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

(11) EP 0 874 122 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
28.10.1998 Bulletin 1998/44

(51) Int. Cl.[6]: **E05D 13/00**, E05D 15/24, E05F 1/00

(21) Application number: **98107211.9**

(22) Date of filing: **21.04.1998**

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

(30) Priority: **24.04.1997 IT MI970980**
03.06.1997 IT MI970403 U

(71) Applicant: **Ristolfi, Oscar**
20019 Settimo Milanese, (MI) (IT)

(72) Inventor: **Ristolfi, Oscar**
20019 Settimo Milanese, (MI) (IT)

(74) Representative: **Coloberti, Luigi**
Via E. de Amicis No. 25
20123 Milano (IT)

(54) Balancing and guiding device for sliding doors

(57) A balancing and guiding device (16) for vertically movable doors (10). The door (10) is sliding on tracks (13) vertically extending on both sides, and it is operatively connected to a balancing device; according to an embodiment, the balancing device (16) comprises a vertically movable body member having an upper body portion (17) of constant weight, and a bottom body portion (18) of variable weight, provided by superimposable and hingeably connected plates (23). The tracks (13) for the door are provided by channel members comprising bottom and side walls defining a guide portion (40) and a protective portion (41) partially extending on both faces of the paneling (10) of the door.

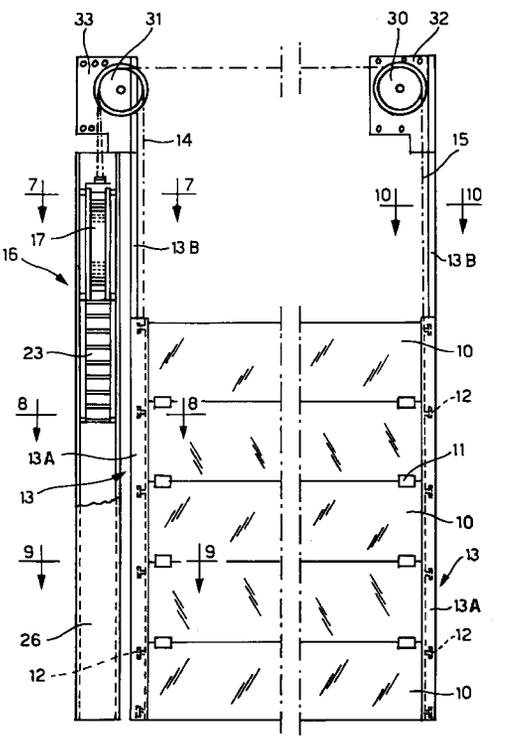

FIG. 1

EP 0 874 122 A2

Description

The present invention relates to a device for the guiding and balancing of variable loads, and in particular it relates to some improvements to sliding doors which are vertically movable along guiding rails or tracks provided on both sides of an aperture or opening in a wall.

For the purposes of the present invention, the term "sliding door" is understood to mean any type of vertically movable partition for the closing of apertures, such as, for example, sectional doors, roll-up doors or entrance doors, shutters and the like, which in general require an upward drawing system designed to allow for a partial or gradual compensation of the weight of the door during movement.

Furthermore, the invention relates to possible applications of the above mentioned balancing and/or guiding device and in particular to sectional doors provided with a static balancing device capable of varying its weight, depending on the variation of the door load during raising and lowering, and equipped as well with suitable lateral guides ensuring a higher degree of safety and reliability when the door is in movement.

The invention will be described hereinbelow with reference to vertically sliding sectional doors; nevertheless, it is obvious that the balancing and/or guiding device according to the invention is suitable for any other application.

As is known, vertically sliding sectional doors are substantially composed of a plurality of transversely extending panels which are hingeably joined to one another and move guided by lateral travel tracks or guides comprising a vertical section connected via a wide curved intermediate part to a rearwardly extending horizontal section, on which the entire weight of the panels or part thereof gradually bears during rising and lowering of the door.

The gradual balancing of the weight of the various panels, as the door moves along the tracks, is effected at the present time by means of suitably pretensioned recoil springs which form part of an upwardly drawing system intended to progressively balance the variable weight of the door which moves while being guided along the side tracks.

The traditionally used drawing-up and guiding systems have considerable drawbacks, including the progressive loss of tension of the rolling-up springs which inevitably takes place with prolonged use, resulting in problems with opening and closing of the door. Moreover, the springs are susceptible to breakage, and are fastened to walls by expansion plugs on any type of wall surface, exerting a considerable force on the plugs with the consequent danger that they may become detached; fall-breaking devices are also provided to operate on the outside of the guide tracks and thus do not allow any protection system to be used. Finally, a possible drive system for controlling opening and closing of the door must be located at the same height as the balancing springs, that is at a considerable height from the ground, with the serious risk of becoming detached from the supporting wall whenever it is subjected to an excessive force or other unforseen circumstances.

The use of spring-type balancing systems is also not very recommendable in many applications, in particular when, for hygienic reasons, suitable covering and protection systems must be used.

As previously stated sectional or vertically sliding doors are mainly used for closing large access openings. In general, they are composed of a plurality of panels provided on the side edges with support wheels sliding on lateral guide tracks which extend vertically upwards from the ground towards the ceiling, where they may continue in a vertical direction or in a substantially horizontal or slightly inclined arrangement so as to enable the door to be raised completely.

In general, the door sliding tracks substantially comprise sheet-metal section in the form of channel shaped element laterally arranged to a support member which longitudinally extend for travel of the door.

