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(54) Connecting mechanism for connecting a movable wing to a fixed frame

(57) A connecting mechanism (1) for connecting a movable wing (2) to a fixed frame (3), the connecting mechanism (1) having at least one connecting rod (9, 10) hinged at one end to the frame (3) and at the opposite end to the wing (2); a guide (11) integral with the frame (3); and a carriage (12) mounted to run along the guide (11) and connected mechanically to the wing (2) to allow the wing (2) to rotate with respect to the carriage (12); and the carriage (12) has a pin (14) integral with the carriage (12) and engaging a seat (15) on the wing (2) to rotate with respect to the seat (15).

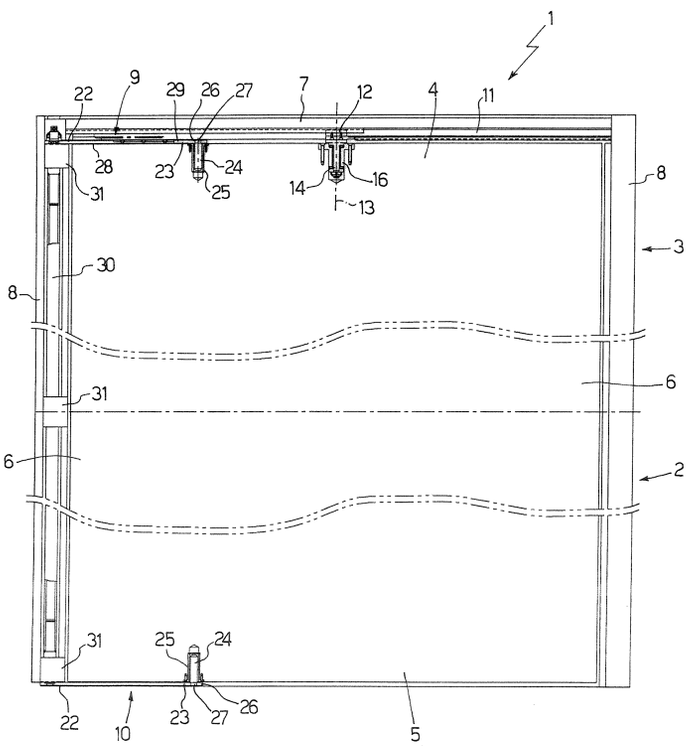

Fig.1

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Description

[0001] The present invention relates to a connecting mechanism for connecting a movable wing to a fixed frame.

[0002] The present invention may be used to advantage for connecting a door to a fixed frame, to which the following description refers purely by way of example.

[0003] The mechanism connecting a door to a fixed frame traditionally comprises at least two hinges, which are each fixed on one side to the frame, and on the opposite side to the same end of the door, so that the door can only rotate with respect to the fixed frame about a fixed vertical axis. Though widely used, by being cheap and easy to produce, this type of connecting mechanism has various drawbacks, in that it normally only allows the door to be opened in one direction, and, above all, a good deal of space must be left clear on one side for the door to open.

[0004] To open a door in both directions and, above all, to greatly reduce the size of the door as it is opened, mechanisms for connecting a door to a fixed frame have been proposed whereby the door performs a rotary-translatory movement, i.e. a combined rotation-translation movement, with respect to the fixed frame.

[0005] One example of a connecting mechanism for rotating and translating a door is described in Patent EP-0674077-B1, in which the connecting mechanism comprises two connecting rods, each hinged at one end to the frame and at the opposite end to the door; a guide integral with the frame; and a carriage mounted to run along the guide and connected mechanically to the door to allow the door to rotate with respect to the carriage. More specifically, the carriage is fitted with a vertical pin, which is mounted to rotate with respect to the carriage, and is connected rigidly to the door.

[0006] Another example of a connecting mechanism for rotating and translating a door is described in Patent Application FR-2846028-A1, which differs from Patent EP-0674077-B1 by comprising at least one rolling member interposed between the carriage and the lateral walls of the guide.

[0007] The connecting mechanisms described above have various drawbacks, by being complicated and expensive to produce and install.

[0008] It is an object of the present invention to provide a connecting mechanism for connecting a movable wing to a fixed frame, which is cheap and easy to produce and, at the same time, eliminates the aforementioned drawbacks.

[0009] According to the present invention, there is provided a connecting mechanism for connecting a movable wing to a fixed frame, as claimed in the accompanying Claims.

