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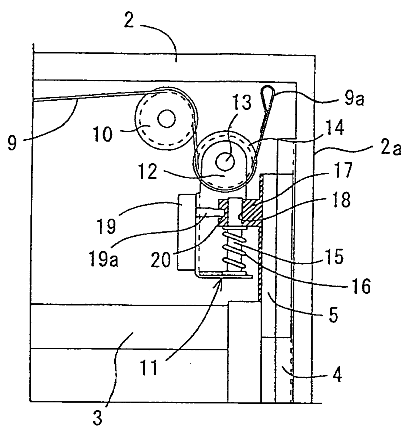
(54) **LIFTING CABINET**

(57) A storage box 3 is provided so as to be movable with respect to a cabinet support frame 2. A base section 11 is provided so as to be vertically movable with respect to the cabinet support frame 2 by operation of a motor 6. A sensor means 19 is provided between the base section 11 and the storage box 3. The sensor means 19 detects the position of the storage box 3 with respect to the base section 11; if the detected value departs greatly from the value before the motor started, contact of the storage box 3 with an intervening object is recognized and driving of the motor 6 is stopped.

FIG. 2



EP 1 692 967 A1

Description

TECHNICAL FIELD

[0001] The present invention relates to an electric elevator cabinet that is installed in, for example, a kitchen, has a storage box disposed in a vertically movable manner with respect to the cabinet support frame, and has an electromagnetic drive unit for raising and lowering the storage box.

BACKGROUND ART

[0002] In an electric elevator which has been proposed, it has a storage box that can move vertically with respect to the cabinet support frame installed in a high position in a home kitchen, for example, and the storage box is moved by operation of a motor or other electromagnetic drive unit. In an elevator cabinet of this type, a human hand may get caught in the space between the storage box and the cabinet support frame while the storage box is being raised, or the storage boxmay strike and damage a chopping board or other object while being lowered.

DISCLOSURE OF INVENTION

[0003] An obj ect of the present invention is to provide an electric elevator cabinet that can detect contact of its storage box with an intervening object during the upward or downward motion of the storage box.

[0004] To achieve the above obj ect, the elevator cabinet according to the present invention includes a storage box disposed in a vertically movable manner with respect to a cabinet support frame, an electromagnetic drive unit for raising and lowering the storage box, and a base section that is raised and lowered by the operation of the electromagnetic drive unit. In addition, a sensor means for detecting the position of the storage box with respect to the base section is provided between the base section and the storage box.

[0005] The elevator cabinet according to the present invention may have a control means that does not read the value detected by the sensor means until a preset time has elapsed from the time the storage box starts rising, starts sequentially reading the value detected by the sensor means when the preset period of time has elapsed from the time the storage box starts rising, and stops raising the storage box if the difference between a value detected by the sensor means at the time the storage box starts rising and a value the sensor means sequentially detects equals to or exceeds a preset value.

[0006] With the above configuration, the elevator cabinet according to the present invention can raise and lower the storage box by operating the electromagnetic drive unit. If the storage box strikes an intervening object during the upward or downward motion of the storage box, a force is applied in a direction opposing the upward or downwardmotion of the storage box, causing the value detected by the sensor means to deviate greatly from the normal value. This enables detection of contact with an intervening object during the upward or downward motion of the storage box.

[0007] In one aspect of the elevator cabinet according to the present invention, the detection output of the sensor means is not read until a preset time has elapsed from the time the electromagnetic drive unit starts, so detection values of the sensor means which is affected by the inertia of the storage box at the time when it starts rising can be ignored. Detection values of the sensor means are read successively after a preset time has elapsed from the time the electromagnetic drive unit starts, and the raising of the storage box is stopped if the difference between the value detected by the sensor means at a time the storage box starts rising and a value sequentially detected by the sensor means equals to or exceeds a preset value. Accordingly, the accuracy with which the sensor means detects an intervening object can be improved, contact of the storage box with an intervening object can be detected reliably, and damage to the intervening object can be prevented.

BRIEF DESCRIPTION OF DRAWINGS

[0008]

FIG. 1 is a front view showing an electric elevator cabinet embodying the present invention.

FIG. 2 is a partial sectional view showing the mechanism for raising and lowering the storage box in the elevator cabinet in FIG. 1 (when the storage box is relatively lightly loaded).

FIG. 3 is a partial sectional view showing the mechanism for raising and lowering the storage box in the elevator cabinet in FIG. 1 (when the storage box is relatively heavily loaded).

FIG. 4 is a block diagram of the electrical system in the elevator cabinet, including the controller that controls the upward or downward motion of the storage box.

FIG. 5 is a flowchart illustrating the processing performed by the CPU of the controller in FIG. 4 to move the storage box up and down.

FIG. 6 is the remaining part of the flowchart in FIG. 5.

BEST MODE FOR CARRYING OUT THE INVENTION

[0009] An elevator cabinet 1 comprises a box-shaped cabinet support frame 2 that is open at the front and bottom and a storage box 3 placed inside the cabinet support frame 2. The cabinet support frame 2 has guide rails 4 mounted on the insides of its left and right side walls 2a. The storage box 3 has sliders 5 mounted at its upper left and upper right corners. The left and right sliders 5 of the storage box 3 engage the guide rails 4 on the left and right side walls 2a of the cabinet support frame 2 to enable the storage box 3 to be raised and lowered with respect to the cabinet support frame 2.

