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(73) Proprietor: **Hitachi, Ltd.**
Chiyoda-ku,
Tokyo 100-8010 (JP)

(72) Inventors:

- **AYANO, Hideki,**
Hitachi Research Laboratory
Hitachi-shi,
Ibaraki 319-1292 (JP)
- **INABA, Hiromi,**
Hitachi Research Laboratory
Hitachi-shi,
Ibaraki 319-1292 (JP)
- **YAMATO, Ikuo,**
Hitachi Research Laboratory
Hitachi-shi,
Ibaraki 319-1292 (JP)
- **HOKARI, Sadao**
Hitachinaka-shi, Ibaraki 312-0033 (JP)
- **FUJINO, Atsuya**
Hitachinaka-shi, Ibaraki 312-0033 (JP)
- **MORI, Kazuhisa,**
Hitachi Research Laboratory
Hitachi-shi,
Ibaraki 319-1292 (JP)
- **NAGURA, Hirokazu,**
Hitachi Research Laboratory
Hitachi-shi,
Ibaraki 319-1292 (JP)

• **YAMAMOTO, Kouki,**
Hitachi Research Laboratory
Hitachi-shi,
Ibaraki 319-1292 (JP)

(74) Representative: **Strehl Schübel-Hopf & Partner**
Maximilianstrasse 54
80538 München (DE)

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EP 1 354 837 B1

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Description

TECHNICAL FIELD

[0001] The present invention relates to an elevator having batteries mounted in a cage or a counter weight.

BACKGROUND ART

[0002] An example of a conventional technique is disclosed in JP-A-57-121568.

[0003] With this conventional technique, a linear motor, an inverter, batteries, and a charger are mounted in a counter weight. When the counter weight stops at a bottom position, power is supplied to the linear motor via the charger, the batteries, and the inverter.

[0004] However, depending on the state of utilization of the elevator, the counter weight may not stop at the bottom position. In this case, no power is supplied to the batteries mounted in the counter weight.

[0005] Although not in the field of elevators, JP-A-7-8428 describes an automotive cleaning robot that moves to a charging device for charging once the batteries for the cleaning robot have been exhausted.

[0006] Conventional techniques similar to that in JP-A-7-8428 are disclosed in JP-A-7-231512,

[0007] JP-A-48131, JP-A-883125, and US-A-4 402 386.

DISCLOSURE OF THE INVENTION

[0008] The present invention is defined by the features of independent claim 1. Further embodiments are defined in the dependent claims.

[0009] Thus, the elevator can be operated without exhausting the batteries.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIG. 1 is a diagram showing a first embodiment of the present invention.

FIG. 2 is a diagram showing in detail a controller of a machine 2A shown in FIG. 1.

FIG. 3 is a flow chart showing the flow of processing executed by the controller for the machine.

FIG. 4 is a flow chart showing the flow of processing executed by the controller for the machine.

FIG. 5 is a block diagram of a group supervisory control system 1.

FIG. 6 is a flow chart showing the flow of processing executed by the group supervisory control system 1.

FIG. 7 is a diagram showing a display form of a display apparatus 10.

FIG. 8 is a diagram showing a second embodiment of the present invention.

FIG. 9 is a diagram showing a third embodiment of

the present invention.

FIG. 10 is a process flow chart of the third embodiment.

FIG. 11 is a diagram showing another embodiment of a weight side power supply section.

FIG. 12 is a diagram showing another embodiment of a cage side power supply section.

FIG. 13 is a diagram showing another example of a connection method for a charger.

BEST MODE FOR CARRYING OUT THE INVENTION

[0011] FIG. 1 is a diagram showing a first embodiment of the present invention.

[0012] An elevator system of the present embodiment is constituted by a group supervisory control system 1, controllers for machines 2A to 2C acting as slaves of the group supervisory control system, and machines #1 to #3 3A to 3C controlled by these controllers for the machines, respectively.

[0013] The controllers for the machines 2A to 2C transmit information on the machines 3A to 3C, respectively, to the group supervisory control system

1. The group supervisory control system 1 controls the controllers for the machines 2A to 2C on the basis of the transmitted information.

[0014] Each of the machines is provided with a charging device composed of commercial power supplies 41 to 44, chargers 51 to 54 that convert power from the corresponding commercial power supplies 41 to 44 into direct or alternating currents, control circuits 61 to 64 that control the corresponding chargers 51 to 54, power supplying units 71 to 74, and position sensors 81 to 84, all components being located closer to an elevator shaft.

[0015] The position sensors 81 to 84 detect whether or not a moving member (a counter weight 11 or a cage 12) is at a predetermined position, i.e. the position at which it can be charged. When the moving member is at the predetermined position, the position sensors 81 to 84 output a charging start signals to the corresponding control circuits 61 to 64. Upon receiving these signals, the control circuits 61 to 64 control the corresponding chargers 51 to 54 to supply power to the moving member through the corresponding power supplying units 71 to 74.

[0016] When the position sensors 81 to 84 detect that the moving member is not at the predetermined position, the control circuits 61 to 64 stop the function of the corresponding chargers 51 to 54.

[0017] The charging devices provided in a weight side elevator shaft are arranged at a reference floor and the lowest floor, respectively. The charging devices provided in a cage side elevating shaft are arranged at the uppermost floor and the reference floor, respectively.

[0018] At each floor, a hall call button 9 and a display apparatus 10 are provided on its hall side of the system.

The display apparatus 10 displays the conditions of battery 111 in the counter weight 11 or battery 121 in the cage 12.

[0019] In each of the machines 3A to 3C, the counter weight 11 and the cage 12 are suspended through the pulley 13.

