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

(11) EP 2 003 082 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.12.2008 Bulletin 2008/51

(51) Int Cl.:
B66B 13/08 *(2006.01)* ***B66B 13/30*** *(2006.01)*

(21) Application number: **08445022.0**

(22) Date of filing: **16.06.2008**

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

(30) Priority: **16.06.2007 SE 0701499**

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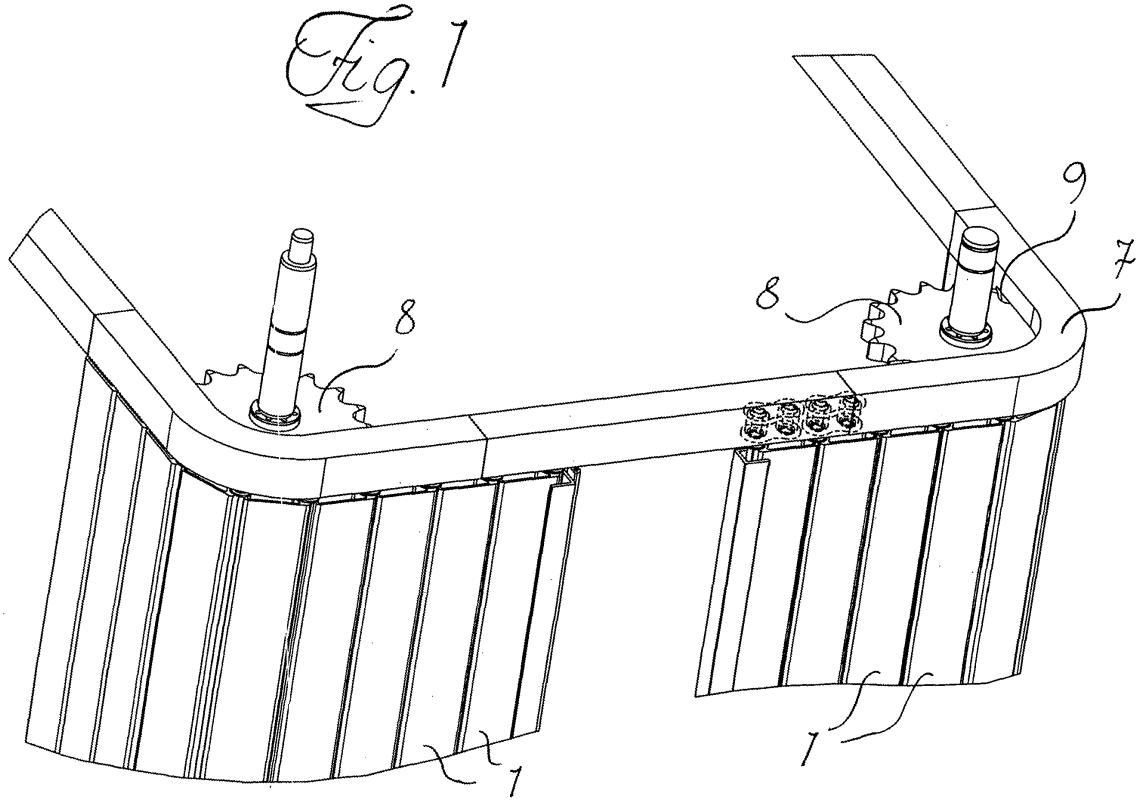
(54) Motorized elevator door

(57) Section door were the sections (1) are guided by upwards extending pins (2) that extend upwards into a C-shaped rail (6) with the opening facing downwards. Chain pieces with one or several chain links are journaled pivotable on the pins and running inside the rails (6). The drive is achieved with an horizontally arranged sprocket (8) gripping into the chain pieces, in particular placed in a bend in the rail and extending from the side into this through an opening (9). The links and the chain pieces respectively are as wide as the rail on the inside so that the force delivered by the sprocket can be transferred through pulling as well as pushing. The chain links transfer the force to respective pin and door section that then in turn act on remaining sections.

