(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 472 043 A1**

(12) **EUROPEAN PATENT APPLICATION**

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

(21) Application number: **10197256.0**

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

(51) Int Cl.:
E05F 15/12 *(2006.01)* ***E04D 13/03*** *(2006.01)*
E04D 13/035 *(2006.01)* *E05F 11/06* *(2006.01)*

(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

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

(72) Inventors:
- **Lindgren, Claes**
  3520 Farum (DK)
- **Moller, Brent**
  2820 Gentofte (DK)
- **The other inventors have agreed to waive their entitlement to designation.**

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

(54) **A window system having a concealed operator**

(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 an operator including an operator member having a first and a second end and adapted to extend between the frame structure and the sash structure, said frame structure being adapted to be installed in a roof structure by means of a bracket arrangement. The operator is mounted on the external side of a first frame member, and is connected to the bracket arrangement of the window system.

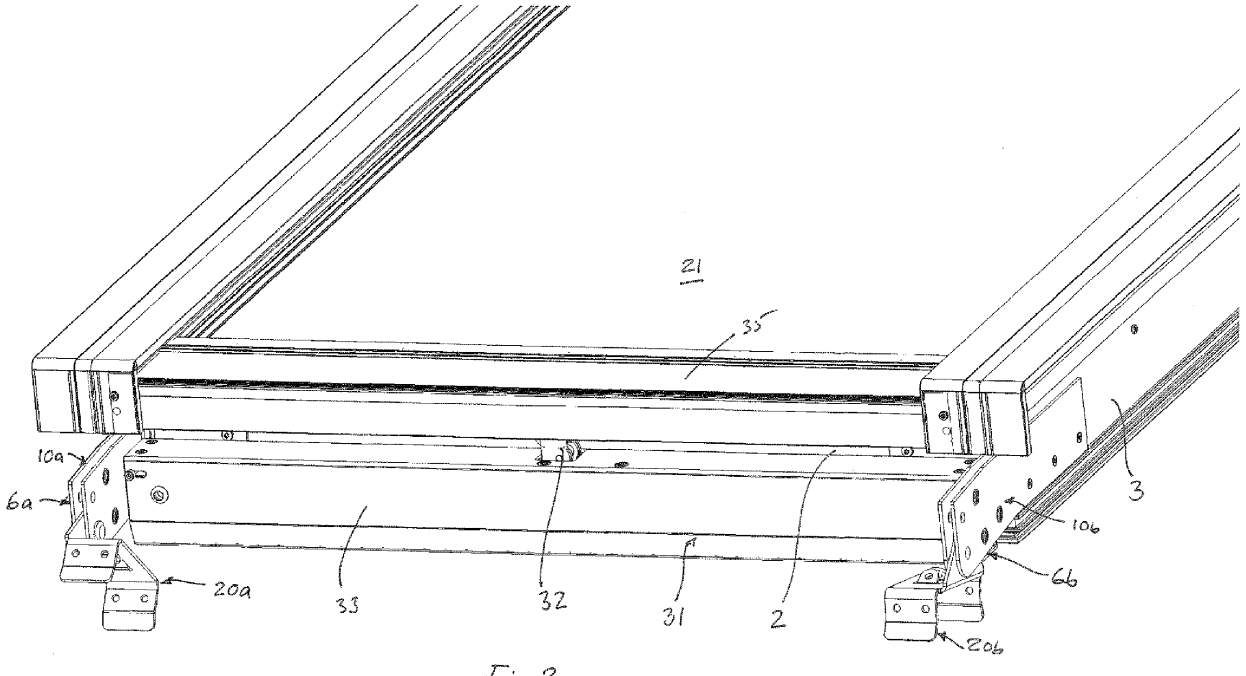

Fig. 2

EP 2 472 043 A1

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 an operator including an operator member having a first and a second end and adapted to extend between the frame structure and the sash structure, said frame structure being adapted to be installed in a roof structure by means of a bracket arrangement.

[0002] Opening and closing of the sash structure relative to the frame structure in such window systems normally takes place by means of a suitable operator. In traditional roof windows and other roof penetrating structures mounted in a roof, such as hatches and panel systems, one type of operator is the chain operator, another type being the scissors operator. Examples of such arrangements are described in for instance DE 101 26 395 C1 and WO 2009/076952. As it is desired to make the operator as inconspicuous as possible, the operator itself or its housing is embedded in the frame structure, typically the bottom frame member.

[0003] However, this solution requires that the space needed to accommodate the operator in the frame member may be provided in the frame member. In some windows, this is either not an option due to the geometrical restrictions of the window parts or it is not for some reason desired to make room for the operator in the frame structure. One way of operating such windows is by mounting a pressure medium operated cylinder at the bottom frame member, and connecting the free end of the piston to the bottom sash member, one example of prior art disclosing such an arrangement being EP 0 692 640 A1.

[0004] Increasing architectural demands have rendered it desirable to provide windows or panels to be positioned side-by-side or opposite each other with a uniform appearance. One document concerned with the uniform appearance of such panels is published international application No. WO 00/65172, in which openable and fixed panels are provided with a similar appearance. However, in this document there is no frame structure and no solution as to how the inconspicuous opening and closing of the panels relative to the fixed structure is provided.

[0005] 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 frame member, in particular which renders it possible to obtain a similar appearance.

[0006] This object is achieved by a window system, in which the operator is mounted on the external side of a first frame member.

[0007] Providing the operator as an operator positioned externally, i.e. on the side of the frame member facing the exterior and thus not visible from the inside, provides for the flexible design of the frame structure aimed at as no space inside the frame member must be allocated to the operator, and at the same time, the operator is inconspicuous and concealed from a viewer standing in the room below the window system.

[0008] 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.

[0009] 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. By providing the operator externally and in particular in a separate housing, the operator may also easily be after-mounted, and maintenance and exchange of parts of or of the entire operator is facilitated to a great extent.

[0010] 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.

[0011] 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, such as side sash members. 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.

[0012] In order to render the distribution of forces 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 fittings.

[0013] The operator forms a contained unit positioned externally and is thus 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.

[0014] In a preferred embodiment, the operator is a chain operator and the operator member a chain. This provides for a particularly compact design.

[0015] Further details are described, and further advantages stated, in the description of particular embodiments of the invention.

[0016] 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.

[0017] 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 element 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.

[0018] 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.

[0019] 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.

[0020] 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.

[0021] In the following, the operator and its connection and positioning relative to the frame and sash structures will be described in further detail. The fundamental principle underlying the invention is that the operator is mounted on the external side of a first frame member.

[0022] 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.

[0023] 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 concealed from a viewer standing in the room below the window system.

[0024] 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.

[0025] 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).

[0026] 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.

[0027] 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.

[0028] 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.

[0029] 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.

[0030] 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.

[0031] 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. However, one possible design is by accommodating the connection between the sash structure and the frame structure within the bracket arrangement. This is shown in detail in Figs 12 and 13.

[0032] 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. 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.

[0033] 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.

[0034] 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 an operator including an operator member having a first and a second end and adapted to extend between the frame structure and the sash structure, said frame structure being adapted to be installed in a roof structure by means of a bracket arrangement, **characterized in that** the operator is mounted on the external side of a first frame member.

2. A window system according to claim 1, wherein the operator is connected to the bracket arrangement of the window system.

3. A window system according to claim 2, wherein the operator is accommodated in a housing extending substantially between two adjacent bracket units of the bracket arrangement.

