



(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.09.2002 Bulletin 2002/38

(51) Int Cl.⁷: **E05D 15/06**

(21) Application number: **01130522.4**

(22) Date of filing: **21.12.2001**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
 MC NL PT SE TR**
 Designated Extension States:
AL LT LV MK RO SI

(72) Inventor: **Zappa, Roberto, Dr.-Ing.**
24046 Osio Sotto, Bergamo (IT)

(74) Representative:
Klingseisen, Franz, Dipl.-Ing. et al
Patentanwälte,
Dr. F. Zumstein,
Dipl.-Ing. F. Klingseisen,
Postfach 10 15 61
80089 München (DE)

(30) Priority: 15.03.2001 IT MI010145 U

(71) Applicant: **SEMATIC ITALIA S.p.A.**
24046 Osio Sotto, (Bergamo) (IT)

(54) **Sliding device for elevator doors**

(57) Sliding device for door leaves (10) of elevators, which is fitted in the region of one or both of the upper and/or lower guides for the movement of opening and closing of the door leaves, wherein the sliding device comprises at least one linear sliding bearing (22, 22') or a linear ball bearing (33, 35).

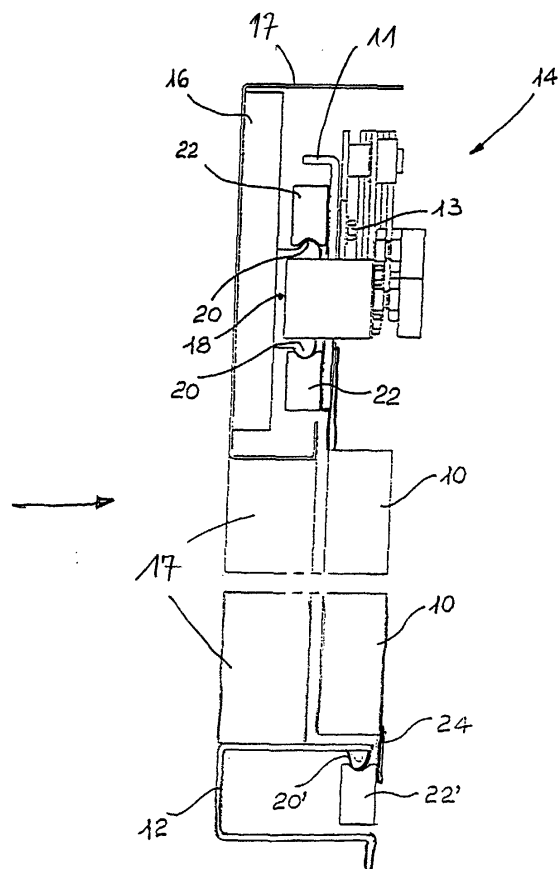


FIG. 1

Description

[0001] This invention relates to a sliding device for elevator doors.

[0002] In particular, this invention relates to a sliding device for elevator doors opening from the side or in the middle, which sliding device can be fitted in the region of the upper and/or lower guide of a door.

[0003] It is known that the doors of elevators consist of one or a plurality of door leaves which, for opening and closing, are slidably displaced on suitable, horizontally extending guides. In the upper part of the door, in the region of the mechanism for opening and closing, a first guide is arranged, which generally consists of two sliding fits, arranged one above the other, for one holding element of the door leaf or of the door leaves. In the lower part of the cabin, in the region of the doorsill, a second guide or sliding rail for the door leaf or the door leaves is inserted. This guide consists conventionally of metal profiles, which are provided with one or a plurality of horizontally extending recesses which are suitable for receiving conventional plastic or metal rollers. On these rollers, when being opened and closed, the door leaves are displaced by an electric motor which belongs to the drive unit of the control part.

[0004] This known solution has several considerable disadvantages, which are essentially connected with the use of said rollers as sliding parts.

[0005] In other words, these rollers have the unavoidable tendency to wear, sometimes even unevenly, causing the precision of the movement when opening and closing the door leaves to suffer. The resultant play cannot be removed and further an undesired noisiness of the general arrangement arises, which results in complicated replacement work becoming necessary.

[0006] Further, the rollers have constructional limitations regarding the supporting capacity of loads. In the case of heavy door leaves, for example made of crystal, in order to obtain an appropriate quality of rolling movement, over-dimensioned rollers have to be provided, resulting in an increased spatial requirement.

