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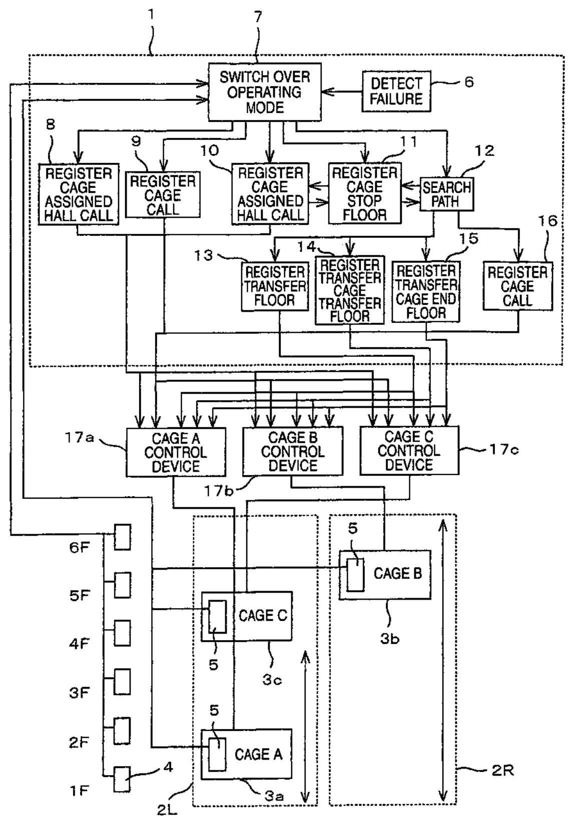
(54) Multi-car elevator

(57) A multi-car elevator composed of two or more shafts (2L, 2R) and having a plurality of cages (3a, 3c) moving in the same shaft vertically is provided. The multi-car elevator includes: a failure detecting unit (6) that detects failure in the cages (3a, 3b, 3c) and a position in which failure is caused; an operating mode switching unit (7) for switchover to degrade operation for service of those cages (3a, 3b, 3c) in which failure is not detected, in the case where failure is detected; and a cage stop floor assigning unit (11) that assigns a stop floor to each cage (3a, 3b, 3c) between a highest floor or a lowest floor and that position in which the failure is caused. In the case where switchover to the degraded operation is made and a hall call is generated, a cage is assigned to service, the cage having been assigned as the stop floor to a floor called by the hall call.

FIG.1



EP 2 003 081 A1

Description

Technical Field

[0001] The present invention relates to a multi-car elevator having a plurality of cages every shaft, and is particular suited to a degraded operation of the remaining cages when one cage fails.

Background of the Invention

[0002] Conventionally, a circulating type multi-car elevator has been known, in which upper and lower portions of two shafts are connected to constitute a circulatory path and a plurality of cages move circulatingly, such as described in JP-A-2006-111408.

[0003] Also, a method of degraded operation has been known, in which maintenance and standby floors are provided on a plurality of upper and lower floors of an omnidirection type multi-car elevator, in which a plurality of cages move freely horizontally and vertically in any locations in two shafts, and the remaining cages are caused to move even when one cage fails, such as described in JP-A-6-263361.

[0004] In the conventional technology described above, the circulating type multi-car elevator described in JP-A-2006-111408 can move to one shaft from another at the highest floor and the lowest floor. When degraded operation is performed withdrawing a cage having failed to an upper or lower floor as shown in JP-A-6-263361, however, the other normally operating cages can not move to one shaft from another at upper or lower regions.

[0005] Accordingly, when a conventional degraded operation is applied to a circulating type multi-car elevator as it is, a cage traveling in the shaft in which a failure cage travels cannot stop at the floor at which the failure cage stops and in the vicinity thereof.

[0006] Also, since a plurality of cages are also present in the shaft in which the failure cage is absent, upwardly positioned cage can not stop at the lowest floor and in the vicinity thereof by virtue of other cage being present therebelow, and downwardly positioned cage can not stop at the highest floor and in the vicinity thereof by virtue of other cage being present thereabove.

[0007] Furthermore, since any cage going straight between the highest floor and the lowest floor is absent, a single cage can not transport a passenger to all floors in the same manner as a double deck elevator, of which a cage is two-storied, or a one-shaft multi-car elevator with a plurality of cages in a single shaft.

[0008] Furthermore, when a failure cage should be moved to maintenance and standby floors provided on upper and lower floors, it is necessary to stop all cages in the case where a cage fails at a location except the maintenance and standby floors and can not be moved from the location.

Summary of the Invention

[0009] It is an object of the invention to efficiently perform degraded operation with the use of a remaining cage which operates normally, when a multi-car elevator fails, and thus enable to transport a passenger to all floors.

[0010] In order to solve the problem described above, the invention provides a multi-car elevator composed of two or more shafts and having a plurality of cages moving in the same shaft vertically, the multi-car elevator comprising: failure detecting means that detects failure in the cages and a position where failure is caused; operating mode switching means for switchover operating mode to degraded operation for service of a cage in which failure is not detected, in the case where failure is detected; and cage stop floor assigning means that assigns a stop floor to each cage between a highest floor or a lowest floor and that position in which the failure is caused, wherein in the case where switchover to the degraded operation is made and a hall call is generated, a cage is assigned to service, the cage having been assigned as the stop floor to a floor called by the hall call.

