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(54) **EMERGENCY STOP TESTING METHOD OF ELEVATOR**

VERFAHREN ZUM TESTEN DES NOTSTOPPS EINES AUFZUGES

MÈTHODE POUR TESTER UNE FREIN DE SECURE D'ASCENSEUR

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(56) References cited:
EP-A2- 0 427 075
DE-A1- 4 311 011
JP-A- 5 105 349
JP-B2- 3 061 939
JP-B2- 6 013 394
US-B1- 6 325 179

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Description

Field of the Invention

[0001] The invention relates to an elevator emergency stop testing method.

Background Art

[0002] An elevator is usually obliged to have emergency stopper for gripping a car in preparation for, e.g. , the case where the car cannot be suspended by ropes. In relation to confirmation of safety of the elevator having the emergency stopper, the safety of the emergency stopper must be naturally ascertained. Likewise, ascertainment of secure attachment of the emergency stopper to an actual elevator and ascertainment of whether or not the emergency stopper operate reliably are also important.

[0003] For example, Standards EN81 of the pan-European laws pertaining to an elevator (Lift Directives) stipulate a method for ascertaining whether or not emergency stopper operate without fail before an elevator is handed over to a user after installation. This method is generally adopted.

[0004] The Standards EN81 stipulate a method for ascertaining a safety device as below.

[0005] The Standards stipulate that power is supplied to a motor of a hoisting machine while emergency stopper are locked, and output torque of the hoisting machine is increased until

(1) a rope slips over a sheave of the hoisting machine or

(2) the rope of the car becomes loosened.

If the emergency stopper operate without any problem in this state, operation of the safety device is determined to be nondefective.

[0006] However, traction capability (i.e. , frictional force) of the rope and that of the sheave are determined so as to be optimal for the elevator in consideration of many elements, such as the shape of a sheave, an angle of contact, and a total weight of the car and a counterweight. Accordingly, difficulty is encountered in setting traction capability suitable for the previously-described conventional method for testing emergency stopper.

[0007] In short, in many cases, traction capability is usually designed to have an allowance. Hence, output torque of the hoisting machine must be increased in order to cause the rope to slip over the sheave as described in (1) of the standards.

[0008] Alternatively, when traction capability is high, the output torque of the hoisting machine must be increased by raising the counterweight as described in (2) until the rope of the car becomes loosened. At this time, if the maximum torque of the hoisting machine is small, the rope cannot slip over the sheave, and hence the hoisting machine becomes stalled without rotating.

[0009] This presents a problem of a necessity for increasing the maximum torque of the hoisting machine in order to cause the elevator to comply with the Standards EN81. Rated torque of the hoisting machine is increased for only testing emergency stopper, thereby adding to costs for manufacturing an elevator.

[0010] For instance, JP-A-5-294575 and JP-A-6-135653 describe countermeasures against this problem. The methods described in these patent publications are intended for driving a drive apparatus (inverter) which drives a motor of a hoisting machine for testing emergency stopper, with the capacity required for normal operation of the elevator and without increasing the capacity of drive apparatus to a level required to drive heavy load used in a catch test.

[0011] Of these methods, the method described in JP-A-5-294575 enables inhibition of an increase in the amount of electric current of torque current component and prevention of an increase in the capacity of the inverter, by increasing an excitation current with reference to an output of the inverter, to thereby effect so-called intensified magnetic field operation.

[0012] According to the method described in JP-A-6-135653, an electric current required at the time of driving heavy load is reduced by changing a winding of the motor which serves as a load from a Δ wire bound to a Y wire bound. Another method is described in US-A-632519

[0013] However, the methods described in the patent publications involve a necessity for driving heavy load and causing the hoisting machine to produce output torque not required during normal operation.

[0014] Accordingly, the invention is intended for constructing an inexpensive elevator, by minimizing output torque of the hoisting machine to a level required for normal operation, thereby inhibiting an increase in rated torque.

Disclosure of the Invention

[0015] An elevator emergency stop testing method of the invention has an elevator which comprises a car, a counterweight; a rope for connecting the car to the counterweight; a hoisting machine around which the rope is passed and which drives the car and the counterweight; guide rails which are providedwithin a hoistway through which the car travels, so as to extend in a direction in which the car travels; emergency stopper which are attached to the car and cause the car to grip the guide rails under abnormal conditions; and a tension detector which is attached to a part of the rope to be attached to the car and which measures tension of the rope, wherein, when an output from the tension detector produced only when the hoisting machine has hoisted the counterweight at maximum torque required for driving an elevator is equal to a difference between the force caused by the counter-

weight and traction capability or when the output from the tension detector produced only when the hoisting machine has hoisted the counterweight at maximum torque required for driving an elevator is smaller than the difference between the force caused by the counterweight and the traction capability, the emergency stopper are determined to be safe.

