

(19)



(11)

EP 1 663 837 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
08.10.2008 Bulletin 2008/41

(51) Int Cl.:
B66B 5/18 (2006.01)

(21) Application number: **04742137.5**

(86) International application number:
PCT/FI2004/000394

(22) Date of filing: **28.06.2004**

(87) International publication number:
WO 2005/021413 (10.03.2005 Gazette 2005/10)

(54) **ELEVATOR SAFETY GEAR ARRANGEMENT**

AUFZUGSFANGVORRICHTUNG

AGENCEMENT D'ENGRENAGE DE SECURITE D'ASCENSEUR

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**

• **AULANKO, Esko**
FI-04230 Kerava (FI)

(30) Priority: **02.09.2003 FI 20031240**

(74) Representative: **Zipse Habersack Kritzenberger**
Patentanwälte
Wotanstraße 64
80639 München (DE)

(43) Date of publication of application:
07.06.2006 Bulletin 2006/23

(73) Proprietor: **Kone Corporation**
00330 Helsinki (FI)

(56) References cited:
EP-A- 0 872 444 WO-A-03/072479
US-A- 4 565 264 US-A1- 2002 066 622

(72) Inventors:
• **MUSTALAHTI, Jorma**
FI-05620 Hyvinkää (FI)

EP 1 663 837 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] The present invention relates to an elevator safety gear arrangement as defined in the preamble of claim 1.

[0002] To detect elevator overspeed, the speed of the elevator car is monitored during both downward and upward travel by means of an overspeed governor, which, when an overspeed situation occurs, reacts e.g. by activating a safety device called safety gear mounted on the elevator car, which stops the elevator car safely before the car reaches an excessive overspeed. In most cases this happens in a situation where, after the occurrence of a disturbance, the elevator car starts falling downwards at an increasing speed. The overspeed governor is usually a device based on centrifugal force and comprising a rope loop connected to a safety gear mounted on the elevator car, in which loop a rope runs around diverting pulleys of the overspeed governor with the motion of the elevator car. If the elevator car reaches an excessive speed, then the overspeed governor will be locked by the action of centrifugal force, stopping the said rope, with the result that the safety gear is activated and stops the elevator car by gripping an elevator guide rail with a wedge.

[0003] In prior-art overspeed governors based on centrifugal force, the overspeed governor rope passes around an overspeed governor rope pulley placed in the upper part of the shaft or in the machine room and runs through the whole length of the shaft to the lower part of the shaft, where the rope passes around a diverting pulley. The rope is tensioned by a counterweight attached to the diverting pulley in the lower part of the shaft and pulling the lower diverting pulley downwards. Between the overspeed governor and the diverting pulley in the lower part of the shaft, the rope is fastened to the safety gear mounted on the elevator car, so that the rope runs along with the elevator car.

[0004] A problem with the use of overspeed governor rope counterweights is the space taken up by the counterweights especially when a limited space is available below the elevator car. The counterweights take up space in the vertical direction, so when the shaft space below the elevator car is low, it is difficult to find room for the counterweights below the overspeed governor diverting pulley, which has to be located substantially below the lower position of the elevator car. A further problem is that, in prior-art solutions based on centrifugal force, the overspeed governor can only be placed in the upper part of the rope loop, which constitutes a limitation of flexibility of design and layout.

[0005] The US 4,565,264 discloses an elevator safety gear arrangement comprising at least an elevator car moving along guide rails provided with a safety gear and an overspeed governor which is fastened to the safety gear. The second end of the overspeed governor is connected to the safety gear via a tensioning spring.

[0006] EP 872 444 discloses an apparatus for testing

a safety gear. On this behalf the elevator rope is connected to the elevator car by means of a testing apparatus monitoring the rope slackening to trigger the safety gear.

[0007] The object of the present invention is to overcome the above-mentioned drawbacks and achieve a simple, safe and compact safety gear arrangement in which the overspeed governor can be disposed either in the upper or in the lower end of the shaft and which can also be used as an installation-time safety gear. A further object of the invention is to achieve an economical and versatile safety gear arrangement that can also be used for detecting an elongation or rupture of the overspeed governor rope. The safety gear arrangement of the invention is characterized by what is disclosed in the characterization part of claim 1. Other embodiments of the invention are characterized by what is disclosed in the other claims.