[0011] According to the invention, even when a part of cages constituting a multi-car elevator fails, other normally operating cages are used to have a floor, at which normal cages should stop, assigned thereto and to operate between a highest floor or a lowest floor and that position in which failure is caused, so that it is possible to efficiently transport a passenger without stopping the operation of all cages even at the time of failure.

[0012] Other objects, features and advantages of the invention will become apparent from the following description of the embodiments of the invention taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

[0013]

Fig. 1 is a block diagram of an embodiment of the invention;
Fig. 2 is a perspective view showing a circulating type multi-car elevator according to an embodiment;
Fig. 3 is a view illustrating the relationship between respective elevators and respective floors according to an embodiment; and
Fig. 4 is a view illustrating the relationship between respective elevators and respective floors according to a further embodiment.

Detailed Description of the Invention

[0014] An embodiment will be described with reference to a block diagram shown in Fig. 1.

[0015] A control device 1 operates two cages 3a, 3c present in a left shaft 2L and a single cage 3b present in a right shaft 2R.

[0016] Hall call buttons 4 for calling of an elevator are mounted on respective floors and each respective cage 3 is provided with a cage call button 5, with which a passenger designates an end floor.

[0017] The control device 1 includes a failure detecting unit 6, an operating mode switching unit 7, a cage assigned hall call registering unit 8, a cage call registering unit 9, a cage assigned hall call registering unit 10 in degraded operation, a cage stop floor assigning unit 11, a path searching unit 12, a transfer floor registering unit 13, a transfer cage transfer floor registering unit 14, a transfer cage end floor registering unit 15, and a cage call registering unit 16.

[0018] The control device 1 issues a command to a cage control device 17 for each of the cages 3 to operate each of the cages 3. In a normal operating mode, the cage assigned hall call registering unit 8 assigns a cage 1, which answers a hall call, out of all the cages 3a to 3c. When assignment is determined, the control device 1 registers a destined floor in the corresponding cage control device 17 and assigns a cage 3 to that floor which makes a call. When the cage call button 5 in the cage 3 is pressed and an end floor is determined, the cage call registering unit 9 registers an end floor as a destined floor in the cage control device 17. The cage 3 successively stops at the destined floors registered in the cage control device 17.

[0019] The failure detecting unit detects failure of a cage 3 and a position thereof according to safety signals given by the respective cages 3 and by the use of a position detecting device (not shown). The safety signals are given when various safety devices such as emergency stops of the cages 3 or the like act. Also, positions of cages 3 are detected by an encoder mounted to a drive motor.

[0020] When the failure detecting unit 6 detects a cage 3 in a stoppage state by failure, etc., the operating mode switching unit 7 performs switchover to degraded operation. Let assume that the first cage 3a is present in a lower region of the left shaft 2L, the second cage 3b is present in the right shaft 2R, and the third cage 3c fails above the first cage 3a. The cage stop floor assigning unit 11 determines those floors, at which the respective cages 3 should stop, according to a position of the failure cage 3c to assign the cages to the floors. In the embodiment, let assume that the third cage 3c fails between a fourth floor and a fifth floor.

[0021] Since the failure cage 3c cannot stop anywhere, no stop floor is assigned thereto. Since the first cage 3a present below the failure cage 3c can move to a third floor from a first floor, the first to third floors are assigned as stop floors. Since there is no obstacle to the second cage 3b present in the right shaft 2R, the first to sixth floors, which are the same as those in normal operation, are assigned as stop floors.

[0022] An explanation will be given to the case where the hall call button 4 on the first floor is pressed. In degraded operation, the cage assigned hall call registering unit 10 refers to stop floors assigned to the respective cages 3 to make those cage, to which the first floor is assigned as a stop floor, candidates for cage assignment. The first cage 3a and the second cage 3b make candidates and the first cage 3a, which is positioned close to the first floor and for which waiting time is short, is assigned. When cage assignment is determined, a destined floor is registered in the corresponding cage control device 17 in the same manner as in normal operation.

[0023] Subsequently, an explanation will be given to the case where an end floor indicated by the cage call button 5a in the first cage 3a is the second floor. The path searching unit 12 refers to a stop floor assigned to the first cage 3a to determine that the first cage 3a can stop at the second floor. The cage call registering unit 16 registers an end floor as a destined floor of the first cage 3a.

[0024] As a further example, an explanation will be given to the case where an end floor indicated by the cage call button 5a in the first cage 3a is the fifth floor. Since stop floors assigned to the first cage 3a are the first to third floors, the path searching unit 12 determinates that transfer is necessary. That cage 3, which is common to the first cage 3a with respect to a stop floor and in which a stop floor is assigned to an end floor, is searched. That is, the second cage 3b corresponds to this. Subsequently, in view of an efficiency, a transfer floor is determined out of those stop floors, which are common to the first cage 3a and the second cage 3b.

[0025] A first method of determining a transfer floor comprises first calculating an estimated period of time elapsed for movement of the first cage 3a until it reaches a candidate floor for transfer, and an estimated period of time elapsed for movement of the second cage 3b until it reaches a candidate floor for transfer. A comparison is made between the both estimated periods of time and a floor having a minimum time difference is set as a transfer floor.

