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(54) **Hidden hinge**

(57) Hidden hinge with two hinge parts (11-12) that are connected by a first arm (26) which is hinge-mounted to the first hinge part (11) and the second hinge part (12) respectively with its far ends, whereby a second arm (35) of the hinge (9-10) is hinge-mounted to the first hinge part (11) on the one hand, and is hinge-mounted to the first arm (26) on the other hand, such that an imaginary triangle (D) can be defined between the hinged joints (28, 36) of the first and the second arm with the first hinge part (11) on the one hand, and the hinged joint (33) of both arms (26, 35) between themselves on the other hand, and whereby the hinged joint (31) of the second hinge part (12) with the first arm (26) is situated outside said imaginary triangle (D).

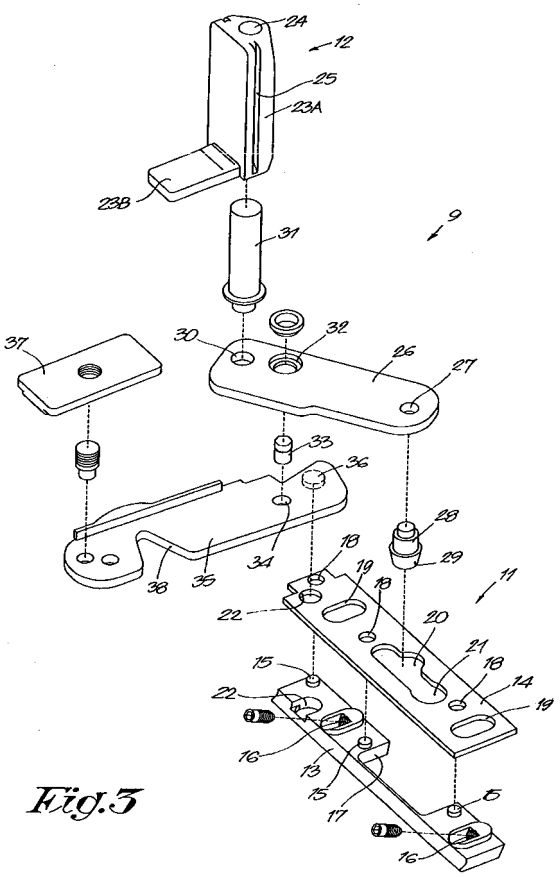

Fig.3

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Description

[0001] The present invention concerns a hidden hinge.

[0002] As is known, windows are formed of a fixed frame and a leaf that is hinge-mounted to the fixed frame by means of a hinged construction.

[0003] For aesthetical reasons, what is called a hidden hinged construction can be applied that is hidden from view when the window is closed.

[0004] Such a hidden hinged construction is usually formed of two hinges that are each provided on an opposite far end of the hinge side of the leaf.

[0005] Characteristic for a window with hidden hinges is that the leaf, while pivoting in relation to the fixed frame, undergoes a rotational movement as well as a translation movement. The translation movement is required to move the leaf out of the plane of the frame when opening the window, such that the posts of the leaf and the fixed frame do not strike against each other.

[0006] A first point of interest when designing a hidden hinge is that the translation movement of the leaf must be limited as much as possible, without restricting the pivoting of the leaf in relation to the fixed frame.

[0007] Although with a relatively large translation of the leaf in relation to the fixed frame, a window can be made whereby the leaf can rotate some 180° in relation to the leaf, such a large translation is disadvantageous in that a large opening is created between the hinge side of the leaf and the hinge side of the fixed frame.

[0008] For safety reasons, such a large opening is unwished-for, however, since when closing the window, objects or even a person's hand or fingers can get stuck between the hinge sides of the leaf and the fixed frame.

[0009] Also for stability reasons, a large opening on the hinge side is unwished-for, since this implies that the hinge side of the leaf is situated far from the fixed frame, as a result of which the centre of gravity of the window will shift out of the fixed frame.

[0010] A second point of interest is that a hinge should have sufficient bearing capacity so as to support the leaf in an opened position of the window and to guarantee the stability of the leaf.

[0011] It is clear that, the stronger the hinge can be made, the heavier and larger the leaf posts may be that are hung up with the hinge.

[0012] A third point of interest concerns the compactness of the hinge. It is of major importance for a hinge to be compact, since the available space between the fixed frame and the leaf, and in particular between the posts of both, is extremely limited.

[0013] Different embodiments of hidden hinges exist which are designed in such a way that they have either sufficient bearing capacity, or are safe or very compact, but none of the known hinges scores well for all three points of interest.

[0014] The present invention aims a hinge that provides a good compromise between the demands of safety, compactness and strength.

[0015] To this end, the invention concerns a hidden hinge which is mainly formed of two hinge parts that are mutually hinge-mounted by means of an arm, which is hinge-mounted to the first hinge part with one far end, and which is hinge-mounted to the second hinge part with its other far end, whereby the hinge further comprises a second arm which is hinge-mounted to said first hinge part at a distance from the hinged joint of the first arm on the one hand, and which is hinge-mounted to the first arm on the other hand, such that an imaginary triangle can be defined between the hinged joints of the first and the second arm with the first hinge part on the one hand, and the hinged joint of both arms between themselves on the other hand, characterised in that the hinged joint of the second hinge part with the first arm is situated outside said imaginary triangle.

[0016] An advantage of a hinge according to the invention is that it becomes possible to hinge-mount a leaf in a fixed frame, whereby only two arms have to be provided in the space between the posts of the fixed frame and the leaf, while the hinge parts can be provided in grooves provided to that end.

[0017] Moreover, these arms can be made relatively thin, since the first arm is guarded against bending by hinge-mounting it to the second arm according to a configuration in conformity with the invention.

[0018] Moreover, it is clear that the above-mentioned protection against bending of the first arm also makes it possible to support relatively heavy leaves with a relatively thin arm.

[0019] The side extending between the hinged joints of the second arm with the first arm and the first hinge part respectively is preferably the shortest side of the imaginary triangle.

[0020] An advantage of this preferred embodiment is that the safety of the window can be optimised, in particular by minimising the distance between the posts of the leaf and the fixed frame on the hinge side of the window during the full rotation of the leaf.

[0021] For, by minimizing the distance between the hinged joints of the second arm with the first arm and the first hinge part respectively, the distance over which the hinged joint of the second hinge part is moved is restricted, such that when opening the window, also the distance between the posts on the hinge side of the leaf and the fixed frame is restricted.

[0022] Moreover, restricting this distance has as an additional advantage that the protection against bending of the first arm offered by the second arm is improved.

[0023] In other words, a hinge according to the invention offers a good compromise between the aforesaid different points of interest that need to be taken into account in the design stage, without this resulting in serious restrictions to the angle at which a window with such a hinge according to the invention can be opened.

[0024] Further, the hinged joint of the second arm with the first hinge part is preferably a fixed hinged joint.

[0025] This preferred embodiment is advantageous in

that the short side of the triangle always has the same length and in that the mutual hinged joint between both arms of the hinge is situated at a fixed distance from the plane of the fixed frame, such that the stability of the window stays optimal when opening the window.

