when an elevator car stops on the lobby floor or the observation floor, and the operation of the elevator will be stopped by the foregoing emergency operation device.

SUMMARY

In general, according to one embodiment, an elevator control apparatus including an elevator car which ascends and descends by a rope provided in a shaft of a building, includes building shake sensing means for sensing a shake of the building; ~~and~~ operation control means for when an amount of shaking of the building sensed by the building shake sensing means is a given amount or greater, restricting passengers' entry and exit operations on a resonant floor where the rope is swayed greatly due to shaking of the building, to only entry or exit according to an operation mode of the elevator car, and controlling an operation of the elevator car; and notification means for notifying the passengers that the operation control means restricts the passengers' entry and exit operations to only entry or exit.

According to another embodiment, there is provided an elevator control apparatus including a plurality of elevator cars in a shaft of a building, each of the elevator cars ascending and descending by a rope provided in the shaft, the apparatus comprising: building shake sensing means for sensing a shake of the building; ~~and~~ operation control means for when an amount of shaking of the building sensed by the building shake sensing means is not smaller than a preset amount, restricting passengers' entry and exit operations on a resonant floor where the rope is swayed greatly due to shaking of the building, to only ~~enter~~ entry or exit for each of the elevator cars, and controlling an operation of the elevator cars; and notification means for notifying the passengers that the operation control means restricts the passengers'

entry and exit operations to only entry or exit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagram showing a configuration of an elevator according to a first embodiment;

FIG. 2 is a block diagram showing a functional configuration of a control apparatus for the elevator according to the first embodiment;

FIG. 3 is a diagram showing a configuration of an elevator hall for the elevator according to the first embodiment;

FIG. 4 is a graph showing a relationship between the sway (maximum displacement) of a main rope attached to a car of the elevator according to the first embodiment and the position of the car;

FIG. 5 is a graph showing a relationship between the sway (maximum displacement) of a main rope attached to a counterweight of the elevator according to the first embodiment and the position of the car;

FIG. 6 is a graph showing a relationship between the sway (maximum displacement) of a compensating rope attached to the car of the elevator according to the

WHAT IS CLAIMED IS:

1. An elevator control apparatus including an elevator car which ascends and descends by a rope provided in a shaft of a building, comprising:

building shake sensing means for sensing a shake of the building; ~~and~~

operation control means for when an amount of shaking of the building sensed by the building shake sensing means is a given amount or greater, restricting passengers' entry and exit operations on a resonant floor where the rope is swayed greatly due to shaking of the building, to only entry or exit according to an operation mode of the elevator car, and controlling an operation of the elevator car; and

notification means for notifying the passengers that the operation control means restricts the passengers' entry and exit operations to only entry or exit.

2. The elevator control apparatus according to claim 1, wherein the operation control means restricts passengers' entry and exit operations to only enter or exit on both an upper floor and a lower floor of the building when at least one of the upper floor and the lower floor corresponds to the resonant floor, and controls an operation of the elevator car.

3. The elevator control apparatus according to claim 2, wherein the operation control means performs a first one-way operation in which the elevator car picks up passengers on the lower floor, ascends and discharges the passengers on the upper floor and a second one-way operation in which the elevator car picks up passengers on the upper floor, descends and discharges the passengers on the lower floor.

4. The elevator control apparatus according to claim 3, wherein the operation control means selects one of the first one-way operation and the second one-way operation at preset time intervals.

5. The elevator control apparatus according to claim 3, wherein the operation control means selects one of the first one-way operation and the second one-way operation in accordance with a congestion state of the upper floor or the lower floor of the building.

6. The elevator control apparatus according to claim 3, wherein the operation control means performs the second one-way operation in which the elevator car discharges passengers on the upper floor by the first one-way operation, then travels in an opposite direction on a non-resonant floor close to the upper floor, and returns to the upper floor, and

the operation control means performs the first one-way operation in which the elevator car discharges passengers on the lower floor by the second one-way operation, then travels in an opposite direction on a non-resonant floor close to the lower floor, and returns to the lower floor.

7. The elevator control apparatus according to claim 2, wherein the upper floor and the lower floor of the building each have a structure including an entry-only floor and an exit-only floor,

the operation control means performs a first one-way operation in which the elevator car picks up passengers on the entry-only floor of the upper floor, ascends and discharges the passengers on the exit-only floor of the upper floor, and

the operation control means performs a second one-way operation in which the elevator car picks up passengers on the entry-only floor of the upper floor, descends and discharges the passengers on the exit-only floor of the lower floor.

8. The elevator control apparatus according to claim 7, wherein the operation control means selects one of the first one-way operation and the second one-way operation at preset time intervals.

9. An elevator control apparatus including a plurality of elevator cars in a shaft of a building, each of the elevator cars ascending and descending by a rope provided in the shaft, the apparatus comprising:

building shake sensing means for sensing a shake of the building; ~~and~~

operation control means for when an amount of shaking of the building sensed by the building shake sensing means is not smaller than a preset amount, restricting passengers' entry and exit operations on a resonant floor where the rope is swayed greatly due to shaking of the building, to only ~~enter~~ entry or exit for each of the elevator cars, and controlling an operation of the elevator cars; and

notification means for notifying the passengers that the operation control means restricts the passengers' entry and exit operations to only entry or exit.

10. The elevator control apparatus according to claim 9, wherein the operation control means restricts passengers' entry and exit operations to only enter or exit on both an upper floor and a lower floor of the building when at least one of the upper floor and the lower floor corresponds to the resonant floor, and controls an operation of the elevator cars.

11. The elevator control apparatus according to claim 10, wherein the operation control means divides the elevator cars into at least two groups,

in one of the groups, the operation control means performs a first one-way operation in which the elevator cars pick up passengers on the lower floor, ascend and discharge the passengers on the upper floor, and

in the other group, the operation control means performs a second one-way operation in which the elevator cars pick up passengers on the upper floor, descend and discharge the passengers on the lower floor.

12. The elevator control apparatus according to claim 11, wherein the upper floor and the lower floor of the building each have a structure including an entry-only floor and an exit-only floor,

in the one of the groups, the operation control

means performs a first one-way operation in which the elevator cars pick up passengers on the entry-only floor of the lower floor, ascend and discharge the passengers on the exit-only floor of the upper floor,

and

in the other group, the operation control means performs a second one-way operation in which the elevator cars pick up passengers on the entry-only floor of the upper floor, descend and discharge the passengers on the exit-only floor of the lower floor.

13. The elevator control apparatus according to claim 11, wherein the operation control means changes the number of elevator cars that perform the first one-way operation and the number of elevator cars that perform the second one-way operation in accordance with a congestion state of the upper floor or the lower floor.

14. The elevator control apparatus according to claim 11, wherein the operation control means changes the number of elevator cars that perform the first one-way operation and the number of elevator cars that perform the second one-way operation in accordance with a preset period of time.

~~15. The elevator control apparatus according to one of claims 1 and 9, further comprising notification means for notifying the passengers that the operation control means restricts the passengers' entry and exit operations to only entry or exit.~~