[0010] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a schematic front view of a connecting mechanism for connecting a door to a fixed frame, in accordance with the present invention;

Figure 2 shows a top plan view of the Figure 1 door in a closed position and a first open position;

Figure 3 shows a larger-scale section of a detail of the Figure 1 connecting mechanism;

Figure 4 shows a larger-scale section of a further detail of the Figure 1 connecting mechanism;

Figure 5 shows an exploded view of a connecting rod of the Figure 1 connecting mechanism.

[0011] Number 1 in Figure 1 indicates as a whole a connecting mechanism for connecting a door 2 to a fixed frame 3. Connecting mechanism 1 allows door 2 to move, with respect to frame 3, between a closed position (shown in Figure 1), in which door 2 is fully inserted inside frame 3 to prevent access through frame 3, and an open position (shown by the dash line in Figure 2), in which door 2 is substantially crosswise to frame 3 to permit access through frame 3.

[0012] Door 2 is parallelepiped-shaped, and comprises a horizontal top wall 4; a horizontal bottom wall 5 parallel to and opposite top wall 4; and two parallel, opposite, vertical lateral walls 6. Frame 3 is in the form of a rectangular border having a horizontal top cross member 7 parallel to and facing horizontal top wall 4 of door 2 when door 2 is in said closed position; and two parallel, opposite, vertical lateral posts 8 parallel to and facing lateral walls 6 of door 2 when door 2 is in said closed position.

[0013] Connecting mechanism 1 comprises a top connecting rod 9 and a bottom connecting rod 10, each hinged at one end to frame 3 and at the opposite end to door 2; a guide 11 integral with top cross member 7 of frame 3; and a carriage 12 mounted to run along guide 11 and connected mechanically to top wall 4 of door 2 to allow door 2 to rotate with respect to carriage 12 about a vertical axis 13.

[0014] As shown in Figure 3, carriage 12 comprises a vertical pin 14 connected rigidly to, and extending downwards from, carriage 12. Pin 14 is fitted removably to carriage 12, preferably by means of a dovetail joint, so that pin 14 can be withdrawn from carriage 12 in a direction parallel to the travelling direction of carriage 12 along guide 11. In addition to the joint, pin 14 may also be fixed to carriage 12 by one or more screws (not shown).

[0015] As shown in Figure 4, at top wall 4, door 2 comprises a seat 15 connected rigidly to door 2 and for receiving pin 14 of carriage 12 to allow pin 14 to rotate freely about axis 13. More specifically, a connecting body 16 comprises seat 15, and is made integral with top wall 4 of door 2, which, for the purpose, comprises a recess 17 negatively reproducing the shape of connecting body 16, so that connecting body 16 can be inserted/withdrawn inside/from recess 17 of door 2 in a direction parallel to axis 13. Once inserted inside recess

17, connecting body 16 is fixed to door 2 by a number of screws 18 (some of which are shown in Figure 4).

[0016] Seat 15 is defined by a cylindrical hole formed in connecting body 16, which preferably comprises bearings 19 and 20 positioned along and coaxially with seat 15 to receive pin 14 and allow pin 14 to rotate with respect to seat 15 with as little friction as possible. More specifically, connecting body 16 comprises two thrust bearings 19 located at opposite ends of seat 15; and a bearing 20 located centrally between the two thrust bearings 19.

[0017] To prevent axial movement of pin 14 with respect to seat 15 and along axis 13, connecting body 16 comprises a bolt 21, which screws onto an end portion of pin 14 projecting from seat 15 when pin 14 is inserted inside seat 15.

[0018] As shown in Figure 1, each connecting rod 9, 10 has one end 22 hinged to a post 8 of frame 3; and one end 23, opposite end 22, hinged to top wall 4 of door 2 by a pin 24. More specifically, each pin 24 is integral with connecting rod 9, 10, and engages a seat 25, formed in top wall 4 of door 2, so as to rotate with respect to seat 25. The inner surface of each seat 25 is preferably covered with a low-friction material, such as Teflon. Alternatively, each seat 25 may be provided with bearings (not shown). A stop member, preferably defined by an interference fit between pin 24 and seat 25, is provided to limit axial movement of pin 24 with respect to seat 25. For example, both pin 24 and seat 25 are barrel-shaped, so that axial insertion and withdrawal of pin 24 with respect to seat 25 call for a certain amount of force to overcome the dimensional interference.

[0019] Each pin 24 is connected mechanically to connecting rod 9, 10, so that the position of pin 24 is adjustable with respect to connecting rod 9, 10. More specifically, each connecting rod 9, 10 comprises a through hole 26, and pin 24 comprises a connecting member 27 fitted eccentrically to pin 24 and for engaging through hole 26 in connecting rod 9, 10.

