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(54) **Support and adjustment device of a trolley for sliding doors or panels**

(57) Support and adjustment device (A) of a trolley (C) for sliding doors or panels (P) comprising a support bracket (1) for a trolley (C) that is shaped as an overturned L, and a horizontal slide (2) coupled, by means of taper-cam type coupling means (CP) with a stem (3) constrained in the upper part to the trolley (C); wherein said

slide (2) is associated with a threaded bar (6) with horizontal axis, provided with a maneuvering head (6a) contained inside a housing (7) obtained on the support bracket (1) in such manner that a rotation of said threaded bar corresponds to a translation of the slide (2).

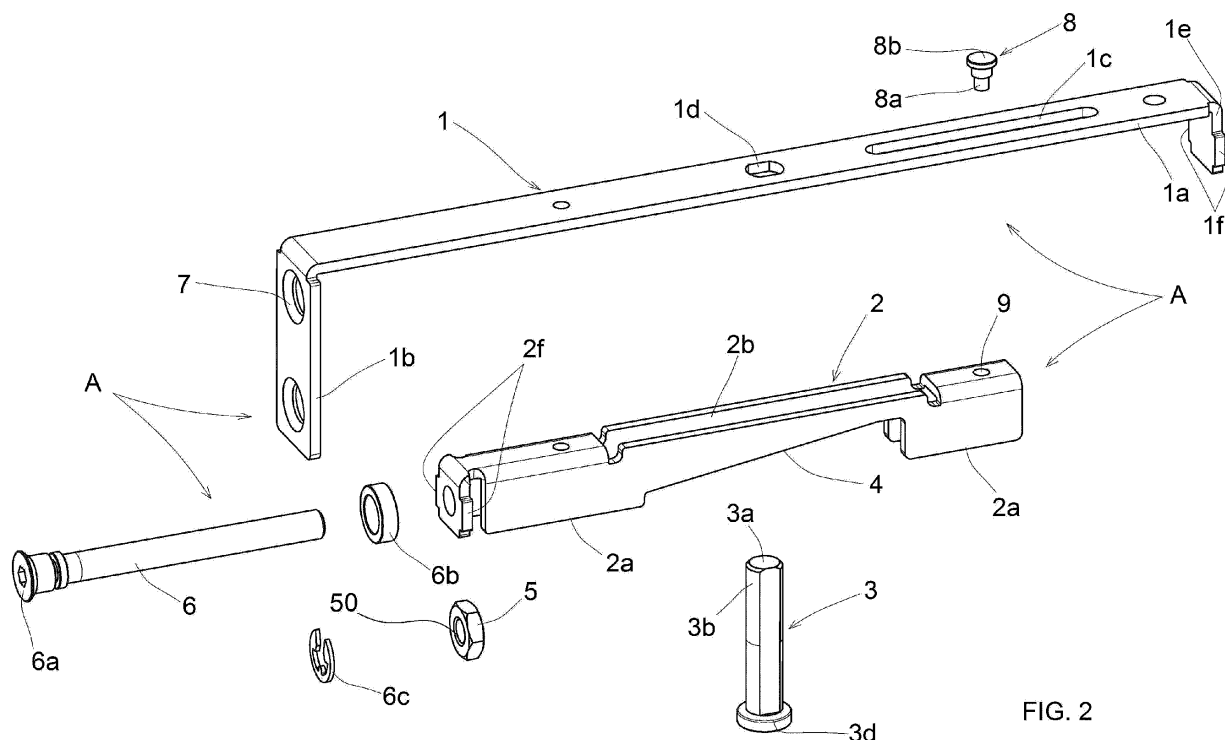


FIG. 2

Description

[0001] The present invention relates to a support and adjustment device for a trolley for sliding doors or panels of any type or made of any material.

[0002] Although this description refers to doors, the invention is extended to panels of cabinets, closets or the like.

[0003] As it is known, a sliding door comprises at least a spaced pair of trolleys applied on the upper edge and adapted to be coupled, when assembling the door, with a horizontal track that guides the alternate travels of the sliding door.

[0004] The connection between the trolley and the sliding door is normally obtained by means of a device that comprises a plate adapted to be fixed to the door and incorporating a vertical stem joined on top with the frame of the trolley. Such a plate is fixed in the upper part of the door, generally on the back, i.e. facing towards the internal compartment of the cabinet closed by the sliding door.

[0005] Therefore the sliding door is hung to the trolley by means of said vertical connection stem coupled with the plate and the trolley. Said vertical stem is normally threaded and screwed into the frame of the trolley or in said plate, in such way that the stem can also be used to adjust the height of the sliding door.

[0006] Evidently, the leveling of the sliding door is necessary if the guide track is not perfectly horizontal. Such a leveling operation of the sliding door is carried out by the operator by means of the threaded stem.

[0007] The threaded stem is associated with an adjustment knob that is used by the operator to adjust the height of the sliding door.

[0008] It must be considered that the use of plasterboard false ceilings has become very popular in houses. In such a case, the plasterboard false ceiling is provided with a housing that contains the guide track of the trolley. In order to hide the mechanism of the sliding door, the housing of the plasterboard false ceiling is very small and exactly contains the guide track of the trolley. Therefore it is extremely difficult to actuate the stem that connects the trolley to the door in order to adjust the height of the door.

[0009] Patent EP 1 108 845 discloses a support and adjustment device of a trolley for sliding doors similar to the one described herein. Patent EP 1 108 845 discloses two alternative embodiments: a first embodiment in which the vertical stem is screwed to the support wing, and a second embodiment in which the stem is prismatically coupled with the support wing to make upward or downward translations. This type of support and adjustment device of a trolley for sliding doors is impaired by several drawbacks, among them the fact that the adjustment means are disposed on the back wall of the sliding door, and therefore the operator is forced to access the internal compartment of the cabinet in order to reach and actuate the adjustment means. Such an access is extremely dif-

ficult and uncomfortable in case of small cabinets.

[0010] An additional drawback consists in the fact that the known devices cannot be mounted on any type of doors, being mainly and exclusively used on wooden doors.

[0011] US1370037 discloses a door hanger and adjuster for sliding doors according to the preamble of claim 1. Such a device comprises a support plate that must be fixed directly on the panel of a wooden door by means of screws. Therefore, such a device cannot be used, for example, on glass doors where no screws can be used. Moreover, the support plate of the device must be spaced from the track in which the trolley slides in order to allow the operator to screw the fixing screws. This is drawback because the market requires the guide tracks of the trolley to be very close to the upper edge of the panel. Moreover, such a device cannot be used for doors fixed to plasterboard secondary frames in which the guide track of the trolley is hidden in a housing of the plasterboard false ceiling.