[0026] The present invention also concerns a window in which one or several hinges according to the invention are applied.

[0027] In order to better explain the characteristics of the present invention, the following preferred hinge according to the invention is described hereafter by way of example only without being limitative in any way, with reference to the accompanying drawings, in which:

figure 1 represents a part of a window with a hinge according to the invention;
figure 2 represents the same view, but in an open position of the window;
figure 3 represents a disassembled view of a hinge according to the invention to a larger scale;
figure 4 represents the same hinge as in figure 3, but as assembled;
figure 5 represents a section according to line V-V in figure 2 to a larger scale;
figure 6 represents the same view as in figure 5, but for different positions of the window;
figure 7 represents a view according to line VII-VII in figure 1 to a larger scale;
figure 8 represents the part indicated by F8 in figure 7 to a larger scale;
figure 9 represents the same view as figure 8, but in a tilted position of the window;
figure 10 represents a variant of figure 4 to a smaller scale;
figure 11 represents the part indicated by F11 in figure 10 to a larger scale;
figure 12 represents the view according to arrow F12 in figure 11 to a larger scale;
figure 13 represents a section according to line XIII-XIII in figure 10 to a larger scale;
figure 14 represents a section according to line XIV-XIV in figure 10 to a larger scale.

[0028] Figures 1 and 2 represent a part of a window which consists of a fixed frame 1 in which the leaf 2 hangs.

[0029] As is known, the fixed frame 1 and the leaf 2 are formed of posts 3-4, whereby these posts are provided with grooves 5 on the inner perimeter of the fixed frame 1 and on the outer perimeter of the leaf 2, and whereby both posts are provided with a stop 6-7 with which the corresponding posts 3-4 of the leaf 2 and the fixed frame 1 connect in a closed position of the window.

[0030] If the posts 3-4 are made of aluminium, the tendency is to make the posts as narrow as possible, resulting in the need to restrict the available space 8 between the corresponding posts 3-4 as much as possible, so as to be able to restrict the width of the stop 6-7.

[0031] As represented, the leaf 2 is hinge-mounted to the fixed frame 1 by means of a hidden hinged construction, in this case with two hinges 9-10.

[0032] In this case, the leaf 2 is hinge-mounted round a vertical shaft in relation to the fixed frame 1, and figures 1 and 2 only represent a lower part of the window.

[0033] The hinge 9, which is represented in figures 2 to 9, is the lower hinge and mainly has a supporting function, since this hinge supports the leaf 2.

[0034] The hinge 10, which is represented in figures 10 to 13, is the upper hinge and it will be further described in more detail.

[0035] As is represented in greater detail in figures 3 and 4, the lower hinge 9 consists of two hinge parts 11-12, the first hinge part 11 of which in this case consists of a body 13 and a lath 14.

[0036] The body 13 is in this case provided with different gudgeons 15, with two slantingly directed threaded holes 16 and a central notch 17.

[0037] The above-mentioned lath 14 is provided on the body 13 and it is provided with several holes 18 in which the gudgeons 15 are positioned, as well as with two passages 19 through which access is provided to the above-mentioned threaded holes 16.

[0038] Centrally in the lath 14 and opposite the notch 17 is provided a slot 20 whose peripheral edge preferably recedes in at least one place so as to form a housing 21.

[0039] Finally, a hole 22 is provided on one of the far ends of the lath 14.

[0040] The first hinge part 11 is provided in a groove 5 of a post 3, in particular a rail of the fixed frame 1, whereby the far end of the lath 14, in which the hole 22 is provided, connects to or practically connects to the hinge side S of the fixed frame 1.

[0041] The first hinge part 11 is fixed in the fixed frame by providing pressing screws through the threaded holes 16, such that the body 13 is clamped between the side walls of a groove 5 of the post 3 concerned.

[0042] The second hinge part in this case consists of an L-shaped body 23 in which, in the long leg 23A, is provided a central passage 24. In this long leg are preferably also provided two parallel slots 25 with which the body 23 can be provided in a jamb of the leaf, in a groove 5. The short leg 23B forms a stop, such that the second hinge part 12 can be provided up to an appropriate distance in the jamb of the leaf 2.

[0043] Both hinge parts 11-12 are hinge-mounted to one another by means of a first arm 26 provided with a hole 27 on one far end in which, in this case, is fixed a mushroom-shaped gudgeon 28 provided in a freely rotating manner behind the side edges of the slot 20 with its thickened far end 29, such that the first arm 26 is hinge-mounted to the first hinge part 11 with this far end.

[0044] In the other far end of the first arm 26 is provided a second hole 30, in which a cross pen 31 is provided in a rigid manner, which extends in a freely rotating manner through the above-mentioned passage 24 in the second hinge part, such that the first arm 26 is hinge-mounted to the second hinge part 12 with this far end.

[0045] Finally, a passage 32 is provided in the first arm 26 in which a shaft 33, extending further in a passage 34 in a second arm 35, is provided in a rotating manner.

[0046] This second arm 35 is provided with a pen 36 with one far end, which is hinge-mounted, preferably in a tilting manner, in the above-mentioned hole 22 in the first hinge part 11.

[0047] It should be noted that the hinged joint between both arms 26 and 35 is preferably situated near the hinged joint of the second arm 35 with the first hinge part 11.

[0048] In the opposite far end of the second arm 35 is hinge-mounted a sliding piece 37, designed to be provided in a moving manner in a guide that is fixed in relation to the second hinge part 12. In this case, said sliding piece 37 is provided in a moving manner in a groove 5 in a joist of the leaf 2.

[0049] In this case, a recess 38 is provided in the second arm 35 in which, in a closed position of the hinge 9, the above-mentioned mushroom-shaped gudgeon 28 is situated.

[0050] As represented in figures 7 to 9, a cross rib 39 is preferably provided on one of the side edges of the second arm 35 which, in a closed position of the hinge 9, extends along the first hinge part 11.

[0051] In the case of a simple side-hung window, the upper hinge 10 can be made the same as the lower hinge 9.

[0052] In the case of a side-hung window that can tilt as well, it is known that the upper hinge 10 should be coupled to a linking mechanism 40 that enables the leaf 2 to tilt in the fixed frame 1.

[0053] Such a linking mechanism 40 is generally known to the professional and it will be only briefly described here to illustrate a few adjustments to this mechanism.

[0054] As is represented in figure 10, the linking mechanism 40 mainly consists of a lath 41 on which are provided one or several gudgeons 42, provided in a moving manner in a guide 43. At least one of these gudgeons 42 is preferably provided with an end-piece 44 which is preferably eccentrically mounted on the gudgeon 42 and with which the lath 41 can be guided in the guide 43 in a more or less clamping manner so as to avoid any play between the lath 41 and the guide 43.

[0055] Said guide 43 is formed of a body provided in the groove of a joist of the leaf 2, and which can be shifted in this groove by means of the locking mechanism of the window that can be operated by means of a crank.

[0056] As different recesses are provided in the guide 43, as is known, the lath 41 can hinge in relation to the guide 43 in a tilting position of the crank, whereby the leaf 2 pivots around a - in this case - horizontal shaft in relation to the fixed frame.