[0020] As shown in Figure 5, top connecting rod 9 is divided into a portion 28 hinged to fixed frame 3, and a portion 29 hinged to door 2, and comprises a releasable connecting member for rigidly connecting the two portions 28, 29 of connecting rod 9, and which in turn comprises both a mechanical joint and a number of screws. The two portions 28, 29 of connecting rod 9 are preferably overlapped for connection to each other. Bottom connecting rod 10 may also be divided into two portions, in the same way as top connecting rod 9.

[0021] The connecting mechanism also comprises a tubular member 30 located laterally with respect to door 2, connected to a lateral post 8 of frame 3, and for supporting connecting rods 9 and 10. As shown in Figure 1, ends 22 of connecting rods 9 and 10 are connected rigidly (e.g. by screws) to tubular member 30; and tubular member 30 is connected in rotary manner to lateral post 8 of frame 3 by means of three connecting bodies 31 (e.g. bushings). In an alternative embodiment not shown, tubular member 30 is integral with lateral post 8 of frame 3, and ends 22 of connecting rods 9 and 10 are connected in rotary manner to tubular member 30.

[0022] Connecting mechanism 1 as described above has numerous advantages : in particular, it is cheap and easy to produce (i.e. involves no complicated machining, and employs substantially standard commercial component parts), and is quick and easy to install.

[0023] In the accompanying drawings, connecting mechanism 1 is used to connect a door 2 to fixed frame 3. In alternative embodiments not shown, however, connecting mechanism 1 as described above may also be used to connect a window or a furniture door to a fixed frame.

Claims

1. A connecting mechanism (1) for connecting a movable wing (2) to a fixed frame (3), the connecting mechanism (1) comprising at least one connecting rod (9, 10) hinged at one end to the frame (3) and at the opposite end to the wing (2); a guide (11) integral with the frame (3); and a carriage (12) mounted to run along the guide (11) and connected mechanically to the wing (2) to allow the wing (2) to rotate with respect to the carriage (12); the connecting mechanism (1) being **characterized in that** the carriage (12) comprises a first pin (14) integral with the carriage (12) and engaging a first seat (15) on the wing (2) to rotate with respect to the first seat (15).

2. A connecting mechanism (1) as claimed in Claim 1, wherein the first pin (14) is fitted removably to the carriage (12).

3. A connecting mechanism (1) as claimed in Claim 1 or 2, wherein the first pin (14) is fitted to the carriage (12) by means of a joint.

4. A connecting mechanism (1) as claimed in Claim 3, wherein the first pin (14) is fitted to the carriage (12) by means of a dovetail joint.

5. A connecting mechanism (1) as claimed in Claim 3 or 4, wherein the first pin (14) is removable from the carriage (12) in a direction parallel to the travelling direction of the carriage (12) along the guide (11).

6. A connecting mechanism (1) as claimed in one of Claims 1 to 5, and comprising a connecting body (16) made integral with the wing (2) and having the first seat (15); the wing (2) having a recess (17) negatively reproducing the shape of the connecting body (16).

7. A connecting mechanism (1) as claimed in Claim 6,

wherein the first seat (15) is defined by a cylindrical hole formed in the connecting body (16).

8. A connecting mechanism (1) as claimed in Claim 7, wherein the connecting body (16) comprises at least one bearing (19, 20) coaxial with the first seat (15) and located along the first seat (15).

9. A connecting mechanism (1) as claimed in Claim 8, wherein the connecting body (16) comprises two thrust bearings (19) located at opposite ends of the first seat (15).

10. A connecting mechanism (1) as claimed in Claim 8, wherein the connecting body (16) comprises two thrust bearings (19) located at opposite ends of the first seat (15); and a further bearing (20) located centrally between the two thrust bearings (19).

11. A connecting mechanism (1) as claimed in Claim 7, 8 or 9, wherein the connecting body (16) comprises first stop means (21) for preventing axial movement of the first pin (14) with respect to the first seat (15).

12. A connecting mechanism (1) as claimed in Claim 11, wherein the first stop means (21) are defined by a bolt, which screws onto an end portion of the first pin (14) projecting from the first seat (15) when the first pin (14) is inserted inside the first seat (15).

13. A connecting mechanism (1) as claimed in one of Claims 6 to 12, wherein the connecting body (16) is removable from the wing (2) in a direction parallel to the extension direction (13) of the first pin (14).