Fig. 1



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Description

[0001] This invention is related to doors in elevator cages, that is doors which prevent elevator travellers and goods from coming in contact with the inner side of the elevator shaft at the movement up and down of the elevator. In order to prevent these doors from encroaching the elevator space at opening it is known to fabricate them of vertical articulately connected door sections and that they at opening are pushed in along the side walls of the elevator cage, in particular on the outside thereof. In order to achieve the opening and closing movement of a door of this type it is known to arrange, in one of the sections most distal from the opening side, a slot and a pivot arm gripping into this, said pivot arm displacing the door with its pivot movement. A drawback with this solution is however that it in itself demand further space between the inside of the elevator cage and the inside of the shaft.

[0002] The object of the invention is to provide a less space requiring solution.

[0003] In accordance with the invention the sections are guided and possibly also supported in their upper ends in C-shaped rails with the opening facing downwards and that grip around protruding pins provided with washers or the like that rest on inward facing shelves or the like in the C-shaped rails. Furthermore the door sections are articulately connected with each other at their edges, for instance with a female part and a male part. Female and male parts have circular cross sections that allow a relative angle between the sections. Since the encircling angle of the female part is more than 180° a stable connection is achieved between the sections preventing these from being pushed apart and that can transfer pulling as well as pushing forces at the displacing of the door forth and back. Centered in each hinge or male part one of the protruding and supporting pins is arranged. At each supporting pin is further more fastened a separate piece of a drive chain, that is of the same type as a bicycle chain. The chain can include one single link or several. Furthermore the pin is arranged concentric with one of the hinge axles of the chain or the link. In the separate links a pinion extends to transfer movement and force from a motor to the sectioned door. Since the pieces of chain are guided laterally in the rail they can transfer forces between sprocket and door both in the pulling and pushing direction.

[0004] The sprocket may be arranged at a straight part of the rail that guides the door or even better in a bend between door opening and elevator side or sides. The chain pieces are also guided by the rail and has such a length or pitch that it coincides with that of the sprocket.

[0005] By the invention the need of a space requiring pivot arm is eliminated and an efficient drive is achieved that can be located in the roof of the elevator. The invention enables the use of a pitch for the sprocket that is smaller than that of the door sections, that if so is desired, can be made broader than what otherwise would have been practically possible.

[0006] The door sections supporting washers may be integrated with the chain link journaled on the pin and in particular it is possible to settle for use of one single chain link.

[0007] The above described device requires a minimum of space and is furthermore safe and durable.

[0008] In an elevator door in accordance with the invention broader door sections may be used and/or a smaller sprocket and a better use of the space may be achieved. The slot in the C-rail for the insertion of the sprocket can be short which provides a lighter construction. The use of broader door sections provide the torsionally stiffer and stronger door at a lower cost and the drive with separate chain pieces provide a soft and silent action.

[0009] Further advantages and characteristics of the invention are a apparent from the patent claims and the following embodiment of the invention. At this Fig 1 depicts the upper edge of an elevator cage door in accordance with invention and Fig 2 a door section supporting pin and its rail profile.

[0010] The essentially mirrorlike arranged elevator doors shown in fig 1. consists of vertical sections 1 that are connected to each other by means of each other facing and in each other inserted male- and female profiles. In the center of each male part a supporting pin 2 is fastened, protruding vertically upwards. In the upper end of the pin 2 an internal chain link like part is pivotable on the pin with one of its ends. The internal chain link like part is separate from proximate chain parts and includes two washers 3 with two intermediate cylinders 4 that are turnable in relation to the washers 3. The upper washers rest on internal shoulders 5 in the supportive rail 6.

[0011] In the rail bends 7 at the front edges of the elevator cage sprockets 8 extend in through openings 9 on the insides of the rail bends 7 and grip over the cylinders 4 of the chain links. The rotation of the sprockets 8 move the sections of the door halves between open and closed position.

