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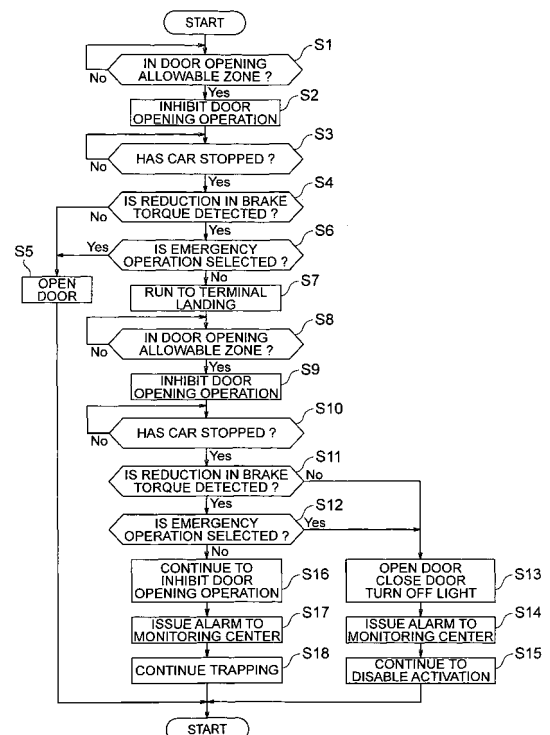
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(54) **ELEVATOR CONTROLLER**

(57) Provided is an elevator controller in which a controller main body controls operation of a car and monitors presence of an abnormality of a brake torque of a brake device for braking running of the car. The controller main body judges whether or not an emergency operation is being performed upon detection of the abnormality of the brake torque when the car stops, and allows a door to be opened when the emergency operation is being performed and inhibits the door from being opened when a normal operation is being performed.

**FIG. 2**



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## Description

### Technical Field

**[0001]** The present invention relates to an elevator controller having a function of monitoring presence of an abnormality of a brake torque.

### Background Art

**[0002]** In a conventional elevator controller, when a rotation of a motor is detected by a speed detector at a time of detection of a brake command, it is judged that an abnormality occurs in a brake device. A brake torque is compensated for by the motor, whereas a car is operated to a terminal landing (for example, see Patent Document 1).

**[0003]** Patent Document 1: Japanese Patent Application Laid-Open No. 1-247383

### Disclosure of the Invention

#### Problem to be solved by the Invention

**[0004]** In the conventional elevator controller as described above, however, the judgment of whether or not a door is allowed to be opened/closed at an occurrence of the abnormality in the brake device is not taken into consideration at all. Moreover, a type of control to be performed when the abnormality is detected in the brake device in an event of emergency such as a fire or an earthquake is not considered either.

**[0005]** The present invention has been devised to solve the problem as described above, and has an object of obtaining an elevator controller capable of distinguishing normal times and an emergency from each other to perform more appropriate elevator control for an abnormality of a brake torque.

#### Means for solving the Problems

**[0006]** The elevator controller according to the present invention includes a controller main body for controlling an operation of a car and for monitoring the presence of an abnormality of a brake torque of a brake device for braking running of the car. If the abnormality of the brake torque is detected when the car stops, the controller main body judges whether or not an emergency operation is being performed. If the emergency operation is being performed, a door is allowed to be opened. If a normal operation is being performed, the door is inhibited from being opened.

#### Brief Description of the Drawings

**[0007]**

[FIG. 1] FIG. 1 is a configuration diagram illustrating

an elevator apparatus according to a first embodiment of the present invention.

[FIG. 2] FIG. 2 is a flowchart illustrating an operation of an elevator controller illustrated in FIG. 1 when a car stops.

#### Best Mode for carrying out the Invention

**[0008]** Hereinafter, a preferred embodiment of the present invention is described referring to the drawings.

#### First Embodiment

**[0009]** FIG. 1 is a configuration diagram illustrating an elevator apparatus according to a first embodiment of the present invention. In FIG. 1, a car 1 and a counterweight 2 are suspended by a main rope 3 in a hoistway, and are raised and lowered by a drive force of a hoisting machine 4. The hoisting machine 4 includes a driving sheave around which the main rope 3 is wound, a motor for rotating the driving sheave, and a brake device for braking the rotation of the driving sheave.

