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Description

The present invention relates to a sliding door system for an elevator.

Elevator doors can be roughly divided into turning doors and sliding doors on the one hand and car doors and landing doors on the other hand.

Turning doors, which, in view of safety and traffic demands, are by far the worst solution in many respects, have been traditionally used in the Nordic countries in the elevators of accommodation units, mainly for reasons of space and economy. A characteristic feature of modern turning door solutions is that doors are only provided in the shaft wall while the traditional gates serving as car doors have been left out. Besides the safety risk - although it can be minimized e.g. by making the doors as smooth as possible - this means in practice that the doors are opened manually, require plenty of turning space and are slow in operation.

Among the worst drawbacks of sliding doors are the facts that they require a wider elevator shaft than would otherwise be necessary to allow the landing doors to be pushed aside, and that both landing doors and car doors have to be provided with separate automatic mechanisms which make them very expensive as compared to ordinary turning doors. In order to overcome these drawbacks there has been proposed that each floor level is provided with one or more sliding doors which, relative to the elevator shaft, are located on the external side of the landing door opening. That means in other words that the elevator's sliding doors on the floor levels are placed like turning doors of known construction, not inside the elevator shaft like conventional sliding doors. This arrangement offers several advantages:

- The elevator doors can be provided with the same safety equipment as conventional sliding doors, e.g. with photo-cells, mechanical or electrical safety edges on the front surfaces, radar, etc.
- The doors are easier to handle e.g. for handicapped persons or children.
- The arrangement allows mechanical door actuation (which would be unthinkable in the case of corresponding turning doors), resulting in shorter door operation times and therefore faster elevator traffic.
- The arrangement makes it possible to reduce the cross-sectional area of the elevator shaft since no part of it is occupied by the door and its mechanisms.

Furtheron it has been proposed that the sliding doors on the floor levels are actuated by a power means which is mounted on the elevator car and engages the respective door when The elevator stops at a floor level.

FR-A-980 892 discloses a sliding door system for an elevator wherein a sliding door is located on the external side of the landing door opening and is operated by a power means mounted on the elevator car and engaging the respective door when the elevator stops at the floor level. The power means on the elevator consists of a motor with a pulley or sprocket drive comprising at least one element designed to engage a stud connected to the sliding door so that the door is opened and closed by driving the chain or belt round the wheels of the pulley or sprocket drive through certain distance. However, this system needs the stud 16 at the sliding door to transfer the movement of the sprocket drive to the sliding door. The connection of the stud to the sliding door requires a further expensive production step and the corners between the start and the sliding door are liable to sale and dirt.

The object of the present invention is to provide simple and light actuating means for actuating the respective sliding door located on the external side of the landing door opening.

This object is obtained by the features of claim 1. Advantageous embodiments of the invention are subject matter of the subclaims.

A preferred embodiment of the sliding door system of the invention is characterized in that the elevator car is provided with a gate, a light sliding door or equivalent, which can be pushed aside manually or mechanically when passengers enter or leave the car.

In this way, the same level of safety is achieved as in the case of conventional sliding door systems. The elevator car can be provided with a collapsible gate or preferably with a light sliding door of a segmental construction, which can be so designed that it will take up but very little space and, when opened, is pushed aside into a space which is otherwise useless, e.g. along the external sides of the car walls or between its inner and outer walls.

The features characteristic of the rest of the embodiments of the invention are presented in the claims to follow.

In the following, the invention is described in detail with reference to the drawings attached, wherein:

Figs. 1a-1c present elevator doors constructed by known techniques.

Figs. 2a-2c present a sliding door system with doors on the floor levels only.

Figs. 3a-3b present a sliding door system with doors on the floor levels as well as on the elevator car.

Fig. 4 presents a diagram of the means used for actuating the landing door.

Fig. 5 shows the elevator door of Fig. 4 in front view.

Fig. 6 represents an elevator system using different types of door.

