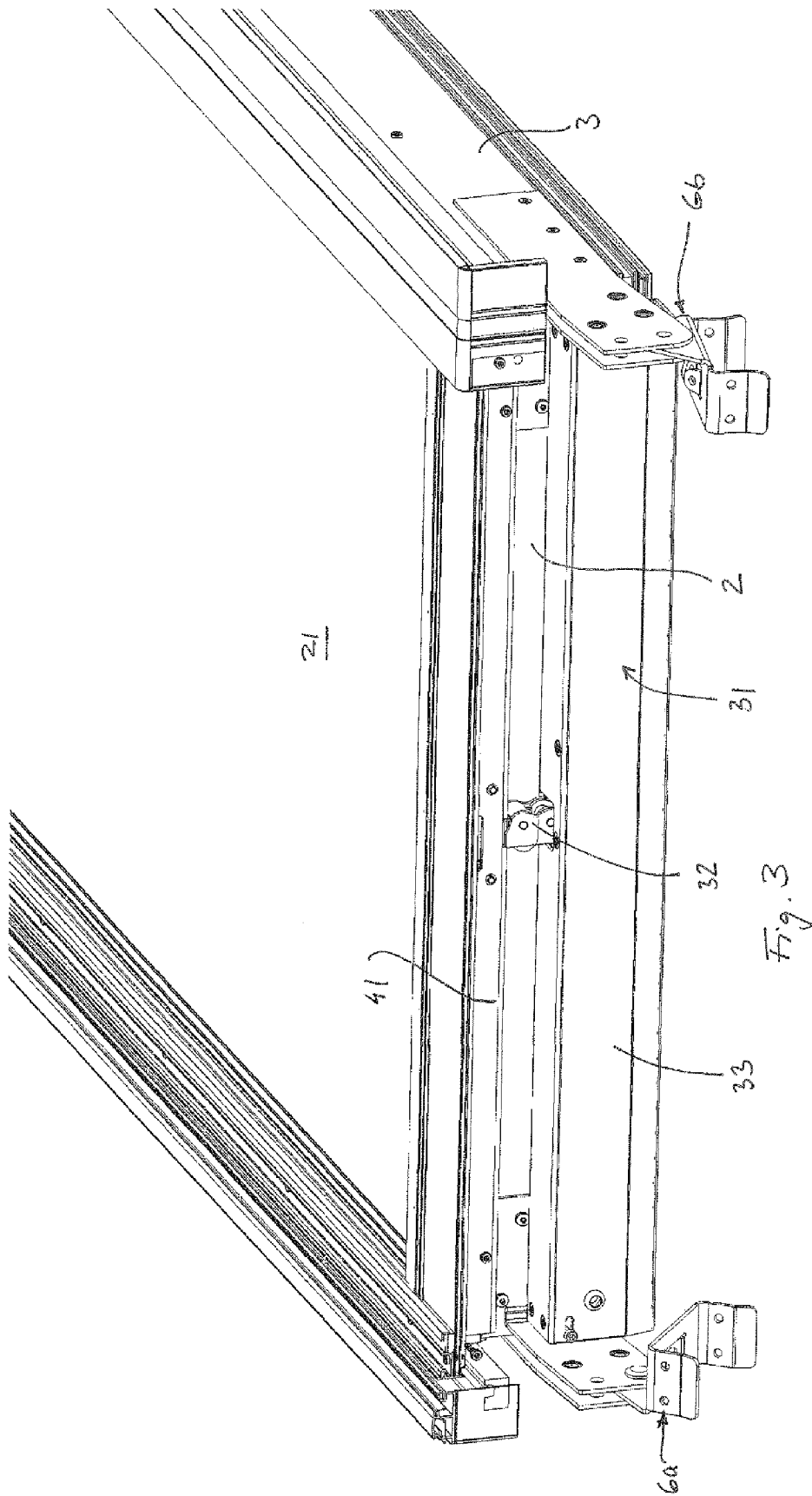
1. A window system comprising a frame structure including a plurality of frame members, a sash structure carrying a pane element and including a plurality of sash members, and a bracket arrangement, the sash structure being connected to the frame structure, **characterized in that** the connection between the sash structure and the frame structure is accommodated within the bracket arrangement.
2. A window system according to claim 1, wherein the connection includes a first hinge part connected to the sash structure and a second hinge part connected to the bracket arrangement.
3. A window system according to claim 2, wherein the first hinge part includes at least one arc-shaped arm and the second hinge part includes at least one arc-shaped guidance to cooperate with the arc-shaped arm of the first hinge part.
4. A window system according to claim 2 or 3, wherein the second hinge part comprises a folded portion connected to a base element of a bracket unit of the bracket arrangement.
5. A window system according to claim 4, wherein the folded portion is formed integrally with a plate-shaped element of the second hinge part or connected with the plate-shaped element by fastening means.
6. A window system according to any one of the preceding claims, wherein the window system further-

