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SPECIFICATION

PASSENGER TRANSPORTATION FACILITIES



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FIELD OF THE INVENTION

5 The present invention relates to the improvement
in passenger transportation facilities such as an
elevator, an escalator, a moving walk and so on and,
particularly, to passenger transportation facilities
capable of reliably warning the necessity of the
10 inspection and maintenance.

BACKGROUND OF THE INVENTION

As this kind of technique, as is disclosed in JP-
A 7-25558, there are conventional apparatuses in which
15 when a valid term of the legal inspection and maintenance
approaches the due date, an announcement by voice or a
display to that effect is done for the warning purpose,
whereby it is prevented that passenger transportation
facilities make the service operation of the facilities
20 impossible, after the legal inspection and maintenance
has lost its validity.

According to the conventional technique, an
appropriate announcing or informing device is necessary
because it is broadcast by an announcing device provided
25 in a caretaker's room, or, displayed by a displaying

device provided in an elevator hall and/or within an elevator cage when the due date of the legal inspection and maintenance is approaching. Further, such warning means has a high possibility that the warning means is
5 reset and the service operation is being done without the inspection and maintenance.

However, if the service operation of the facilities is interrupted suddenly, the convenience thereof is heavily damaged, which is undesirable because
10 the elevator can not be used.

An object of the present invention is to provide passenger transportation facilities which can warn the necessity of the inspection and maintenance, without largely damaging the passengers' convenience by
15 continuing the service operation thereof.

Another object of the present invention is to provide passenger transportation facilities which can effectively warn the necessity of the inspection and maintenance, without any additional warning means.
20

DISCLOSURE OF THE INVENTION

It is undesirable to provide any specific warning device to urge practice of the inspection and maintenance of passenger transportation facilities and it is
25 desirable to warn the necessity not only to a manager

thereof but also to passengers and so on in order to effectively practice the inspection and maintenance.

Passenger transportation facilities such an elevator, an escalator, a moving walk and so on in an aspect of the present invention comprise means for setting time for the next inspection and maintenance, means for measuring time lapse for the present time, means for discriminating whether or not the present time reaches the time for the inspection and maintenance and means for adding, to the passenger transportation facilities, a prescribed warning operation for putting some perceptible restrictions on the availability of service of the facilities in accordance with an output of the discriminating means.

In a preferable embodiment of the present invention, the time for the inspection and maintenance as mentioned above can be replaced by a term till the next inspection and maintenance, a time lapsed only in the service operation, the number of times of starting of the service operation and a predetermined change in a certain kind of physical quantity, etc.

Examples of the warning operation for putting a restriction on the availability of service of the facilities as mentioned above is: to stop the indication of usual guidance or information in existing displays

only for a predetermined period or in succession; to light on or flicker a display or an indicator only for a predetermined period or in succession notwithstanding no reason for doing so; and to reduce the brightness of a display or an illumination device in the facilities.

Another example of the warning operation for putting some perceptible restrictions on the availability of service of the facilities is, as will be described later, reduction of performance such as the reduction of the transportation speed of the facilities, the application of vibration to the facilities during the service operation or the reduction in the number of passengers, and in the case of an elevator, the reduction of a door opening or closing speed or the increase in the landing error of an elevator cage at respective floors.

As a further example of the warning operation, a part of the service function, such as the discontinuation of the guidance or any other display in passenger transportation facilities or the suspension of the door re-open function or the door closing button function in the elevator, which usual passenger transportation facilities originally have, is restricted or halted.

In passenger transportation facilities, such as an elevator, an escalator, a moving walk and so on, the inspection term of the different length is usually set

for various parts to be checked. Therefore, there is a demand that both of a part to be checked and the inspection term thereof are announced or displayed together for each part to be checked.

5 In a preferred embodiment of the present invention, therefore, means for setting the different value for each part to be checked of the facilities is provided, with respect to the predetermined term till the next time of the inspection and maintenance in the
10 discriminating means, the predetermined specific time of the same, the predetermined number of times of the same, or the predetermined value.

 According to another preferred embodiment, there is provided means for setting, to plural levels, the
15 predetermined term, the predetermined specific time, the predetermined number of times and the predetermined value as mentioned above, which functions as a reference to be compared with the present value of the respective variable, and means for adding the different warning
20 operation in accordance with the detected level, as will be described later.

