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

(11) **EP 2 543 618 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.01.2013 Bulletin 2013/02

(51) Int Cl.:
B66B 13/12 *(2006.01)*

(21) Application number: **11425178.8**

(22) Date of filing: **05.07.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **Prisma S.p.A.**
43055 Mezzani Località Casale (PR) (IT)

(72) Inventor: **Valero, Oscar**
08670 Navas, Barcelona (ES)

(74) Representative: **Riccardi, Sergio**
Riccardi & Co.
Via Macedonio Melloni, 32
20129 Milano (IT)

(54) Elevator door coupling apparatus

(57) An elevator door coupling apparatus comprises a support (60) fixed at the elevator car door for a pair of actuating member (20) which displaces a pair of engaging member (10) between a first disengaged condition and a second engaged condition with locking system of elevator shaft door; an assembly (30; 40; 80) moves each actuating member (20) from a first retracted position to a second advanced position in which the actuating members (20) are allowed to displace said at least one engaging member (10) from said first disengaged condition to said second engaged condition with said locking system of the elevator shaft door.

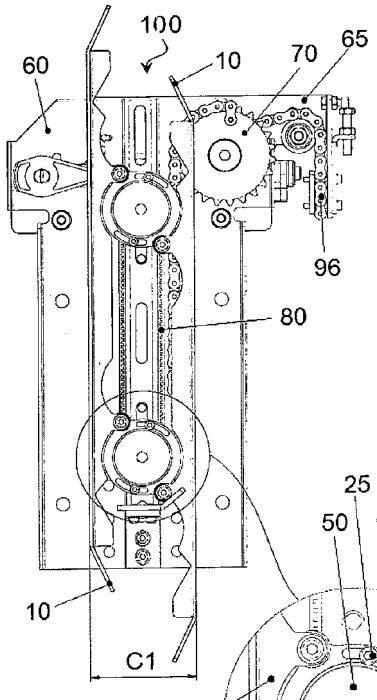


Fig. 1

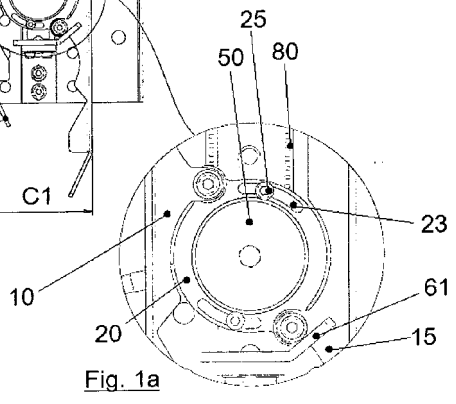


Fig. 1a

EP 2 543 618 A1

Description

[0001] The present invention relates to an elevator door coupling apparatus and more particularly to a coupling apparatus able to engage and release elevator car door and elevator shaft door.

[0002] Most of the elevators currently adopt for both car door and shaft door sliding shutters, generally at least a pair of shutters, moving horizontally on rails provided on the sills of car and floor. Regardless arrangement and number of said sliding shutters which, with reference to the opening thereof, can move either in opposite directions or along a common direction, opening and closing of the car door and shaft door occur preferably in accordance with an almost synchronous driving so as to assure a fast and ease transfer of people from floor to the car and vice versa during opening thereof and also safety conditions while closing. Such driving is, as said, not exactly timed synchronous but the door opening starts during landing of the car at the floor requested thus avoiding unnecessary downtimes. A correctly timing of driving is commonly achieved by coupling apparatuses comprising at least a first engaging member on the elevator car door fitted to engage a second engaged member on each shaft door. In order to contain plant and maintenance costs an unique driving motor is usually provided on the elevator car, said motor controlling the first member of the coupling apparatus engaging the second member thus permitting the aforementioned almost synchronous movement of elevator car door and elevator shaft door. The driving motor can be shared with the car door operator through suited transmission system or, alternatively, can be a dedicated electric motor. Yet referring to elevator plant currently known, said first engaging member of the coupling apparatus is constituted by a hinged parallelogram in which a pair of opposed vertical arms-where vertical is the direction parallel to the elevator lifting movement - are pivotally joined by a couple of rotatable arms whilst the engaged member is constituted by a pair of rollers rotatably fixed at opposite ends of a lever, said lever being in turn operatively connected to locking system of the elevator shaft door. In locked position said lever of the engaged member is inclined at a given angle so as to misalign in respect of vertical direction said rollers and define a gap therebetween. During landing of elevator car vertical arms of hinged parallelogram enter such gap and, under control of the driving motor, are moved apart from each other by rotation of said rotatable arms thus contacting rollers and forcing lever to consequently rotate. The lever rotation unlocks elevator shaft door while the vertical arms keep the roller engaged and allow a synchronous movement of shaft door and car door, the latter being driven by the car door operator.