[0008] The solution of the invention has the advantage that the overspeed governor need not be placed only in the upper part of the shaft or in the machine room, but, depending on the case, the overspeed governor may be located at either the upper or lower end of the overspeed governor rope loop. A further advantage is that no space consuming rope weights for rope tensioning are needed, which is why the solution can be installed in a small space and is therefore very well suited for use in situations where the space above or below the elevator is limited. In addition, the solution of the invention is simpler and more economical in structure than prior-art solutions. This is due, among other things, to the fact that the safety gear contactor and the tensioning contactor can be combined. An additional advantage is that the elevator safety gear is capable of gripping when necessary even in cases where the overspeed governor rope is broken or elongated and the overspeed governor would therefore normally be no longer operational in an overspeed situation. Another advantage is that the new safety gear arrangement can also be used during installation as an installation safety gear in combination with a pedal.

[0009] In the following, the invention will be described in detail with reference to an embodiment example and the attached drawings, wherein

Fig. 1 presents a simplified side view of the safety gear arrangement of the invention, and
Fig. 2 shows in magnified side view how the overspeed governor rope is fastened in the safety gear arrangement presented in Fig. 1.

[0010] The figures present an elevator car 1 arranged to travel upwards and downwards along vertical guide rails 2, guided by guides 12. The figure does not show the elevator drive machine or suspension structures, which are inessential to the present invention. The elevator car is provided with a safety gear 3 comprising at least a safety lever 7, whose movement causes a wedge to move in a gripping device housing 13 so that the wedge gets wedged between the gripping device housing 13

and the guide rail 2, thus stopping the elevator car 1.

[0011] The movement of the safety lever 7 is usually originated by an overspeed governor 4 based on centrifugal force, which in this embodiment has been installed in the lower part of the elevator shaft. The rotating overspeed governor 4 is driven by a rope 6 placed in the elevator shaft and having its first end fastened to the free end of the safety lever 7. From the safety lever 7, the rope 6 goes to the overspeed governor 4 and passes under the diverting pulley of the overspeed governor 4, after which the rope 6 goes upwards and passes around a diverting pulley 5 mounted in the upper part of the elevator shaft and then goes downwards again and is connected by its second end to the safety lever 7, the rope being tensioned by a tensioning spring 8 placed below the safety lever. When the elevator car 1 is moving at normal speed, the overspeed governor rope 6 moves along with the elevator car 1 and the safety lever 7 remains in the normal position.

[0012] The tensioning spring 8 works like a prior-art counterweight, keeping the rope 6 tight. The safety gear arrangement also comprises a back stop 9 placed below the tensioning spring. If the back stop 9 is disposed at a suitable distance from the spring, the tensioning spring 8 will activate the safety gear 3 even when the rope 6 becomes slack or breaks. In such a situation, the rope 6 will no longer compress the tensioning spring 8 towards the safety lever 7 but the released spring will hit against the stop face of the back stop 9, with the result that the supporting force lifts the safety lever 7 upwards and the wedge of the safety gear 3 is pushed between the gripping device housing 13 and the guide rail 2, stopping the motion of the elevator car.

[0013] The safety gear 3 is additionally provided with a contactor 10, which is activated in a when the safety gear grips and also in situations where the rope 6 of the overspeed governor 4 becomes slack or breaks. Upon activation of the contactor 10, the elevator control system receives information regarding the disturbance and reacts according to the situation, e.g. by switching off the driving power to the elevator.

[0014] The safety gear 3 also comprises a back stop 11 in the elevator car to support the safety lever 7, which rests on it in a normal situation.

[0015] The safety gear arrangement of the invention can also be utilized as an installation safety gear at installation time. In this case, the brake pedal of the safety gear used during installation is connected by a rod to the safety lever 7, so that when the pedal is pressed down, the safety gear 3 is activated and the falling movement of the elevator car 1 is stopped. The connecting rod is not shown in the figures.

[0016] It is obvious to the person skilled in the art that the invention is not limited to the example described above, but that it may be varied within the scope of the claims presented below. Thus, for example, the overspeed governor may also be mounted in the upper part of the elevator shaft if this is more sensible in a given

situation. Likewise, the structure of the safety gear 3 may differ from that described above.