[0010] A motor 6 is mounted at the upper middle of the cabinet support frame 2 as a drive unit for raising and lowering the storage box 3. Raising and lowering mechanisms 8 for raising and lowering the storage box 3 are provided at the upper left and upper right of the cabinet support frame 2. A winding sheave 7 is fastened to a driving axis (not shown) of the motor 6. Left and right wire ropes 9 suspend the storage box 3 via the left and right raising and lowering mechanisms 8, with one end of each being wrapped around the sheave 7.

[0011] FIG. 2 is a partial sectional view of a raising and lowering mechanism 8 for raising and lowering storage box 3. Of the two raising and lowering mechanisms 8 provided on the left and right sides of the cabinet support frame 2, FIG. 2 shows only the raising and lowering mechanism 8 on the right side. The structure of the raising and lowering mechanism 8 on the left side is the same as on the right side, so a description thereof is omitted.

[0012] A fixed pulley 10 is mounted in the upper right of the inside of the cabinet support frame 2. The right wire rope 9, which extends to the right from the sheave 7, passes around the fixed pulley 10 from above. The end 9a of the wire rope 9 is held by a part of the cabinet support frame 2 to the right of fixed pulley 10.

[0013] A movable pulley 14 engages, from above, part of the wire rope 9 between the end of wire rope 9 held by the cabinet support frame 2 and the part that engages the fixed pulley 10. The movable pulley 14 is rotatably mounted on an axis 13, which extends horizontally from a bracket 12 that rises vertically from the base section 11. The base section 11 is thus suspended by the wire rope 9 via the movable pulley 14. Therefore, if the wire rope 9 is wound or unwound by the operation of the motor 6, the base section 11 ascends or descends.

[0014] A guide pin 15 extends upward from the bottom of the base section 11. A suspending member 17 extends horizontally toward the base section 11 from the slider 5 provided at the upper left or upper right of the storage box 3. A through hole 18 is formed vertically in the suspending member 17 and an upper part of guide pin 15 of the base section 11 is inserted into the through hole 18. A coil spring 16 is coiled around the part of the guide pin 15 between the base section 11 and the bottom of the suspending member 17 to urge the suspending member 17 upward with respect to the base section 11. A pneumatic or hydraulic damper can be used in place of the coil spring 16 as the urging means.

[0015] When the weight of articles loaded in the storage box 3 is increased, the suspending member 17 fixed to the slider 5 is lowered by gravity, the spring 16 is greatly compressed, and the position of the storage box 3 with respect to base section 11 is significantly lowered as shown in FIG. 3. When the weight of the articles loaded in the storage box 3 is decreased, the amount of compression of the spring 16 becomes smaller and the position of the storage box 3 with respect to the base section 11 is higher than in FIG. 3, as shown in FIG. 2.

[0016] A sensor means 19, which detects the position of the storage box 3 with respect to the base section 11, is mounted between the base section 11 and the suspending member 17. In this embodiment, the sensor means 19 includes a linear-motion potentiometer. A detector arm 19a of the sensor means 19 is inserted into a hole 20 provided in the suspending member 17. Accordingly, when the storage box 3 and the suspending member 17 which is integral with storage box 3 move upward or downward with respect to the base section 11, the detector arm 19a of the sensor means 19 moves upward or downward together with the suspendingmember 17 with respect to base section 11. The position of the detector arm 19a with respect to the base section 11 is converted into an electric signal, input to the control means described later, and detected as the position of the storage box 3 with respect to the base section 11.

[0017] The upward or downward motion of the storage box 3 in the electric elevator cabinet 1 configured as shown above will be described below.

[0018] When motor 6 is driven in the direction (forward) that causes the sheave 7 to wind up the wire rope, the base section 11, which is suspended by the rope 9 via the movable pulley 14, is lifted up. When the base section 11 is raised in this way, the suspending member 17, which is engaged with the guide pin 15 provided on the base section 11, and the slider 5 and the storage box 3 integral with suspending member 17 are raised together with the base section 11. When the storage box 3 is raised, the slider 5 is guided by the guide rail 4 mounted on the cabinet support frame 2.

[0019] When the motor 6 is driven in the (reverse) direction that causes the sheave 7 to unwind the wire rope, the base section 11, which is suspended by wire rope 9 via movable pulley 14, is lowered. When the base section 11 is lowered in this way, the suspending member 17, which is engaged with the guide pin 15 provided on the base section 11, and the slider 5 and the storage box 3 integral with the suspending member 17 descend by their own weight together with the base section 11. When the storage box 3 descends, the slider 5 is guided by the guide rail 4 mounted on the cabinet support frame 2.

[0020] FIG. 4 is a block diagram showing a controller that controls the upward or downward motion of the storage box 3 with respect to the cabinet support frame 2. The controller 21 has a microcomputer as its main part and is equipped with a CPU that reads the value detected by the sensor means 19 and controls the raising and lowering action of the motor 6, a ROM that stores control programs, a RAM that stores data temporarily, input/output circuitry, and the like. The motor 6 is connected to the input/output circuitry of the controller 21 via a driver 22. The sensor means 19, a start button switch 23 (push type), an upper limit position detection sensor 24 provided in the upper limit position of the upward or downward motion of the storage box 3, and a lower limit position detection sensor 25 provided in the lower limit position of the upward or downward motion of the storage box 3 are connected to the input/output circuitry of the controller 21.

