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**(54) TELESCOPIC CURVILINEAR ELEVATOR DOORS**

TELESKOPISCHE GEKRÜMMTE AUFZUGSTÜREN

PORTES D'ASCENCEURS CURVILIGNES TELESCOPIQUES

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**US-A- 4 991 347 US-A- 6 032 762**

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- **PATENT ABSTRACTS OF JAPAN vol. 1997, no. 01, 31 January 1997 (1997-01-31) -& JP 08 245141 A (TOSHIBA CORP), 24 September 1996 (1996-09-24)**

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**Description**

## TECHNICAL FIELD AND BACKGROUND ART.

**[0001]** The present invention relates to a car door for lifts and/or elevators, of the type comprising at least a pair of wings with telescopic opening, each of which is integrally connected to a corresponding carriage able to slide on a guide.

**[0002]** The present invention further relates to a floor door for lifts and/or elevators.

**[0003]** It is well known that, in the case of automatically opening doors constructed with sliding wings, each wing is integral to a carriage able to move along a guide usually positioned above the car door.

**[0004]** Generally, the shape of the guide conforms to the trajectory followed by the sliding wings, the latter being integral with the carriage.

**[0005]** The movement of the carriage is obtained by means of a positive drive belt, or a chain, connected to a motor or to a gear motor and mounted on one or more pulleys fastened to a plate positioned in correspondence with the sliding guide of the carriage.

**[0006]** In accordance with a possible embodiment variation, the transmission of motion, from the motor to the carriage, takes place by means of the interposition of a plurality of mechanical linkages able to transform the rotary motion of the motor into a linear motion, useful to drive the carriage along the guide.

**[0007]** Currently, telescopically opening wings of car doors and of floor doors move along rectilinear trajectories and are substantially planar.

**[0008]** This type of door has little aesthetic value and it often penalises highly appreciable architectural solutions, especially when the latter provide for panoramic lifts with rounded profiles.

**[0009]** JP 08 245141 discloses an elevator device with a curved elevator cab fitted with equally curved not telescopic doors.

## DISCLOSURE OF INVENTION.

**[0010]** An aim of the present invention is to propose a car door and a floor door provided with telescopic wings having high aesthetic value.

**[0011]** An additional aim of the present invention is to provide a car door and a floor door within the context of a simple, rational and reliable constructive solution.

**[0012]** Said aims are fully achieved by the car door and by the floor door of the present invention, which are characterised by the content of the claims set out below.

## BRIEF DESCRIPTION OF DRAWINGS.

**[0013]** These and other aims shall become more readily apparent from the following description of a preferred embodiment, illustrated purely by way of non limiting example in the accompanying drawing tables in which:

- Figure 1 shows a top view of a section of a car door associated with a floor door, both in accordance with the present invention;
- Figure 2 shows a front view of means for actuating the car door of Figure 1;
- Figure 3 shows an enlarged view of a constructive detail of the actuating means shown in Figure 2.

## BEST MODE FOR CARRYING OUT THE INVENTION.

**[0014]** With reference to Figure 1, the car door and the floor door for lifts and/or elevators, of the present invention, are respectively designated by the numbers 1 and 2.

**[0015]** In the embodiment illustrated in Figures 1 and 2, the car door 1 comprises two pairs of telescopic wings 3, each of which is integrally connected to a corresponding carriage 4 able to slide on a guide 5 positioned above an entrance threshold of the car.

**[0016]** Originally, the guide 5 is substantially curvilinear to allow the wings 3 to translate telescopically, according to a substantially curvilinear trajectory which preferably conforms to a circumference arc.

**[0017]** In the preferred embodiment, the wings 3 have a substantially curvilinear external development, with radius of curvature preferably constant and equal to a radius of curvature of the guide 5.

**[0018]** In the illustrated embodiment, the wings 3 have central telescopic opening, although, in an alternative embodiment not shown herein, curvilinear wings with lateral opening may be installed.

**[0019]** The car door 1 is provided with actuating means comprising a cable 6, or a belt, connected to the carriage 4 to drive it along the guide 5.

**[0020]** The actuating means are provided with at least a tensioning element 7 associated to the cable 6, to adjust its tension.

**[0021]** The tensioning element 7 is integrally fastened to an appendage 8 of the car and it is originally able to rotate about an axis, which is substantially vertical in this specific case, to adapt the cable 6 to the curvilinear profile of the guide 5. In particular, the appendage 8 is constituted by a vertical plate positioned above the car.

**[0022]** The cable 6 has a first end 6a keyed onto a pulley 20 able to move along the sliding guide 5 of the carriage 4 and a second end (not shown) keyed onto a pulley integrally associated with the carriage 4.