 In the concrete embodiment of the present invention, the time lapse from the time of the last inspection or maintenance to the present time is measured
25 by a timer for each part to be checked. There is

provided inspection term memory means for memorizing the inspection term of each part, and the time lapse measured for every part from the time of the last inspection and maintenance to the present time is compared with the inspection term stored in the inspection term memory means. When the measured time lapse enters in a predetermined range, the warning operation recorded in a memory is carried out to announce or inform of the necessity of the inspection and maintenance.

Further, the inspection term of each part can be prepared in plural levels, and there can be performed a different kind of the warning operation corresponding to the level, every time when a respective one of the levels of the term is reached. Thereby, the degree of urging the inspection and maintenance can be made strong.

After the inspection or maintenance, initializing means initializes the memory in counting means corresponding to the part inspected or maintained.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the whole construction of an elevator system of an embodiment of the present invention;

FIG. 2 is a flow chart showing the processing operation of the embodiment of the present invention;

FIG. 3 shows an example of an inspection schedule table;

FIG. 4 shows the whole construction of an elevator system of another embodiment of the present invention;

FIG. 5 is a flow chart showing the processing operation of the another embodiment of the present invention;

FIG. 6 shows an example of a counting table;

FIG. 7 shows another example of the counting table;

FIG. 8 is a time chart showing the operation of the present invention;

FIG. 9 is an example of a table of warning operation giving passengers of the elevator a certain restriction;

FIG. 10 shows two examples of changing indication of existing indication devices;

FIG. 11 shows the whole construction of an elevator of another embodiment of the present invention, in which a maintenance management section is provided separately; and

FIG. 12 shows the whole construction of an escalator of another embodiment of the present invention, in which a maintenance management section is provided

separately.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Hereunder, embodiments of the present invention
5 will be explained, referring to the accompanying
drawings. The following mainly is described about an
elevator taken as an example, however it is of course
that the same can be applied to the other type of
passenger transportation facilities such as an escalator,
10 a moving walk and so on.

FIG. 1 is a view of the whole construction of an
elevator system according to an embodiment of the present
invention.

First, an elevator control apparatus 1 is
15 composed of elevator control section 11 and maintenance
management section 12. The elevator control section 11
has operation control part 111 determining how to make
elevator cage 6 travel in response to a call of a
passenger, driving control part 112 for driving an
20 elevator motor according to an instruction from the
operation control part 111, a door and other equipment,
and information control part 113 for collecting various
information from hall call buttons, cage call buttons and
so on, and controlling the indication of a cage position
25 and call registration lamps.

The maintenance management section 12 receives signals indicative of status of various parts of the elevator system from the elevator control section 11 through interface 121. Discriminating part (term judging
5 part) 122 compares information from timer 123 with the contents recorded in inspection schedule table 124, in which time of the last inspection or maintenance is recorded for every part. When the inspection time approaches or has already passed, the predetermined
10 processing, which is stored in the inspection schedule table 124 for every part to be checked, is read out.

Next, the processing determined for each part is transmitted to the elevator control section 11 through the interface 121. The elevator control section 11
15 executes the processing operation transmitted from the maintenance management section 12. That is, the driving control part 112 carries out the processing operation concerning the elevator speed and a door movement, and the information control part 113 carries out the
20 processing operation concerning call registration lamps in hall call buttons 51, 52 and indicator lamps 41 to 43.

When the inspection or maintenance is done, the content of the area, which corresponds to the part inspected in the inspection schedule table 124, is
25 rewritten, and thereafter a signal is transmitted to the

elevator control section 11, whereby the processing operation is released, which has been carried out since the inspection time with respect to the part to be checked lapsed.

5 It can be known, based on a signal from the elevator control section 11, whether or not the inspection or maintenance has been performed. Further, it is possible to appoint a part to be checked by using external input device 3. Of course, the external input
10 device 3 can be also used jointly with a monitoring device used for the inspection.

FIG. 2 is a flow chart generally showing the processing done in FIG. 1. Hereunder, the operation after the first inspection has been conducted will be
15 described.