4. A window system according to claim 3, wherein the housing is rotatably and detachably connected to the bracket units.

5. A window system according to any one of the preceding claims, 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.

6. A window system according to claim 5, wherein the transverse element extends substantially externally of the pane element of the sash structure.

7. A window system according to claim 5 or 6, 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.

8. 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 cover element and/or a flashing arrangement.

9. A window system according to any one of the preceding claims, wherein the operator is a chain operator and the operator member a chain.

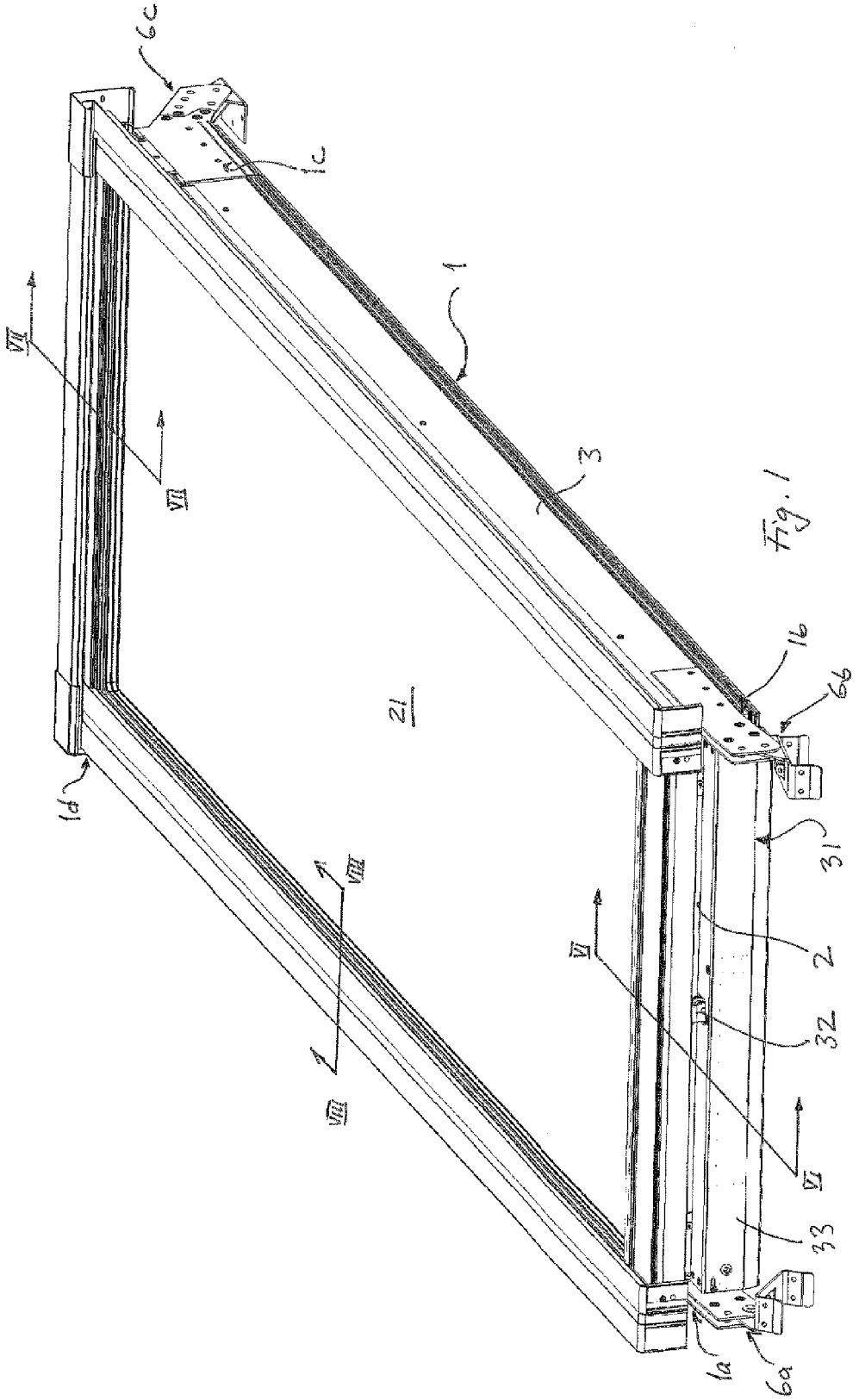