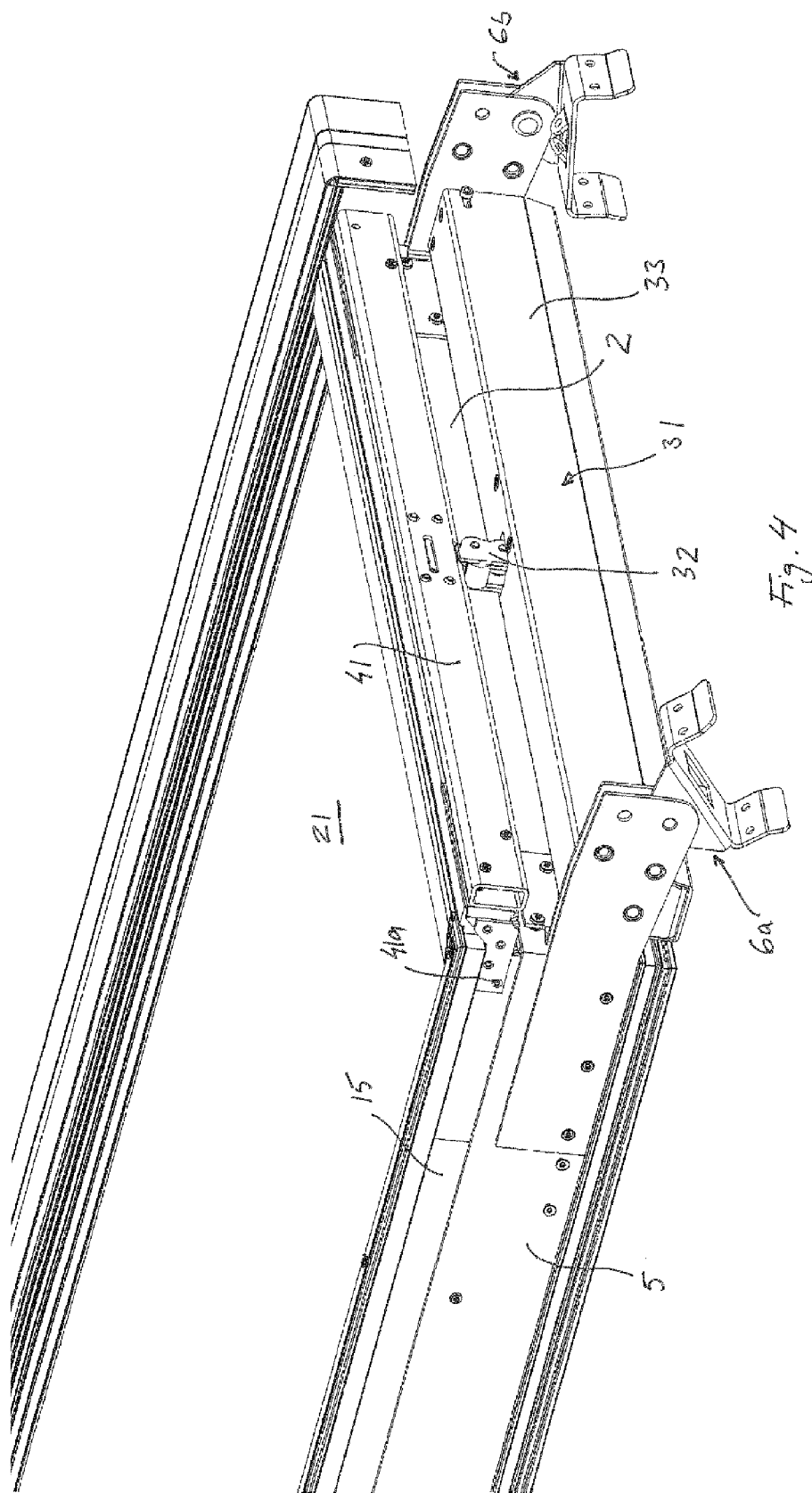
more comprises an operator mounted on the external side of a first frame member.

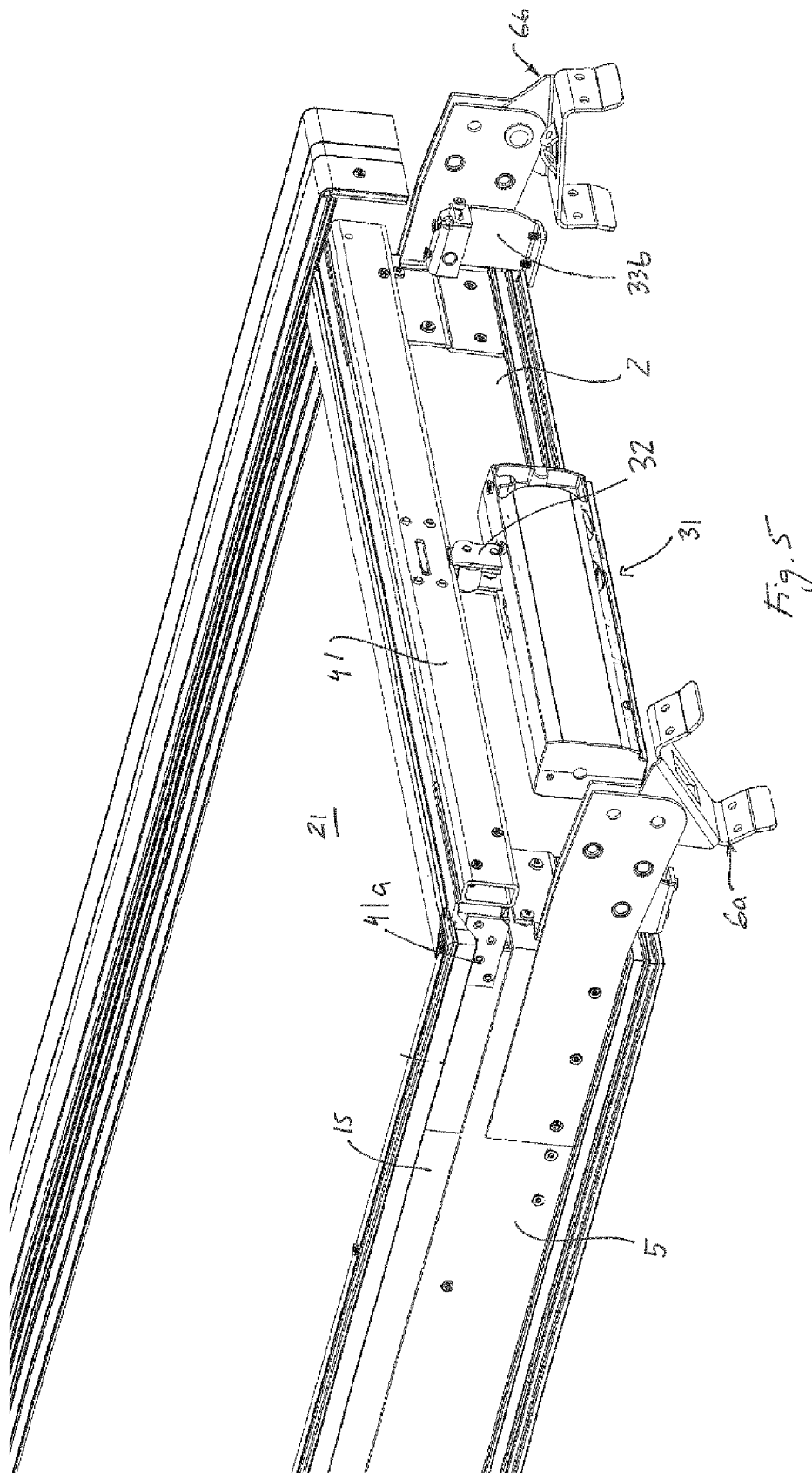
7. A window system according to claim 6, wherein the operator is connected to the bracket arrangement of the window system.
8. A window system according to claim 7, wherein the operator is accommodated in a housing extending substantially between two adjacent bracket units of the bracket arrangement.
9. A window system according to claim 8, wherein the housing is rotatably and detachably connected to the bracket units.
10. A window system according to any one of claims 6 to 9, wherein a first end of the operator member accommodated in the operator itself and a second end of the operator member is connected to a transverse element extending between sash members adjacent to the sash member opposite the first frame member.
11. A window system according to claim 10, wherein the transverse element extends externally of the pane element of the sash structure.
12. A window system according to claim 10 or 11, wherein the transverse element is fastened to the sash members adjacent to the sash member opposite the first frame member by means of a fitting.
13. A window system according to any one of the preceding claims, wherein the operator in the installed position of the window system is at least partly concealed under a flashing arrangement.
14. A window system according to any one of claims 6 to 13, wherein the operator is a chain operator and the operator member a chain.

