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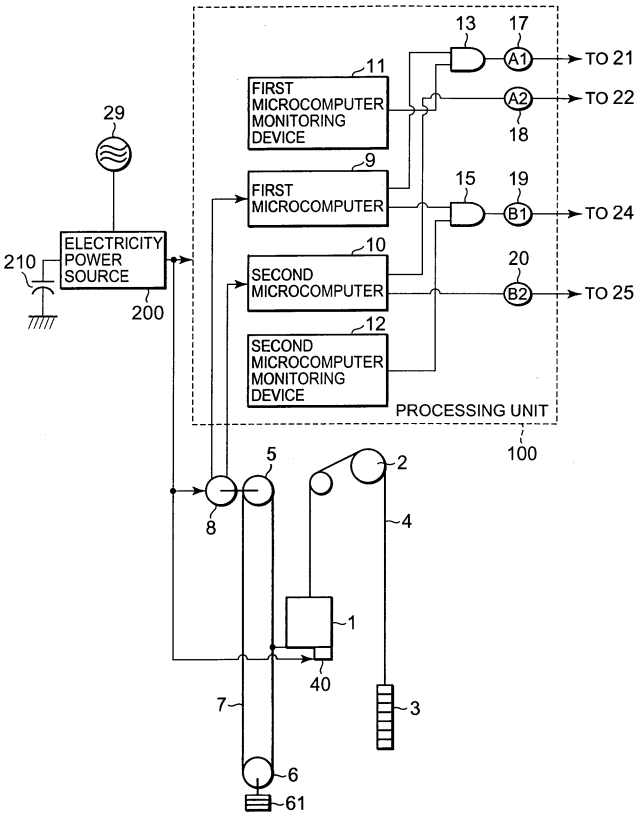
(54) GOVERNOR FOR ELEVATOR

(57) An elevator governor includes an encoder 8 for detecting physical volume variations that accompany ascent and descent of an elevator car 1, and a first microcomputer 9 that computes speed of the car 1, based on a signal output from the encoder 8, and judges whether or not the computed speed of the car 1 has exceeded a first abnormal speed level set in advance, and if the first microcomputer 9 judges that the car speed has exceeded the first abnormal speed level, the car is halted.

FIG. 1



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Description

TECHNICAL FIELD

[0001] The present invention relates to elevator governors, and, in particular, to electric governors using microprocessors.

BACKGROUND ART

[0002] Elevator governors can generally be roughly divided into disk types and flyball types. Their specific structure is disclosed, for example, in "Description of Elevator Technical Standards for Conformity with Building Standards and Legal Implementation" (1994 edition) published by the Japan Elevator Association. This reference discloses that the disk type and the flyball type "are both configured to convert movement of an elevator car into rotational action; a pendulum arranged thereon operates by centrifugal force according to speed; by this means, the speed is detected and an excess-speed switch is opened; and the mechanism then bites on the governor rope and activates an emergency halting device." In what follows, an operation that opens the excess-speed switch is referred to as a switch operation, and an operation that restrains a governor rope and activates the emergency halting device is referred to as a catch operation. Furthermore, Japanese Laid-Open Patent Publication 2001-122549 discloses a means in which electrical energy is induced according to the car speed, and, by providing an actuator that operates by this electrical energy, a means in which excess speed is detected and the catch operation is enacted.

[0003] In these technologies, the car movement is converted into the operation of a pendulum, so as to realize the switch operation and the catch operation, or alternatively, the car movement is converted into electrical energy, and an actuator is made to operate by this electrical energy, so as to realize the switch operation and the catch operation. That is, various operations are realized so that the car movement is converted into mechanical energy of the arm, or into electrical energy. By converting into a different form of energy, operations can be assured; however, there will be variations, to some extent, in the speed of operations, and it is not easy to prevent malfunctions.

DISCLOSURE OF INVENTION

[0004] The present invention has as an object the solution of the above problems though the realization of a governor with good accuracy and that can prevent malfunctions, without sacrificing safety.

[0005] The elevator governor related to the present invention comprises: a detector for detecting physical volume variations that accompany ascent and descent of an elevator car, and a first microcomputer that has a first speed computation unit for computing speed of the car, based on a signal output from the detector, and a first speed judging unit for judging whether or not the car speed computed by the first speed computation unit has exceeded a first speed level set in advance, and if the first speed judging unit judges that the car speed has exceeded the first speed level, the car is brought to a halt.

[0006] Further, the elevator governor related to the present invention comprises: a detector for detecting physical volume variations that accompany ascent and descent of an elevator car, and a first microcomputer that has a first speed computation unit for computing the speed of the car, based on a signal output from the detector, a first speed judging unit for judging whether or not the car speed computed by the first speed computation unit has exceeded a first speed level set in advance, a second speed judging unit for judging whether or not the car speed computed by the first speed computation unit has exceeded a second speed level that is higher than the first speed level, wherein if the first speed judging unit judges that the car speed has exceeded the first speed level, electricity supply to a hoisting winch for the car is stopped, and if the second speed judging unit judges that the car speed has exceeded the second speed level, the car is brought to an emergency stop.

[0007] The elevator governor related to the present invention comprises: a detector for detecting physical volume variations that accompany ascent and descent of an elevator car, a first microcomputer that has a first speed computation unit for computing the speed of the car, based on a signal output from the detector, and a first speed judging unit for judging whether or not the car speed computed by the first speed computation unit has exceeded a first speed level set in advance, and a first monitoring device for monitoring the action state of the first microcomputer, wherein, if the first speed judging unit judges that the car speed has exceeded the first speed level, or if the first monitoring device judges that the first microcomputer is in a state in which it cannot judge the speed, the car is brought to a halt.

[0008] Further, the elevator governor related to the present invention comprises: a detector for detecting physical volume variations that accompany ascent and descent of an elevator car, a first microcomputer that has a first speed computation unit for computing the speed of the car, based on a signal output from the detector, and a first speed judging unit for judging whether or not the car speed computed by the first speed computation unit has exceeded a first speed level set in advance, and a second microcomputer that has a second speed computation unit for computing the speed of the car, based on a signal output from the detector, and a second speed judging unit for judging whether or not the car speed computed by the second speed computation unit has exceeded a first speed level set in advance, wherein if the first speed judging unit judges that the car speed has exceeded the first speed level, or if the second speed judging unit judges that the car speed has exceeded the first speed level, the car is brought to an emergency halt.