Figures 1a-1c show three elevator doors of known construction, Fig.1a representing an elevator provided with an ordinary turning door 1, Fig.1b an elevator with automatic double sliding doors 2,3 both on the elevator car and in the shaft wall, and finally Fig.1c a variation of the previous construction in which all the doors 4,5 move sideways in the same direction. The drawbacks of these constructions have already been described, and special attention should be paid to the placement of the doors in Figs. 1b and 1c when comparing with the constructional alternatives of Figs. 2a-c.

Fig. 2a shows a sliding door system with two sliding doors 6 of light construction which move in opposite directions. Relative to the elevator shaft 7, the sliding doors 6 are placed on the external side of the landing door opening 8, and they are operated by a power means mounted on the elevator car 9 (see Fig.4) which engages and actuates the doors when the elevator stops at the landing. From the safety point of view, the essential thing about this construction is that the doors should be made flat and smooth, e.g. in accordance with the regulations concerning turning doors. The door opening of the elevator car is provided with the same safety equipment as conventional sliding doors, e.g. with photocells and mechanical or electrical safety edges on the front faces of the doors.

Fig. 2b shows a variation of the system in Fig. 2a, with only one door 10 moving sideways (cf. Fig. 1c).

Fig. 2c presents another sliding door system resembling the one in Fig. 2a and having two sliding doors movable in opposite directions, each door consisting of two or more vertical laminar segments joined together to make the door lighter and more flexible.

Figs. 3a-3b shows an embodiment of the sliding door system with doors provided both on the elevator car and on each floor level. The car door is a gate, a light sliding door or equivalent, which is pushed aside manually or mechanically when a passenger enters or leaves the car. In Fig. 3a, the landing door 12 corresponds to the solution in Fig. 2b while the elevator car is provided with a light sliding door 14 or equivalent, which is pushed aside (as indicated by the broken lines) when a passenger enters or leaves the car. This type of gate, which may be a collapsible gate or, as shown in the present case, a light sliding door consisting of laminar segments, can be so constructed that it will only take up a minimal space and, in the case shown, is pushed aside e.g. along the external side of the car walls.

Fig. 3b shows another embodiment of the sliding door system resembling the one in Fig. 3a, in which the landing door opening is provided with two sliding doors 15 movable in opposite directions and the elevator car 17 similarly with two sliding doors 16 movable in opposite directions. In this case, the sliding doors 15 at the landings correspond to the solution shown in Fig. 2a, and the light sliding doors 16 are similarly pushed sideways in opposite directions (as indicated by the broken lines) along the external side of the car walls when passengers enter or leave the elevator.

Fig. 4 shows a schematic diagram of the door actuating means used in the sliding door system exemplified by Fig. 2b. The basic idea is that the door 10, which is provided with wheels or other sliding elements 24 placed at its lower edge, is driven by a motor 30 which is mounted on the elevator car 9. The motor drives the upper one of a pair of pulleys or sprockets 18 for a V-belt or chain 19 running around them. When the car arrives at a floor level 23, the chain is driven anti-clockwise so that a catch 22 on the upper wheel 18 grips a rope 21 connected to the elevator door 10 via a deflecting wheel 20 and other requisites (see Fig. 5). As the catch 22 then moves continuously downward through a preset distance, it pulls the rope with it through an equal distance, thus causing the elevator door 10 to open by sliding leftwards in Fig. 5.

In this way, the door opening mechanism is actuated by the motor 30 on the elevator car every time when the car 9 stops at a floor level. Thus, a light door construction is achieved and the space requirement is minimized without losing any of the advantages provided by an automatic landing door.

By examining Fig. 5 and identifying in it the door 10, deflecting pulley 20 and rope 21 shown in Fig. 4, and the door suspension rail 25, the rope lug 27 on the door and the deflecting pulley 26 fixed to the wall, it is easy to see that when a downward pull (indicated by the arrow) is applied to the rope 21, the door is caused to move leftwards in the figure, thereby revealing the doorway of the elevator car. A safety stop 28 prevents the door from being opened when the car is not present at the landing. The closing of the door can be implemented using a return spring, a counterweight etc., which counteracts the opening motion of the door. When opened, the door preferably slides into a space behind a protective cover 29 provided on the opposite side of the door opening, so that the door cannot hit or squeeze anything or anybody when it is opened.