[0007] The present invention has the object of removing the above mentioned disadvantages.

[0008] In particular, this invention has the object of providing a sliding device for elevator doors, wherein the members which render possible the movement of the door leaves along the guides, guarantee a constant, precise movement and prevent advancing signs of deterioration.

[0009] A further object of this invention is to provide a device as described above which is suitable for still rendering it possible for this movement to be noiseless even after opening and closing of the door leaves many times.

[0010] Not least, this invention has the object of providing a device suitable for sustaining considerable loads without demanding an increased spatial requirement.

[0011] Further, this invention has the object of making

available a sliding device for elevator doors which can guarantee long durability and reliability and further can be simply and economically manufactured.

[0012] These and further objects are solved by a sliding device for elevator doors according to the invention, which can be fitted in the region of the upper and/or lower guide, which is arranged in the region of one or both of the upper and/or lower guides for the movement of opening and closing of the door leaves, and is essentially characterized in that it consists of at least one linear sliding bearing or a ball bearing.

[0013] Embodiments according to the present invention are shown as an example in more detail by means of the drawings wherein

Fig. 1 shows schematically from a side view a sliding device according to the invention, which as an example is fitted to both guides, the upper and the lower, of an elevator door,

Fig. 2 shows a front view of an elevator door,

Fig. 3 is a longitudinal section along the line I-I in Fig. 2,

Fig. 4 is a cross section along the line II-II in Figure 2.

[0014] In Fig. 1, a leaf 10 of an elevator door is limited below along the entrance side (see arrow) of the elevator space (not shown) by a door sill 12 consisting of a conventional, horizontally extending profiled metal.

[0015] The door leaf 10 is connected at its opposite, upper end with a per se known drive unit 14. The upper sliding guide 18 for the door leaf or door leaves is fixedly joined to a supporting structure 16 of the door, which supporting structure is fixed on a frame 17 of the door. This guide 18, which consists of an elongated bar of metal or another suitable material, has at least one longitudinal rib 20, which forms a guiding rail for the sliding device according to the invention. According to a preferred embodiment in Fig. 1, the guide 18 has preferably two longitudinal ribs 20 located opposite one another, which are aligned towards one another in a vertical direction, have an essentially semicircular, convex profile, and are arranged on the upper and lower side of the guide 18. The sliding device comprises one or a plurality of linear sliding bearings 22 or ball bearings, the surface of which facing the respective rib 20 has a complementary semicircular, concave profile.

[0016] These linear sliding bearings 22 are fitted by means of conventional bolts 13 to a carriage 11, which is connected with the door leaf 10.

[0017] Fig. 1a shows in more detail the guide 18 provided with longitudinal ribs 20 on the upper and lower side and a linear sliding bearing 22. In the embodiment of Figure 1 the carriage is fitted with four bearings of the type with recirculating balls or sliding bearings i.e. by using a type of self lubricating plastic material as it is

shown in Figure 1a.

[0018] At least one analogue sliding device is preferably arranged in the region of the door sill 12. A linear sliding bearing 22' is operatively joined to the door leaf or the door leaves 10 by means of one or a plurality of plate-shaped supporting elements 24 or equivalent means. The door sill 12, which consists, for example, of a profiled metal part with an essentially U-shaped cross section, has an elongated rib 20' which extends inwardly starting from the upper horizontal leg of the profiled sill 12 and forms the lower sliding guide or rail for the door leaf. Analogue to the rib 20 of the guide 18, this rib 20' has an essentially semicircular profile, that is, a profile with a complementary shape to that of the front of the linear sliding bearing 22', which abuts hereon.

[0019] It has been proved that by using the linear sliding bearings 22, 22', optimal movement of the door leaves 10 is guaranteed with regard to longterm precision and noiselessness. Further, such devices are extremely compact and suitable for supporting even heavy loads without a greater spatial requirement.

[0020] The device according to the invention can, for example, be used only in the region of the upper or of the lower sliding guide, in connection with sliding blocks of self lubricating plastic material or with ball bearings of the type with recirculating balls which are arranged functionally along the other guide.