[0021] FIGs. 5 and 6 are flowcharts illustrating the raising and lowering of storage box 3 performed by the CPU of the controller 21 in FIG. 4. The storage box 3 may be loaded or empty.

[0022] The CPU always monitors whether or not the start button switch 23 is pressed (step S01). When a user presses the start button switch 23 to raise or lower the storage box 3, the CPU detects this and starts raising or lowering the storage box 3. More specifically, the CPU turns the motor 6 forward or backward to make the sheave 7 wind up or unwind the wire rope 9, thereby raising or lowering the base section 11.

[0023] When the start button switch 23 is pressed, the CPU reads the current value X0 detected by the sensor means 19 and records it (step S02). In effect, the CPU records the position of the storage box 3 with respect to base section 11 at the instant when the upward or downward motion of the storage box 3 starts. Next, the CPU sets a timer value equivalent to a detection waiting time (described later) (step S03).

[0024] The CPU determines whether or not the storage box 3 is currently located at the lower limit position of its upward and downward motion, that is, whether or not the lower limit position detection sensor 25 is switched on (step S04). If the storage box 3 is not located at the lower limit position, the CPU further determines whether or not the storage box 3 is located at the upper limit position, that is, whether or not the upper position detection sensor 24 is switched on (step S14). If the storage box 3 is located at the lower limit position of its upward and downward motion (when the decision in step S04 is YES) or located between the lower limit position and the upper limit position (when the decision results of step S04 and step S14 are both NO) , the CPU executes process in steps S05 to S13 below. If the storage box 3 is located at the upper limit position of its upward and downward motion (when the result of the decision in step S14 is YES) , the CPU executes process in steps S15 to S23 below. (1) When the storage box 3 is located at the lower limit position or between the lower limit position and the upper limit position:

The CPU first drives the motor 6 forward to raise the storage box 3 (step S05). Next, the CPU decrements the timer value set in step S03 by a certain value (step S06), program returns to step S05 if the resulting timer output is not zero (if the result of the decision in step S07 is NO) , and repeats process in steps S06, S07, and S05 in this order. The CPU continues driving the motor 6 forward and, when the timer output is zero (the detection waiting time has elapsed), reads the value X1 detected by the sensor means 19 (step S08).

[0025] Next, the CPU calculates the difference Y between the value X1 detected by the sensor means 19 read in step S08 and the value X0 detected by the sensor means 19 which has been recorded in step S02 (step S09). When the storage box 3 is rising normally without hindrance by any object, the storage box 3 and the base section 11 rise as a single unit, so the current value X1 detected by the sensor means 19 does not differ greatly from the value X0 detected by the sensor at the point when the start switch button was pressed.

[0026] If the difference Y does not exceed a preset allowable value (or if the result of the decision in step S10 is NO), and if the storage box 3 has not reached the upper limit position (or if the result of the decision in step S11 is NO), the CPU continues forward driving of the motor (step S12) to further raise the storage box 3. Then CPU returns to step S08 and again obtains the value X1 detected by the sensor means 19. If the difference Y does not exceed the above allowable value, and if the storage box 3 has not reached the upper limit position, that is, as long as the storage box 3 is rising normally, then the CPU repeats process is steps S08 to S12 at intervals of, for example, 0.1 second. When the storage box 3 reaches the upper limit position (or when the result of the decision in step S11 is YES), the CPU stops driving the motor 6 (step S13).

[0027] If, while being raised, the storage box 3 strikes an intervening object that impedes its progress, the base section 11 rises alone and the relative position of the storage box 3 to the base section 11 changes greatly, compressing the spring 16. As a result, the difference Y (= X1 - X0) between the current value X1 detected by the sensor means 19 and the value X0 detected just before the storage box 3 was raised becomes large. The difference Y corresponds to the amount of variation in the length of spring 16, or the magnitude of the force (which depends on the amount of variation in the length of the spring 16 and the spring constant) hindering the raising of the storage box 3.

[0028] The CPU determines whether or not the difference Y (or the magnitude of the force hindering the raising of the storage box 3) falls within an allowable range (step S10) in order to judge whether or not the raising of the storage box 3 is being impeded by a strong force caused. The allowable range is set by determining how much force can be allowed to oppose the raising of the storage box 3, calculating the amount of variation in the length of the spring 16 from the magnitude of this force and the spring constant of the spring 16, and obtaining the difference in the value detected by the sensor means 19 that corresponds to this amount of variation in the length of the spring 16.

[0029] When the difference Y falls within the allowable range, the CPU continues to drive the motor 6 forward (step S12) as long as the storage box 3 is not located at the upper limit position (step S11). When the difference Y falls outside the allowable range, the CPU immediately stops driving the motor 6 (step S13) and stops raising the storage box 3. Therefore, even if the storage box 3 strikes an intervening object while being raised, damage to the intervening object and the storage box 3 is prevented because the motion of the storage box 3 is stopped.