[0003] The member of the coupling apparatus is arranged in the current elevator plants so that the vertical arms of the hinged parallelogram pass the gap between rollers of each shaft door till the elevator car reaches the floor requested. The obvious variable clearances existing between the engaging member and pair of rollers at each floor together with the unavoidable horizontal vibrations of the elevator car during its movement generate continuous impacts between said members that result in further vibrations and excessive stress of the apparatus. Moreover, as the elevator car speed increases due to more and more advanced technology of the driving systems adopted, the above drawbacks of the known coupling apparatuses need to be overcome.

[0004] Main object of the present invention is therefore to provide an elevator door coupling apparatus which is not affected by vibrations related to elevator car speed causing impacts between members of the same coupling apparatus.

[0005] Another object of the present invention is then to provide an elevator door coupling apparatus which solves issue regarding variable clearances during engagement of members of the same coupling apparatus.

[0006] These and other advantages and features of the elevator door coupling apparatus of the present invention will be clear from a detailed description of a preferred not limiting embodiment thereof, also taken with reference to the annexed drawings in which:

fig. 1 is a front view of engaging member of the elevator car door coupling apparatus according to a preferred embodiment of the present invention in its closed arrangement
fig. 1 a is an enlarged front view of a detail in fig. 1,
fig. 2 is a side view of the embodiment in fig. 1,
fig. 3 is a front view of the embodiment in fig. 1 in its opened arrangement,
fig. 3a is an enlarged front view of a first detail in fig. 3,
fig. 3b is an enlarged bottom view of a second detail in fig. 3,
fig. 4 is a side view of the embodiment in fig. 3,
fig. 5 is a partial perspective exploded view of embodiment in fig. 1a, and
fig. 6 is a perspective view of embodiment in fig. 1.

[0007] With reference to the figures, there is shown an elevator door coupling apparatus 100 comprising a pair of vertical arms 10, a lower and an upper ring 20. Each ring 20 has diametrically opposed protrusions 21 and 22 and also peripheral slots 23 and 24 formed between said protrusions 21 and 22. Each vertical arm 10 is hinged to both lower and upper rings 20 at said one protrusion 21 or 22 such that a hinged parallelogram is formed. A pair of annular members 30 are dimensioned in order to be concentrically fitted in the upper and lower rings 20, respectively, and adjustably fixed thereto by bolts 25 inserted in said slots 23 and 24: in particular, said members 30 are internally threaded according to a helical profile 31. Further, a pair of internally hollow cylinders 40 are threaded on a portion of their external surface so as to have a profile 41 mating said helical profile 31, the remaining portion of said external surface being a toothed surface 42. Said hollow cylinders 40 are pivotally fixed,

through a pair of pin 50 fitting the hollow of said cylinders 40 by a set of roller cages 51, to a supporting plate 60 at separate positions along a vertical direction. Said supporting plate 60 is also configured to pivotally support, on its top right hand side, a transmission sprocket wheel 70 of a chain 75, connected at a first end 76 thereof to a spring (schematically shown in the figures) and at second end 77 to said sprocket wheel 70; the spring is also connected to the supporting plate 60 such that it assures a constant pulling action for the chain 75. A second supporting plate 65, connected fixedly to the elevator car door operator (not shown) and slideably to the supporting plate 60, supports a snub pin 95 around which a chain 90 is partially wound. Said chain 90 has a first end 96 fixed to said second supporting plate 65 by a pair of bolts and a second end connected to periphery of a second smaller wheel (not shown), said second smaller wheel being coaxially mounted to said sprocket wheel 70 and integrally movable therewith. A toothed belt 80 is selected in order to mate with portion of toothed surface 42 of the cylinders 40 and wound around them in a closed configuration; suitable coupling means are provided for coupling said toothed belt 80 to said chain 75. Finally a profiled plate 61, having a L-shaped guide 63, is fixed to said supporting plate 60 under the lower cylinder 40; a pin 62 protruding from the lower annular member 30 is dimensioned in order to engage the guide 63 (see fig. 3b).