During the manufacture and mounting of said tracks, there are a series of adjustment requirements for each specific use, which are difficult to satisfy with the presently known guide tracks unless guide tracks suitable for each individual application are manufactured in each case.

In particular, the widthwise dimensions of the tracks must be designed or provided according to the diameter of the support wheels of the door. However, in the case of sectional or sliding doors, the thickness of the door panels can vary depending on the structural requirements, for example when it is required to vary the thickness of the thermally insulating inner layer; consequently, the diameter of the support wheels as well as the dimensions of the respective guide tracks must be adapted or varied accordingly.

All of this makes it necessary to provide beforehand guide tracks of different widths or to produce tracks having specific dimensions at the time when they are required by a user.

Thus, there exists the need to have guiding tracks for universal use which can be easily adapted and adjusted at the time of their use and which at the same time allow standardized production.

The main object of the present invention is to provide a balancing and guiding device for the drawing-up of variable loads, in particular for the guiding and balancing of vertically movable doors, resulting in an entirely mechanical solution suitable for satisfying a wide range of applicational requirements.

A further object of the present invention is to provide a system for the guiding and balancing of a variable load, in particular of vertically movable doors, which is provided with a suitable guiding and protection system during vertical sliding movement of the same balancing

device.

Yet another object of the present invention, according to a particular use thereof, is to provide a sectional door combined with a balancing and guiding device mentioned above, which makes use of guiding tracks for the door, which may be suitably protected at least over a vertical portion of the travel path so as to prevent an operator from being injured or foreign objects from entering into the guide tracks themselves, hindering or blocking the sliding movement of the door.

Another object of the invention is to provide a guide track for doors and the like, which is able to satisfy the above mentioned requirement for a safety guiding of the door and an easy mounting of the tracks and the door, as well as the removing of the same door from the tracks.

These and other objects and features of the invention may be achieved by means of a variable-weight balancing and guiding system according to claim 1.

Some preferred embodiments of the guiding and balancing device according to the invention and an application thereof to sectional doors will be now explained in detail hereinbelow with reference to the accompanying drawings, in which:

Fig. 1 is a front view of a sectional door combined with a balancing and guiding device according to the invention;
Fig. 2 is a side view of the balancing and guiding device of Fig. 1;
Fig. 3 a front view of a variable-weight balancing device according to the invention;
Fig. 4 is a longitudinal sectional view along the line 4-4 of Fig. 3 in the normally raised condition of the device;
Fig. 5 is a sectional view similar to that of Fig. 4 with the balancing device partly lowered;
Fig. 6 is a detail, on a larger scale, showing the hinge and stop means for limiting the angular opening of two adjacent modular weight members of the balancing device;
Fig. 7 is a cross-sectional view along the line 7-7 of Fig. 1;
Fig. 8 is a cross-sectional view along the line 8-8 of Fig. 1;
Fig. 9 is a cross-sectional view of a first embodiment of a guide track, along the line 9-9 of Fig. 1;
Fig. 10 is cross-sectional view along the line 10-10 of Fig. 1;
Fig. 11 is a cross-sectional view showing a second embodiment of a guide track;
Fig. 12 shows a detail of Fig. 11;
Fig. 13 is a cross-sectional view showing a third embodiment of a guide track; and
Fig. 14 is a cross-sectional view showing a fourth embodiment of a guide track.

With reference to Figures 1 to 5, we will describe a sectional door provided with a guiding and balancing device according to the invention.

As shown in Fig. 1, a sectional sliding door substantially comprises a plurality of panels 10 transversely extending to the door and hingeably connected at the hinge points 11 and provided on the side edges with support wheels 12 allowing them to rotate along horizontal axes and to slide along guide tracks 13 which extend vertically upwards on both sides.

In the example of Figure 1, each guide track 13 comprises a lower section 13A which extends over a height equal to the overall length of the door, and an upper section 13B which may extend horizontally in a manner per se known as shown with 13C and 13D in Fig. 2.

The door is furthermore connected, by cables 14 and 15, to a weight balancing system 16 for raising and lowering assisting the door itself.

With reference now to Figs. 1 to 8 we will describe a balancing device with variable counterweight according to a preferred embodiment of the invention. The balancing device 16 substantially is provided by a counterweight comprising an upper portion 17 of constant and predetermined weight, which is usually less than the maximum weight of the door to be balanced, for example one-half or more and a lower modular portion 18 of variable weight, intended to gradually compensate the variation of the weight to be balanced during upward or downward movement of the door.

More precisely, as shown in the various figures, the upper portion 17 of the counterweight substantially consists of a housing 19 into which a mass of material of predetermined weight is loaded.

In the case shown, the housing 19 is in the form of a metallic container provided by four angle-pieces 19' (see also Fig. 7) side arranged at the vertices of a rectangle and suitably welded to a bottom plate 20 and to an upper plate 21 respectively; the plate 21 in turn is provided with a fastening element 22 for connecting the entire counterweight 17, 18 to supporting cables 14, 15 which in turn are connected, via a system of transmission pulleys, to the panels 10 of the door to be balanced.

In the case shown, the balancing material inside the container 19 is composed of a plurality of superimposed plates 22 simply threaded between the angle-pieces 19', the number of which can be varied depending on the desired weight portion of the door to be balanced. If desired, it would be also possible to use loose material, for example sand, instead of the plates 22, in which case the container 19 should be designed in a closed configuration having bottom and side walls. In both cases, it is possible to vary or adjust the weight of the upper portion 17 of the balancing device so as to adapt it to different conditions of use.