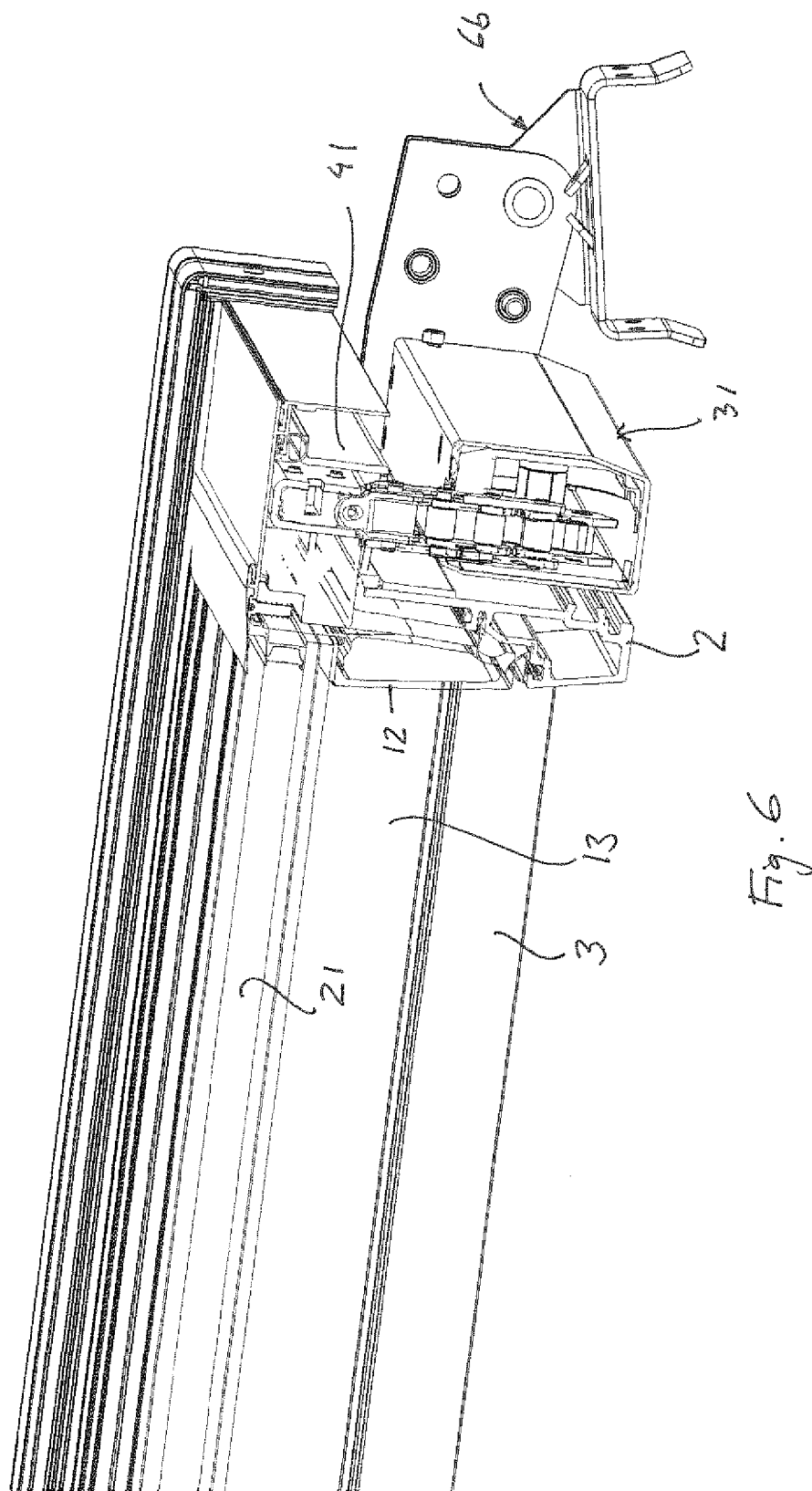


