

ELEVATOR CONTROL APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001]

The present invention relates to an elevator control apparatus. Particularly, it relates to an elevator control apparatus suitable for operation of an elevator during power failure.

2. Description of the Background Art

[0002]

A technique has been disclosed as follows (JP-A-2007-238316). When power failure occurs in a building in which an elevator is installed, a power source for driving the elevator is switched to a storage battery placed in a site of the building, while the elevator is operated at a lower speed than an ordinary speed to reduce the power consumption of the storage battery so that the elevator can be operated for a long time by the storage battery.

[0003]

In addition, another technique has been disclosed as follows (Japanese Patent No. 4062595). In accordance with the

residual capacity of the storage battery, registration of a call from a cage or a landing zone may be forbidden to restrict the operation of the elevator so that the storage battery can be used effectively.

SUMMARY OF THE INVENTION

[0005]

According to the technique in JP-A-2007-238316, however, it takes time to call the cage to come or for the cage to arrive at a destination floor because the elevator is switched to a low-speed running mode when the power is supplied from the storage battery due to the occurrence of power failure. Since the operation efficiency is lowered, there is a problem that inconvenience may be given to elevator users.

[0006]

In addition, the cage and a balancing weight of the elevator are hung like a can hoisting system on a sheave by use of a main rope. In such a circumstance that there is no passenger in the cage, the cage can be pulled by the balancing weight when the cage moves upward, but an electric motor needs to be rotated to pull up the balancing weight when the cage moves downward. Little power is consumed when the cage moves up with no passenger. Even when the speed of the elevator is

switched to a low speed as in JP-A-2007-238316, the power consumption cannot be suppressed on a large scale because the driving time of the electric motor increases.

[0007]

On the other hand, according to the technique in Japanese Patent No. 4062595, a call for the elevator is restricted in accordance with the residual capacity of the storage battery. It is therefore possible to suppress the power consumption, but there is a problem that inconvenience may be given to users.

[0008]

An object of the invention is to provide an elevator control apparatus by which the power capacity of a storage battery can be used effectively for the running of an elevator after the occurrence of power failure, while convenience of passengers can be prevented from being lowered extremely.

[0009]

In order to attain the foregoing object, according to the invention, there is provided an elevator control apparatus including: a storage battery which drives an elevator when power failure occurs; a power source changeover unit which changes over a power source for driving the elevator to the storage battery when the power failure is detected; a monitoring device

which monitors occurrence of abnormality of the elevator including the power failure, and sends information about the occurrence of the abnormality to at least a display device placed in a cage or each landing zone; a schedule pattern storage portion which stores a plurality of elevator rest intervals, each indicating a predetermined time for forbidding registration of any call after a response to registration of a call for the elevator is completed when the power source changeover unit changes over the power source to the storage battery; and an elevator operation calculation portion which selects one of the elevator rest intervals stored in the schedule pattern storage portion based on time data including the time when the power failure occurred. The elevator control apparatus may include: an internal clock; wherein: the time data includes a power failure occurrence time block, an office-going time block, a lunch time block, an office-leaving time block, a late night time block, and other time blocks, and the internal clock counts for the time blocks. The elevator rest intervals stored in the schedule pattern storage portion may be set for the power failure occurrence time block, the office-going time block, the lunch time block, the office-leaving time block, the other time blocks and the late night time block respectively so as

to increase in this named order. The time when the registration of any call will be able to be accepted may be displayed on the display device when the elevator is in a rest condition due to the occurrence of the power failure.

[0010]

According to the invention, the elevator operation calculation portion selects one of the rest intervals stored in the schedule pattern storage portion in accordance with the time when power failure occurred and a usage time block indicating an operating frequency of the elevator so that the elevator is operated with the selected rest interval. Thus, it is possible to supply power from the storage battery to the elevator for a long time and it is also possible to gain the understanding of users about the inconvenient operation of the elevator during the power failure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

Fig. 1 is a block diagram showing the configuration of an elevator control apparatus according to an embodiment of the invention;

Fig. 2 is a flow chart for explaining the operation of the elevator control apparatus according to the embodiment of

the invention;

Fig. 3 is a flow chart for explaining the operation of the elevator control apparatus according to the embodiment of the invention;

Fig. 4 is a time chart showing rest intervals of the elevator control apparatus according to the embodiment of the invention; and

Fig. 5 is a time chart showing an example of hourly operation of the elevator control apparatus according to the embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0012]

An embodiment of an elevator control apparatus according to the invention will be described below with reference to the drawings.