[0020] The counter weight 11 is provided with the battery 111, an inverter 112 connected to the battery 111, a motor 113 connected to an AC side of the inverter 112 and driven by the inverter 112, a power receiving unit 114, a battery condition detecting device 115 for detecting the amount of power remaining in the battery 111, and a signal transmitting and receiving device 116. A pulley 117 is connected to the motor 113 so that the motor 113 drives and rotates the pulley 117 to drive the counter weight 11 up and down. The inverter 112 is controlled by a control signal outputted by the controller for the machine 2A. The signal transmitting and receiving device 115 receives this control signal and then outputs it to the inverter 112 by radio.

[0021] The power supplying units 71 and 72 and power receiving units 114 in the charging device are composed of metal of a high dielectric constant. The power supplying units 71 and 72 and the power receiving units 114 are directly contacted with each other to supply power from the charging device to the battery 111 via the power receiving units 114. In this case, if the power supplied by the charging device is AC power, a rectifier must be provided between the power receiving unit 114 and the battery 111.

[0022] A value detected by the battery condition detecting device 115 is transmitted to the controller for the machine 2A via the signal transmitting and receiving device 116. The controller for the machine 2A determines whether or not the amount of power remaining in the battery 111 is equal to or less than a reference value. If the amount is equal to or less than the reference value, the controller for the machine 2A outputs an operation command that automatically activates a charging operation mode. In this case, the charging operation mode is such that when the counter weight 11 stops at a floor where the charging device is installed, a "call" is generated for the floor where the cage 12 stops.

[0023] This call may be either a cage call or a hall call.

[0024] The above described reference value is set to be larger than the amount of power sufficient to move the counter weight 11 up to the charging device installed floor. This enables the counter weight 11 to be moved to the charging device installed floor before the battery 111 is exhausted.

[0025] Alternatively, the reference value may be set so that the counter weight 11 can reciprocate once between the uppermost floor and the lowest floor and so that the value is larger than the amount of power sufficient to move the counter weight 11 up to the charging device. In this case, even when the amount of power remaining in the batteries is smaller than the reference value if any passenger is in the cage, the counter weight 11 can be

moved to the passenger's desired floor. Further, the counter weight 11 can be moved to the charging device installed floor before the battery 111 is exhausted.

[0026] The amount of power remaining in the battery 111 can be detected by measuring the voltage at the battery 111 or a current flowing into and out of the battery.

[0027] The cage 12 is provided with battery 121, an inverter 122 connected to the battery 121, an air conditioner 1231 connected to the inverter 122, an illumination (lighting) 1232, an operation panel 1233, a power receiving unit 123, a battery condition detecting device 125 for detecting the amount of power remaining in the battery 121, and a signal transmitting and receiving device 116.

[0028] The inverter 122 is controlled by a control signal outputted by the controller for the machine 2A. The signal transmitting and receiving device 125 receives this control signal and then outputs it to the inverter 122 by radio.

[0029] The power supplying units 73 and 74 and power receiving unit 124 in the charging device are composed of metal of a high dielectric constant. The power supplying units 73 and 74 and the power receiving units 124 are directly contacted with each other to supply power from the charging device to the battery 121 via the power receiving units 124. In this case, if the power supplied by the charging device is AC power, a rectifier must be provided between the power receiving unit 124 and the battery 121.

[0030] A value detected by the battery condition detecting device 125 is transmitted to the controller for the machine 2A via the signal transmitting and receiving device 126. The controller for the machine 2A determines whether or not the amount of power remaining in the battery 121 is equal to or less than a reference value. If the amount is equal to or less than the reference value, the controller for the machine 2A outputs an operation command that automatically activates a charging operation mode. In this case, the charging operation mode is such that a "call" is generated for the floor where the charging device that supplies power to the cage 12 stops is installed.

[0031] This "call" may be either a cage call or a hall call.

[0032] The above described reference value can be set as in the case with the above described counter weight.

[0033] Further, the amount of power remaining in the battery 121 can be detected as in the case with the above described counter weight.

[0034] FIG. 2 is a diagram showing the details of the controller for the machine 2A shown in FIG. 1.

[0035] The configuration shown in this figure will be described with reference to the flow charts shown in Figs. 3 and 4.

[0036] The battery condition detecting devices 115 and 126 mounted in the counter weight 11 and the cage 12, respectively, detect the amount of power remaining in the batteries (step S1). Information on the battery remaining power is transmitted to the controller for the machine 2A. The transmitted battery remaining power infor-

mation is inputted to a battery control display circuit 23 and a charge/display/replacement request generating section 21. The battery control display circuit 23 displays the detected battery remaining power on the display 10 (steps S2 and S3). The charge/display/replacement request generating section 21 compares the detected battery remaining power with a reference battery remaining power stored in a set value data storing section 22. If the detected battery remaining power is less than the reference battery remaining power, a display request and a charge request are generated. If the detected battery remaining power is greater than the reference battery remaining power, the procedure returns to step S1 (steps S4, S5, and S6). The above described display request is inputted to the battery condition display circuit 23. The circuit 23 indicates on the display 10 that "charge required" (step S3).

[0037] When the above described charge request is generated, a "call" for the charge floor is generated (step S11).

[0038] For the counter weight, the charge floor is the one at which the cage is stopped when the counter weight stops at the charging device installed floor. For the cage, the charge floor is the one at which the charging device is installed.

[0039] In this case, the charge/display/replacement request generating section 21 counts the number of times the charge request is generated (step S7). When this charge request number is equal to or larger than a reference charge number stored as reference value data, a request is generated indicating that the batteries 111 and 121 must be replaced with new ones (steps S8 and S9). This replacement request is transmitted to a maintenance company (step S10).