Unlike the upper portion 17 of the device, the weight of which is kept at a predetermined constant value, the lower portion 18 is characterized by a gradu-

ally variable weight in order to adapt the balancing action to the variation in weight of the door to be compensated as the same door moves along the guide tracks 13, as explained further below.

To this end, in the example of Figures 3 to 6, the lower portion 18 of the balancing device comprises a plurality of modular weight members 23 in the form of rectangular plates hingeably connected to one another at 24 on facing sides and to the upper portion 17 of the balancing device, so as to rotate angularly about horizontal hinging axes, transversely arranged to the longitudinal or vertical direction in which the entire counterweight of the balancing device may extend.

More precisely, as shown in the various figures, the plates 23 can rotate angularly with respect to one another between a maximum angularly spaced condition, shown in Fig. 4, and a superimposed condition, shown in Fig. 5.

Therefore, when the entire balancing device is in a partially or totally raised position with respect to the floor or an underlying resting surface 25, the plates 23 are arranged in the open or angled condition of Fig. 2, forming an angle between adjacent plates of a little less than 180° since a stop element 26 (Fig. 6) is provided in a suitable angular position on each hinge 24 preventing the adjacent plates 23 from assuming a completely aligned or planar arrangement in the vertical direction, which would prevent the balancing device from functioning properly. For this purpose, it is advantageous to provide a stop element 26' for the lower plate 23' (Fig. 4) to be differently positioned so as to keep the plate 23' always in a horizontal disposition in order to facilitate initial resting on the surface 25.

In contrast, when the door to be balanced is raised and, consequently, the entire balancing device is lowered, as soon as the bottom plate 23' makes contact with the resting surface 25, while lowering of the counterweight continues, the individual plates 23 close up or overlap onto each other, gradually bearing with their own weight on the resting surface 25; in this manner, the balancing action on the movable load is lightened.

As an alternative to the plates 23 being hinged and foldable onto each other in concertina fashion, a different arrangement and a different hinge-type connection can be used; for example, the plates 23 can be kept suitably spaced apart from one another in a horizontal position by connecting them via flexible hinges or in another manner, provided this allows the weight of the plates 23 to be gradually discharged onto a resting surface 25 during lowering of the balancing device, thus compensating accordingly the variation in the weight of the door while moving along the sliding tracks 13.

From what has already been said and shown in the accompanying drawings, it is obvious that the invention relates to a completely mechanical, static balancing device which is devoid of springs or other actuating parts and which allows extremely quick and simple adaptation to different conditions of use by simply varying and adjusting both the weight of the upper portion 17 and that of the lower modular portion 18.

As shown in Figures 1, 2, 7 and 8, according to another aspect of the present invention, it is possible to provide the weight balancing device with a protective casing which encloses and guides the entire counterweight 17, 18 during its vertical movement; this prevents the counterweight itself from moving laterally and striking objects or persons located nearby during its raising and lowering movements.

For this purpose, as shown in Figures 7 and 8, the entire counterweight is enclosed in a vertical casing 26 of substantially tubular shape formed by two halves 26A and 26B from folded metal sheets; the part 26B of the casing 26 is designed to be fixed to a wall or resting surface while the part 26A is removably fixed to the former so as to provide access to the counterweight sliding inside the protective casing thus formed.

Apart from providing protection against knocks during the raising and lowering movements of the counterweight, it is also possible to prevent lateral movements by advantageously guiding the counterweight along its vertical travel path. For this purpose, as shown in Fig. 7, the side edges 27 of the casing part 26B are folded back towards the inside so as to slidingly engage with guiding blocks 28 fixed onto both sides of the housing 19 of the upper portion 17 of the counterweight. Similar guiding blocks 28' are provided on both sides of the bottom plate 23' of the modular weight portion 18, as shown.

In this way, complete safety is ensured, since the balancing device is guided and moves in a closed environment completely protected along its entire travel path.

Referring again to Figures 1 and 2, the application of the balancing device according to the invention to a sectional door will be now described.

As described and shown, the door is substantially composed of a plurality of panels 10 connected to one another via a series of hinges 11 allowing them to rotate with respect to the sliding plane.

The individual panels 10 are provided at both ends with wheels 12 travelling in suitable guide tracks 13; each track has a lower part 13A which extends vertically upwards from the ground and continues with an upper part 13B which may extend upwardly or be connected via a curved portion 13C to a horizontal guide 13D.

As it can be seen from Fig. 1, the upper panel 10 of the door is connected to the upper portion 17 of the balancing device by means of a pair of steel cables 14, 15 which are deviated by suitable pulleys 30 and 31 mounted on plates 32 and 33 fixed to a wall.

The door panels 10 are made of galvanised and painted double sheet-metal 10A, 10B connected by a tubular frame 34; each panel 10 is furthermore provided on each vertical side with a wheel 12 rotatably supported by the panel itself by means of the frame 34. The wheels 12 can be made from plastic material or can be die-cast and mounted on a steel shaft 35 fixed to the

frame 34 coplanar with the panel 10, lying in its middle plane.

From Fig. 1 as well as Fig. 10, it can be seen furthermore that the vertical tracks are made from cold-galvanised and press-folded steel sheet, and have, in the lower section 13A, a sufficiently large width to cover the edge portions of the panels 10 so as to protect an operator or prevent the entry of foreign material or bodies, which could block the sliding movement of the door.