[0016] The torque developing in a hoisting machine can be detected by means of an output of a tension detector. If the maximum torque of a hoisting machine required for normal operation of an elevator is produced, safety of emergency stopper can be ascertained even when the hoisting machine has become stalled because of excessive traction capability while producing torque.

[0017] The elevator emergency stop testing method further comprising an indicator for displaying an output from the tension detector.

[0018] An output of the tension detector can be readily ascertained by means of an indicator, thereby enabling a highly reliable test. Further, the

[0019] Further, the indicator is provided in a display device disposed at a hall.

[0020] An output of the tension detector can be readily visually ascertained by means of an indicator installed in an elevator hall.

[0021] Further the emergency stopper have gripping force ascertainment means for ascertaining the safety of gripping force to be used gripping the guide rails, and the gripping force ascertainment means ascertains safety of the gripping force on the basis of the output from the tension detector produced when the counterweight is hoisted at the maximum torque required for the hoisting machine to drive the elevator.

[0022] As a result of comparison performed by gripping force ascertaining means, if the maximum torque of the hoisting machine required for operating an elevator has developed in the hoisting machine, safety of emergency stopper can be ascertained even when the hoisting machine has become stalled because of excessive traction capability while producing torque.

Brief Description of the Drawings

[0023]

Fig. 1 is a schematic representation showing an elevator emergency stopper tester according to a first embodiment of the invention.

Fig. 2 is a schematic diagrams showing four operating states of the elevator.

Fig. 3 is a schematic diagrams showing four operating states of the elevator.

Fig. 4 is a schematic diagrams showing four operating states of the elevator.

Fig. 5 is a schematic diagrams showing four operating states of the elevator.

Fig. 6 is a block diagram showing the functional configuration of the elevator emergency stopper tester.

Fig. 7 is a flowchart showing procedures for testing the emergency stopper tester.

Fig. 8 is a schematic representation showing an elevator emergency stopper tester according to a second embodiment of the invention.

Best Modes for Implementing the Invention

[0024] The invention will be described in more detail by reference to the accompanying drawings.

[0025] Fig. 1 is a schematic representation showing an elevator emergency stopper tester according to a first embodiment of the invention. The configuration of the first embodiment will now be described by reference to Fig. 1. In Fig. 1, reference numeral 1 designates an elevator car into which passengers and objects are loaded; 2 designates a counterweight; 3 designates a hoisting machine sheave; and 4 designates a rope. The car 1 is fastened to one end of the rope 4, and the counterweight 2 is fastened to the other end of the same. The rope 4 is suspended by the sheave 3 of the hoisting machine.

[0026] Reference numeral 5 designates emergency stopper attached to the car 1; and 6 designates guide rails for the car. When the car guide rails 6 are engaged with the emergency stopper 5 as a result of the emergency stopper 5 being activated, lowering action of the car 1 during emergency situations is inhibited.

[0027] Reference numeral 7 designates a rope tension detector provided at one end of the rope 4 to be attached to the car 1; 8 designates an indicator for indicating tension; 9 designates a hoistway; and 10 designates a brake for preventing rotation of the sheave 3 of the hoisting machine.

[0028] The principle of the invention will now be described by reference to Figs. 2 through 5. Figs. 2 through 5 are schematic diagrams showing four operating states of the elevator. In the respective operating states, the emergency stopper 5 attached to the car 1 remain engaged with the guide rails 6 and in an operating state.

[0029] Fig. 2 shows that the brake 10 of the sheave 3 of the hoisting machine is opened. In this state, rotational torque does not arise in the sheave 3 of the hoisting machine.

[0030] Fig. 3 shows that the sheave 3 of the hoisting machine is rotating and the rope 4 is slipping over the sheave 3 of the hoisting machine. In this state, the car 1 remains stationary.

[0031] Fig. 4 shows that the sheave 3 of the hoisting machine raises the counterweight 2 by means of traction capability and the rope 4 attached to the car 1 remains slackened.

