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(54) Closing systems for movable platforms

(57) The present invention relates to a closing system for movable transport platforms for passengers/goods having curved front doors (1, 11), for allowing/preventing the entrance/exit of passengers/goods to a floor of the movable platform in loading/unloading areas and for preventing passengers/goods from falling from the floor of the movable platform in transport during an outbound path from the loading area to the unloading area, and opening/closing devices for moving the front doors between an opened position and a closed position comprising operating devices (8, 13) for generating an opening/closing movement and drive devices (5, 9 and 12, 14) connected at a first end to the operating devices (8, 13) and at a second end to the front doors, for transmitting the opening/closing movement from the operating devices to the front doors.

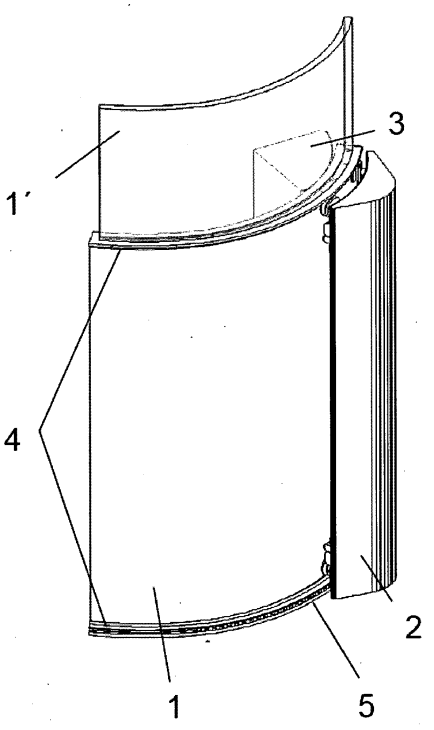

Fig. 1

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Description

Field of the Invention

[0001] The present invention relates to different options for operating the opening and closing of doors in movable platforms pertaining to a universal and accessible transport system for people/goods.

Background of the Invention

[0002] In reference to the field of actuating transport systems for passengers/goods including closing doors in the passenger platform, the need for a solution that reduces the overall dimensions of the equipment and that protects the user during the path in dangerous situations such as possible falls and blows is detected.

[0003] The most common transport systems having a platform for passengers on the market with closing means are vertical moving equipment such as elevators. These elevators use a door closing and opening system located both in the passenger car (car doors) and on the floor (floor doors), the operation of which is located in the upper part of the car and it has a telescopic horizontal movement that increases its constructive dimensions since it requires space in the side part in order to open the doors.

[0004] A need to find an improved movable car closing system which allows increasing the possibilities of the movement of the different cars in these systems for allowing new movement trajectories without limiting them to vertical movement trajectories of elevators and which in turn allow improvements in terms of the overall dimensions of the equipment which entail reduced construction work is detected.

Description of the Invention

[0005] The present invention relates to two alternatives for closing and opening doors in a platform pertaining to a system for the transport of people/goods, with the fundamental feature that the opening/closing movement is performed following a curved trajectory. Therefore, the invention relates to a closing system for movable platforms as defined in the set of claims.

[0006] In the first proposal, the drive means comprise a rack and pinion system moving the door which is supported on a set of support wheels on a V-shaped guiding which provides rigidity to the door and geometrically determine the trajectory of the closing/opening movement of the door. Once closed, the doors project over the floor of the platform, preventing having to make a slot in the floor, as occurs with current doors with mechanism located in the lower part. The distance between the floor and the lower part of the projecting door in the closed position is in accordance with the parameters indicated in the regulations in force on transport systems and goods for preventing trapping.

[0007] In the second proposal, the drive means comprise a worm screw-crown mechanism located in the lower part of the platform and the rigidity is provided by a special L-shaped structure supporting the door itself.

[0008] An aspect of the invention relates to a closing system for movable platforms as defined in the set of claims.

Brief Description of the Drawings

[0009] A series of drawings which aid in better understanding the two proposals of the invention and which are expressly related to the embodiment of said invention presented as a non-limiting embodiment thereof is very briefly described below.

Figure 1 shows a perspective view of the system of the invention.

Figure 2 shows a perspective view of one of the support and drive columns.

Figure 3 shows a detailed view of the support and drive column.

Figure 4 shows a perspective view of the support column.

Figure 5 shows a perspective view of the door of the system.

Figure 6 shows a perspective view of the system with the second operating alternative.

Figure 7 shows a bottom view of the system with the second operating alternative.

Figure 8 shows a perspective view of the door isolated with the second operating alternative.

Description of Preferred Embodiments of the Invention

[0010] Both systems are described in detail below.