[0009] The governor includes the first monitoring de-

vice for monitoring the operation state of the first microcomputer, and further comprises: a second monitoring device for monitoring the operation state of the second microcomputer, wherein if the first monitoring device judges that the first microcomputer is in a state where it cannot judge speed, or if the second monitoring device judges that the second microcomputer is in a state where it cannot judge speed, the car is brought to a halt.

[0010] Further, the elevator governor related to the present invention comprises: a detector for detecting physical volume variations that accompany ascent and descent of an elevator car, a first microcomputer that has a first speed computation unit for computing the speed of the car, based on a signal output from the detector, and a second microcomputer that has a second speed computation unit for computing the speed of the car, based on a signal output from the detector, wherein the first microcomputer comprises a first variation judging unit for judging whether or not the variation between the car speed computed by the first speed computation unit and the car speed computed by the second speed computation unit exceeds a value set in advance, and based on the judged result of the first variation judging unit, the car is brought to a halt.

[0011] The second microcomputer comprises a second variation judging unit for judging whether or not the variation between the car speed computed by the first speed computation unit and the car speed computed by the second speed computation unit exceeds a value set in advance, and based on the judged result of the second variation judging unit, the car is brought to a halt.

[0012] A battery is provided to supply power to the detector and the microcomputer if there is an electricity outage. The car is brought to a halt by cutting off power supply to the car hoisting winch. The car is brought to a halt by activating the emergency stop means of the car. The detector is an encoder or acceleration sensor.

BRIEF DESCRIPTION OF DRAWINGS

[0013]

Fig. 1 is a configuration diagram of an elevator having a governor in accordance with Embodiment 1.

Fig. 2 is a diagram illustrating a driver circuit for an actuator for activating an emergency stop.

Fig. 3 is a diagram illustrating a driver circuit with a main contactor MC 27 or the like, in a motor driver circuit.

Fig. 4 is a schematic view of the motor driver circuit.

Fig. 5 is a conceptual view illustrating a configuration for an encoder 8.

Fig. 6 is a diagram illustrating an internal configuration of a first microcomputer 9 and a second microcomputer 10.

Fig. 7 is a diagram illustrating an internal configuration of a first microcomputer 9 and a second microcomputer 10 for Embodiment 2.

Fig. 8 is a configuration diagram where an accelerator sensor 53 is used as a detector.

BEST MODE FOR CARRYING OUT THE INVENTION

[0014] Embodiments of the present invention will be described below.

Embodiment 1

[0015] Embodiment 1 of the present invention is described using Figs. 1 through 6.

[0016] In Fig. 1, an elevator car 1 is linked to one end of a main wire-rope 4, and a counterweight 3 is linked to the other end of the main wire-rope 4. A portion of this main wire 4 is wound around a drive sheave of a hoisting winch 2, and through the revolution of this drive sheave, the car 1 and the counterweight 3 move up and down in the elevator shaft. An upper pulley 5 is disposed in a machine room arranged in the upper portion of the elevator shaft or above the elevator shaft. A lower pulley 6 is disposed in the lower portion of the elevator shaft, and an endlessly looped rope 7 is stretched between the upper pulley 5 and the lower pulley 6. Since a weight is suspended from the lower pulley 6, the rope 7 is held in tension. Since the rope 7 is linked to the car 1 at one position, the upper pulley 5 and the lower pulley 6 revolve as the car 1 goes up or down.

[0017] An encoder 8 that has two output systems is attached to the upper pulley 5; the encoder 8 detects revolving of the upper pulley 5 and outputs a pulse signal. Since the upper pulley 5 revolves as the car 1 ascends or descends, the encoder 8 constitutes a detector for detecting physical volume variations that accompany the ascent and descent of the car 1. The output signal from the encoder 8 is a signal that varies in correspondence with the speed of the car 1.

[0018] A first microcomputer 9, a second microcomputer 10, a first microcomputer monitoring device 11, a second microcomputer monitoring device 12, and AND-circuits 13 and 15 are arranged in a processing unit 100 for the governor.

[0019] A first output signal from the encoder 8 is input to the first microcomputer 9, and the first microcomputer 9 computes the speed of the car 1 from this first output signal. A second output signal from the encoder 8 is input to the second microcomputer 10, and the second microcomputer 10 computes the speed of the car 1 from this second output signal. The first microcomputer monitoring device 11 monitors the operation state of the first microcomputer 9, and the second microcomputer monitoring device 12 monitors the operation state of the second microcomputer 10. The AND-circuit 13 receives the output signal from the first microcomputer 9 and the output signal from the first microcomputer monitoring device 11, and if either of the output signals is LO, it shuts off a relay A1 17. The AND-circuit 15 receives the output signal from the first microcomputer 9 and the output signal from the

second microcomputer monitoring device 12, and if either of the output signals is LO, it shuts off a relay B1 19.

[0020] A relay A2 18 receives the output signal from the second microcomputer 10, and if this output signal is LO, it is shut off.

[0021] A relay B2 20 receives the output signal from the second microcomputer 10, and if this output signal is LO, it is shut off.

[0022] An emergency stop is arranged on the car 1, and this emergency stop has an actuator 40. The emergency stop is activated by the operation of the actuator 40.

[0023] In normal operation, an electrical power source 200 supplies electrical current from a three-phase alternating current source 29 to each member of the processing unit 100, the encoder 8 and the emergency stop actuator 40; and if there is a power outage, electrical current is supplied from a battery 210 to each of these members. In normal operation, the battery 210 is charged in advance.

[0024] Fig. 2 is a diagram illustrating a driver circuit for the emergency stop actuator 40, this driver circuit having normally open contact breaker points 24 in the relay B1 19, normally open contact breaker points 25 in the relay B2 20, and a coil B 26 for the actuator 40. The coil B 26 normally has an electricity supply and since the actuator 40 is excited by this electricity supply, the emergency stop is not activated. In cases of abnormalities, the excitation of the actuator 40 is cut by the electricity power source to the actuator 40 being shut off, and the emergency stop is activated.