5 Claims

1. An elevator safety gear arrangement, said arrangement comprising at least an elevator car (1) moving along guide rails (2) and provided with a safety gear (3) and an overspeed governor (4) and an overspeed governor (4) rope (6) fastened to the safety gear (3), and whereby the second end of the overspeed governor (4) rope (6) is connected to the safety gear (3) via a tensioning spring (8) **characterized in that** the tensioning spring is placed between the safety lever (7) and a back stop (9) comprised in the safety gear arrangement, and that the stop face of the back stop (9) is disposed at distance from the tensioning spring (8) such that if the overspeed governor (4) rope (6) becomes slack and/or breaks, the tensioning spring (8) will hit the stop face of the back stop (9) and activate the safety gear (3) by means of the safety lever (7).
2. A safety gear arrangement according to claim 1, **characterized in that** the second end of the overspeed governor (4) rope (6) is connected to the safety lever (7) of the safety gear (3) via the tensioning spring (8), and that the first end of the overspeed governor (4) rope (6) is secured to the free end of the safety lever (7) of the safety gear (3).
3. A safety gear arrangement according to claim 1 or 2, **characterized in that** the safety gear (3) is provided with a contactor (10), which has been arranged to be activated in connection with blocking, slackening or breakage of the overspeed governor (4) rope (6).
4. A safety gear arrangement according to any one of the preceding claims, **characterized in that** the overspeed governor is disposed in the lower part of the elevator shaft.
5. A safety gear arrangement according to any one of the preceding claims, **characterized in that** the safety gear (3) has been arranged to function as an installation-time safety gear as well.

Patentansprüche

1. Aufzugsfanganordnung, die wenigstens eine sich entlang von Führungsschienen (2) bewegendende Aufzugskabine (1) aufweist und mit einer Fangeinrichtung (3) und einem Geschwindigkeitsbegrenzer (4) und einem Geschwindigkeitsbegrenzer(4)seil (6) versehen ist, welches mit der Fangeinrichtung (3)

verbunden ist, und in welcher das zweite Ende des Geschwindigkeitsbegrenzer(4)seils (6) mit der Fangeinrichtung (3) über eine Spannfeder (8) verbunden ist, **dadurch gekennzeichnet, dass** die Spannfeder zwischen dem Sicherheitshebel (7) und einem Anschlag (9) angeordnet ist, der in der Fanganordnung enthalten ist, und dass die Anschlagfläche des Anschlags (9) in einem Abstand von der Spannfeder (8) angeordnet ist, so dass wenn das Geschwindigkeitsbegrenzer(4)seil (6) locker wird und/oder reißt, die Spannfeder (8) die Anschlagfläche des Anschlags (9) trifft und die Fanganordnung (3) mittels des Sicherheitshebels (7) aktiviert.

2. Fanganordnung nach Anspruch 1, **dadurch gekennzeichnet, dass** das zweite Ende des Geschwindigkeitsbegrenzer(4)seils (6)) mit dem Sicherheitshebel (7) der Fangeinrichtung (3) über die Spannfeder (8) verbunden ist, und dass das erste Ende des Geschwindigkeitsbegrenzer(4)seils (6) an dem freien Ende des Sicherheitshebels (7) der Fangeinrichtung (3) festgelegt ist.
3. Fanganordnung nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Fanganordnung (3) mit einem Kontakt (10) versehen ist, der in Verbindung mit dem Blockieren, Lockerwerden oder Bruch des Geschwindigkeitsbegrenzer(4)seils (6) aktivierbar ist.
4. Fanganordnung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der Geschwindigkeitsbegrenzer im unteren Teil des Aufzugschachtes angeordnet ist.
5. Fanganordnung nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Fanganordnung (3) konzipiert ist, um auch als Fangeinrichtung während der Installationszeit zu agieren.

(8) de telle sorte que, si le câble (6) du limiteur de vitesse (4) se relâche et/ou casse, l'élément de ressort de traction (8) frappera la face d'arrêt de l'élément de butée arrière (9) et activera l'engrenage de sécurité (3) au moyen du levier de sécurité (7).