[0013]

Fig. 1 is a block diagram showing the configuration of an elevator control apparatus according to an embodiment of the invention. Figs. 2 and 3 are flow charts for explaining the operation of the elevator control apparatus according to the embodiment of the invention. Fig. 4 is a time chart showing rest intervals of the elevator control apparatus according to

the embodiment of the invention. Fig. 5 is a time chart showing an example of practical operation of the elevator control apparatus according to the embodiment of the invention.

[0014]

In Fig. 1, an elevator is generally constituted by an incoming panel 1, an elevator control panel 2, a cage 4 and a balancing weight 5. The incoming panel 1 receives power from a three-phase AC commercial power source 6 which is a commercial power source. In the elevator control panel 2, at least a not-shown elevator control apparatus is placed to perform elevator control including the control of an electric motor 3. The cage 4 and the balancing weight 5 are disposed in a hoistway 30 provided in a not-shown building. Here, the cage 4 and the balancing weight 5 are attached to the opposite ends of a plurality of wire ropes 10 like a can hoisting system. The wire ropes 10 are wound around a not-shown sheave which rotates in sync with the electric motor 3.

[0015]

In addition, power from the three-phase AC commercial power source 6 is supplied to the elevator control panel 2 through the incoming panel 1 and a power source changeover panel 15 serving as a power source changeover unit, so that the elevator

control panel 2 can make control to rotate the electric motor 3 forward and backward to move the cage 4 and the balancing weight 5 up and down by means of the wire ropes 10. Thus, not-shown passengers riding on the cage 4 can be transported.

[0016]

In addition, a landing zone button 7A for descending is provided in a landing zone on the top floor of the not-shown building. A landing zone button 7B for ascending and a landing zone button 7C for descending are provided in a landing zone on each middle floor. A landing zone button 7D for ascending is provided in a landing zone on the bottom floor. By pushing anyone of the landing zone buttons 7A to 7D, a not-shown passenger can call the cage 4 to come and ride on the cage 4.

[0017]

In addition, a display device 8 which is, for example, formed out of a liquid crystal display, is provided near the landing zone button 7A-7D on each landing zone. The display device 8 displays operation information etc., for example, displays a floor where the cage 4 is located.

[0018]

In addition, a power-failure automatic landing apparatus 9 is connected to the elevator control panel 2. When power

failure occurs so that no power is supplied from the three-phase AC commercial power source 6 to the incoming panel 1, the cage 4 of the elevator stops running. The power-failure automatic landing apparatus 9 makes control to stop the cage 4 at a nearest floor and open a not-shown door so that not-shown passengers locked in the cage 4 can be helped out. Here, the power-failure automatic landing apparatus 9 includes a not-shown storage battery. The power failure of the three-phase AC commercial power source 6 is detected by a power failure detection portion 19 of a monitoring apparatus 16 which is connected to the incoming panel 1 and which will be described later. In accordance with a signal from the monitoring apparatus 16, the elevator control panel 2 gives an instruction to start up the power-failure automatic landing apparatus 9.

[0019]

In addition, a storage battery 13 is provided in a site of the not-shown building in order to operate facilities and equipment of the building even during the power failure. The facilities and equipment include an elevator provided in a public area of the not-shown building, waterworks, lightings in corridors and stairs, an access control system provided in a public area or a private area, a security system, etc.

[0020]

The storage battery 13 is connected to a charger 12, an inverter 14 and a storage battery indicator 25. The charger 12 charges the storage battery 13 with power from the three-phase AC commercial power source 6. DC power outputted from the storage battery 13 is converted to three-phase AC power by the inverter 14. The storage battery indicator 25 detects the residual capacity of the storage battery 13 and outputs a signal. Here, the storage battery indicator 25 is connected to an input/output unit 17 of the monitoring apparatus 16.