Therefore, the lower part 13A of the tracks 13, viewed in the cross-section of Fig. 9, comprises a guide portion 40 defining a path for the travel movement of the wheels 12, and a protective portion 41 consisting of an extension of the two side walls of the guide portion 40, which laterally extend towards and beyond the side edges of the panels 10; a seal 42 is fitted onto the edges of the guide portion 40 to contact both faces of the panels 10 of the door.

A rib 43 in the form of a "V" shaped protrusion is provided inside the two side walls of the track between the guiding portion 40 and the protective portion 41, both in order to reinforce the guide itself and prevent the wheels 12 from escaping outside.

In its upper part 13B, 13C and 13D, as shown in Fig. 10, the guide track has a section of smaller width, similar to the guide portion 40 of the lower track 13A, being devoid of protective portion 41 since the upper part of the track is present at a greater height than that which can be reached by an operator.

A damping device, for example consisting of a spring or a steel plate, can be provided at the end of the horizontal section 13D of the guide track in order to provide a soft-action stop at the end of the travel path of the door.

The tracks 13A may be performed from a single metal sheet duly bent to perform the bottom wall and the shaped side walls to define the guide portion and the protective portion of the track; nevertheless, according to a preferred embodiment of the present invention, the lower portion 13A of each track consists of two separate parts: more precisely, as shown in Fig. 9 it consists of a rear part intended to be fixed to a wall along a side edge of an access opening, and a front part removably fixed to the rear part in an adjustable manner as explained further below.

In particular, according to the example of Fig. 9, the track 13 is formed by an L-shaped rear part 45 and by an L-shaped front part 46 facing each other to provide a channel shaped track.

Therefore, the two parts 45 and 46 of the track have overlapping flat flanges 45A and 46A defining the bottom wall of the track, and side wings defining the guide portion, the intermediate V-shaped protrusion and the protective portion of the side walls.

As previously stated the ribs or V-shaped protrusions 43 reinforce the track and create a barrier which prevents both any possibility of the wheels 12 from escaping laterally and the entry or forced introduction of objects from the outside into the guiding and sliding channel for the wheels 12 of the door.

A further protection and barrier against the entry of dust and foreign objects is provided by the use of seals 42 on the inwardly folded edges of the protective portion 41 of each front and rear parts 45 and 46 of the track.

From Fig. 9, it can also be seen that the track can be mounted on a wall in an extremely simple manner by firstly fixing the rear part 45 by means of suitable plugs and subsequently fixing the front part 46 to the rear part 16A, for example by screwing in a set of screws into holes in aligned positions of the two bottom flanges 45A and 46A.

From the same Fig. 9, it can also be seen that it is possible to vary the width of the guide track by simply adjusting the position of the front part of the track in respect to the rear part.

This makes it possible to vary or adapt the space between the guide walls depending on the diameter of the wheels 12 and the thickness of the panels 10 of the door.

A second embodiment for the track 13 is shown in Fig. 11; in the case of Fig. 11, only one part 47 of the track is provided with a rear flange 48, having an outwardly bent edge 49 to connect the same part 47 to a front part 50 of the track having a flat rear portion screwed at 51 to the bent edge 49.

In this case, also, a widthwise adjustment of the tract is made possible, for example by disposing a spacer 52 between the flange 49 and the rear edge of the front part 50 as schematically shown in the detail of Figure 12.

Fig. 13 relates to a third embodiment of a modified track 13 of Fig. 11, in which the protective portion of the track has been omitted while maintaining the advantage of the two part construction 53, 54 of the track according to the invention.

Lastly Fig. 14 relates to a fourth solution which maintains the advantage of the track of Fig. 9, providing at the same time reduction in cost, simplification in the design, preventing the wheel 12 from contacting and braking against the bottom wall of the track.

In Fig. 14 a construction in two parts 55, 56 of the track has been again provided, comprising a guide portion and a protective portion according to the example of Fig. 9. In the case of Fig. 17, the V-shaped projection 43 has been only provided on the front part 56 of the track, while the rear part 55 of the track is provided with a bevelled corner 57 between the side and bottom walls preventing the wheel 12 to contact and wear against the same bottom of the guide track.

From what has been said and shown in the accompanying drawings, it will therefore be understood that a first aspect of the invention relates to a balancing and guiding device for vertically sliding doors, such as sectional doors, rolled-up doors or the like, as well as to sliding doors provided with suitably protected guide tracks in combination with a door drawing system which

uses a modular balancing device.

It will also be understood that it has been possible to provide a safety and adjustable guiding track for sliding doors having a new and original track structure, which can be produced using standardized parts, thus allowing widthwise adjustment and adaptation to various requirements of use.

In any case, it is understood that what has been said and shown with reference to the accompanying drawings has been provided purely by way of a non-limiting example of the features of the invention.

Claims

1. A balancing and guiding device for a vertically movable door (10), in which the door (10) is movable along vertically arranged wide tracks (13), and in which the same door (10) is operatively connected to a weight balancing body member (16) vertically movable and arranged on one side of the door (10) characterized in that said body member (16) comprises an upper body portion (17) of constant weight, and a bottom body portion (18) of variable weight, said bottom body portion (18) of the balancing device being provided by modular weight members (23) gradually superimposing each other during rising and lowering movement of the door (10) along said guide tracks (13).

2. A balancing and guiding device according to claim 1 in which said modular weight members (23) are hingeably connected to each other.

3. A balancing and guiding device according to claim 2 in which said modular weight members (23) are hingeably connected to rotate from an angularly spaced condition with the body member (16) in the raised position and a superimposed condition when the body member (16) is lowered against a resting surface (25) during rising movement of the door, and in which stop means are provided to maintain an angular disposition of the modular weight members (23) hanging from the upper body portion (17) of the balancing device.