2. Agencement d'engrenage de sécurité selon la revendication 1, **caractérisé par le fait que** la seconde extrémité du câble (6) du limiteur de vitesse (4) est reliée au levier de sécurité (7) de l'engrenage de sécurité (3) par l'intermédiaire de l'élément de ressort de traction (8), et que la première extrémité du câble (6) du limiteur de vitesse (4) est arrimée à l'extrémité libre du levier de sécurité (7) de l'engrenage de sécurité (3).
3. Agencement d'engrenage de sécurité selon la revendication 1 ou 2, **caractérisé par le fait que** l'engrenage de sécurité (3) est muni d'un contacteur (10) ayant été disposé pour être activé en fonction du blocage, du relâchement ou de la rupture du câble (6) du limiteur de vitesse (4).
4. Agencement d'engrenage de sécurité selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** le limiteur de vitesse est disposé dans la partie inférieure de la cage d'ascenseur.
5. Agencement d'engrenage de sécurité selon l'une quelconque des revendications précédentes, **caractérisé par le fait que** l'engrenage de sécurité (3) a été arrangé pour fonctionner également en tant qu'engrenage de sécurité durant la période d'installation.

Revendications

1. Agencement d'engrenage de sécurité d'ascenseur, ledit agencement comportant au moins une cabine d'ascenseur (1) se déplaçant le long de rails-guides (2) et munie d'un engrenage de sécurité (3) et un limiteur de vitesse (4) et un câble (6) du limiteur de vitesse (4) fixé à l'engrenage de sécurité (3), et la seconde extrémité du câble (6) du limiteur de vitesse (4) étant reliée à l'engrenage de sécurité (3) par l'intermédiaire d'un élément de ressort de traction (8) **caractérisé par le fait que** l'élément de ressort de traction est placé entre le levier de sécurité (7) et un élément de butée arrière (9) compris dans l'agencement d'engrenage de sécurité, et que la face d'arrêt de l'élément de butée arrière (9) est disposée à une certaine distance de l'élément de ressort de traction