[0008] According to the above described arrangement the coupling apparatus 100, with reference to the door opening operation, from a first retracted position P1 (fig. 1a) and in a closed condition C1 axially moves towards a second advanced position P2 between rollers of the shaft door and then displaced in an opened condition C2 (fig. 3) so as to engage said rollers: the supporting plate 65 is horizontally drawn by the door operator thus causing the chain 90 to be pulled and said second wheel to be accordingly rotated. The sprocket wheel 70, actuated by said second wheel, clockwisely rotates and upwardly moves both the chain 75 and the toothed belt 80 fixed, as above said, to the chain 75. The cylinders 40 are therefore driven by said toothed belt 80 mating toothed portion of their external surfaces 42 and synchronously rotate so as to allow the annular members 30 to advance by mating action of helical profiles 31 and 41. Advancing movement of the annular members 30 is controlled by said pin 62 which is engaged in the guide 63 of the profiled plate 61. In the retracted position P1 the pin 62 is at the end of the guide 63 next to the supporting plate 60; constrained by the first portion of the L-shaped guide 63, said pin 62 forces the lower annular member 30, and therefore also the upper annular member 30, to advance under the cylinder rotation while not allowing any rotation of the same annular members 30: therefore the arms 10 are moved in a still closed condition C1 towards the advanced position P2. In the advanced position P2, but yet in closed condition C1, which is a disengaged condition, the pair of arms 10 is displaced due to actuating action imposed by the rings 20 between rollers of the locking system of the elevator shaft door (not shown). Once the pin 62 has reached the second portion of the L-shaped guide 63, which is almost normal to the first portion, the annular members 30 are no more allowed to advance: in this latter portion of the guide 63 the cylinder rotation indeed results in a corresponding rotation of the annular members 30 which can lead the arms 10 from the closed condition C1 to an open condition C2. In the latter open condition C2 the arms 10 contact said rollers and rotate lever the rollers are connected to: as known, such lever rotation unlocks elevator shaft door. Therefore this final open condition C2, which is an engaging condition, allows the elevator shaft door and the elevator car door to be coupled and opened, namely slid horizontally, substantially driven by the elevator door operator, as desired.

[0009] With reference to the door closing operation, the pair of arms 10 is disengaged from rollers and the corresponding lever of the elevator shaft door locking system by a reverse rotation of said cylinders 40 resulting from reverse movement of the car door operator; the action of the return spring arranged between the end 76 of the chain 75 and a fixed point of the supporting plate 60 assures a reverse counterclockwise rotation of the sprocket wheel 75 which, in turn, rotates the smaller wheel and pulls the chain 95 connected thereto. The toothed belt 80 can be therefore reversely actuated thus causing the cylinders 40, through the annular members 30, to rotate the pair of arms 10 in the closed condition C1 and, still withdrawn by the annular member 30 mating the cylinders 40, to move backwards to the retracted position P1.

[0010] The pair of cylinders 40, the pair of annular members 30 and the belt 80 can be so considered as constituting an unique assembly, said assembly serving for displacing the engaging members or arms 10 from the retracted position to the advanced position, said engaging members being actuated by said rings 20. The assembly can be also driven by car door operator by interposing transmission means constituted by chains 75 and 95 and the coaxially arranged sprocket wheel 70 and smaller wheel. It is to be envisioned that ratio between diameters of the sprocket wheel 70 and the smaller wheel is selected for amplifying movement of the chain 75 in respect of the movement of the chain 95 thus adjusting the door operator stroke to advanced movement required for the coupling apparatus 100 generally being 20 mm. The helical thread pitch must be also selected in order to comply with the desired advancing movement of the apparatus 100.

[0011] The preceding detailed description clearly shows how the elevator door coupling apparatus according to the present invention solves all the issues related to the prior art apparatuses, since any contact between shaft door members and car door members is eliminated during lifting of the car door whilst the engagement of said member and the coupling thereof only occur while landing of the same car. Such improvement over prior art noticeably applies in high speed elevator plants in

which any damage resulting from impacts of the involved members is avoided and every consequent downtime avoided.

[0012] Those skilled in the art will envision obvious changes and modifications to the above described preferred embodiment including, for example, different shape of each hinged parallelogram parts and connection thereof, or alternative driving and transmission systems, all of these changes and modifications falling within the scope of the present invention as claimed below.

