



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 158(3) EPC

(43) Date of publication:
07.11.2007 Bulletin 2007/45

(51) Int Cl.:
B66B 5/04 (2006.01)

(21) Application number: **05719453.2**

(86) International application number:
PCT/JP2005/003003

(22) Date of filing: **24.02.2005**

(87) International publication number:
WO 2006/090453 (31.08.2006 Gazette 2006/35)

(84) Designated Contracting States:
DE NL

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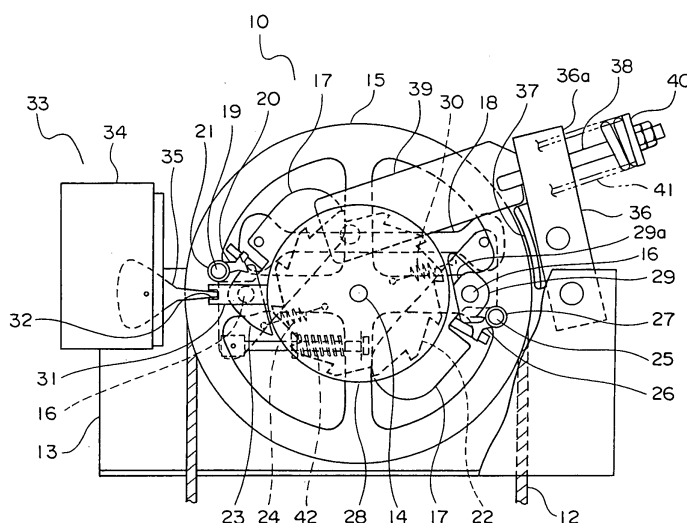
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(54) **GOVERNOR FOR ELEVATOR**

(57) A speed governor sheave rotatable about a sheave shaft and a friction pulley rotatable coaxially with the speed governor sheave are supported on a pedestal. The speed governor sheave is provided with a flyweight that is turned due to a centrifugal force resulting from rotation of the speed governor sheave. The speed governor sheave is turnably provided with a contact for rotating the friction pulley in the same direction as the speed

governor sheave when the speed of a car reaches a pre-determined overspeed by coming into contact with the friction pulley. The friction pulley is provided with an engagement member for operating a switch lever of a car stop switch when the speed of the car reaches the pre-determined overspeed. The switch lever, which normally engages with the engagement member, is operated when the friction pulley is rotated.

FIG. 2



Description

Technical Field

[0001] The present invention relates to a speed governor for an elevator having a speed governor sheave that is rotated as a car moves.

Background Art

[0002] In a conventional speed governor for an elevator, with a view to detecting that a speed of a car has reached a predetermined overspeed, a flyweight may be turned due to a centrifugal force resulting from rotation of a speed governor sheave. The speed governor sheave is rotated in accordance with the speed of the car. A pedestal for supporting the speed governor sheave is provided with a car stop switch. An actuation pawl for actuating the car stop switch is provided at an outer end of the flyweight. In a case where the speed of the car has reached the predetermined overspeed, a switch lever of the car stop switch is operated by the actuation pawl to actuate the car stop switch. Thus, a power of a driving machine of the elevator is shut off, and the car is stopped by a brake device of the driving machine (see Patent Document 1).

[0003] Patent Document 1: JP 2002-370879 A

Disclosure of the Invention

Problem to be solved by the Invention

[0004] In the conventional speed governor for the elevator constructed as described above, however, the actuation pawl passes the position of the switch lever only once while the speed governor sheave rotates by 360°. Accordingly, even in the case where the speed of the car has reached the predetermined overspeed, it takes the actuation pawl a long time to reach the position of the switch lever when the switch lever is located far from the actuation pawl, so the car stop switch cannot be actuated immediately. As a result, there is a risk of the speed of the car exceeding the predetermined overspeed before an actuation of the car stop switch.

[0005] The present invention has been made to solve the problem discussed above, and it is therefore an object of the invention to obtain a speed governor for an elevator which makes it possible to more accurately detect that the speed of a car has reached a predetermined overspeed.