[0025] Fig. 3 is a diagram illustrating a driver circuit with a main contactor MC 27 or the like, in a motor driver circuit, this driver circuit having normally open contact breaker points 21 in the relay A1 17, normally open contact breaker points 22 in the relay A2 18, contact breaker points 23 of another safety device for the elevator, a main contactor MC 27 for the motor driver circuit, a main contactor driver circuit 28, a contactor BK 36 for driving a brake for the hoisting winch 2, and a contactor driver circuit 37 for driving the brake.

[0026] Fig. 4 is a schematic view of the motor driver circuit. The motor driver circuit is connected to a three phase alternating current electricity source 29, and has breaker points 30 for the main contactor MC 27, and an inverter 31 for driving a motor 32 attached to the hoisting winch 2.

[0027] Fig. 5 is a conceptual view illustrating a configuration of the internal parts of the encoder 8, the encoder 8 having a disk 35 with teeth to give the form of a gear wheel, and magnetic sensors 33 and 34 for detecting the teeth of the disk 35 and outputting pulse signals. The disk 35 is arranged on the upper pulley 5 and the disk 35 revolves as the upper pulley 5 revolves. The magnetic sensors 33 and 34 detect the teeth of the disk 35 and output pulse signals. The output signal from this magnetic sensor 33 is input to the first microcomputer 9 as a first output signal. The output signal from the magnetic sensor 34 is input to the second microcomputer 10 as a second output signal.

[0028] Fig. 6 is a diagram illustrating an internal configuration of the first microcomputer 9 and the second microcomputer 10. A first speed computation unit 41, a first speed judging unit 42 and a second speed judging unit 43 are disposed inside the first microcomputer 9. The first output signal from the encoder 8 is input to the first speed computation unit 41. The output signal from the first speed computation unit 41 is input to the first speed judging unit 42 and the second speed judging unit 43. A second speed computation unit 44, a third speed judging unit 45 and a fourth speed judging unit 46 are disposed inside the second microcomputer 10.

Behavior and Operation

[0029] Next, the behavior and operation of these circuits are described using Figs. 1 through 6.

[0030] First, when the car 1 ascends or descends, the encoder 8 attached to the upper pulley 5 outputs a signal corresponding to the speed of the car 1. That is, the magnetic sensors 33 and 34 of the encoder 8 detect the teeth of the disk 35 and output pulse signals. The first output signal output from the magnetic sensor 33 is input to the first microcomputer 9, and the second output signal output from the magnetic sensor 34 is input to the second microcomputer 10.

[0031] The first speed computation unit 41 of the first microcomputer 9 counts the pulses of the first output signal, computes the speed of the car 1, and outputs a signal indicating the detected speed of the car 1 to the first speed judging unit 42 and the second speed judging unit 43. The first speed judging unit 42 judges whether the car speed has exceeded a first abnormal speed level that is decided in advance, and if the car speed has exceeded the first abnormal speed level, outputs a LO signal to the AND-circuit 13. When the LO signal is input to the AND-circuit 13, the relay A1 17 is shut off. As a result, the normally open contact breaker points 21 of the relay A1 17 are shut off, and electricity power supply to the main contactor MC 27 and contactor BK 36 for driving the brake is cut. Since electrical power supply to the inverter 31 is cut, power supply to the hoisting winch 2 is cut and the elevator comes to a halt. Moreover, since electrical power supply to the contactor BK 36 for driving the brake is cut, the brake is activated and the elevator comes to an abrupt halt.

[0032] When the speed of the car 1 does not exceed the first abnormal speed level, the first speed judging unit 42 constantly outputs a HI signal to the AND-circuit 13, and the elevator does not come to an abrupt halt.

[0033] The second speed judging unit 43 of the first microcomputer 9 receives, from the first speed computation unit 41, a signal indicating the speed of the car 1, and judges whether the speed of the car 1 has exceeded a second abnormal speed level that is decided in advance. The second abnormal speed level is set to a value

higher than the first abnormal speed level. Where the speed of the car 1 exceeds the second abnormal speed level, the second speed judging unit 43 outputs a LO signal to the AND-circuit 15. When the LO signal is input to the AND-circuit 15, the relay B1 19 is shut off. As a result, the normally open contact breaker points 24 of the relay B1 19 are shut off, and electrical power supply to the coil B 26 of the actuator 40 is cut. In this way, the excitation of the actuator 40 is cut and the emergency stop is activated. As a result, the elevator comes to an abrupt halt.

[0034] Where the speed of the car 1 does not exceed the second abnormal speed level, the second speed judging unit 43 constantly outputs a HI signal to the AND-circuit 15, and the emergency stop is not activated.

[0035] On the other hand, the second microcomputer 10 also receives a second output signal from the encoder 8, and operates in the same way as the first microcomputer 10. That is, if the speed of the car 1 exceeds the first abnormal speed level, a third speed judging unit 45 outputs a LO signal to the relay A2 18. When the LO signal is input to the relay A2 18, the normally open contact breaker points 22 of the relay A2 18 are cut off, and electrical power supply to the main contactor MC 27 and contactor BK 36 for driving the brake is cut. Since electrical power supply to the inverter 31 is then cut, power supply to the hoisting winch 2 is cut and the elevator comes to a halt. Since electrical power supply to the contactor BK 36 for driving the brake is cut, the brake is activated and the elevator comes to an abrupt halt.

[0036] Further, if the speed of the car 1 exceeds the second abnormal speed level, a fourth speed judging unit 46 outputs a LO signal to the relay B2 20. When the LO signal is input to the relay B2 20, the normally open contact breaker points 25 of the relay B2 20 are cut off, and electrical power supply to the coil B 26 of the actuator 40 is cut. In this way, the excitation of the actuator 40 is cut, and the emergency stop is activated. As a result, the elevator comes to an abrupt halt.