Fig. 1

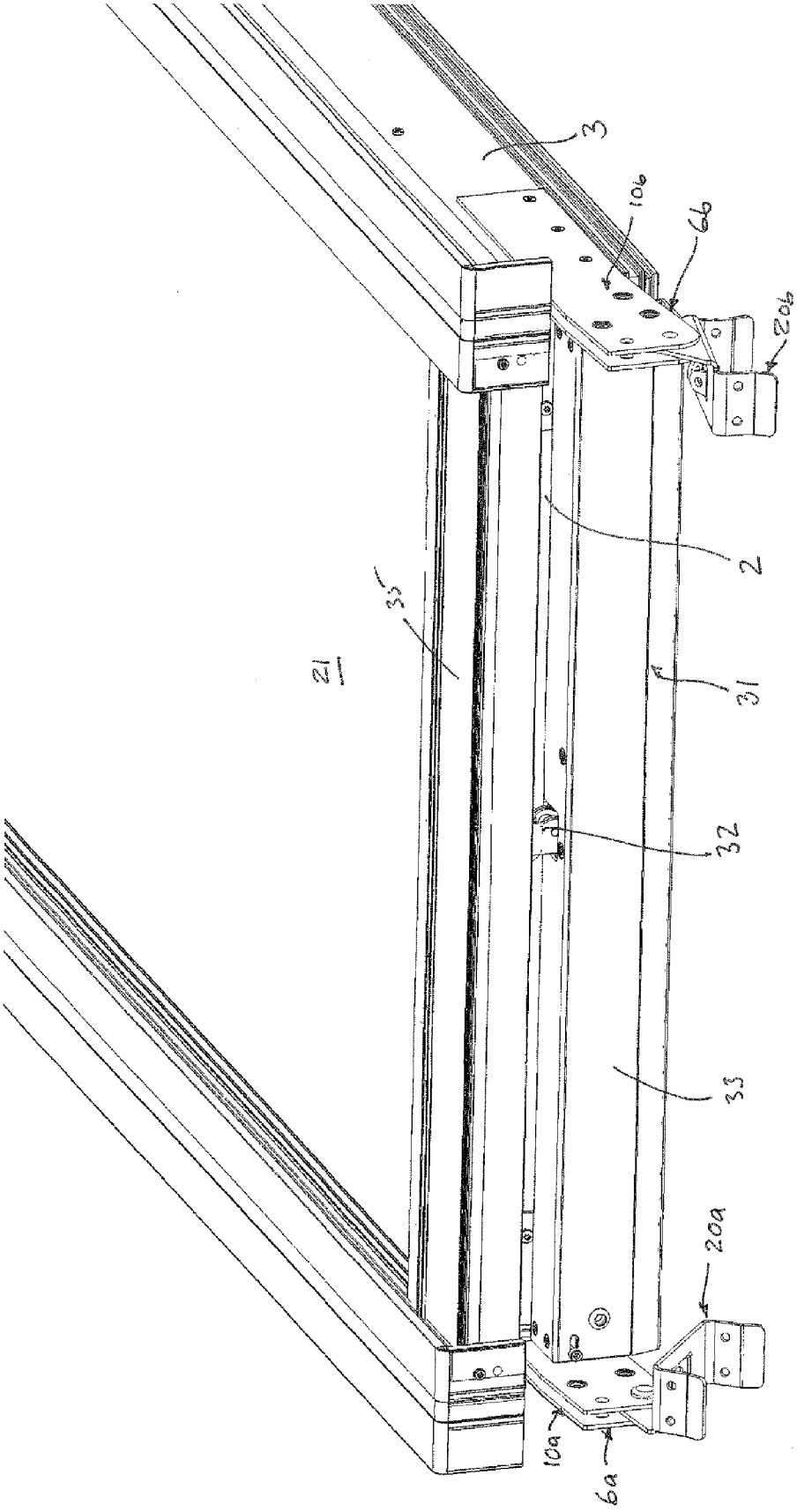

Fig. 2

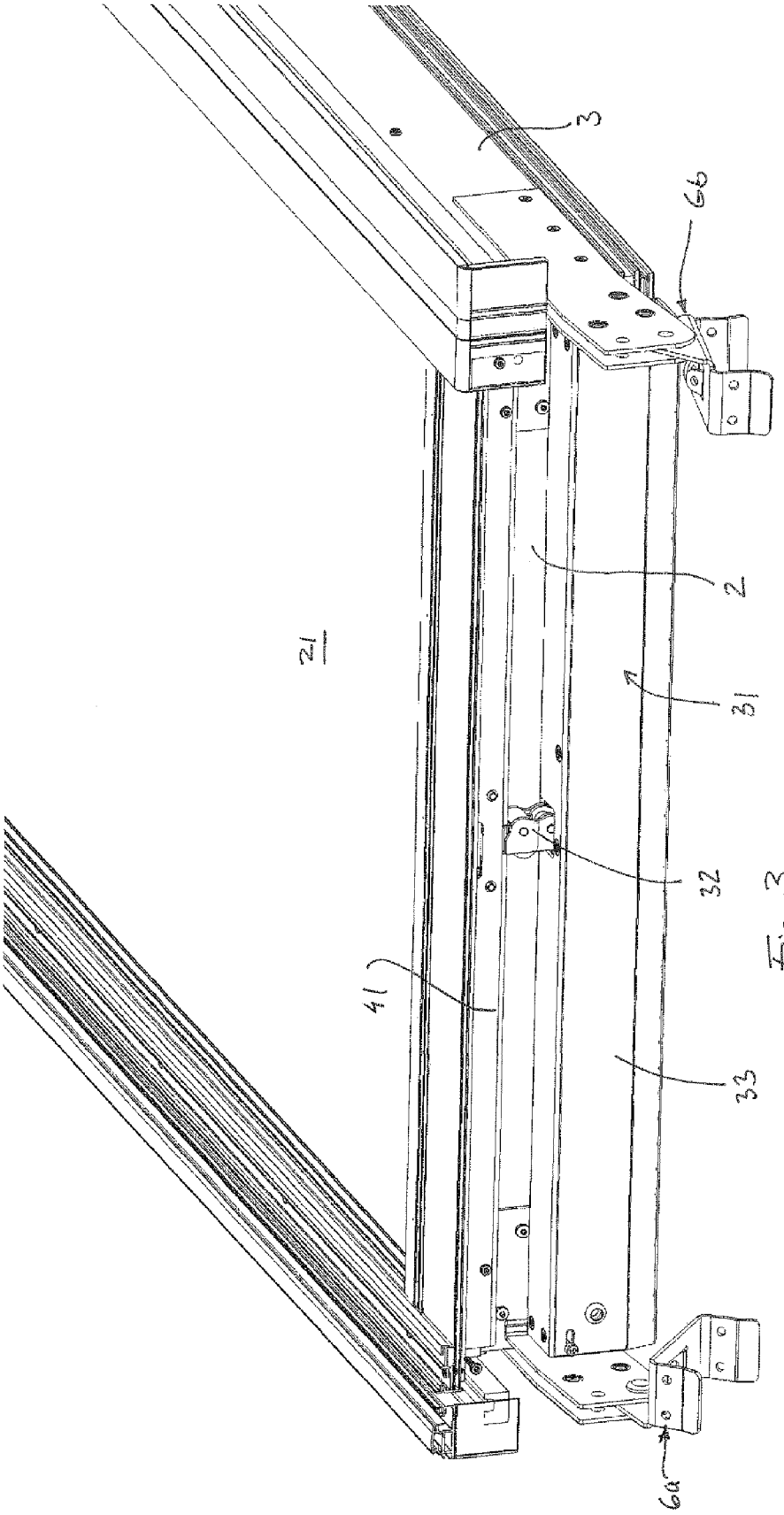

Fig. 3

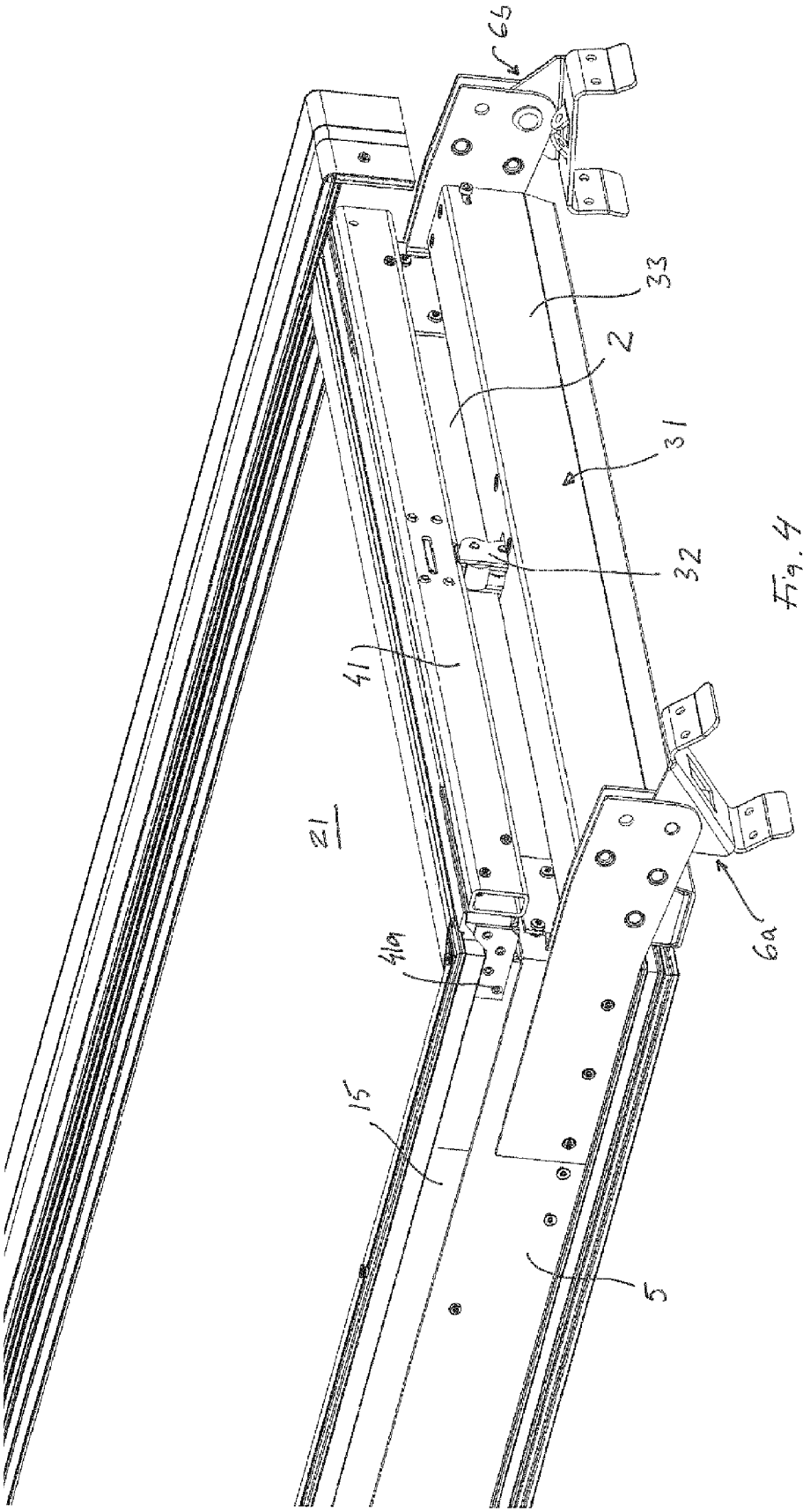

Fig. 4

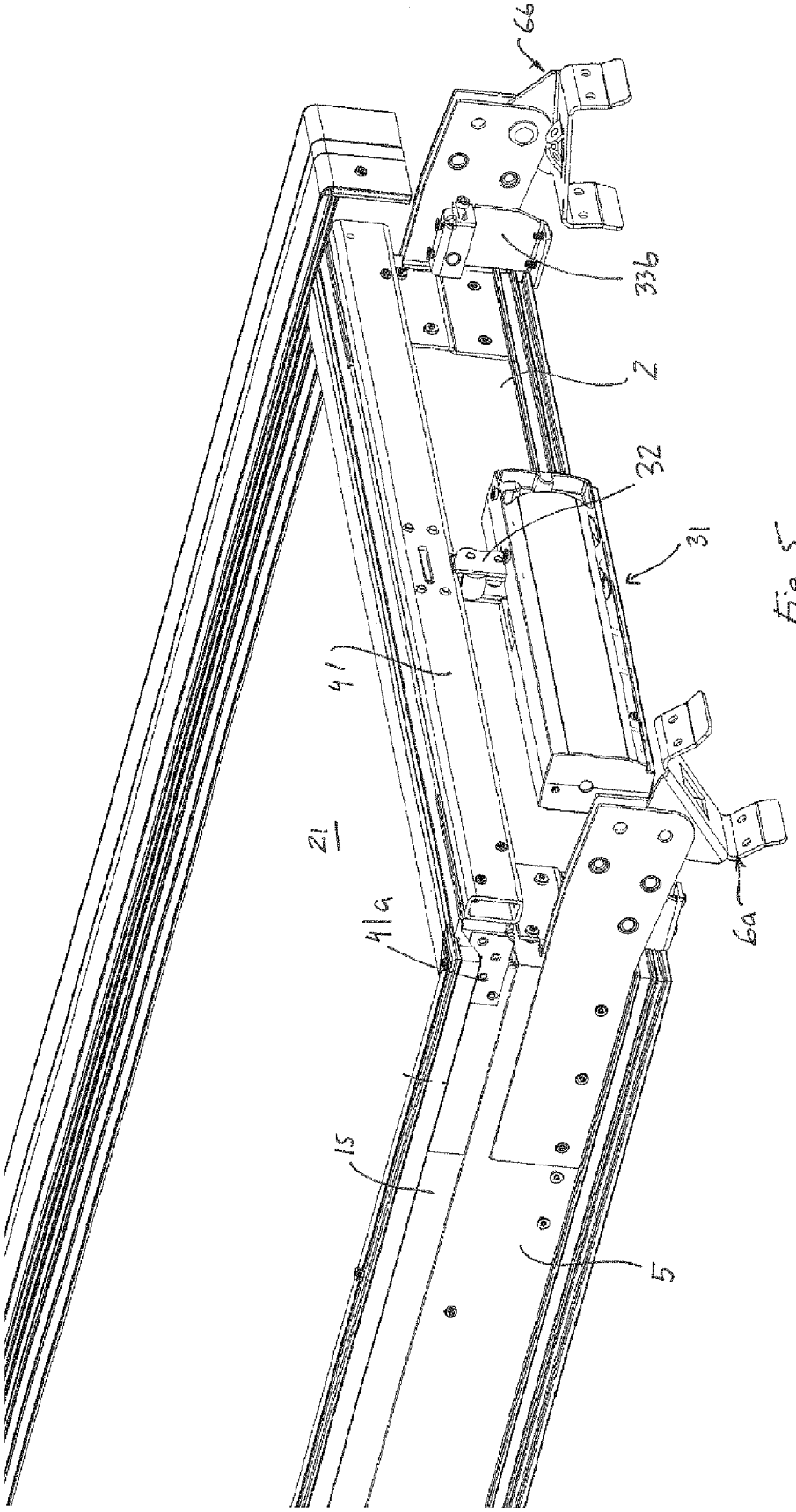

Fig. 5

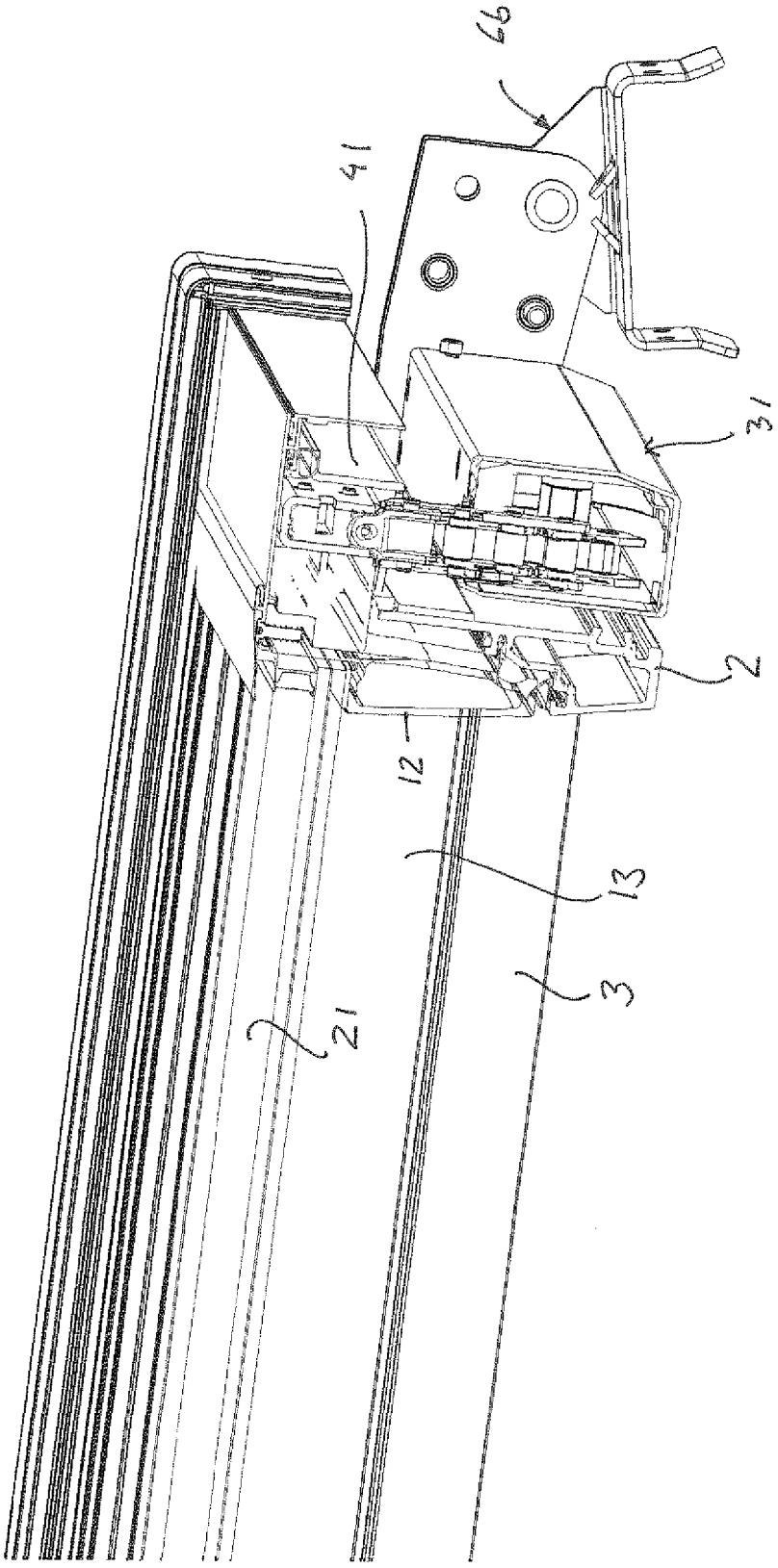

Fig. 6

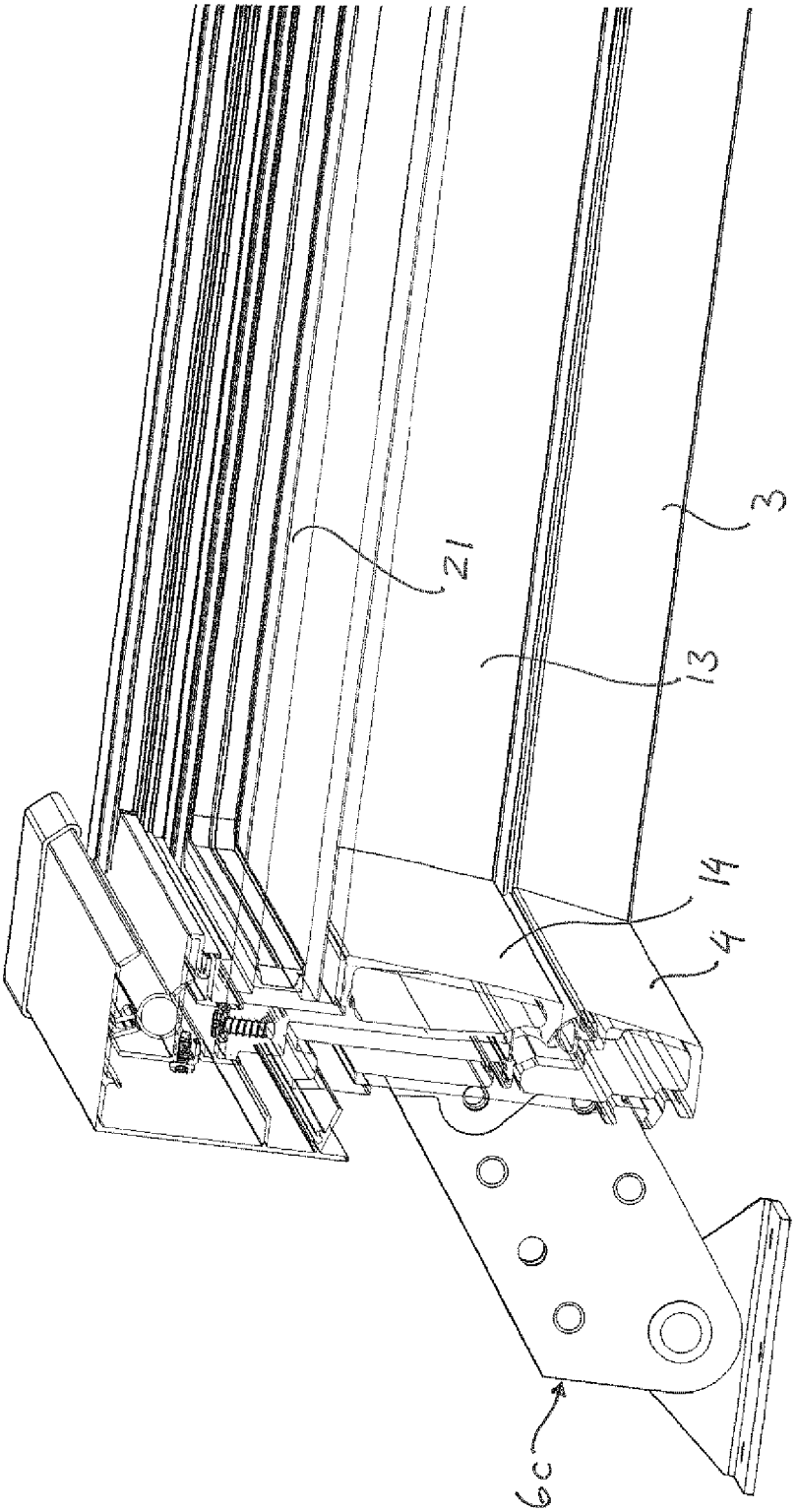

Fig. 7

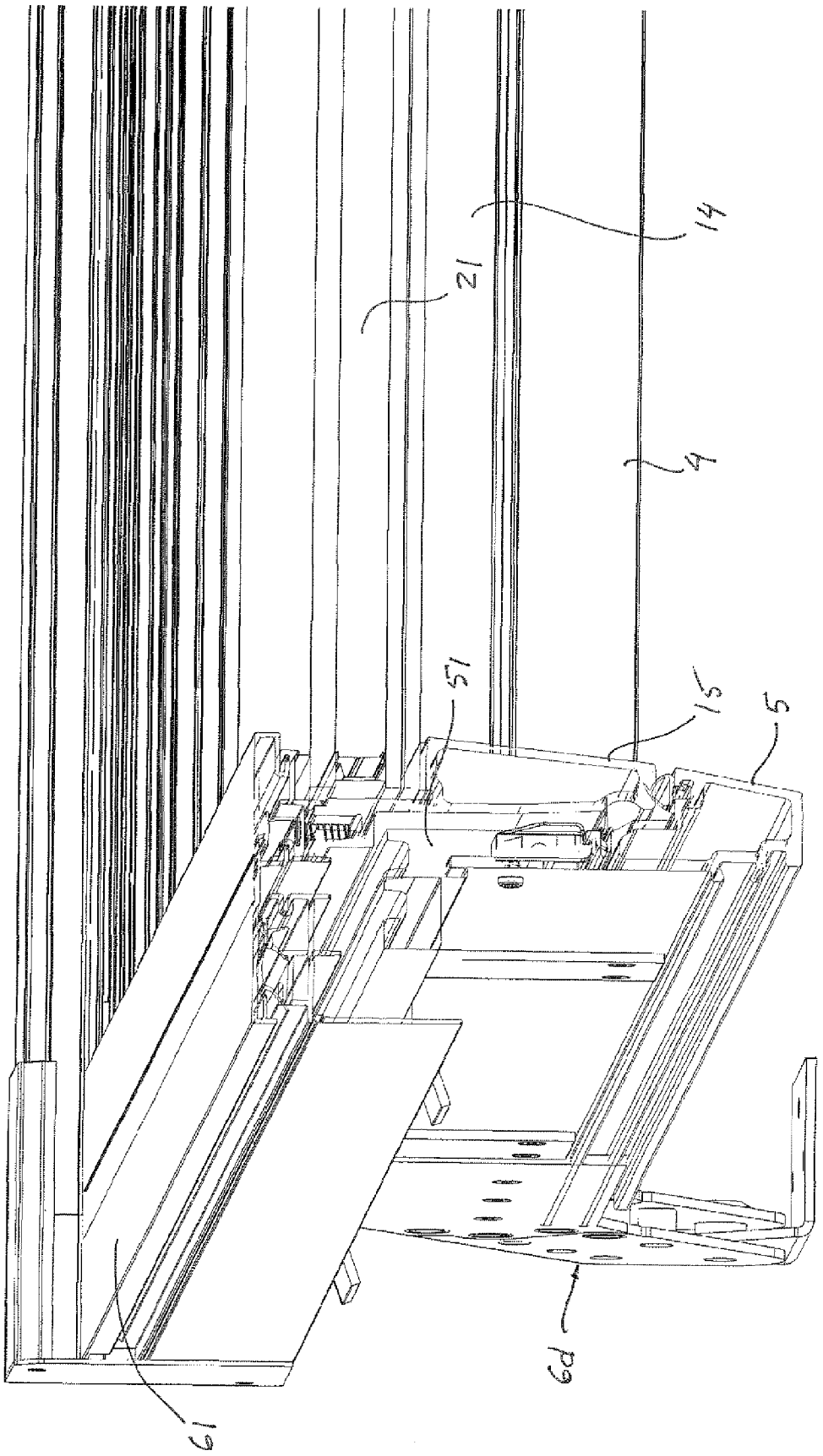

Fig. 8

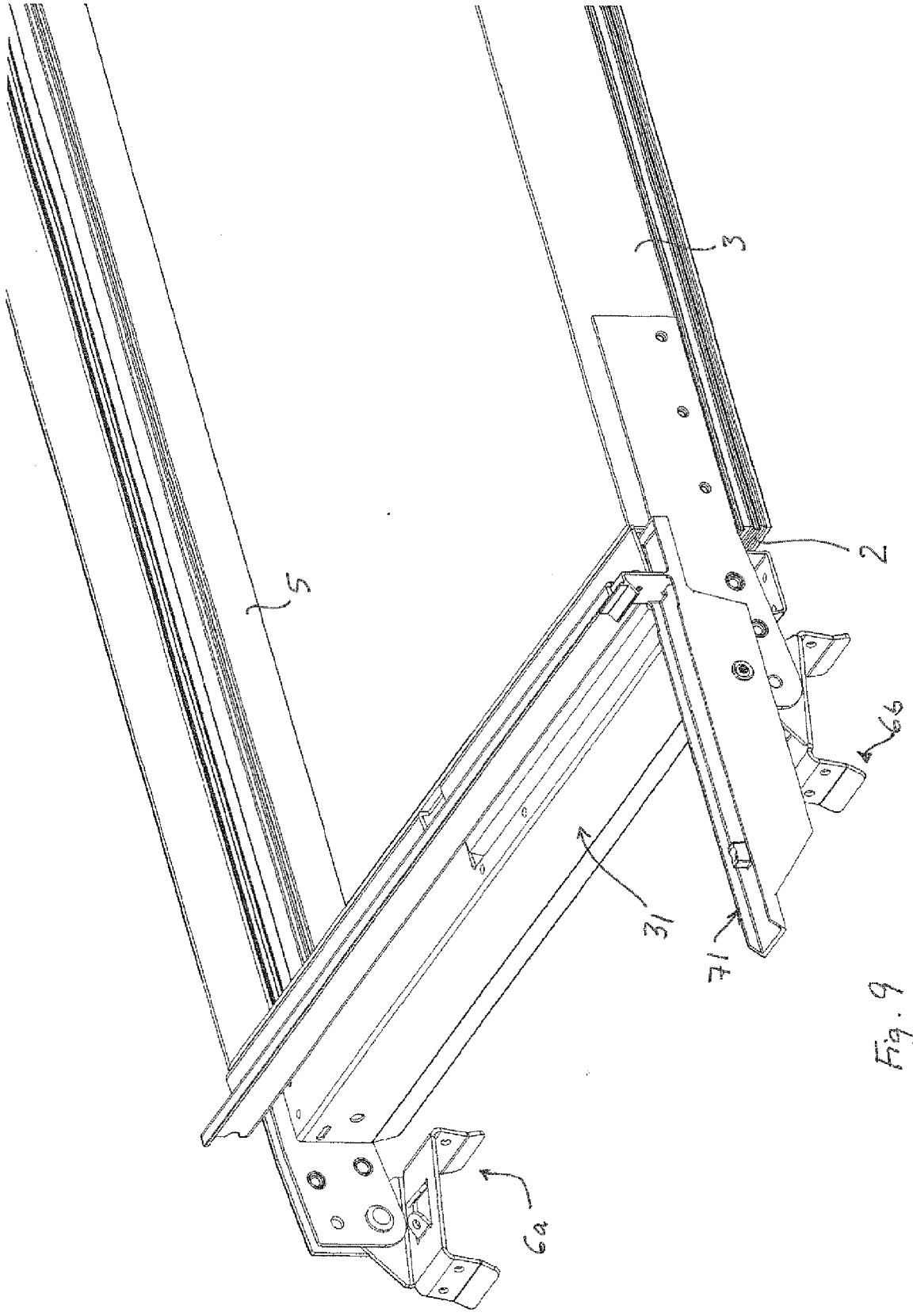