Means for solving the Problem

[0006] A speed governor for an elevator according to the present invention includes: a speed governor sheave which is rotatably supported on a pedestal and is rotated according to a movement of a car; a friction pulley provided coaxially with the speed governor sheave and ro-

tatably supported on the pedestal; a flyweight which is turnably provided on the speed governor sheave and is turned due to a centrifugal force resulting from rotation of the speed governor sheave; a contact trip lever which is turnably provided on the speed governor sheave and is turned through turning of the flyweight; a contact turnably provided on the speed governor sheave and normally engaged with the contact trip lever, for rotating the friction pulley in the same direction as the speed governor sheave when a speed of the car reaches a predetermined overspeed by coming into contact with the friction pulley through disengagement from the contact trip lever; an engagement member provided on the friction pulley and is rotated integrally with the friction pulley; and a car stop switch which has a switch lever, which is normally engaged with the engagement member and operated by the engagement member when the friction pulley is rotated, and is actuated through an operation of the switch lever.

Brief Description of the Drawings

[0007]

Fig. 1 is a diagram showing a structure of an elevator apparatus according to Embodiment 1 of the present invention.

Fig. 2 is a front view showing a speed governor of Fig. 1.

Fig. 3 is a front view showing the speed governor immediately after a contact of Fig. 2 has come into contact with a friction pulley.

Fig. 4 is a front view showing the speed governor when a car stop switch of Fig. 2 is actuated.

Best Mode for carrying out the Invention

[0008] A preferred embodiment of the present invention will be described hereinafter with reference to the drawings.

Embodiment 1

[0009] Fig. 1 is a diagram showing a structure of an elevator apparatus according to Embodiment 1 of the present invention. Referring to the figure, a machine room 2 is provided in an upper portion of a hoistway 1. A driving machine (hoisting machine) 3 is installed within the machine room 2. The driving machine 3 has a driving sheave 3a. A plurality of main ropes 4 (only one of them is shown in the figure for the sake of simplicity) are looped around the driving sheave 3a. A car 5 and a counterweight 6 are suspended within the hoistway 1 by means of the main ropes 4. The car 5 and the counterweight 6 are raised/lowered within the hoistway 1 due to a driving force of the driving machine 3. A pair of car guide rails 7 and a pair of counterweight guide rails (not shown) are installed within the hoistway 1. The car 5 is guided by the

car guide rails 7 to be raised/lowered within the hoistway 1. The counterweight 6 is guided by the counterweight guide rails to be raised/lowered within the hoistway 1.

[0010] The car 5 is mounted with a pair of emergency stop devices 8 for forcibly stopping the car 5 from moving, and a link mechanism 9 connected to the emergency stop devices 8. A speed governor 10 for detecting an overspeed of the car 5 to operate the respective emergency stop devices 8 is provided within the machine room 2. The speed governor 10 may also be provided within the hoistway 1.

[0011] A rotatable tension sheave 11 is provided in a lower portion of the hoistway 1. A speed governor rope 12 connected to the link mechanism 9 is looped around the speed governor 10 and the tension sheave 11. The speed governor rope 12 is moved in a circulating manner as the car 5 is raised/lowered.

[0012] Fig. 2 is a front view showing the speed governor 10 of Fig. 1. Referring to the figure, a speed governor sheave 15 rotatable about a sheave shaft 14 extending horizontally, is supported on a pedestal 13 fixed within the machine room 2. The speed governor rope 12 is looped around the speed governor sheave 15. A pair of flyweights 17, which can turn around pins 16, respectively, are provided on lateral surfaces of the speed governor sheave 15. The flyweights 17 are coupled to each other via a link member 18.

[0013] The flyweights 17 are turned due to a centrifugal force resulting from rotation of the speed governor sheave 15. A balance spring 42 for acting against the centrifugal force is provided between an end of one of the flyweights 17 and the speed governor sheave 15.

[0014] The speed governor sheave 15 is provided with an engagement pawl trip lever 20, which can turn around a shaft 19 extending parallel to the pins 16. A part of the engagement pawl trip lever 20 abuts on the aforementioned one of the flyweights 17. The engagement pawl trip lever 20 is turned around the shaft 19 through the turning of the aforementioned one of the flyweights 17. The shaft 19 is provided with a torsion spring 21 for urging the engagement pawl trip lever 20 in such a direction that the engagement pawl trip lever 20 comes into abutment on the aforementioned one of the flyweights 17.