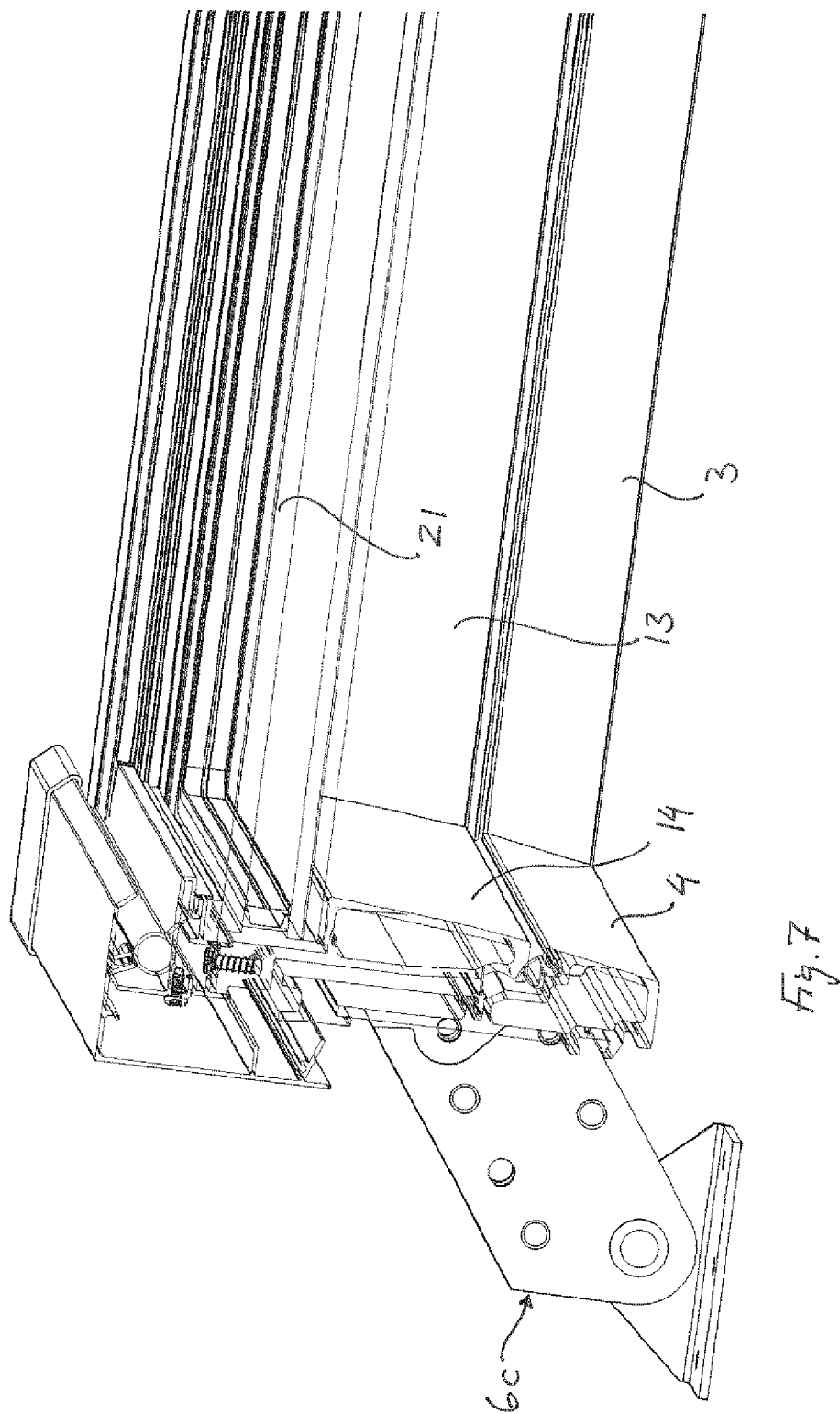












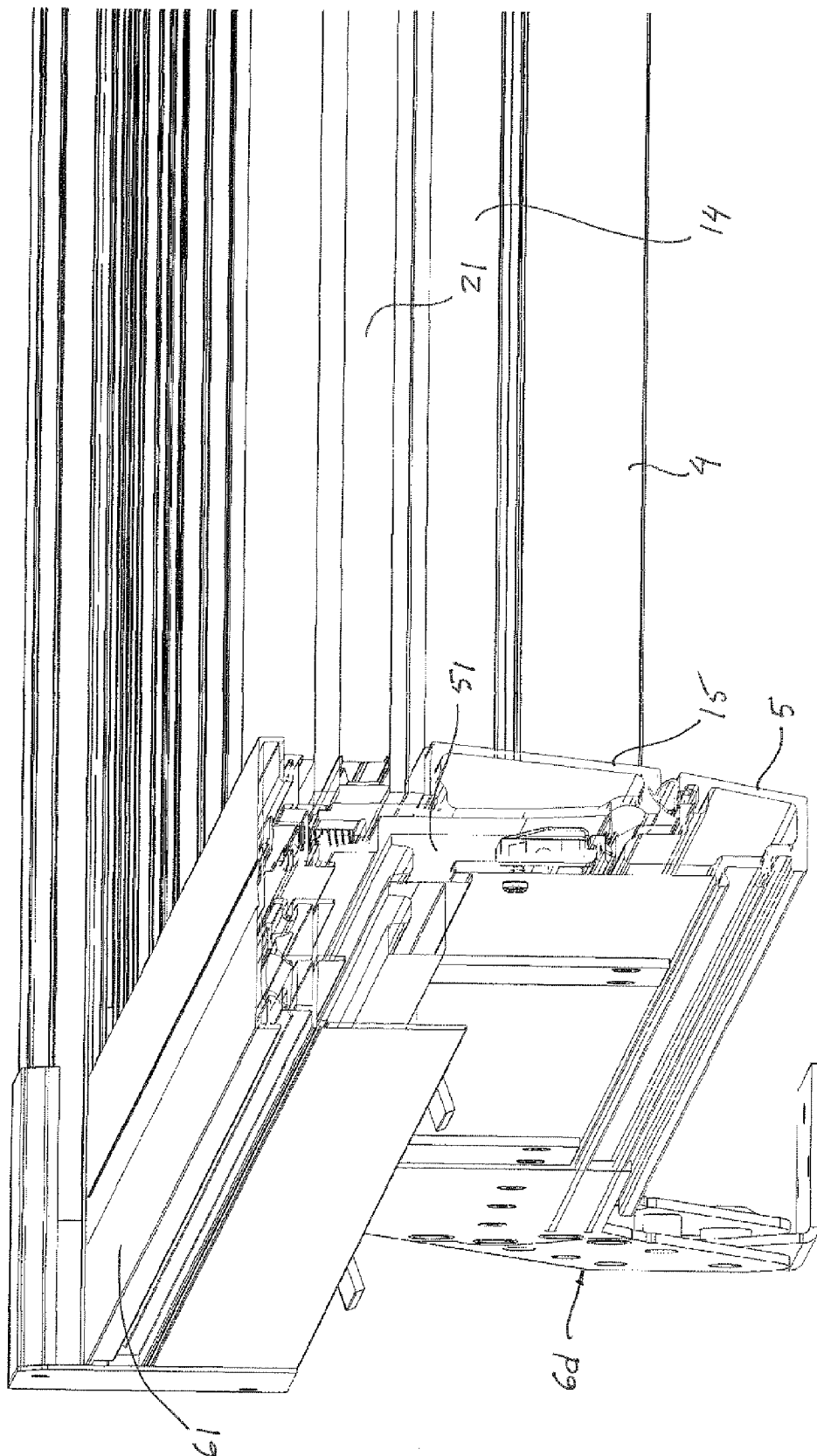