**[0010]** An operation of the car 1 is controlled by an elevator controller including a controller main body 5. Specifically, the motor and the brake device of the hoisting machine 4 are controlled by the elevator controller. The controller main body 5 is connected to a monitoring center 8 installed at a remote location through a notification device 6 and a general public network 7. In the event of occurrence of an abnormality in the elevator apparatus, the monitoring center 8 is notified of the abnormality from the controller main body 5 through the notification device 6 and the general public network 7.

**[0011]** The controller main body 5 includes travel control means 9, brake torque check means 10, emergency operation means 11, door opening/closing judgment means 12, terminal landing running means 13, and alarm means 14.

**[0012]** The travel control means 9 controls the overall travel of the elevator apparatus. The brake torque check means 10 monitors, for example, a motor current value to monitor whether or not there is an abnormality in a brake torque of the brake device of the hoisting machine 4. The emergency operation means 11 selects and executes an emergency operation according to a detection signal for an emergency such as an earthquake or a fire. In the emergency operation, the car 1 is moved to stop at the nearest floor or a preset evacuation floor.

**[0013]** The door opening/closing judgment means 12 judges whether or not a door is allowed to be opened/closed when the car 1 stops at a stop floor. The terminal landing running means 13 causes the car 1 to run to the terminal landing to be stopped there. The alarm means 14 generates an abnormality detection signal, and outputs the generated abnormality detection signal to the notification device 6.

**[0014]** Here, the travel control means 9, the brake

torque check means 10, the emergency operation means 11, the door opening/closing judgment means 12, the terminal landing running means 13, and the alarm means 14 are realized by software. Specifically, the controller main body 5 consists of a computer including a processing unit (CPU), a storage unit (a ROM, a RAM, a hard disk and the like) and a signal input/output unit. More specifically, functions of the controller main body 5 are realized by the computer. In the storage unit, programs for realizing the functions of the travel control means 9, the brake torque check means 10, the emergency operation means 11, the door opening/closing judgment means 12, the terminal landing running means 13, and the alarm means 14 are stored.

**[0015]** Next, an operation of the controller main body 5 is described. FIG. 2 is a flowchart illustrating an operation of the controller main body 5 illustrated in FIG. 1 when the car stops. The operation illustrated in FIG. 2 is started when the car 1 starts decelerating. When the car 1 is decelerated, the controller main body 5 monitors whether or not the car 1 has entered a door opening allowable zone (door zone) (Step S1). When the car 1 is in the door opening allowable zone, a door-opening operation is temporarily inhibited (Step S2) to monitor whether or not the car 1 has stopped (Step S3).

**[0016]** When the car 1 stops, it is confirmed whether or not there is the abnormality of the brake torque, specifically, whether or not the torque is lowered (Step S4). When the brake torque is normal, a car door and a landing door are opened (Step S5). Then, the processing is terminated. When the abnormality of the brake torque is detected, it is confirmed whether or not an emergency operation is selected (Step S6). If the emergency operation is selected, the car door and the landing door are opened (Step S5). Then, the processing is terminated.

**[0017]** On the other hand, if the emergency operation is not selected and a normal operation is being performed, the car 1 is caused to run to the terminal landing (Step S7). When a load on the car 1 side is larger than that on the counterweight 2 side at this time, it is suitable to move the car 1 to a bottom terminal landing. When the load on the counterweight 2 side is larger than that on the car 1 side, it is suitable to move the car 1 to a top terminal landing.

**[0018]** When the running of the car 1 to the terminal landing is started, it is monitored whether or not the car 1 has entered the door opening allowable zone (Step S8). When the car 1 is in the door opening allowable zone, the door-opening operation is temporarily inhibited (Step S9) to monitor whether or not the car 1 has stopped (Step S10).

**[0019]** When the car 1 stops, it is confirmed again whether or not there is the abnormality of the brake torque (Step S11). If the abnormality of the brake torque is detected again, it is confirmed again whether or not the emergency operation is selected (Step S12).

**[0020]** If the brake torque has returned to normal and if the emergency operation is selected while the car 1 is

running to the terminal landing although the abnormality of the brake torque is detected again, the car door and the landing door are opened and then closed after a predetermined period of time. Then, a light inside the car 1 is turned off (Step S13). After an alarm is issued to the monitoring center 8 (Step S14), the activation of the car 1 is continuously disabled until a maintenance person cancels the state of the disabled activation (Step S15). Then, the processing is terminated. However, if the car 1 is in the door opening allowable zone and a door open button inside the car 1 is operated, the car door and the landing door are opened for a predetermined period of time.