[0026] It is intuitively found in a simple example as shown in Fig. 1 that it suffices to set the third floor intermediate between the first floor and the fifth floor as a transfer floor. However, it is actually necessary to make a calculation taking into consideration stoppage at an intermediate floor for other passengers in the first cage 3a and the second cage 3b, a difference in speed of operation, or the like.

[0027] A second method of determining a transfer floor comprises determining a transfer floor taking preference of a total period of time for movement to an end floor from a starting floor, to a waiting time at the time of transfer.

[0028] For example, in the case where the second cage 3b is operated at a higher speed than that of the first cage 3a, the longer a distance of movement getting into the second cage 3b, the shorter a total period of time for movement. Hereupon, an estimated period of time elapsed for movement of the first cage 3a to a transfer candidate floor from a starting floor and an estimated period of time elapsed for movement of the second cage 3b to an end floor from a transfer candidate floor are calculated and that transfer candidate floor, for which a total period of time for movement is short, is set as a transfer floor. According to this method, a waiting time at the time of transfer is not necessarily shortest but it is possible to reach an end floor in a shortest period of time.

[0029] The path searching unit 12 determinates a transfer floor according to any one of the measures described above. The transfer floor registering unit 13 sets a transfer floor as a destined floor of the first cage 3a in a cage control device 17a of the first cage 3a. Furthermore, the transfer cage transfer floor registering unit 14 registers a transfer floor as a destined floor in a cage control device 17b of the second cage 3b and the transfer cage end floor registering unit 15 registers a destined floor in the cage control device 17b of the second cage 3b, so that after the second cage 3b stops at the transfer floor, it moves to the end floor.

[0030] In case of transfer, after the cage call button 5a is pressed in the first cage 3a, it is necessary to specifically point out a transfer floor to a passenger to urge transfer. Hereupon, a transfer floor is indicated together with a destined floor in the cage 3a. Furthermore, guidance for transfer is preferably made by a voice at the time of stoppage at a transfer floor.

[0031] Also, when the second cage 3b reaches a transfer floor, a destined floor may be indicated or guided by a voice. It suffices to light up a button of an end floor on the cage call button 5b in the second cage 3b to show that registration is over.

[0032] Furthermore, after the first cage 3a reaches a transfer floor, the second cage 3b opens a door and closes the door after the lapse of a certain period of time to move to an end floor.

[0033] Subsequently, a fundamental construction of an opposed cage balance type circulating multi-car elevator will be described with reference to Fig. 2.

[0034] A plurality of pulleys 18 are arranged top and bottom in a circular manner to constitute a circulating rope 19, and two set of circulating ropes 19F, 19R are arranged in front and in rear relative to a cage 3. Two rope clamping portions 20F, 20R are mounted on a diagonal on an upper portion of the cage 3, and the cage 3 is fixed to the forward and rearward circulating ropes 19F, 19R.

[0035] While the forward and rearward circulating ropes 19F, 19R, respectively, are depicted by a single line in Fig. 2, they actually comprise a plurality of circulating ropes 19F, 19R. The respective cages 3, respectively, are fixed to different circulating ropes 19F, 19R. Two cages 3 are fixed in opposite positions on the circulating rope 19 so that mating cages mutually serve as a balancing weight to cancel dead loads of the cages 3.

[0036] Upper drive pulleys 18U are arranged offset in front and in rear to have the different circulating ropes 19 wound thereround. Respective drive motors 21 move the respective drive pulleys 18U whereby the respective circulating ropes 19 are moved individually. Consequently, it is possible to drive the plurality of cages 3 independently.

[0037] While being fixed to the circulating ropes 19, the cages 3 transfer to an adjacent shaft 2 in reversal regions on highest and lowest portions to move circulatingly.

[0038] A configuration, in which no reversal regions are provided top and bottom, provides an opposed cage balance type one-shaft multi-car elevator.

[0039] The circulating type multi-car elevator will be described with respect to degraded operation in the event of failure.

[0040] With the opposed cage balance type circulating multi-car elevator, when one cage 3c stops due to failure, a mating cage 3d positioned diagonally thereof is fixed to the same rope as that for the former cage and so cannot move. Accordingly, in case of moving to a highest floor from a lowest floor, there is no cage 3 capable of moving straight, so that it is necessary to transfer to a cage 3 in a different shaft 2 at an intermediate floor.

[0041] The case where the number of service floors is uneven will be described below with reference to Fig. 3.

[0042] In the case where the number of service floors is uneven, a mating cage 3b is fixed to the same rope to which the first cage 3a is fixed, and is constructionally sure to stop at the same intermediate floor M. Accordingly, assuming that the mating cage 3b is a second cage 3b, the cages surely reach the intermediate floor M at the same time, so that transfer can be smoothly made. Accordingly, the path searching unit 12 does not need to calculate an estimated period of time for movement, but it suffices to set a transfer floor to the intermediate floor M. Fig. 3 shows an example of movement to a B floor above a C floor, at which a cage 3c in failure stops, from a lowest floor A. In this case, it suffices to get into a cage 3a of the left shaft 2L at the lowest floor A to transfer to a mating cage 3b, which reaches the adjacent, right shaft 2R at the same time, at the intermediate floor M to move to the B floor.

