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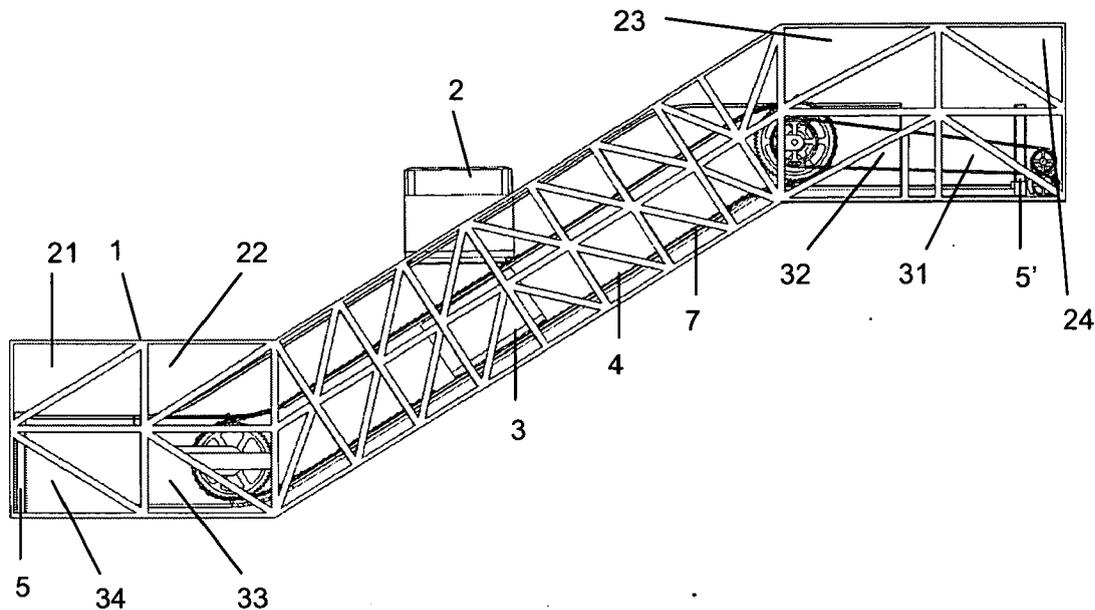
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(54) **Drive system for movable platforms**

(57) The present invention relates to a drive system for movable platforms (2, 3) having a bearing structure (1), independent movement subsystems (4, 5, 10, 11) having a drive chain (4) for being guided between chain guides (7) along a trajectory, a lifting subsystem (5) in the loading area and a lifting subsystem (5') in the unloading area for moving movable platforms (2, 3), a plu-

rality of linear motors (10) for horizontally moving the movable platforms (2, 3), platforms (2, 3) having horizontal movement devices having front rollers (61'), rear rollers (62'), drive devices having a plurality of connectors (8) and drive equipment (12, 13) for moving the drive chain (4) according to a reversible, point-to-point, discontinuous movement.



**Fig. 1**

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## Description

### Field of the Invention

**[0001]** The present invention relates to the drive system for movable platforms pertaining to a universal and accessible transport system for people/goods.

### Background of the Invention

**[0002]** Within the field of operation of universal transport systems for people/goods different proposals for the movement of the platforms or cars of these systems are seen. These systems are characterized by a movement of platforms in rectilinear, point-to-point trajectories, as in elevators and inclined elevators, or closed and coplanar trajectories as in carousel-type systems. The need of solving the platform movement in transport systems for people and/or goods having another type of trajectory and transitions if different directions (horizontal, inclined and vertical), as well as discontinuous movements of the platforms or cars is detected. The different drive methods existing do not satisfy the movement needs required for all platform movement possibilities. The present invention provides a solution to platform movement and control for transport systems for people and/or goods.

### Description of the Invention

**[0003]** The present invention relates to a universal and accessible system for the transport of passengers/goods comprising a series of platforms, and more specifically to the drive subsystem in charge of the movement of the platforms.