[0030] As described above, in this embodiment, the CPU determines whether or not the storage box 3 is rising normally based on the difference Y (= X1 - X0) between the current detected position X1 and the value X0 detected just before storage box 3 was raised. Immediately after the motor 6 starts to be driven, the storage box 3 cannot follow the motion of the base section 11 due to inertia, with the result that the above-mentioned difference Y becomes large even if the storage box 6 does not encounter an intervening object. Accordingly, the difference Y is not detected in that time (by the processes in steps S05 to S07). Immediately after the motor 6 starts to be driven, the storage box 3 (and the suspending members 17 and the sliders 5 which are integral with the storage box 3) do not quickly follow the motion of the base section 11 due to inertia, with the result that the storage box 3 moves downward relatively to the base section 11, pushing down against the force of the springs 16 around the lower part of the guide pins 15. The resulting movement of storage box 3 relative to the base section 11 is converted into a movement of the detector arms 19a fixed to the suspending members 17 of the storage box 3 and input to the sensor means 19.

(2) When the storage box 3 is located at the upper limit position of its upward and downward motion:

> The CPU first drives the motor 6 backward to lower the storage box 3 (step S15). Next, the CPU decrements the timer value set in step S03 by a certain value (step S16), and program returns to step S15 if the timer output is not zero (or if the result of the decision in step S17 is NO), and the CPU repeats processes insteps S16, S17 and S15 in this order. The CPU continues driving the motor 6 backward and, when the timer output is zero (or the detection waiting time has elapsed), reads the value X1 detected by the sensor means 19 (step S18).

[0031] The reason why the value X1 detected by the sensor means 19 is not read for a certain period of time (or the detection waiting time) after backward driving of the motor 6 starts is that, as described in (1) above, the result of X1 - X0 (= Y) increases even if there is no intervening object, since the storage box 3 does not quickly follow the motion of the base section 11 due to inertia immediately after the motor 6 starts to be driven to raise or lower the base section 11.

[0032] Next, the CPU calculates the difference Y between the value X1 detected by the sensor means 19, which is read in step S18, and the value X0 detected by the sensor means 19 which has been recorded in step S02 (step S19). When the storage box 3 is descending normally without being encountering an intervening object, the current value X1 detected by the sensor means 19 does not greatly differ from the value X0 detected by the sensor means 19 at the point when the start switch button was pressed because the storage box 3 and the base section 11 descend as a single unit.

[0033] If the difference Y does not exceed a preset allowable value (or if the result of the decision in step S20 is NO) and the storage box 3 has not reached the lower limit position (or if the result of the decision in step S21 is NO) , the CPU continues driving the motor backward (step S22) to further lower the storage box 3. Program returns to step S18 and the CPU obtains the value X1 detected by the sensor means 19. If the difference Y does not exceed the above allowable value and the storage box 3 has not reached the lower limit position, that is, as long as the storage box 3 is being lowered normally, the CPU repeats processes in steps S18 to S22 at intervals of, for example, 0.1 second. When the storage box 3 reaches the lower limit position (or when the result of the decision in step S21 is YES), the CPU stops driving the motor 6 (step S23).

[0034] If the storage box 3 strikes an intervening object while being lowered, the storage box 3 is prevented from descending and only the base section 11 descends, the position of the storage box 3 with respect to the base section 11 changes, and the spring 16 is stretched. As a result, a difference Y (=X1 - X0) is generated between the current value X1 detected by the sensor means 19 and the value X0 detected just before the lowering of storage box 3 began. The difference Y corresponds to the change in the length of spring 16, or the magnitude of the force hindering the lowering of the storage box 3.

[0035] The CPU determines whether or not the difference Y (or the magnitude of the force hindering the lowering of the storage box 3) falls within the allowable range (step S20) in order to decide whether or not the lowering of the storage box 3 is being impeded by a strong force. When the difference Y falls within the allowable range, the CPU continues to drive the motor 6 backward (step S22) as long as the storage box 3 is not located at the lower limit position (step S21). When the difference Y falls outside the allowable range, the CPU immediately stops driving the motor 6 (step S23) and stops lowering the storage box 3. Therefore, even if the storage box 3 strikes an intervening object while being lowered, damage to the intervening object and the storage box 3 is prevented because the lowering of the storage box 3 is stopped.

[0036] In the above embodiment, if the storage box 3 is located between the upper and lower limit positions of its up and down motion before the start switch button 23 is pressed, the motor is turned forward to raise the storage box 3 (steps S14 and S15) ; however, the motor may be turned backward to lower the storage box 3 instead. In this case, program proceeds from step S04 (when the decision result is NO) to step S15 directly, with the process in step S14 being omitted.

[0037] The sensor means 19 may comprise a load cell instead of the linear-motion potentiometer used in the above embodiment. In this case, the load cell is disposed between base 11 and slider 5 (storage box 3) to detect the load on the storage box 3 during its upward or downward motion. The guide pin 15 and the spring 16 can be omitted in this configuration.

[0038] In the above embodiment, the detection value of the sensor means at the time the rising or lowering motion starts is used as the detection value of the sensor means at the time immediately before upward or downward motion. Alternatively, a detection value of the sensor means at the time a detection waiting time has elapsed from the start of upward or downward motion may also be used as the detection value of the sensor means at the time the rising or lowering motion starts.

Claims

1. An electric elevator cabinet having a storage box disposed so as to be vertically movable with respect to a cabinet support frame and an electromagnetic drive unit for raising and lowering said storage box, comprising:

   a base section vertically movable by operation of said electromagnetic drive unit; and
   a sensor means disposed between said base section and said storage box for detecting the position of said storage box with respect to said base section.