**[0023]** The tensioning element 7 comprises a square 9 fastened to the appendage 8 of the car and a body 10 substantially "U" shaped and hinged on the square 9.

**[0024]** The body 10 has a pair of expansions 10a, 10b facing each other, to each of which is fastened a portion of cable 6, and it is provided with means for adjusting the tension of the cable itself.

**[0025]** Said means can be associated to at least one of said expansions 10a, 10b and comprise at least a helical spring 11 coaxial to the cable 6 and acting on one of said expansions.

**[0026]** The tensioning element 7, rotating about a ver-

tical axis passing through the hinge point situated on the square 9, is able to compensate for the curvilinear profile of the guide 5, allowing to maintain a correct tension of the cable 6, both during the opening and the closing of the wings 3.

[0027] In the absence of a tensioning element 7 able to rotate, it would not be possible to use driving cables or belts to actuate wings having a curvilinear development, without jamming the sliding of the carriage on the guide.

[0028] In the preferred embodiment illustrated in Figure 1, the floor door 2 comprises wings 12 with central telescopic opening and having curvilinear external development.

[0029] Similarly to the description provided for the car door 1, the wings 12 too are integrally connected to corresponding carriage able to slide on a guide (not shown herein) positioned above the threshold of the car. The opening and closing of the wings 12 are synchronised with those of the wings 3 of the car door 1 and commanded thereby.

[0030] The actuation of the doors is accomplished by an actuation assembly (not shown) comprising an electric motor, preferably of the reluctance type, and a plurality of mechanical transmissions to transmit the motion of the engine to the cable 6 and thence to the carriage 4.

[0031] Advantageously, the actuation assembly can be positioned substantially side by side or below the car. In the latter case, the actuation assembly is positioned below a treading plane of the car, which shall therefore be provided with an inspection manhole, necessary for servicing.

[0032] The invention achieves the important invention of conferring a considerable aesthetic value to the lift apparatus, adding value to the environment and/or the spaces within which it is installed.

[0033] In particular, car doors and floor doors in accordance with the present invention are particularly well suited to be installed on lifts and/or elevators of the panoramic type, in which case they can even be made of transparent material, for instance glass.

[0034] Another advantage is given by the presence of the tensioning element 7 confers extreme flexibility and precision when opening and closing.

## Claims

1. Car door (1) for lifts and/or elevators, comprising at least a pair of wings (3) with telescopic opening, each of which is integrally connected to a corresponding carriage (4) able to slide on a substantially curvilinear guide (5) to allow the wings (3) to translate telescopically following a substantially curvilinear trajectory, the wings (3) having a substantially curvilinear external development,  
**characterised in that** it comprises :

at least a cable (6) or a belt connected to the carriage (4) to drive it along the guide (5);  
at least a tensioning element (7) associated to the cable (6) or to the belt to adjust its tensioning, the tensioning element (7) being integrally fastened to an appendage (8) of the car and hinged with the possibility to oscillate about an axis to adapt the cable (6) or the belt to the curvilinear profile of the guide (5).

2. Car door as claimed in claim 1, **characterised in that** the cable (6) or the belt have a first end keyed onto a pulley (20) able to move along the sliding guide (5) of the carriage (4) and a second end keyed onto a pulley integrally associated with the carriage (4).

3. Car door as claimed in claim 1, **characterised in that** the tensioning element (7) comprises:

at least a square (9) fastened to an appendage (8) of the car;  
at least a body (10), substantially U shaped, hinged on said square (9) and  
having a pair of expansions (10a;10b) set side by side, to each of which is fastened a portion of cable (6) or belt; and  
means for adjusting the tension of the cable (6) or of the belt associated to  
at least one of said expansions (10; 10b).

4. Car door as claimed in claim 3, **characterised in that** said means for adjusting the tension of the cable (6) or of the belt comprise at least a helical spring (11) coaxial to the cable (6) or belt and acting on one of said expansions (10a;10b).

5. Car door as claimed in claim 1, **characterised in that** it comprises an assembly for actuating the wings (3) positioned substantially side by side or below the car.

6. Car door as claimed in claim 5, **characterised in that** the actuation assembly comprises:

at least an electric motor;  
a plurality of mechanical linkages to transmit the motion of the motor to a  
cable (6) connected to the carriage (4).