[0011] The first embodiment comprises two clearly distinguished areas; on one hand there is the door (1) itself which has an inner structure (10) providing it with rigidity and on which the V-shaped guides (4) and the lower rack (5) are secured. The V-shaped guides (4) are located: two in the upper part and two in the lower part, and the rack (5), is located in the lower part and in the area outside the passenger area, such that the rack (5) and, therefore, the drive system are not within reach of the user. At the same time, there will be a coating which covers the structure of the door and serves as an element providing comfort to the user and an aesthetic appearance to the platform. The second element forming the system is formed by the support columns (2, 3), which are fixed to the structure of the platform (15). These support columns (2, 3) can be tubular elements for reducing the weight of the assembly. The height-adjustable supports (6) for the support wheels (7) are located on these columns. The V-shaped guides (4) slide on these support wheels (7) and will provide the rolling path of the door (1), since the profile of these support wheels (7) copies the profile of the guide (4) and, therefore, the support wheels (7) have a V-

shaped rolling profile. The shape of the V-shaped profile of the support wheels (7) conjugated with the V-shaped guide (4) allows a more guided rolling. Each support column (2, 3), one on each side of the structure of the door (10), will have 4 support wheels (7) distributed as follows, two in the upper part and two in the lower part, whereby providing great stability to the closing/opening movement of the door (1). On the other hand, said support wheels (7) are assembled on height-adjustable supports (6) which are adjusted in height in order to align and fix the support wheels (7) against the V-shaped guides (4) and to allow a precise adjustment of the assembly of the door (1) to prevent vibrations in the closing/opening movement of the door (1). These height-adjustable supports (6) are fixed to the support columns (2, 3). One of the two support columns is referred to as support and drive column (2), since the part of the drive system made up of a pinion (9) operated by a gear motor (8) is assembled therein. The rotating movement of the pinion (9) allows the rack (5) assembled on the door (1) to be moved following the trajectory of the V-shaped guides (4) and performing the closing and opening movements of the door. The gear motor (8) and pinion (9) assembly is fixed in the inner part of the support and drive column (2) and distanced from the useful passenger area such that it is inaccessible for the passenger.

[0012] The second embodiment is made up of a worm screw-crown mechanism (14, 12) located in the lower part of the platform and therefore not seen by the passenger. The operating of the worm screw-crown mechanism (14, 12) comprises a gear motor (13) operating a shaft (18) to which the worm screw-crown mechanism (14, 12) is connected. Each L-shaped structure (16) of the door (11) is integrally attached to a crown (12) at the lower part as shown in Figure 8. These crowns (12) rotate integrally with the worm screw (14) when the worm screw (14) is operated by the gear motor (8), such that since the crown (12) is integrally attached to the structure of the door, the rotation of the worm screw (14) in one direction will allow the movement of the door (11) in the closing or opening direction, and the rotation of the worm screw (14) in the opposite direction will allow the movement of the door (11) in the opening or closing direction.

[0013] The invention thus relates to a closing system for movable transport platforms for passengers/goods having:

1a) front doors (1, 11), configured for:

1a1) allowing/preventing an entrance/exit of passengers/goods to a floor of the movable platform in loading/unloading areas;
1a2) preventing passengers/goods from falling from the floor of the movable platform in transport during an outbound path from the loading area to the unloading area;

1b) opening/closing means for moving the front doors (1, 11) between an opened position and a closed position; In the closing system:
1 c) the front doors (1, 11):

1c1) are curved for reducing the width necessary for housing the platform inside the system and for increasing the rigidity for impacts of the door against a flat door;
1c2) have an inner wall oriented towards an inner part of the movable platform;
1c3) have an outer wall visible from a part outside the movable platform;
1c4) have an inner reinforcement structure (10) between the inner wall and the outer wall configured for increasing the rigidity of the front door (1, 11);

1d) the opening/closing means:

1d1) comprise operating means for generating an opening/closing movement;
1d2) comprise drive means connected at a first end to the operating means and at a second end to the front doors (1,11), configured for transmitting the opening/closing movement from the operating means to the front doors (1,11);
1d3) are located in areas inaccessible for the passengers from inside the movable platform.

[0014] Other features of the invention are included below:

2. The front doors (1, 11) comprise 2 independent leaves having a movement:

2a) synchronized by an element selected from the drive means and the operating means;
2b) configured for reducing a front door (1, 11) opening/closing time and a loading/unloading time.

3. The movable platform has a platform side height and the front doors (1, 11) have a door height h less than the platform side height H, h<H.

4. The front doors (1, 11) further comprise telescopic panels (1', 11') configured for being vertically moved;

4a) between a drawn-in position in an inner part of the front door (1, 11);
4b) and an extended position for reaching a minimal safety height at least equal to an anti-fall protective barrier height. The minimal safety height will be at least 900 mm.

5. The closing system for movable platforms further comprises:

5a) guiding means configured for guiding the

doors (1, 11) in the opening/closing movement for defining a movement trajectory of the doors (1, 11) assuring geometric tolerances of the opening/closing movement.
6a) The operating means comprise a plurality of gear motors (8, 13).
7a) The drive means comprise a plurality of mechanical gears (5,9 and 12,14).