Obviously, a gate or door possibly provided on the elevator car itself can be driven by the same motor 30 as the landing door to open them both simultaneously. Alternatively, the light car door may be of a manually operated design. It is also

obvious that the idea of the invention allows some of the sliding doors on the floor levels to be provided with their own power means for mechanical actuation.

Fig. 6 shows a view of the floor levels of a building, illustrating how, by virtue of the invention, different floors can have different door systems for the same elevator car.

Reference number 30 identifies an ordinary sliding door, number 31 a dual sliding door with the doorway in the middle, number 32 an ordinary turning door with a door closer, and number 33 a typical basement landing door without an automatic closing mechanism. In practice, the same type of sliding doors are used as far as possible, but the invention offers flexibility in the choice of door type and suspension arrangements depending on the space available on the floor level in question, its use and other factors.

Claims

1. A sliding door system for an elevator shaft, in which at least some of the floors are provided with one or more sliding doors (6;10;11;12;15) which, relative to the elevator shaft (7), are located on the external side of the landing door opening, and in which the sliding doors (6;10;11;12;15) on the floor levels are operated by a power means (18,19,30) mounted on the elevator car and engaging the respective door (10) when the elevator stops at a floor level (23), wherein the power means on the elevator car consists of a motor with a pulley or sprocket drive (18,19) characterized in that at least one of the wheels (18) of the drive comprises a catch (22) gripping a rope (21) or equivalent connected to the sliding door (10) via a deflecting wheel (20), so that when the car (9) arrives at a floor level (23), the door (10) is opened and closed by driving the belt or chain (19) round the wheels (18) of the pulley or sprocket drive (18, 19) through a certain distance.
2. Sliding door system according to claim 1, **characterized** in that the elevator car (13;17) is provided with a gate, a light sliding (14;16) door or equivalent, which can be pushed aside manually or mechanically when passengers enter or leave the car.
3. Sliding door system according to claim 2, **characterized** in that the light sliding door (14;16) consists of a number of vertical laminar segments turnable relative to each other, enabling the sliding door to be pushed into spaces provided for this purpose in the side

walls of the elevator car.

4. Sliding door system according to any one of the preceding claims, **characterized** in that, when opened, the sliding door slides into a protective cover (29).
5. Sliding door system according to any one of the preceding claims, **characterized** in that at least one of the floor levels is provided with one or more doors of a different type, e.g. turning doors (32,33).