[0012] WO2011 /161707 discloses a system for adjusting the height of a sliding door that is provided with two carriages. The system comprises plates that are fixed to the upper edge of the panel by means of screws; therefore the system cannot be applied, for example, to glass panels or panels made of other materials on which no screws can be used. Moreover, the carriages cannot be inserted in a track that is premounted on a secondary frame of the door. In fact, the carriages that are fixed to the panel by means of the system of the invention must be inserted in the track and then, after fixing the panel, the track must be fixed to the secondary frame of the door. Moreover, the carriages of the system are mobile with respect to the door; therefore, by adjusting the height of the door, the first carriage or the second carriage changes its position with respect to the front edge of the panel. Consequently, the position of the carriage changes in closed condition, as well as the end-of-travel position of the carriage. Thus, the end-of-travel position of the carriage must be changed and adjusted by the operator. The adjustment of the end-of-travel position is especially complicated in case of systems with decelerated return of the carriage.

[0013] EP 0 940 542 A discloses a mounting mechanism for sliding glass doors that cannot be vertically adjusted by directly actuating the system. For a vertical adjustment, the system must be dismantled from the panel, adjusted vertically and mounted again on the panel.

[0014] EP 1 108 845 discloses a system for fixing a carriage to a panel, which is fixed on one side of the panel rather than on the upper edge of the panel. This type of system can be only used for wooden panels in cabinets and cannot be used in different applications, such as glass panels or panels that are visible from both sides.

[0015] The purpose of the present invention is to remedy the aforementioned drawbacks that impair the devices of known type.

[0016] More precisely, the purpose of the present in-

vention is to design a support and adjustment device of a trolley for sliding doors of any type, which can be used in doors of any material, including glass doors, and wherein the adjustment means of the door height can be accessed easily.

[0017] These purposes have been achieved by the device of the invention, the primary and secondary characteristics of which are described in the attached first claim and in the following secondary claims depending on the first claim.

[0018] The device of the invention comprises a support bracket for the trolley, which is shaped as an overturned L, and a horizontal slide, which is associated with coupling means of tappet-cam type to a vertical stem with one end constrained to a trolley. The slide incorporates a cam, which consists in a section with inclined rectilinear profile with respect to the horizontal direction along which the slide translates. The movement of the slide is obtained by turning a threaded bar with horizontal axis, associated with said slide with screw-female screw coupling means, in such manner that the rotation of said threaded bar corresponds to a translation of the slide.

[0019] The vertical stem is provided with a base collar that slides on said inclined rectilinear profile. Therefore, the horizontal translation of the slide corresponds to a vertical translation of the stem, thus lifting or lowering the sliding door.

[0020] The horizontal wing of the support bracket is much longer than the vertical wing. The threaded bar is provided with a maneuvering head contained in a suitable housing obtained in the vertical wing of the support bracket. The overturned L shape of the support bracket has been chosen in order to fix said support bracket in each of the two upper corners of the sliding door, thus engaging and fixing the vertical wing of the bracket against the vertical edge of the sliding door, whereas the horizontal wing of said bracket is parallel to the upper edge of the door.

[0021] In view of the above the height of the sliding door can be adjusted without accessing the internal compartment of the cabinet, unlike the known devices. As a matter of fact, the maneuvering head of the threaded bar is disposed on the vertical edge of the sliding door, so the operator can easily and comfortably reach and operate the maneuvering head while remaining out of the cabinet.

[0022] The peculiar characteristic of the invention consists in the fact that the device also comprises a case provided with a lower portion adapted to be connected to an upper edge of a sliding door and two lateral edges that define an upper compartment with U section, which is adapted to receive the support bracket and slide assembly.

[0023] The two lateral edges have two opposite longitudinal grooves wherein said horizontal wing of the support bracket is slidably inserted. The vertical wing of the support bracket is fixed to a vertical edge of the sliding door.

[0024] The advantages of the case are evident since it allows for the easy mounting of the support bracket and slide assembly and at the same time allows for adjusting the device to any type of door, including doors made of glass or any other material, on which no screws can be used.

[0025] For purpose of clarity, the description of the device according to the present invention continues with reference to the attached drawings, which are intended for purposes of illustration only, and not in a limiting sense, wherein:

- Fig. 1 is an axonometric view of the device of the invention and of a corner of the sliding door where said device is to be mounted;
- Fig. 2 is an exploded axonometric view of the device of the invention;
- Fig. 3 is a sectional view of the device of the invention sectioned with a longitudinal vertical plane, which is about to be mounted on a corner of the sliding door;
- Figs. 4 and 5 are two lateral views of the device of the invention, wherein the slide is shown in two end-of-travel positions;
- Fig. 6 is an axonometric view of the device of the invention mounted on a corner of the sliding door;
- Figs. 7 and 8 are an axonometric view of the device of the invention associated with a case that allows for mounting the device on glass doors.

[0026] With reference to Figs. 1 to 3, the device (A) of the invention comprises a support bracket (1) shaped as an overturned L, comprising a horizontal wing (1 a) and a vertical wing (1 b). The horizontal wing (1 a) is longer than the vertical wing (1 b).

[0027] The device (A) also comprises a slide (2) situated under said horizontal wing (1 a) and a stem (3) with an upper part (3a) adapted to be constrained to a frame (T) of a trolley (C) of the sliding door (P). The slide (2) has a through slot (2b) that extends longitudinally to let the stem (3) pass.

[0028] With reference to Fig. 6, the trolley (C) is adapted to slide in a guide track (B) mounted in a crosspiece of a door secondary frame. Tappet-cam type coupling means (4, 3d) are used to couple the slide (2) to the stem (3) of the trolley.

[0029] The trolley (C) is of traditional type, is already known and normally found on the market, and therefore it is not described in detail herein.

[0030] The slide (2) is preferably made of a press-formed sheet metal section with transverse section shaped as an overturned U. The slide (2) comprises a cam (4) consisting in a portion with an inclined rectilinear profile with respect to the horizontal direction (X) along which the slide (2) is translated. The inclined profile (4) is obtained along a lower edge (2a) of the slide (2) and extends under the through slot (2b). The vertical stem (3) of the trolley is provided with a base collar (3d), acting as tappet, which is slidably engaged inside said inclined

profile (4) of the slide, thus providing a taper-cam type coupling (4, 3d). Because of said coupling, the horizontal translation of said slide (2) corresponds to a vertical translation of the stem (3), thus lifting or lowering the sliding door (P).