8. According to an embodiment of the invention, in the transmission mechanism of the opening/closing movement of the doors, which is of the rack and pinion type:

8a) the doors (1) comprise:

8a1) a plurality of guides (4) fixed to the inner structure (10):

8a1a) two guides (4) in an upper part of the door(1):

8a1a1)a guide (4) in the inner wall;
8a1a2)a guide (4) in the outer wall;

8a2) a rack (5) fixed to the inner structure (10) located in a lower part of the outer wall of the door (1);

8b) the movable platform comprises:

8b1) a plurality of support wheels (7) assembled in height-adjustable supports (6):

8b1a) four support wheels (7) in an upper part of the movable platform:

8b1a1)two support wheels (7) in a support column (3) facing the inner wall;
8b1a2)two support wheels (7) in a drive column (2) facing the outer wall;

8b2) a pinion (9) configured for engaging with the rack (5) and generating the opening/closing movement of the door (1), assembled in the drive column (2);
8b3) a gear motor (8) configured for operating the pinion (9), assembled in the drive column (2).

9a) The doors (1) comprise:

9a1) two guides (4) in a lower part of the door (1):

9a1a) a guide (4) in the inner wall;
9a1b) a guide (4) in the outer wall.

9b) The movable platform comprises:

9b1) four support wheels (7) in a lower part of the movable platform:

9b1a) two support wheels (7) in a support column (3) facing the inner wall;
9b1b) two support wheels (7) in a drive column (2) facing the outer wall.

10. The guides (4) and the support wheels (7) have conjugated V shapes wherein:

10a) the guides (4) have a V-shaped cross-section forming a protuberance;
10b) the support wheels (7) have a V-shaped cross-section forming a groove having a depth configured for allowing a guided rolling of the guides (4) on the support wheels (7).

11. The front doors (1, 11):

11a) are configured for maintaining a distance between a lower part of the front doors (1, 11) and the floor of the movable platform selected from greater than 20 mm and less than 6 mm.

12. According to another embodiment of the invention, in the transmission mechanism of the opening/closing movement of the doors, which is of the worm screw-crown type:

12a) the doors (11) comprise:

12a1) an L-shaped support structure (16) having:

12a1a)a horizontal branch in a parallel plane below the floor of the movable platform;
12a1b)a vertical branch fixed to a lower part of the doors (11);

12b) the movable platform comprises:

12b1) a crown (12):

12b1a) having a rotating shaft perpendicular to the floor of the movable platform;
12b1b) assembled in a plane lower than the floor of the movable platform;
12b1c) connected to the horizontal branch of the L-shaped support structure (16);

12b2) a worm screw (14) configured for engaging with a crown (12) and generating the opening/closing movement of the door (11), the worm screw (14) being assembled in a parallel plane to the crown (12);
12b3) a gear motor (13) configured for operating the worm screw (14), assembled below the floor of the movable platform.

Claims

1. A closing system for movable transport platforms for passengers/goods comprising:

1a) front doors (1, 11), configured for:

1a1) allowing/preventing an entrance/exit of passengers/goods to a floor of the movable platform in loading/unloading areas;
1a2) preventing passengers/goods from falling from the floor of the movable platform in transport during an outbound path from the loading area to the unloading area;

1b) opening/closing means for moving the front doors (1, 11) between an opened position and a closed position;
characterized in that:
1c) the front doors (1, 11):

1c1) are curved;
1c2) have an inner wall oriented towards an inner part of the movable platform;
1c3) have an outer wall visible from a part outside the movable platform;
1c4) have an inner reinforcement structure (10) between the inner wall and the outer wall configured for increasing the rigidity of the front door (1, 11);

1d) the opening/closing means:

1d1) comprise operating means for generating an opening/closing movement;
1d2) comprise driving means connected at a first end to the operating means and at a second end to the front doors (1,11), configured for transmitting the opening/closing movement from the operating means to the front doors (1,11);
1d3) are located in areas inaccessible for the passengers from the inside of the movable platform.

2. The closing system for movable transport platforms for passengers/goods of claim 1, **characterized in that** the front doors (1, 11) comprise two independent leaves having a movement:

2a) synchronized by an element selected from the driving means and the operating means;
2b) configured for reducing a front door (1, 11) opening/closing time and a loading/unloading time.

3. The closing system for movable transport platforms for passengers/goods of any of claims 1-2, **characterized in that** the movable platform has a platform side height H and the front doors (1, 11) have a door height h less than the platform side height H, h<H.

4. The closing system for movable transport platforms for passengers/goods of any of claims 1-3, **characterized in that** the front doors (1, 11) further comprise telescopic panels (1', 11') configured for being vertically moved;

4a) between a drawn-in position in an inner part of the front door (1, 11);
4b) and an extended position for reaching a minimal safety height at least equal to an anti-fall protective barrier height.

5. The closing system for movable transport platforms for passengers/goods of any of claims 1-4, **characterized in that** it further comprises:

5a) guiding means configured for guiding the doors (1, 11) in the opening/closing movement for defining a movement trajectory of the doors (1, 11) assuring geometric tolerances of the opening/closing movement.

6. The closing system for movable transport platforms for passengers/goods of any of claims 1-5, **characterized in that**:

6a) the operating means comprise a plurality of gear motors (8, 13).

7. The closing system for movable transport platforms for passengers/goods of any of claims 1-6, **characterized in that**:

7a) the driving means comprise a plurality of mechanical gears (5-9, 12-14).