Patentansprüche

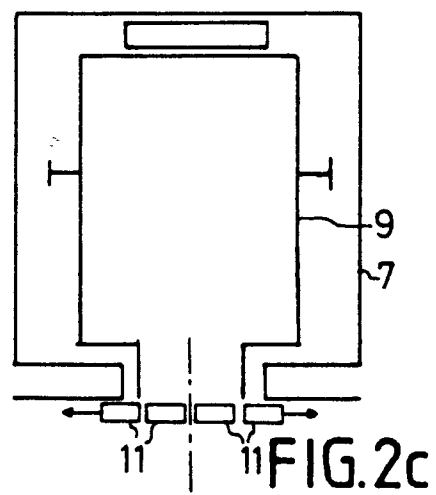
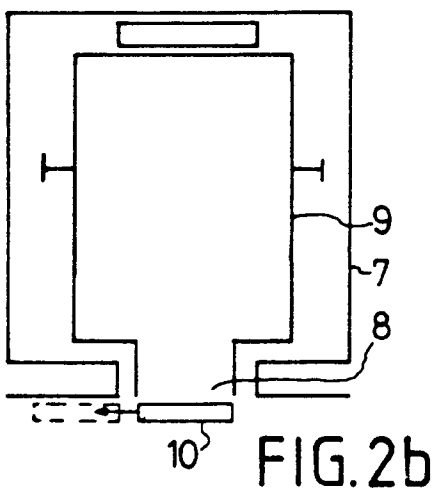
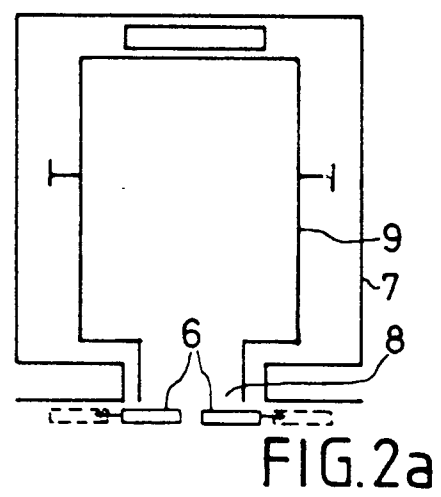
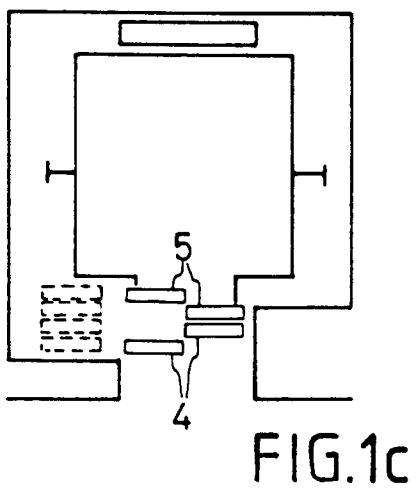
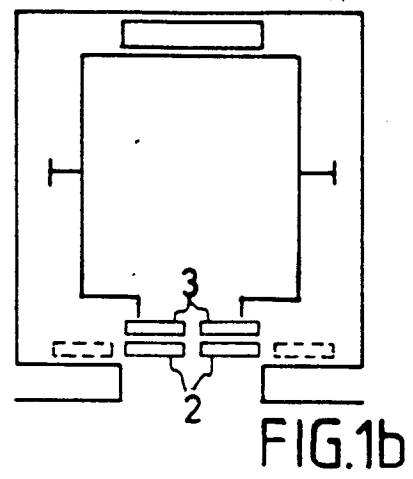
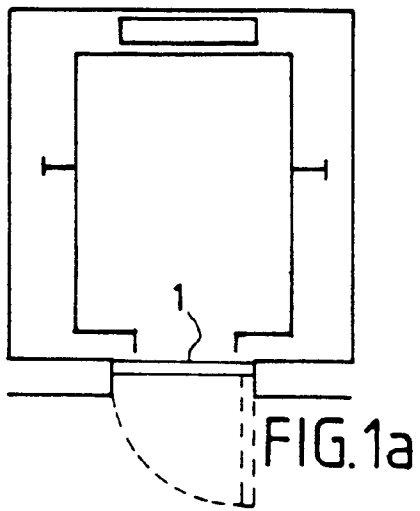
1. Schiebetürsystem für einen Aufzugschacht, in dem zumindest einige Stockwerke mit einer oder mehreren Schiebetüren (6,10,11,12,15) vorgesehen sind, die relativ zum Aufzugschacht (7) auf der äußeren Seite der Aufzugstüröffnung angeordnet sind und bei dem die Schiebetüren (6,10,11,12,15) auf den Stockwerken durch eine Antriebseinrichtung (18,19,30) betätigbar sind, die an dem Aufzugswagen angeordnet ist und mit der entsprechenden Tür (10) in Eingriff gelangt, wenn der Aufzug an dem entsprechenden Stockwerk (23) stoppt, wobei die Antriebseinrichtung an dem Aufzugswagen aus einem Motor mit einem Seilrollen- oder Kettenradantrieb (18,19) besteht, dadurch **gekennzeichnet**, daß zumindest eines der Räder (18) des Antriebs einen Mitnehmer (22) aufweist, der ein Seil (21) oder dergleichen greift, das mit der Schiebetür (10) über ein Umlenkrad (20) verbunden ist, so daß, wenn der Wagen (9) an dem Stockwerk (23) ankommt, die Tür (10) geöffnet oder geschlossen wird, indem das Band oder die Kette (19) um die Räder (18) des Seilrollen- oder Kettenradantriebs (18,19) über eine gewisse Distanz betätigt wird.
2. Schiebetürsystem nach Anspruch 1, dadurch gekennzeichnet, daß der Aufzugswagen (13,17) mit einem Gitter, einer leichten Schiebetür (14,16) oder dergleichen versehen ist, welche manuell oder mechanisch zur Seite gedrückt werden kann, wenn Benutzer den Wagen betreten oder verlassen.
3. Schiebetürsystem nach Anspruch 2, dadurch gekennzeichnet, daß die leichte Schiebetür (14,16) aus einer Anzahl vertikaler laminarer Segmente besteht, die relativ zueinander drehbar sind, wodurch die Schiebetür in Freiräume gedrückt werden kann, die zu diesem Zwecke in den Seitenwänden des Aufzugwagens vor-