Claims

1. An elevator door coupling apparatus comprising:

   (i) a support (60) fixed at elevator car door for
   (ii) at least one actuating member (20) displacing, between a first disengaged condition and a second engaged condition with locking system of elevator shaft door,
   (iii) at least one engaging member (10),

   characterized by at least an assembly (30; 40; 80) displacing said at least one actuating member (20) from a first retracted position to a second advanced position in which said at least one actuating member (20) is allowed to displace said at least one engaging member (10) from said first disengaged condition to said second engaged condition with said locking system of the elevator shaft door.

2. The elevator door coupling apparatus according to claim 1, wherein said assembly (30; 40; 80) is driven by the car door operator.

3. The elevator door coupling apparatus according to claim 2, wherein said assembly (30; 40) and said car door operator are connected by transmission means (65; 75; 95).

4. The elevator door coupling apparatus according to claim 1, wherein displacement of said assembly (30; 40; 80) and engagement of said at least one engaging member (10) are controlled by a protruding member (62) constrained in profiled guide (63).

5. The elevator door coupling apparatus according to one or more preceding claims, wherein a pair of first actuating members (20) and a pair of engaging members (10) are provided, each first actuating member (20) being connected, preferably hinged, to both engaging members (10) so as to form a hinged parallelogram.

6. The elevator door coupling apparatus according to claim 5, wherein said first actuating members (20) are in the form of rings and said engaging members (10) are in the form of arms.

7. The elevator door coupling apparatus according to one or more preceding claims, wherein said assembly (30; 40; 80) comprises a first member (30) and a second member (40) configured so as to cooperate with each other, one of said first or second members being fixedly connected to said actuating member (20), the other of said first or second members (40) being operatively connected to driving means (80).

8. The elevator door coupling apparatus according to claim 4, wherein said first member (30) and said second member (40) cooperate with each other by mating profiles formed on surfaces thereof, preferably threaded or helical profiles.

9. The elevator door coupling apparatus according to one or more of preceding claims, wherein said support (60) is a plate further provided with a plate (61) in which said guide (63) is formed.

10. The elevator door coupling apparatus according to one or more of preceding claims, wherein said protruding member (63) is connected to one of said first and second members (30, 40) of said assembly (30; 40; 80).