2. The electric elevator cabinet according to claim 1, further comprising a control means that does not read the value detected by the sensor means until a preset time has elapsed from the time the storage box starts rising, starts sequentially reading the value detected by the sensor means when the preset period of time has elapsed from the time the storage box starts rising, and stops raising the storage box if the difference between a value detected by the sensor means at the time the storage box starts rising and a value the sensor means sequentially detects equals to or exceeds a preset value.

3. An elevator cabinet comprising:

   a cabinet support frame;
   a base section mounted in said cabinet support frame so as to be vertically movable with respect to the cabinet support frame;
   a motor controlling up and down motion of said base section;
   a storage box suspended by said base section via a spring and vertically movable while guided by a guide frame formed in said cabinet support frame; and
   a position sensor that detects a position of said storage box with respect to said base section; wherein
   a drive stop signal is sent to said motor when the difference between the current output of said position sensor and the output of the motor before it is driven exceeds a preset value.

4. The elevator cabinet according to claim 3, further comprising a timer for stopping the output of said position sensor until a certain period of time set in said timer elapses from the driving of said motor.

FIG. 1

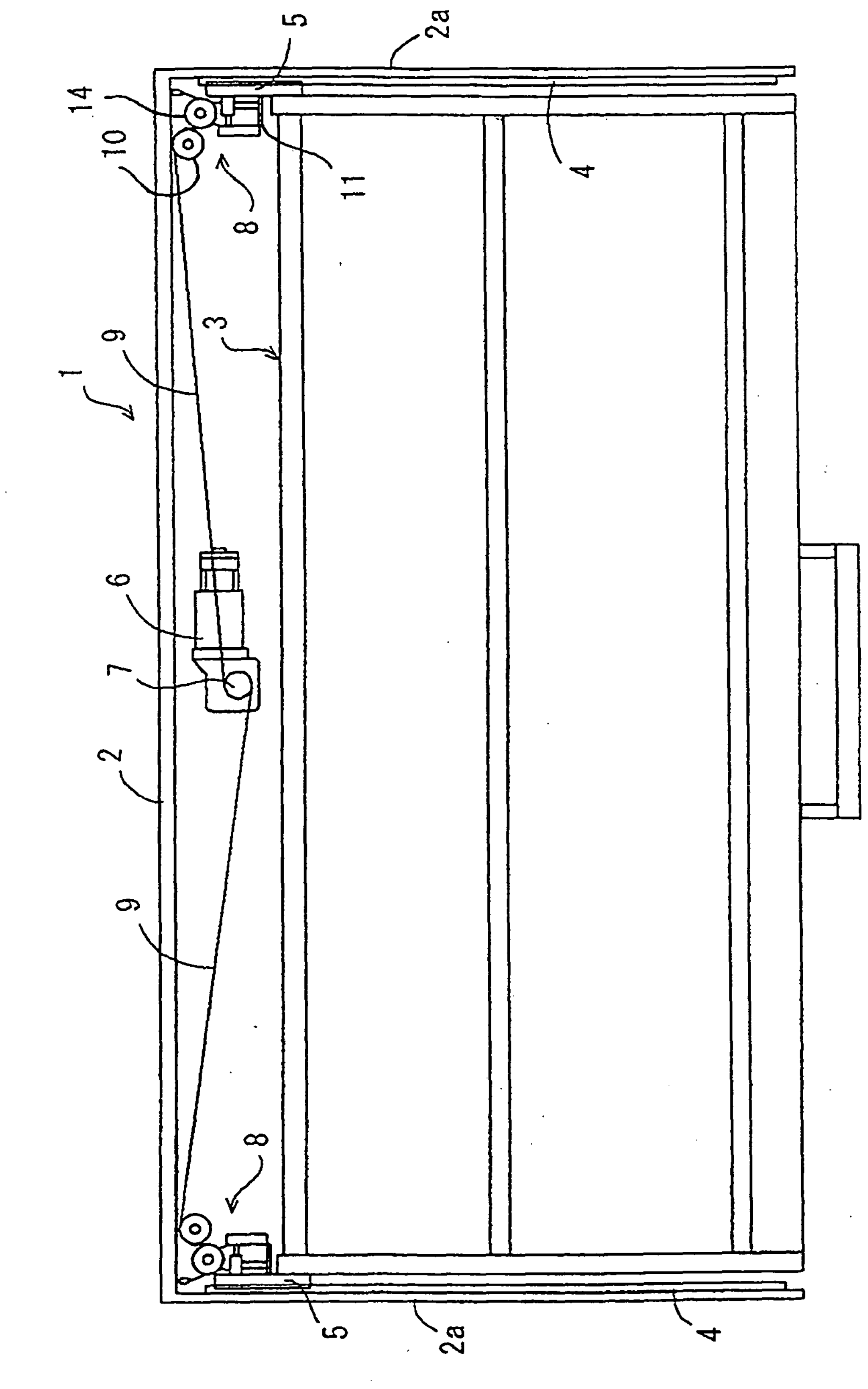


FIG. 2

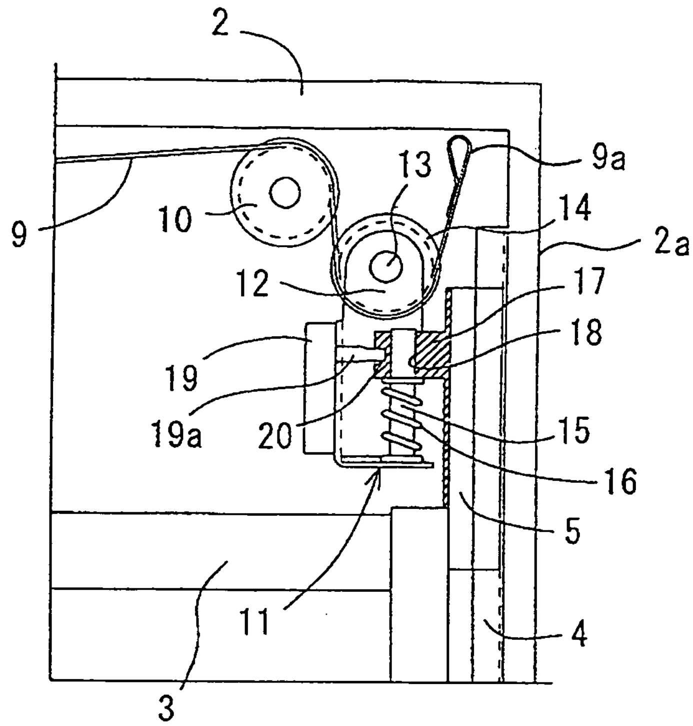
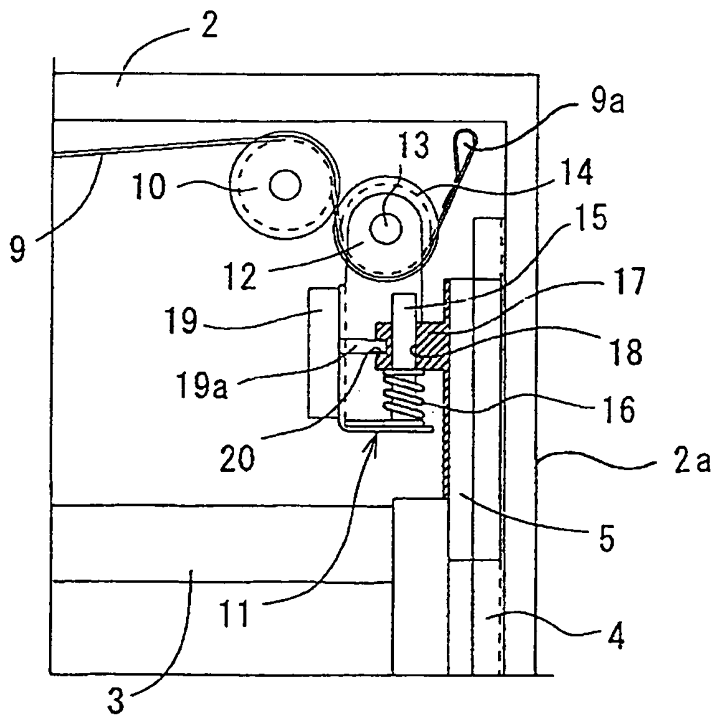

2
9a
13
14
2a
9
10
12
17
18
19
19a
20
15
16
5
11
4
3

FIG.3


2
9a
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14
15
10
9
12
17
19
18
19a
16
20
2a
5
11
4
3

FIG. 4

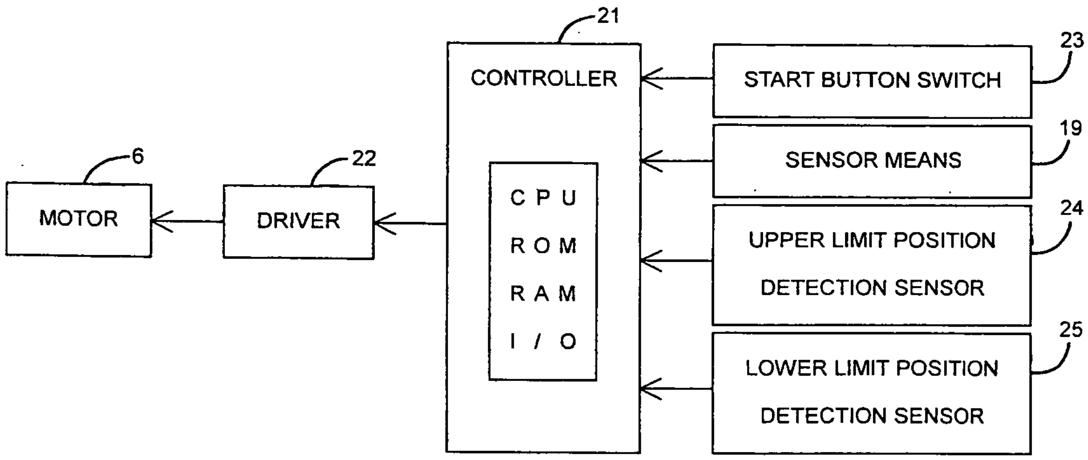

CONTROLLER
21
CPU
ROM
RAM
I / O
START BUTTON SWITCH
23
SENSOR MEANS
19
UPPER LIMIT POSITION DETECTION SENSOR
24
LOWER LIMIT POSITION DETECTION SENSOR
25
MOTOR
6
DRIVER
22