8. The closing system for movable transport platforms for passengers/goods of any of claims 1-7, **characterized in that**:

8a) the doors (1) comprise:

8a1) a plurality of guides (4) fixed to the inner structure (10):

8a1a) two guides (4) in an upper part of the door (1):

8a1a1)a guide (4) in the inner wall;
8a1a2)a guide (4) in the outer wall;

8a2) a rack (5) fixed to the inner structure (10) located in an inner part of the outer wall of the door (1);

8b) the movable platform comprises:

8b1) a plurality of support wheels (7) assembled in height-adjustable supports (6):

8b1a) four support wheels (7) in an upper part of the movable platform:

8b1a1)two support wheels (7) in a support column (3) facing the inner wall;
8b1a2)two support wheels (7) in a drive column (2) facing the outer wall;

8b2) a pinion (9) configured for engaging with the rack (5) and generating the opening/closing movement of the door (1), assembled in the drive column (2);
8b3) a gear motor (8) configured for operating the pinion (9), assembled in the drive column (2).

9. The closing system for movable transport platforms for passengers/goods of claim 8, **characterized in that**

9a) the doors (1) comprise:

9a1) two guides (4) in a lower part of the door (1):

9a1a) a guide (4) in the inner wall;
9a1b) a guide (4) in the outer wall;

9b) the movable platform comprises:

9b1) four support wheels (7) in a lower part of the movable platform:

9b1a) two support wheels (7) in a support column (3) facing the inner wall;
9b1b) two support wheels (7) in a drive column (2) facing the outer wall.

10. The closing system for movable transport platforms for passengers/goods of any of claims 8-9, **characterized in that** the guides (4) and the support wheels (7) have conjugated V shapes wherein:

10a) the guides (4) have a V-shaped cross-section forming a protuberance;
10b) the support wheels (7) have a V-shaped cross-section forming a groove having a depth configured for allowing a guided rolling of the guides (4) on the support wheels (7).

11. The closing system for movable transport platforms for passengers/goods of any of claims 1-10, **characterized in that** the front doors (1, 11):

11a) are configured for maintaining a distance between an lower part of the front doors (1, 11) and the floor of the movable platform selected from greater than 20 mm and less than 6 mm.

12. The closing system for movable transport platforms for passengers/goods of any of claims 1-7, **characterized in that**:

12a) the doors (11) comprise:

12a1) an L-shaped support structure (16) having:

12a1a)a horizontal branch in a parallel plane below the floor of the movable platform;
12a1 b)a vertical branch fixed to a lower part of the doors (11);

12b) the movable platform comprises:

12b1) a crown (12):

12b1a) having a rotating shaft perpendicular to the floor of the movable platform;
12b1b)assembled in a plane lower than the floor of the movable platform;
12b1c)connected to the horizontal branch of the L-shaped support structure (16);

12b2) a worm screw (14) configured for engaging with a crown (12) and generating the opening/closing movement of the door (11), the worm screw (14) being assembled in a parallel plane to the crown (12);
12b3) a gear motor (13) configured for operating the worm screw (14), assembled below the floor of the movable platform.