[0040] The "call" generated in step S11 is inputted to a speed command generating section 24. The section 24 outputs a command to the inverter 112, mounted in the counter weight 11, the command indicating that the counter weight must be moved to the charge floor at a low speed (step S12). Upon receiving this command, the inverter 112 drives the motor 113 to move the elevator to the power supply floor at a low speed.

[0041] When the elevator reaches the charge floor, the power supplying device supplies power to the counter weight 11 or the cage 12 (step S14). The charge amount is calculated by a charge amount calculating circuit 27 on the basis of data outputted by the control circuits 61 to 64 (step S15). The calculated charge amount is inputted to a free car operation for standby or reference floor return command generating section 26. Upon determining that the counter weight 11 or the cage 12 has been completely charged, the command generating section 26 outputs a free car operation for standby or reference floor return command to the speed command generating section 24 (step S16). On the basis of this command, the speed command generating section 24 transmits a command to the inverter 112 to bring the elevator into a free car operation for standby condition or return to the refer-

ence floor.

[0042] Now, with reference to FIG. 4, description will be given of a process flow executed when a user pushes a hall call button.

[0043] When the user pushes the hall call (step S18), an operation determining circuit 25 determines whether or not a charging operation is being performed (step S19). The charge amount has been inputted to the operation determining circuit 25 by the charge amount calculating circuits 61 to 64. If a charging operation is not being performed, the operation determining circuit 25 generates a "call" for the requesting floor (step S21). On the basis of this "call", the speed command generating section 24 transmits a command to the inverter 112 to move the elevator to the requesting floor (step S22).

[0044] In step S19, when the operation determining circuit 25 determines that a charging operation is being performed, it determines whether or not the elevator can be operated on the basis of charge information obtained from the charge amount calculating circuit 27 and information on the floor where the "call" has been generated. If the elevator can be operated, a "call" for the desired call is generated (step S21). The procedure shifts to the above described step S22.

[0045] When the operation is not possible, the operation determining circuit 25 gives a command to the battery condition display circuit 23 to indicate on the display 10 that the "charging in progress" (step S23).

[0046] Now, the group supervisory control system 1 will be described.

[0047] FIG. 5 is a block diagram of the group supervisory control system 1.

[0048] The group supervisory control system 1 is constituted by a hall call collecting section 52 that collects information from the hall call buttons, a battery information collecting section 51 that collects battery information through respective machines, and a cage information collecting section that collects cage information on cage calls and cage positions through the respective machines.

[0049] An assigning section 54 selects a cage for service on the basis of information collected by the battery information collecting section 51, hall call collecting section, and cage information collecting section. For example, the assigning section 54 provides control such that a higher priority is given to the cage of a machine with a larger amount of power remaining in the batteries than to the cage of a machine with a smaller amount of power remaining in the batteries.

[0050] Further, the group supervisory control system 1 in the present embodiment is constituted by a charge mode predicting section 55, a first reference value storing section 56, a second reference value storing section 57, a charge/display request generating section 58, and a display circuit 59.

[0051] A first reference value stored in the first reference value storing section is the same data as that of the reference value stored in the set value storing section

22, shown in FIG. 2. If the battery remaining power is determined to be less than the reference value, it is judged that the batteries must be charged. A second reference value stored in the second reference value storing section 57 is larger than the first reference value.

[0052] The charge mode predicting section compares battery remaining power information inputted by the battery remaining power collecting section 51 with the first reference value stored in the first reference value storing section 56 and the second reference value stored in the second reference value storing section 57. The charge mode predicting section thus determines whether or not the machines will enter the charge mode soon.

[0053] The result of this determination is inputted to the charge/display request generating section 58. When it is predicted that a plurality of machines will enter the charge mode soon, the charge/display request generating section 58 generates a "call" for the charge floor. The charge/display request generating section 58 then transmits this signal to the controller for one of the plurality of machines that will enter the charge mode soon.

[0054] Further, on the basis of a signal from the charge/display circuit 59, the display indicates that the elevator will enter the charge mode soon. Alternatively, the display indicates that the elevator just enters the charge mode.

[0055] Now, with reference to FIG. 6, description will be given of a process flow executed by the group supervisory control system 1.

[0056] The battery remaining power collecting section 51, the hall call collecting section 52, and the cage information collecting section 53 collect battery information, hall call information, and cage information (step S61). Next, it is determined whether or not there is any "hall call". If there are no "hall calls", the procedure proceeds to step S61. If there is any "hall call", the procedure proceeds to step S63. The assigning section 54 selects the optimum machine for service in response to the corresponding "hall call" on the basis of the information collected in step S61 (step S63).

[0057] In step S64, it is determined whether or not the battery remaining power in any machine is equal to or less than the first reference value. That is, it is determined whether or not a charging operation must be started.

[0058] If it is determined that the battery remaining power in any machine is equal to or less than the first reference value, this machine starts a charging operation. This charging operation is performed by the charge/display request generating section 58 of the group supervisory control system 1 by generating a "call" and transmitting this "call" signal to the speed command generating section of the controller of this machine (step S67).

[0059] On the other hand, if it is determined that the battery remaining power in all machines is greater than the first reference value, the procedure shifts to step S65.

[0060] In step S65, it is determined whether or not the battery remaining power in a plurality of machines is equal to or greater than the first reference value and equal

to and less than the second reference value. That is, it is determined whether or not there is any possibility of starting to charge a plurality of machines at the same time (step S65).