[0057] As is represented in greater detail in figure 11, the lath 41 in this case has a double buckle 45. At this double buckle 45 is provided a longitudinal slot 46 in the lath in which a gudgeon 47 can be moved, provided on the locking mechanism of the window and which is moved in this way by operating the crank.

[0058] In the lath 41 of the linking mechanism 40 is further provided a slot 48 in which the sliding piece 37 that is hinge-mounted to the second arm 35 of this upper hinge 12 is provided in a moving manner.

[0059] As is represented in figures 12 and 13, the first arm 26 of the upper hinge 10 is provided with a notch 49 on the far end that is hinge-mounted to the first hinge part 11, which notch 49, when the window is closed, is positioned opposite the slot 48 at the double buckle 45 in the lath 41, such that the gudgeon 47 can be moved in this notch 49. The gudgeon 47 is preferably mushroom-shaped with a base and a widened head, whereby this head can mesh behind the side edges of the slot 46 in the lath 41 and thus provides a better protection against burglary than a simple cylindrical gudgeon 47.

[0060] The working of the lower hinge when the window is opened is illustrated in figures 5 and 6, and it is simple and as follows.

[0061] When the window is closed, both hinge parts 11 and 12 and the arms 26 and 35 are situated parallel to one another in the space 8 between the leaf 2 and the fixed frame 1.

[0062] When the leaf 2 is opened, the leaf pivots around the cross pen 31 together with the second hinge part 12, which cross pen 31 undergoes a translation movement as such as the first arm 26 pivots around the gudgeon 28, which is moved in the slot 20 of the first hinge part 11.

[0063] Also the second arm 35 starts to pivot, namely around the hinged joint 36 with the first hinge part 11, whereas the movement of the second arm 35 is guided by a movement of the sliding piece 37 in a groove 5 of the leaf 2.

[0064] As is represented in figure 5, in an open position of the hinge 9, an imaginary triangle can be defined between the hinged joints 28 and 36 of the first and the second arm with the first hinge part 11 on the one hand, and the hinged joint 33 of both arms 26 and 35 between themselves on the other hand. The above-mentioned triangle D is represented by means of a dashed line in figure 5.

[0065] According to the invention, the hinged joint 31 of the second hinge part 12 with the first arm 26 is situated outside said imaginary triangle D.

[0066] The side of this triangle D which extends between the hinged joints 33 and 36 of the second arm 35 with the first arm 26 and the first hinge part 11 respectively is preferably the shortest side of the imaginary triangle D, whereby the length of this side should be minimised as a function of the angle at which the window can be opened.

[0067] Indeed, the shorter this side is, the smaller the translation of the leaf 2 in relation to the fixed frame 1 will be as the window is opened. Restricting this translation movement results in a window with less space between the hinge sides of the leaf 2 and the fixed frame 1 in an

open position of the window, as a result of which the window is safer.

[0068] On the other hand, this distance should be sufficiently large to prevent the hinge sides of the leaf 2 and the fixed frame 1 from striking against each other when the window is opened.

[0069] The maximum distance A, represented in figure 6, between the stop 7 on the hinge sides of the leaf 2 and the post 3 of the fixed frame 1 is preferably restricted to 1.5 cm at the most, and better still to a distance of maximally 6 mm during a full rotation of the leaf 2 in relation to the fixed frame 1. The maximum distance of 6 mm or less is reached in an open position in which the leaf has rotated 90° in relation to the fixed frame. Further, when opening the leaf, the distance between the stop 7 and the post 3 again decreases to preferably 2 mm at the most when the leaf 2 has been opened at 105°.

[0070] Further, the distance B between the pen 31 and the mutual hinged joint 33 between both arms 26 and 35 is preferably minimized, since in case of an increasing distance B, the place where the weight of the leaf 2 is absorbed by the hinge 9, in an open position, is moved further outside the plane of the fixed frame 1, which is disadvantageous to the stability and to the power that is exerted on the first arm 26 of the hinge.

[0071] The working of the upper hinge 10 when the window is opened is identical to the working of the lower hinge 9.

[0072] The tilting of the window is controlled in a known manner by the aforesaid linking mechanism 40. The hinge pin of the leaf in relation to the fixed frame 1 is the lower joist of the window when tilting, and it extends parallel to the lower hinge 9 that is situated in a closed position during the tilting of the window.

[0073] In order to enable this pivoting motion, the first arm 26 with the mushroom-shaped gudgeon 28 is provided in a tilting manner in the first hinge part 11, and the pen 36 is provided in a tilting manner in the first hinge part 11.

[0074] The above-mentioned cross rib 39 which extends as of the second arm 35 along the first hinge part 11 in a closed position of the hinge 9 forms a stop when the leaf 2 is tilted, which stop, as represented in figures 8 and 9, is pressed against the first hinge part 11. The advantage offered by this rib 39 is that it prevents any undesired shifting of the leaf 2 in relation to the fixed frame 1.

[0075] The present invention is by no means restricted to the above-described embodiment represented in the accompanying drawings; on the contrary, such a hinge or window according to the invention can be made in all sorts of variants while still remaining within the scope of the invention.

Claims

1. Hidden hinge which is mainly formed of two hinge parts (11-12) that are mutually hinge-mounted by means of a first arm (26) which is hinge-mounted to the first hinge part (11) with one far end, and which is hinge-mounted to the second hinge part (12) with its other far end, whereby the hinge (9-10) further comprises a second arm (35) which is hinge-mounted to said first hinge part (11) at a distance from the hinged joint (28) of the first arm (26) with the first hinge part (11) on the one hand, and which is hinge-mounted to the first arm (26) on the other hand, such that, in an open position of the hinge, an imaginary triangle (D) can be defined between the hinged joints (28,36) of the first and the second arm with the first hinge part (11) on the one hand, and the hinged joint (33) of both arms (26, 35) between themselves on the other hand, **characterised in that** the hinged joint (31) of the second hinge part (12) with the first arm (26) is situated outside said imaginary triangle (D).

2. Hidden hinge according to claim 1, **characterised in that** the hinged joint (36) of the second arm (35) with the first hinge part (11) is a fixed hinged joint.

3. Hidden hinge according to claim 1 or 2, **characterised in that** the hinged joint (31) of the second hinge part (12) with the first arm (26) consists of a pen (31) that is fixed crosswise to the first arm (26) and that forms a rigid whole with the latter.

4. Hidden hinge according to any one of the preceding claims, **characterised in that** the first arm (26) is hinge-mounted to the first hinge part (11) and cooperates with the latter in a moving manner.

5. Hidden hinge according to any one of the preceding claims, **characterised in that** the second arm (35) is provided with a cross rib (39) which, in a closed position of the hinge, extends along the first hinge part (11).

6. Hidden hinge according to any one of the preceding claims, **characterised in that** the second arm (35) is provided with a pivoting sliding piece (37) on its free end, designed to be provided in a guide which is fixed in relation to the second hinge part (12).

7. Hidden hinge according to claim 1, **characterised in that** the side of the imaginary triangle (D) which extends between the hinged joints (33, 36) of the second arm (35) with the first arm (26) and the first hinge part (11) respectively forms the shortest side of the imaginary triangle (D).