4. A balancing and guiding device according to claim 1 in which weight of the upper body portion (17) of the body member (16) is adjustable.

5. A balancing and guiding device according to claim 4 in which the upper body portion (17) of the body member (16) comprises a housing (19) and a plurality of weight plate members (22) removably stacked into said housing (19).

6. A balancing and guiding device according to claim 4 in which the upper body portion (17) of the body member (16) comprises a housing (19) having bottom and peripheral walls, and loose material into said housing (19).

7. A balancing and guiding device according to claim 1 furthermore comprising guide means (27, 28) for guiding the body member (16) over at least part of the vertical travel path for the same body member (16) of the balancing device.

8. A balancing and guiding device according to claim 7 in which a peripheral protection (26) for the body member (16) is provided along said vertical path.

9. A balancing and guiding device according to the preceding claims in which said peripheral protections (26) comprises rear and front sheet-metal sections (26A, 26B) defining a tubular path for the body member (16) and in which said guide means comprises inwardly folded edge portions engaging with guide blocks (28) on the sides of the upper body portion (17) of the balancing device (16).

10. A vertically movable door of the type comprising:

    - a paneling (10) sliding along vertically arranged side tracks (13);

    - balancing means (16) operatively connected to the door for balancing the weight of the paneling (10) during movement along the side tracks (13);

    - each of said tracks (13) comprising a channel shaped guide member having bottom and side walls defining a first guide portion (40) for the paneling (10) and a protective portion (41) laterally extending for a short length over both faces of the paneling (10) of the door.

11. A vertically movable door according to claim 10 in which the paneling of the door comprises a plurality of panel members (10) hingeably connected to each other, and wheels (12) on both sides of each panel member (10) running along the guide portion (40) of said tracks (13).

12. A vertically movable door according to claim 11 in which said wheels (12) are rotatably supported by a shaft (35) coplanary arranged to the panel (10) of the door.

13. A vertically movable door according to claim 11 in which seal members (42) are provided on the front edges of the protective portion (41) of the guide tracks (13).

14. A vertically movable door according to anyone of the preceding claims in which an inward projection

(43) is longitudinally extending on at least one side wall, between the guide portion (40) and the protective portion (41) of the track (13).

15. A vertically movable door according to claim 10 in which said channel shaped guide member (13) comprises front and rear guide portions (45, 46; 47, 50; 53, 54; 55, 56) removably connected to each other, defining bottom and side walls of the track (13).

16. A vertically movable door according to the preceding claims in which means (45A, 46A; 49, 51, 52) are provided for adjusting the width between the side walls of the track (13).

17. A vertically movable door according to claim 10 in which the guide portion (40) of the track (13) is provided with a bevelled corner (57) between the bottom and a side wall of the track (13).

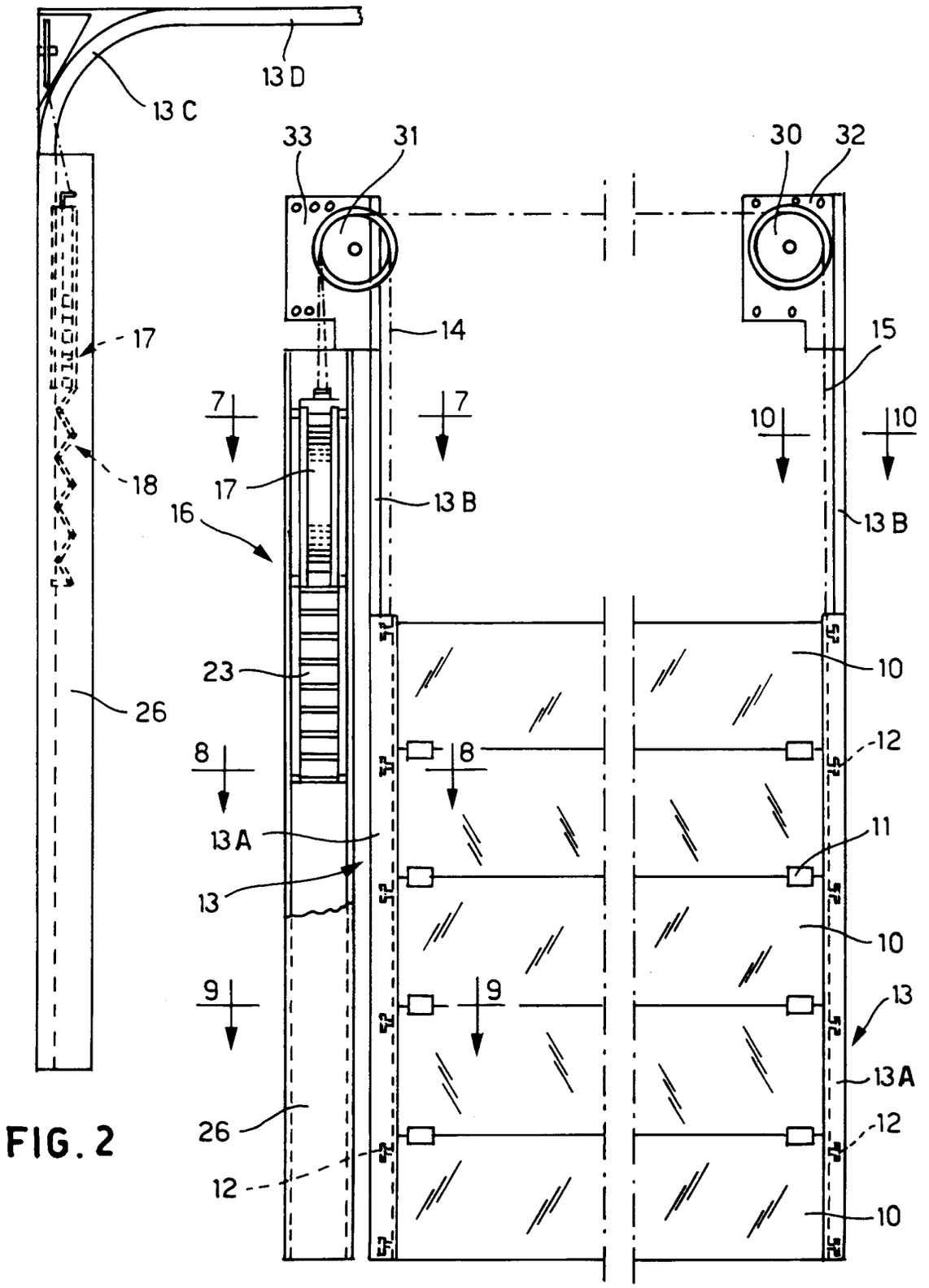
13 D
13 C
33
31
30
32
17
14
15
7
7
10
10
18
17
13 B
13 B
16
23
10
26
8
8
12
13 A
11
13
10
9
9
13
13 A
26
12
12
10