[0015] A ratchet 22, which can rotate around the sheave shaft 14, is supported on the pedestal 13. A plurality of teeth are provided on an outer peripheral portion of the ratchet 22. An engagement pawl 23 for selectively engaging one of the engagement pawl trip lever 20 and the ratchet 22 is pivoted on one of the pins 16. The engagement pawl 23 is urged by a draft spring 24 in such a direction as to engage the ratchet 22. The engagement pawl 23 is normally open and separate from the ratchet 22 through engagement with the engagement pawl trip lever 20. However, when the engagement pawl 23 is disengaged from the engagement pawl trip lever 20, the engagement pawl 23 is turned due to a spring force of the draft spring 24 and then engaged with the ratchet 22.

[0016] The speed governor sheave 15 is provided with

a contact trip lever 26 that can turn around a shaft 25 extending parallel to the pins 16. A part of the contact trip lever 26 abuts on the other flyweight 17. The contact trip lever 26 is turned around the shaft 25 through the turning of the other flyweight 17. The shaft 25 is provided with a torsion spring 27 for urging the contact trip lever 26 in such a direction that the contact trip lever 26 comes into abutment on the other flyweight 17.

[0017] A friction pulley 28, which can rotate about the sheave shaft 14, is supported on the pedestal 13. The friction pulley 28 is disposed on the other side of the speed governor sheave 15 side with respect to the ratchet 22 in an axial direction of the sheave shaft 14. In other words, the ratchet 22 is disposed between the speed governor sheave 15 and the friction pulley 28 in the axial direction of the sheave shaft 14. An outer peripheral portion of the friction pulley 28 is made of an abrasion-resistant material with a high coefficient of friction.

[0018] The speed governor sheave 15 is provided with a contact 29, which can turn around the other pin 16. The contact 29 has a contact surface 29a made of a material with a high coefficient of friction. The contact 29 can turn between a contact position, in which the contact surface 29a is in contact with the outer peripheral portion of the friction pulley 28 (Fig. 3), and a separate position, in which the contact surface 29a is separate from the friction pulley 28 while being engaged with the contact trip lever 26 (Fig. 2).

[0019] The contact 29 is urged by a draft spring 30 in such a direction that the contact surface 29a comes into contact with the friction pulley 28, namely, in such a direction that the contact surface 29a approaches the contact position. The contact 29 is normally separate from the friction pulley 28 while being engaged with the contact trip lever 26. However, when the contact 29 is disengaged from the contact trip lever 26, the contact 29 is turned due to a spring force of the draft spring 30 to be brought into contact with the outer peripheral portion of the friction pulley 28. The turning amount of the other flyweight 17 when the contact 29 and the contact trip lever 26 are disengaged from each other is set smaller than the turning amount of the one of the flyweights 17 when the engagement pawl 23 and the engagement pawl trip lever 20 are disengaged from each other.

[0020] The friction pulley 28 is provided with an engagement member 31 extending radially outward from the friction pulley 28. Thus, the engagement member 31 is rotated integrally with the friction pulley 28. A recess portion 32 is provided at an outer end of the engagement member 31.

[0021] The pedestal 13 is provided with a car stop switch 33 for stopping the driving machine 3 from being supplied with power to operate a brake device (not shown) of the driving machine 3. The car stop switch 33 has a switch body 34 and a switch lever 35 which is turnably provided to the switch body 34. The car stop switch 33 is actuated through an operation of the switch lever 35.

[0022] The switch lever 35, which normally engages

with the engagement member 31, is operated by the engagement member 31 when the friction pulley 28 is rotated. The switch lever 35 is engaged, through insertion of a tip thereof into the recess portion 32, with the engagement member 31 in a circumferential direction of the friction pulley 28.

[0023] The pedestal 13 is turnably provided with an arm 36. A shoe 37, which is pressed against the speed governor rope 12, is turnably provided at an intermediate portion of the arm 36. A spring shaft 38 is passed through a tip 36a of the arm 36. A connection lever 39 is connected between one end of the spring shaft 38 and the ratchet 22. A spring receiving member 40 is provided at the other end of the spring shaft 38. A pressure spring 41 for pressing the shoe 37 against the speed governor rope 12 is provided between the tip 36a of the arm 36 and the spring receiving member 40.