8. Window which consists of a fixed frame in which a leaf is hinge-mounted by means of at least one hinge according to any one of claims 1 to 7, **characterised in that** the first hinge part (11) is fixed to the fixed

frame (1) and **in that** the second hinge part (12) is fixed to the leaf (2).

9. Window according to claim 8, **characterised in that** the hinge (10) is provided with a pivoting sliding piece (37) on its second arm (35) which can be moved in the slot (46) of a lath (41) that is part of a linking mechanism (40) for tilting the leaf (2) in relation to the fixed frame (1).

10. Window according to claim 9, **characterised in that** the lath (41) has a double buckle (45), as well as a longitudinal slot (46) extending at this double buckle (45).

11. Window according to claim 10, **characterised in that** a mushroom-shaped gudgeon (47) is provided on the locking mechanism with a base and a widened head, whereby this head can mesh behind the side edges of the above-mentioned slot (46).

12. Window according to claim 10, **characterised in that** the first arm (26) of the hinge (10) is provided with a notch (49) on the far end that is hinge-mounted to the first hinge part (11) in a moving manner, which notch (49) is positioned opposite the longitudinal slot (46) in a closed position of the hinge.

13. Window according to any one of claims 8 to 12, **characterised in that** the distance between a stop on the hinge side (S) of the leaf (2) and a post (3) on the hinge side of the fixed frame (1) amounts to maximally 1.5 cm and preferably maximally 6 mm when opening the leaf (2).