First of all, the inspection time, at which a part has been inspected, is reset (step 201), and then, the time for the next inspection is newly written (step 202). Content of the timer 123 is read out (step 204)
20 and it is discriminated whether or not the content thereof agrees with the inspection time (step 205). Steps 204 and 205 are sufficient to be executed once a day. At this time if the time of inspection does not lapse upon the time to be inspected, the processing
25 returns to step 203, and steps 204 and 205 are executed

the next day. If the inspection time is judged to lapse, the operation to be taken care for the part to be checked is read out (step 205) and transmitted to the elevator control section 11 (step 206). In the elevator control
5 section 11, the operation control part 111 receives the operation to be taken care, and the operation to be taken is instructed to the driving control part 112 and the information control part 113.

FIG. 3 shows an example of the inspection
10 schedule table 124. The record about the inspection time for every part to be checked and the content of the warning operation to be carried out upon lapse of a respective inspection time are stored in the table, and by comparing with the timer 123, the warning operation is
15 carried out, when the present time exceeds the inspection time. The content of this warning operation is an express operation that puts some restrictions on the availability of service of the elevator. In the example as shown in FIG. 3, the availability by passengers is
20 restricted to a certain extent by lighting on lamps in elevator halls, hall call registration lamps and so on in a manner different from normal or by flickering those lamps.

In the present embodiment, it becomes possible to
25 make the elevator facilities conduct the different

warning operation for every part to be checked, when it is detected that the present time approaches or has passed the predetermined inspection time of the respective part. Further, since the time of the next inspection or maintenance is recorded for every part to be checked, the next inspection or maintenance for each part can be easily scheduled.

FIG. 4 shows the whole construction of an elevator system of another embodiment of the present invention. Difference from FIG. 1 is that a counting table 125 is used instead of the inspection time schedule table 124.

Hereunder, description will be done of the operation of FIG. 4 as processing flows after the last inspection has been conducted, referring to the flow chart of FIG. 5.

At first, the number of days counted with respect to the part checked is reset (step 501). Then, referring to the timer 123, the counter for the checked part in the table 125 is increased one by one day (step 502). Further, the thus counted number of days is compared with the inspection interval recorded in the table 125 (step 503). If the former does not exceed the latter, the processing operation returns to step 502. If, however, the former exceeds the latter, the operation to be taken

for the part to be checked is read out (step 504). The processing after this step is the same as that in FIG. 2.

FIG. 6 shows an example of the counting table 125, in which the inspection interval and the number of counted days from the last inspection time are recorded and the number of days counted by the timer 123 are rewritten each day.

According to this embodiment, a memory is required for counting the number of days, however, the case is different from the inspection schedule table 124, the next inspection time is not necessary to be input, and the automation thereof is made easy.

FIG. 7 shows an example of the counting table 125 in the case where operation is changed according to the lapsed days. The table 125 shares different operation according to the lapsed days even for the same part to be checked. According to the lapsed time, an prominent operation is made to be taken, whereby an inspection can be urged to conduct early.

According to the present embodiment, by carrying out the different warning operation according to the number of days lapsed, it can be known not only what part has been inspected, but also how many days are left till the time of the next inspection or maintenance, or how many days lapsed from the regularly scheduled day of the

inspection or maintenance. Thereby, the inspection or maintenance can be urged to practice earlier.

FIG. 8 is a time chart for explaining the operation of the present invention. Usually, the interval of inspection is set shorter than the legal inspection interval prescribed by a law. When the time of the inspection approaches and the number of days left becomes smaller than a predetermined number of days, the light warning operation, as is not so conspicuous and as is flickered once a day, is preformed, whereby the approach of the time of the inspection or maintenance is announced or informed. Then, if the inspection is not performed notwithstanding the lapse of the inspection term, a call registration lamp of the button is flickered, every time when a hall call button is pushed, whereby it is changed to the more conspicuous warning operation. Further, if such warning operation is changed for each part to be checked, a part, which is necessary to be inspected or maintained next time, can be pointed out.

If the inspection is not still performed thereafter and the legal inspection time approaches, the more conspicuous warning operation such as lighting-on of all lamps, applying vibrations to an elevator cage and so on, is done, whereby it is announced or informed that the

legal inspection or maintenance is needed. If the inspection or maintenance is not done even after the lapse of the legal inspection time, the service operation of an elevator is stopped, and, further, depending upon
5 the content of an item uninspected timely within the legal inspection time, the traveling speed of an elevator cage or the speed of opening or closing an elevator door can be reduced, in order to urge to perform the inspection or maintenance.