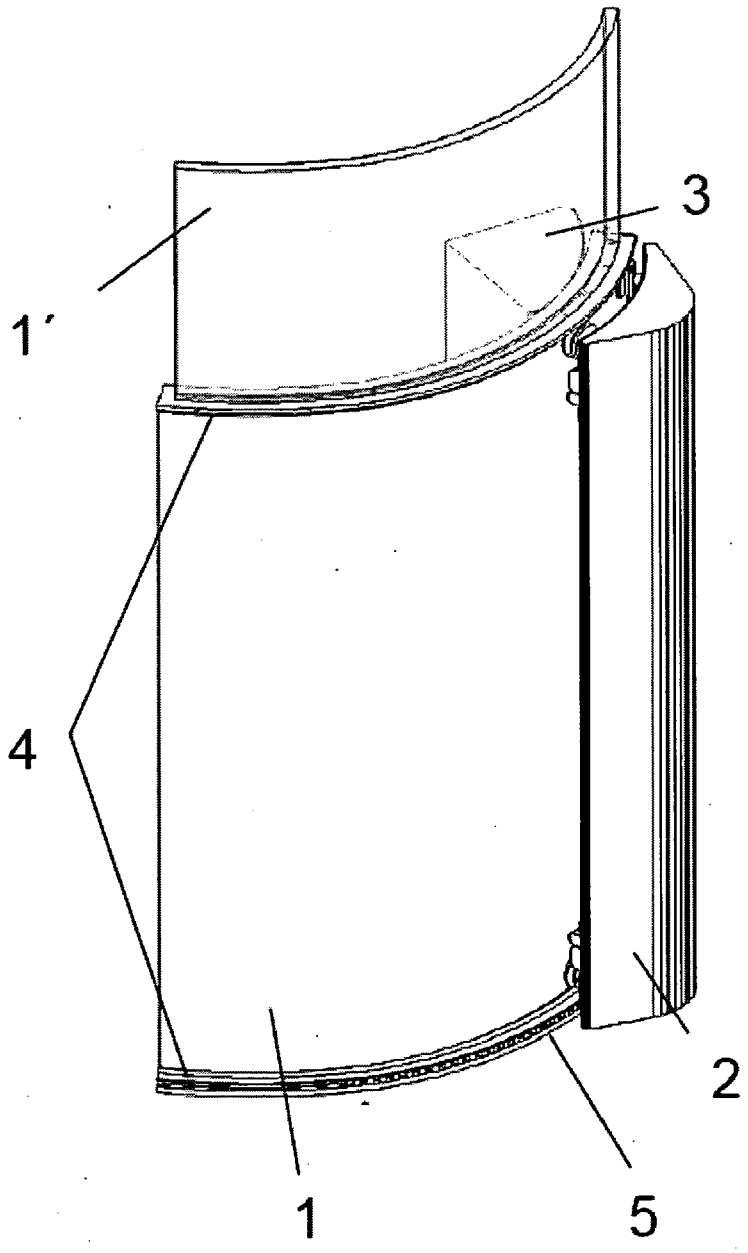


Fig. 1

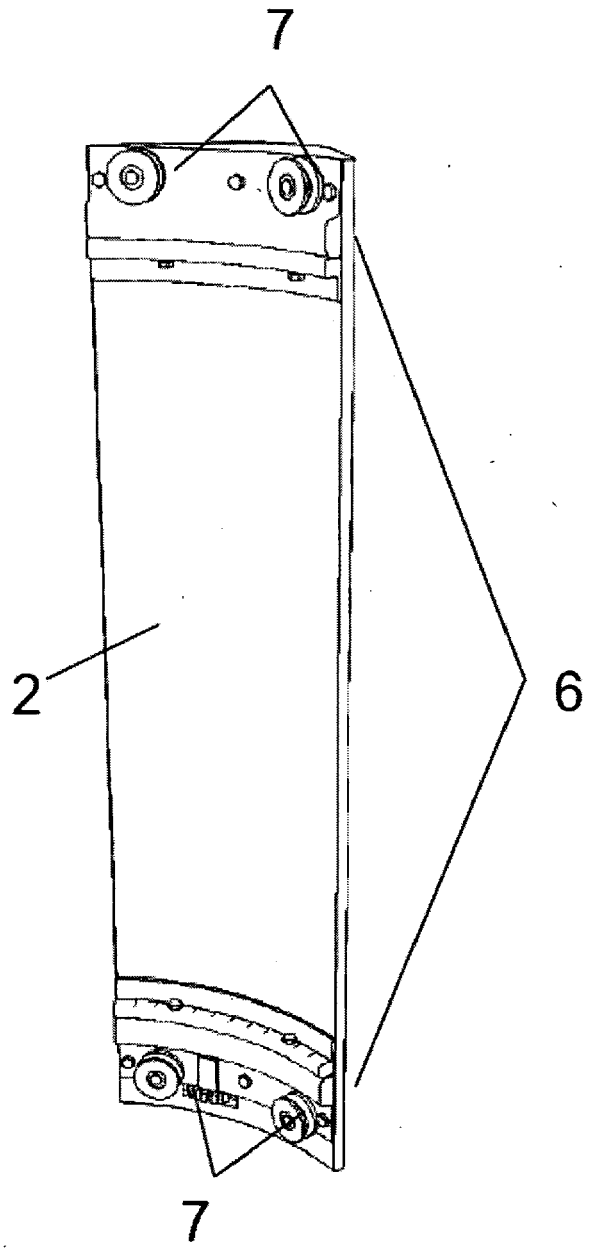


Fig. 2