[0061] If the battery remaining power in a plurality of machines is equal to or greater than the first reference value and equal to and less than the second reference value, one of the machines starts to be charged so as to be avoid charging the plurality of machines at the same time. This charging operation is performed by the charge/display request generating section 58 of the group supervisory control system 1 by generating a "call" and transmitting this "call" signal to the speed command generating section of the controller of this machine (step S66).

[0062] If the battery remaining power in a plurality of machines is equal to or greater than the first reference value and greater than the second reference value, the procedure shifts to step S61.

[0063] Now, description will be given of displays according to the present embodiment.

[0064] FIG. 7 is a diagram showing an example of display on the display apparatus 10 according to the present embodiment.

[0065] FIG. 7(a) is a detailed diagram of the floor section shown in FIG. 1. The floor section is constituted by a display apparatus 71 showing a synchronous floor operating direction and the display apparatus 10 showing the battery condition, both provided above an elevator door 72.

[0066] The display apparatus 10 shows information on the batteries. The signal transmitting and receiving devices 116 and 126 input battery information to the controller for the machine. On the basis of the inputted signal, the battery condition display circuit 23 of the controller for the machine shows the battery conditions on the display apparatus 10.

[0067] On the other hand, when the batteries are being charged, the display apparatus 10 displays a sign meaning that a charging operation is being performed, e.g. "adjustment in progress", "charging in progress", or "setting-up in progress", as shown in FIG. 7(b).

[0068] If the charge/display/replacement request generating section 21, shown in FIG. 2, determines that battery replacement is required (step S9, shown in FIG. 3), then the battery condition display circuit 23 causes the display apparatus 10 to display such a sign that urges the battery replacement, e.g. "batteries must be replaced" or "replace batteries", as shown in FIG. 7(c).

[0069] If the group supervisory control system 1 determines that the battery remaining power in a plurality of machines is equal to or greater than the first reference value and equal to or less than the second reference value, then the display circuit 59 controls the display apparatus 10 to display a sign meaning that a charging operation will be started soon, such as e.g. "Near charging" or "Changing about to start", as shown in FIG. 7(d).

[0070] If the group supervisory control system deter-

mines that the battery remaining power is equal to or less than the first reference value, the display apparatus 10 displays the sign shown in FIG. 7(b).

[0071] In this regard, the display apparatus 71 may display the signs shown in FIGS. 7(a) to 7(d).

[0072] The displaying of the signs such as those described above serves to eliminate users' uneasiness or dissatisfaction. Further, the display of battery replacement information is useful for maintenance. Effects similar to those described above are obtained by integrating the battery condition display apparatus with a synchronous floor or an operating direction display apparatus or with the hall call button device.

[0073] This display of the signs allows users to recognize that a charging operation is being performed, thus making them relieved.

[0074] Further, during charging, the displays of the display apparatus 71 or 10, showing a synchronous floor or operating direction, can be turned off to cause the users to recognize that the elevator is unavailable owing to the charging. Furthermore, the signs shown in FIG. 7 may be adapted to react only when a user pushes the hall call button. In this case, power consumption can be saved. Furthermore, to provide for emergency, the signs may be displayed on the display apparatus in the cage or not only the display but also sound transmission means may be used together.

[0075] As described above, the first embodiment of the present invention is characterized in that when the battery remaining power is equal to or less than the reference value, a "call" for the power supply floor is generated.

[0076] Here, the "call" for the elevator is normally generated by an elevator user; it is a reservation of operation that specifies the floor on which the user is present, the reservation also indicating the direction in which the elevator moves after the user has gotten in the elevator as well as the floor at which the user desires to stop. That is, even if a "call" for a specified floor is generated in the midst of the elevator running in response to a "call" for a different floor, the elevator does not immediately move to the specified floor but moves thereto after finishing moving to the different floor.

[0077] In the present embodiment, a "call" different from the one generated by the user is generated owing to the battery remaining power. Accordingly, compared to the forced movement of the elevator to the power supply floor, the elevator can be moved to the power supply floor without troubling the user.

[0078] Further, in the present embodiment, the batteries are used as the power supply in the cage and as the power supply for the counter weight. Furthermore, power is supplied to the batteries at the specified floor. This eliminates the need for a power supply tail cord, thus reducing the weight of the system and suppressing the adverse effects of vibration of the tail cord. Moreover, this helps a glazed elevator shaft to appear beautiful.

[0079] Further, according to the present embodiment, the position sensor is provided, and power is supplied

based on this sensor. Consequently, power supply is ensured.

[0080] Furthermore, according to the present embodiment, the charging device is arranged at the reference floor. This increases the number of opportunities to supply power to prevent the batteries from being exhausted. Moreover, rapid charging or discharging of the batteries is prevented to suppress a decrease in their lifetime.

[0081] Further, in the present embodiment, the charging device for supplying power to the counter weight is arranged at a lower floor, while the charging device for supplying power to the cage is provided at an upper floor. Preferably, the charging device for supplying power to the counter weight is arranged at the lowest floor, while the charging device for supplying power to the cage is provided at the uppermost floor.

[0082] This is because, in general, if some passengers or a small number of passengers are in the cage, smaller driving force is required for movement when the cage is moved to the upper floor and the counter weight is moved to the lower floor. Further, the number of opportunities to operate the elevator with only a small number of passengers is larger than that to operate the jam-packed elevator.

[0083] That is, the arrangement of the charging devices such as that in the present embodiment serves to reduce the power consumption during a charging operation. This reduces the possibility of exhausting the batteries.