[0021] Figs. 2 to 4 show another embodiment according to the present invention. Fig. 3a shows in detail a bearing rail 30 which has a U-shaped cross section and is fixed by screws 31 in a recess 32 on the upper horizontal part of the frame 17 of the door. Adjacent to the upper end of the door leaf 10 a guiding rail 33 is fastened by means of screw bolts 34. This guiding rail 33 extends along the width of the door leaf 10, whereas the bearing rail 30 extends laterally over the width of the door corresponding to the movement of the door leaf when opening as shown in Fig. 2.

[0022] Both legs of the U-shaped bearing rail 30 are provided on the inner side with a runway for balls 35 which runway has in cross section a concave form corresponding to the radius of the balls 35. In the same way, the upper and lower side of the guiding rail 33 is provided with a runway for the balls 35, which balls 35 are guided in a cage 36 extending essentially along the guiding rail 33. The cage 36 is connected with the guiding rail 33, so that the position of the plurality of balls 35 is maintained in relation to the guiding rail 33 by means of the cage 36.

[0023] The sliding device on the lower side of the door leaf 10 comprises an elongated rib 40 which is provided directly on the lower side of the door leaf 10. This rib 40 is guided between inwardly bent ends 41 of the legs of a U-shaped guiding rail 42 which is inserted in the door sill in such a way that the upper edge of the guiding rail 42 is aligned with the plane of the floor as shown in Fig. 3. In this embodiment, the rib 40 is not a load bearing element, but only a guiding element for the door leaf 10.

[0024] The frame 17 of the door is fastened by means of brackets 50 on the wall 51 of a building or the like. 52 is a cover piece of metal sheet provided as usual in an elevator shaft.

[0025] Figs. 2 and 3 show on the upper part of the door leaves 10 elements of a usual door locking device 14'.

[0026] The linear sliding bearing according to Figs. 3 and 3a has the advantage of an overall reduced number of parts, wherein the sliding device can be directly mounted to the door header 17 and connected to the door panels or door leaves directly, avoiding fitting on door carriages. Further, the overall dimensions of the sliding device are reduced in relation to the embodiment of Fig. 1.

[0027] Due to the reduced number of parts and the reduced dimensions, the maintenance of the device will be reduced as well as the installation time. By using such a monorail system, the door stability at slow and high speed is improved by multiple points of contact at the guiding rail. As a consequence, the noise level is reduced to a minimum. Furthermore, the weight of the sliding device is reduced remarkably, and the device can be manufactured very quickly.

Claims

1. Sliding device for door leaves (10) of elevators, which is fitted in the region of one or both of the upper and/or lower guides for the movement of opening and closing of the door leaves, wherein the sliding device comprises at least one linear sliding bearing (22, 22') or a linear ball bearing (33, 35).
2. Device according to claim 1, wherein a stationary elongated sliding guide (18) is provided at least on the upper side with an elongated rib (20) which cooperates with a linear sliding bearing (22) connected to the door leaf (10).
3. Device according to claim 2, wherein the guide (18) is provided on the upper and the lower side with elongated ribs (20) which cooperate with linear sliding bearings (22).
4. Device according to the preceding claims, wherein at least one linear sliding bearing (22') connected with the lower side of the door leaf (10) cooperates with a longitudinal rib (20'), which extends within the door sill (12).
5. Device according to claims 2 to 4, wherein the elongated ribs (20, 20') have an essentially semicircular, convex profile, and the side of the linear sliding bearing (22) which is in contact with these ribs, has a complementary profile.

6. Device according to claim 1,
wherein adjacent to the upper end of the door leaf
(10) a guiding rail (33) is provided which is guided
by means of a linear sliding bearing in a bearing rail
(30) extending horizontally on a stationary part (17) 5
of the door.
7. Device according to claim 6,
wherein the bearing rail (30) has a U-shaped cross
section, and the guiding rail (33) is guided within the 10
bearing rail (30).
8. Device according to claim 7,
wherein a linear ball bearing is provided for guiding
the guiding rail (33) within the bearing rail (30). 15