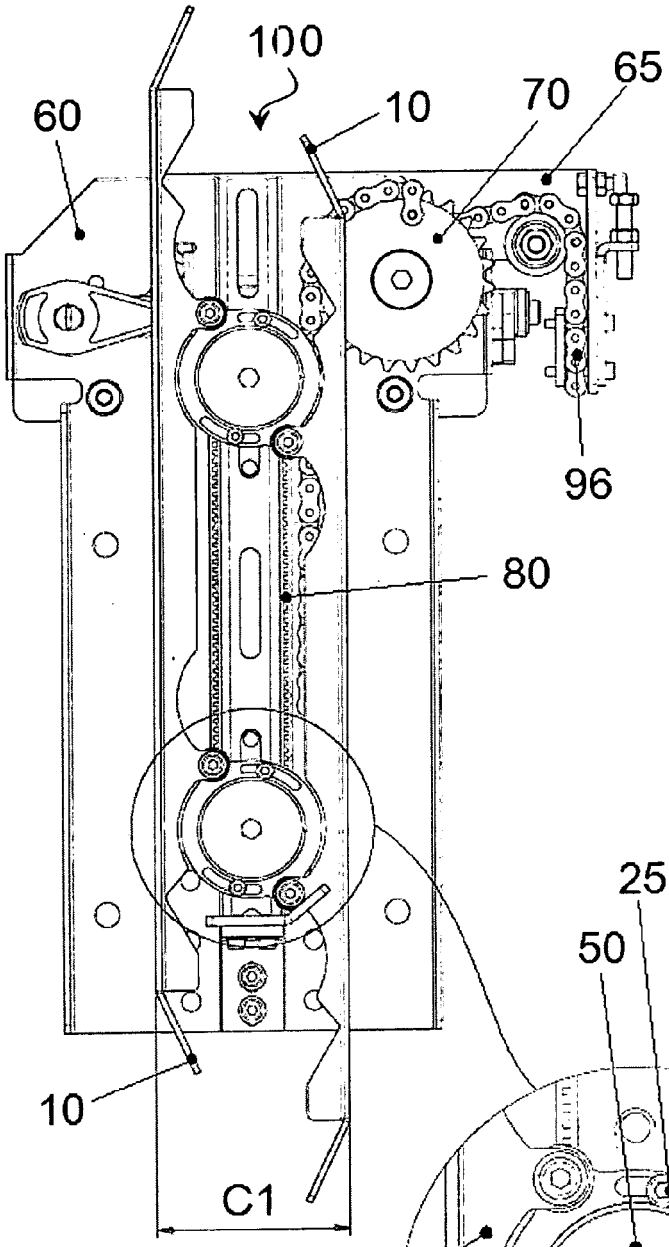


Fig. 1

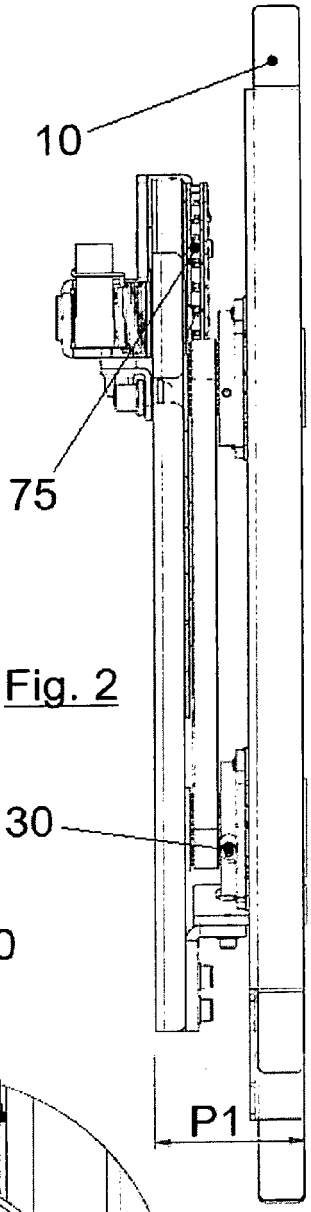


Fig. 2

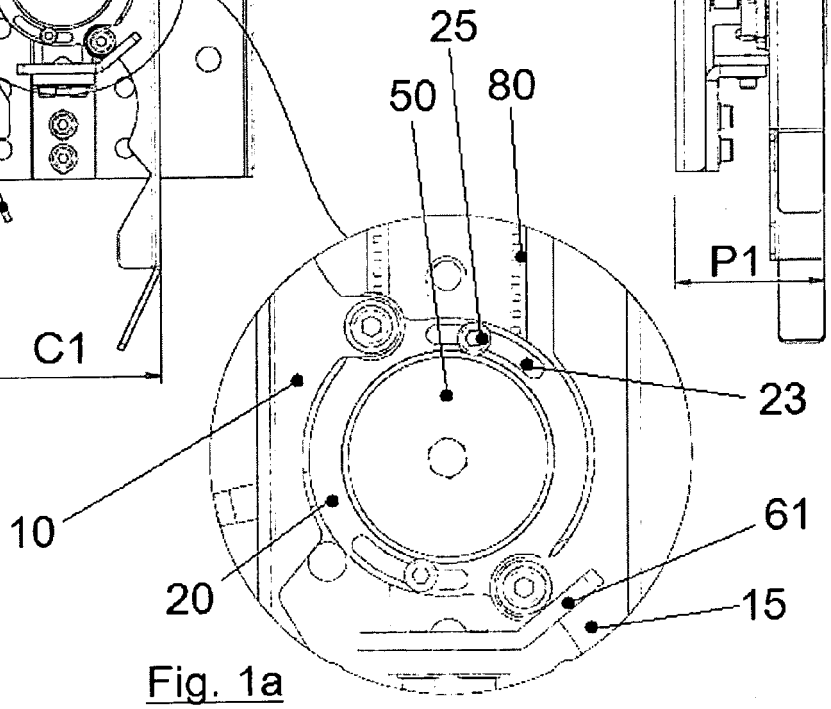


Fig. 1a

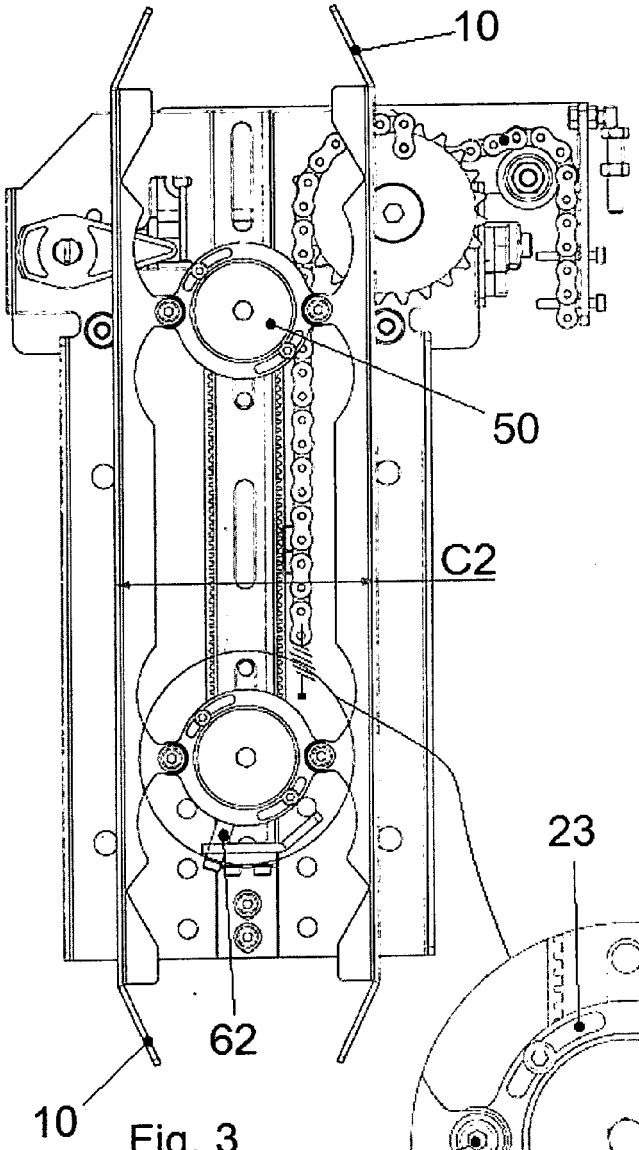


Fig. 3

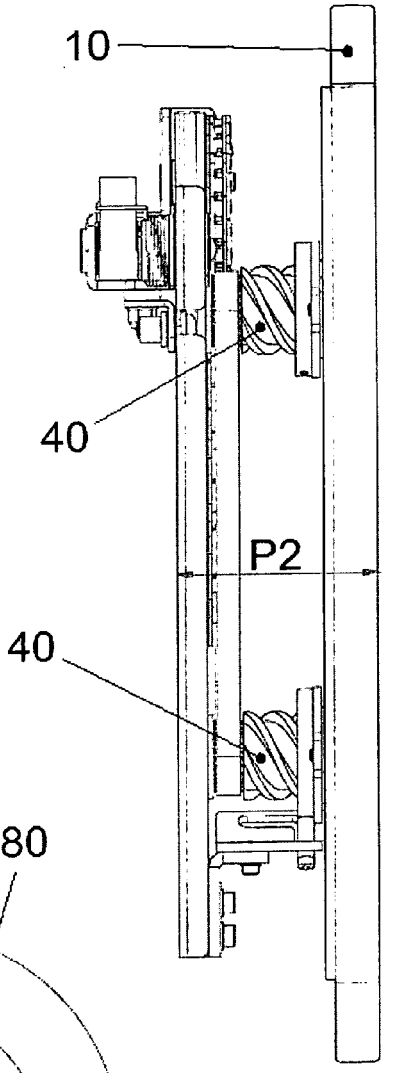


Fig. 4

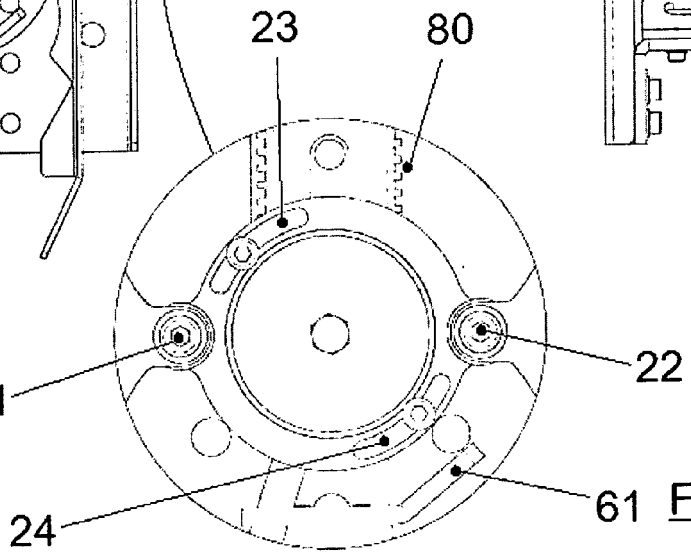


Fig. 3a

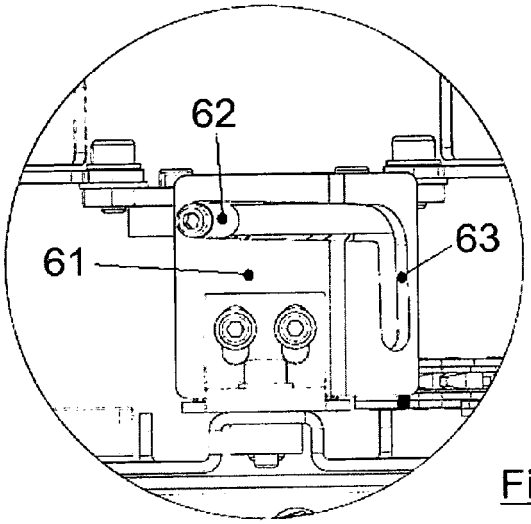


Fig. 3b

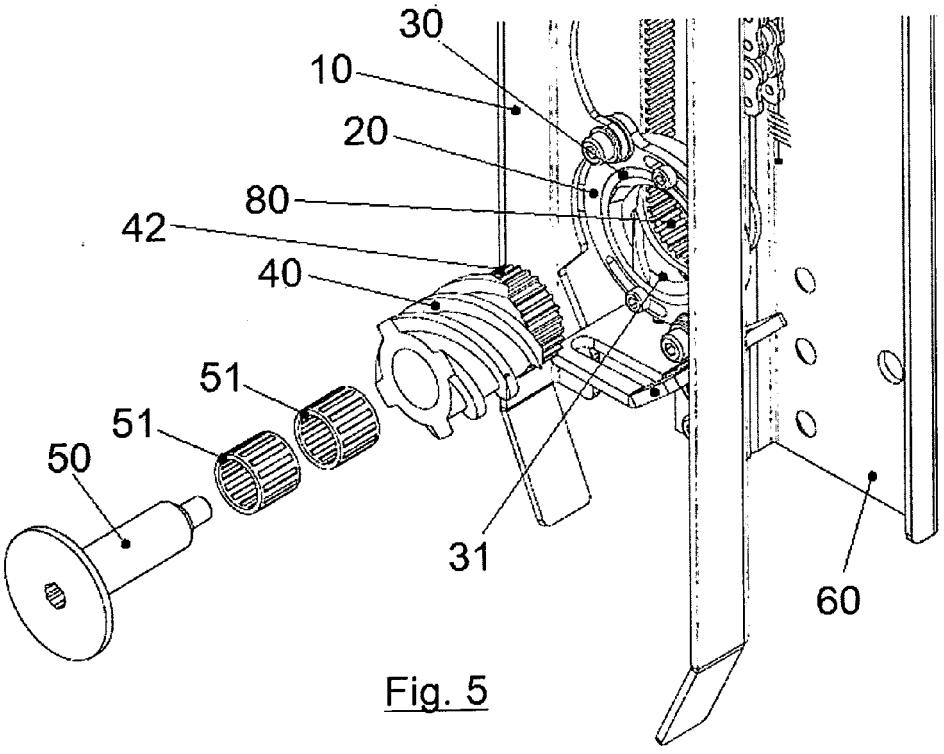


Fig. 5

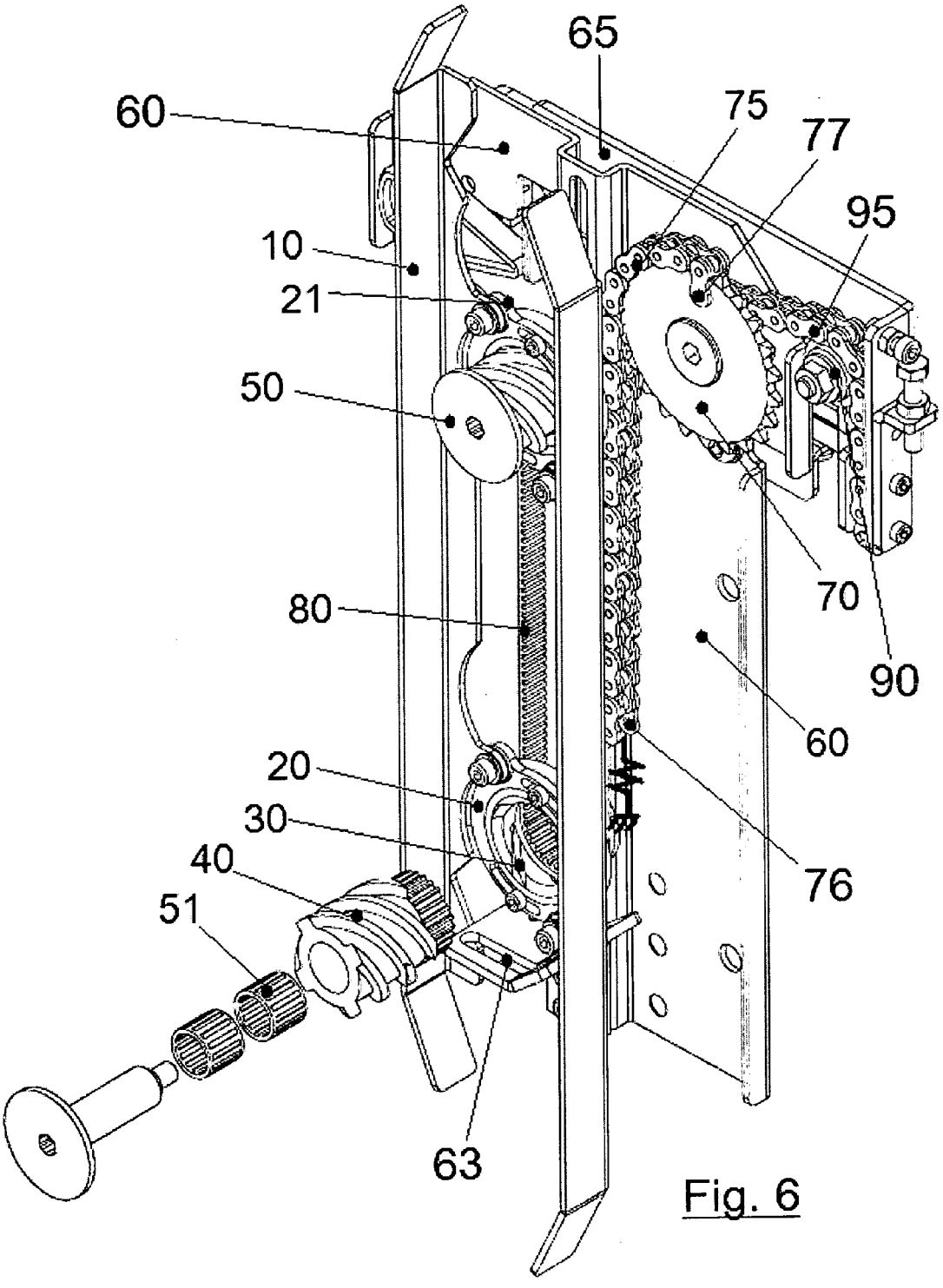