[0032] Fig. 5 shows that the sheave 3 of the hoisting machine becomes stalled while producing torque.

[0033] In Figs. 2 through 5, the weight of the car 1 is taken as M (kg); the load of the car is taken as L (kg); and the weight of the counterweight is taken as W (kg). In Figs. 2 through 5, forces which develop between the sheave 3 of the hoisting machine and the rope 4 are taken

as FA, FB, FC, and FD,.

[0034] Fig. 2 shows that the brake 10 of the sheave 3 of the hoisting machine is only released. Hence, FA=0.

[0035] Fig. 4 shows that the rope attached to the car remains slackened. Hence, FC = Wg ("g" designates gravitational acceleration, and the same also applies to any counterparts in the following descriptions).

[0036] Fig. 3 shows that the rope 4 is slipping in excess of a frictional force limit existing between the sheave 3 of the hoisting machine and the rope 4. FB designates a frictional force determined by a coefficient of dynamic friction developing between the sheave 3 of the hoisting machine and the rope 4.

[0037] In Fig. 5, FD designates force corresponding to a torque limit achieved when the sheave 3 of the hoisting machine has become stalled.

[0038] As shown in Figs. 2 through 5, under assumption that the "gripping force of the emergency stopper 5"; that is, the "force exerted on the emergency stopper 5 which stop the car 1 engaged with the car guide rails 6, " is taken as SA, SB, SC, and SD while being oriented upward,

$$SA = (M + L - W)g$$

$$SB = (M + L - W) + FB$$

$$SC = (M + L)g$$

$$SD = (M + L - W) + FD.$$

[0039] Of the conditions stipulated in the Standards EN81 of the pan-European Unified Laws, the condition (1) corresponds to the state shown in Fig. 3, because the rope 4 slips over the sheave 3 of the hoisting machine. In order to satisfy the condition, the gripping force SB of the emergency stopper 5 assumes a value greater than (M + L - W) + FB in the state shown in Fig. 3.

[0040] As mentioned above, FB designates a frictional force developing between the rope 4 and the sheave 3 of the hoisting machine when the rope 4 slips over the sheave 3 of the hoisting machine. In general, dynamic frictional force is smaller than static frictional force. Hence, the value of FB is equal to or smaller than the static frictional force obtained immediately before the rope 4 slips over the sheave 3 of the hoisting machine. If the value of FB corresponds to static frictional force obtained immediately before the rope 4 slips, FB can be said to be equal to or more than the minimum traction capability Tm required by the elevator.

[0041] The minimum required traction capability of the elevator is deemed to fall within an allowable range in terms of actual performance and regulatory aspects, if the capability enables lifting of predetermined excessive load from the lowest floor. The traction capability Tm can be usually computed readily from the capacity of the elevator, the distance over which the elevator ascends and descends, and the number of ropes. In the case of an actual elevator, the traction capability is designed by imparting an allowance to the minimum required traction capability. Hence, FB≤Tm always stands. When the rope 4 slips over the sheave 3 of the hoisting machine with traction capability equal to or lower than the minimum required traction capability, the car 1 cannot be driven.

[0042] Similarly, even when the sheave 3 of the hoisting machine has become stalled, the safety of the emergency stopper 5 can be said to be sufficient if the maximum torque FD is higher than the traction capability Tm.

[0043] In Figs. 2 through 5, DA, DB, DC, and DD designate values output from the tension detector 7 provided on the car 1; that is, values displayed on the indicator 8. The values are

$$DA = Wg$$

$$DB = Wg - FB$$

$$DC = 0$$

$$DD = Wg - FD.$$

Reference symbol W designates the weight of the counterweight 2 and is defined for each elevator. As mentioned above, the traction capability Tm can be readily computed for each elevator.

[0044] Accordingly, the DD (= Wg - FD) detected by the tension detector 7 is compared with (Wg - Tm). If (Wg - FD)≤(Wg - Tm), Tm≤FD stands. Hence, the emergency stopper 5 can be ascertained to have sufficient safety.

[0045] In this case, even when the rope 4 does not slip over the sheave 3 of the hoisting machine, the safety of the emergency stopper 5 can be ascertained with the condition (1) being the same as that achieved when the rope 4 slips over the sheave 3.