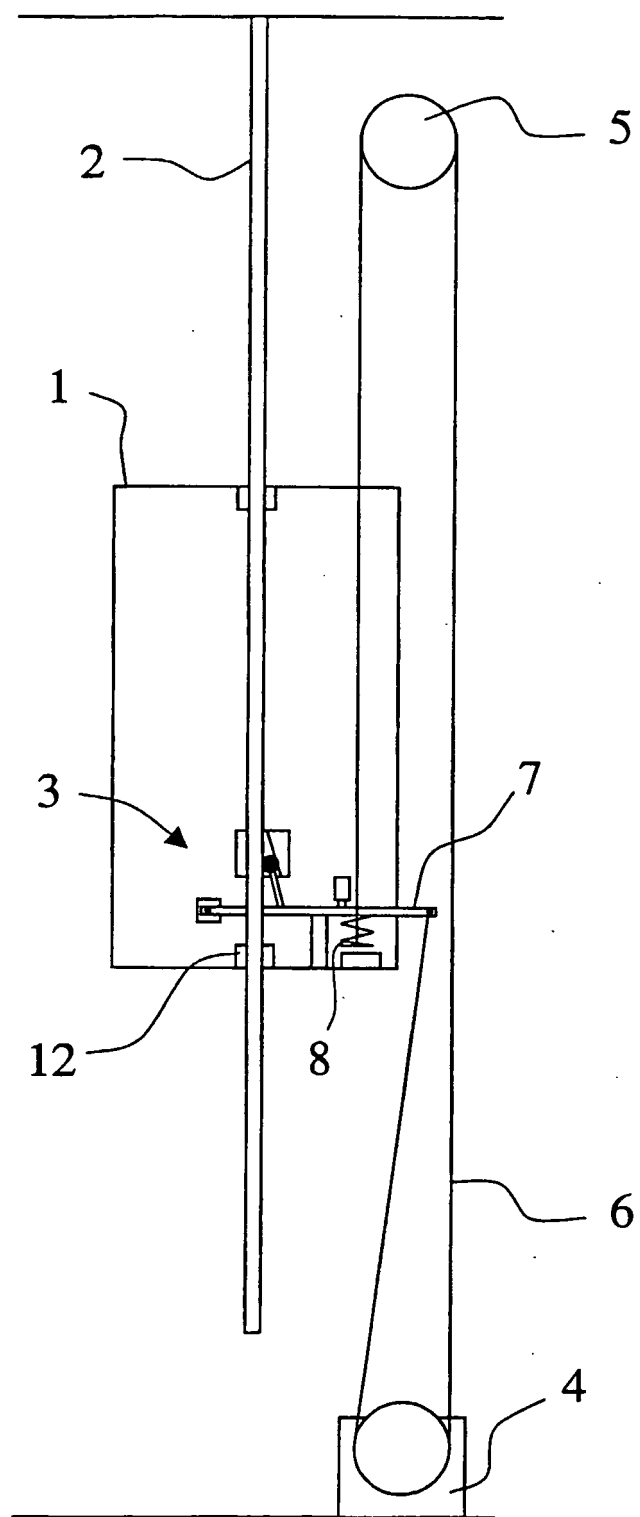


Fig. 1

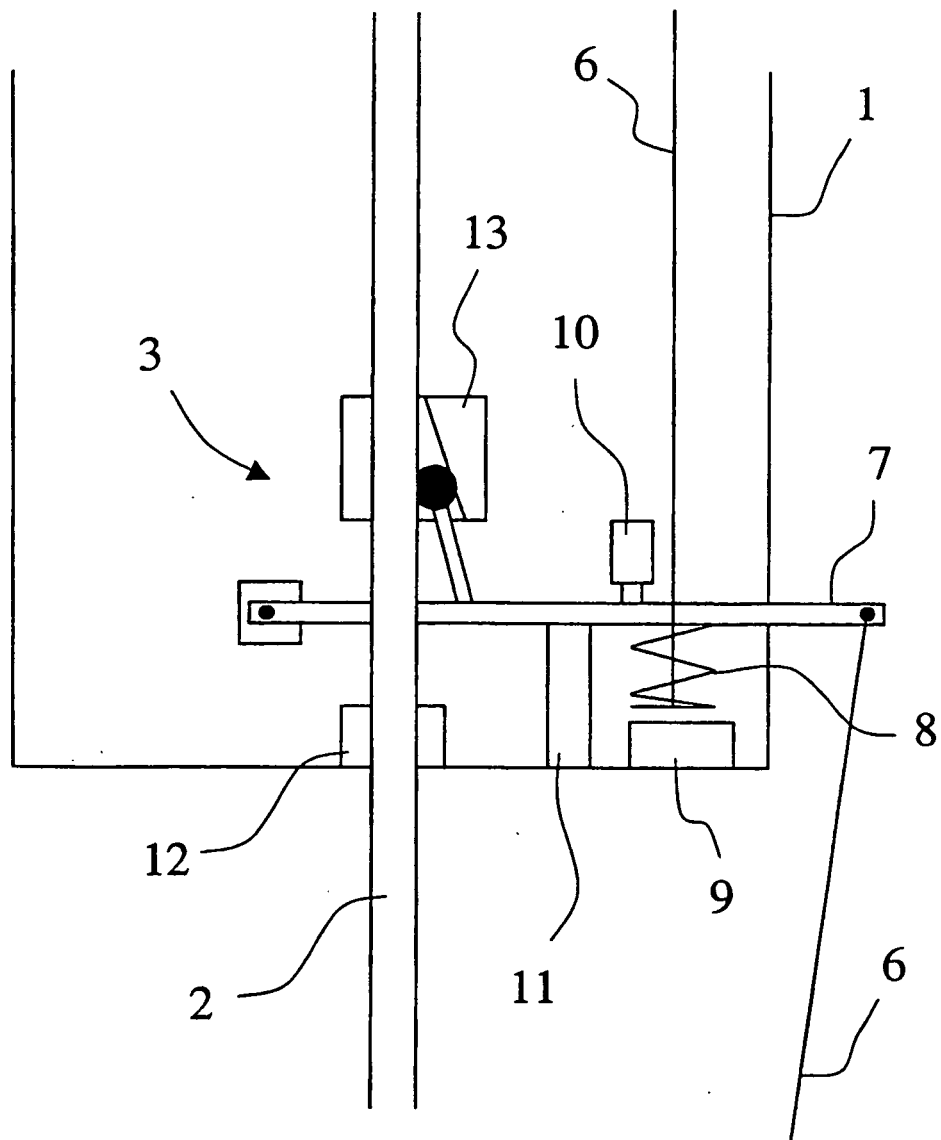


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 4565264 A [0005]
- EP 872444 A [0006]