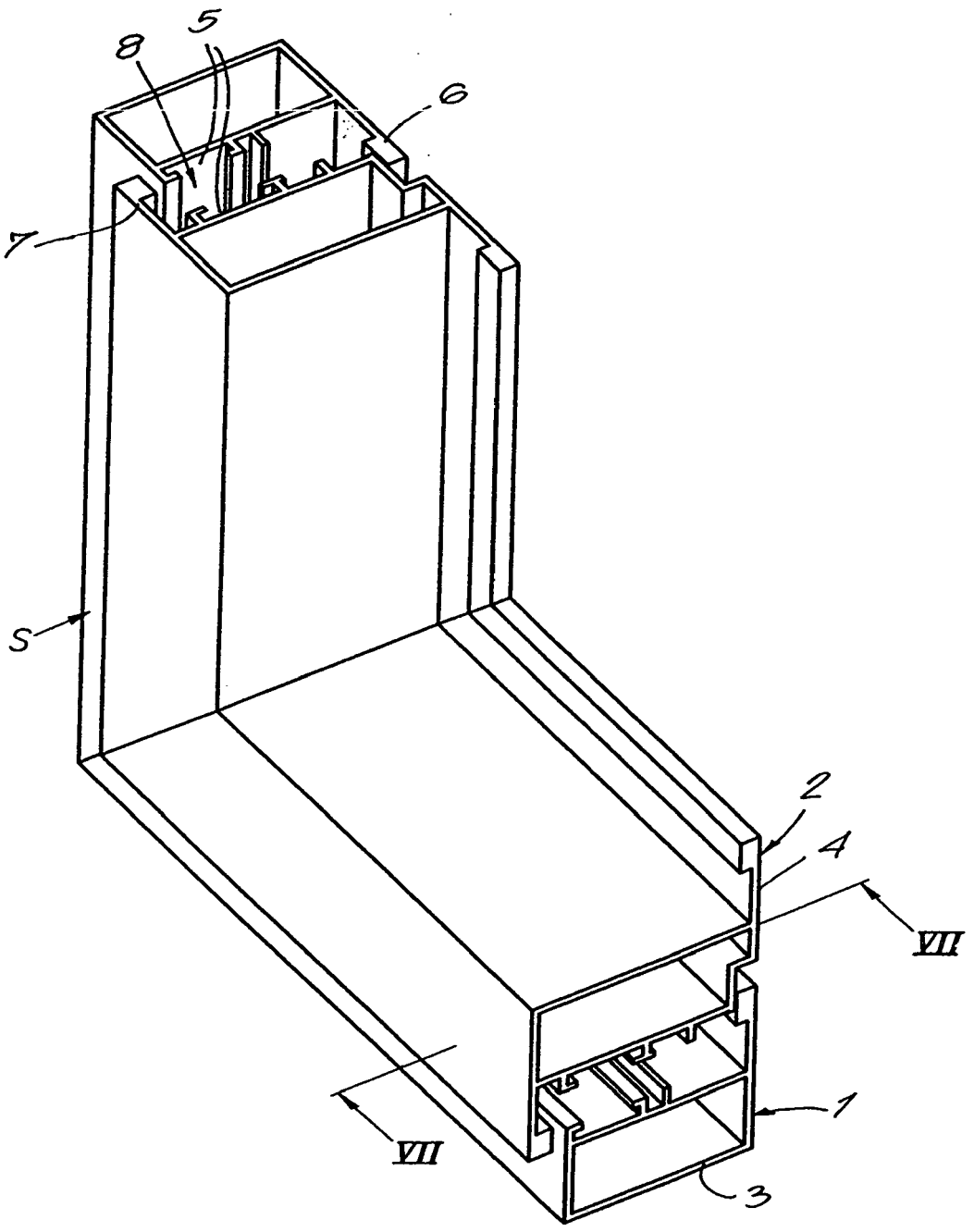

Fig. 1

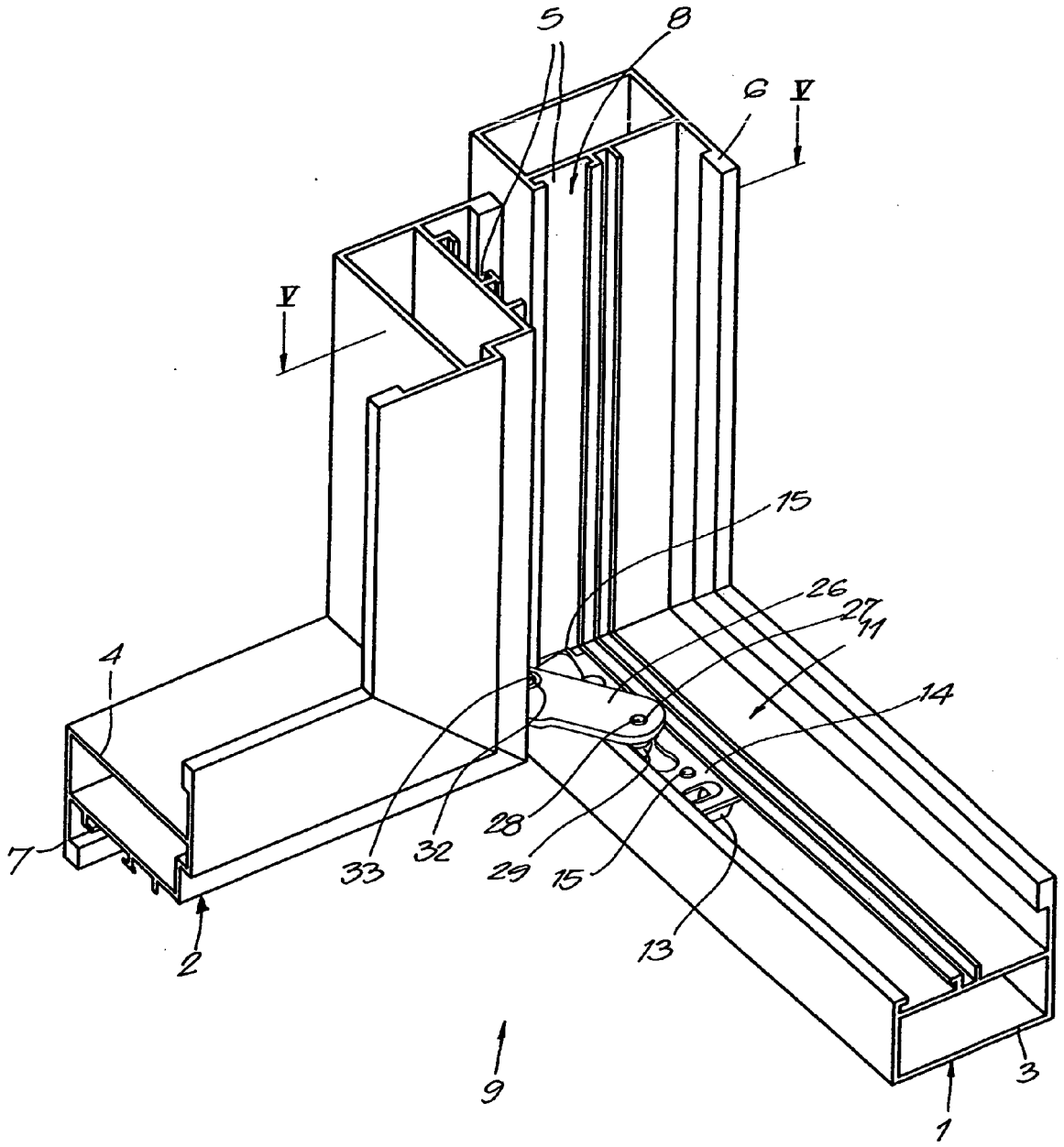

Fig.2

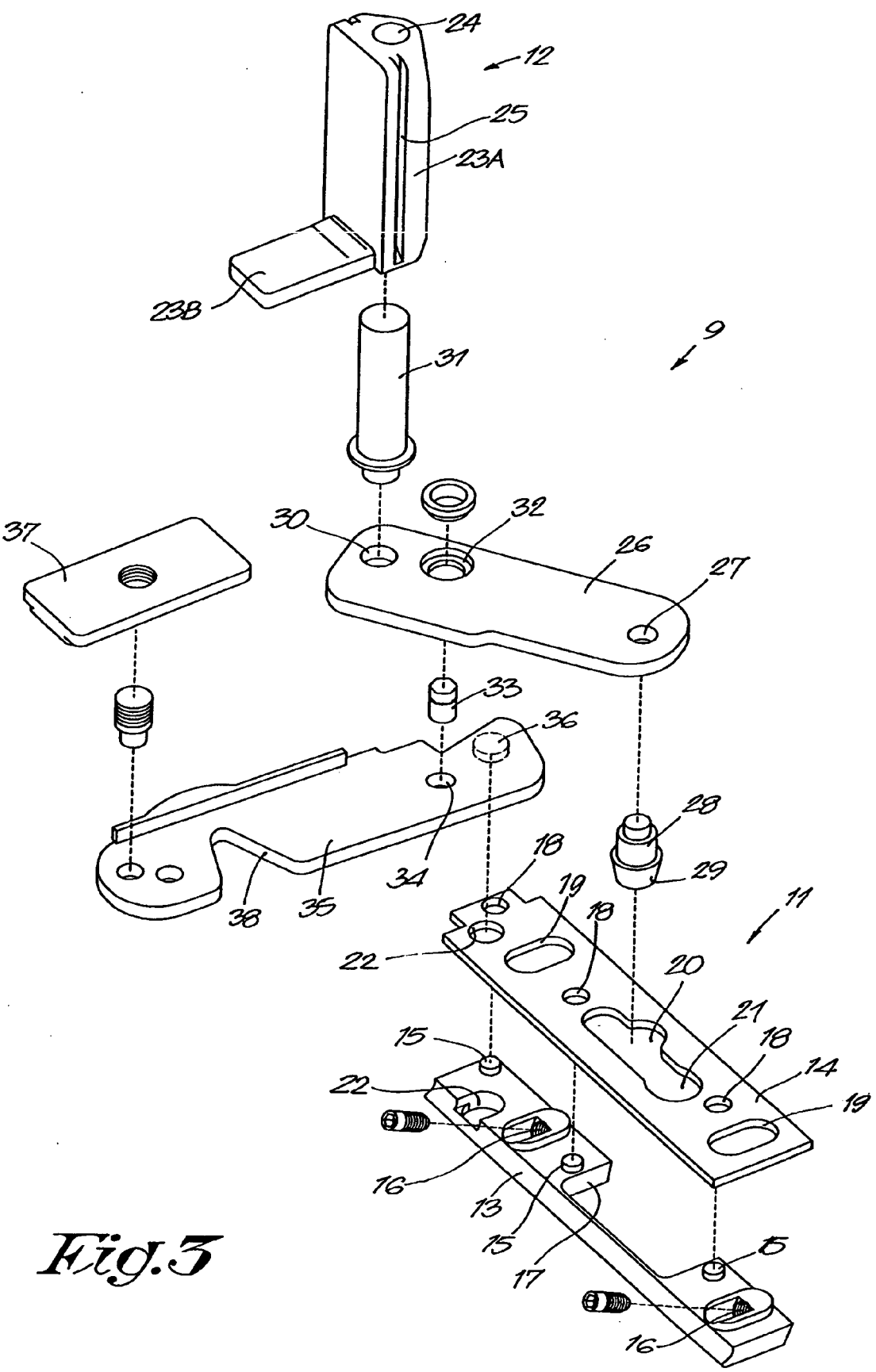
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Fig.3