[0031] The slide (2) comprises a non-revolving threaded nut (5) into which a threaded bar (6) with horizontal axis is engaged. The threaded nut (5) comprises a polyamide (nylon) washer (50) into which the threaded bar (6) is screwed. The washer (50) presses against the threaded bar (6) in such manner to prevent unscrewing because of the door vibrations.

[0032] Therefore the slide (2) and the threaded bar (6) are mutually joined by means of screw-female screw type coupling, in such manner that the rotation of the threaded bar (6) corresponds to the horizontal translation of the slide (2).

[0033] It must be noted that the screw-female screw coupling is frictioned, in such manner to avoid the risk that the threaded bar (6) can accidentally and involuntarily enter into rotation because of the vibrations suffered by the device (A).

[0034] The threaded bar (6) ends with a maneuvering head (6a), wherein notches or housings are obtained, which can be used by the operator either manually or with a screwdriver or an Allen wrench to put the threaded bar (6) into rotation. The maneuvering head (6a) of the threaded bar (6) is contained in a housing (7) obtained in said the support bracket (1) and in particular in the vertical wing (1a) of the support bracket. In view of the above, the threaded bar (6) can only rotate, not translate.

[0035] For a safe support and a balanced travel of the slide (2), the slide (2) is slidingly mounted under said horizontal wing (1 a). The horizontal wing (1a) of the support bracket comprises a longitudinal slot (1c), wherein a peg (8) of the slide is inserted and slides.

[0036] The peg (8) of the slide is shaped as a mushroom. The peg (8) has a stem (8a) fitted in a hole (9) of the slide (2) and a head (8b) that slidingly rests on the edges of said longitudinal slot (1 c) of the horizontal wing of the support bracket.

[0037] The horizontal wing (1 a) of the bracket is also provided with a hole (1 d) for the stem (3) that, according to the preferred embodiment of the invention, is provided with a thread (3b) adapted to be engaged with a threaded hole obtained on the frame (T) of the trolley (C).

[0038] According to this embodiment, the stem (3) is also provided with an opposite pair of lateral facets (3c) that are conjugated with corresponding facets obtained on the hole (1d) in order to hinder the rotation of the stem (3) around its vertical axis, while leaving it free to make vertical translations.

[0039] Finally, it must be noted that the stem (3) also passes through the longitudinal slot (2b) of the slide (2), which can slide forward and backward with respect to the stem (3).

[0040] The threaded bar (6) is guided in rotation by a collar (6c) inserted in the bar (6) and blocked with a

Seeger ring (6d) against the internal side of the vertical wing (1 b) of the support bracket, as shown in Fig. 3. Said Seeger ring (6d) is used to prevent the free translation of the threaded bar (6) that can rotate, but not translate.

[0041] Figs. 4 and 5 illustrate the slide (2) in two end-of-travel positions that correspond to a maximum travel (H MAX) and a minimum travel (H MIN) in height of the door.

[0042] As shown in Figs. 4 and 5, upon changing the position of the slide (2), the distance (K) between the axis of the stem (3) and the maneuvering head (6a) of the threaded bar is constant.

[0043] As mentioned above, the support bracket (1) is shaped as an overturned L in order to fix the support bracket (1) in each of the two upper corners of the sliding door (P), engaging and fixing the vertical wing (1 b) of the bracket against the vertical edge (BV) of the sliding door (P), whereas the horizontal wing (1 a) of the bracket is parallel to the upper edge (BS) of the door (P).

[0044] In order to hide the device (A), the upper edge (BS) of the door is provided with a groove (S) where the device (A) is recessedly housed.

[0045] With reference to Fig. 1, according to the preferred embodiment of the invention, the device (A) comprises a first type of case (10) used as housing means for connecting the device (A) to wooden doors (P).

[0046] The case (10) comprises a lower portion (15) adapted to be fixed to the upper edge (BS) of the door and an upper portion adapted to receive the support bracket (1) and slide (2) assembly. If the door (P) is made of wood, the lower portion (15) of the case (10) can be fixed to the upper edge (BS) of the door by means of vertical screws (11) that are screwed in the upper edge (BS) of the door.

[0047] The case (10) preferably consists in a U metal section, which is contained in the groove (S) of the upper edge of the door. The case (10) comprises two lateral edges (10a, 10b) that define an upper compartment (VS) that contains the support bracket (1) and the slide (2) assembly.

[0048] The lateral edges (10a, 10b) of the case are provided with two opposite longitudinal grooves (11a) into which the horizontal wing (1 a) of the support bracket is inserted (in the direction of arrow F in Fig. 3) and fitted, as shown in Fig. 6. The vertical wing (1 b) of the support bracket is fixed to the vertical edge (BV) of the door (P) by means of a screw (12).

[0049] In order to guarantee a stable anchoring between the bracket (1) and the case (10), the case (10) comprises two opposite tracks (11f) obtained in the lateral edges (10a, 10b) and ending in a fixing housing. The support bracket (1) comprises a vertical tongue (1 e) disposed at the opposite end with respect to the vertical wing (1 b). The vertical tongue (1 e) has a basically rectangular shape and comprises vertical edges with a lateral pair of teeth (1 f), adapted to slide inside said opposite tracks (11 f) obtained on the lateral edges of the case and be blocked in the fixing housings of the two tracks.

[0050] In order to give a higher vertical strength to the device (A), also the slide (2) is provided with a pair of teeth (2f) adapted to slide inside said opposite tracks (11 f) of the lateral edges of the case.

[0051] Figs. 7 and 8 illustrate a second type of case (20), wherein identical or corresponding elements are indicated with the same reference numerals used for the first type of case, omitting a detailed description. The case (20) is used as a housing means for connecting the device (A) to glass doors (PV).

[0052] The case (20) is formed of an H metal section in such manner to have an opposite specular pair of compartments (VS, VI).

[0053] In particular, the lower portion (15) of the case (20) comprises two lower edges (15a, 15b) that define a lower compartment (VI) adapted to receive the upper edge (BS) of the glass door, which can be glued.

[0054] The fixing of the support bracket (1) and the slide (2) assembly inside the case (20) is of snap-fitting type.

[0055] The support bracket (1) comprises a flexible shelf (31) fixed in projecting position on the horizontal wing (1a) on the vertical tongue (1 e). The flexible shelf (31) has a fixing tooth (32).

[0056] The case (20) comprises a block (42) disposed inside the upper compartment (VS) of the case. Therefore the tooth (32) of the shelf is snap-fitted to said block (42) of the case further to the elastic bending of the shelf (31) of the support bracket.