14. A connecting mechanism (1) as claimed in one of Claims 1 to 13, wherein the connecting rod (9, 10) has a first end (22) hinged to the frame (3); and a second end (23), opposite the first end (22), hinged to the wing (2) by a second pin (24).

15. A connecting mechanism (1) as claimed in Claim 14, wherein the second pin (24) is connected mechanically to the connecting rod (9, 10), so that the position of the second pin (24) is adjustable with respect to the connecting rod (9, 10).

16. A connecting mechanism (1) as claimed in Claim 15, wherein the connecting rod (9, 10) has a through hole (26), and the second pin (24) has a connecting member (27) for engaging the through hole (26) in the connecting rod (9, 10); the connecting member (27) being fitted eccentrically to the second pin (24).

17. A connecting mechanism (1) as claimed in Claim 14, 15 or 16, wherein the second pin (24) is integral with the connecting rod (9, 10), and engages a second seat (25) on the wing (2) to rotate with respect to the second seat (25).

18. A connecting mechanism (1) as claimed in Claim 17, wherein the inner surface of the second seat (25) is covered with a low-friction material.

19. A connecting mechanism (1) as claimed in one of Claims 14 to 18, wherein second stop means are provided to limit axial movement of the second pin (24) with respect to the second seat (25).

20. A connecting mechanism (1) as claimed in Claim 19, wherein the second stop means define an interference fit between the second pin (24) and the second seat (25).

21. A connecting mechanism (1) as claimed in one of Claims 1 to 20, wherein the connecting rod (9, 10) is divided into a first portion (28) hinged to the frame (3), and a second portion (29) hinged to the wing (2); the connecting rod (9, 10) comprising releasable connecting means for rigidly connecting the first and second portion (28, 29) of the connecting rod (9, 10) to each other.

22. A connecting mechanism (1) as claimed in Claim 21, wherein the connecting means comprise a number of screws.

23. A connecting mechanism (1) as claimed in Claim 21 or 22, wherein the connecting means comprise a mechanical joint.

24. A connecting mechanism (1) as claimed in Claim 21, 22 or 23, wherein the first and second portion (28, 29) of the connecting rod (9, 10) are overlapped for connection to each other.

25. A connecting mechanism (1) as claimed in one of Claims 1 to 24, and comprising a tubular member (30), which is located laterally with respect to the wing (2), is connected to the frame (3), and supports the connecting rod (9, 10).

26. A connecting mechanism (1) as claimed in Claim 25, wherein the tubular member (30) is integral with the frame (3), and one end of the connecting rod (9, 10) is connected in rotary manner to the tubular member (30).

27. A connecting mechanism (1) as claimed in Claim 25, wherein the tubular member (30) is fitted in rotary manner to the frame (3), and one end of the connecting rod (9, 10) is connected rigidly to the tubular member (30).

28. A connecting mechanism (1) as claimed in one of Claims 1 to 27, and comprising two connecting rods

(9, 10) located on opposite sides of the wing (2).

29. A connecting mechanism (1) for connecting a movable wing (2) to a fixed frame (3), the connecting mechanism (1) comprising at least one connecting rod (9, 10) hinged at one end to the frame (3) and at the opposite end to the wing (2); a guide (11) integral with the frame (3); and a carriage (12) mounted to run along the guide (11) and connected mechanically to the wing (2) to allow the wing (2) to rotate with respect to the carriage (12); the connecting mechanism (1) being **characterized in that** the carriage (12) comprises a first pin (14) fitted removably to the carriage (12).

30. A connecting mechanism (1) as claimed in Claim 29, wherein the first pin (14) is fitted to the carriage (12) by means of a joint.

31. A connecting mechanism (1) as claimed in Claim 30, wherein the first pin (14) is fitted to the carriage (12) by means of a dovetail joint.

32. A connecting mechanism (1) as claimed in Claim 29, 30 or 31, wherein the first pin (14) is removable from the carriage (12) in a direction parallel to the travelling direction of the carriage (12) along the guide (11).

33. A connecting mechanism (1) for connecting a movable wing (2) to a fixed frame (3), the connecting mechanism (1) comprising at least one connecting rod (9, 10) hinged at one end to the frame (3) and at the opposite end to the wing (2); a guide (11) integral with the frame (3); and a carriage (12) mounted to run along the guide (11) and connected mechanically to the wing (2) to allow the wing (2) to rotate with respect to the carriage (12); the connecting mechanism (1) being **characterized by** comprising a connecting body (16) made integral with the wing (2) and having a first seat (15); the wing (2) having a recess (17) negatively reproducing the shape of the connecting body (16); and the connecting body (16) being removable from the wing (2) in a direction parallel to the extension direction (13) of a first pin (14).