[0021]

The power is supplied from the inverter 14, for example, to the elevator control panel 2 of the elevator which is one of the facilities and equipment of the building through the power source changeover panel 15 which changes over a power source from the three-phase AC commercial power source 6 to the storage battery 13 when power failure occurs.

[0022]

Next, the monitoring apparatus 16 detects the situation of abnormality in the facilities and equipment and reports the abnormality to a not-shown monitoring center connected remotely through a communication line. The monitoring apparatus 16 is

constituted by an input/output unit 17, a control unit 18, a power failure detection portion 19, an internal clock 20, a schedule pattern storage portion 21A, a display device screen storage portion 21B, an elevator operation confirmation portion 22, a landing zone registration information acquisition portion 23, an elevator operation calculation portion 24, and a storage battery indicator confirmation portion 26. Signals are inputted/outputted from/to the facilities and equipment through the input/output unit 17. The control unit 18 detects change of an input signal from the input/output unit 17, and performs control on the monitoring apparatus 16 in accordance with a predetermined built-in program. When the control unit 18 acquires power failure information or power resumption information from the incoming panel 1 through the input/output unit 17, the power failure detection portion 19 outputs a power source changeover instruction signal to the power source changeover panel 15 to selectively change over the power source to the three-phase AC commercial power source 6 or the storage battery 13. The internal clock 20 is connected to the control unit 18. The internal clock 20 counts time. The schedule pattern storage portion 21A is provided in a storage unit 21 connected to the control unit 18. For example, the schedule

pattern storage portion 21A stores a plurality of rest intervals of the elevator which is one of the facilities and equipment of the building in accordance with each day of the week, each hour of the day, etc. The display device screen storage portion 21B is provided in the storage unit 21. The display device screen storage portion 21B stores a plurality of display screens to be displayed on each display device 8. The elevator operation confirmation portion 22 acquires a plurality of signals indicating the condition of the elevator from the elevator control panel 2 through the input/output unit 17, and determines whether the elevator is in a rest condition, in a waiting condition, in a running condition, in a failure condition, or the like. The landing zone registration information acquisition portion 23 acquires registration information about calls from the elevator landing zone buttons 7A to 7D, from the elevator control panel 2 through the input/output unit 17. The elevator operation calculation portion 24 selects one of the rest intervals of the elevator stored in the schedule pattern storage portion 21A based on information from the power failure detection portion 19, the internal clock 20, the elevator operation confirmation portion 22, the landing zone registration information acquisition portion 23, etc. The

elevator operation calculation portion 24 outputs an instruction signal to the elevator control panel 2 through the control unit 18 and the input/output unit 17. The storage battery indicator confirmation portion 26 acquires information about the residual capacity of the storage battery 13 from the storage battery indicator 25 and selects one of the display screens suitable for the residual capacity, from the display device screen storage portion 21B. The storage battery indicator confirmation portion 26 gives each display device 8 an instruction to display the selected display screen.

[0023]

Next, the operation of the embodiment of the invention will be described with reference to Figs. 2 to 4.

[0024]

In Figs. 2 to 4, when power failure occurs so that power supply from the three-phase AC commercial power source 6 to the incoming panel 1 is disconnected, power failure information is transmitted from the incoming panel 1 to the power failure detection portion 19 through the input/output unit 17 and the control unit 18 of the monitoring apparatus 16 so that the power failure is detected (Step S1). Then, the elevator operation confirmation portion 22 receives stoppage position information

of the cage 4 of the elevator in the hoistway 30 through the elevator control panel 2, the input/output unit 17 and the control unit 18, and determines whether the cage 4 is stopping at a floor level or not (Step S2).

[0025]

When the cage 4 is not stopping at any floor level, the control unit 18 gives an instruction to the elevator control panel 2 through the input/output unit 17 so as to activate the power-failure automatic landing apparatus 9 based on information about the determination of the elevator operation confirmation portion 22. The activated power-failure automatic landing apparatus 9 gives an instruction to the elevator control panel 2 so as to land the cage 4 of the elevator at a nearest floor level, and tries to land the cage 4 at the floor level (Step S3). When the cage 4 cannot be landed at the floor level, Step S3 is repeatedly executed by the elevator control panel 2 and the power-failure automatic landing apparatus 9 so that the cage 4 can be landed at the floor level.