[0012] The length of the washers or chain pieces or rather the distance between the rollers journaled in these is so dimensioned that the distance between these and the following male part (in a joint between sections) and its pin 2 coincide with the pitch of the sprocket at the location in the rail were the sprocket is or is intended to be arranged. At the bend of the rail the chain pieces follow a part of a circular path while the distance between proximate pins correspond to a chord that consequently is shorter. At a given door section width the peripheral pitch of the sprocket (as of the chain links) is larger at a bend than if the sprocket is arranged at a straight length of the guiding rail. This is also the reason why it is possible only to use separate not continuous chain pieces or single links at the drive so that the distance between these can change between curved or straight conditions for the door sections.

[0013] The drive in accordance with the invention can

be made very compact even if it in a normal manner can be provided with a slipping coupling as well as different types of electronic supervising and control respectively.

[0014] By the location of the sprockets in the bends themselves for the movement of the door sections the friction is reduced that otherwise arise between door sections and between the guides in the bends securing that the door runs easy and with a minimum of wear.

[0015] The invention has above been described with sections that hang in a rail in the roof. One can also consider to arrange the drive in the lower end of the door sections.

[0016] For the opening and closing of the doors one of the two sprockets is driven by a motor that also via a cog belt drives the other sprocket, this cog belt being twisted 180° so that the directions of turning become opposite for the door halves on the right and left side respectively.

Claims

1. Elevator door comprising vertical relative each other articulated sections (1) that can transfer pulling as well as pushing forces at the pushing forth and back of the door, with concentricly with the axles of the joints between the sections guiding pins (2) that extend into a rail (6) supporting the sections, **characterized in that** at each guiding pin (2) concentricly with the pin a single link or pieces of chains are pivotably journaled and guided in the rail (6) and that sprockets (8) are arranged succesivly to grip into the chain pieces for the driving of the elevator door.

2. Elevator door according to claim 1, **characterized in that** each pin (2) is provided with a chain link in each direction.

3. Elevator door according to any of the preceding claims, **characterized in that** it is constituted of two half-doors that are each driven by a sprocket (8) and that the sprockets are connected together with a cogged belt, the ends of which are turned a half turn so that the driving sprockets receive opposite rotational directions.

4. Elevator door according to any preceding claims, **characterized in that** chain pieces or at least one on each pin journaled chain link also serves to support its door section (1).