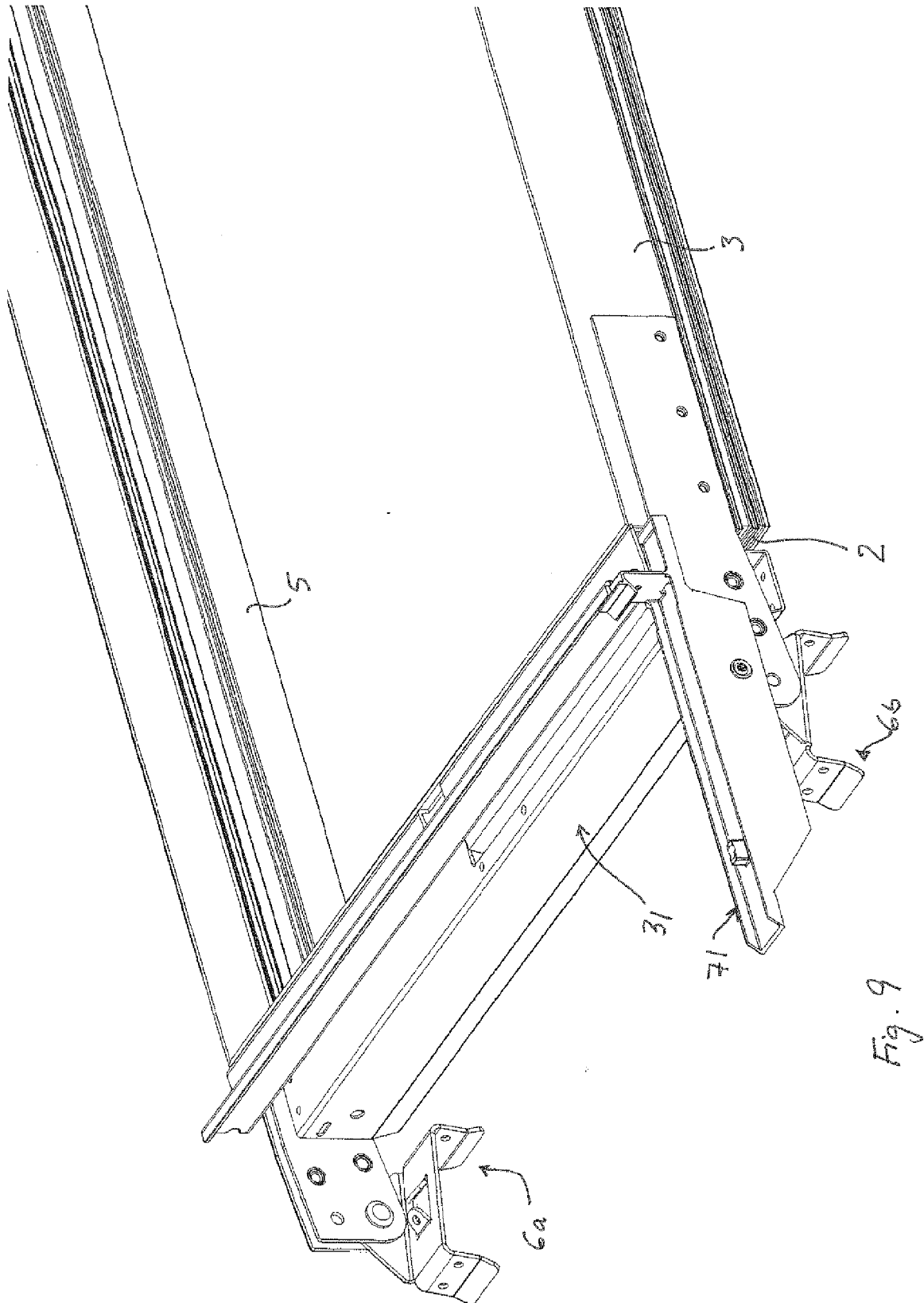