[0043] Also, a plurality of cages 3 may be withdrawn above or below an intermediate floor in a lump. For example, a cage 3 moving to the intermediate floor M from the lowest floor in the left shaft 2L may be left and other cages 3 may be withdrawn above the intermediate floor M in the left shaft 2L. At this time, cages 3 coupled to the same rope collect below the intermediate floor M in the right shaft 2R. The first cage 3a serves in a state, in which an obstructive cage or cages 3 are absent from the lowest floor to the intermediate floor M in the left shaft 2L, and likewise the second cage 3b serves from the intermediate floor M to the highest floor in the right shaft 2R.

[0044] Subsequently, an explanation will be given to the case where a cage 3c stops at the intermediate floor M due to failure.

[0045] In this case, no other cages 3 are capable of stopping at the intermediate floor M in the left and right shafts 2, so that transfer cannot be made when it is desired to move to a floor above the intermediate floor M from a floor below the intermediate floor M. Hereupon, a further elevator 22 serving at intermediate floors is arranged to enable transfer. Fig. 3 shows an example, in which a shuttle elevator 22 is provided in combination. Doors 23 are provided even at intermediate floors, at which the shuttle elevator 22 does not stop, and a cage 3i of the shuttle elevator 22 is enabled to stop at these floors in degraded operation.

[0046] In a multi-car elevator, it is necessary to leave a margin in vertical spacing between two cages 3 so that upper and lower cages 3 do not collide against each other in an emergency.

[0047] In the case where a story height is large, spacings between the intermediate floor M and floors above and below the intermediate floor are sufficiently large, and a cage 3 can stop at one story spacing, other cages 3 can stop at a floor just above the intermediate floor M and a floor just below the intermediate floor even when failure generates at an intermediate floor. Accordingly, in this case, the shuttle elevator 22 is provided with three doors 23 so as to enable stopping at three floors, that is, the intermediate floor M and floors just above and just below the intermediate floor.

[0048] In the case where a story height is small and a cage 3 can stop only at two story spacings in order to ensure safety, those floors, at which the circulating type multi-car elevator is impossible to stop, include three floors, that is, the intermediate floor M and floors just above and just below the intermediate floor. Accordingly, a fifth floor is made an intermediate floor, at which the elevator 22 such as a shuttle elevator or the like should serve.

[0049] With the construction, in case of going to the intermediate floor M from regions above and below the intermediate floor M, it is possible to go to an end floor in one transfer. In case of going to upper and lower regions with the intermediate floor M therebetween, however, it is necessary to make two transfers. Since it is possible to eliminate a waiting time in the second transfer, however, the transfer is efficient.

[0050] Subsequently, an explanation will be given to the case where a cage 3c stops in a reversal region due to failure. That is, an explanation is given to the case where a cage 3 stops in the vicinity of a region intermediate between the left shaft 2L and the right shaft 2R at the lowest floor A and the highest floor D.

[0051] In this case, other cages 3 are impossible to stop at the lowest floor A and the highest floor D in the both left and right shafts 2. Accordingly, further elevators 24 serving at the lowest floor A and the highest floor D are arranged to enable transfer and movements to the lowest floor A and the highest floor D.

[0052] In the case where the lowest floor A and the highest floor D are large in story height and other cages 3 are enabled to stop at a floor just above the lowest floor A and a floor just below the highest floor D, it suffices that the multi-car elevator overlap the further elevators 24 over two floors. In Fig. 3, a multi-car elevator 24L in a lower zone is arranged to overlap the lowest floor over two floors and a multi-car elevator 24U in an upper zone is arranged to overlap the highest floor over two floors.

[0053] Thereby, even when failure generates in a reversal region of either of the multi-car elevators 24, it is possible to get into a cage 3 of the multi-car elevator 24 in another zone to move to a floor, which is obstructed by a failure cage 3.

[0054] In addition, in the case where a story height is small and a cage 3 can stop only at two story spacings, multi-car elevators 24 in further zones overlap the multi-car elevator over three floors.

[0055] Referring to Fig. 4, an explanation will be given below to a method of transfer at an intermediate floor in the case where the number of service floors is even.

[0056] In the case where the number of service floors is even, it is not possible to have cages 3a, 3b, which are coupled to the same rope, stopping at the same floor. Accordingly, a cage 3f coupled to a different rope is selected as a second cage 3. When two intermediate floors M1, M2 are large in story height and a stoppage spacing is sufficiently large, it is possible to have a cage 3, which is coupled to a different rope, stopping at one story spacing. Accordingly, it suffices to make either of the two intermediate floors M1, M2 a transfer floor. Fig. 4 shows an example of getting into a cage 3a in a left shaft 2L from a lowest floor A to move to the intermediate floor M1 and transferring to a second cage 2f, which is coupled to a different rope, in a right shaft 2R to move to the same floor as that of a cage 3c, which has failed at a B floor. At this time, a mating cage 1b coupled to the same rope as that of the first cage 3a and a mating cage 3e coupled to the same rope as that of the second cage 2f move to the intermediate floor M2 at the time of transfer. This is because two cages 3 coupled to the same rope stand in a symmetrical, positional relationship at all times.