34. A connecting mechanism (1) as claimed in Claim 33, wherein the connecting body (16) comprises first stop means (21) for preventing axial movement of the first pin (14) with respect to the first seat (15).

35. A connecting mechanism (1) as claimed in Claim 34, wherein the first stop means (21) are defined by a bolt, which screws onto an end portion of the first pin (14) projecting from the first seat (15) when the first pin (14) is inserted inside the first seat (15).

36. A connecting mechanism (1) for connecting a movable wing (2) to a fixed frame (3), the connecting mechanism (1) comprising at least one connecting rod (9, 10) hinged at one end to the frame (3) and at the opposite end to the wing (2); a guide (11) integral with the frame (3); and a carriage (12) mounted to run along the guide (11) and connected mechanically to the wing (2) to allow the wing (2) to rotate with respect to the carriage (12); the connecting rod (9, 10) having a first end (22) hinged to the frame (3), and a second end (23), opposite the first end (22), hinged to the wing (2) by a second pin (24); the connecting mechanism (1) being **characterized in that** the second pin (24) is connected mechanically to the connecting rod (9, 10), so that the position of the second pin (24) is adjustable with respect to the connecting rod (9, 10).

37. A connecting mechanism (1) as claimed in Claim 36, wherein the connecting rod (9, 10) has a through hole (26), and the second pin (24) has a connecting member (27) for engaging the through hole (26) in the connecting rod (9, 10); the connecting member (27) being fitted eccentrically to the second pin (24).

38. A connecting mechanism (1) as claimed in Claim 36 or 37, wherein the second pin (24) is integral with the connecting rod (9, 10), and engages a second seat (25) on the wing (2) to rotate with respect to the second seat (25).

39. A connecting mechanism (1) as claimed in Claim 38, wherein the inner surface of the second seat (25) is covered with a low-friction material.

40. A connecting mechanism (1) as claimed in one of Claims 36 to 39, wherein second stop means are provided to limit axial movement of the second pin (24) with respect to the second seat (25).

41. A connecting mechanism (1) as claimed in Claim 40, wherein the second stop means define an interference fit between the second pin (24) and the second seat (25).

42. A connecting mechanism (1) for connecting a movable wing (2) to a fixed frame (3), the connecting mechanism (1) comprising at least one connecting rod (9, 10) hinged at one end to the frame (3) and at the opposite end to the wing (2); a guide (11) integral with the frame (3); and a carriage (12) mounted to run along the guide (11) and connected mechanically to the wing (2) to allow the wing (2) to rotate with respect to the carriage (12); the connecting mechanism (1) being **characterized in that** the connecting rod (9, 10) is divided into a first portion (28) hinged to the frame (3), and a second portion (29) hinged to the wing (2); the connecting rod (9,

10) comprising releasable connecting means for rigidly connecting the first and second portion (28, 29) of the connecting rod (9, 10) to each other.

43. A connecting mechanism (1) as claimed in Claim 42, wherein the connecting means comprise a number of screws.

44. A connecting mechanism (1) as claimed in Claim 42 or 43, wherein the connecting means comprise a mechanical joint.

45. A connecting mechanism (1) as claimed in Claim 42, 43 or 44, wherein the first and second portion (28, 29) of the connecting rod (9, 10) are overlapped for connection to each other.