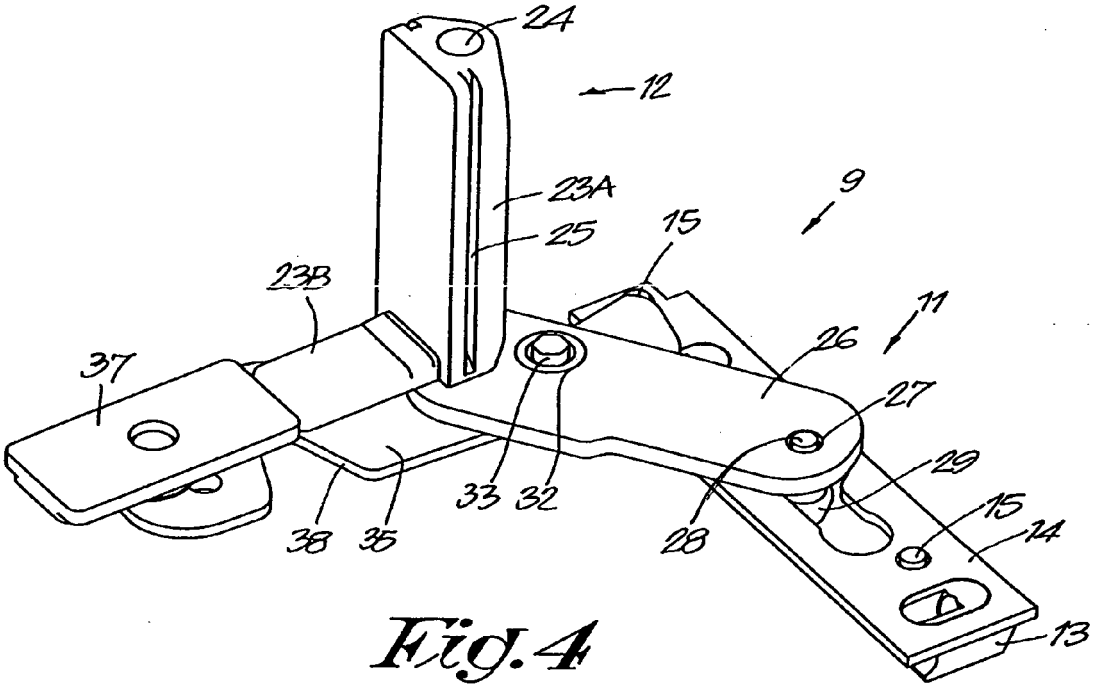
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Fig.4

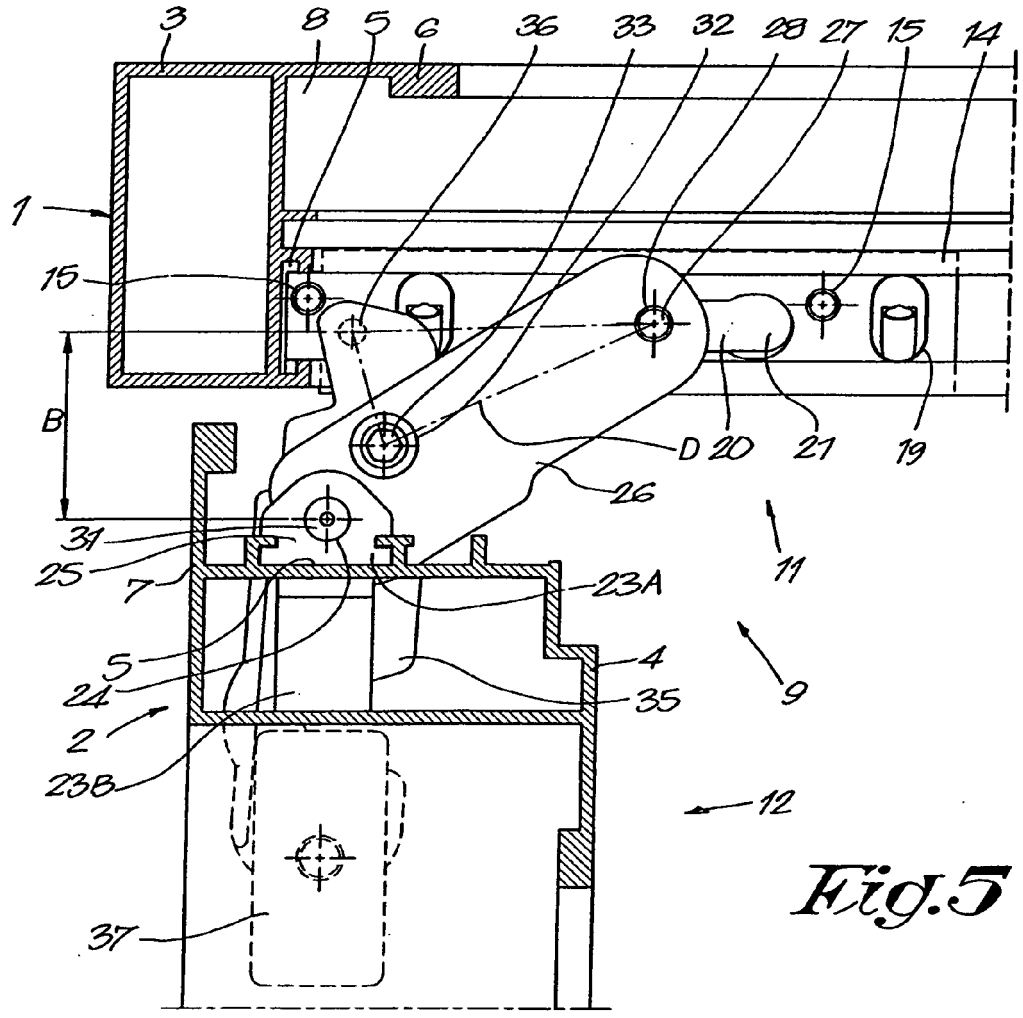
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Fig.5