[0057] In addition, in the case where a cage 3 can stop only at two story spacings in order to ensure a sufficient stoppage spacing, a transfer floor is set to a floor distant one or more floors from the two intermediate floors and a second cage 3f coupled to a different rope from that of the first cage 3a is caused to stop at the same transfer floor as that, at which the first cage stops.

[0058] Subsequently, an explanation will be given to the case where a cage 3c stops at the intermediate floors M1, M2.

[0059] In the same manner as in the case where the number of service floors is uneven, a further elevator 22 serving at intermediate floors is arranged. In Fig. 4, transfer to the shuttle elevator 22 can be made.

[0060] Even in the case where a story height is large, spacings between the intermediate floors M1, M2 and floors above and below the intermediate floors are sufficiently large, a mating cage 3d also stops intermediate between the floor M1 and the floor M2 when a cage 3c fails intermediate between the floor M1 and the floor M2, and other cages 3 cannot stop at the floor M1 and at the floor M2 in left and right shafts 2. Accordingly, in this case, the shuttle elevator 22 is provided with four doors 23 so as to enable stopping at four floors, that is, the intermediate floors M1, M2 and floors just above and just below the intermediate floors.

[0061] In the case where a story height is small and a cage 3 stops at two story spacings in order to ensure safety, those floors, at which the circulating type multi-car elevator is impossible to stop, are four floors. Accordingly, intermediate floors, at which the further elevator 22 such as a shuttle elevator or the like should serve, are made six floors.

[0062] While the circulating type multi-car elevator has been described above, it sufficed to apply the same also when a one-shaft multi-car elevator fails.

[0063] Also, in the case where emergency elevators are provided in plural, operating modes of a part of the emergency elevators may be switched over in degraded operation so as to preferentially serve floors, which a multi-car elevator 24M in failure serve. By doing so, it is possible to efficiently transport a passenger or passengers to all floors even when the shuttle elevator 22 and multi-car elevators 24L, 24U in other zones are not used in combination.

[0064] It should be further understood by those skilled in the art that although the foregoing description has been made on embodiments of the invention, the invention is not limited thereto and various changes and modifications may be made without departing from the spirit of the invention and the scope of the appended claims.

Claims

1. A multi-car elevator composed of two or more shafts (2L, 2R) and having a plurality of cages (3a, 3c) moving in the same shaft (2L) vertically, the multi-car elevator comprising:

   failure detecting means (6) that detects failure in the cages (3a, 3b, 3c) and a position in which failure is caused;
   operating mode switching means (7) for switchover to degraded operation for service of a cage (3a, 3b, 3c) in which failure is not detected, in the case where failure is detected; and
   cage stop floor assigning means (11) that assigns a stop floor to each cage (3a, 3b, 3c) between a highest floor or a lowest floor and that position in which the failure is caused,

   wherein in the case where switchover to the degraded operation is made and a hall call is generated, a cage (3a, 3b, 3c) is assigned to service, the cage (3a, 3b, 3c) having been assigned as the stop floor to a floor called by the hall call.

2. The multi-car elevator according to claim 1, wherein in the case where a cage call are generated in the degraded operation, it is determined whether an end floor by the cage call is assigned as the stop floor, and in case of being not assigned, a further cage (3a, 3b, 3c), for which the stop floor is assigned to the end floor, is searched and a transfer floor is determined.

3. The multi-car elevator according to claim 1, wherein in the case where a cage call is generated in the degraded operation, a cage (3a, 3b, 3c), to which an end floor by the cage call is assigned as the stop floor, is searched,
   a floor, which overlap for the respective cages (3a, 3b, 3c) as searched is made transfer candidate floor, and
   a transfer floor is determined so that a period of time elapsed for movement to the end floor is made minimized, assuming that transfer is made at the transfer floor.