Fig. 8



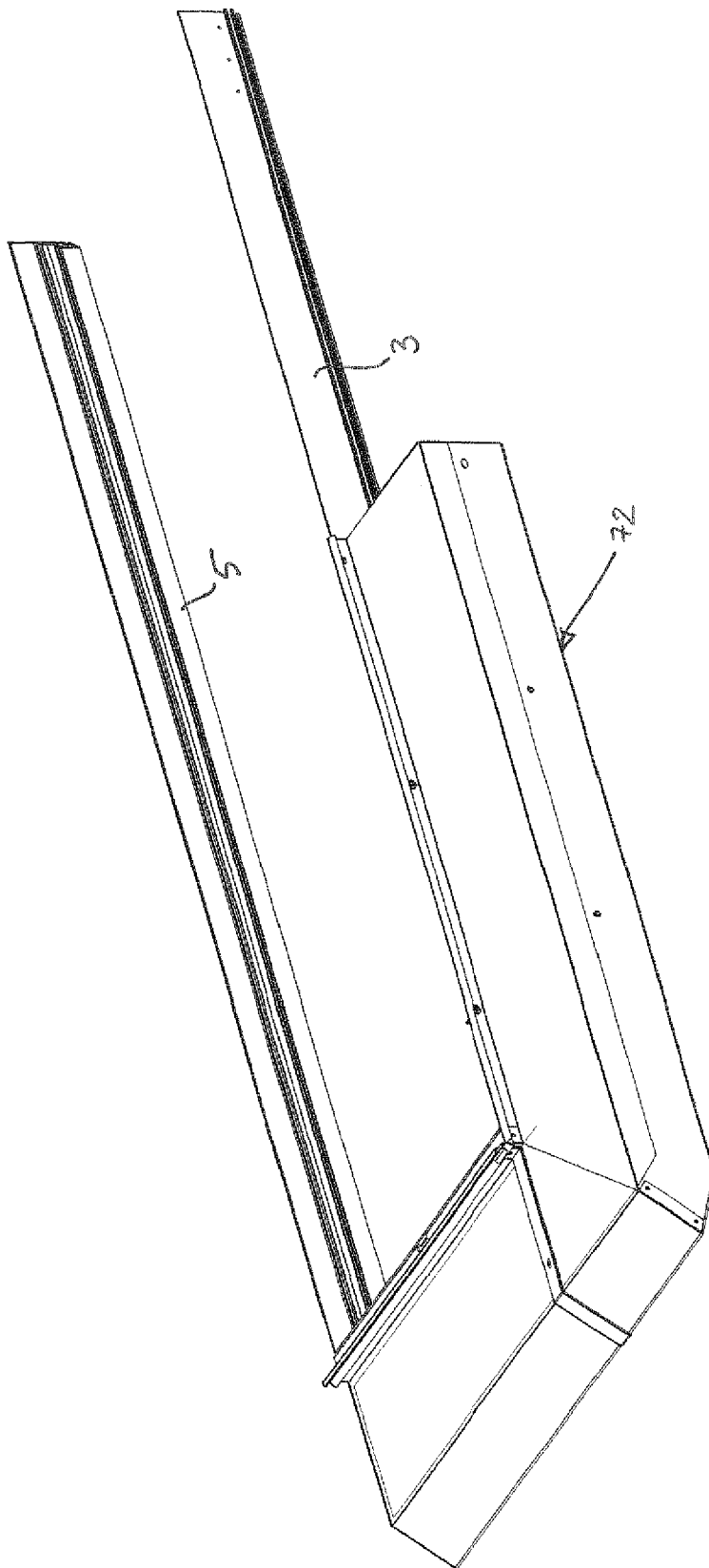
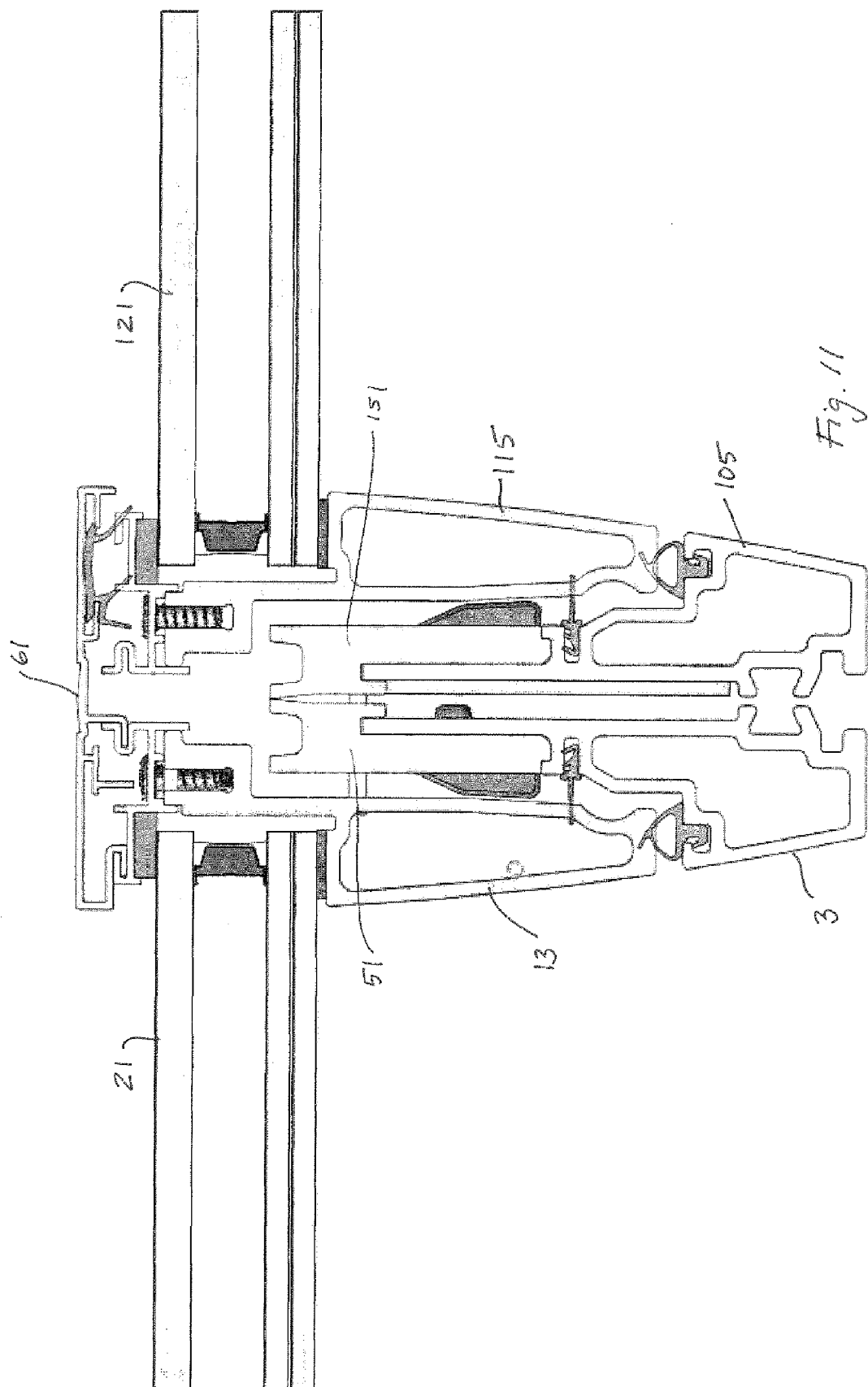