FIG. 2

FIG. 1

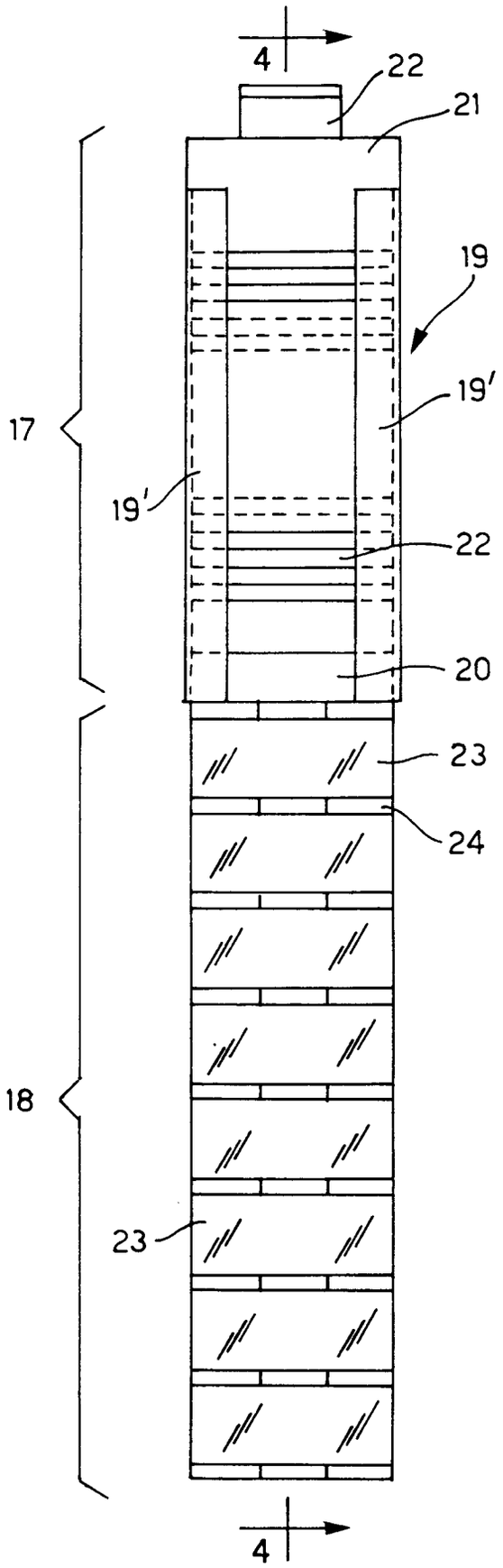
4
22
21
19
19'
17
19'
22
20
23
24
18
23
4

FIG. 3

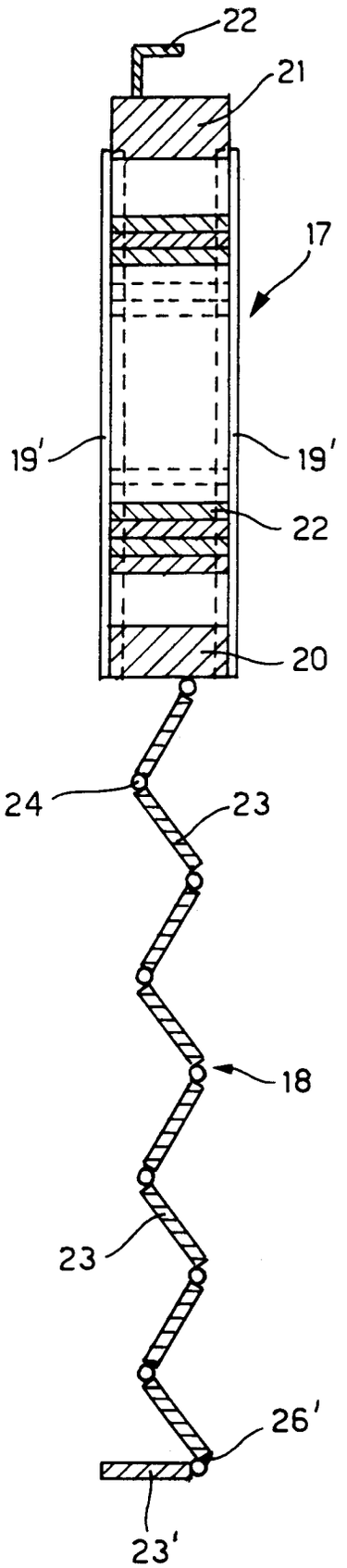
22
21
17
19'
19'
22
20
24
23
18
23
26'
23'