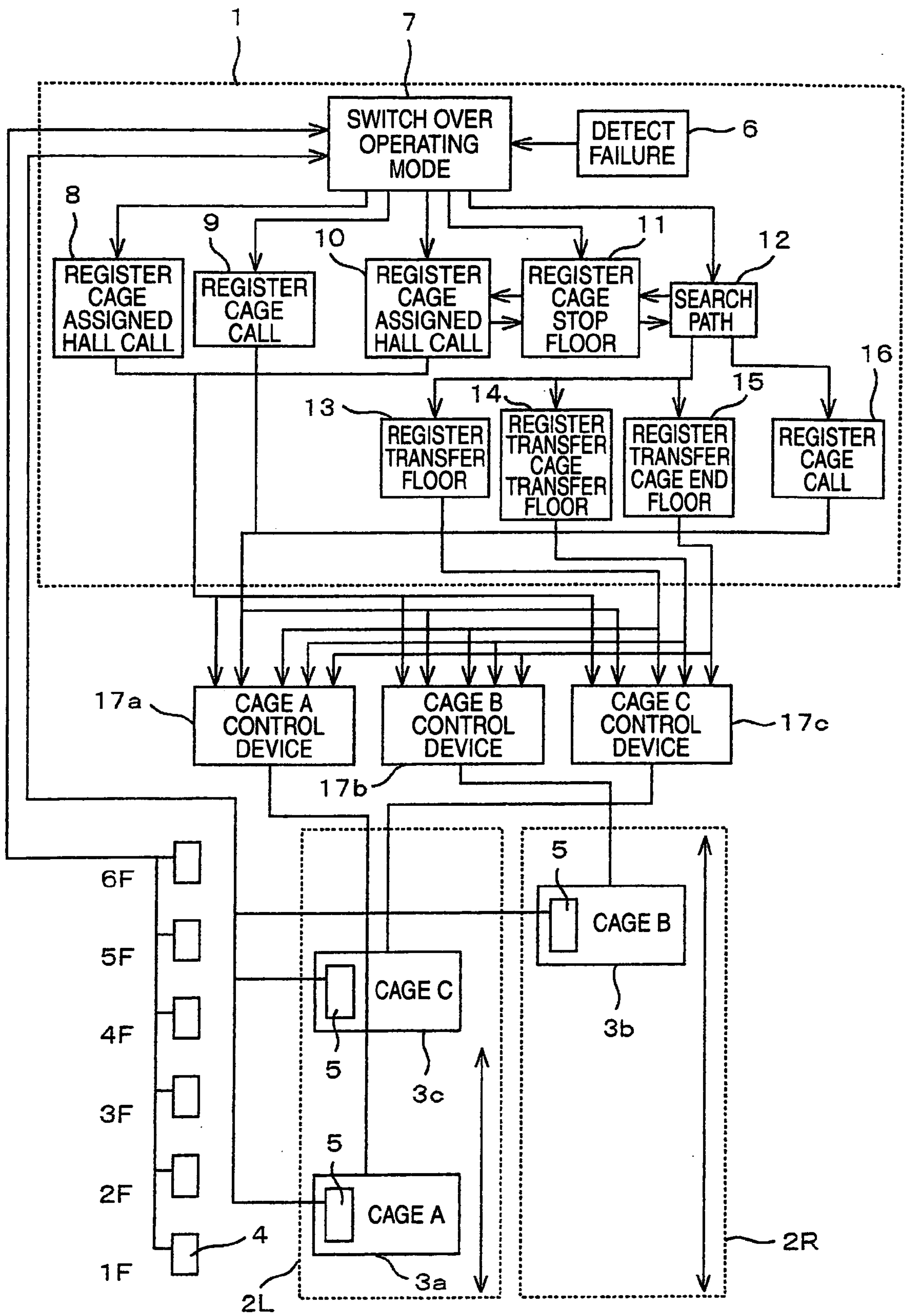
4. The multi-car elevator according to claim 1, wherein upper and lower portions of the two shafts (2L, 2R) are connected to permit a cage (3a, 3b, 3c) to be transferred to the mutual shafts (2L, 2R), whereby a plurality of the cages (3a, 3b, 3c) are enabled to move circulatingly.

5. The multi-car elevator according to claim 1, wherein the shafts (2L, 2R) having the same length are paired, and the cages (3a, 3b, 3c) standing in a symmetrical, positional relationship are connected by rope (19F, 19R) to be driven.

6. The multi-car elevator according to claim 1, wherein the cages (3a, 3b, 3c) standing in a symmetrical, positional relationship are connected by rope (19F, 19R) to be driven, and
   wherein in the case where failure is caused above an intermediate floor in one of the shafts (2L, 2R), a floor below the position of failure is assigned as a stop floor in the one of the shafts and a floor above the position of failure is assigned as a stop floor in the other of the shafts (2R, 2L).

7. The multi-car elevator according to claim 1, wherein the shafts (2L, 2R) having the same length are paired, the cages (3a, 3b, 3c) standing in a symmetrical, positional relationship are connected by rope (19F, 19R) to be driven, and a shuttle elevator (22) capable of stopping at an intermediate floor in the shaft is provided.

FIG.1



1
7
SWITCH OVER OPERATING MODE
DETECT FAILURE
6
8
REGISTER CAGE ASSIGNED HALL CALL
9
REGISTER CAGE CALL
10
REGISTER CAGE ASSIGNED HALL CALL
11
REGISTER CAGE STOP FLOOR
12
SEARCH PATH
13
REGISTER TRANSFER FLOOR
14
REGISTER TRANSFER CAGE TRANSFER FLOOR
15
REGISTER TRANSFER CAGE END FLOOR
16
REGISTER CAGE CALL
17a
CAGE A CONTROL DEVICE
17b
CAGE B CONTROL DEVICE
CAGE C CONTROL DEVICE
17c
6F
5F
4F
3F
2F
1F
4
5
CAGE B
3b
CAGE C
3c
CAGE A
3a
2L
2R