[0037] If the first microcomputer 9 runs out of control and falls into a state where judgment of speed is not possible, the first microcomputer monitoring device 11 outputs a LO signal. Since the LO signal is input to the AND-circuit 13, the relay A1 17 is shut off, and the elevator comes to an abrupt halt as described above.

[0038] If the second microcomputer 10 runs out of control and falls into a state where judgment of speed is not possible, the second microcomputer monitoring device 12 outputs a LO signal. Since the LO signal is input to the AND-circuit 15, the relay B1 19 is shut off, the emergency stop is activated as described above, and the elevator comes to an abrupt halt.

[0039] The elevator governor in this embodiment provides the following advantages. Since the judgment as to whether or not the speed of the car 1 has exceeded the first abnormal speed level is arranged to be carried out in the first speed judging unit 42 of the first microcomputer 9, little variability occurs in the operations, and it is possible to prevent malfunctions.

[0040] Since the judgment as to whether or not the speed of the car 1 has exceeded the first abnormal speed level, and the judgment as to whether or not the speed of the car 1 has exceeded the second abnormal speed level are arranged to be carried out in the first microcomputer 9, it is possible to carry out a two-stage elevator halting operation.

[0041] Further, the first microcomputer monitoring device 11 is provided for monitoring the operation state of the first microcomputer 9, and if the first microcomputer monitoring device 11 judges that the first microcomputer 9 is in a state where judgment of speed is not possible, the arrangement is such that the car 1 is brought to a halt; thus, it is possible to raise the safety level of the governor.

[0042] Additionally, two microcomputers, the first and the second microcomputers 9 and 10, are provided, and if the first speed judging unit 42 of the first microcomputer 9 judges that the speed of the car 1 has exceeded the first abnormal speed level, or if the third speed judging unit 45 of the second microcomputer 10 makes a judgment, the arrangement is such that the car 1 is brought to a halt, and thus it is possible to increase the reliability of the governor.

[0043] Moreover, since the second microcomputer monitoring device 12 for monitoring the operation state of the second microcomputer 10 is provided, it is possible to raise the safety level of the governor even further.

[0044] Since the battery 210 is provided to backup the electrical power source in times of a power outage, it is possible to operate, with the battery 210, the encoder 8, the first microcomputer 9, the second microcomputer 10, the actuator 26, the first microcomputer monitoring device 11 and the second microcomputer monitoring device 12, even when there is a power outage.

Embodiment 2

[0045] In addition to the configuration of Embodiment 1, it is possible to add a configuration illustrated in Fig. 7 to the first microcomputer 9 and the second microcomputer 10. In accordance with this configuration, in Embodiment 2, the detected speeds, obtained by the computations in the first microcomputer 9 and the second microcomputer 10, are compared, and if there is a discrepancy between the two detected speeds, the situation is deemed abnormal, and the relay 17 or 19 is cut off.

[0046] In Fig. 7, the first microcomputer 9 has a first comparison unit 47, a first variation judging unit 48, and a second variation judging unit 49. An output signal from the first variation judging unit 48 is output to an AND-circuit 13, and an output signal from the second variation judging unit 49 is output to an AND-circuit 15. The second microcomputer 10 has a second comparison unit 50, a third variation judging unit 51, and a fourth variation judging unit 52. An output signal from the third variation judging unit 51 is output to the relay B2 20, and an output

signal from the fourth variation judging unit 52 is output to the relay A2 18.

[0047] Operations are explained as follows. The output signal from the first speed computation unit 41 and the output signal from the second speed judging unit 44 are input to the first comparison unit 47. The output signal from the first speed computation unit 41 and the output signal from the second speed judging unit 44 constitute signals indicating the detected speed of the car 1. In the first comparison unit 47, the speed of the car 1, computed by the first speed computation unit 41, and the speed of the car 1 computed by the second speed computation unit 44 are compared, and the absolute value of the variation in the speeds is outputted. When the absolute value of the variation in speeds is larger than a first variation volume set in advance, the first variation judging unit 48 outputs a LO signal to the AND-circuit 13. When the LO signal is input to the AND-circuit 13, the relay A1 17 is cut off, and as a result, the electrical power supply to the main contactor MC 27 and the contactor BK 36 for driving the brake is cut. Since the electrical power supply to the inverter 31 is cut, power supply to the hoisting winch 2 is cut and the elevator comes to a halt. Since the electrical power supply to the contactor BK 36 for driving the brake is cut, the brake is activated and the elevator comes to an abrupt halt.

[0048] When the absolute value of the variation in speeds is larger than a second variation volume set in advance, the second variation judging unit 49 outputs a LO signal to the AND-circuit 15. This second variation volume has a value larger than the first variation volume. When the LO signal is input to the AND-circuit 15, the relay B1 19 is cut off and an emergency stop is activated. As a result, the elevator comes to an abrupt halt.

[0049] The second comparison unit 50 operates similarly to the first comparison unit 47 and outputs the absolute value of the variation in speeds. When the absolute value of the variation in speeds is larger than the first variation volume, the third variation judging unit 51 outputs a LO signal to the relay A2 18. As a result, the normally open contact breaker points 22 of the relay A2 18 are shut off, and electricity power supply to the main contactor MC 27 and the contactor BK 36 for driving the brake is cut. As a result of the electrical power supply to the inverter 31 being cut, power supply to the hoisting winch 2 is cut and the elevator comes to a halt. Since the electrical power supply to the contactor BK 36 for driving the brake is cut, the brake is activated and the elevator comes to an abrupt halt.

[0050] When the absolute value of the variation in speeds is larger than the second variation volume, the fourth variation judging unit 52 outputs a LO signal to the relay A2 20. As a result, an emergency stop is activated.

[0051] Furthermore, where the absolute value of the variation between the speed of the car 1 computed by the first speed computation unit 41 and the speed of the car 1 computed by the second speed computation unit 44 is smaller than the first variation volume, the first through to the fourth variation judging units 48, 49, 51, 52 output a HI signal. Therefore, the elevator operates normally.

[0052] The elevator governor in this embodiment provides the following advantages. Since the first microcomputer 9 includes the first variation judging unit 48 that receives an output signal from the second speed computation unit 44 and judges whether or not the variation between the speed of the car 1 computed by the first speed computation unit 41 and the speed of the car 1 computed by the second speed computation unit 44 has exceeded the first variation volume, it is possible to improve the reliability of the governor.