## Patentansprüche

1. Kabinentür (1) für Lifte bzw. Aufzüge umfassend mindestens ein Paar teleskopische Flügel (3), die jeweils fest mit einem entsprechenden, an einer im wesentlichen gekrümmten Schiene (5) verschiebbaren Wagen (4) verbunden sind, um die Flügel (3)

entlang einer im wesentlichen gekrümmten Bahn teleskopisch verfahren zu können, wobei die Flügel (3) auf der Aussenseite einen im wesentlichen gekrümmten Verlauf aufweisen, **dadurch gekennzeichnet, dass** sie umfasst:

mindestens einen mit dem Wagen (4) verbundenen Zug (6) oder Riemen zum Antrieb desselben entlang der Führung (5);  
mindestens ein dem Zug (6) oder dem Riemen zugeordnetes Spannelement (7) zum Einstellen seiner Spannung, wobei das Spannelement (7) einstückig an einem Fortsatz (8) der Kabine ausgebildet und angelenkt ist, so dass es zur Anpassung des Zugs (6) oder Riemens an die gekrümmte Kontur der Führung (5) um eine Achse schwenkbar ist.

2. Kabinentür nach Anspruch 1, **dadurch gekennzeichnet, dass** der Zug (6) oder der Riemen ein erstes, auf eine Riemenscheibe (20) aufgekeiltes Ende aufweist, welche Riemenscheibe entlang der Gleitführung (5) des Wagens (4) bewegbar ist, sowie ein zweites, auf eine Riemenscheibe aufgekeiltes Ende, welche Riemenscheibe einstückig mit dem Wagen (4) ausgebildet ist.

3. Kabinentür nach Anspruch 1, **dadurch gekennzeichnet, dass** das Spannelement (7) umfasst:

mindestens einen an einem Fortsatz (8) der Kabine befestigten Winkel (9);  
mindestens einen im wesentlichen U-förmig ausgebildeten Körper (10), der an dem genannten Winkel (9) angelenkt ist und ein Paar einander gegenüberliegende Bereiche (10a; 10b) aufweist, an welchen jeweils ein Bereich des Zuges (6) oder Riemens befestigt ist; und  
Mittel zum Einstellen der Spannung des Zuges (6) oder Riemens, die zumindest einem der genannten Bereiche (10;10b) zugeordnet sind.

4. Kabinentür nach Anspruch 3, **dadurch gekennzeichnet, dass** die genannten Mittel zum Einstellen der Spannung des Zuges (6) oder Riemens mindestens eine koaxial zu dem Zug (6) oder Riemen angeordnete Schraubenfeder (11) umfassen, die auf die genannten Bereiche (10a; 10b) einwirkt.

5. Kabinentür nach Anspruch 1, **dadurch gekennzeichnet, dass** sie eine Anordnung zum Betätigen der Flügel (3) umfasst, die im wesentlichen seitlich oder unterhalb der Kabine angeordnet ist.

6. Kabinentür nach Anspruch 5, **dadurch gekennzeichnet, dass** die Betätigungsanordnung umfasst:

mindestens einen Elektromotor;

eine Vielzahl von mechanischen Verbindungen zum Übertragen der Bewegung eines Motors an einen mit dem Wagen (4) verbundenen Zug (6).

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## Revendications

1. Porte de cabine (1) pour ascenseurs et/ou élévateurs, comprenant au moins une paire de vantaux (3) à ouverture télescopique, chacun desquels étant intégralement connecté à un chariot (4) correspondant pouvant coulisser sur un guide substantiellement curviligne (5) pour permettre aux vantaux (3) de translater de manière télescopique en suivant une trajectoire substantiellement curviligne, les vantaux présentant un développement externe substantiellement curviligne, **caractérisée en ce qu'elle** comprend:

- au moins un câble (6) ou courroie connecté au chariot (4) pour le déplacer le long du guide (5);  
- au moins un élément tendeur (7) associé au câble (6) ou à la courroie pour régler sa tension, l'élément tendeur (7) étant fixé de manière intégrante à un appendice (8) de la cabine et articulé avec possibilité d'osciller autour d'un axe pour adapter le câble (6) ou la courroie au profil curviligne du guide (5).

2. Porte de cabine (1) selon la revendication 1, **caractérisée en ce que** le câble (6) ou la courroie présentent une première extrémité insérée sur une poulie (20) pouvant se déplacer le long du guide coulissant (5) du chariot (4) et une seconde extrémité insérée sur une poulie associée de manière solidaire au chariot (4).

3. Porte de cabine selon la revendication 1, **caractérisée en ce que** l'élément tendeur (7) comprend:

- au moins une équerre (9) fixée à un appendice (8) de la cabine;  
- au moins un corps (10), substantiellement en forme de U, articulé sur ladite équerre (9) et ayant une paire d'expansions (10a, 10b) côte-à-côte, à chacune desquelles étant fixée une partie de câble (6) ou courroie; et  
- des moyens pour ajuster la tension du câble (6) ou de la courroie associée à au moins l'une des dites expansions (10a, 10b).