[0084] Further, in the present embodiment, the display shows the "battery remaining power". Accordingly, a superintendent of a building can check the conditions of the batteries for each machine. Furthermore, the display apparatus displays the sign "charging in progress". This prevents users from fearing that the elevator is defective even when it is not activated.

[0085] Moreover, according to the present embodiment, if a plurality of elevators are about to be charged, one of them is allowed to start a charging operation before the others. It is possible to avoid allowing the plurality of elevators to start a charging operation at the same time. This prevents a marked decrease in conveyance efficiency caused by simultaneous charging.

[0086] Now, a second embodiment of the present embodiment will be described.

[0087] FIG. 8 shows the second embodiment of the present invention.

[0088] In the first embodiment, the amounts of power remaining in the batteries 111 and 121 in the counter weight 11 and cage 12, respectively, are directly detected. However, in the second embodiment, the conditions of the batteries are estimated from operation data.

[0089] The second embodiment is arranged such that the first embodiment is added with an operation history storing section 81 and a battery condition calculating section 82.

[0090] The operation history storing section 81 obtains and records data on the number of operations and oper-

ation distances from the speed command generating section 24. Further, the operation history storing section 81 obtains information on loadage from the cage 12 and stores this information.

[0091] The battery condition calculating section 82 estimates the battery remaining power from the above described operation number, operation distance, and loadage. For example, the estimated battery remaining power is calculated by $K1 \times (\text{operation number}) + K2 \times (\text{operation distance}) + K3 \times (\text{loadage})$ ($K1$, $K2$, $K3$: weighting factors).

[0092] The succeeding process is similar to that in the above described first embodiment, the process including a charging operation performed when the estimated battery remaining power is equal to or less than the reference value.

[0093] According to the present embodiment, the battery remaining power is estimated on the basis of operation data. Consequently, a charging operation can be performed as required even when batteries such as nickel hydrogen cells which have a small voltage variation range are used.

[0094] Further, in the case where the amount of power remaining in the batteries is detected and the detected value is transmitted by radio to the controller for the machine, the counter weight or the cage is moved to increase or reduce the wireless distance to the controller for the machine. Thus, when the wireless distance increases, the controller for the machine may not determine the battery remaining power. This makes it impossible to perform a charging operation.

[0095] In the present embodiment, the battery remaining power is estimated on the basis of the operation data. Consequently, the above described problems do not occur, thus enabling a charging operation to be performed as required.

[0096] Now, a third embodiment of the present invention will be described.

[0097] FIG. 9 is a diagram showing the third embodiment.

[0098] In the first and second embodiments, the battery remaining power is detected or estimated. However, in the third embodiment, a charging operation is started at a predetermined time.

[0099] The third embodiment is arranged such that the first embodiment is added with an operation pattern database 91, an internal clock 92, and a charge amount commanding section 93.

[0100] This embodiment is applied if daily operation patterns are already known. For example, in office buildings, when employees come to and leave the office in the morning and evening, respectively, as well as during a lunch break, the rate of operation is high. However, the rate of operation is very low at night. Further, the rate of operation on Sundays is much lower than that on the other days of the week. Furthermore, the rate of operation in summer is higher than that in the other seasons.

[0101] These characteristics are stored as a data base

in an operation pattern database 91. That is, the operation pattern database 91 stores the operation pattern in which a charging operation is started during time zones before and after the employees come to and leave the office in the morning and evening, respectively, during a time zone before the lunch break, and during the nighttime.

[0102] The operation pattern database 91 also stores an operation pattern including a rapid charge mode in which a large charge current is used for charging in order to give top priority to the prevention of exhaustion of the batteries in the daytime when the rate of elevator operation is high and a nighttime (low-speed) charge mode in which a small charge current is used for charging in order to extend the lifetime of the batteries in the nighttime when the rate of operation is low.

[0103] The charge/display/replacement request generating section 21 generates a "call" as in the case with the above described embodiment, on the basis of the operation pattern from the operation pattern database 91 and the time inputted by the internal clock 92.

[0104] The charge amount commanding section 93 determines the charge amount, the magnitude of a current for charging, and a charge duration on the basis of the operation pattern from the operation pattern database 91 and the time inputted by the internal clock 92. The charge amount commanding section 93 then transmits the determined items to the control circuit 61. The control circuit 61 then controls charging on the basis of the transmitted signal.

[0105] Now, with reference to FIG. 10, description will be given of flow of a process according to the third embodiment of the present invention.

[0106] FIG. 10 is a process flow chart of the third embodiment.

[0107] Steps S3 and S5 to S17 are similar to those in the first embodiment.

[0108] In step S101, it is determined whether or not a set time has been reached. That is, it is determined whether or not a time to start a charging operation has been reached. This determination is made by the charge/display/replacement request generating section 21 on the basis of the operation pattern from the operation pattern database 91 and the time inputted by the internal clock 92 as previously described.

[0109] If the set time has not been reached, the procedure shifts to step S101 again.

[0110] If the set time has been reached, the procedure shifts to steps S5, S6, and S102.

[0111] The flow of the process succeeding steps S5 and S6 is similar to that in the above described first embodiment (the flow shown in FIG. 3). Its description is thus omitted.

[0112] In step S102, a command is given indicating a charge form or pattern. That is, the charge amount commanding section 93 determines the charge amount, the magnitude of a current for charging, and the charge duration on the basis of the operation pattern from the op-

eration pattern database 91 and the time inputted by the internal clock 92. The charge amount commanding section 93 then transmits the determined items to the control circuit 61.

[0113] According to the present embodiment, the current for charging is reduced depending on the utilization of the elevator. Therefore, the lifetime of the batteries can be extended.

[0114] Now, description will be given of another embodiment of the weight side power supply section, shown in FIG. 1.