[0026]

When the cage 4 can be landed at the floor level in Step S2 and Step S3, the power failure detection portion 19 determines whether the three-phase AC commercial power source 6

disconnected at that time is resumed or not, based on information from the incoming panel 1 (Step S4).

[0027]

When the power supply from the three-phase AC commercial power source 6 to the incoming panel 1 is resumed and the power failure detection portion 19 can receive a power resumption signal, the power failure is instantaneous. Therefore, the power source is not switched to the storage battery, but the control unit 18 selects a screen for informing resumption from the power failure, from the screens stored in the display device screen storage portion 21B of the storage unit 21 so as to display the selected screen on each display device 8 through the input/output unit 17 and the elevator control panel 2 (Step S5). Thus, the control of the elevator by the monitoring apparatus 16 is terminated.

[0028]

On the other hand, when the power supply from the three-phase AC commercial power source 6 to the incoming panel 1 is still disconnected but the power failure detection portion 19 cannot confirm power resumption in Step S4, the control unit 18 outputs an instruction to the power source changeover panel 15 through the input/output unit 17 so as to change over the

power source from the three-phase AC commercial power source 6 to the storage battery 13 (Step S6).

[0029]

Next, when the power source is switched to the storage battery 13 to supply power through the inverter 14 so that the elevator can be operated, the control unit 18 displays a display screen which indicates that the elevator can be operated and which is stored in the display device screen storage portion 21B of the storage unit 21 on each display device 8 through the input/output unit 17 and the elevator control panel 2 (Step S7).

[0030]

Next, the power failure detection portion 19 determines again whether the three-phase AC commercial power source 6 disconnected at that time is resumed or not, based on information from the incoming panel 1 (Step S8). When the power supply from the three-phase AC commercial power source 6 to the incoming panel 1 is resumed and a power resumption signal can be received by the power failure detection portion 19, the control unit 18 outputs an instruction to the elevator control panel 2 through the input/output unit 17 so as to rest the elevator once (Step S9).

[0031]

When the elevator operation confirmation portion 22 confirms the rest of the elevator through the elevator control panel 2, the input/output unit 17 and the control unit 18, the control unit 18 outputs an instruction to the power source changeover panel 15 through the input/output unit 17 so as to change over the power source from the storage battery 13 to the three-phase AC commercial power source 6 (Step S10).

[0032]

Next, when the power source is switched to the three-phase AC commercial power source 6, the control unit 18 outputs an instruction to the elevator control panel 2 through the input/output unit 17 so as to resume the elevator from the rest condition (Step S11). The routine of processing goes to Step S5, in which the control unit 18 displays a power resumption screen stored in the display device screen storage portion 21B of the storage unit 21 on each display device 8 through the input/output unit 17 and the elevator control panel 2. Thus, the control of the elevator by the monitoring apparatus 16 is terminated.

[0033]

On the other hand, when the power supply from the

three-phase AC commercial power source 6 to the incoming panel 1 is still disconnected but the power resumption cannot be confirmed by the power failure detection portion 19 in Step S8, the power supply from the storage battery 13 to the elevator is continued and the control unit 18 outputs an instruction to the elevator through the elevator control panel 2 so as to wait till any one of the landing zone buttons 7A to 7D is pushed and the landing zone registration information acquisition portion 23 confirms the registration of the landing zone call through the elevator control panel 2, the input/output unit 17 and the control unit 18 (Step S12).

[0034]

When no landing zone button 7A to 7D is pushed, the routine of processing goes back to Step S8, in which whether power is resumed or not is confirmed. After that, Steps S8 and S12 are repeated till any one of the landing zone buttons 7A to 7D is pushed or power resumption is confirmed.

[0035]

On the other hand, when any one of the landing zone buttons 7A to 7D is pushed and the landing zone registration information acquisition portion 23 confirms the registration of the landing zone call through the elevator control panel 2, the input/output

unit 17 and the control unit 18, the control unit 18 gives an instruction to the elevator control panel 2 so as to move the cage 4 to a floor indicated by the registration of the landing zone call acquired by the landing zone registration information acquisition portion 23, allow not-shown passengers to ride on the cage 4, and transport the passengers to floors registered by not-shown destination buttons of the cage 4 pushed by the passengers respectively (Step S13).