[0024] Next, an operation will be described. Fig. 3 is a front view showing the speed governor 10 immediately after the contact 29 of Fig. 2 has come into contact with the friction pulley 28. Fig. 4 is a front view showing the speed governor 10 when the car stop switch 33 of Fig. 2 is actuated. When the speed at which the car 5 is raised/lowered reaches a predetermined first overspeed (normally about 1.3 times as high as a rated speed), the contact 29 and the contact trip lever 26 are disengaged from each other through the turning of the flyweights 17 resulting from a centrifugal force. Thus, the contact 29 is turned toward the contact position due to a spring force of the draft spring 30, and the contact surface 29a comes into contact with the outer peripheral portion of the friction pulley 28 as shown in Fig. 3. Thus, the friction pulley 28 is rotated in the same direction as the speed governor sheave 15 as shown in Fig. 4, and the switch lever 35 is operated by the engagement member 31. Thus, the car stop switch 33 is actuated, the driving machine 3 is stopped from being supplied with power, and the car 5 is stopped from moving by the brake device of the driving machine 3.

[0025] In a case of, for example, breakage of the main ropes 4, the car 5 continues to be lowered without being stopped even after the driving machine 3 has stopped. When the speed of the car reaches a second overspeed (normally about 1.4 times as high as the rated speed), the respective flyweights 17 are further turned due to a centrifugal force resulting from rotation of the speed governor sheave 15, so the engagement pawl 23 and the engagement pawl trip lever 20 are disengaged from each other. Thus, the engagement pawl 23 is turned due to a spring force of the draft spring 24, thereby engaging with the teeth of the ratchet 22. Thus, the ratchet 22 is slightly rotated together with the speed governor sheave 15.

[0026] After that, rotation of the ratchet 22 is transmitted to the arm 36 via the connection lever 39, the spring shaft 38, the spring receiving member 40, and the pressure spring 41, so the arm 36 is turned in such a direction as to approach the speed governor sheave 15. Thus, the shoe 37 abuts on the speed governor rope 12, and is

pressed against the speed governor rope 12 by the pressure spring 41. Thus, the speed governor rope 12 is restrained between the speed governor sheave 15 and the shoe 37, so the speed governor rope 12 is braked from moving. When the speed governor rope 12 is stopped from moving in a circulating manner, the car 5 keeps moving. As a result, the link mechanism 9 is operated, and the emergency stop device 8 is actuated.

[0027] In the speed governor 10 constructed as described above, when the car 5 reaches the predetermined overspeed, the contact 29 comes into contact with the outer peripheral portion of the friction pulley 28, thereby allowing the friction pulley 28 to be rotated. The switch lever 35 of the car stop switch 33 is operated through rotation of the friction pulley 28. Therefore, when the car 5 reaches the predetermined overspeed, the car stop switch 33 can be actuated immediately regardless of the positions of the flyweights 17 with respect to the switch lever 35. Thus, it is possible to more accurately detect that the speed of the car 5 has reached the predetermined overspeed. Accordingly, the car stop switch 33 can be prevented from being actuated with delay. Consequently, the driving machine 3 can be more instantaneously stopped from being supplied with power, and the brake device of the driving machine 3 can be more instantaneously operated.

[0028] The engagement member 31 provided on the friction pulley 28 is provided with the recess portion 32, and the switch lever 35 is inserted into the recess portion 32 and thereby engaged with the engagement member 31 in the circumferential direction of the friction pulley 28. Therefore, the switch lever 35 can be operated regardless of the rotational direction of the friction pulley 28. Thus, it is possible to more accurately detect that the speed of the car 5 has reached the predetermined overspeed, not only when the car 5 is lowered but also when the car 5 is raised.

Claims

1. A speed governor for an elevator, **characterized by** comprising:

- a speed governor sheave which is rotatably supported on a pedestal and is rotated according to a movement of a car;
- a friction pulley provided coaxially with the speed governor sheave and rotatably supported on the pedestal;
- a flyweight which is turnably provided on the speed governor sheave and is turned due to a centrifugal force resulting from rotation of the speed governor sheave;
- a contact trip lever which is turnably provided on the speed governor sheave and is turned through turning of the flyweight;
- a contact turnably provided on the speed gov-

ernor sheave and normally engaged with the
contact trip lever, for rotating the friction pulley
in the same direction as the speed governor
sheave when a speed of the car reaches a pre-
determined overspeed by coming into contact 5
with the friction pulley through disengagement
from the contact trip lever;
an engagement member provided on the friction
pulley and is rotated integrally with the friction
pulley; and 10
a car stop switch which has a switch lever, which
is normally engaged with the engagement mem-
ber and operated by the engagement member
when the friction pulley is rotated, and is actu-
ated through an operation of the switch lever. 15