[0057] When the support bracket (1) and the slide (2) assembly is inserted into the upper compartment (VS) of the case (20), the accidental backward removal of the support bracket (1) and slide (2) assembly from the case (20) is hindered by the tooth (32) of the shelf of the support bracket fitted to the block (42) of the case.

[0058] Although the shelf (31) and the block (42) assembly has been illustrated in the case (20) of Figs. 7 and 8, the shelf (31) and block (42) assembly can be provided also in the case (10) of Fig. 1.

[0059] According to an alternative embodiment of the invention, not shown in the attached figures, the stem (3) is not screwed to the frame (T) of the trolley, but simply blocked to the frame.

[0060] As already mentioned, although the drawings show the preferred embodiment of the device (A), numerous modifications can be made to its parts, while still falling within the same inventive idea.

[0061] For example, the threaded bar (6) may be screwed into a threaded hole directly obtained in the vertical portion of the slide (2) in such manner to eliminate the nut (5).

[0062] According to another modification, the peg (8) of the slide may be eliminated and replaced with a tooth obtained in one piece with the slide. Alternatively, the slide may be provided with a longitudinal slot and the horizontal wing of the support bracket may be provided with a tooth or peg that slides in the longitudinal slot of the slide.

[0063] The invention also relates to an assembly comprising the device (A), the door (P, PV), the trolley (C) and the guide track (B) of the trolley.

Claims

1. A support and adjustment device (A) of a trolley (C) for sliding doors or panels (P), comprising:

- a support bracket (1) shaped as an overturned "L", comprising a horizontal wing (1 a) and a vertical wing (1 b);
- a slide (2) situated under said horizontal wing (1 a) in order to slide horizontally under said horizontal wing;
- a stem (3) with upper end (3a) constrained to a frame (T) of the trolley (C), wherein said stem (3) passes through a hole (1d) of said horizontal wing (1 a) and a longitudinal slot (2b) of the slide;
- tappet-cam type means (4, 3d) disposed between the slide and the stem in such manner that a horizontal translation of said slide (2) corresponds to a vertical translation of said stem (3);
- a threaded bar (6) with horizontal axis, provided with a maneuvering head (6a) contained in a housing (7) of said vertical wing (1 b) of the support bracket in such manner that it can rotate and not translate, wherein said threaded bar (6) is connected to the slide (2) by means of coupling means of screw-female screw type (5), in such manner that the rotation of said threaded bar (6) corresponds to a horizontal translation of the slide (2);

characterized in that it also comprises

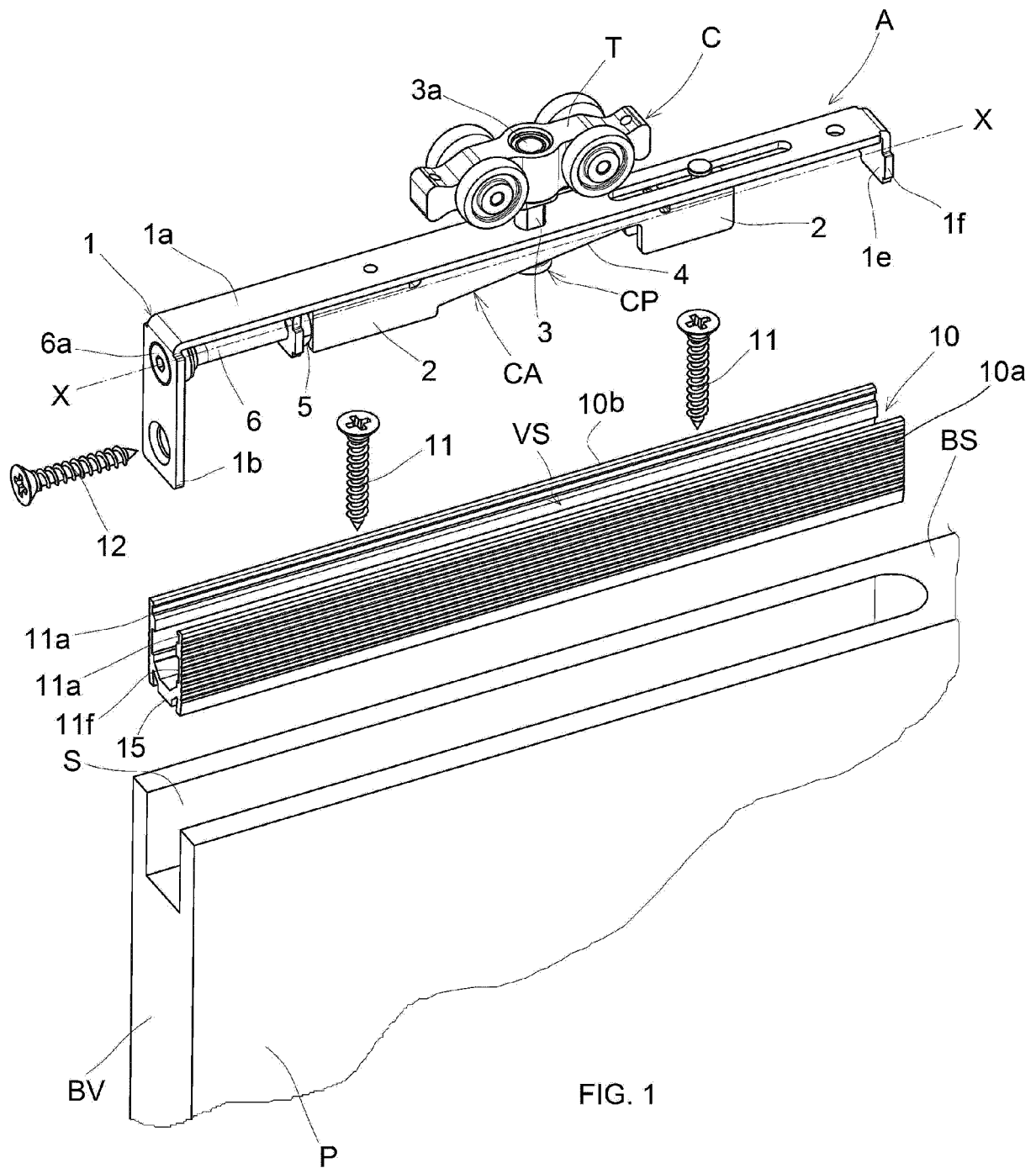
- a case (10; 20) comprising a lower portion (15) adapted to be connected to the upper edge (BS) of a sliding door (P; PV) and two lateral edges (10a, 10b) that define an upper compartment (VS) with "U"-section adapted to receive the support bracket (1) and slide (2) assembly, said two lateral edges (10a, 10b) of the case having two opposite longitudinal grooves (11a, 11b) into which the horizontal wing (1a) of the support bracket is slidingly inserted, wherein said vertical wing (1b) of the support bracket is fixed to a vertical edge (BV) of the sliding door (P; PV).