FIG. 4

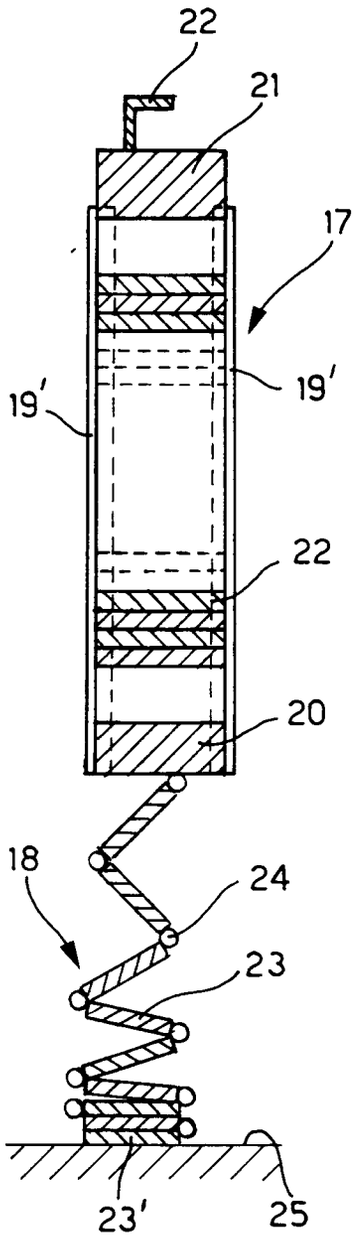

FIG. 5

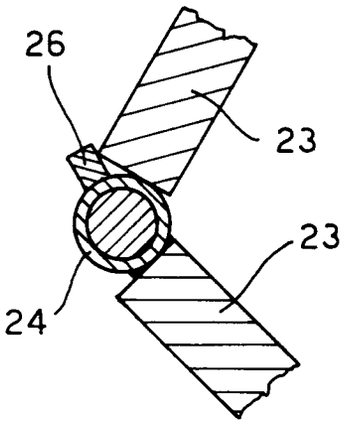

FIG. 6

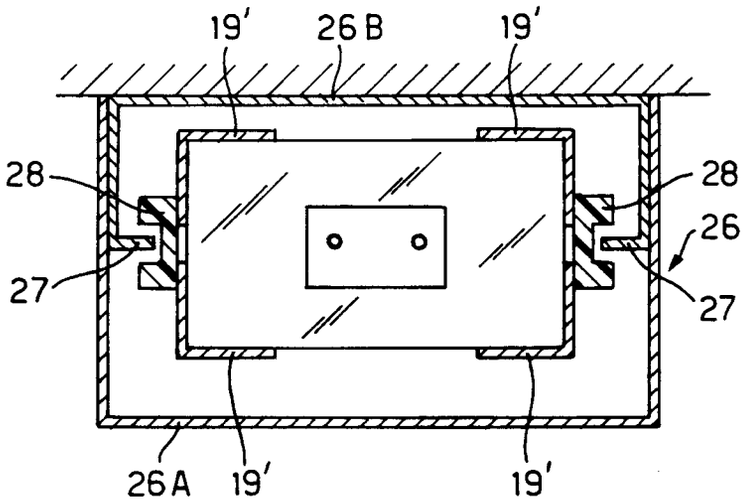

FIG. 7

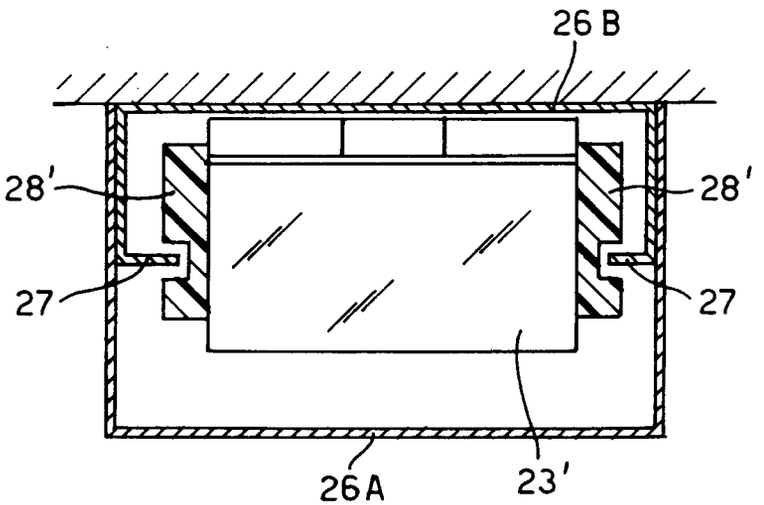

FIG. 8

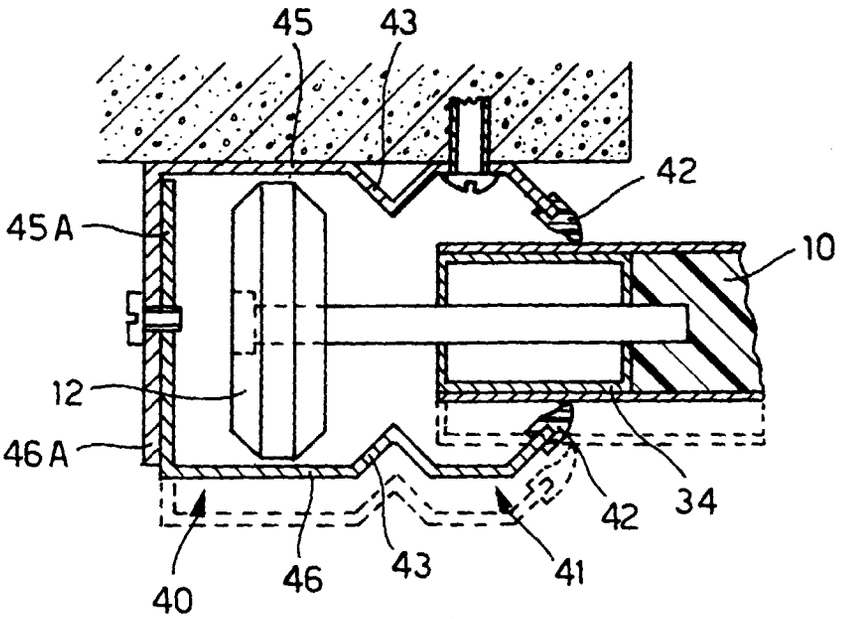

FIG. 9