20

25

30

35

40

45

50

55

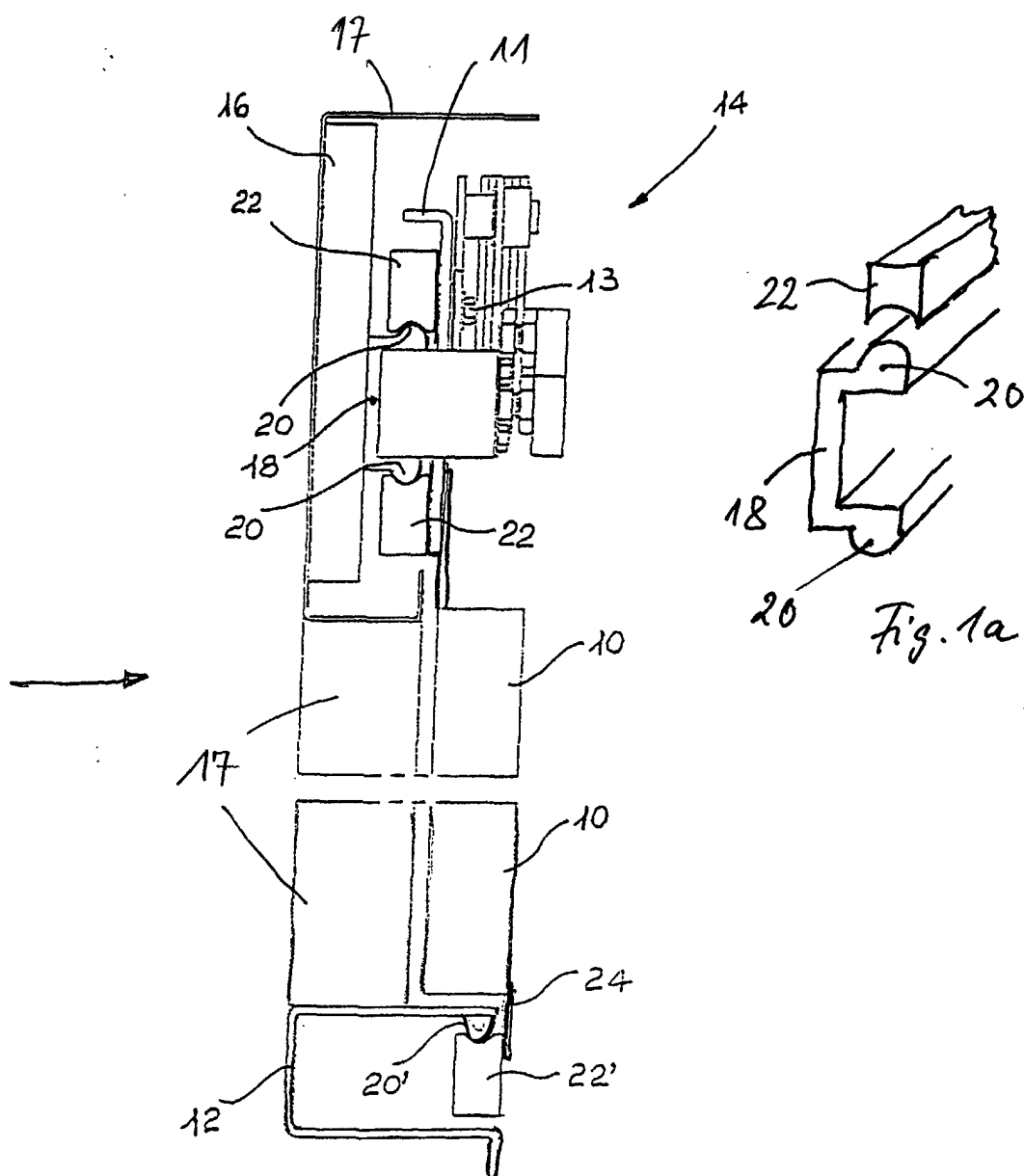