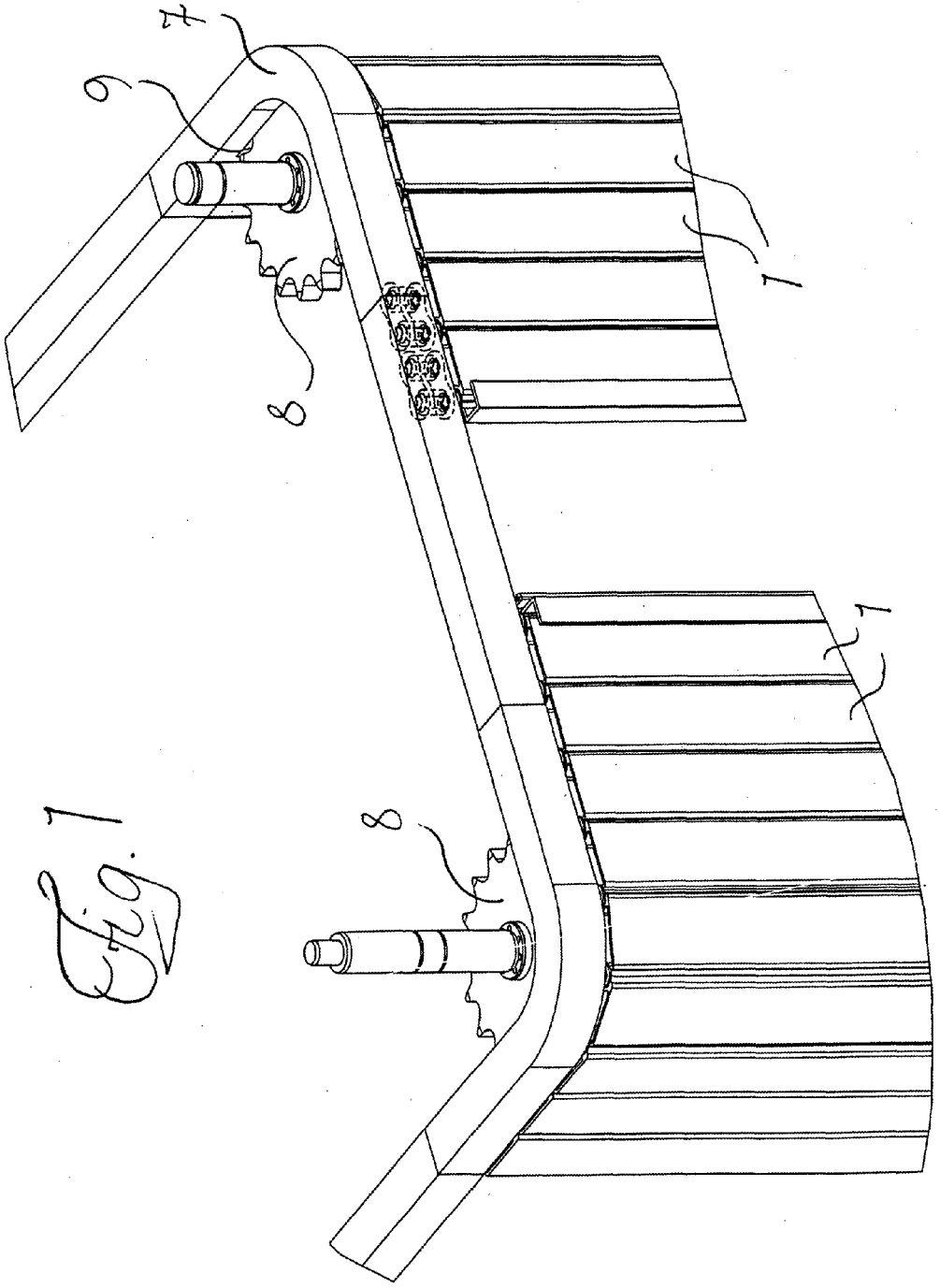

Fig. 1

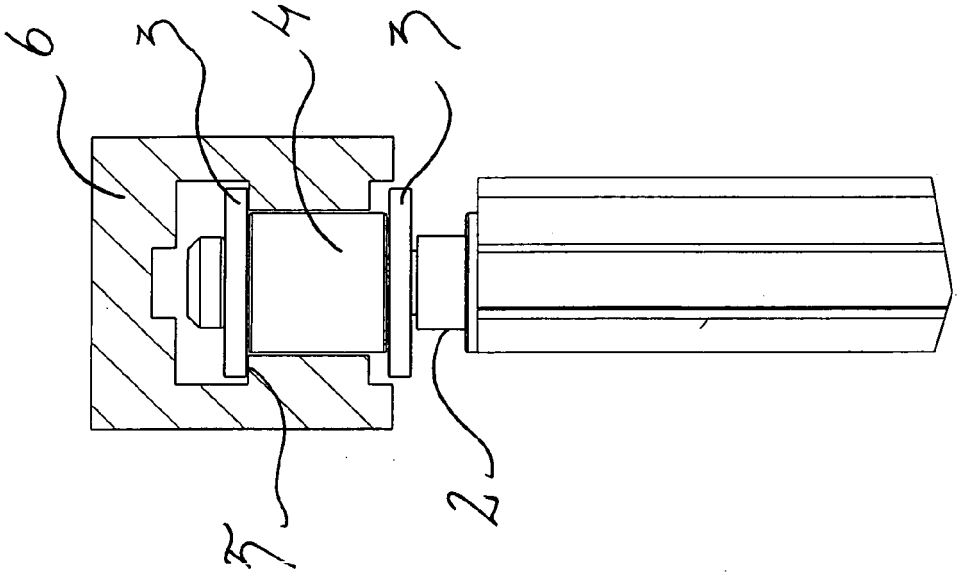

Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 08 44 5022

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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	4 September 2008	Kebemou, Augustin

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 08 44 5022

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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