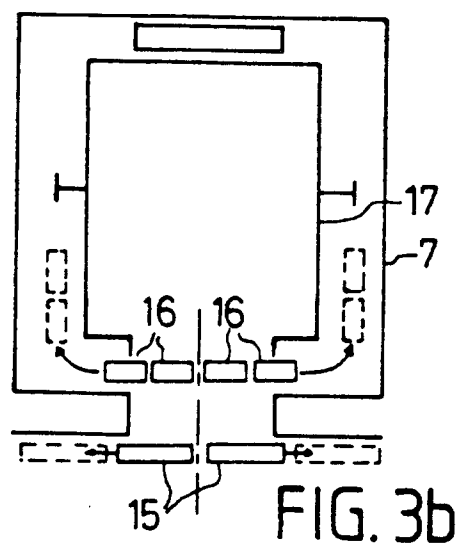
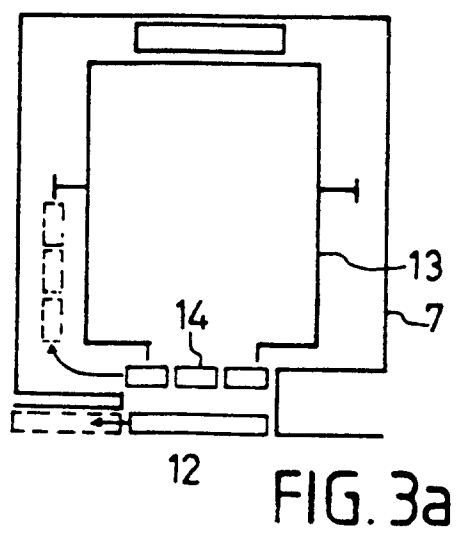
gesehen sind.