FIG. 5

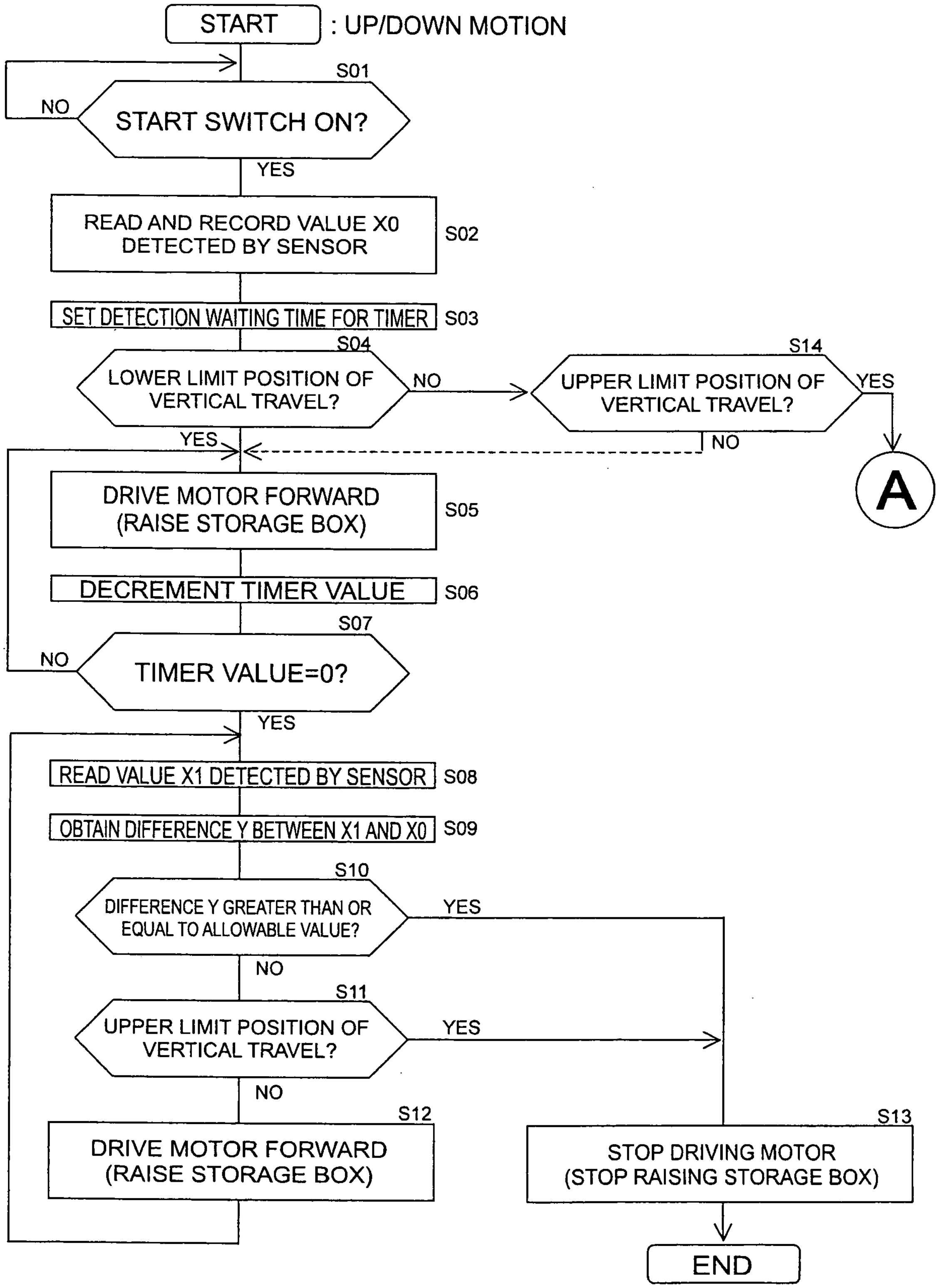
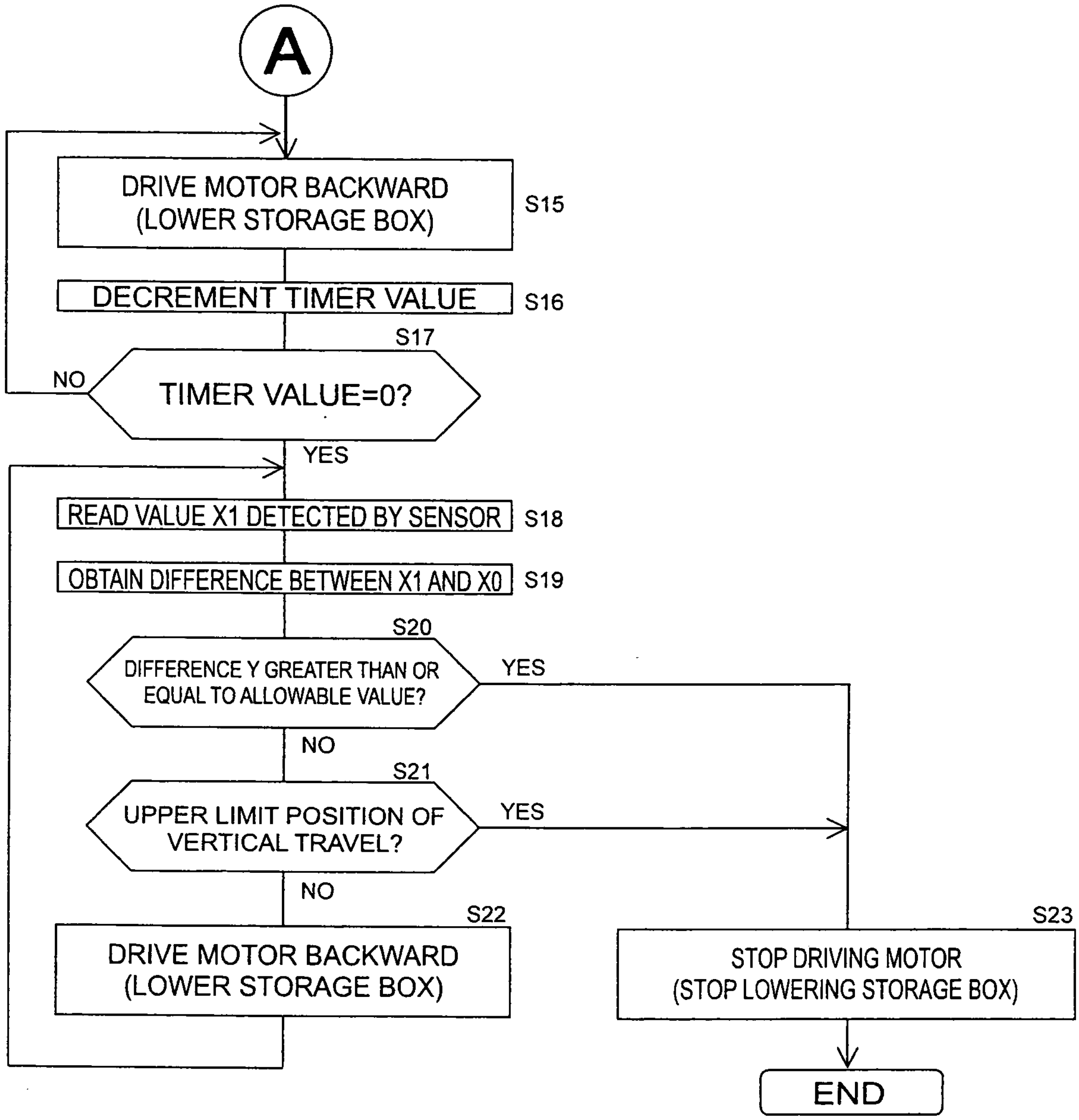