**[0004]** For understanding the object of the invention, firstly, the operating cycle of one of the platforms of the system must be studied, such cycle starting in the passenger loading position, an area in which the passengers have access to the platform located in the horizontal position. Next, the platform starts to run along the outbound path, which can be inclined, where the platform moves parallel to the floor for assuring the horizontality of the platform or car, and allowing a suitable comfort level for the passenger. When the platform reaches the unloading area, the platform is maintained in the horizontal position to allow the passengers to exit the platform comfortably. Once the unloading of the passengers is done, the platform is moved horizontally to the higher elevation area, where a lifting system positions the platform for taking the return path. The platform travels the return path with its floor in a position parallel to the inclined plane for reducing the height of the structure of the system in the central sector (sector central is understood as that comprised between the loading and unloading areas).

**[0005]** Said return path consists of an upper horizontal sector, an inclined sector and a lower horizontal sector. After the platform reaches the lower area, the platform is moved to the lower elevation area where, by means

of a lifting system, the platform is placed in the useful or outbound path and allows the loading of passengers. Another platform movement cycle would begin again.

**[0006]** The movement cycle previously described by the platforms is carried out by two independent drive systems, according to the trajectory taken by the platform:

- A first drive subsystem is needed for achieving a first trajectory in horizontal planes, in the loading and unloading areas, both at the return path level and at the transport path level;
- A second drive subsystem is needed for achieving a second trajectory in inclined sectors, both at the transport path level and at the return path level.

**[0007]** The independent drive systems are synchronized with one other for allowing the transitions of the platforms in the different trajectories. This synchronization must also allow a symmetrical movement of the platforms being moved in the inclined path for achieving a weight compensation and less power needed in the drive system formed by a roller chain, i.e., at the time when the platform in loading starts its inclined ascending movement, the post-unloading platform starts its inclined descending movement.

**[0008]** The first subsystem comprises linear motors as a drive element. The second drive subsystem comprises mechanical transmission systems of roller chains.

**[0009]** The transition between the drive subsystems is performed by means of a guiding system on which rollers placed in the outer lower part of the platforms roll. Said guiding system is continuous in the horizontal and inclined sectors and is discontinuous in lifting systems for allowing the trajectory change of the platform from the lower horizontal plane to the upper horizontal plane and vice versa, allowing an ascending/descending movement of the platform. Therefore the lifting systems have installed guides configured for allowing the transition of the platform from the horizontal areas to the lifting system itself. This guide system is supported on fastenings which in turn are anchored to the bearing structure of the system, providing it the rigidity needed for supporting the stresses to which the guiding system is subjected.

**[0010]** The subsystem in charge of providing movement to the platform in the horizontal parts of the system comprises a linear motor or a group of linear motors located at the end of the elevator, which acts on a series of magnetic plates located in the lower part of the platform, closing the magnetic circuit of the linear motor. These linear motors are configured so that the platforms:

are horizontally moved toward the elevators:

from the mechanical drive subsystem of the inclined sector coming from the return path in the loading area;

from the mechanical drive subsystem of the inclined sector coming from the useful or transport

path in the unloading area;

are horizontally moved from the elevators:

to the mechanical drive subsystem of the inclined sector going to the transport path in the loading area;

to the mechanical drive subsystem of the inclined sector going to the return path in the unloading area.

**[0011]** The subsystem in charge of providing movement to the platform in the inclined sector comprises a variety of elements the main drive part of which is a roller chain rolling on a guide for controlling its position at all times. A mechanical element or hook installed in each platform is connected to this roller chain for allowing the platform to be hooked and driven by the roller chain. The roller chain is located on both sides of the platform for allowing a symmetrical pull and this roller chain is operated by means of two gear wheels operated by a gearmotor group. The two gear wheels are supported on the structure by the outer part of the wheels for allowing the passage of the platform by the inner part of the gear wheels. These wheels are supported by the structure of the system by means of bearings that allow their rotation.

**[0012]** One aspect of the invention relates to a drive system for movable platforms as defined in the set of claims.

#### Brief Description of the Drawings

**[0013]** A series of drawings which aid in better understanding the invention and its improvement which are expressly related to an embodiment of said invention presented as a non-limiting example of the latter is very briefly described below.

Figure 1 shows a side view of the entire system.

Figure 2 shows a perspective view of the central part of the system.

Figure 3A shows a detailed view of the lifting system of the lower part of the system and Figure 3B shows a detailed view of the horizontal movement of the lower part of the system.