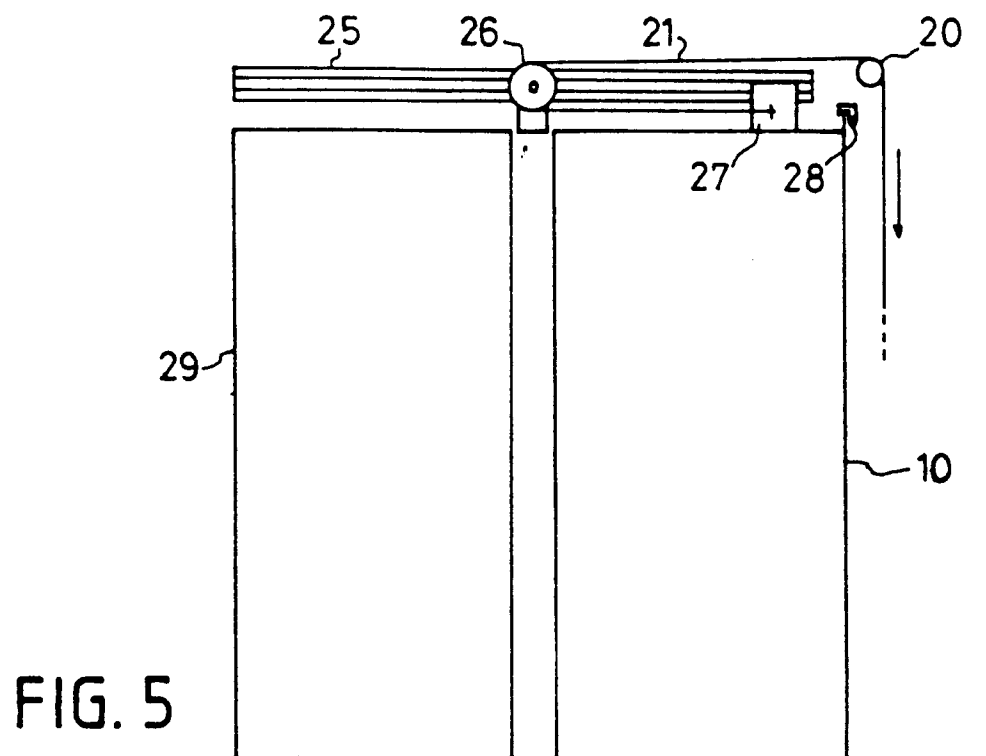
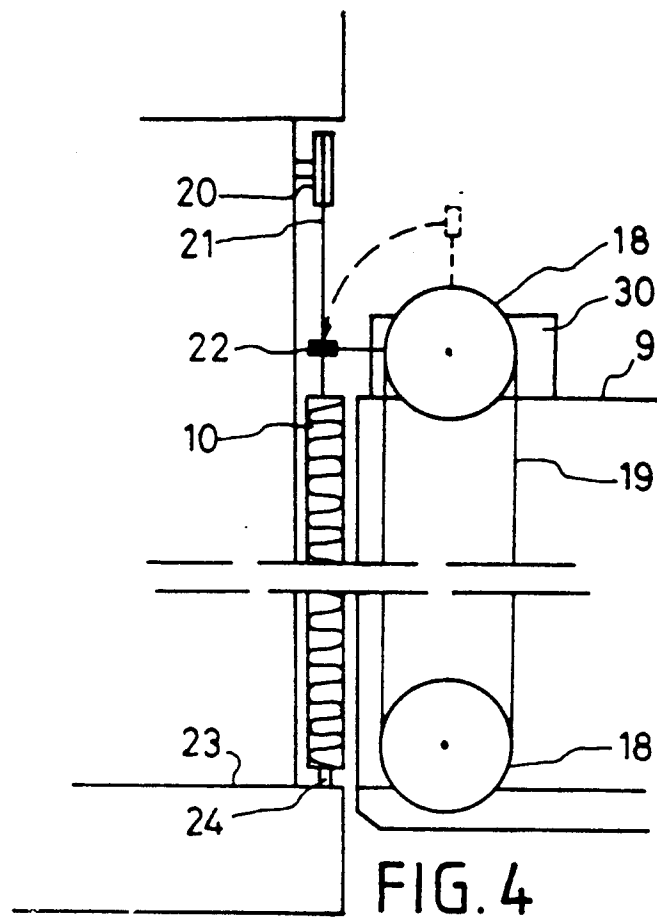
4. Schiebetürsystem nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Schiebetür in eine Schutzumhüllung (29) gleitet, wenn sie geöffnet wird. 5
5. Schiebetürsystem nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß zumindest eines der Stockwerke mit einer oder mehreren Türen unterschiedlichen Typs, z.B. Drehtüren (32,33), versehen ist. 10
4. Système de porte coulissante suivant une quelconque des revendications précédentes, caractérisé en ce que, lorsqu'elle est ouverte, la porte coulissante coulisse dans un capot de protection (29).
5. Système de porte coulissante suivant une quelconque des revendications précédentes, caractérisé en ce qu'au moins un des paliers est équipé d'une ou plusieurs portes d'un type différent, par exemple de portes pivotantes (32, 33).