[0053] Since the first microcomputer 9 includes the second variation judging unit 49 for judging whether or not the variation between the speed of the car 1 computed by the first speed computation unit 41 and the speed of the car 1 computed by the second speed computation unit 44 has exceeded the second variation volume or not, it is possible to halt the elevator in two stages.

[0054] Since the second microcomputer 10 also includes the third variation judging unit 51 and the fourth variation judging unit 52, even if the first microcomputer 9 should stop operating, it is possible to halt the elevator.

Embodiment 3

[0055] In the above described embodiments, programs for the first microcomputer 9 and the second microcomputer 10 may be written in devices, such as a ROM, in which they cannot be overwritten. In this way, it is possible to avoid alterations to the programs for any reason, that might lead to unsafe operation.

Embodiment 4

[0056] In the above described embodiments, an encoder 8 is used for detecting the speed of the car 1; however, the speed may also be computed by an accelerator sensor.

[0057] Fig. 8 is a configuration view where an accelerator sensor is used. An acceleration sensor 53 is attached to the roof portion of the car 1; a first speed computation member 41 and a second speed computation member 44 each having an acceleration signal computation unit 54 and an integrator 55.

[0058] The acceleration sensor 53 detects the acceleration of the car 1 and outputs a signal corresponding to the acceleration of the car 1. The acceleration sensor 53 is a detector for detecting physical volume variations that accompany acceleration of the car 1 as it ascends and descends. In other respects the configuration is similar to that of the above embodiments and explanations are omitted.

[0059] The acceleration signal computation unit 54 obtains an output signal from the acceleration sensor 53 and computes the acceleration. The integrator 55 integrates the acceleration computed by the acceleration sig-

nal computation unit 54 and outputs the speed of the car 1. Subsequent processing is similar to the above described embodiments. The governor in accordance with the present invention enables accuracy to be improved without sacrificing safety.

INDUSTRIAL APPLICABILITY

[0060] As described above, the present invention can be applied, as an electrical governor, to elevators.

Claims

1. An elevator governor comprising:

a detector for detecting physical volume variations that accompany ascent and descent of an elevator car; and
a first micro-computer having
a first speed computation unit for computing speed of the car, based on a signal output from the detector, and
a first speed judging unit for judging whether or not the speed of the car, computed by the first speed computation unit, has exceeded a first speed level preset in advance; wherein
if the first speed judging unit judges that the car speed has exceeded the first speed level, the car is brought to a halt.

2. An elevator governor comprising:

a detector for detecting physical volume variations that accompany ascent and descent of an elevator car; and
a first micro-computer having
a first speed computation unit for computing speed of the car, based on a signal output from the detector,
a first speed judging unit for judging whether or not the car speed computed by the first speed computation unit has exceeded a first speed level set in advance, and
a second speed judging unit for judging whether or not the car speed computed by the first speed computation unit has exceeded a second speed level that is higher than the first speed level; wherein
if the first speed judging unit judges that the car speed has exceeded the first speed level, electric supply to a hoisting winch for the car is suspended, and
if the second speed judging unit judges that the car speed has exceeded the second speed level, the car is brought to an emergency stop.

3. An elevator governor comprising:

a detector for detecting physical volume variations that accompany ascent and descent of an elevator car;
a first micro-computer having
a first speed computation unit for computing speed of the car, based on a signal output from the detector, and
a first speed judging unit for judging whether or not the car speed computed by the first speed computation unit has exceeded a first speed level set in advance; and
a first monitoring device for monitoring the operational state of the first microcomputer; wherein
if the first speed judging unit judges that the car speed has exceeded the first speed level, or if the first monitoring device judges that the first microcomputer is in a state in which the first micro-computer cannot judge the speed, then the car is brought to a halt.

4. An elevator governor comprising:

a detector for detecting physical volume variations that accompany ascent and descent of an elevator car;
a first microcomputer having a first speed computation unit for computing speed of the car, based on a signal output from the detector, and
a first speed judging unit for judging whether or not the car speed computed by the first speed computation unit has exceeded a first speed level set in advance; and
a second microcomputer having a second speed computation unit for computing the speed of the car, based on a signal output from the detector, and a second speed judging unit for judging whether or not the car speed computed by the second speed computation unit has exceeded a first speed level set in advance; wherein
if the first speed judging unit judges that the car speed has exceeded the first speed level, or if the second speed judging unit judges that the car speed has exceeded the first speed level, the car is brought to a halt.

5. The elevator governor as set forth in claim 4 further comprising:

a first monitoring device for monitoring the operational state of the first microcomputer; and
a second monitoring device for monitoring the operational state of the second microcomputer; wherein
if the first monitoring device judges that the first microcomputer is in a state in which the first microcomputer cannot judge speed, or if the sec-

ond monitoring device judges that the second microcomputer is in a state in which the second microcomputer cannot judge speed, the car is brought to a halt.

6. An elevator governor comprising:

a detector for detecting physical volume variations that accompany ascent and descent of an elevator car;
a first microcomputer having a first speed computation unit for computing speed of the car, based on a signal output from the detector; and
a second microcomputer having a second speed computation unit for computing the speed of the car, based on a signal output from the detector; wherein
the first microcomputer includes a first discrepancy judging unit for judging whether or not discrepancy between the car speed computed by the first speed computation unit and the car speed computed by the second speed computation unit exceeds a preset value, and
based on the result of judgment by the first discrepancy judging unit, the car is brought to a halt.

7. The elevator governor as set forth in claim 6, wherein:

the second microcomputer further comprises a second discrepancy judging unit for judging whether or not discrepancy between the car speed computed by the first speed computation unit and the car speed computed by the second speed computation unit exceeds a preset value; and
based on the result of judgment by the second discrepancy judging unit, the car is brought to a halt.

8. The elevator governor as set forth in any one of claims 1 through 7, further comprising a battery for supplying electrical power to the detector and the microcomputers if there is a power outage.

9. The elevator governor as set forth in any one of claims 1 through 7, wherein the car is halted by shutting off electrical power to a hoisting winch for the car.