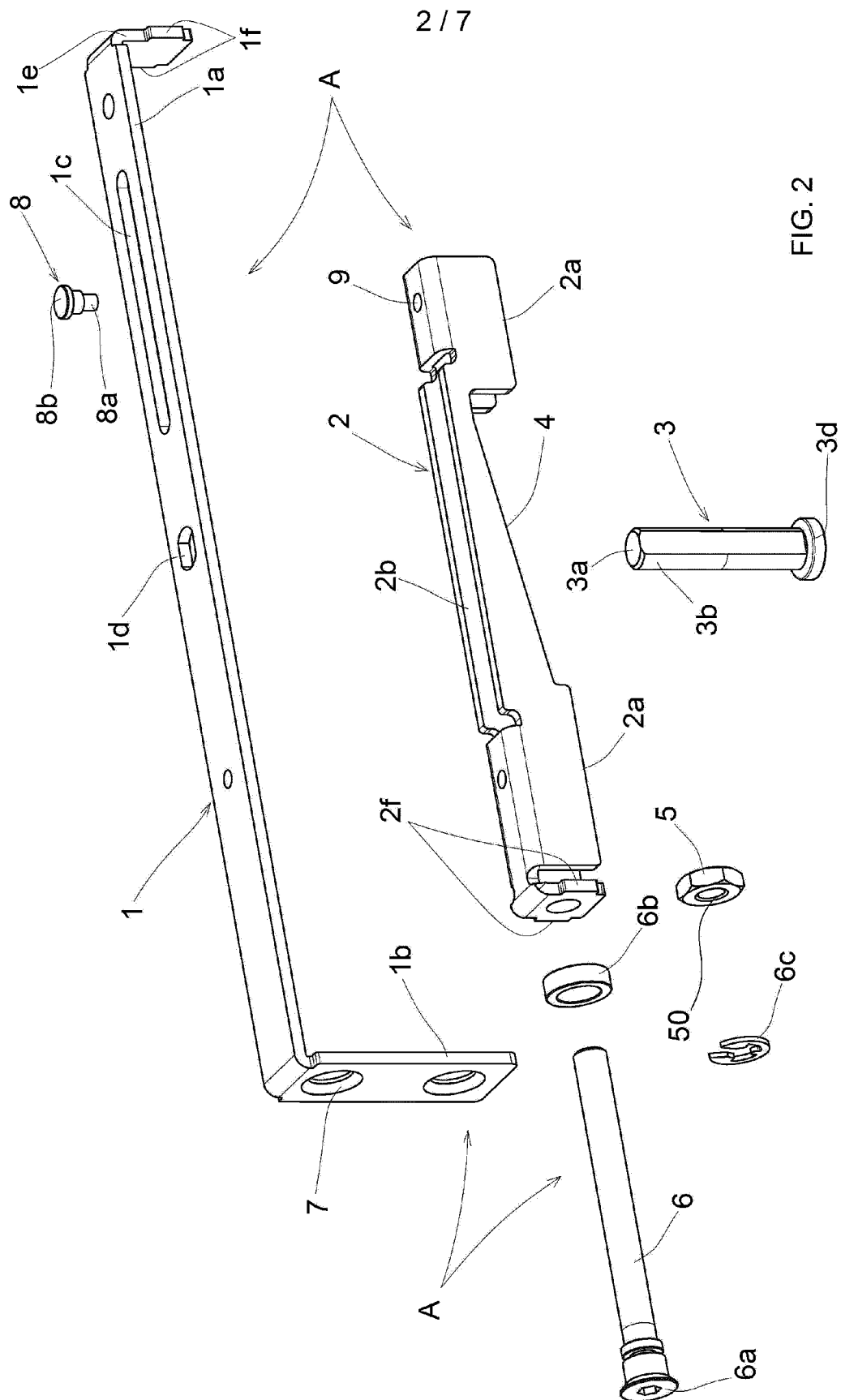
2. The device of claim 1, wherein said case (10) is a U-shaped metal section and the lower portion (15) of the case is inserted into a groove (S) obtained in the upper edge (BS) of said door (P).
3. The device of claim 1, wherein the lower portion (15) of said case (20) comprises two lateral edges (15a, 15b) that define a lower compartment (VI) wherein the upper edge (BS) of said door (PV) is inserted.

4. The device of claim 3, wherein said case (20) is an H-shaped metal section or is composed of two U-shaped metal sections in opposite position.
5. The device of any one of the preceding claims, comprising automatic snap-fit coupling means (42, 31) for the automatic blocking of the device inserted in the case (10, 20). 5
6. The device of claim 5, wherein said in automatic snap-fit coupling means (42, 31) comprise a block (42) disposed inside the upper compartment (VS) of the case (10, 20) and a flexible shelf (31) fixed in projecting position at one free end of the horizontal wing (1 a) of the support bracket (1) and said flexible shelf being fitted to said block (42) in such manner to block the support bracket and slide assembly inside the case (10; 20). 10 15
7. The device of any one of the preceding claims, wherein said lateral edges (10a, 10b) of the upper compartment of the case comprise two opposite tracks (11 f) and the support bracket (1) comprise a free end with a vertical tongue (1 e) provided with vertical edges with teeth (1 f) adapted to slide inside said tracks (11 f) of the lateral edges. 20 25
8. The device of claim 7, wherein the slide (2) has a lateral pair of teeth (2f) adapted to slide inside said opposite tracks (11 f) of the lateral edges (10a, 10b) of the upper compartment of the case. 30
9. The device of any one of the preceding claims, wherein said tappet-cam type means (4, 3d) comprise an inclined rectilinear profile (4) of the lower edge of the slide and a base collar (3d) of the stem (3) that slides along said inclined rectilinear profile (4) of the slide. 35
10. The device of one of the preceding claims, wherein said screw-female screw type coupling means (5) comprise a threaded nut (5) joined to the slide (2) wherein said threaded bar (6) is engaged. 40
11. The device of claim 10, wherein said threaded nut (5) comprises a washer (50) that presses against the threaded bar (6) to prevent loosening in case of vibrations. 45
12. The device of one of the preceding claims, wherein said horizontal wing (1 a) is provided with a longitudinal slot (1 c) wherein a mushroom-shaped peg (8) is inserted and slides, comprising: 50
 - a stem (8a) engaged and screwed into a hole (9) of the slide (2); 55
 - a head (8b) that slides on the edges of said slot (1 c).