**[0021]** On the other hand, if the abnormality of the brake torque is still detected and the normal operation is being performed, the door is continuously inhibited from being opened (Step S16) and the alarm is issued to the monitoring center 8 (Step S17). A passenger is continuously trapped in the car 1 (Step S18). Then, the processing is terminated. In this state, until the maintenance person checks to verify the safety, the door is not opened in response to the operation of the door open button inside the car 1.

**[0022]** In the elevator controller as described above, if the abnormality of the brake torque is detected when the car 1 stops, it is judged whether or not the emergency operation is being performed. When the emergency operation is being performed, the door is allowed to be opened. When the normal operation is being performed, the door is inhibited from being opened. Therefore, in the event of emergency, the passenger is prevented from being trapped in the car 1, giving priority to evacuation. In normal times, the door close state is maintained to prevent the passenger from getting into and off the car 1 although the brake torque is still abnormal. Specifically, for the abnormality of the brake torque, the normal times and the emergency can be distinguished from each other to perform more appropriate elevator control.

**[0023]** Moreover, if the abnormality of the brake torque is detected when the car stops 1 and if the normal operation is being performed, the car 1 is moved to the terminal landing. Therefore, after stopping, the car 1 can be prevented from being moved a long distance due to the abnormality of the brake torque without any control.

**[0024]** Furthermore, if the brake torque returns to normal after the car 1 is moved to the terminal landing, the door is allowed to be opened and the alarm is issued to the monitoring center 8 while the activation of the car is disabled. Therefore, when the abnormality of the brake torque is detected even once, the operation of the elevator apparatus is stopped to quickly implement a check.

**[0025]** Furthermore, if the abnormality of the brake torque still continues after the car 1 is moved to the terminal landing, it is judged again whether or not the emergency operation is being performed. When the emergency operation is being performed, the door is allowed to be opened and the alarm is issued to the monitoring center 8 while the activation of the car 1 is disabled. Therefore,

it is possible to cope with the case where the emergency occurs while the car 1 is being moved to the terminal landing.

**[0026]** Moreover, if the abnormality of the brake torque still continues after the car 1 is moved to the terminal landing, it is judged again whether or not the emergency operation is being performed. When the normal operation is being performed, the door is continuously inhibited from being opened and the alarm is issued to the monitoring center 8. Therefore, the passenger can be prevented from getting into and off the car 1 while the brake torque is still abnormal.

**[0027]** Although the functions of the travel control means 9, the brake torque check means 10, the emergency operation means 11, the door opening/closing judgment means 12, the terminal landing running means 13, and the alarm means 14 are executed by the single computer in the above-mentioned example, the functions may be executed by a plurality of devices in a distributed manner.

Moreover, various known methods can be used as the method of checking the brake torque, and therefore, the method of checking the brake torque is not particularly limited.

Furthermore, the present invention is applicable to an elevator apparatus including the hoisting machine and a control panel installed in a machine room provided in an upper part of the hoistway and to a machine-room-less elevator apparatus.

## Claims

1. An elevator controller comprising a controller main body for controlling an operation of a car and for monitoring presence of an abnormality of a brake torque of a brake device for braking running of the car, wherein the controller main body judges whether or not an emergency operation is being performed upon detection of the abnormality of the brake torque when the car stops, and allows a door to be opened when the emergency operation is being performed and inhibits the door from being opened when a normal operation is being performed.
2. The elevator controller according to Claim 1, wherein the controller main body moves the car to a terminal landing in a case where the abnormality of the brake torque is detected when the car stops and the normal operation is being performed.
3. The elevator controller according to Claim 2, wherein the controller main body allows the door to be opened and issues an alarm to a monitoring center while disabling activation of the car when the brake torque returns to normal after the car is moved to the terminal landing.
4. The elevator controller according to Claim 2, wherein the controller main body judges again whether or not the emergency operation is being performed when the abnormality of the brake torque still continues after the car is moved to the terminal landing, and allows the door to be opened and issues an alarm to a monitoring center while disabling activation of the car when the emergency operation is being performed.
5. The elevator controller according to Claim 2, wherein the controller main body judges again whether or not the emergency operation is being performed when the abnormality of the brake torque still continues after the car is moved to the terminal landing, and continues to inhibit the door from being opened and issues an alarm to a monitoring center when the normal operation is being performed.