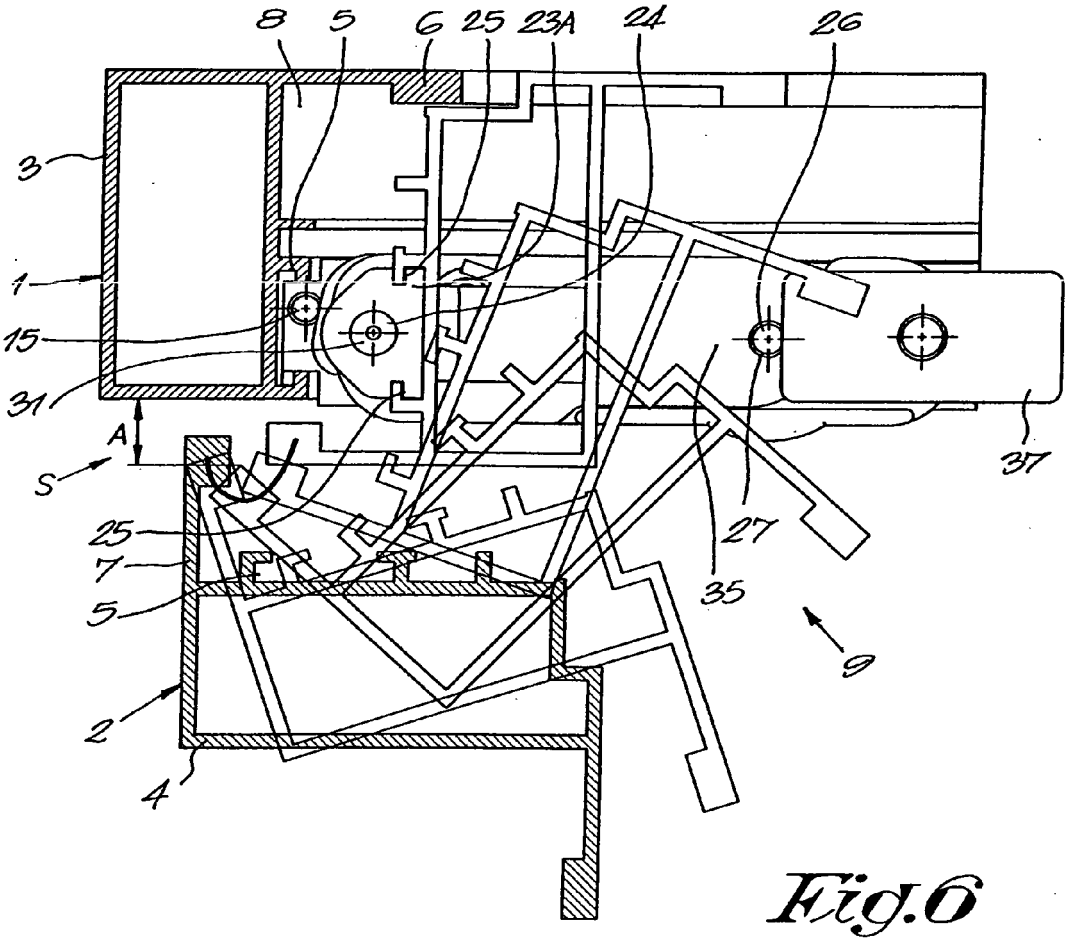

Fig.6

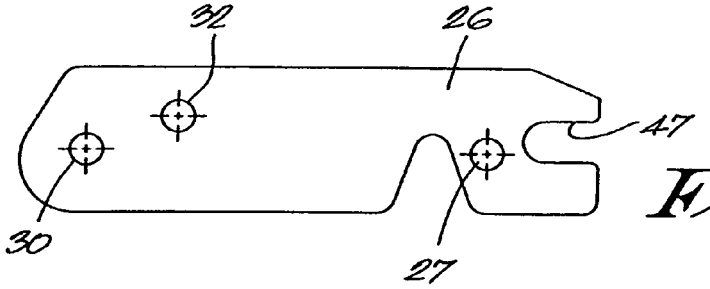

Fig.12

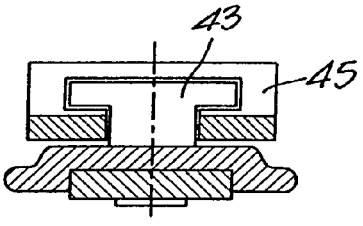

Fig.13

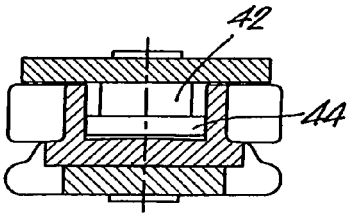

Fig.14

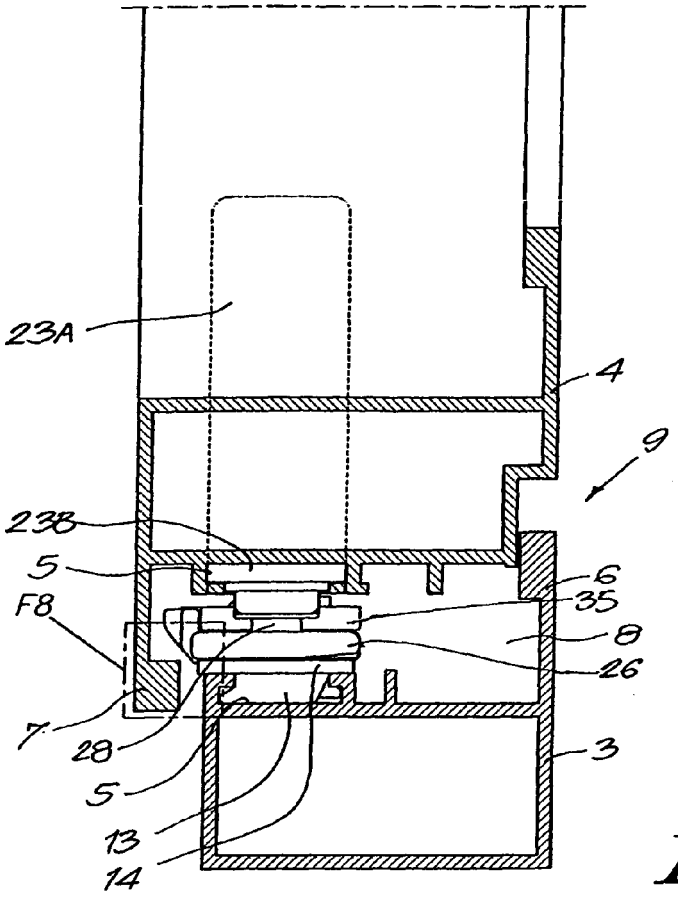

Fig.7

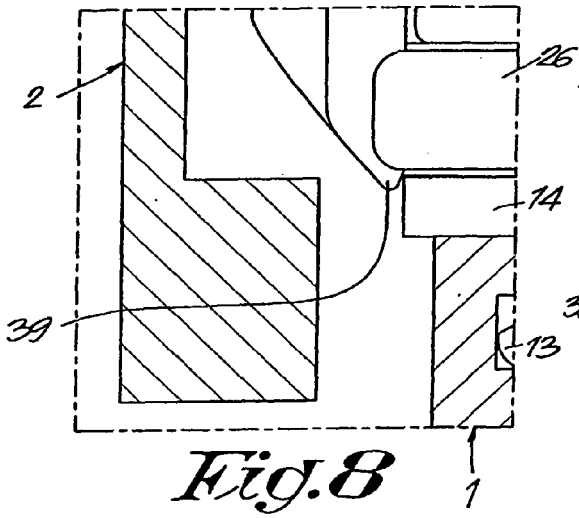

Fig.8

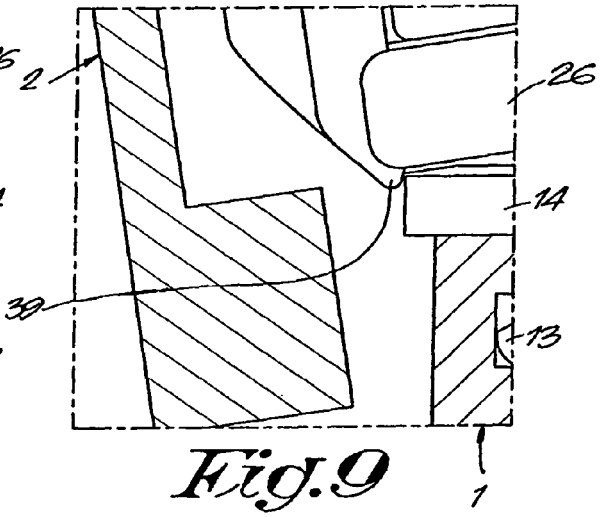

Fig.9