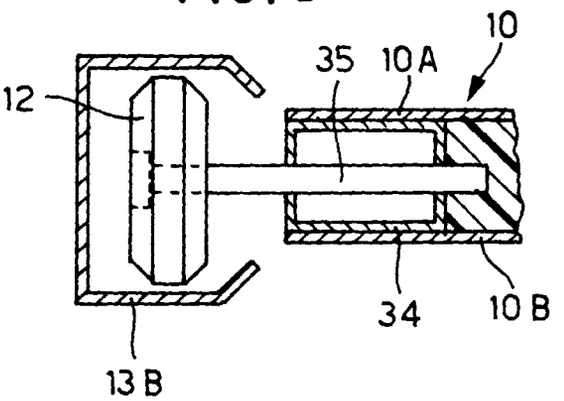

FIG. 10

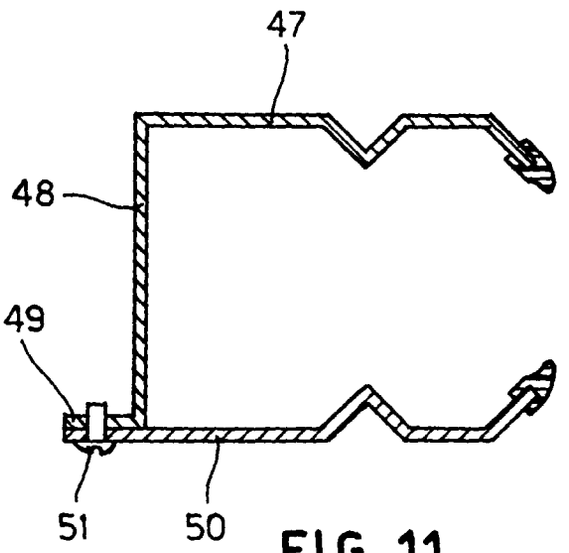

FIG. 11

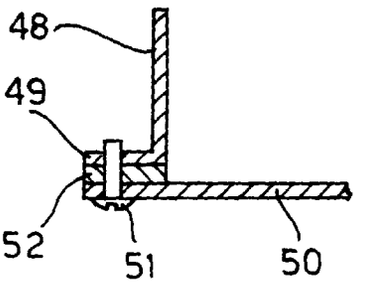

FIG. 12

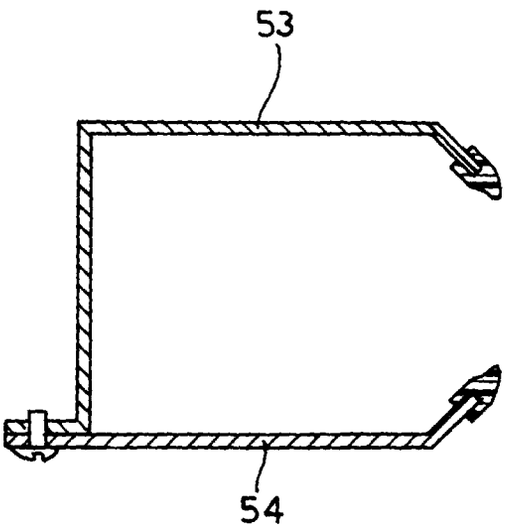

FIG. 13

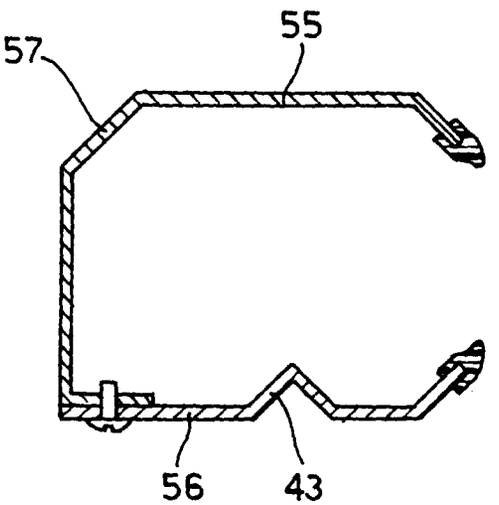

FIG. 14