FIG. 1

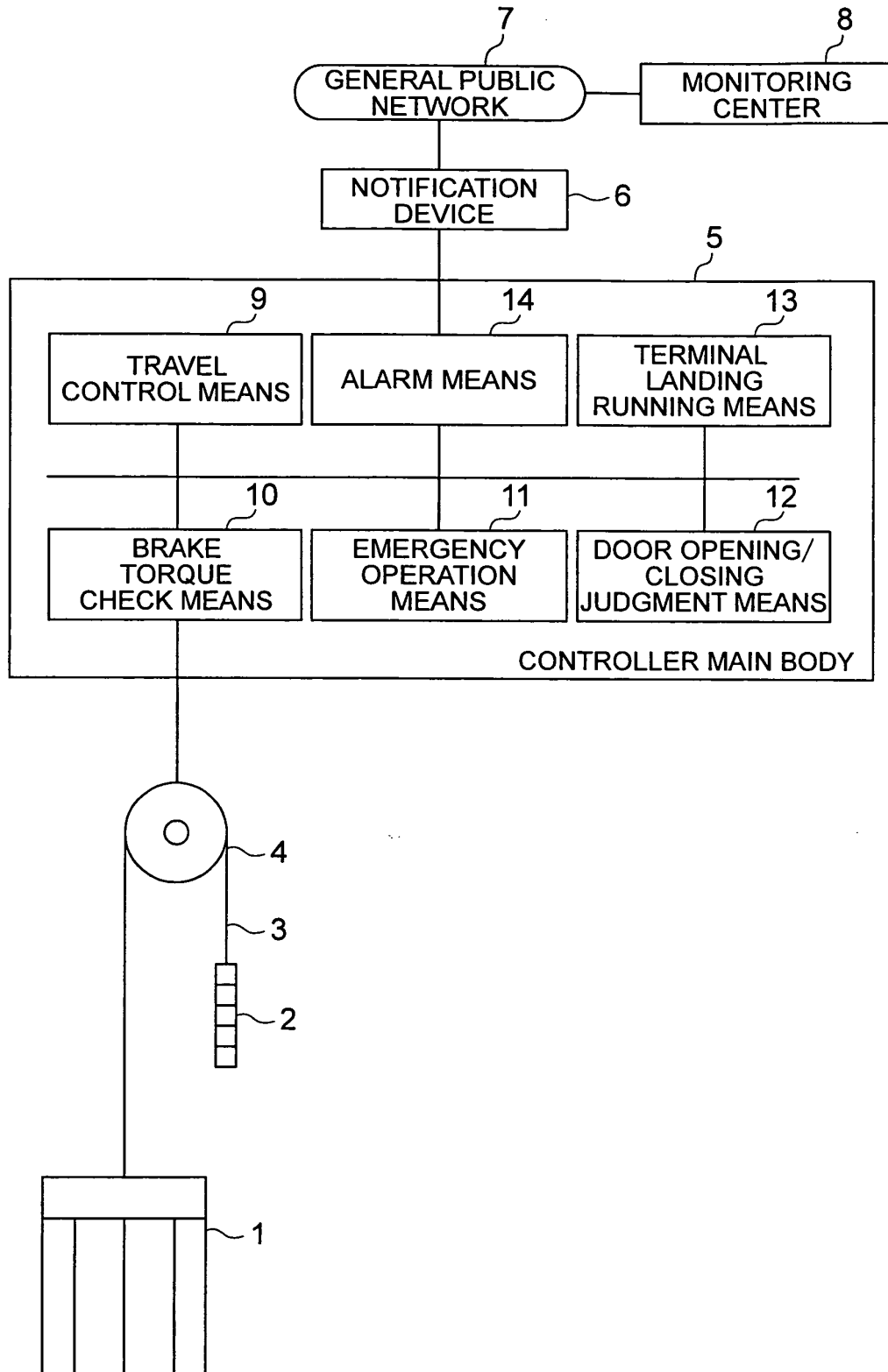
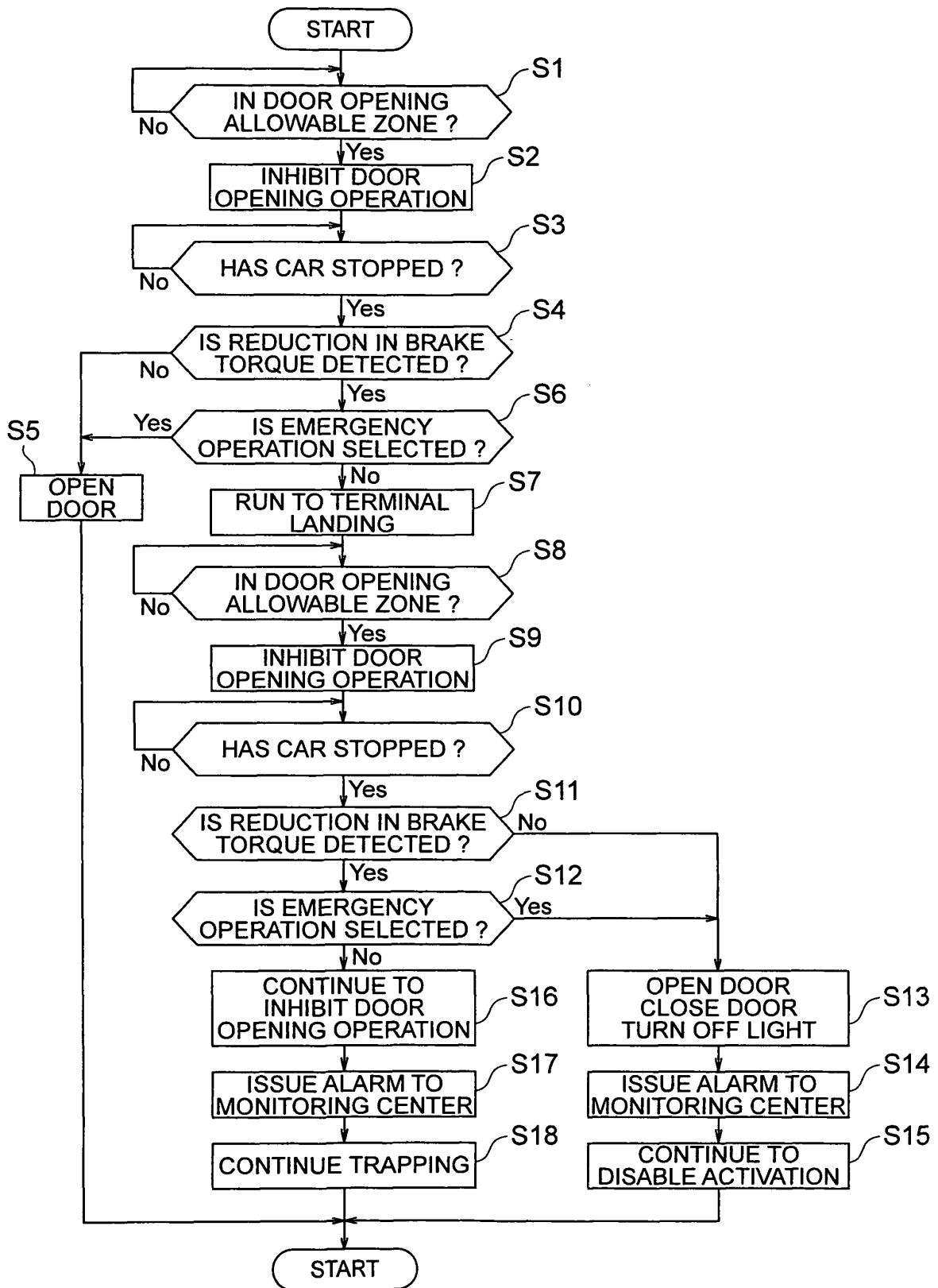


FIG. 2



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2006/323163

## A. CLASSIFICATION OF SUBJECT MATTER

B66B5/02(2006.01) i, B66B13/14(2006.01) i

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-B66B13/30

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 1996-2007  
 Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

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.
Y A	JP 2635257 B2 (Mitsubishi Electric Corp.), 30 July, 1997 (30.07.97), Par. Nos. [0022] to [0055]; Figs. 1 to 4 & CN 1073652 A & KR 9601524 B	1-2 3-5
Y A	JP 3-13502 Y2 (Fujitec Co., Ltd.), 27 March, 1991 (27.03.91), Page 1, right column, line 15 to page 2, right column, line 30; Fig. 1 (Family: none)	1-2 3-5
A	JP 2930807 B2 (Toshiba Corp.), 09 August, 1999 (09.08.99), Par. Nos. [0017] to [0027]; Figs. 1 to 2 (Family: none)	1-5

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Date of the actual completion of the international search  
04 July, 2007 (04.07.07)Date of mailing of the international search report  
17 July, 2007 (17.07.07)Name and mailing address of the ISA/  
Japanese Patent Office

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**Patent documents cited in the description**

- JP 1247383 A [0003]