2. The speed governor for an elevator according to
Claim 1, **characterized in that:**

the engagement member is provided with a re- 20
cess portion; and
the switch lever is engaged with the engagement
member in a circumferential direction of the fric-
tion pulley by being inserted into the recess por-
tion. 25

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FIG. 1

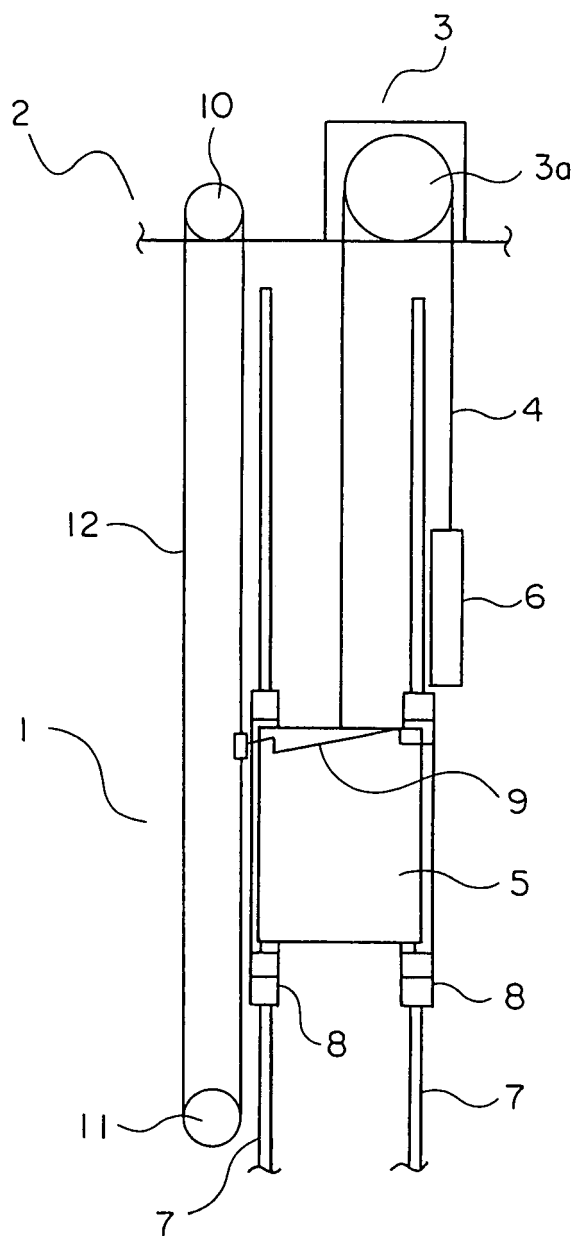


FIG. 2

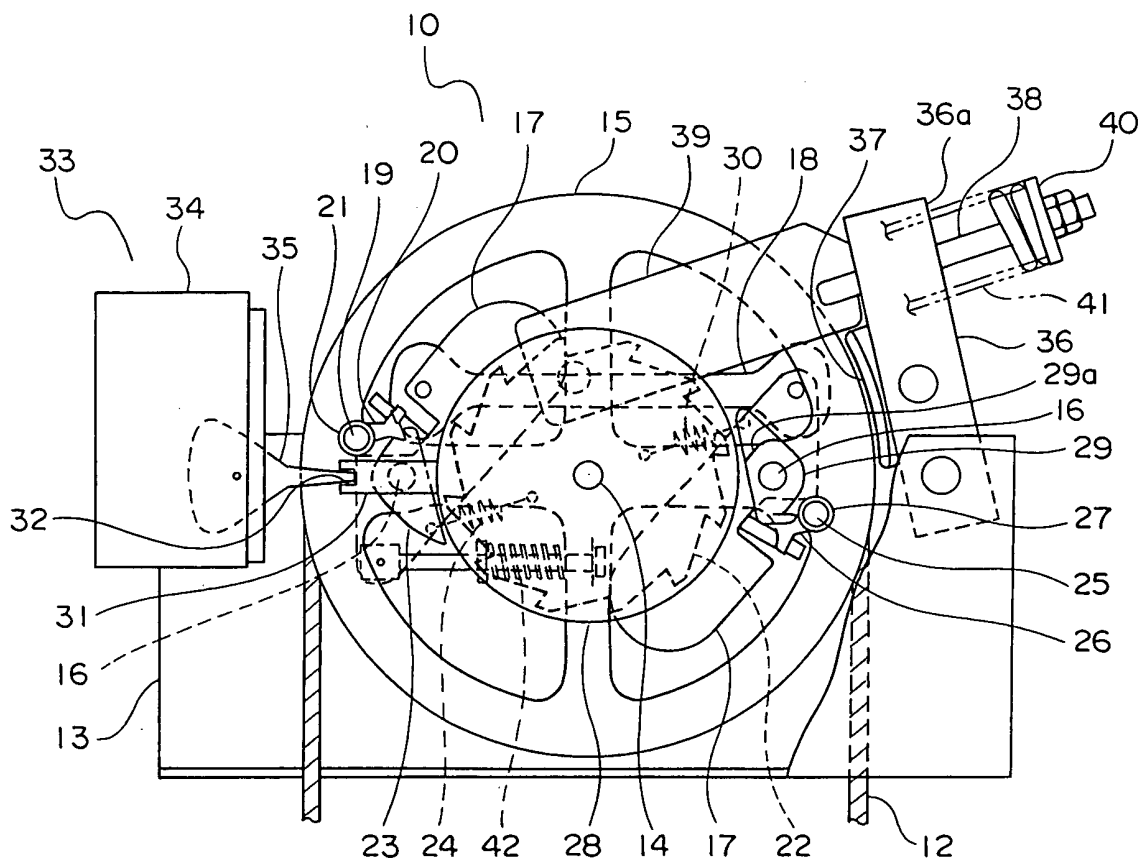


FIG. 3

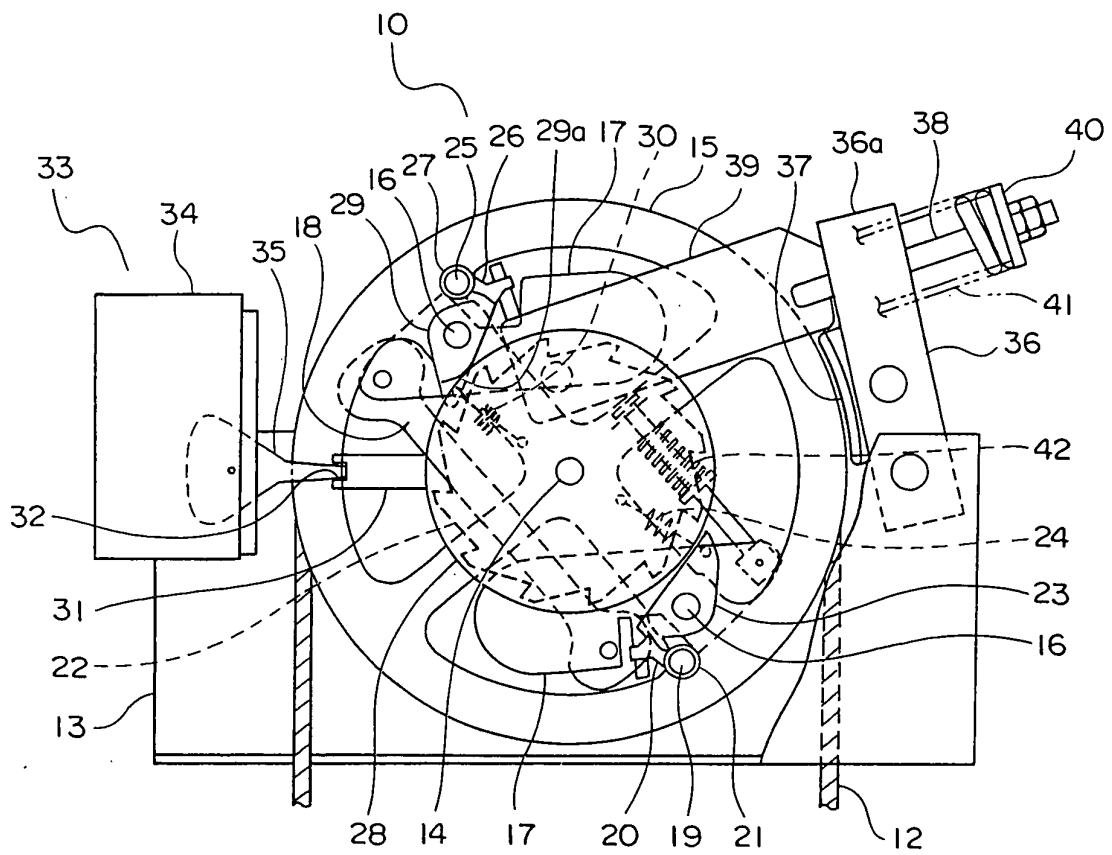
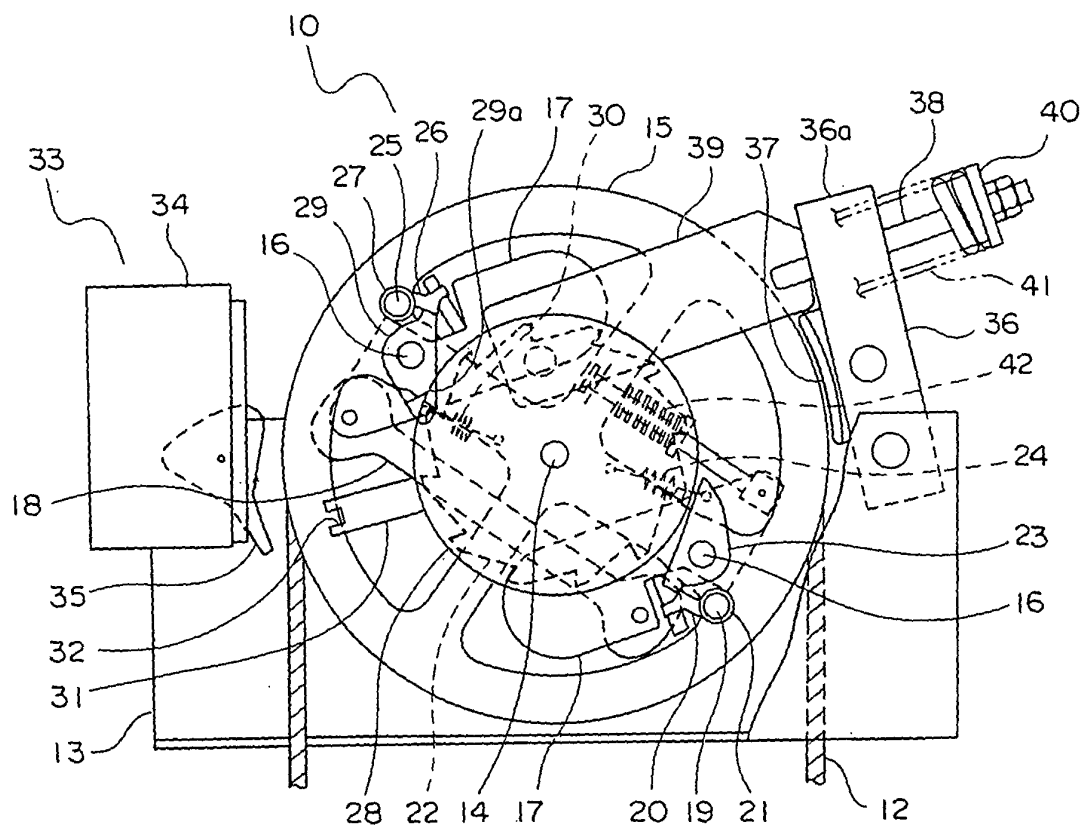


FIG. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2005/003003

A. CLASSIFICATION OF SUBJECT MATTER

B66B5/04 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B66B5/00 (2006.01) - **B66B5/28** (2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Jitsuyo Shinan Toroku Koho	1996-2005
Kokai Jitsuyo Shinan Koho	1971-2005	Toroku Jitsuyo Shinan Koho	1994-2005

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2002-370879 A (Mitsubishi Electric Corp.), 24 December, 2002 (24.12.02), (Family: none)	1-2
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 158391/1983 (Laid-open No. 64963/1985) (Sansei Kenki Kabushiki Kaisha), 08 May, 1985 (08.05.85), (Family: none)	1-2

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"&" document member of the same patent family

Date of the actual completion of the international search
15 November, 2005 (15.11.05)Date of mailing of the international search report
29 November, 2005 (29.11.05)Name and mailing address of the ISA/
Japanese Patent Office

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2002370879 A [0003]