10. The elevator governor as set forth in any one of claims 1 through 7, wherein the car is halted by activating an emergency stop for the car.

11. The elevator governor as set forth in any one of claims 1 through 7, wherein the detector is an encoder or an acceleration sensor.

FIG. 1

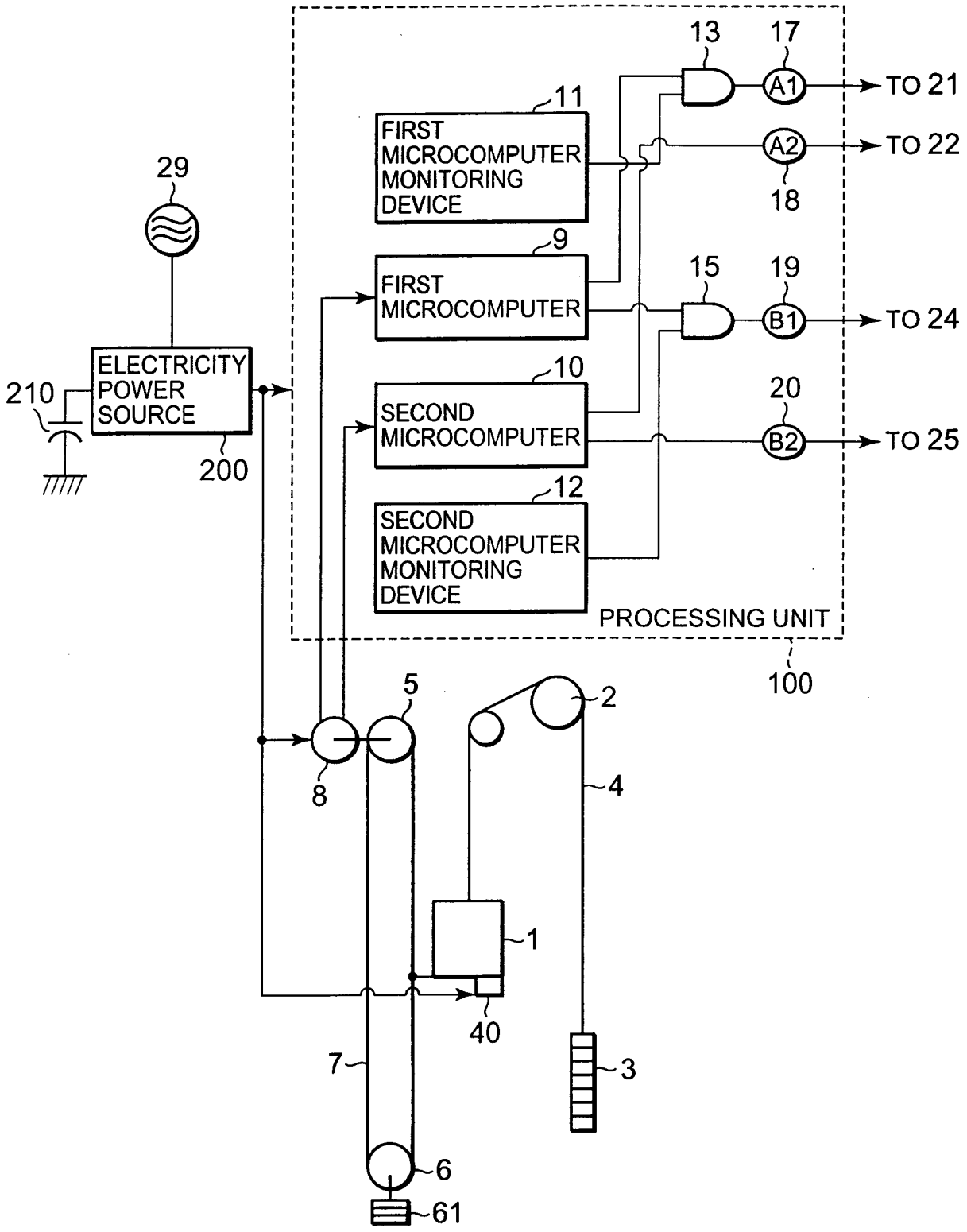

13
17
A1
TO 21
11
FIRST MICROCOMPUTER MONITORING DEVICE
A2
TO 22
18
29
9
FIRST MICROCOMPUTER
15
19
B1
TO 24
ELECTRICITY POWER SOURCE
210
10
SECOND MICROCOMPUTER
20
B2
TO 25
200
12
SECOND MICROCOMPUTER MONITORING DEVICE
PROCESSING UNIT
100
5
2
8
4
1
40
7
3
6
61