Fig. 9

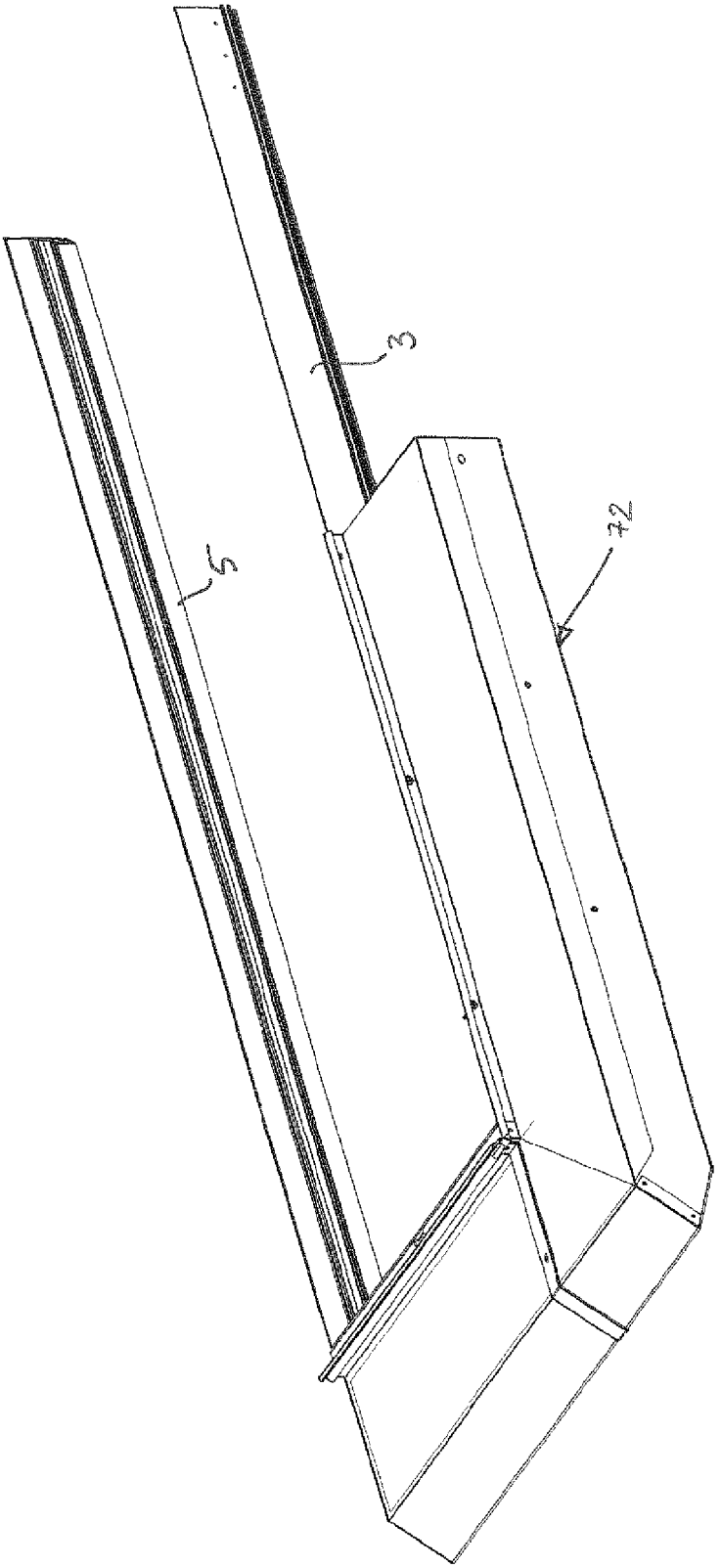

Fig. 10

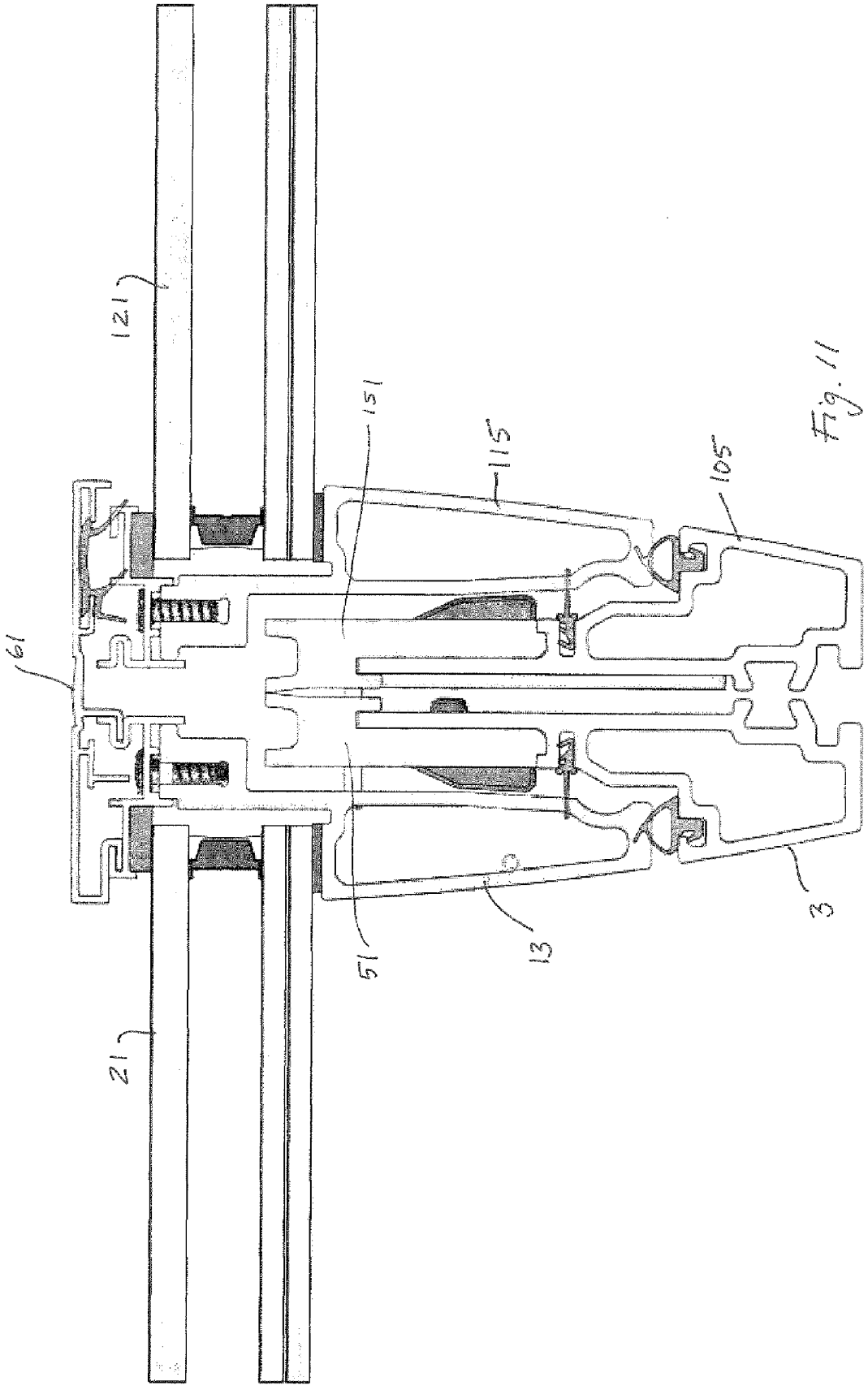

Fig. 11

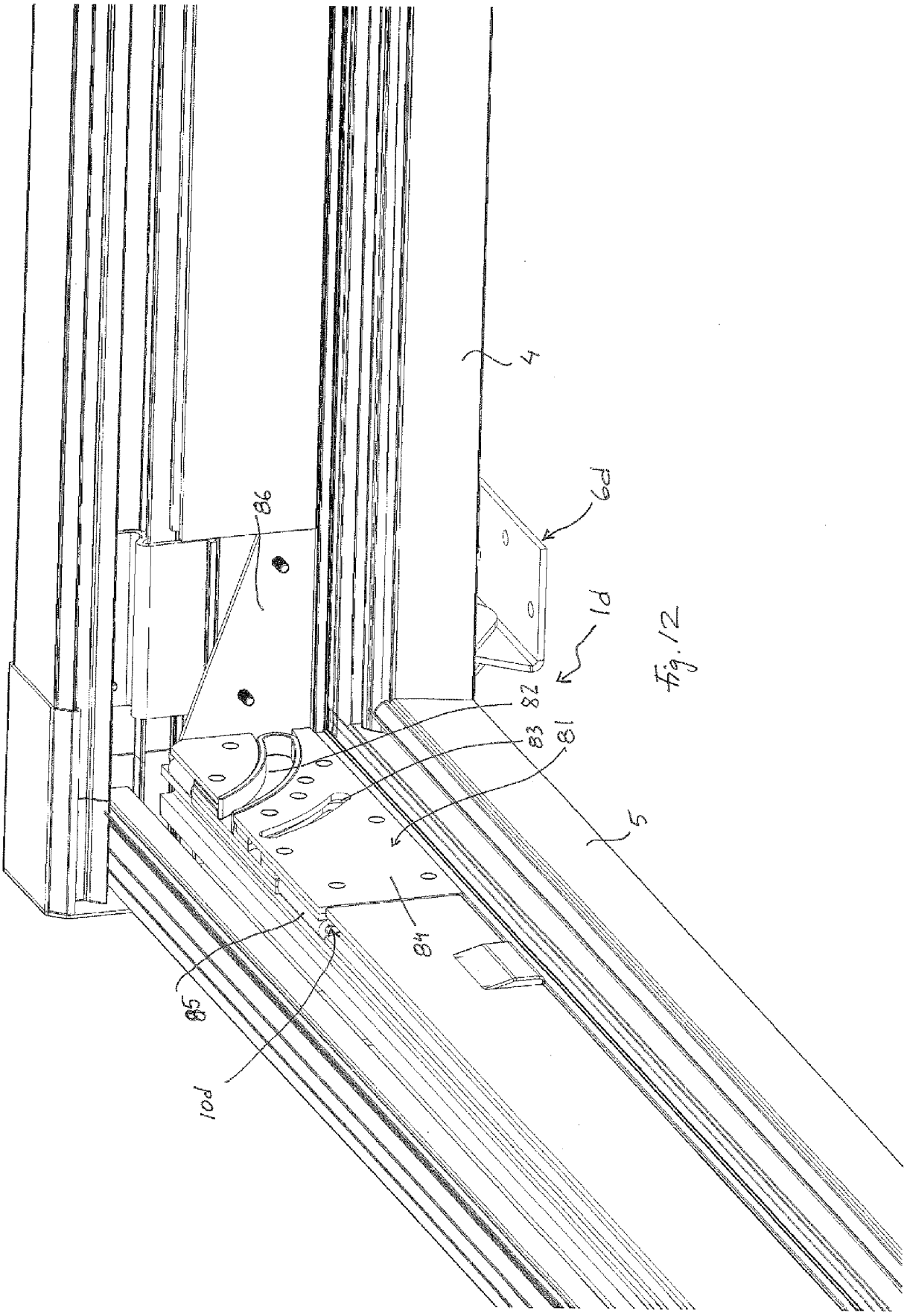

Fig. 12

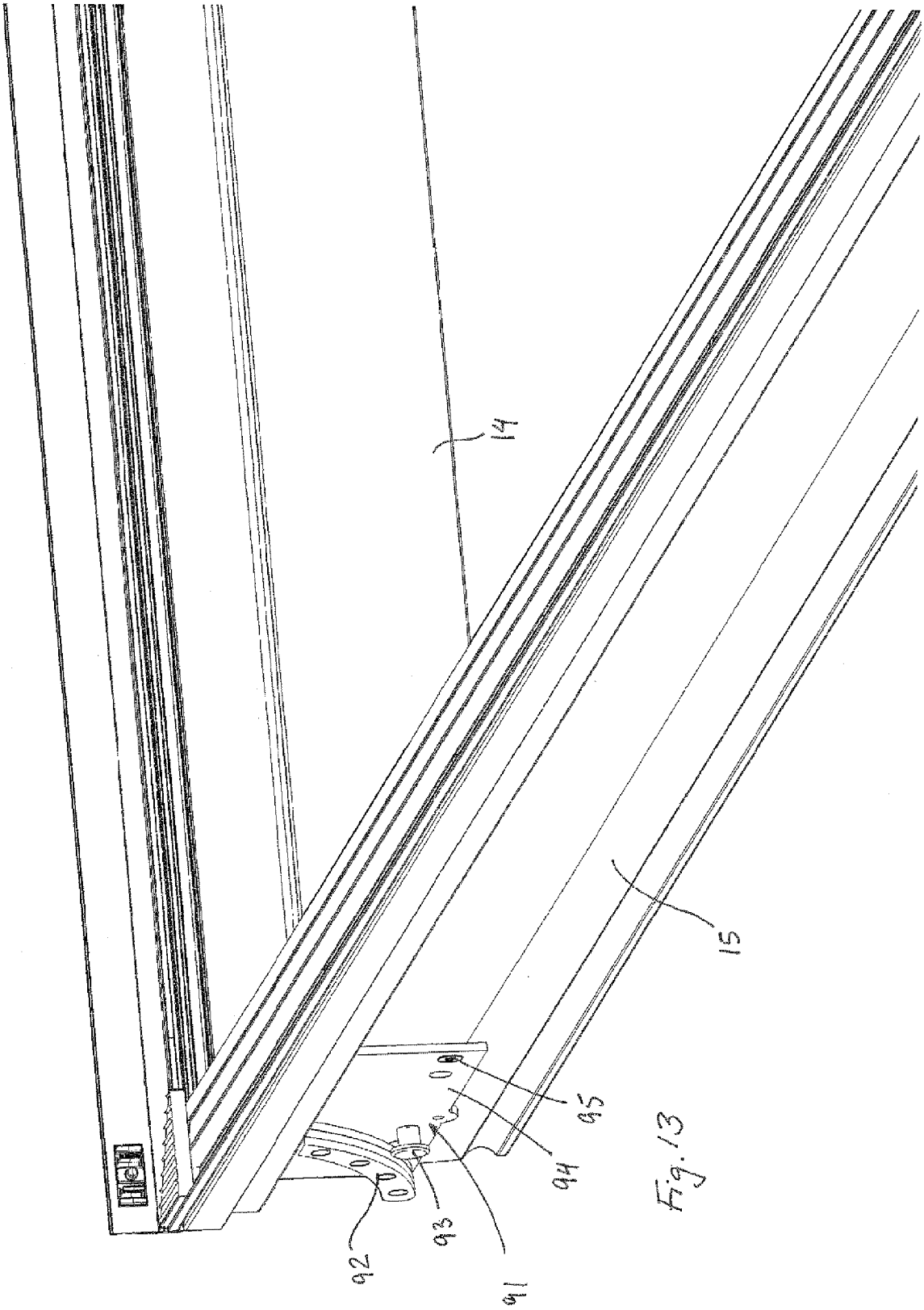

Fig. 13

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 10 19 7256

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	US 4 416 094 A (BUEGENER FRANZ [DE] ET AL) 22 November 