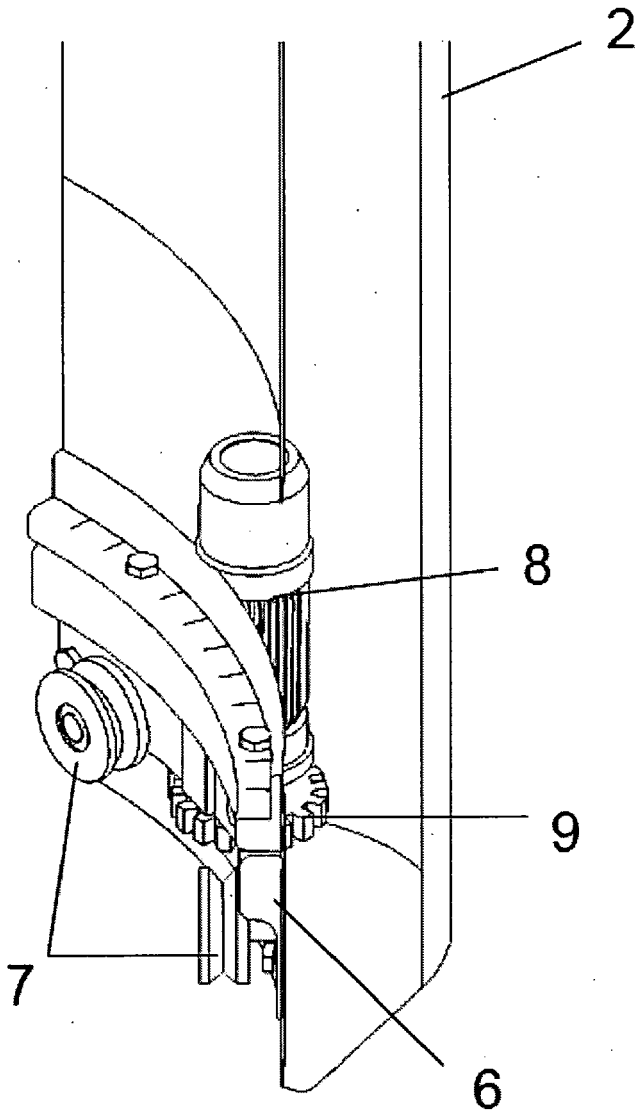


Fig. 3

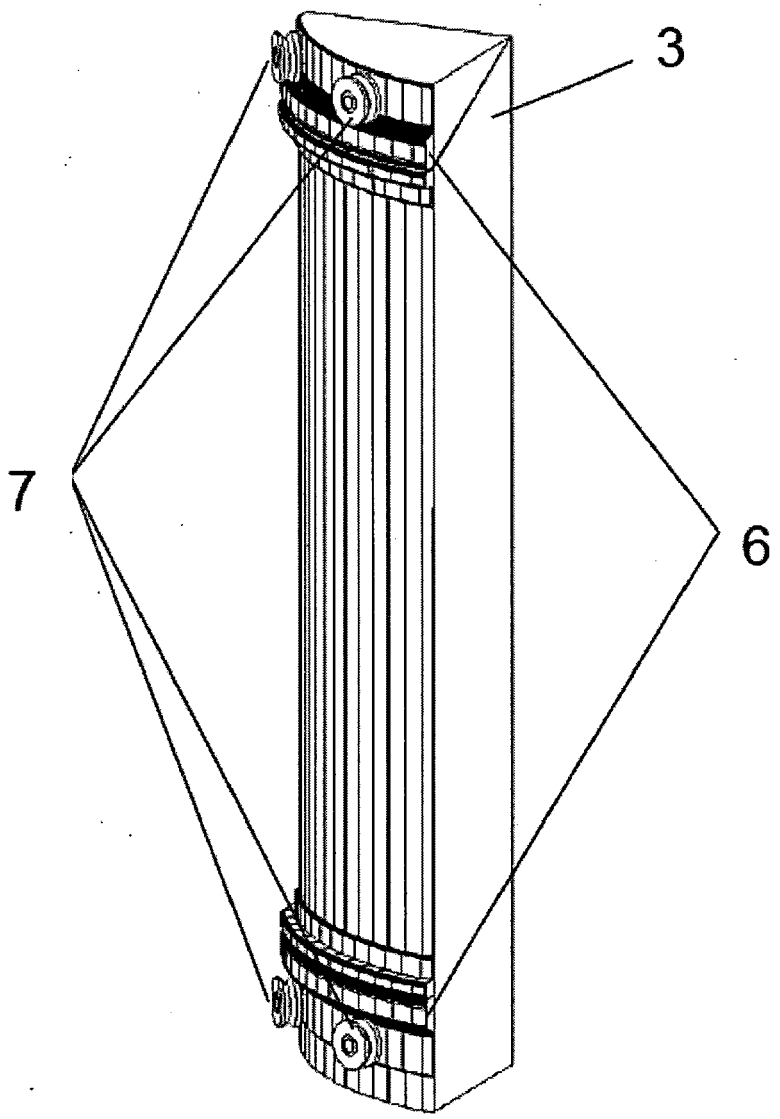
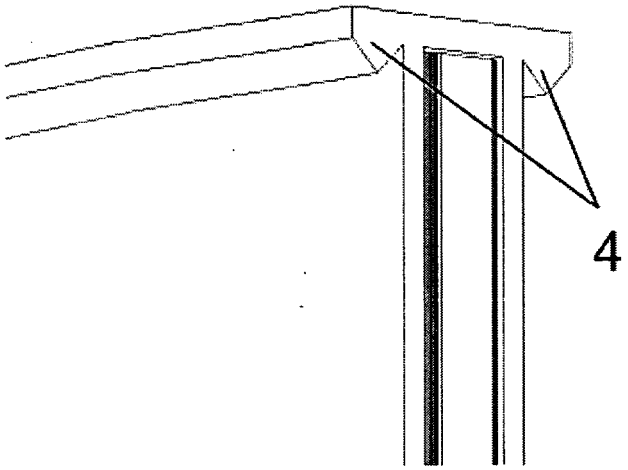