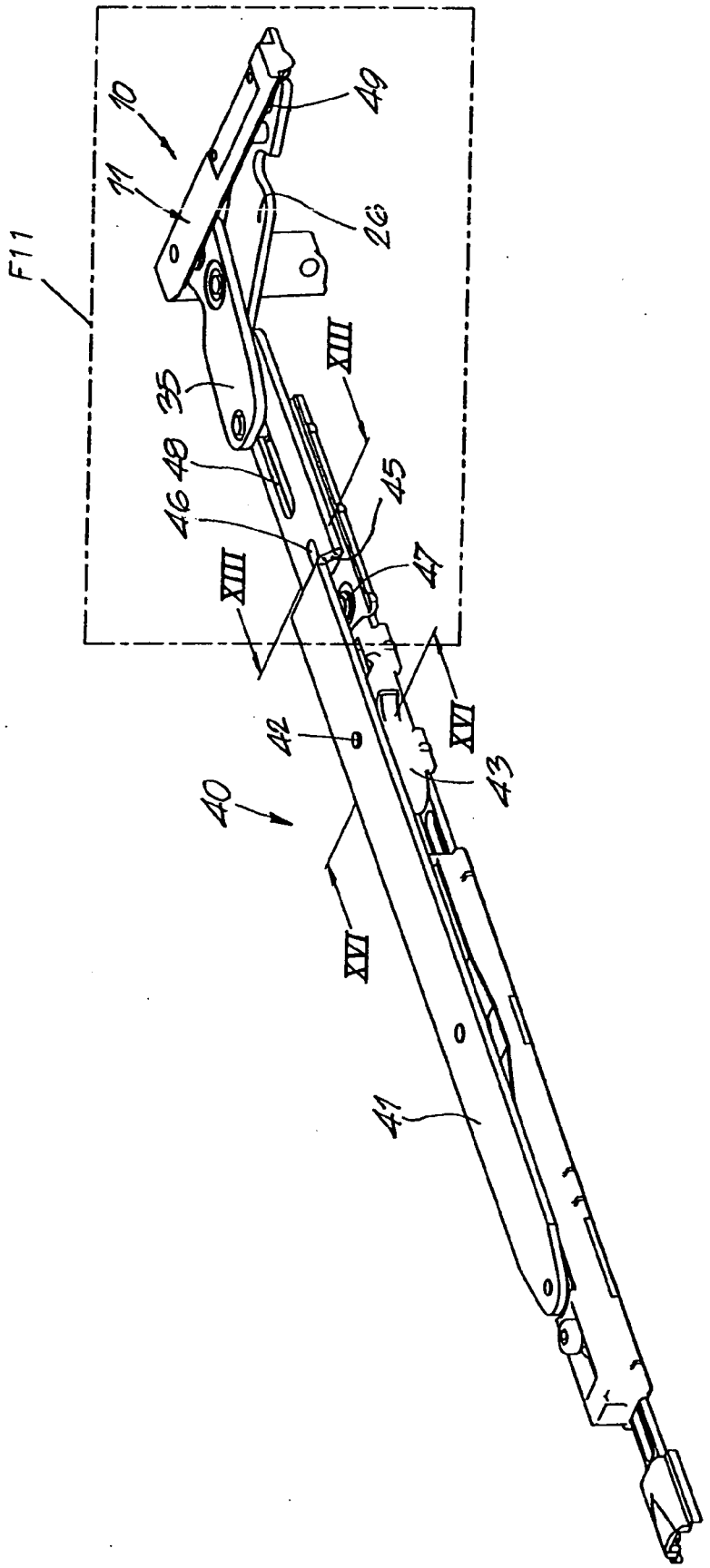

Fig.10

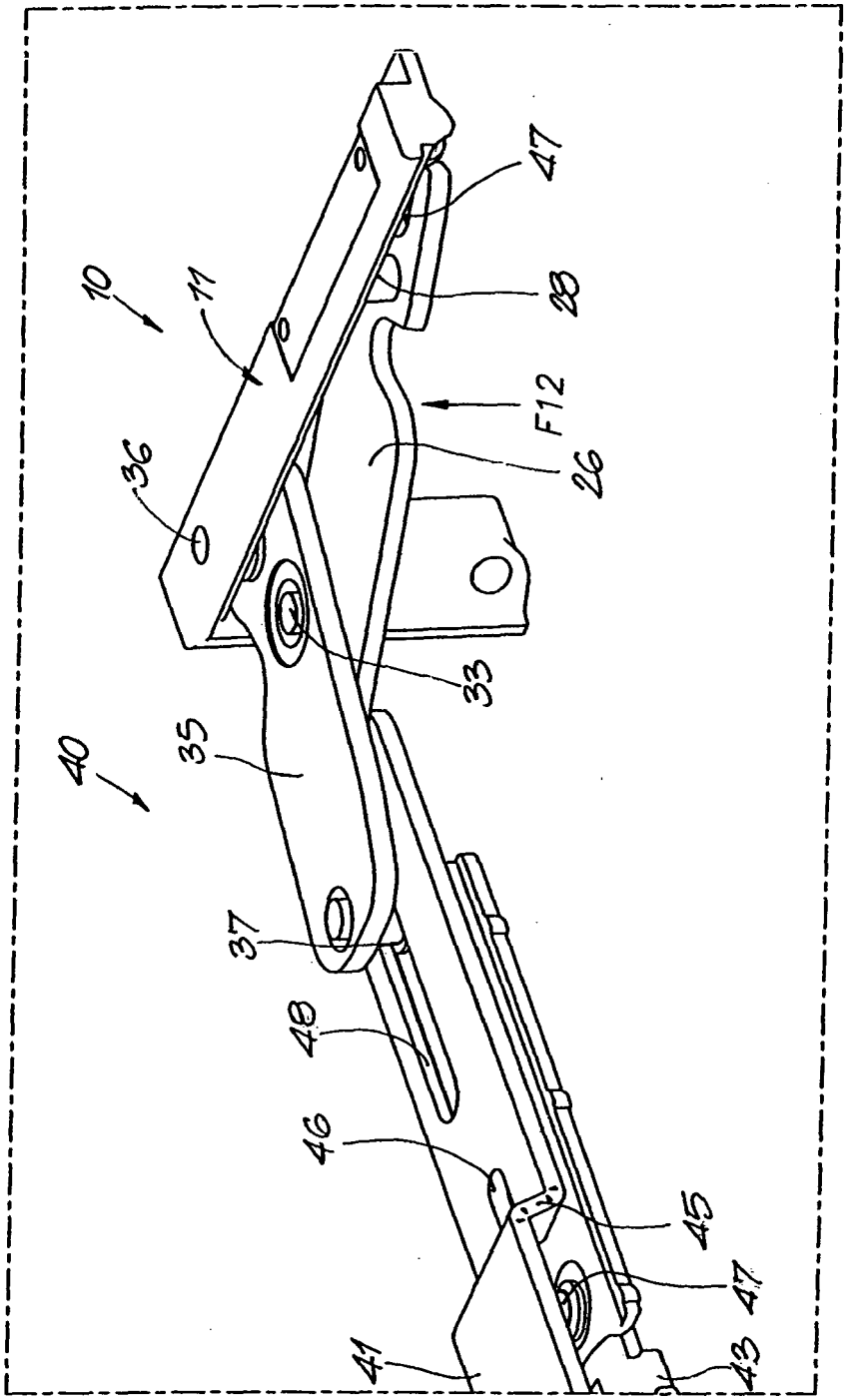

Fig.11

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EUROPEAN SEARCH REPORT

Application Number
EP 07 07 5811

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 November 2007	Guillaume, Geert

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