[0046] Here, as a result of the indicator 8 being provided outside the hoistway 9, operation of the emergency stopper 5 can be ascertained readily and safely even in the case of an elevator without a machine room. Further, so long as the indication of the indicator 8 is displayed on a position display of the car 1 disposed at an elevator

hall, operation of the emergency stopper 5 can be ascertained in a less expensive manner.

[0047] Fig. 6 is a block diagram showing the functional configuration of the elevator emergency stop testing method according to the embodiment. As shown in Fig. 6, the tester comprises a main rope tension measurement instrument 11, a system data storage section 12, emergency stopper gripping force ascertainment means 13, and display means 14.

[0048] The main rope tension measurement instrument 11 is provided at a point of the rope 4 where the car 1 is suspended, thereby measuring tension of the rope 4. The system data storage section 12 stores a value pertaining to gravity of the counterweight 2 and a value pertaining to traction capability of the sheave 3 of the hoisting machine. The values may be input every time measurement is performed, or data stored in the controller of the elevator may be loaded and utilized.

[0049] The emergency stopper gripping force ascertainment means 13 performs arithmetic operation as to whether or not the measured rope tension DD is equal to or greater than a value obtained by subtracting the traction capability Tm from the weight Wg of the counterweight 2 (counterweight), thereby ascertaining whether or not the gripping force of the emergency stopper 5 is sufficient.

[0050] The display means 14 displays whether or not the gripping force of the emergency stopper 5 is sufficient

[0051] Fig. 7 is a flowchart showing procedures for testing the emergency stopper tester.

[0052] In step S1, processing pertaining to a system data input process is performed. Here, a value pertaining to the weight of the counterweight 2 and a value pertaining to the traction capability of the sheave 3 of the hoisting machine are input to the system data storage section 12.

[0053] In step S2, processing pertaining to a emergency stopper operation process is performed. Here, the emergency stopper 5 are activated, to thereby engage with the car guide rails 6.

[0054] In step S3, processing pertaining to a tension measurement process is carried out. Here, the brake 10 is released from the sheave 3 of the hoisting machine, thereby enabling maximum torque on the sheave 3 of the hoisting machine in the lowering direction of the car 1 and measuring the tension of the rope 4 during that period. At this time, there is no necessity for causing slippage between the rope 4 and the sheave 3 of the hoisting machine.

[0055] In step S4, processing pertaining to a gripping force ascertainment operation process is performed. Here, the emergency stopper gripping force ascertainment means 13 ascertains whether or not the gripping force of the emergency stopper 5 is sufficient.

[0056] In step S5, processing pertaining to an ascertainment result display process is performed. Here, the display means 14 displays whether or not the gripping force of the emergency stopper 5 is sufficient.

[0057] As mentioned above, the emergency stopper 5 are activated, to thereby ascertain whether or not the emergency stopper 5 are accurately attached to the car 1 and are operating safely. Subsequently, the sheave 3 of the hoisting machine is rotated in a direction in which the counterweight 2 is raised, thereby ascertaining the safety of the emergency stopper 5 without causing the rope 4 to slip over the sheave 3 of the hoisting machine. As a result, there can be implemented an inexpensive elevator system without providing the sheave 3 of the hoisting machine with torque which is greater than that required for operation.

[0058] Since internal load of the car 1 can be detected by means of tension of the car 1, a weighing device can also serve as a rope tension detector for ascertaining operation of emergency stopper. Further, the tension of the rope can be ascertained by means of a hall indicator outside the hallway. Even in the case of an elevator not having a machine room, operation of the emergency stopper 5 can be readily ascertained from a hall.

[0059] By reference to Fig. 8, a second embodiment of the invention will be described. The second embodiment shows a case of 2-to-1 rope arrangement. Specifically, one end of the rope 4 is not fastened to the counterweight 2, but rather the rope 4 is turned upward by way of an overhead sheave 15 provided on top of the counterweight 2, and fastened to an upper section of the hoistway. In Fig. 8, structural elements having the same functions as those described in connection with the first embodiment are assigned the same reference numerals.

[0060] As shown in Fig. 8, in the second embodiment, the tension detector 7 is provided at a hitch end (a suspension) section of the rope 4 suspended within the hoistway at a position close to the car 1.

[0061] Fig. 8 shows the case of an underslung car. The same principle also applies to the case of an upperslung car. In either case, detection of the tension of the rope provided at a position close to the car 1 is desirable.