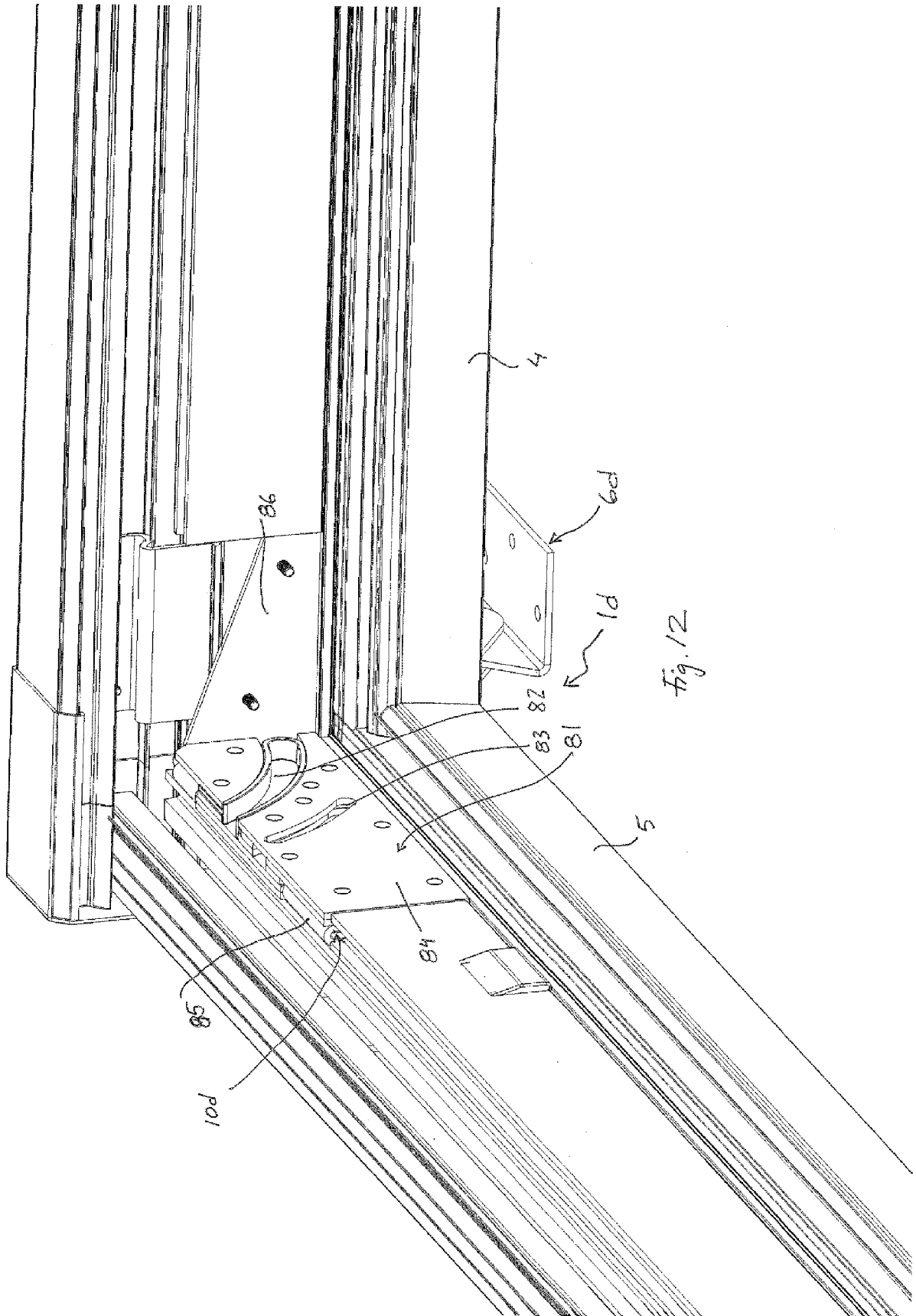
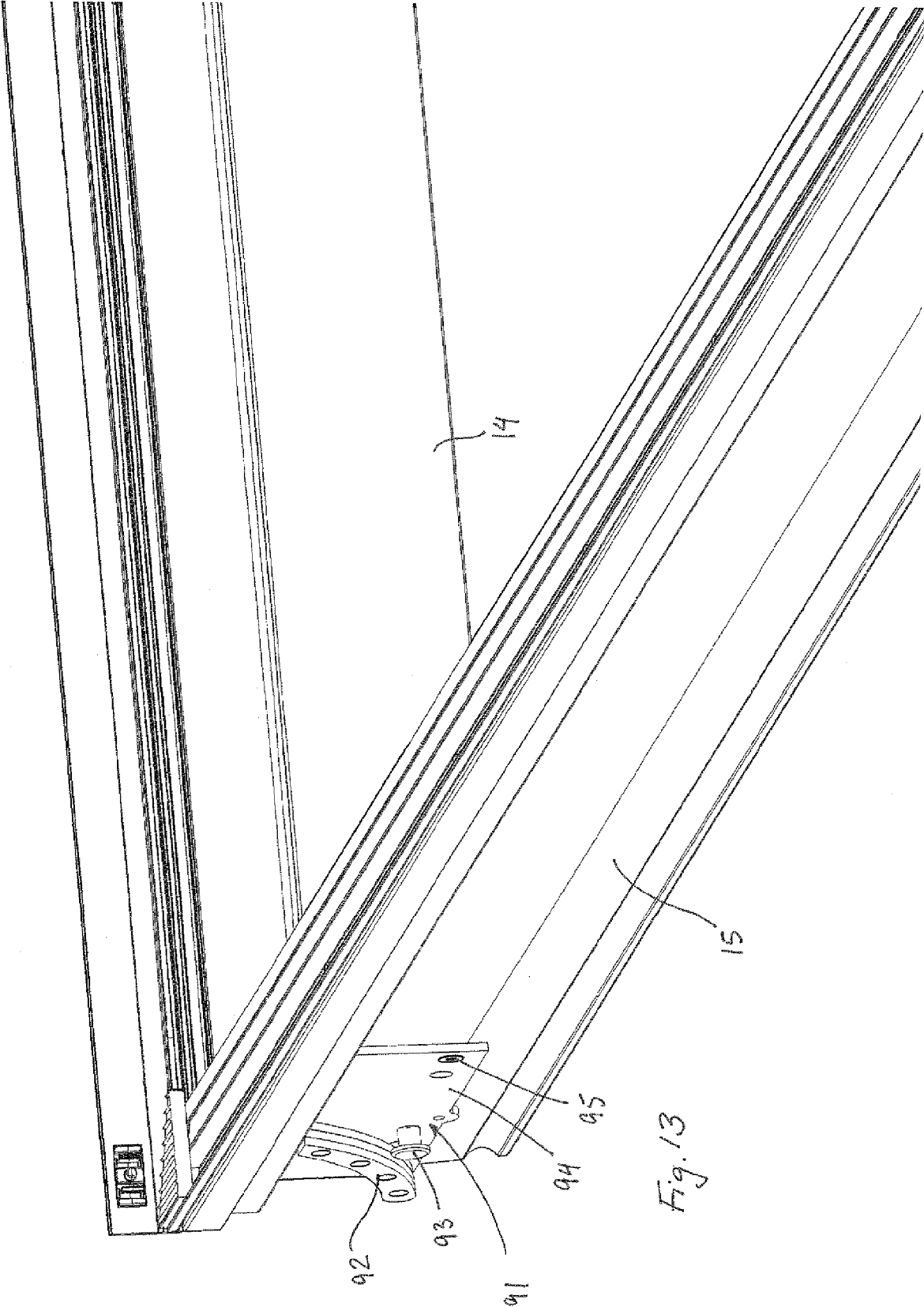