[0036]

Next, when the operation of the elevator is terminated and the landing zone registration information acquisition portion 23 and the elevator operation confirmation portion 22 confirm through the elevator control panel 2, the input/output unit 17 and the control unit 18 that no landing zone button 7A to 7D has been pushed and the elevator has stopped and is in a waiting condition, the control unit 18 gives an instruction to the elevator control panel 2 through the input/output unit 17 so as to rest the elevator, based on information from the landing zone registration information acquisition portion 23 and the elevator operation confirmation portion 22 (Step S14). Here, in Step S13 and Step S14, when not-shown destination floor buttons and the landing zone buttons 7A to 7D are frequently

pushed, the running of the elevator increases to accelerate the consumption of the storage battery 13. Therefore, the registration of the not-shown destination floor call buttons and the landing zone buttons 7A to 7D may be allowed for a predetermined time, for example, only for three minutes.

[0037]

Next, when the elevator is rested in Step S14, the elevator operation calculation portion 24 determines whether the rest time which has elapsed since the power failure detection portion 19 detected the power failure is, for example, within 15 minutes or not, based on time information from the internal clock 20, power failure information from the power failure detection portion 19, and elevator rest information from the elevator operation confirmation portion 22 through the control unit 18 (Step S15). Although the rest time which has elapsed since the detection of the power failure is set here to be within 15 minutes in Step S15, any optimal time limit may be set as the rest time desirably.

[0038]

In addition, when the rest time which has elapsed since the power failure detection portion 19 detected the power failure is within 15 minutes in Step S15, the elevator operation

calculation portion 24 selects a rest interval with a pattern W which will be described later, for example, a rest interval of 2 minutes, based on time chart information about rest intervals of the elevator stored in the schedule pattern storage portion 21A of the storage unit 21 (Step S16).

[0039]

On the contrary, when the rest time which has elapsed since the power failure detection portion 19 detected the power failure exceeds 15 minutes in Step S15, the elevator operation calculation portion 24 determines whether the time when the elevator is rested in Step S14 belongs to a time block when the elevator is used frequently and crowded or not, based on the time chart information (which will be described later) about the rest intervals of the elevator stored in the schedule pattern storage portion 21A (Step S17).

[0040]

Next, when the time when the elevator is rested belongs to a time block when the elevator is crowded in Step S17, the elevator operation calculation portion 24 selects a rest interval with a pattern X which will be described later, for example, a rest interval of 5 minutes, based on the time chart information (which will be described later) about the rest

intervals of the elevator stored in the schedule pattern storage portion 21A of the storage unit 21 (Step S18).

[0041]

On the other hand, when the time when the elevator is rested does not belong to any time block when the elevator is crowded in Step S17, the elevator operation calculation portion 24 determines whether the time when the elevator is rested in Step S14 belongs to a time block when the elevator is used moderately or not, with reference to the time chart information (which will be described later) about the rest intervals of the elevator stored in the schedule pattern storage portion 21A (Step S19).

[0042]

Next, when the time when the elevator is rested belongs to a time block when the elevator is used moderately in Step S19, the elevator operation calculation portion 24 selects a rest interval with a pattern Y which will be described later, for example, a rest interval of 10 minutes, based on the time chart information (which will be described later) about the rest intervals of the elevator stored in the schedule pattern storage portion 21A of the storage unit 21 (Step S20).

[0043]

On the other hand, when the time when the elevator is rested does not belong to a time block when the elevator is used moderately, the elevator operation calculation portion 24 concludes that the time when the elevator is rested belongs to a quiet time block when the elevator is used infrequently and selects a rest interval with a pattern Z, for example, a rest interval of 15 minutes, based on the time chart information (which will be described later) about the rest intervals of the elevator stored in the schedule pattern storage portion 21A (Step S21).

[0044]

Here, the pattern W, the pattern X, the pattern Y and the pattern Z are information stored in the schedule pattern storage portion 21A and each indicating an interval with which the elevator will be rested between when the elevator completes a response to a call for the cage and when the elevator makes a response to the next call.