10 Fig. 9 shows examples of a warning operation which puts some restrictions on the availability of service of an elevator in the case of an elevator system.

That is,

- 15 (1) A part or the whole of indicators in an elevator hall are flickered.
- (2) A part or the whole of indicators in an elevator hall are lighted on.
- (3) A part or the whole of reservation registration lamps and arrival notice lamps are flickered.
- 20 (4) A part or the whole of reservation registration lamps and arrival notice lamps are lighted on.
- (5) A call registration lamp is flickered, when a corresponding hall button switch is pushed.
- (6) The inside of an elevator cage is darkened. A
25 red lamp or the like is lighted on.

- (7) The door open/close speed is slowed down.
- (8) The traveling speed of an elevator cage is slowed down.
- (9) The capacity of passengers or the maximum
5 number of passengers allowed on the elevator is reduced.
- (10) A landing error of an elevator cage and the time necessary for adjustment of the cage to the floor are increased.
- 10 (11) An elevator cage is vibrated.

By the above-mentioned, the warning of the approach to or the lapse of the time of the inspection or maintenance, and indication of parts to be inspected can be conducted.

15 FIG 10 show examples of the case wherein indication is changed. In FIG 10 (a), as shown in the figure on the left side, usually, when the hall call button switch 5 is pushed, a registration lamp corresponding the pushed button switch is lighted on. In
20 the present embodiment, as shown in the figure on the right side, in the case where the maintenance period has lapsed, when the hall call button switch 5 is pushed, first, registration lamps in the up and down direction are flickered alternately for a certain time, and then
25 the lamp in the pushed direction is flickered. Thereby,

it is possible to indicate lapse of the maintenance period. Further, by extending the alternately lighting time of up and down lamps so as to meet the lapse of the maintenance, it can be indicated how long term is left
5 till the time of the next inspection or maintenance or how long time has passed after the time of the last inspection or maintenance.

FIG 10 (b) show the example of lighting an indicator 4 indicating the present position of the
10 elevator cage 6. As shown in the FIG 10 (b) on the above side, only a lighted-on lamp indicating the floor (the fourth floor in the FIG) at which the elevator cage 6 exists is temporarily turned over as shown in FIG. 10 (b) on the down side, and lamps other than the elevator cage
15 position (the fourth floor) are made light on, whereby it is possible to indicate the approach or lapse of the maintenance period.

According to the present embodiment, the inspection or maintenance can be urged without providing
20 any additional guidance means in addition to the existing announcement or information means.

In the embodiments as mentioned above, the different warning operation is prepared for every part to be inspected or maintained. Of course, however, the same
25 warning operation can be performed with respect to the

different part to be inspected or maintained. Further,
it can be known how long term is left until the time of
the next inspection or maintenance, even if the
inspection or maintenance term is set for every part to
5 be inspected or maintained and if only the different
warning operation is assigned in accordance with the time
lapse, as shown in FIG. 7.

Further, it can be done to vary the warning
operation for every part to be checked, only when a
10 maintenance engineer arrives.

FIG. 11 is a view of the whole construction of an
elevator system of another embodiment of the present
invention.

A point that FIG. 11 is different from FIG. 1 is
15 that the maintenance management section 2 is arranged out
of the elevator system 1. According to the present
embodiment, the present invention can be realized also by
adding the maintenance management section 2 to an
existing elevator system.

20 FIG. 12 shows the whole construction of a man-
conveyer, such as an escalator and a moving walk,
according to an embodiment of the present invention.

A point that FIG. 12 is different from FIG. 11 is
that a man-conveyer control system 7 instead of the
25 elevator system 1 is connected. In the case of a man-

conveyer, as a warning operation for putting some restrictions on the availability of service thereof, the reduction of a travelling speed will be preferable, and further it can be also considered that the vibration is applied to step plates at the start of the operation thereof.

According to the embodiments as mentioned above, the approach to or the lapse of the time of the inspection or maintenance can be made known to passengers, too. Further, if a warning operation is made different for every part to be checked, the part inspected can be displayed specifically.

INDUSTRIAL APPLICABILITY

According to the present invention, inspection of the passenger transportation facilities can be urged on managers without largely losing the convenience of passengers under the continuation of the service operation of the passenger transportation facilities, there is no need of any specific additional devices as warning means for urging the inspection.