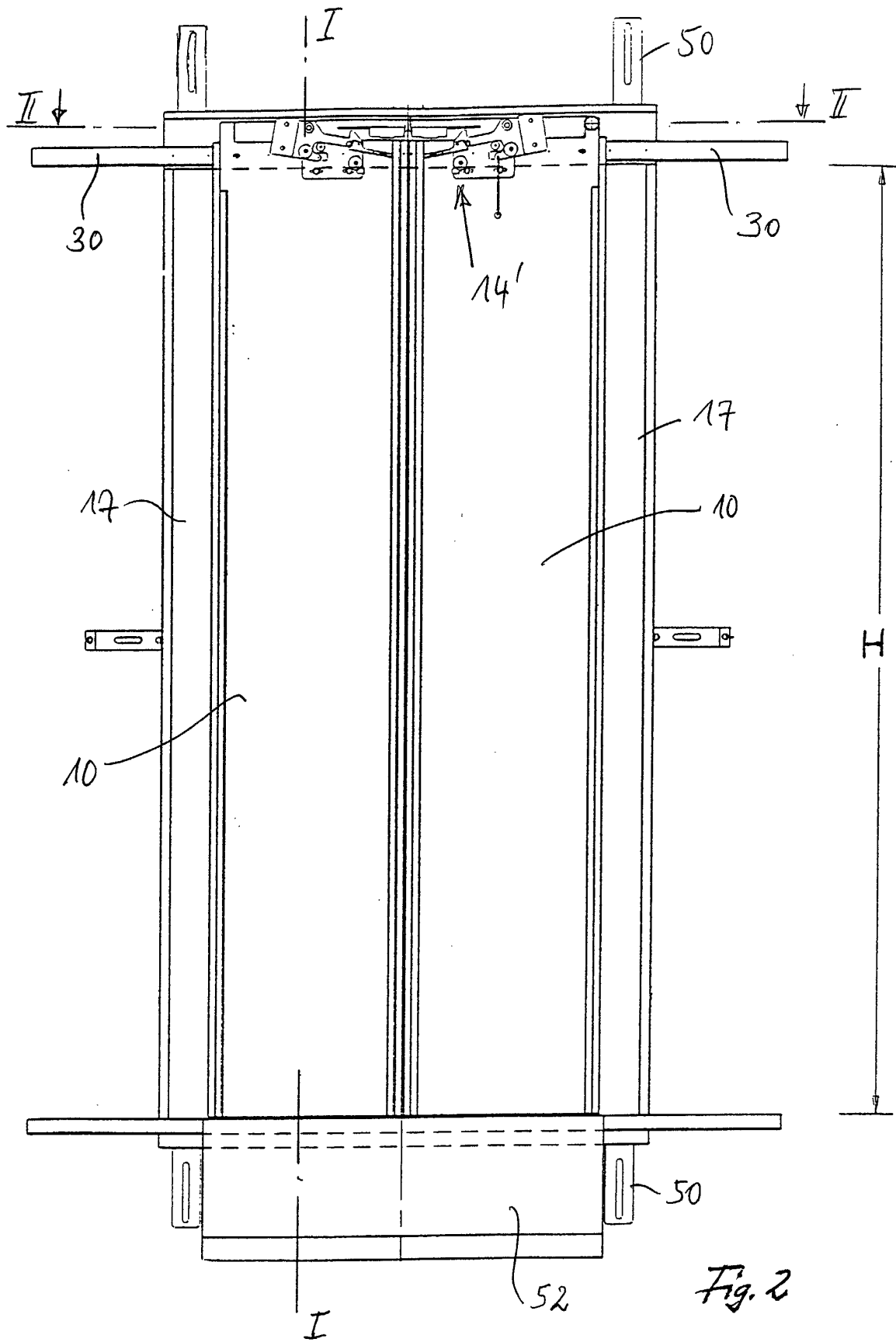
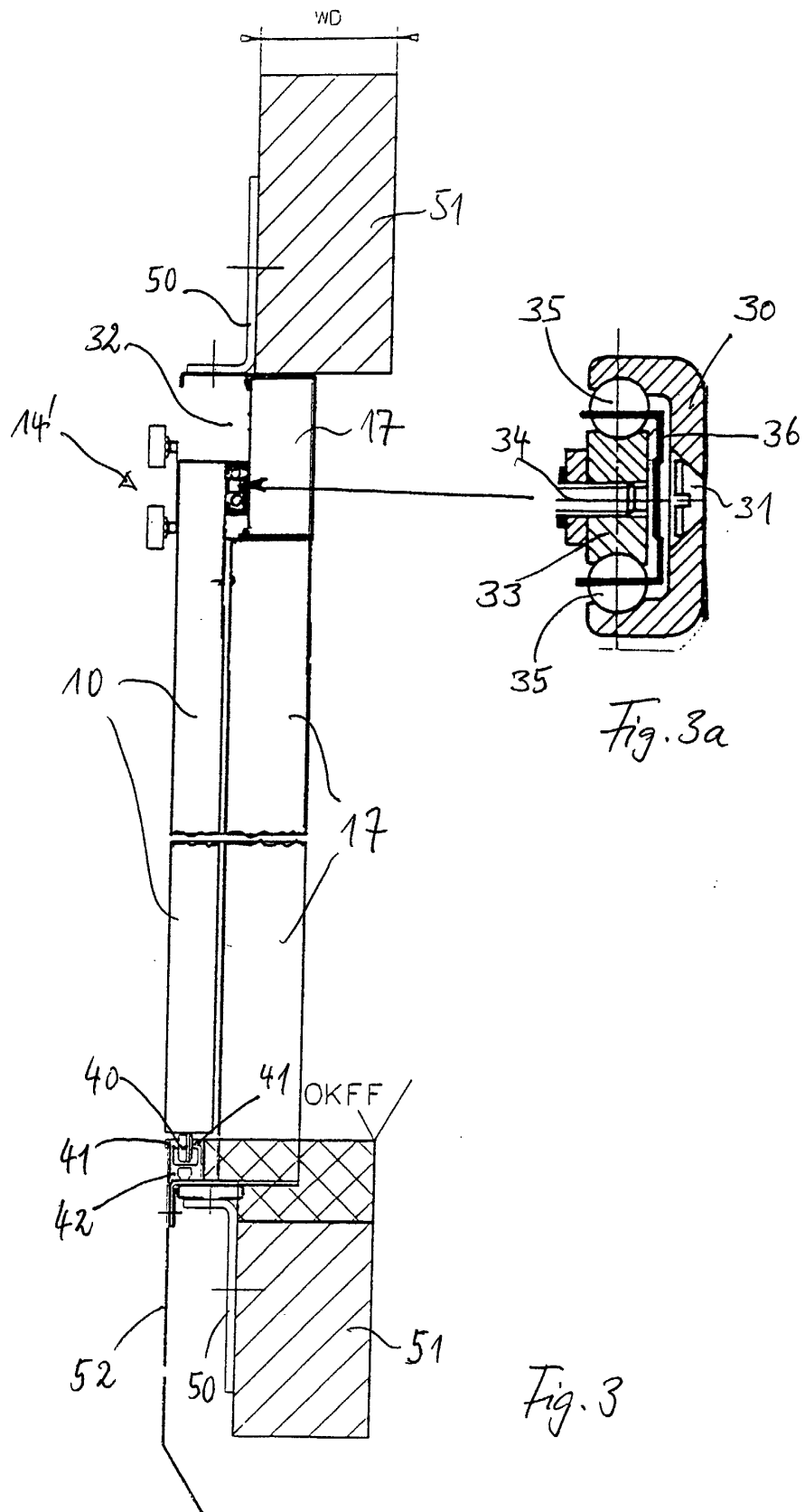