**[0014]** The figure 4A shows a plan view and 4B is a detailed view of figure 4A. Figure 4C shows a detailed view of the upper part of the system.

#### Description of Preferred Embodiments of the Invention

**[0015]** One embodiment of the invention relates to a drive system for movable platforms (2, 3) comprising:

1a) a bearing structure (1):

1a1) comprising a plurality of fixings configured

for supporting a plurality of guides (7, 61, 62, 63) fastened by fastening means (9);

independent movement subsystems (4, 5, 10, 11) comprising:

1b) a drive chain (4) configured for being guided between chain guides (7) along a trajectory comprising:

1b1) a transport path from a loading position (22) at the beginning of the transport path, to an unloading position (23) at the end of the transport path;

1b2) a return path from a post-unloading position (32) at the beginning of the return path, to a pre-loading position (33) at the end of the return path;

1c) a lifting subsystem (5) in the loading area and a lifting subsystem (5') in the unloading area for moving movable platforms (2, 3):

1c1) from an (34) at a return path level to an ascended position (21) at a transport path level;

1c2) from a (24) at a transport path level to a (31) at a return path level;

the lifting subsystems (5, 5') comprise a lifting motor (51), a lifting column (52), a lifting structure (53) and lifting guides (54) for moving the movable platforms (2, 3) between levels;

1d) a plurality of linear motors (10) configured for horizontally moving the movable platforms (2, 3):

in the loading area:

1d1) from a pre-loading position (33) to an (34) or position for entering the lifting subsystem (5);

1d2) from an (21) or position for exiting from the lifting subsystem (5) to a loading position (22);

in the unloading area:

1d3) from an unloading position (23) to a (24) or position for entering the lifting subsystem (5);

1d4) from a (31) or position for exiting from the lifting subsystem (5') to a post-unloading position (32);

1e) a plurality of platforms (2, 3) comprising:

1e1) horizontal movement means comprising a plurality of magnetic plates (11) below a floor of the platform;

rolling means (61', 62') comprising:

1e2) front rollers (61') configured for being guided by:

1e2a) front platform guides (61) in the useful

<p>path; 1e2b) return platform guides (63) in the return path;</p> <p>1e3) rear rollers (62') configured for being guided by:</p> <p>1e3a) rear platform guides (62) in the useful path; 1e3b) return platform guides (63) in the return path;</p> <p>1e4) drive means comprising a plurality of connectors (8) configured for being moved between a connected position where the platform (2, 3) is driven by the drive chain (4), and a disconnected position where the platform (2, 3) is not driven by the drive chain(4);</p> <p>1f) drive equipment (12, 13) configured for moving the drive chain (4) according to a reversible, point-to-point, discontinuous movement; wherein: 1g) the front platform guides (61) and the rear platform guides (62) are arranged for guiding the platforms (2, 3) in the horizontal position along the transport path.</p> <p><b>[0016]</b> Other features of the invention are included below:</p> <p>2a) The return platform guides (63) are arranged for guiding the platforms (2, 3) in a position parallel to the transport path along the return path from a post-unloading position at the beginning of the return path to a pre-loading position at the end of the return path for reducing pit depth.</p> <p><b>[0017]</b> 3. The drive system for movable platforms comprises two drive chains (4), one on each side of the structure of the system for driving the platforms (2, 3) symmetrically without generating turning torque in the rollers (61', 62') of the platforms (2, 3).</p> <p><b>[0018]</b> 4. The independent movement subsystems (4, 5, 10) are synchronized with each other for allowing transitions of the platforms (2, 3) in the different trajectories and a weight compensation between two platforms driven by the drive chain (4), one platform being in the transport path and one platform being in the return path.</p> <p><b>Claims</b></p> <p>1. A drive system for movable platforms, (2, 3) characterized in that it comprises:</p> <p>1a) a bearing structure (1):</p>	<p>5</p> <p>5</p> <p>10</p> <p>15</p> <p>20</p> <p>25</p> <p>30</p> <p>35</p> <p>40</p> <p>45</p> <p>50</p> <p>55</p>	<p>1a1) comprising a plurality of fixings configured for supporting a plurality of guides (7, 61, 62, 63); independent movement subsystems (4, 5, 10, 11) comprising:</p> <p>1b) a drive chain (4) configured for being guided between chain guides (7) along a trajectory comprising:</p> <p>1b1) a transport path from a loading position (22) at the beginning of the transport path, to an unloading position (23) at the end of the transport path; 1b2) a return path from a post-unloading position (32) at the beginning of the return path, to a pre-loading position (33) at the end of the return path;</p> <p>1c) a lifting subsystem (5) in the loading area and a lifting subsystem (5') in the unloading area for moving movable platforms (2, 3):</p> <p>1c1) from an (34) at a return path level to an ascended position (21) at a transport path level; 1c2) from a (24) at a transport path level to a (31) at a return path level;</p> <p>1d) a plurality of linear motors (10) configured for horizontally moving the movable platforms (2, 3): in the loading area:</p> <p>1d1) from a pre-loading position (33) to an (34); 1d2) from an (21) to a loading position (22);</p> <p>in the unloading area:</p> <p>1d3) from an unloading position (23) to a (24); 1d4) from a (31) to a post-unloading position (32);</p> <p>1e) a plurality of platforms (2, 3) comprising:</p> <p>1e1) horizontal movement means comprising a plurality of magnetic plates (11) below a floor of the platform; rolling means (61', 62') comprising: 1e2) front rollers (61') configured for being guided by:</p> <p>1e2a) front platform guides (61) in the useful path; 1e2b) return platform guides (63) in the return path;</p>
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1e3) rear rollers (62') configured for being guided by:

- 1e3a) rear platform guides (62) in the useful path; 5
- 1e3b) return platform guides (63) in the return path;

1e4) drive means comprising a plurality of connectors (8) configured for being moved between a connected position where the platform (2, 3) is driven by the drive chain (4), and a disconnected position where the platform (2, 3) is not driven by the drive chain (4); 10  
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1f) drive equipment (12, 13) configured for moving the drive chain (4) according to a reversible, point-to-point, discontinuous movement; wherein: 20

1g) the front platform guides (61) and the rear platform guides (62) are arranged for guiding the platforms (2, 3) in the horizontal position along the transport path. 25

2. The drive system for movable platforms of claim 1, **characterized in that:** 2a) the return platform guides (63) are arranged for guiding the platforms (2, 3) in a position parallel to the transport path along the return path from a post-unloading position at the beginning of the return path to a pre-loading position at the end of the return path for reducing pit depth. 30
3. The drive system for movable platforms of any of claims 1-2, **characterized in that** it comprises two drive chains (4), one on each side of the structure of the system for driving the platforms (2, 3) symmetrically without generating turning torque in the rollers (61', 62') of the platforms (2, 3). 35  
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4. The drive system for movable platforms of any of claims 1-3, **characterized in that** the independent movement subsystems (4, 5, 10) are synchronized with each other for allowing transitions of the platforms (2, 3) in the different trajectories and a weight compensation between two platforms driven by the drive chain (4), one platform being in the transport path and one platform being in the return path. 45  
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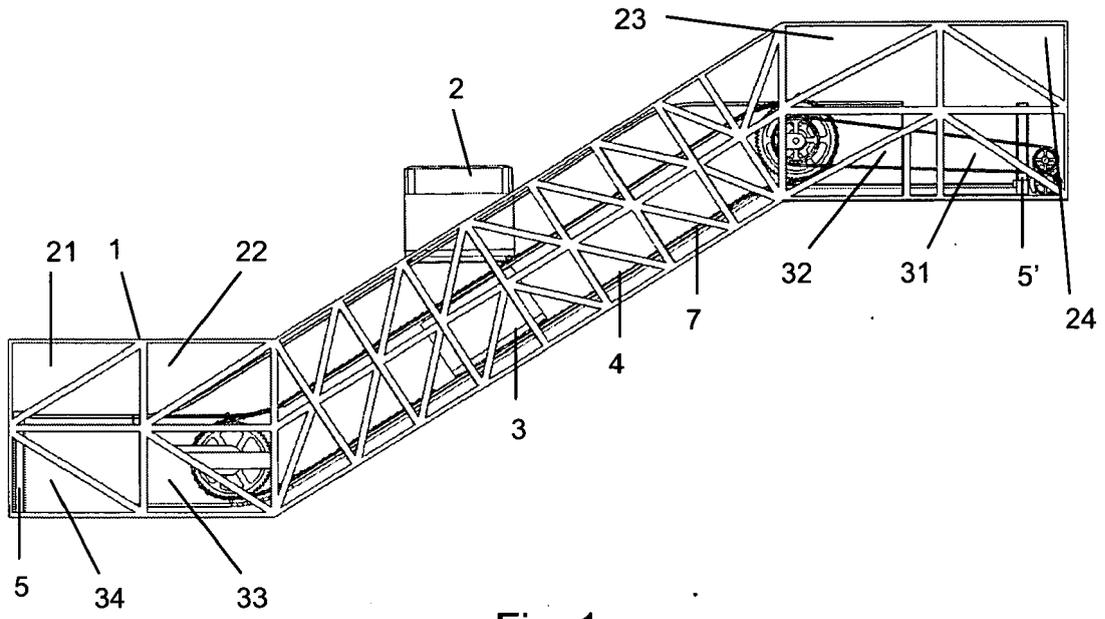