[0115] FIG. 11 is a diagram showing another embodiment of the weight side power supply section.

[0116] In this embodiment, a non-contact power supply method is used.

[0117] The AC power supply 41, the charger 51, the control circuit 61, the position sensor 81, the battery 111, the inverter 112, the motor 113, the battery condition detecting device 115, and the signal transmitting and receiving device 116 are similar to those shown in FIG. 1.

[0118] In the present embodiment, a power supplying unit for non-contact power supply 1101 and a power receiving unit for non-contact power supply 1102 are employed. The power supplying unit 1101 and the power receiving unit 1102 are composed of a magnetic material such as ferrite which can provide and receive energy using high frequencies. Further, a rectifier 1103 is connected between the battery 111 and the power receiving unit for non-contact power supply 1102. Furthermore, a capacitor may be connected between the rectifier and the power receiving unit for non-contact power supply.

[0119] When the power receiving unit for non-contact power supply 1102 and the power supplying unit for non-contact power supply 1101 are located opposite each other, electromagnetic induction occurs to supply power from the charger 51 to the battery 111.

[0120] The thus use of the non-contact power supply method can prevent the power receiving and supplying units from being degraded owing to corrosion or wear caused by rust or the like. It is also possible to prevent noise associated with contact.

[0121] Now, description will be given of another embodiment of the cage side power supply section, shown in FIG. 1.

[0122] FIG. 12 shows another embodiment of the cage side power supply section.

[0123] In the present embodiment, the non-contact power supply method is used.

[0124] The AC power supply 44, the charger 54, the control circuit 64, the battery 121, the inverter 112, the air conditioner 1231, the illumination 1232, the in-cage operation panel 1233, the battery condition detecting device 125, and the signal transmitting and receiving device 126 are similar to those shown in

FIG. 1.

[0125] In the present embodiment, a power receiving

unit for non-contact power supply 1202 and a power supplying unit for non-contact power supply 1201 are employed. The power receiving unit 1202 and the power supplying unit 1201 are composed of a magnetic material such as ferrite which can provide and receive energy using high frequencies. Further, a rectifier 1203 is connected between the battery 121 and the power receiving unit for non-contact power supply 1202. Furthermore, a capacitor may be connected between the rectifier and the power receiving unit for non-contact power supply.

[0126] When the power receiving unit for non-contact power supply 1202 and the power supplying unit 1201 for non-contact power supply are located opposite each other, electromagnetic induction occurs to supply power from the charger 54 to the battery 121.

[0127] The thus use of the non-contact power supply method can prevent the power receiving and supplying units from being degraded owing to corrosion or wear caused by rust or the like. It is also possible to prevent noise associated with contact.

[0128] FIG. 13 is a diagram showing another example of method of connecting the charger.

[0129] In FIG. 13, each machine is viewed from above.

[0130] In FIG. 1, the single charger is provided for each power supplying unit of each machine. In contrast, in FIG. 13, the single charger is used to charge a plurality of elevators.

[0131] The single charger 5 connects to all of the power supplying unit 7a for the machine #1, the power supplying unit 7b for the machine #2, and the power supplying unit 7c for the machine #3. Battery 1303a is mounted in a moving member (cage or counter weight) 1302a for the machine #1 and is connected to the power receiving unit 11a.

[0132] Likewise, battery 1303b is mounted in a moving member (cage or counter weight) 1302b for the machine #2 and is connected to the power receiving unit 11b. Battery 1303c is mounted in a moving member (cage or counter weight) 1302c for the machine #3 and is connected to the power receiving unit 11c.

[0133] Further, switches 1301a to 1301c are provided between the charger 5 and the power supplying units 7a to 7c to disconnect the circuits of the power supplying units that are not carrying out charging.

[0134] According to this embodiment, the number of chargers 5 can be reduced with respect to the number of moving members. This embodiment is thus effective in saving spaces and reducing costs.

[0135] Further, the switches are provided to disconnect the circuits of the power supplying units that are not carrying out charging. Therefore, leakage fluxes can be suppressed to increase efficiency.

55 Claims

1. An elevator comprising:

- a cage (12) and a counter weight (11) suspended through a pulley (13) provided at an upper part of an elevator shaft;
 a battery (111, 121) provided in said cage (12) and/or said counter weight (11);
 supplying means (51-54) for supplying power to said battery (111, 121) when said cage (12) and/or said counter weight (11) stops at a predetermined position;
 means (22) for setting power supply conditions;
 means (24, 113) for moving said cage (12) and/or said counter weight (11) to said predetermined position when said conditions are satisfied,
characterised by,
 means (81-84) for detecting the position of said cage (12) and/or said counter weight (11); and
 means (61-64) for controlling said supplying means (51-54) on the basis of the position detected by the detecting means (81-84).
2. The elevator of claim 1, further comprising means (115, 126) for detecting the amount of power remaining in said battery (111, 121), wherein said conditions for supplying power include supplying said power when the detected remaining power is equal to or less than a predetermined value.
 3. The elevator of claim 1, wherein said means (22) for setting power supply conditions comprises means (91-93) for setting a time to supply power, and said cage (12) and/or said counter weight (11) is moved to said predetermined position when said set time has been reached.
 4. The elevator of claim 1, further comprising means (82) for estimating the amount of power remaining in said battery (111, 121) on the basis of operation data on the elevator, wherein said conditions for supplying power include supplying said power when said estimated remaining power is equal to or less than a predetermined value.
 5. The elevator of any preceding claim, wherein said moving means (24) generates a hall call or a cage call at said predetermined position.
 6. The elevator of any preceding claim, further comprising means (10) for displaying conditions of said battery (111, 121).
 7. The elevator of any preceding claim, wherein said supplying means (51-54) comprises:
 first supplying means (53, 54) for supplying power to a battery (111, 121) provided in said cage (12); and

second supplying means (51, 52), installed below said first supplying means, for supplying power to a battery (111, 121) provided in said counter weight (11).