FIG.2

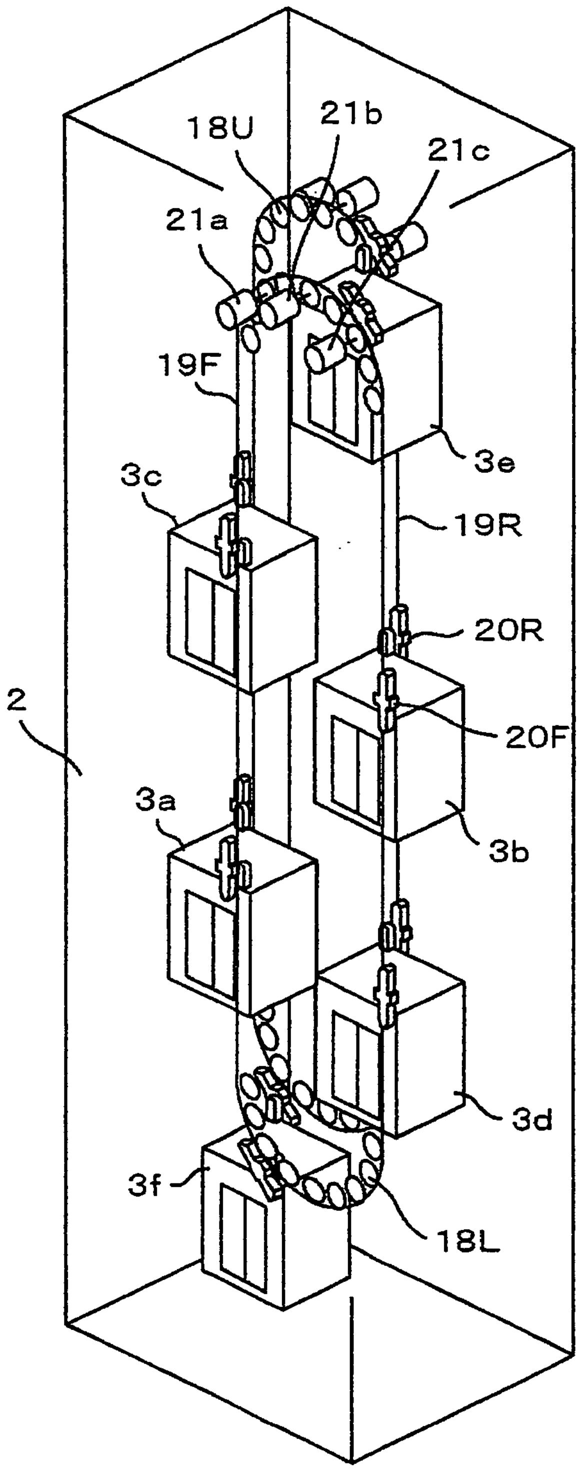
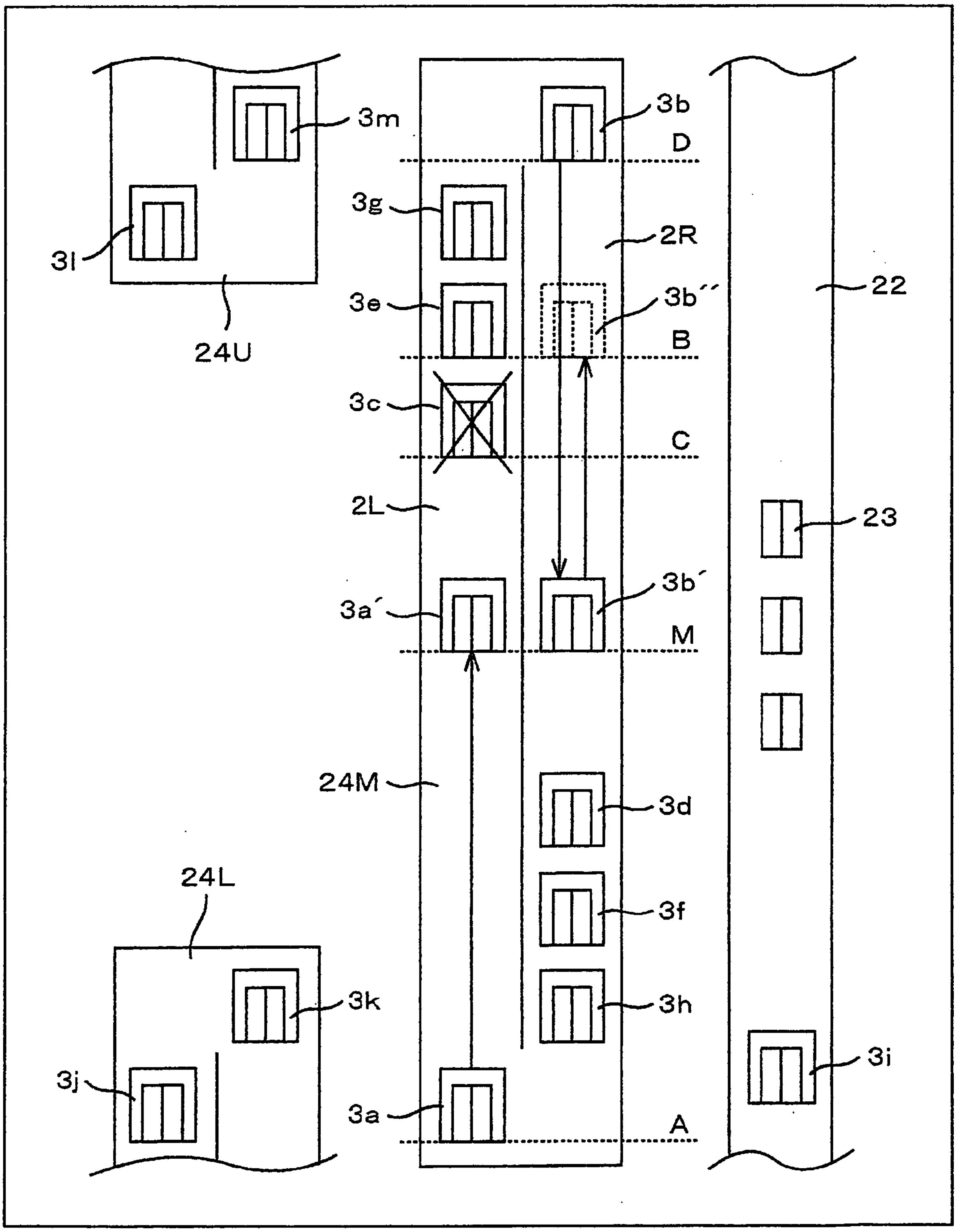