Industrial Applicability

[0062] As mentioned above, an elevator emergency stop testing method of the invention enables ascertainment of safety of emergency stopper even when a hoisting machine has become stalled while generating torque because of excessively high traction capability, so long as the maximum torque of the hoisting machine required for an elevator to operate is produced. Thus, the tester can be useful for a variety of elevators or lifts as a tester whose production cost is curtailed.

Claims

1. An elevator emergency stop testing method, the elevator comprising:

a car (1) ;
a counterweight (2) ;

a rope (4) for connecting the car (1) to the counterweight' (2) ;
a hoisting machine (3) around which the rope (4) is passed and which drives the car (1) and the counterweight (2) ;
guide rails (6) which are provided within a hoistway through which the car (1) travels, so as to extend in a direction in which the car (1) travels;
emergency stopper (5) which are attached to the car (1) and cause the car (1) to grip the guide rails (6) under abnormal conditions; and
a tension detector (7) which is attached to a part of the rope (4) to be attached to the car (1) andwhichmeasures tension of the rope (4), wherein, when an output from the tension detector (7) produced only when the hoisting machine (3) has hoisted the counterweight (2) at maximum torque required for driving an elevator is equal to a difference between the force caused by the counterweight (2) and traction capability or when the output from the tension detector (7) produced only when the hoisting machine (3) has hoisted the counterweight (2) at maximum torque required for driving an elevator is smaller than the difference between the force caused by the counterweight (2) and the traction capability, the emergency stopper (5) are determined to be safe.

2. The elevator emergency stop testing method according to claim 1, further comprising an indicator (8) for displaying an output from the tension detector (7).

3. The elevator emergency stop testing method according to claim 2, wherein the indicator is provided in a display device (14) disposed at a hall.

4. The elevator emergency stop testing method according to any one of claims 1 through 3, wherein the emergency stopper (5) have gripping force ascertainment means (13) for ascertaining the safety of gripping force to be used gripping the guide rails (6), and the gripping force ascertainment means (13) ascertains safety of the gripping force on the basis of the output from the tension detector (7), produced when the counterweight (2) is hoisted at the maximum torque required for the hoisting machine (3) to drive the elevator.

Patentansprüche

1. Aufzug-Notstopp-Testverfahren, wobei der Aufzug aufweist:

eine Kabine (1),
ein Gegengewicht (2),
ein Seil (4) zum Verbinden der Kabine (1) mit dem Gegengewicht (2),
eine Hebemaschine (3), um die das Seil (4) geführt ist, und welche die Kabine (1) und das Gegengewicht (2) antreibt,
Führungsschienen (6), die innerhalb eines Schachts, durch den sich die Kabine (1) bewegt, derart vorgesehen sind, dass sie sich in einer Richtung erstrecken, in der sich die Kabine (1) bewegt,
Notstopper (5), die an der Kabine (1) angebracht sind und die Kabine (1) in einem nicht normalen Zustand die Führungsschienen (6) greifen lässt, und
einen Spannungserfasser (7), der an einem an der Kabine (1) anzubringenden Abschnitt des Seils (4) angebracht ist und eine Spannung des Seils (4) misst, wobei, wenn eine Ausgabe vom Spannungserfasser (7), die lediglich dann erzeugt wird, wenn die Hebemaschine (3) das Gegengewicht (2) mit einem zum Antreiben des Aufzugs benötigten Maximalmoment angehoben hat, gleich einer Differenz zwischen der durch das Gegengewicht (2) verursachten Kraft und einer Zugkraftfähigkeit ist, oder, wenn die Ausgabe vom Spannungserfasser (7), die lediglich dann erzeugt wird, wenn die Hebemaschine (3) das Gegengewicht (2) mit einem zum Antreiben eines Aufzugs benötigten Maximalmoment angehoben hat, kleiner als die Differenz zwischen der durch das Gegengewicht (2) verursachten Kraft und der Zugkraftfähigkeit ist, die Notstopper (5) als sicher bestimmt werden.

2. Aufzug-Notstopp-Testverfahren gemäß Anspruch 1, ferner mit einem Indikator (8) zum Anzeigen einer Ausgabe vom Spannungserfasser (7).

3. Aufzug-Notstopp-Testverfahren gemäß Anspruch 2, bei dem der Indikator in einer an einem Korridor angeordneten Anzeigeeinrichtung (14) vorgesehen ist.