WHAT IS CLAIMED IS

1. Passenger transportation facilities such as an elevator, an escalator, a moving walk and so on, comprising:

means for setting time for the inspection or maintenance of the next time;

means for detecting the present time;

means for discriminating that the present time agrees with the inspection or maintenance time set in said setting means; and

means for performing reduction in transportation speed of said passenger transportation facilities, warning to reduce in transportation capacity of passengers to be transported or reduction of opening or closing speed of an elevator door in the case where said passenger transportation facilities is the elevator in accordance with the output of said discriminating means.

2. Passenger transportation facilities such as an elevator, escalator, moving walk and so on, comprising:

means for measuring the time lapse till the present time from the time of the last inspection or maintenance;

means for discriminating that the time lapse agrees with a predetermined time; and

means for performing reduction in transportation speed of said passenger transportation facilities, warning to reduce in transportation capacity of passengers to be transported or reduction of opening or closing speed of an elevator door in the case where said passenger

transportation facilities is the elevator in accordance with the output of said discriminating means.

3. The passenger transportation facilities according to claim 2, wherein the time lapse is a time passed for service operation of said passenger transportation facilities.

4. Passenger transportation facilities such as an elevator, an escalator, a moving walk and so on, comprising:

means for counting the number of times of starting of a part to be checked of said passenger transportation facilities till the present time from the time of the last inspection or maintenance;

means for discriminating that the number of times of starting agrees with a predetermined number of times; and

means for performing reduction in transportation speed of said passenger transportation facilities, warning to reduce in transportation capacity of passengers to be transported or reduction of opening or closing speed of an elevator door in the case where said passenger transportation facilities is the elevator in accordance with the output of said discriminating means.

5. Passenger transportation facilities such as an elevator, an escalator, a moving walk and so on, comprising:

means for measuring a physical quantity such as current, voltage, vibration, noise, temperature or the like of a part to be checked;

means for discriminating that the physical amount measured agrees with a predetermined value thereof; and

means for performing reduction in transportation speed of said passenger transportation facilities, warning to reduce in transportation capacity of passengers to be transported or reduction of opening or closing speed of an elevator door in the case where said passenger transportation facilities is the elevator in accordance with the output of said discriminating means.

6. Passenger transportation facilities constructed as an elevator and comprising:

means for setting a next inspection and maintenance time;

means for measuring the present time;

means for discriminating that the present time comes to the set time by said setting means; and

means for stopping a function of a door closing button in said elevator in accordance with the output of said discriminating means.

7. Passenger transportation facilities constructed as an elevator and comprising:

means for measuring the time lapsed till the present time from the last inspection and maintenance from the present time;

means for discriminating that the present time agrees with the set time by said setting means; and

means for stopping a function of a door closing button in said elevator in accordance with the output of said discriminating means.

8. Passenger transportation facilities constructed as an elevator and comprising:

means for measuring the number of starting times of a predetermined part in said passenger transportation facilities, occurred till the present time from the last inspection and maintenance;

means for discriminating that said number of starting times agrees with predetermined times; and

means for stopping a function of a door closing button in said elevator in accordance with the output of said discriminating means.

9. Passenger transportation facilities constructed as an elevator and comprising:

means for measuring a physical quantity such as current, voltage, vibrations, noises or temperature of a predetermined part in said passenger transportation facilities;

means for discriminating that said physical quantity agrees with a predetermined value; and

means for stopping a function of a door closing button in said elevator in accordance with the output of said discriminating means.

10. The passenger transportation facilities according to claims 1 to 8, wherein there is provided means for setting a different value for each part to be checked, with respect to the predetermined time, the predetermined term, the predetermined number of times and the predetermined value which are used as a comparison reference in said discriminating means.

11. The passenger transportation facilities according to claims 1 to 5, wherein there is provided means for setting, to plural levels, the predetermined term, the predetermined time, the predetermined number of times or the predetermined value, and means for performing operation of said reduction or warning different in accordance with the level detected.

12. Passenger transportation facilities such as an elevator, an escalator, a moving walk and so on, comprising:

means discriminating that the time lapsed till the present time from the last inspection and maintenance time exceeds a predetermined time or that a value corresponding to said lapsed time comes to a predetermined value; and

means for adding restriction to the operation specification that said passenger transportation facilities have so that said passenger transportation facilities become safe.