FIG.3


3m
3b
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3g
2R
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3b''
24U
B
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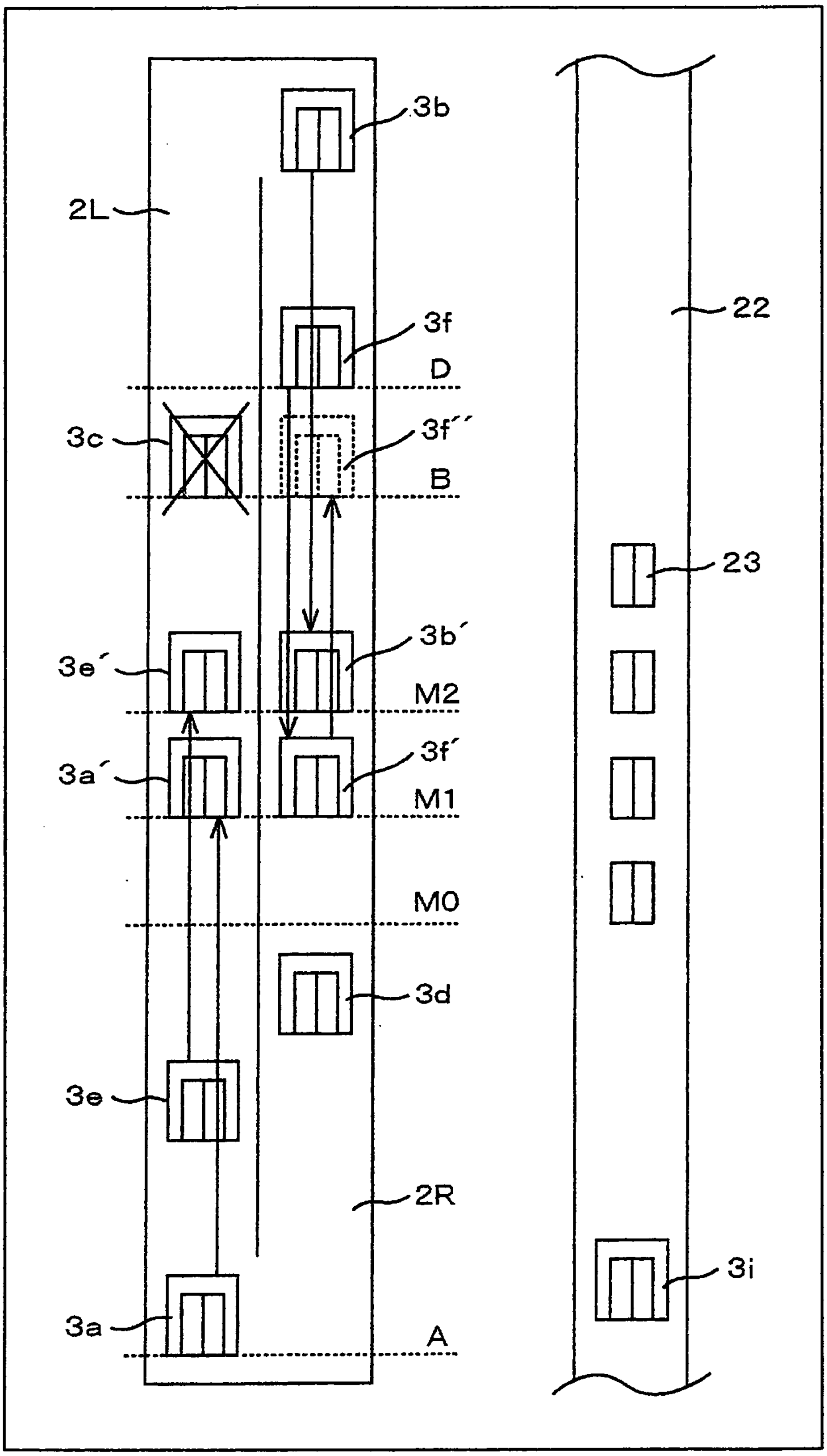
A

FIG.4



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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 08 01 0523

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Place of search	Date of completion of the search	Examiner
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