[0045]

The pattern W is a pattern in which the rest time is set to be the shortest in order to suppress the frequency of operation to deal with sudden usage of the elevator immediately after the occurrence of the power failure and in order to allow

passengers to recognize that the elevator is operated by the storage battery. In the pattern W, the rest time is set as two minutes in 15 minutes after the occurrence of the power failure.

[0046]

The pattern X is a pattern in which the rest time is set to be longer than that in the pattern W in order to prevent the convenience from being extremely lowered due to the shutdown of the elevator in a time block such as an office-going time block, a lunch time block, an office-leaving time block, etc. when the elevator is heretofore crowded. In the pattern X, the rest time is set as 5 minutes.

[0047]

The pattern Y is a pattern provided in a time block in the daytime when the elevator is not crowded but the elevator is used moderately. In the pattern Y, the rest time is set as 10 minutes, which is longer than that in the pattern X.

[0048]

The pattern Z is a pattern set in a quiet time block at night, late at night or the like when the elevator is used infrequently so that even if the rest time of the elevator is set to be long, the influence on passengers will be small.

Therefore, in the pattern Z, the rest time is set as 15 minutes, which is the longest.

[0049]

Here, the time blocks for the pattern W, the pattern X, the pattern Y and the pattern Z may be changed desirably in accordance with the usage frequency of each elevator or changed and set in consideration with each day of the week and so on.

[0050]

Next, the elevator operation calculation portion 24 acquires current time from the internal clock 20 and calculates the operation start time when the operation of the elevator can be started, based on the rest time of the elevator selected in Step S14 and the result of the pattern W, the pattern X, the pattern Y or the pattern Z extracted in Step S16, Step S18, Step S20 or Step 21 (Step S22).

[0051]

Next, the control unit 18 pastes the operation start time calculated in Step S22 on a not-shown display screen stored in the display device screen storage portion 21B and displays the operation start time on each display device 8 through the input/output unit 17 and the elevator control panel 2 (Step S23).

[0052]

Next, the power failure detection portion 19 determines again whether the three-phase AC commercial power source 6 is resumed or not, based on information from the incoming panel 1 (Step S24). When the power supply from the three-phase AC commercial power source 6 to the incoming panel 1 is resumed and the power failure detection portion 19 can receive a power resumption signal, the routine of processing moves to Step S10.

[0053]

On the other hand, when the power supply from the three-phase AC commercial power source 6 to the incoming panel 1 is still disconnected but the power failure detection portion 19 cannot confirm the power resumption in Step S24, the elevator operation calculation portion 24 determines whether the operation start time of the elevator calculated in Step S22 has passed or not, based on time information from the internal clock 20 (Step S25).

[0054]

When the operation start time of the elevator has not passed in Step S25, the routine of processing goes back to Step S24, in order to confirm power resumption. Here, Step S24 and S25 are repeated till the operation start time of the elevator

has passed or power resumption is confirmed.

[0055]

On the other hand, when the operation start time of the elevator has passed in Step S25, the control unit 18 outputs an instruction to the elevator control panel 2 through the input/output unit 17 so as to bring the elevator rested in Step S14 back to its normal operation, based on information from the elevator operation calculation portion 24 (Step S26). When the elevator is brought back to its normal operation and put into a waiting condition, the routine of processing goes back to Step S7. After that, the flow chart is continued till power resumption can be confirmed by the power failure detection portion 19.

[0056]

Next, an example of elevator operation at the time of power failure will be described hourly with reference to Fig. 5.

[0057]

First, when power failure occurs at 10:00, the power source is switched to the storage battery 13, and the elevator waits till any one of the landing zone buttons 7A to 7D is pushed.

[0058]

When any one of the landing zone buttons 7A to 7D is pushed to register a call from a landing zone at 10:10, the time which has passed since the power failure occurred is within 15 minutes. Therefore, the elevator is operated in accordance with the pattern W based on the time chart information about the rest interval of the elevator. After the elevator is operated and stopped in response to the registration of the call from the landing zone, the elevator is rested for two minutes.