4. Aufzug-Notstopp-Testverfahren gemäß einem der Ansprüche 1 bis 3, bei dem die Notstopper (5) ein Greifkraftbestätigungsmittel (13) zum Bestätigen der Sicherheit der Greifkraft aufweisen, die zum Greifen der Führungsschienen zu verwenden ist, und das Greifkraftbestätigungsmittel (13) eine Sicherheit der Greifkraft auf der Basis der Ausgabe vom Spannungserfasser (7) bestätigt, die erzeugt wird, wenn das Gegengewicht (2) mit dem für die Hebemaschine (3) zum Antreiben des Aufzugs benötigten Maximalmoment angehoben wird.

Revendications

1. Procédé de test d'arrêt d'urgence d'ascenseur, l'as-

censeur comprenant :

une cabine (1) ;
un contrepoids (2) ;
un câble (4) pour relier la cabine (1) au contrepoids (2) ;
une machine de levage (3) autour de laquelle on passe le câble (4) et qui entraîne la cabine (1) et le contrepoids (2) ;
des rails de guidage (6) qui sont prévus à l'intérieur d'une cage d'ascenseur à travers laquelle la cabine (1) se déplace, de façon à s'étendre dans une direction dans laquelle la cabine (1) se déplace ;
des dispositifs d'arrêt d'urgence (5) qui sont attachés à la cabine (1) et qui amènent la cabine (1) à s'agripper aux rails de guidage (6) sous des conditions anormales ; et
un détecteur de tension (7) qui est attaché à une partie du câble (4) pour être attaché à la cabine (1) et qui mesure la tension du câble (4), dans lequel, quand une sortie en provenance du détecteur de tension (7) produite seulement lorsque la machine de levage (3) a hissé le contrepoids (2) à un couple maximal nécessaire pour entraîner un ascenseur est égale à une différence entre la force provoquée par le contrepoids (2) et une capacité de traction ou quand la sortie en provenance du détecteur de tension (7) produite seulement lorsque la machine de levage (3) a hissé le contrepoids (2) à un couple maximal nécessaire pour entraîner un ascenseur est plus petite que la différence entre la force provoquée par le contrepoids (2) et la capacité de traction, les dispositifs d'arrêt d'urgence (5) sont déterminés comme étant sûrs.

2. Procédé de test d'arrêt d'urgence d'ascenseur selon la revendication 1, comprenant en outre un indicateur (8) pour afficher une sortie en provenance du détecteur de tension (7).

3. Procédé de test d'arrêt d'urgence d'ascenseur selon la revendication 2, dans lequel l'indicateur est prévu dans un dispositif d'affichage (14) disposé au niveau d'un hall.

4. Procédé de test d'arrêt d'urgence d'ascenseur selon l'une quelconque des revendications 1 à 3, dans lequel les dispositifs d'arrêt d'urgence (5) ont un moyen de détermination de force d'agrippement (13) pour déterminer la sécurité de la force d'agrippement à utiliser en agrippant les rails de guidage (6), et le moyen de détermination de force d'agrippement (13) détermine la sécurité de la force d'agrippement sur la base de la sortie en provenance du détecteur de tension (7) produite lorsque le contrepoids (2) est hissé au couple maximal nécessaire pour que la machine de levage (3) entraîne l'ascenseur.