FIG. 2

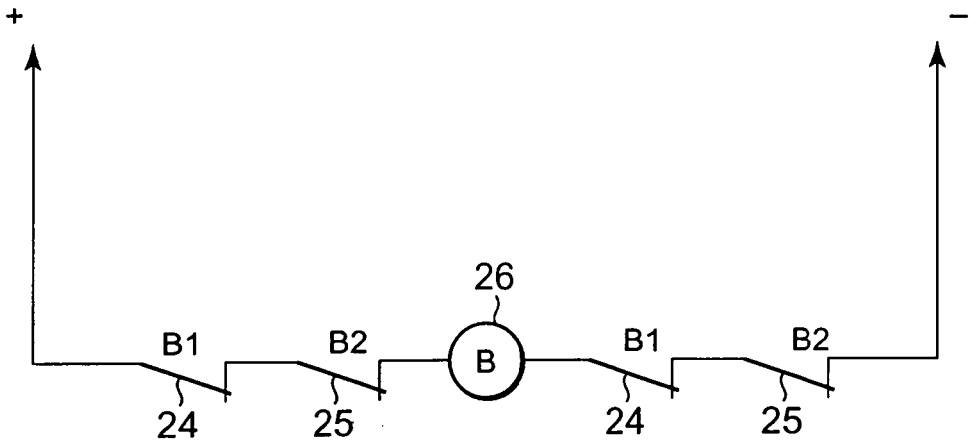


FIG. 3

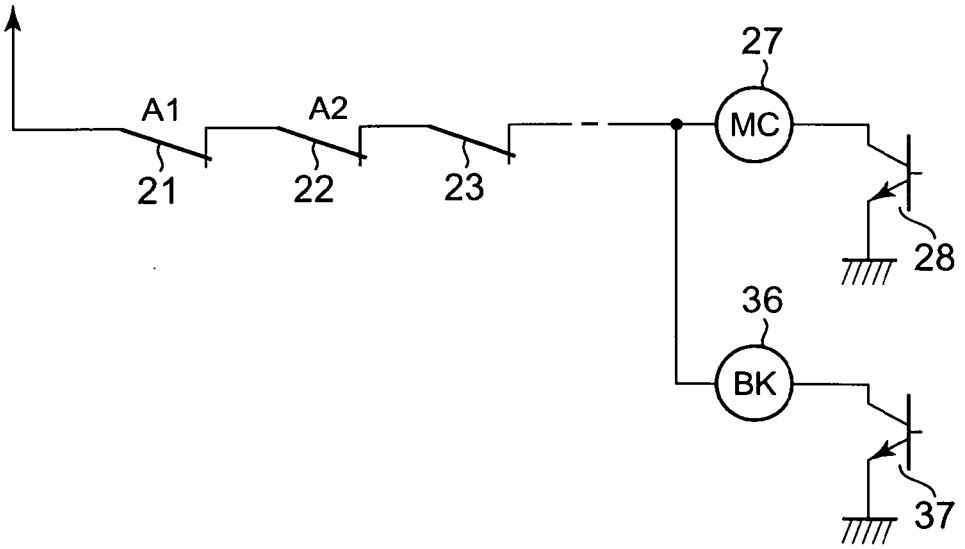


FIG. 4

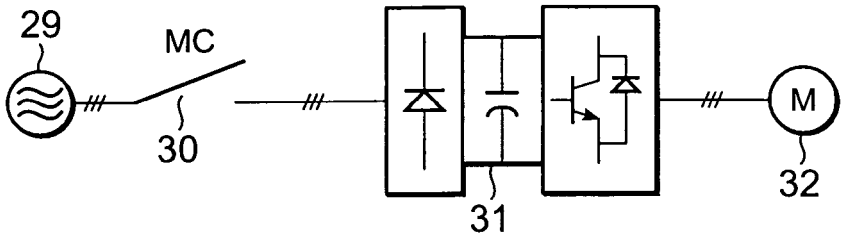


FIG. 5

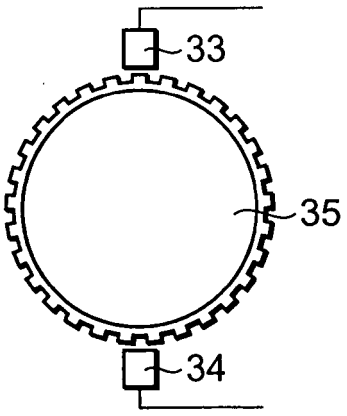


FIG. 6

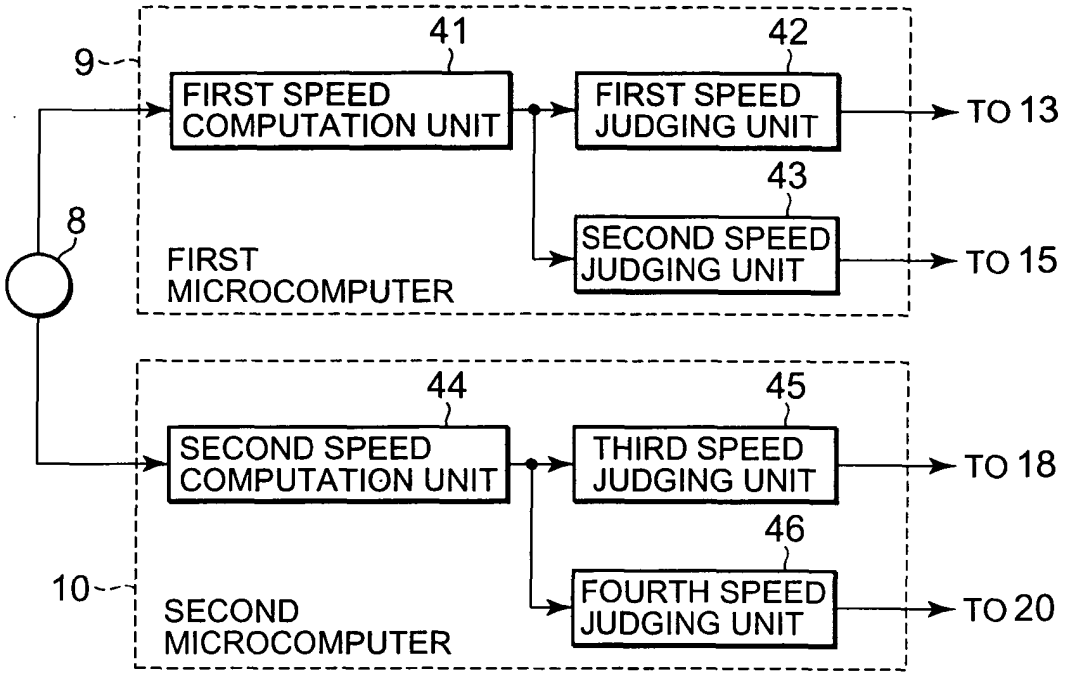
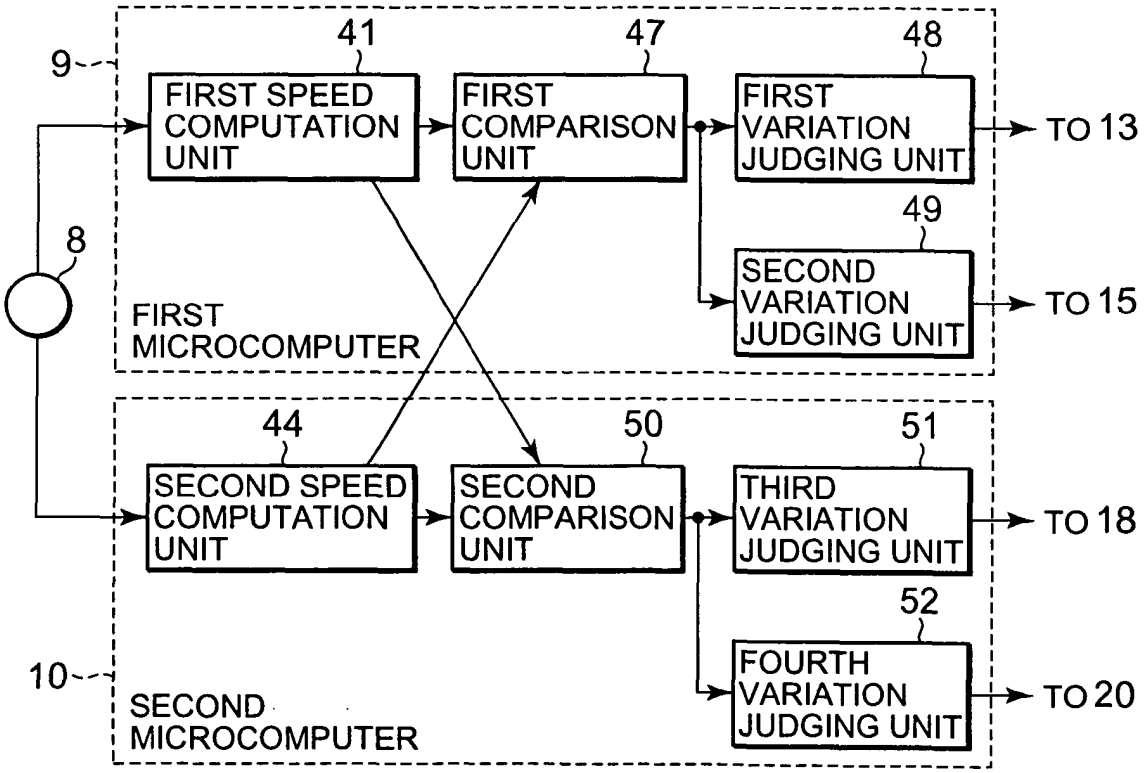