4. Porte de cabine selon la revendication 3, **caractérisée en ce que** lesdits moyens d'ajustement de la tension du câble (6) ou de la courroie comprennent au moins un ressort hélicoïdal (11) coaxial au câble (6) ou courroie et agissant sur l'une des dites expansions (10a, 10b).

5. Porte de cabine selon la revendication 1, **caractérisée en ce qu'elle** comprend un ensemble d'actionnement des vantaux (3) positionné substantiellement côte-à-côte ou sous la cabine.

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6. Porte de cabine selon la revendication 5, **caractérisée en ce que** l'ensemble d'actionnement comprend:

- au moins un moteur électrique;
- une pluralité de liaisons mécaniques pour transmettre le mouvement du moteur à un câble (6) connecté au chariot (4).

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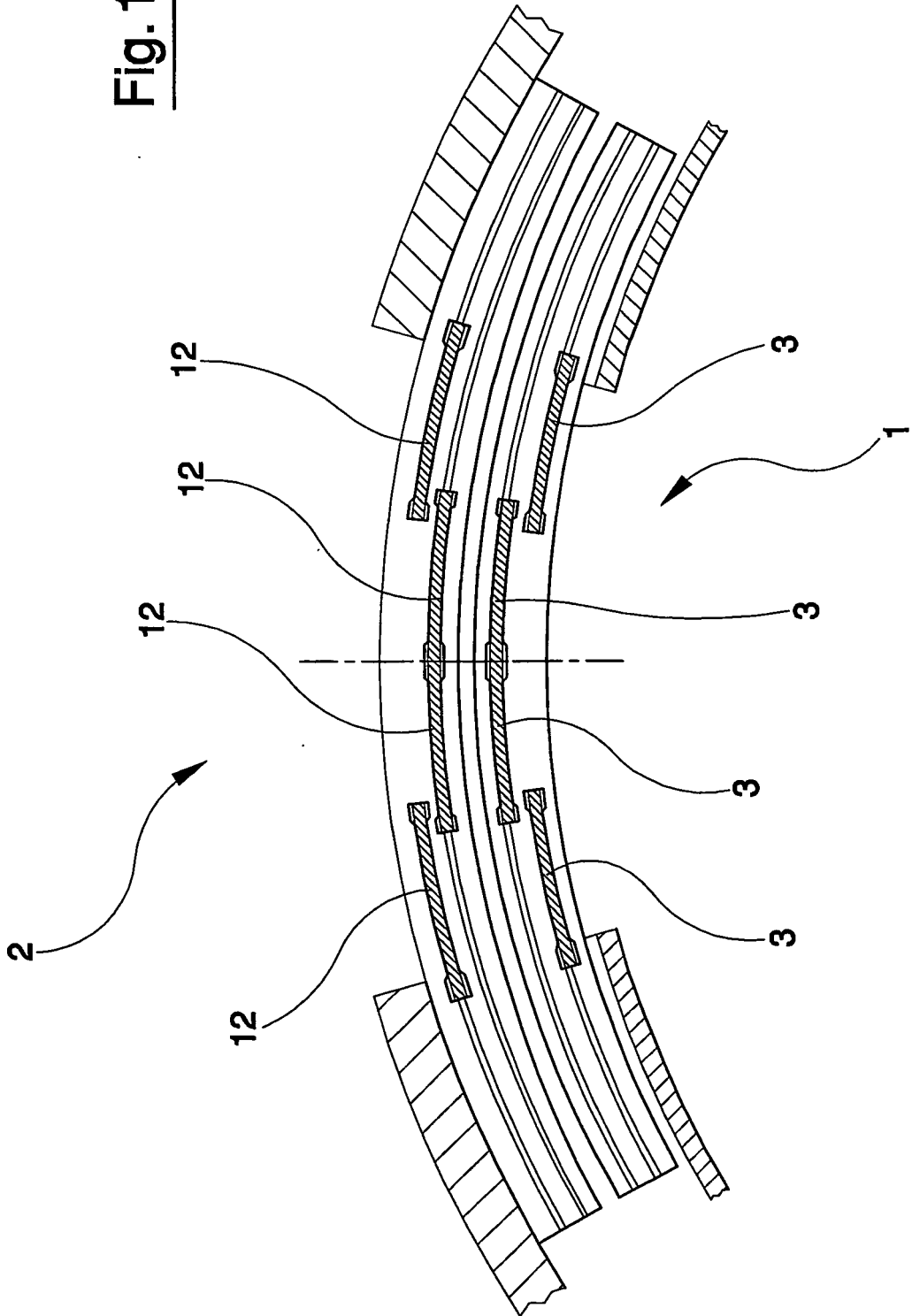
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Fig. 1





**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

- JP 8245141 A [0009]