Fig.1

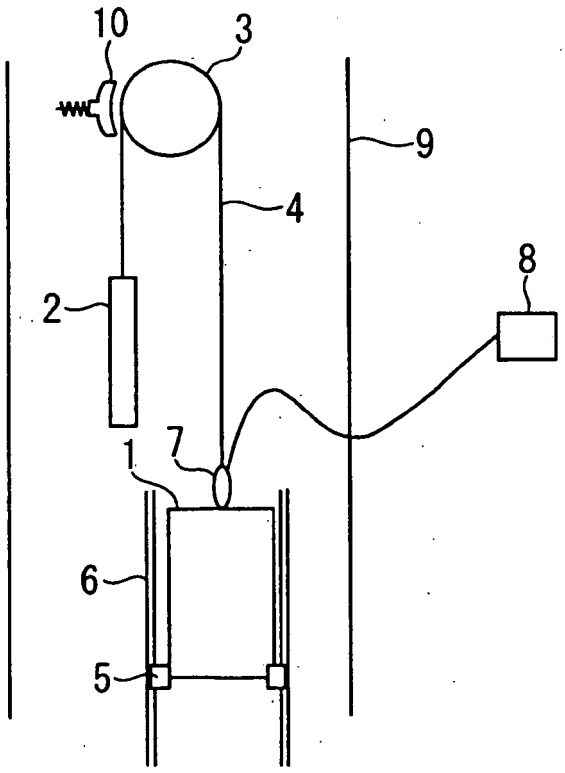


Fig.2

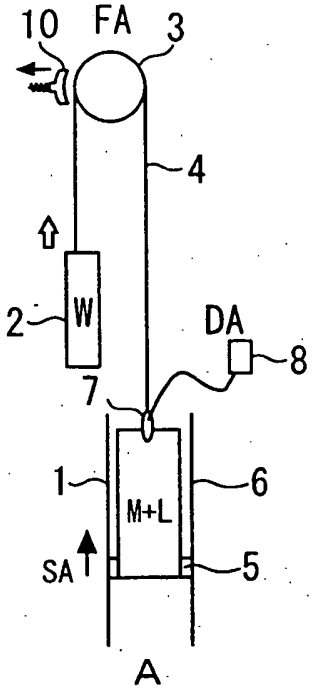


Fig.3

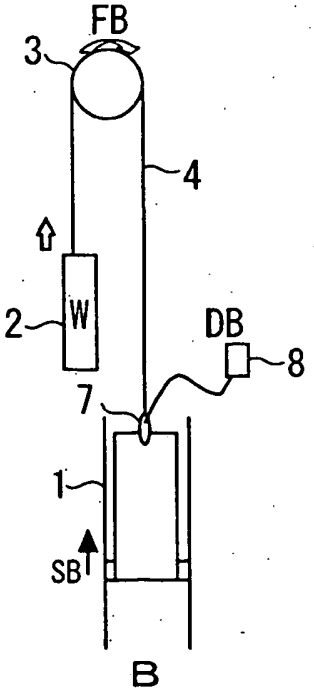


Fig.4

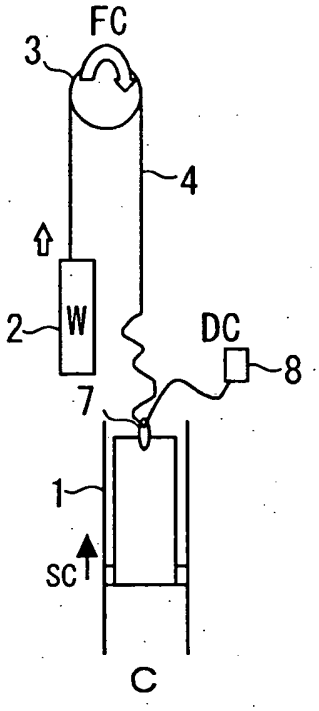


Fig.5

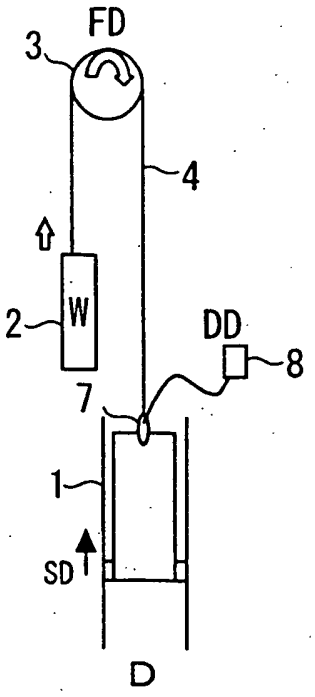


Fig.6

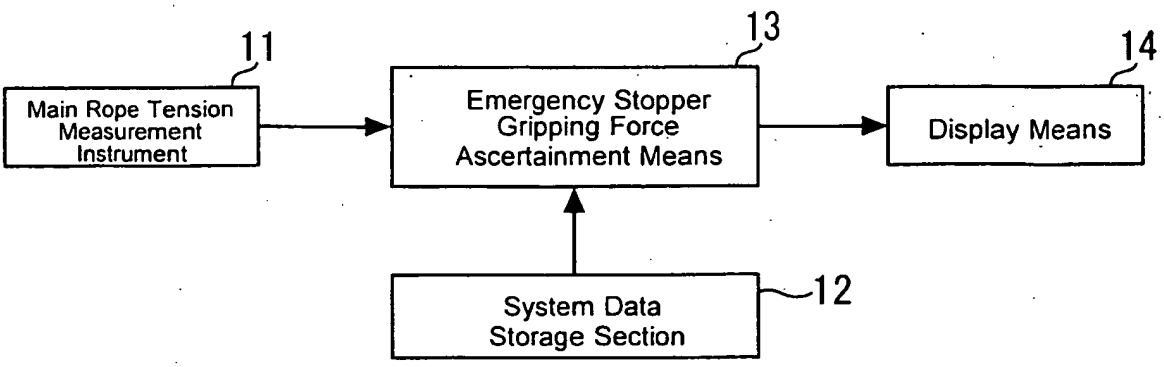

11
Main Rope Tension Measurement Instrument
13
Emergency Stopper Gripping Force Ascertainment Means
14
Display Means
System Data Storage Section