9
41
42
FIRST SPEED COMPUTATION UNIT
FIRST SPEED JUDGING UNIT
TO 13
43
8
SECOND SPEED JUDGING UNIT
TO 15
FIRST MICROCOMPUTER
44
45
SECOND SPEED COMPUTATION UNIT
THIRD SPEED JUDGING UNIT
TO 18
46
10
FOURTH SPEED JUDGING UNIT
TO 20
SECOND MICROCOMPUTER

FIG. 7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FIRST SPEED COMPUTATION UNIT
FIRST COMPARISON UNIT
FIRST VARIATION JUDGING UNIT
TO 13
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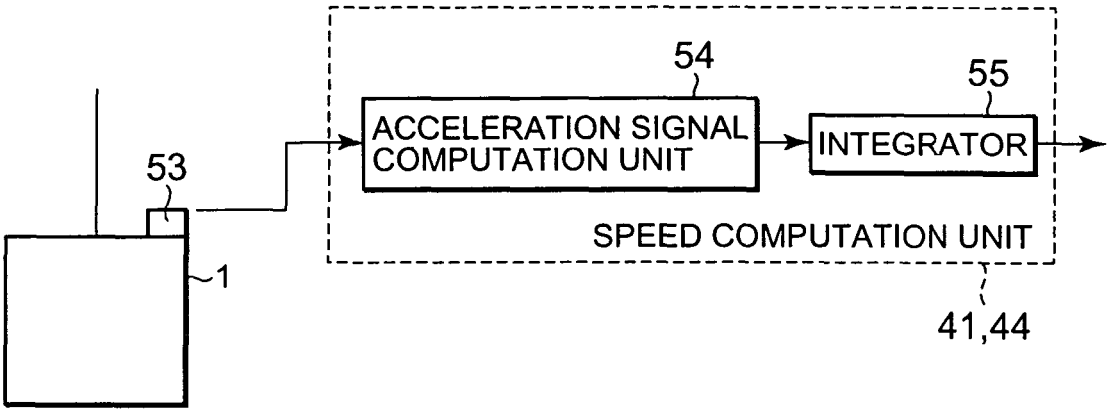
8
SECOND VARIATION JUDGING UNIT
TO 15
FIRST MICROCOMPUTER
44
50
51
SECOND SPEED COMPUTATION UNIT
SECOND COMPARISON UNIT
THIRD VARIATION JUDGING UNIT
TO 18
52
10
FOURTH VARIATION JUDGING UNIT
TO 20
SECOND MICROCOMPUTER

FIG. 8


54
55
ACCELERATION SIGNAL COMPUTATION UNIT
INTEGRATOR
53
1
SPEED COMPUTATION UNIT
41,44

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/02051

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] B66B5/06

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)
Int.Cl[7] B66B5/00-B66B5/28

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	1996-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Toroku Jitsuyo Shinan Koho	1994-2003

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.
X Y	JP 9-165156 A (Inventio AG.), 24 June, 1997 (24.06.97), & EP 0773180 A1 & US 5869794 A	1,8,10-11 3-6,9
X Y	JP 2002-533281 A (Otis Elevator Co.), 08 October, 2002 (08.10.02), Fig. 2 & WO 00/39016 A1 & US 6173813 B1 & EP 1140688 A1	1,8,10-11 3-6,9
Y	JP 2000-327240 A (Toshiba Corp.), 28 November, 2000 (28.11.00), Abstract (Family: none)	3,5-6,9

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

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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	Date of mailing of the international search report
18 November, 2003 (18.11.03)	16 December, 2003 (16.12.03)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/02051

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2001-122549 A (Hitachi, Ltd.), 08 May, 2001 (08.05.01), (Family: none)	1-11
E,X	JP 2003-104648 A (Mitsubishi Electric Corp.), 09 April, 2003 (09.04.03), (Family: none)	1-2,8-11
E,X	JP 2003-327369 A (Mitsubishi Electric Corp.), 19 November, 2003 (19.11.03), (Family: none)	1-2,8-11

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