Fig. 10









EUROPEAN SEARCH REPORT

Application Number
EP 10 19 7251

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 02/057563 A1 (VKR HOLDING AS [DK]; LINDGREN CLAES [DK]; HANSEN BIRGITTE [DK]; DARMER) 25 July 2002 (2002-07-25) * figures 2, 11, 13, 16 * * pages 7-9 * * pages 19-20 * * page 25 *	1,6, 10-14	INV. E04D13/03 E04D13/035
A	EP 1 978 176 A2 (VKR HOLDING AS [DK]) 8 October 2008 (2008-10-08) * figures *	1-14	
A	WO 2010/088904 A1 (VKR HOLDING AS [DK]; KRISTENSEN LARS [DK]; NIELSEN KRISTIAN OERNSVIG []) 12 August 2010 (2010-08-12) * abstract; figure 4 *	6-14	
A	US 7 624 547 B1 (BRINTON JAMES ERIC [US] ET AL) 1 December 2009 (2009-12-01) * abstract; figures 1-9 *	1-5	
A	WO 2005/019575 A1 (VKR HOLDING AS [DK]; BOERRESEN BJARNE [DK]; JENSEN JAN FAHLEN [DK]; SO) 3 March 2005 (2005-03-03) * abstract; figures 1-3 *	1-5	TECHNICAL FIELDS SEARCHED (IPC) E04D
A	EP 0 792 991 A1 (RASMUSSEN KANN IND AS [DK] VKR HOLDING AS [DK]) 3 September 1997 (1997-09-03) * abstract; figures 1, 2a-2e *	6-14	
A	WO 99/28581 A1 (VELUX IND AS [DK]; AGERSKOV TORBEN [DK]) 10 June 1999 (1999-06-10) * abstract; figure 1 *	3	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 November 2011	Examiner Vratsanou, Violandi
CATEGORY OF CITED DOCUMENTS 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 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 & : member of the same patent family, corresponding document			

 1
EPO FORM 1503 03.82 (P04C01)

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

EP 10 19 7251

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.

24-11-2011

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 02057563	A1	25-07-2002	CN	1488024 A	07-04-2004
			DE	10295851 T1	24-12-2003
			GB	2388399 A	12-11-2003
			US	2004139669 A1	22-07-2004
			WO	02057563 A1	25-07-2002

EP 1978176	A2	08-10-2008	CN	101307618 A	19-11-2008
			EP	1978176 A2	08-10-2008

WO 2010088904	A1	12-08-2010	EP	2394013 A1	14-12-2011
			WO	2010088904 A1	12-08-2010

US 7624547	B1	01-12-2009	US	7624547 B1	01-12-2009
			WO	2010009729 A1	28-01-2010

WO 2005019575	A1	03-03-2005	AT	364768 T	15-07-2007
			DE	602004007009 T2	21-02-2008
			EP	1656489 A1	17-05-2006
			ES	2289541 T3	01-02-2008
			WO	2005019574 A1	03-03-2005
			WO	2005019575 A1	03-03-2005

EP 0792991	A1	03-09-1997	AT	202402 T	15-07-2001
			DE	69705250 D1	26-07-2001
			DE	69705250 T2	16-05-2002
			DK	23296 A	02-09-1997
			EP	0792991 A1	03-09-1997
			ES	2159824 T3	16-10-2001
			JP	3976100 B2	12-09-2007
			JP	9328959 A	22-12-1997
			PT	792991 E	28-12-2001

WO 9928581	A1	10-06-1999	AT	215169 T	15-04-2002
			AU	1143999 A	16-06-1999
			DE	69804500 D1	02-05-2002
			DE	69804500 T2	21-11-2002
			DK	128297 A	12-05-1999
			EP	1038083 A1	27-09-2000
			ES	2174504 T3	01-11-2002
			PL	340597 A1	12-02-2001
			WO	9928581 A1	10-06-1999

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

- WO 0065172 A [0003]