8. The elevator of any preceding claim, wherein said supplying means (51-54) is adapted to supply power to said battery (111, 121) when said cage (12) stops at the uppermost floor or when said counter weight (11) stops at the lowest floor.
9. The elevator of any preceding claim, further comprising
 a plurality of said cages each serving a plurality of floors; and
 means for selecting one of the cages which is to give service in response to a hall call, on the basis of conditions of said battery (111, 121).
10. The elevator of any preceding claim, further comprising:
 means for driving the cage (12) or the counter weight (11) using the power supplied by the battery (111, 121); and
 means for moving said cage (12) to said predetermined position if a cage call or a hall call based on human operation has not been generated,
 wherein the moving means (24) is adapted to move the cage (12) to said predetermined position at a speed lower than that of a cage (12) moved in response to a cage call or a hall call generated by a human operation.
11. The elevator of any preceding claim, wherein said controlling means (61-64) comprises a device which outputs a charge start command to said supplying means (51-54), when the position detected by said detecting means (81-84) is said predetermined position, and which stops the function of said supplying means (51-54) when the detected position is off said predetermined position.

Patentansprüche

1. Aufzug mit:
 einer Kabine (12) und einem Gegengewicht (11), die über eine Seilrolle (13) aufgehängt sind, die in einem oberen Abschnitt einer Aufzugsachse vorgesehen ist;
 einer Batterie (111, 121), die in der Kabine (12) und/oder dem Gegengewicht (11) vorgesehen ist;

einer Zuführeinrichtung (51-54) zur Energieversorgung der Batterie (111, 121), wenn die Kabine (12) und/oder das Gegengewicht (11) an einer vorbestimmten Position anhält;
 einer Einrichtung (22) zum Einstellen von Energieversorgungsbedingungen;
 einer Einrichtung (24, 113) zum Bewegen der Kabine (12) und/oder des Gegengewichts (11) zu der vorbestimmten Position, wenn die Bedingungen erfüllt sind,

gekennzeichnet durch:

eine Einrichtung (81-84) zum Erfassen der Position der Kabine (12) und/oder des Gegengewichts (11); und
 eine Einrichtung (61-64) zum Steuern der Versorgungseinrichtung (51-54) auf Grundlage der von der Erfassungseinrichtung (81-84) erfassten Position.

2. Aufzug nach Anspruch 1, ferner mit einer Einrichtung (115, 126) zum Erfassen des Restenergiebetrags in der Batterie (111, 121), wobei die Bedingungen zum Zuführen von Energie den Fall einschließen, dass Energie zugeführt wird, wenn die erfasste Restenergie kleiner oder gleich einem vorbestimmten Wert ist.
3. Aufzug nach Anspruch 1, wobei die Einrichtung (22) zum Einstellen der Energieversorgungsbedingungen eine Einrichtung (91-93) aufweist, um eine Zeit zum Zuführen von Energie einzustellen, und die Kabine (12) und/oder das Gegengewicht (11) zu der vorbestimmten Position bewegt wird, wenn die eingestellte Zeit erreicht ist.
4. Aufzug nach Anspruch 1, ferner mit einer Einrichtung (82) zum Abschätzen des Restenergiebetrags in der Batterie (111, 121) auf Grundlage von Operationsdaten des Aufzugs, wobei die Bedingungen zum Zuführen von Energie den Fall einschließen, dass Energie zugeführt wird, wenn der abgeschätzte Restenergiebetrag kleiner oder gleich einem vorbestimmten Wert ist.
5. Aufzug nach einem der vorstehenden Ansprüche, wobei die Bewegungseinrichtung (24) an der vorbestimmten Position einen Etagenruf oder einen Kabinenruf erzeugt.
6. Aufzug nach einem der vorstehenden Ansprüche, ferner mit einer Einrichtung (10) zum Anzeigen von Zuständen der Batterie (111, 121).
7. Aufzug nach einem der vorstehenden Ansprüche, wobei die Zuführeinrichtung (51-54) aufweist:

eine erste Zuführeinrichtung (53, 54) zum Zuführen von Energie zu einer Batterie (111, 121), die in der Kabine (12) vorgesehen ist; und
 eine zweite Zuführeinrichtung (51, 52), die unterhalb der ersten Zuführeinrichtung eingebaut und zum Zuführen von Energie zu einer Batterie (111, 121) ausgelegt ist, die in dem Gegengewicht (11) vorgesehen ist.