Revendications

1. Système de porte coulissante pour une cage d'ascenseur, dans lequel au moins certains des paliers sont équipés d'une ou plusieurs portes coulissantes (6 ; 10 ; 11 ; 12 ; 15) qui sont placées, par rapport à la cage d'ascenseur (7), du côté extérieur de l'ouverture de porte palière, et dans lequel les portes coulissantes (6 ; 10 ; 11 ; 12 ; 15) des paliers sont actionnées par des moyens de motorisation (18, 19, 30) montés sur la cabine d'ascenseur et venant en prise avec la porte respective (10) lorsque l'ascenseur s'arrête à un palier (23), les moyens de motorisation sur la cabine d'ascenseur comprenant un moteur avec une poulie ou un pignon d'entraînement (18,19), caractérisé en ce qu'au moins une des poulies (18) de l'entraînement comprend un taquet (22) qui vient en prise avec un câble (21) ou un élément équivalent relié à la porte coulissante (10) par l'intermédiaire d'une poulie de renvoi (20) de sorte que, lorsque la cabine (9) arrive à un palier (23), la porte (10) est ouverte et fermée par le mouvement de la courroie ou de la chaîne (19) autour de la poulie ou du pignon d'entraînement (18), sur une certaine distance. 15
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2. Système de porte coulissante suivant la revendication 1, caractérisé en ce que la cabine d'ascenseur (13 ; 17) est équipée d'une grille, d'une porte coulissante légère (14 ; 16) ou d'un dispositif équivalent qui peut être poussé sur le côté, manuellement ou mécaniquement, lorsque des passagers entrent ou sortent de la cabine. 45
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3. Système de porte coulissante suivant la revendication 2, caractérisé en ce que la porte coulissante légère (14 ; 16) est constituée de plusieurs segments laminaires verticaux qui peuvent pivoter les uns par rapport aux autres, ce qui permet de pousser la porte coulissante dans des espaces prévus dans ce but dans les parois latérales de la cabine d'ascenseur. 55







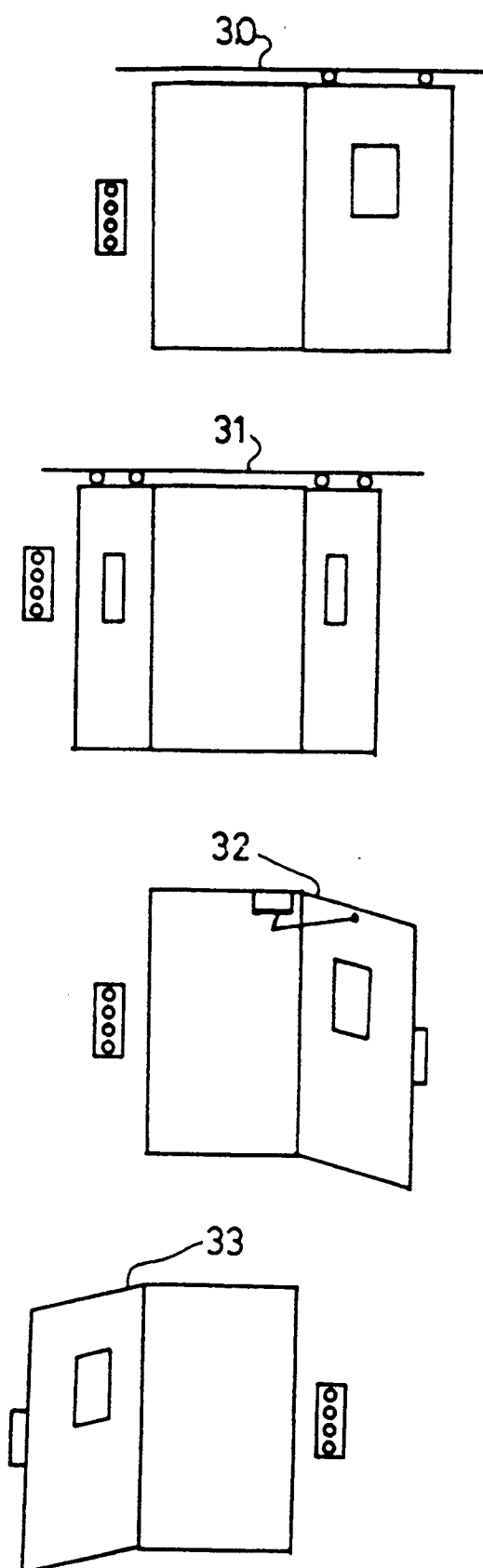


FIG. 6