START
: UP/DOWN MOTION
S01
NO
START SWITCH ON?
YES
READ AND RECORD VALUE X0 DETECTED BY SENSOR
S02
SET DETECTION WAITING TIME FOR TIMER
S03
S04
LOWER LIMIT POSITION OF VERTICAL TRAVEL?
NO
S14
UPPER LIMIT POSITION OF VERTICAL TRAVEL?
YES
NO
A
YES
DRIVE MOTOR FORWARD (RAISE STORAGE BOX)
S05
DECREMENT TIMER VALUE
S06
S07
NO
TIMER VALUE=0?
YES
READ VALUE X1 DETECTED BY SENSOR
S08
OBTAIN DIFFERENCE Y BETWEEN X1 AND X0
S09
S10
DIFFERENCE Y GREATER THAN OR EQUAL TO ALLOWABLE VALUE?
YES
NO
S11
UPPER LIMIT POSITION OF VERTICAL TRAVEL?
YES
NO
S12
DRIVE MOTOR FORWARD (RAISE STORAGE BOX)
S13
STOP DRIVING MOTOR (STOP RAISING STORAGE BOX)
END

FIG. 6


A
DRIVE MOTOR BACKWARD
(LOWER STORAGE BOX)
S15
DECREMENT TIMER VALUE
S16
S17
NO
TIMER VALUE=0?
YES
READ VALUE X1 DETECTED BY SENSOR
S18
OBTAIN DIFFERENCE BETWEEN X1 AND X0
S19
S20
DIFFERENCE Y GREATER THAN OR
EQUAL TO ALLOWABLE VALUE?
YES
NO
S21
UPPER LIMIT POSITION OF
VERTICAL TRAVEL?
YES
NO
S22
DRIVE MOTOR BACKWARD
(LOWER STORAGE BOX)
S23
STOP DRIVING MOTOR
(STOP LOWERING STORAGE BOX)
END

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2004/016641

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] A47B51/00, A47B77/04

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] A47B51/00, A47B77/04

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.
X A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 5154/1990(Laid-open No. 96736/1991) (Johnan Manufacturing Co., Ltd.), 03 October, 1991 (03.10.91), Page 6, line 4 to page 8, line 9; page 9, line 1 to page 11, line 20; all drawings (Family: none)	1 3
A	JP 4-122307 A (Matsushita Electric Industrial Co., Ltd.), 22 April, 1992 (22.04.92), Full text; all drawings (Family: none)	1-4

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

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
21 January, 2005 (21.01.05)	15 February, 2005 (15.02.05)

Name and mailing address of the ISA/	Authorized officer
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