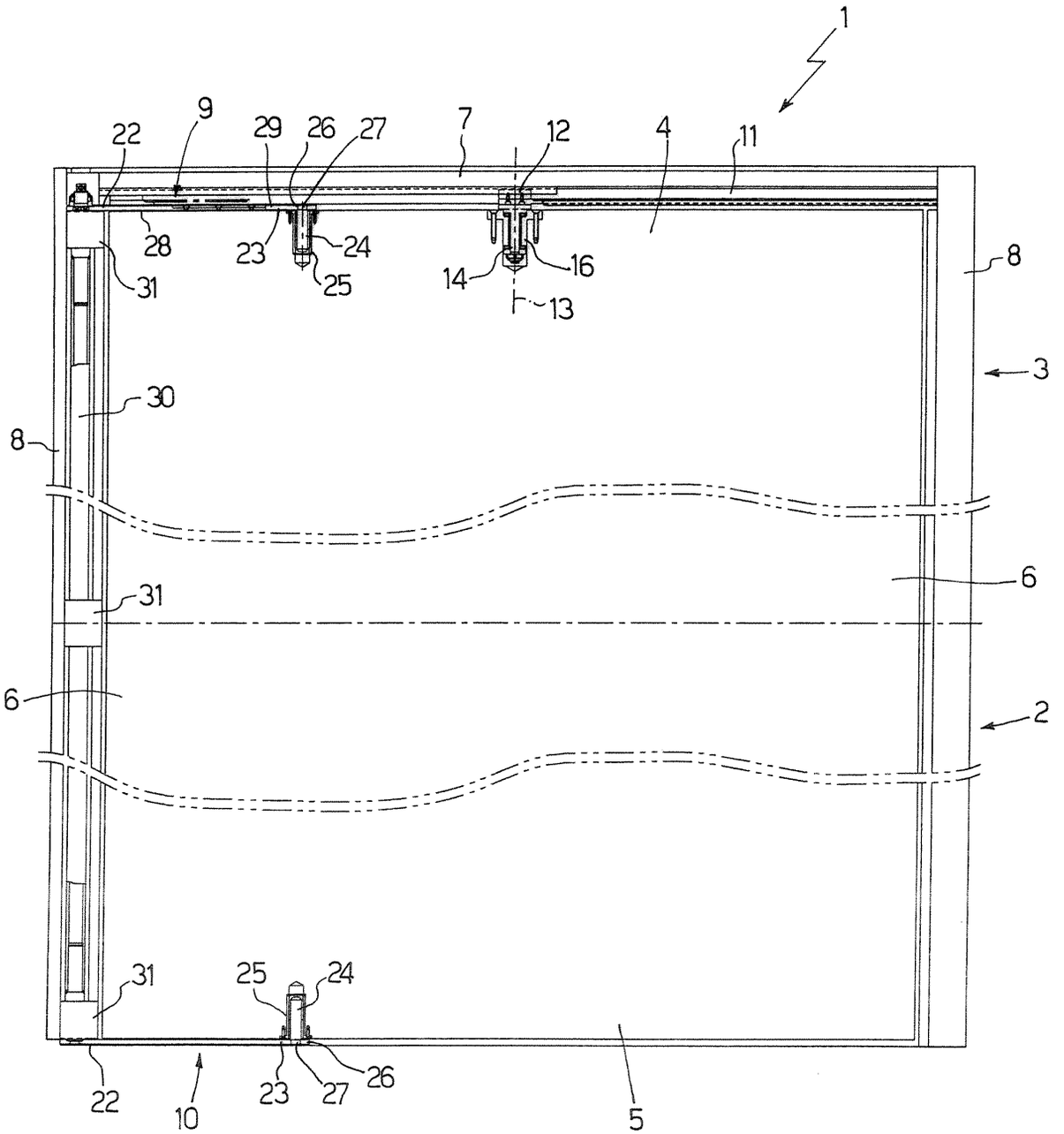
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Fig.1