12

Fig.7

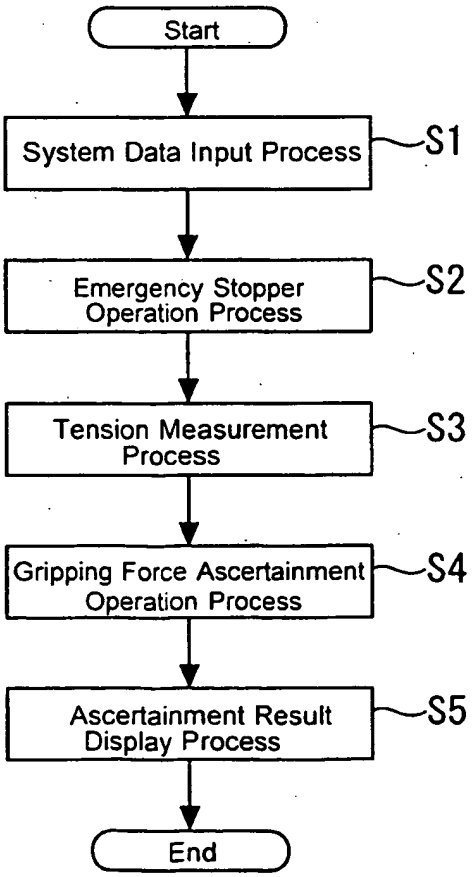
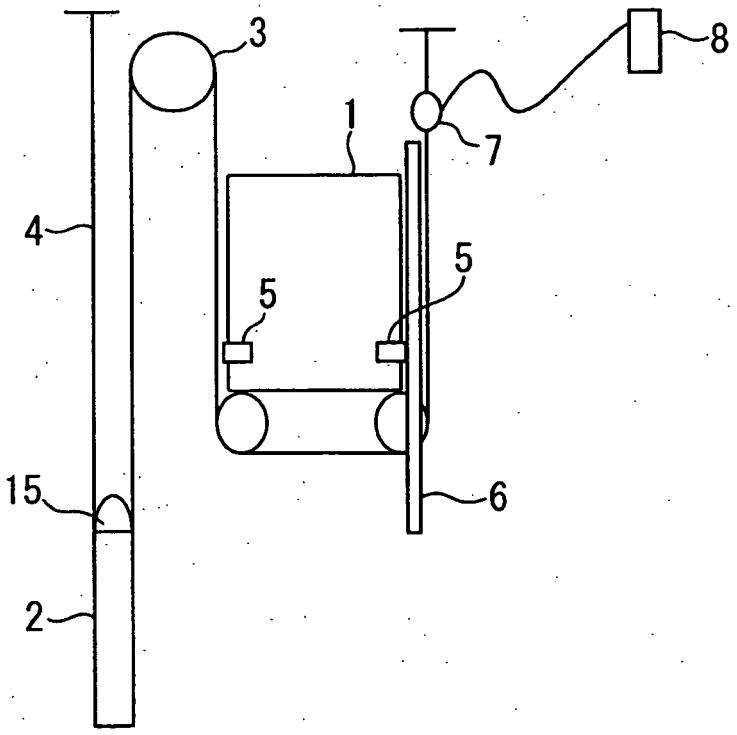

Start
System Data Input Process
S1
Emergency Stopper Operation Process
S2
Tension Measurement Process
S3
Gripping Force Ascertainment Operation Process
S4
Ascertainment Result Display Process
S5
End

Fig.8



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 5294575 A **[0010] [0011]**
- JP 6135653 A **[0010] [0012]**
- US 632519 A **[0012]**