Fig. 6

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 11 42 5178

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2011/072891 A1 (THYSSENKRUPP ELEVATOR AG [DE]; REUTER GUENTER [DE]; STEINZ GERALD [DE]) 23 June 2011 (2011-06-23) * abstract; figures 1-6 * * page 4, line 4 - line 7 * * page 4, line 23 - line 27 *	1-5,7-10	INV. B66B13/12
X	JP 2011 063384 A (TOSHIBA ELEVATOR CO LTD) 31 March 2011 (2011-03-31)	1,2,5	
A	* abstract; figures 1-4 *	7,8	
X	EP 1 086 923 A2 (PRISMA S R L [IT]) 28 March 2001 (2001-03-28) * abstract; figures 2, 3 *	1-3,5	
X	CN 201 325 814 Y (CIXI HONGFENG ELEVATOR FITTING [CN]) 14 October 2009 (2009-10-14) * figures 1, 2 *	1,2,5,6	

TECHNICAL FIELDS SEARCHED (IPC)

B66B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	1 December 2011	Bleys, Philip

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 42 5178

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

01-12-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2011072891 A1	23-06-2011	NONE	
JP 2011063384 A	31-03-2011	CN 102020176 A	20-04-2011
		JP 2011063384 A	31-03-2011
EP 1086923 A2	28-03-2001	AT 350329 T	15-01-2007
		DE 60032698 T2	08-11-2007
		EP 1086923 A2	28-03-2001
		ES 2278575 T3	16-08-2007
		IT MI992000 A1	27-03-2001
CN 201325814 Y	14-10-2009	NONE	

EPO FORM P0459

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