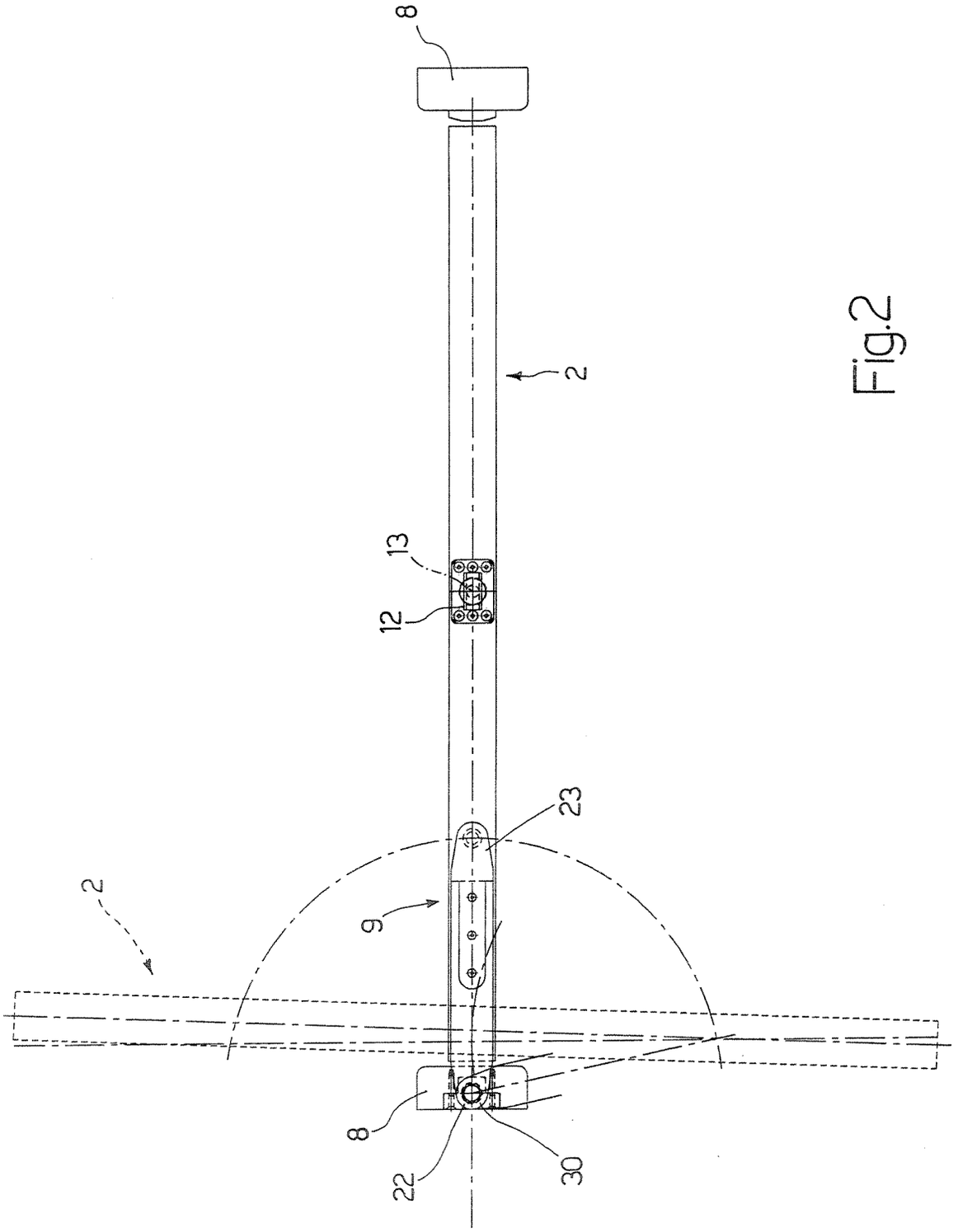


Fig.2

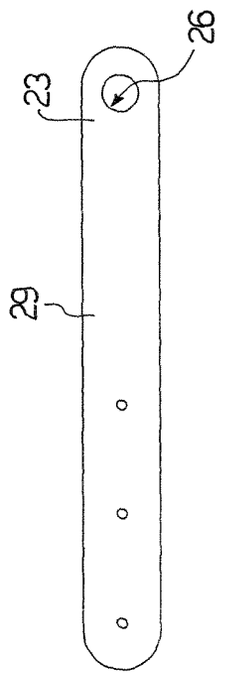
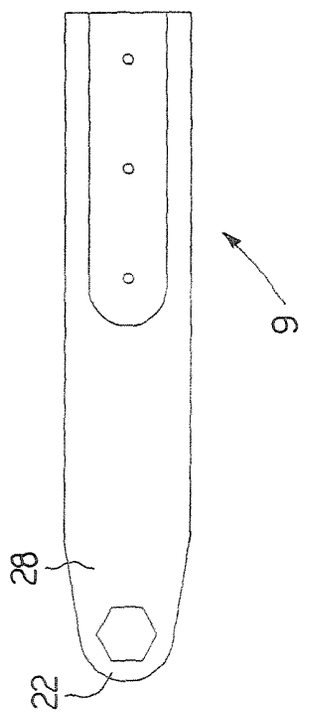