FIG. 1





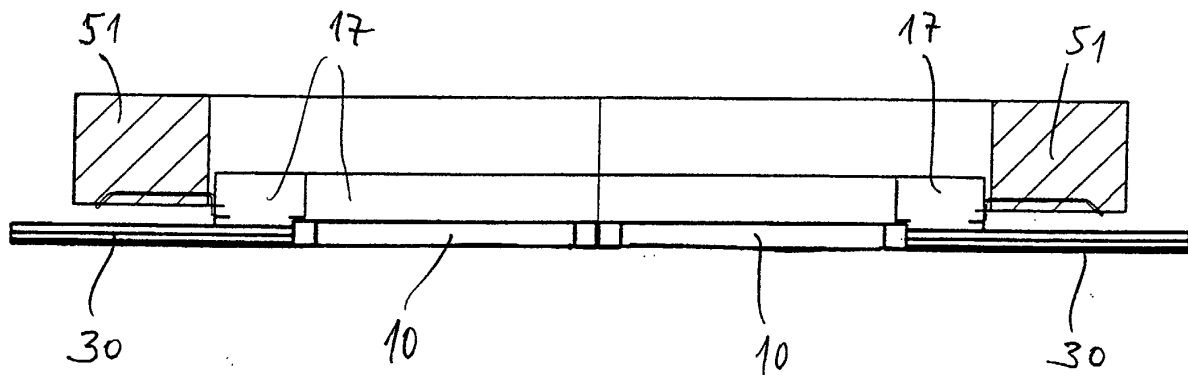


Fig. 4