[0059]

Next, when any one of the landing zone buttons 7A to 7D is pushed to register a call from a landing zone at 11:07, the elevator is operated in accordance with the pattern Y based on the time chart information about the rest interval of the elevator. After the elevator is operated and stopped in response to the registration of the call from the landing zone, the elevator is rested for ten minutes.

[0060]

Next, when a call from a landing zone is registered at 12:13, the elevator is operated in accordance with the pattern X because 12:13 belongs to a crowded time block according to the time chart information about the rest interval of the elevator. After the elevator is operated and stopped in

response to the registration of the call from the landing zone, the elevator is rested for five minutes.

[0061]

Next, even when a call from a landing zone is registered in five minutes from 12:13 to 12:18 in which the elevator is rested, the registration of the call is not accepted. The elevator can be operated on and after 12:18 in which the rest time is terminated. Here, 12:18 still belongs to the crowded time block according to the time chart information about the rest interval of the elevator. Therefore, the elevator is operated in accordance with the pattern X. After the elevator is operated and stopped in response to the registration of the call from the landing zone, the elevator is rested for five minutes.

[0062]

Next, when a call from a landing zone is registered at 16:20, the elevator is operated with the pattern Y because 16:20 belongs to a time block when the elevator is used moderately, based on the time chart information about the rest interval of the elevator. After the elevator is operated and stopped in response to the registration of the call from the landing zone, the elevator is rested for ten minutes.

[0063]

Next, when a call from a landing zone is registered at 22:07, the elevator is operated in accordance with the pattern Z because 22:07 belongs to a quiet time block based on the time chart information about the rest interval of the elevator. After the elevator is operated and stopped in response to the registration of the call from the landing zone, the elevator is rested for 15 minutes.

[0064]

When power is then resumed at 24:00, the power source is switched from the storage battery 13 to the three-phase AC commercial power source 6, and the elevator is brought back to its normal operation.

[0065]

According to the embodiment, when power failure occurs, the operation of the elevator using power from the storage battery 13 is provided with rest time after the response to a call so that the power capacity of the storage battery can be used effectively.

[0066]

In addition, the rest time can be changed in accordance with the usage frequency of the elevator. Thus, inconvenience

is not comparatively given to passengers.

[0067]

The embodiment has been described on the determination in Step S15 as to whether the time which has passed since the power failure occurred is within 15 minutes or not. However, determination may be made on the total time for which the elevator has run with the power of the storage battery 13 after the power failure.

[0068]

Alternatively, determination in Step S15 may be made as to the percentage of the residual power capacity of the storage battery 13 based on information from the storage battery indicator 25 or the storage battery indicator confirmation portion 26.

What is claimed is:

1. An elevator control apparatus comprising:

a storage battery which drives an elevator when power failure occurs;

a power source changeover unit which changes over a power source for driving the elevator to the storage battery when the power failure is detected;

a monitoring device which monitors occurrence of abnormality of the elevator including the power failure, and sends information about the occurrence of the abnormality to at least a display device placed in a cage or each landing zone;

a schedule pattern storage portion which stores a plurality of elevator rest intervals, each indicating a predetermined time for forbidding registration of any call after a response to registration of a call for the elevator is completed when the power source changeover unit changes over the power source to the storage battery; and

an elevator operation calculation portion which selects one of the elevator rest intervals stored in the schedule pattern storage portion based on time data including the time when the power failure occurred.

2. An elevator control apparatus according to Claim 1,

further comprising:

an internal clock; wherein:

the time data includes a power failure occurrence time block, an office-going time block, a lunch time block, an office-leaving time block, a late night time block, and other time blocks, and the internal clock counts for the time blocks.

3. An elevator control apparatus according to Claim 1 and Claim 2, wherein:

the elevator rest intervals stored in the schedule pattern storage portion is set for the power failure occurrence time block, the office-going time block, the lunch time block, the office-leaving time block, the other time blocks and the late night time block respectively so as to increase in this named order.

4. An elevator control apparatus according to any one of Claims 1 through 3, wherein:

the time when the registration of any call will be able to be accepted is displayed on the display device when the elevator is in a rest condition due to the occurrence of the power failure.