Fig.5



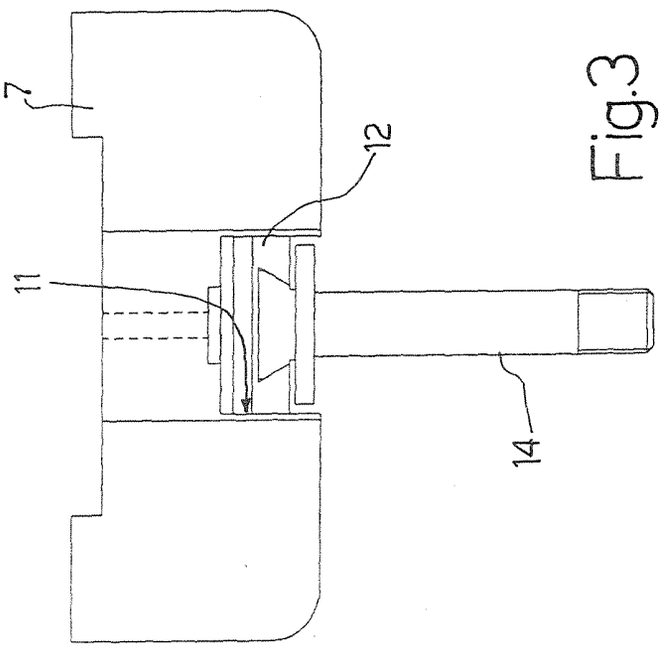


Fig.3

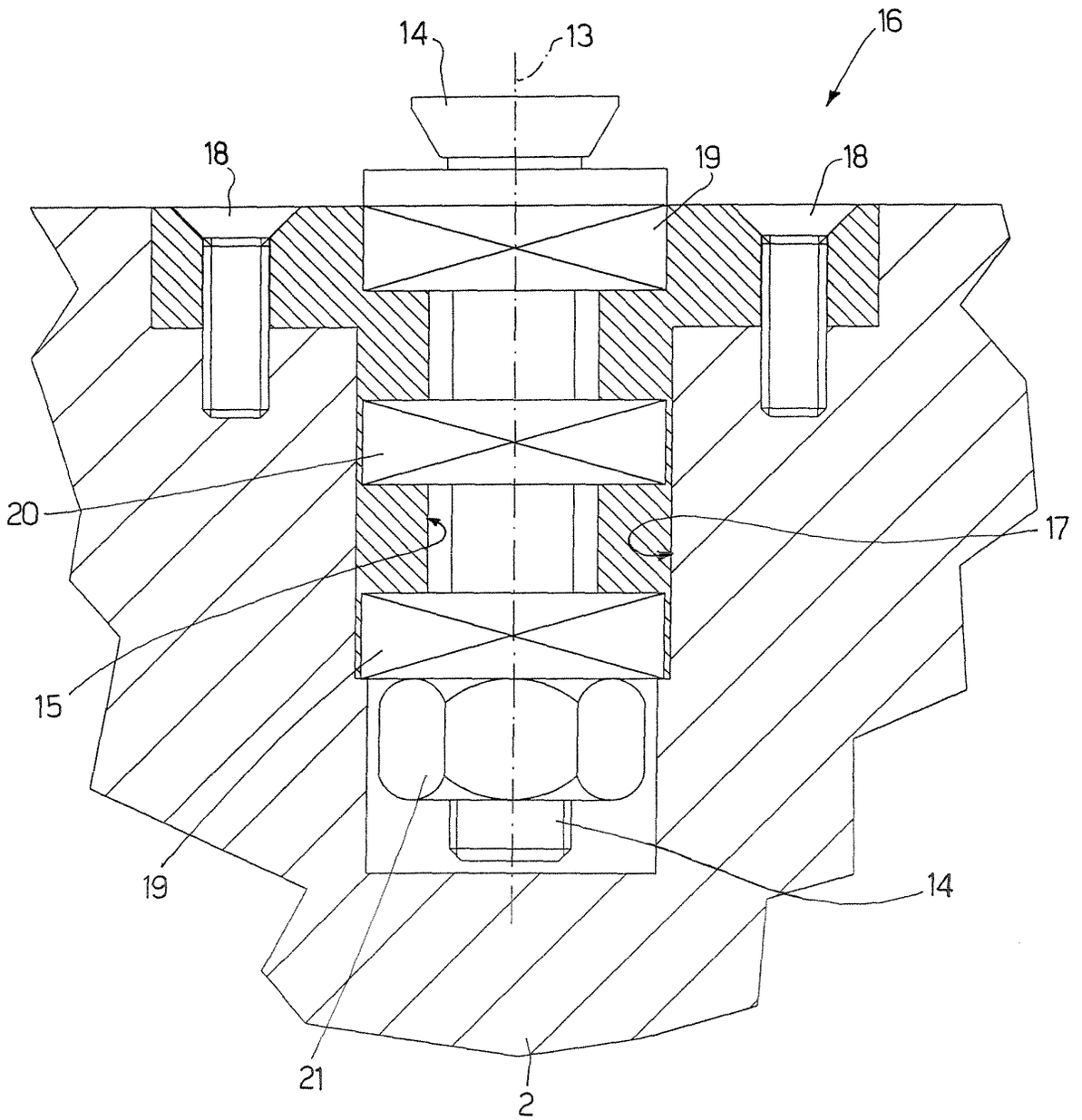


Fig.4