13. Assembly comprising:

- a sliding door (P; PV),
- a guide track (B) connected to the door casing,
- a trolley (C) connected to said door and sliding inside said guide track,
- a device (A) according to any one of the preceding claims, which connects said trolley (C) to said door (P; PV) and allows for adjusting the height of the trolley (C).





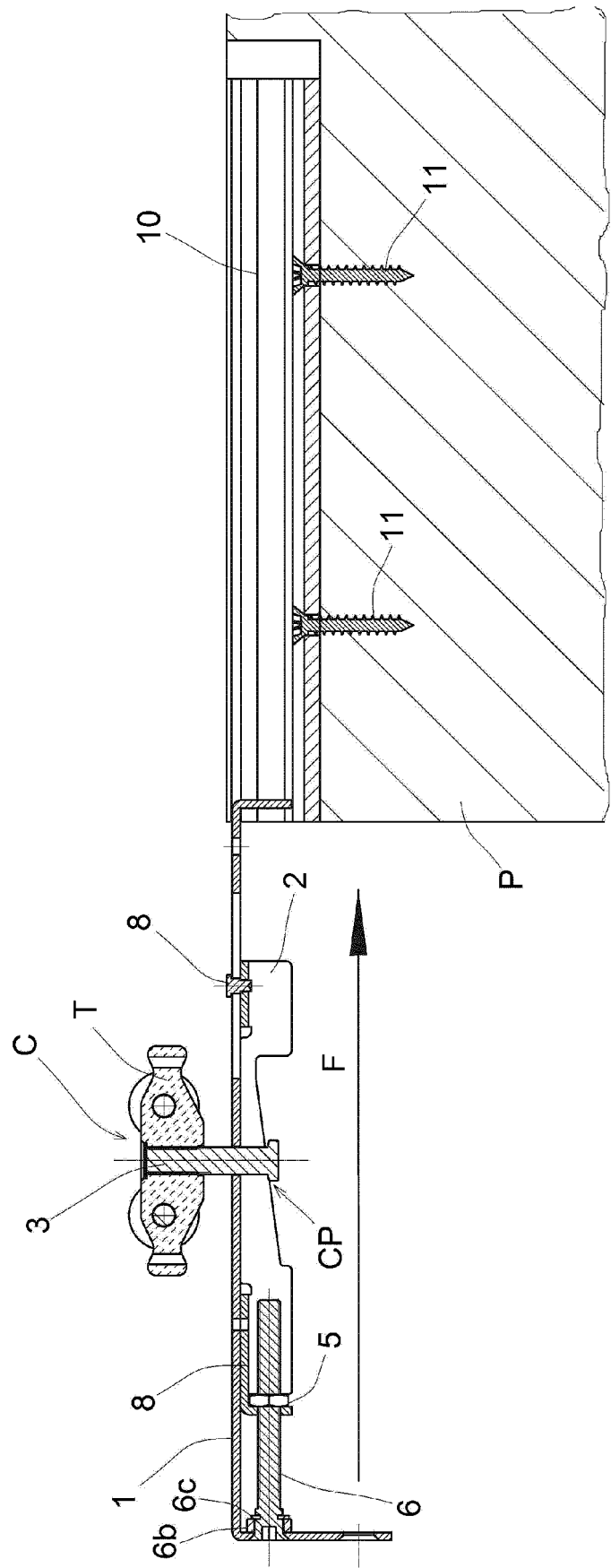


FIG. 3

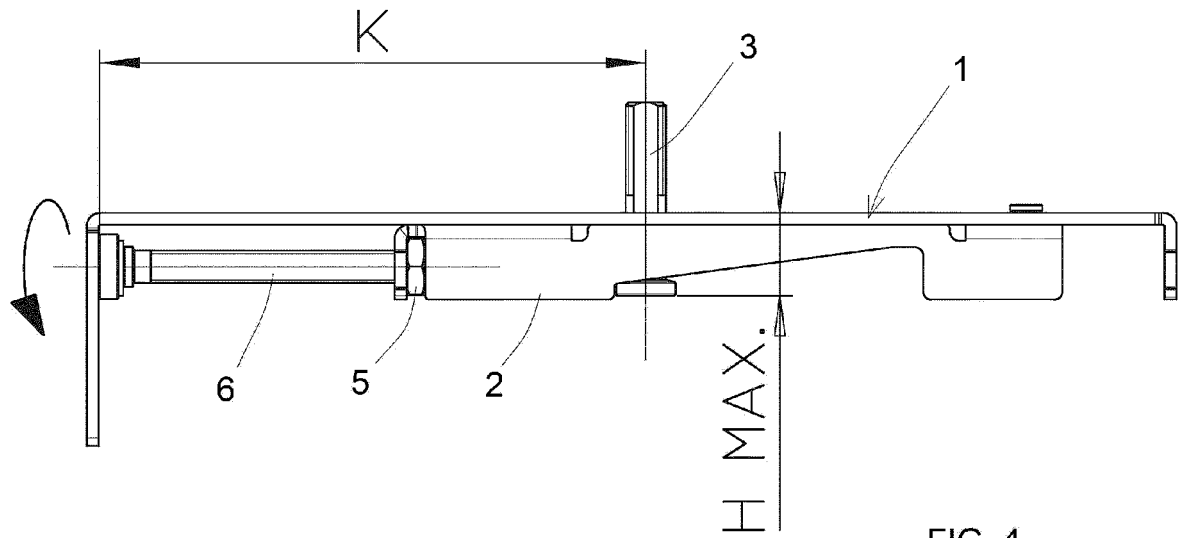


FIG. 4

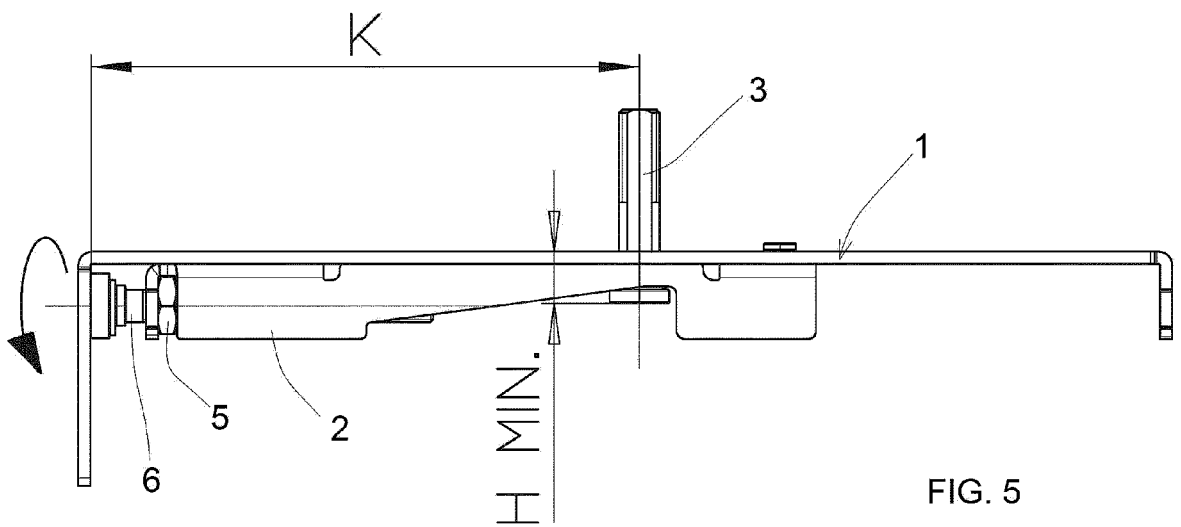


FIG. 5

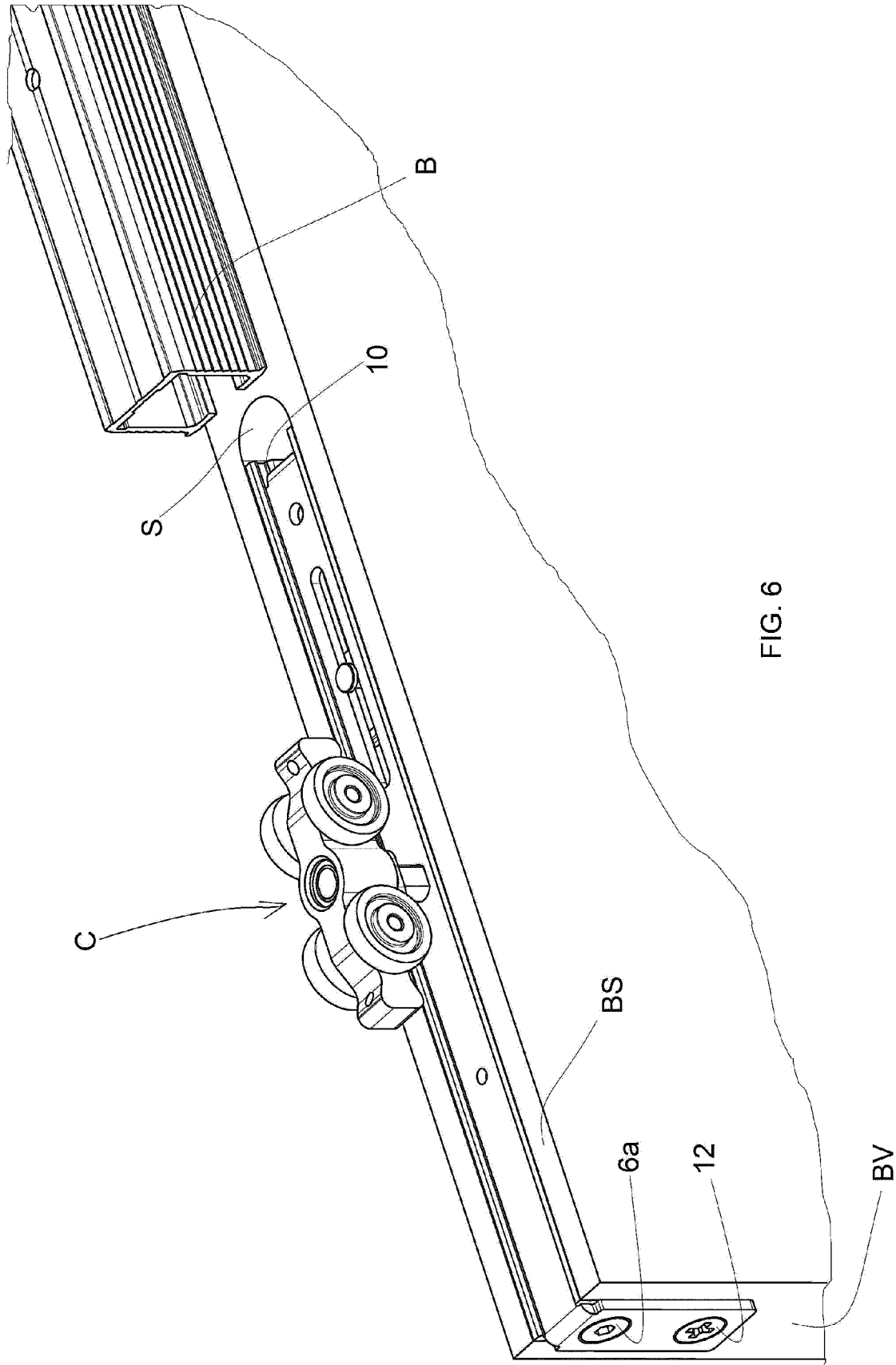


FIG. 6

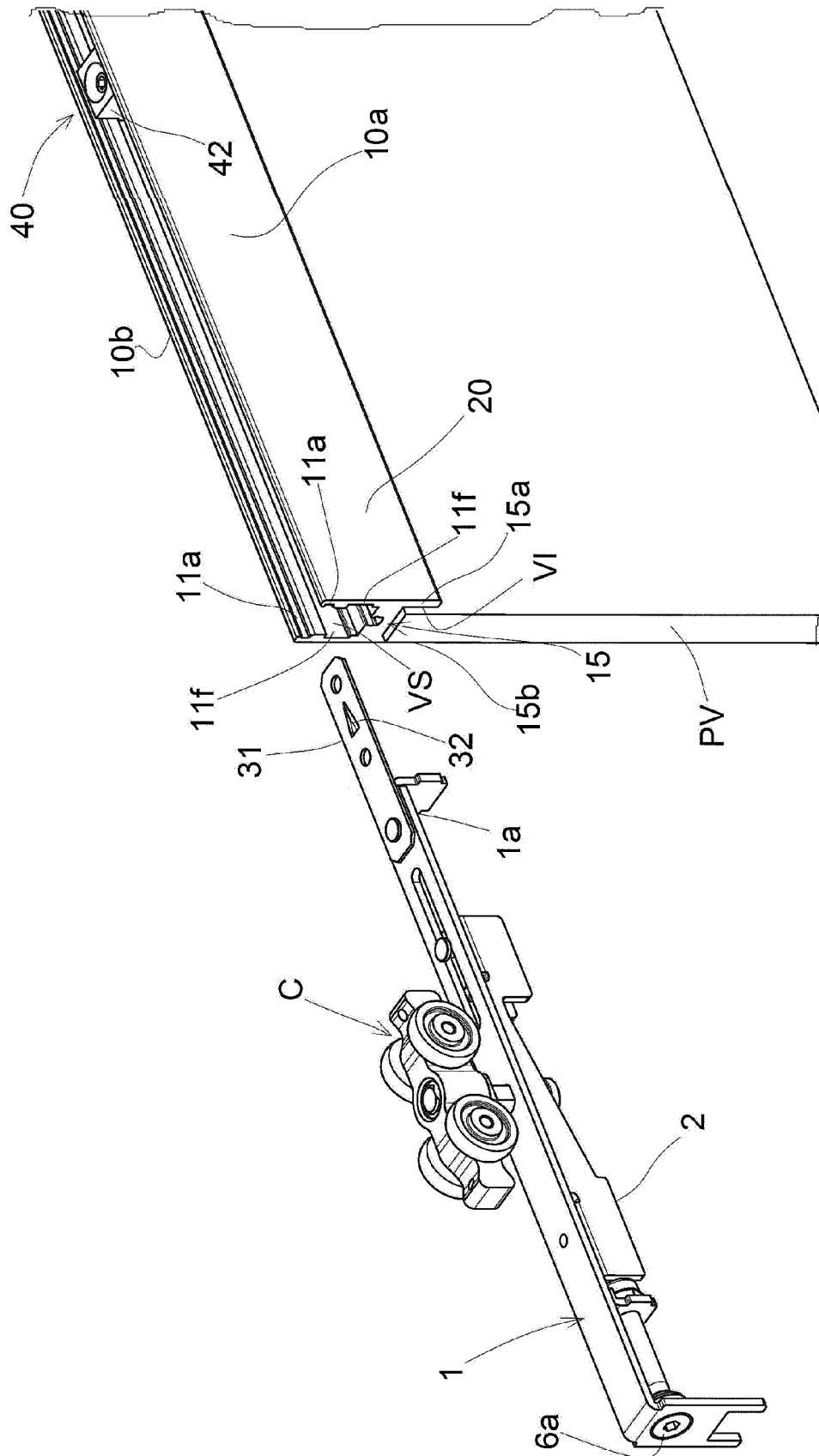
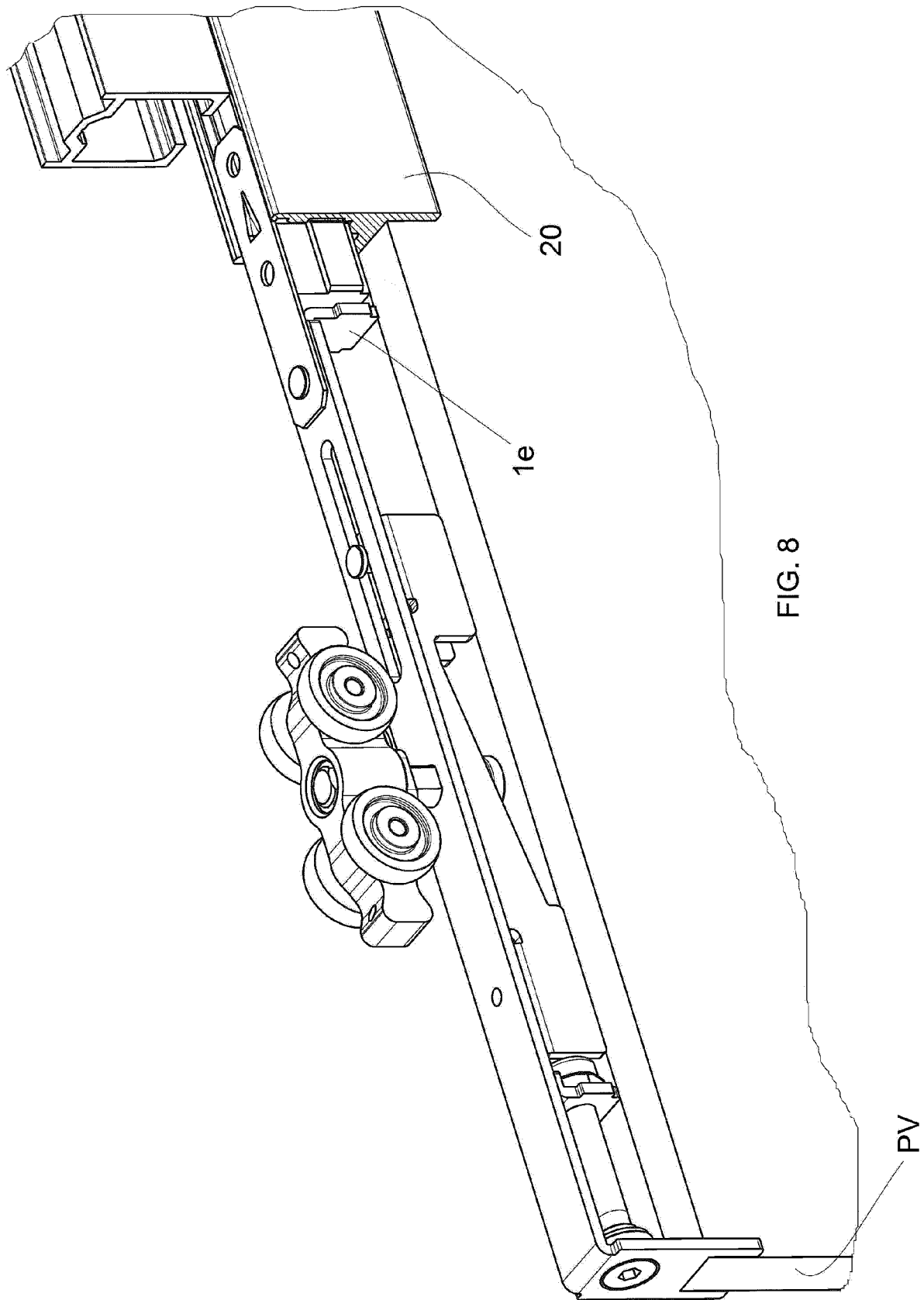


FIG. 7





EUROPEAN SEARCH REPORT

Application Number
EP 14 16 3766

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			E05D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 23 May 2014	Examiner Mund, André
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.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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