Fig. 4



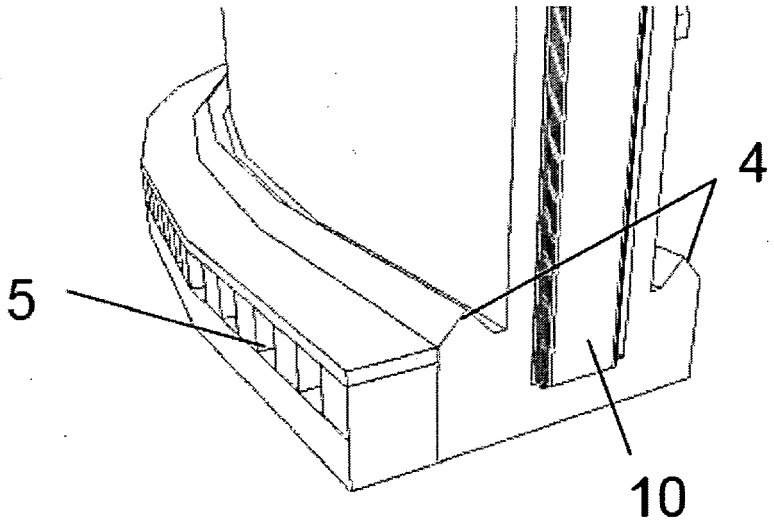


Fig. 5

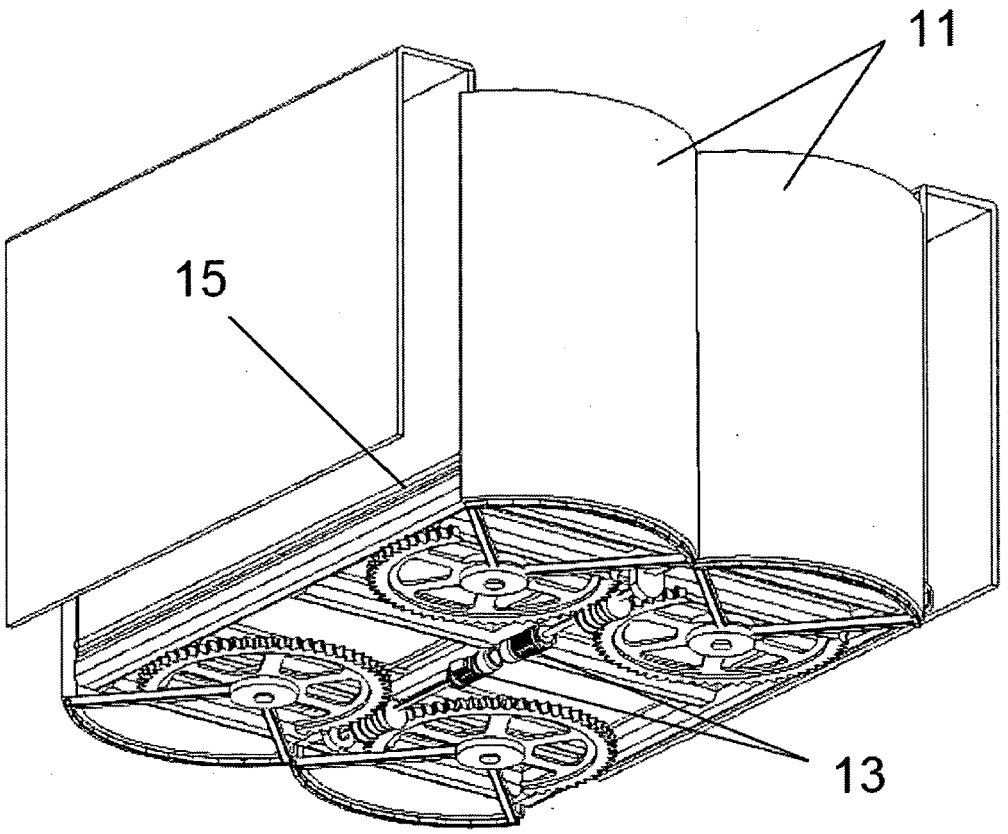


Fig. 6

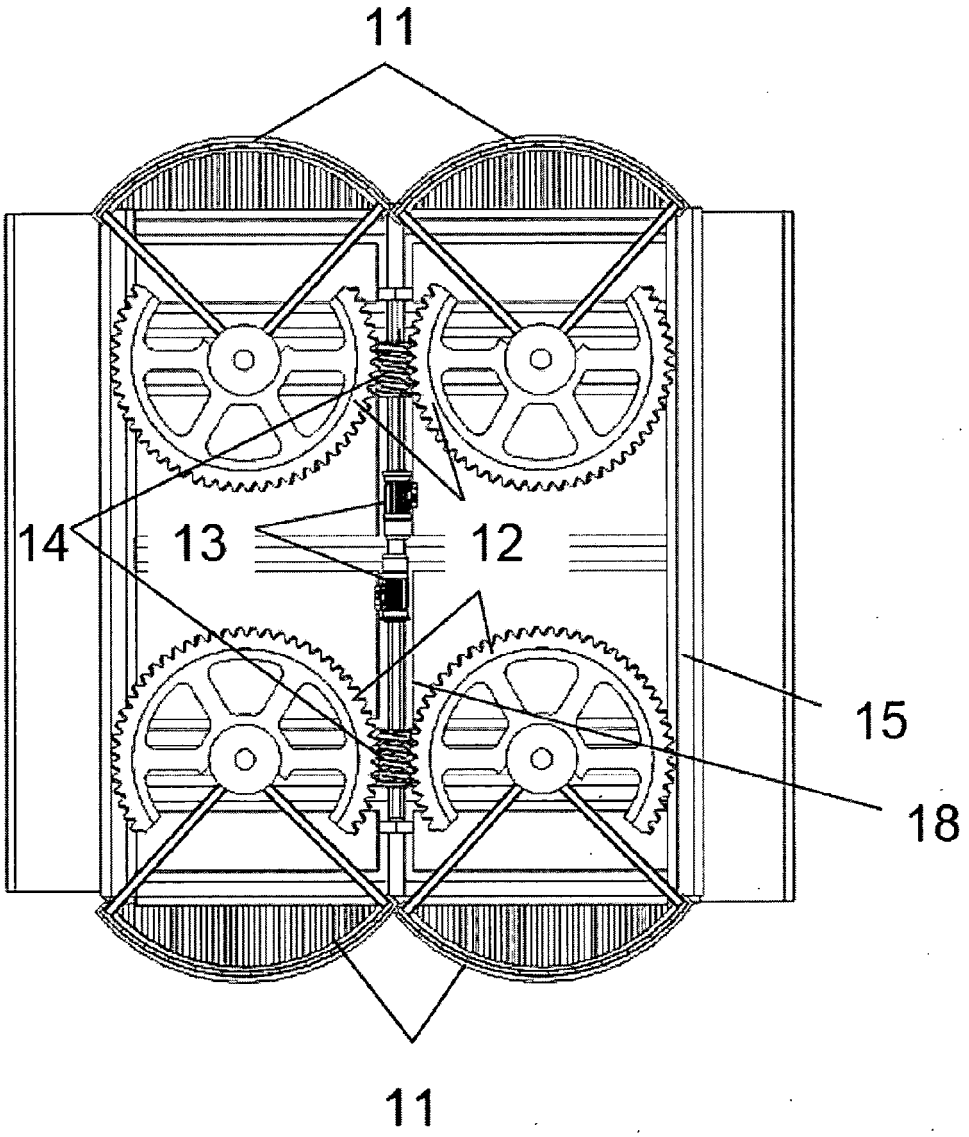


Fig. 7

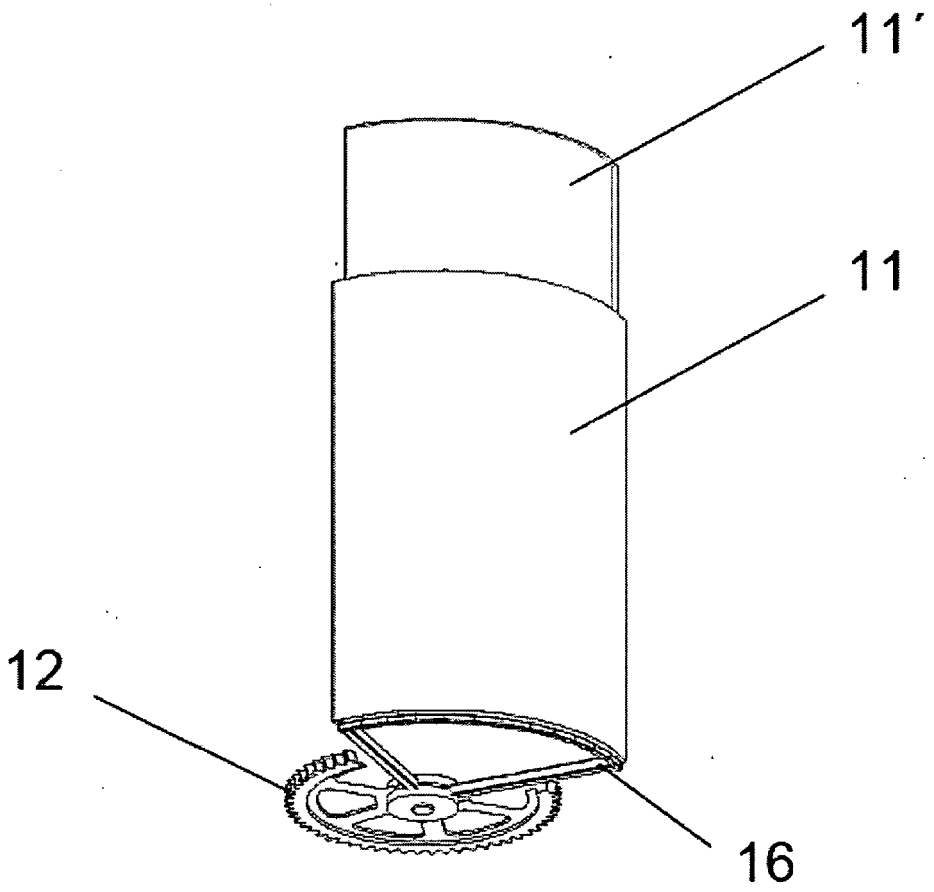


Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 11 38 0069

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 December 2011	Oosterom, Marcel

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 38 0069

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