1983 (1983-11-22) * column 4, line 46 - column 5, line 40 * * column 6, line 11 - line 46; figures 1-4 *	1-8	INV. E05F15/12 E04D13/03 E04D13/035 ADD. E05F11/06
X	NL 1 033 845 C2 (UBBINK BV) 18 November 2008 (2008-11-18) * page 6, line 35 - page 7, line 20 * * page 10, line 12 - line 23; figures 1-7 *	1-3,8,9	

TECHNICAL FIELDS SEARCHED (IPC)

E05F
E04D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 June 2011	Guillaume, Geert

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 10 19 7256

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.

07-06-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4416094 A	22-11-1983	AT 373025 B	12-12-1983
		BE 888382 A1	31-07-1981
		CH 650059 A5	28-06-1985
		DE 3031318 A1	08-04-1982
		DK 130581 A	21-02-1982
		FR 2488936 A1	26-02-1982
		GB 2083117 A	17-03-1982
		IT 1170851 B	03-06-1987
		JP 1401820 C	28-09-1987
		JP 57071979 A	06-05-1982
		JP 62008589 B	24-02-1987
		LU 83256 A1	24-06-1981
		NL 8101530 A	16-03-1982
NL 1033845 C2	18-11-2008	NONE	

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

- DE 10126395 C1 **[0002]**
- WO 2009076952 A **[0002]**
- EP 0692640 A1 **[0003]**
- WO 0065172 A **[0004]**