Fig. 1

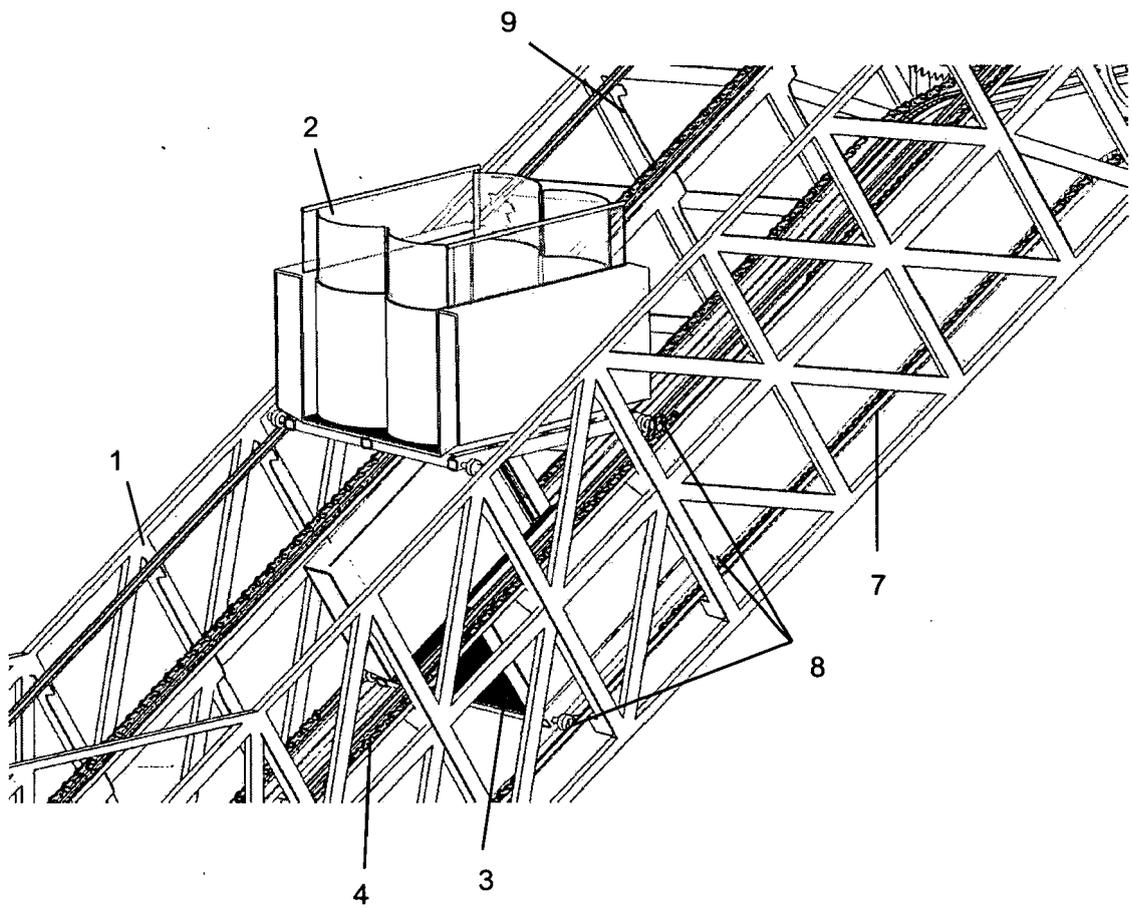


Fig. 2

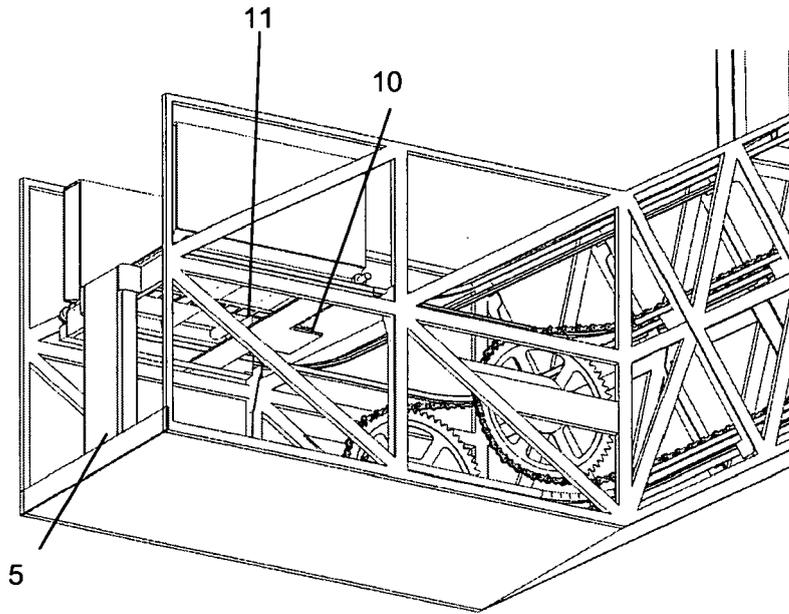


Fig. 3A

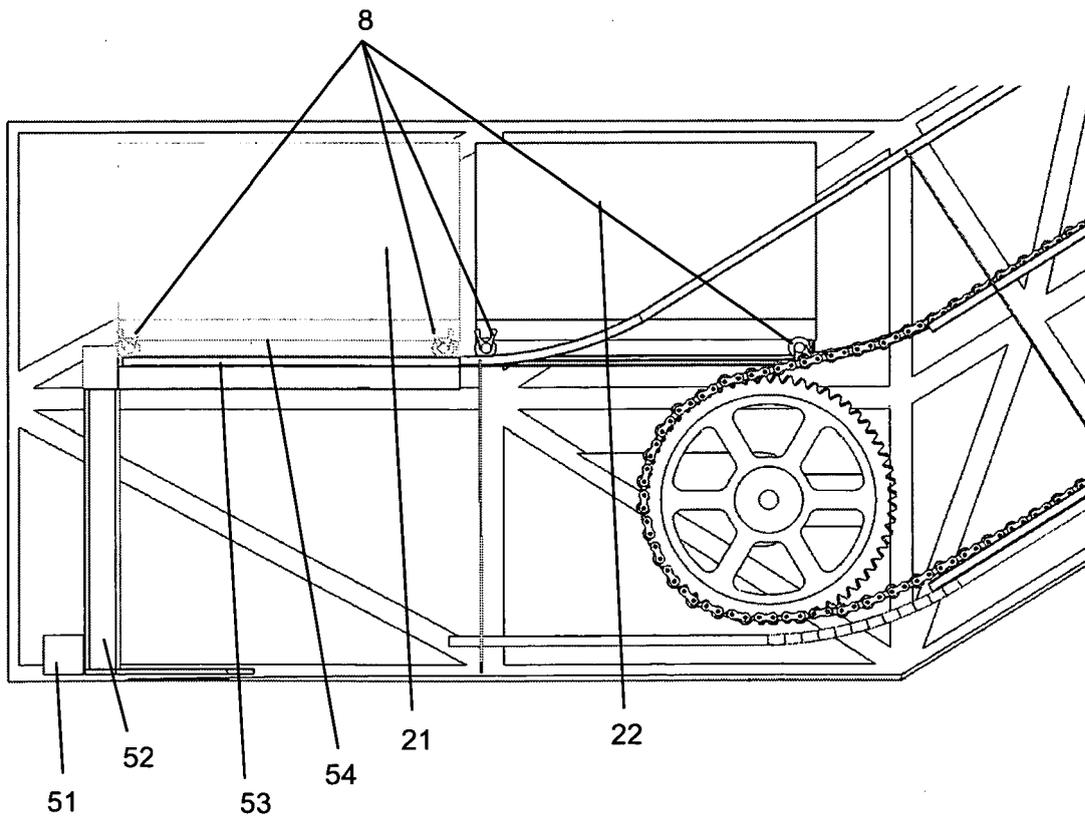


Fig. 3B

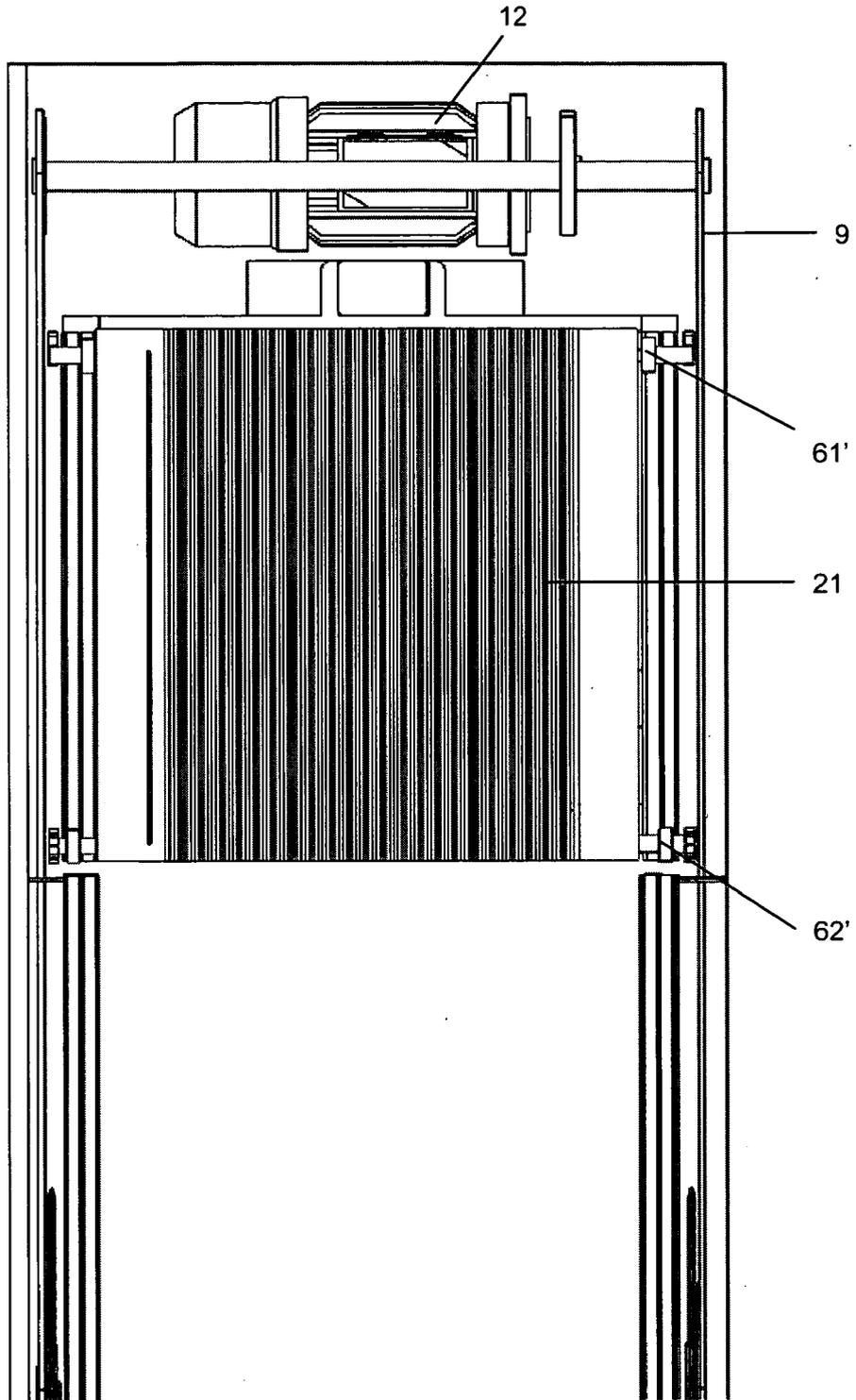


Fig. 4A

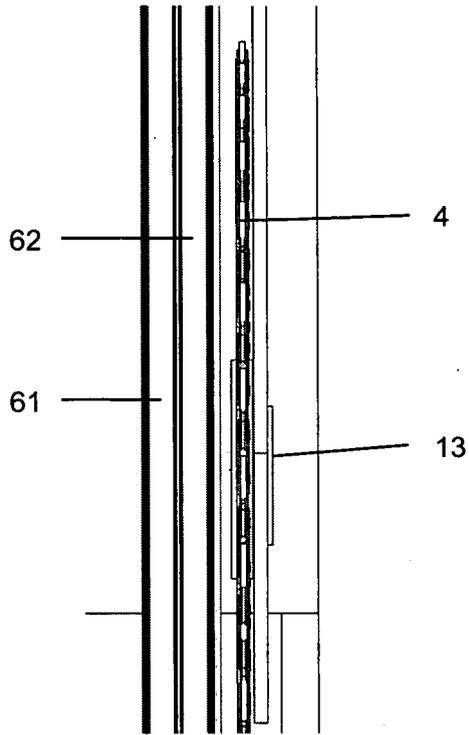


Fig. 4B

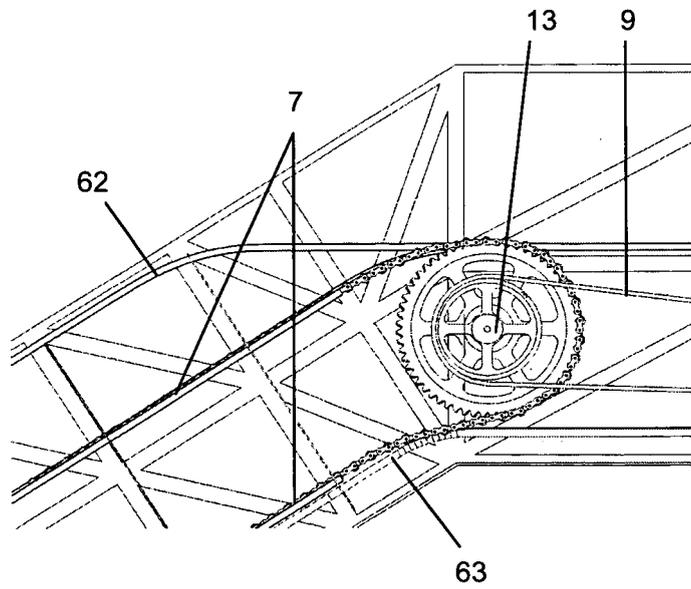


Fig. 4C



EUROPEAN SEARCH REPORT

Application Number  
EP 11 38 0072

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	ES 2 333 640 A1 (THYSSENKRUPP ELEVATOR INNOVATI [ES]; THUSSENKRUPP ELEVATOR ES PBB G) 24 February 2010 (2010-02-24) * the whole document * & EP 2 266 912 A1 (THYSSENKRUPP ELEVATOR INNOVATION CT S A [ES]; THYSSENKRUPP ELEVATOR ES) 29 December 2010 (2010-12-29) -----	1-4	INV. B66B21/00 B66B23/14
A	US 3 610 160 A (ALIMANESTIANU MIHAI) 5 October 1971 (1971-10-05) * column 3, line 6 - line 25; figures 4,5,8 * -----	1-4	
			TECHNICAL FIELDS SEARCHED (IPC)
			B66B B61K
1 The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 9 December 2011	Examiner Nelis, Yves
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 38 0072

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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09-12-2011

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82