8. Aufzug nach einem der vorstehenden Ansprüche, wobei die Zuführeinrichtung (51-54) dazu ausgelegt ist, Energie zu der Batterie (111, 121) zuzuführen, wenn die Kabine (12) in der obersten Etage anhält oder wenn das Gegengewicht (11) in der untersten Etage anhält.
9. Aufzug nach einem der vorstehenden Ansprüche, ferner mit:
 mehreren der Kabinen, die jeweils mehrere Etagen bedienen; und
 einer Einrichtung zum Auswählen einer der Kabinen, die ihren Dienst in Erwiderung auf einen Etagenruf ausführt, auf Grundlage der Zustände der Batterie (111, 121).
10. Aufzug nach einem der vorstehenden Ansprüche, ferner mit:
 einer Einrichtung zum Antreiben der Kabine (12) oder des Gegengewichts (11) unter Verwendung der der Batterie (111, 121) zugeführten Energie; und
 einer Einrichtung zum Bewegen der Kabine zu der vorbestimmten Position, wenn kein Kabinenruf oder Etagenruf aufgrund einer menschlichen Betätigung erzeugt wurde,
 wobei die Bewegungseinrichtung (24) dazu ausgelegt ist, die Kabine (12) mit einer Geschwindigkeit zu der vorbestimmten Position zu bewegen, die niedriger ist als die, mit der eine Kabine (12) in Erwiderung auf einen durch eine menschliche Betätigung erzeugten Kabinenruf oder Etagenruf bewegt wird.
11. Aufzug nach einem der vorstehenden Ansprüche, wobei die Steuereinrichtung (61-64) eine Vorrichtung aufweist, die einen Ladestartbefehl an die Versorgungseinrichtung (51-54) ausgibt, wenn die durch die Erfassungseinrichtung (81-84) erfasste Position die vorbestimmte Position ist, und die die Funktion der Versorgungseinrichtung (51-54) unterbricht, wenn die erfasste Position abseits der vorbestimmten Position liegt.

Revendications

1. Ascenseur, comportant :

une cabine (12) et un contrepoids (11) suspendus à travers une poulie (13) disposée dans une partie supérieure d'une cage d'ascenseur, une batterie (111, 121) disposée dans ladite cabine (12) et/ou ledit contrepoids (11), des moyens d'alimentation (51 à 54) pour alimenter en puissance ladite batterie (111, 121) lorsque ladite cabine (12) et/ou ledit contrepoids (11) s'arrête dans une position prédéterminée, des moyens (22) pour établir des conditions d'alimentation de puissance, des moyens (24, 113) pour déplacer ladite cabine (12) et/ou ledit contrepoids (11) vers ladite position prédéterminée lorsque lesdites conditions sont satisfaites,

caractérisé par,

des moyens (81 à 84) pour détecter la position de ladite cabine (12) et/ou dudit contrepoids (11), et des moyens (61 à 64) pour commander lesdits moyens d'alimentation (51 à 54) sur la base de la position détectée par les moyens de détection (81 à 84).

2. Ascenseur selon la revendication 1, comportant en outre des moyens (115, 126) pour détecter la quantité de puissance restant dans ladite batterie (111, 121), lesdites conditions pour alimenter de la puissance comportant l'alimentation de ladite puissance lorsque la puissance restante détectée est égale ou inférieure à une valeur prédéterminée.

3. Ascenseur selon la revendication 1, dans lequel lesdits moyens (22) pour établir des conditions d'alimentation de puissance comportent des moyens (91 à 93) pour établir un temps d'alimentation de puissance, et ladite cabine (21) et/ou ledit contrepoids (11) est déplacé vers ladite position prédéterminée lorsque ledit temps établi a été atteint.

4. Ascenseur selon la revendication 1, comportant en outre des moyens (82) pour estimer la quantité de puissance restant dans ladite batterie (111, 121) sur la base de données de fonctionnement de l'ascenseur, lesdites conditions pour alimenter de la puissance comportant l'alimentation de ladite puissance lorsque ladite puissance restante estimée est égale ou inférieure à une valeur prédéterminée.

5. Ascenseur selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens de

déplacement (24) génèrent un appel de salle ou un appel de cabine dans ladite position prédéterminée.

6. Ascenseur selon l'une quelconque des revendications précédentes, comportant en outre des moyens (10) pour afficher des conditions de ladite batterie (111, 121).

7. Ascenseur selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens d'alimentation (51 à 54) comportent :

des premiers moyens d'alimentation (53, 54) pour alimenter en puissance une batterie (111, 121) disposée dans ladite cabine (121), et des seconds moyens d'alimentation (51, 52), installés sous lesdits premiers moyens d'alimentation, pour alimenter en puissance une batterie (111, 121) disposée dans ledit contrepoids (11).

8. Ascenseur selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens d'alimentation (51 à 54) sont adaptés pour alimenter en puissance ladite batterie (111, 121) lorsque ladite cabine (12) s'arrête au niveau de l'étage le plus supérieur, ou lorsque ledit contrepoids (11) s'arrête au niveau de l'étage le plus inférieur.

9. Ascenseur selon l'une quelconque des revendications précédentes, comportant en outre

une pluralité desdites cabines desservant chacune une pluralité d'étages, et des moyens pour sélectionner une des cabines qui doit desservir en réponse à un appel de salle, sur la base de conditions de ladite batterie (111, 121).

10. Ascenseur selon l'une quelconque des revendications précédentes, comportant en outre :

des moyens pour entraîner la cabine (12) ou le contrepoids (11) en utilisant la puissance fournie par la batterie (111, 121), et des moyens pour déplacer ladite cabine (12) vers ladite position prédéterminée si un appel de cabine ou un appel de cabine basé sur une opération humaine n'a pas été généré, et dans lequel les moyens de déplacement (24) sont adaptés pour déplacer la cabine (12) vers ladite position prédéterminée à une vitesse inférieure à celle d'une cabine (12) déplacée en réponse à un appel de cabine ou un appel de salle généré par une opération humaine.

11. Ascenseur selon l'une quelconque des revendications précédentes, dans lequel lesdits moyens de

commande (61 à 64) comportent un dispositif qui émet une instruction de démarrage de charge vers lesdits moyens d'alimentation (51 à 54), lorsque la position détectée par lesdits moyens de détection (81 à 84) est ladite position prédéterminée, et qui stoppe le fonctionnement desdits moyens d'alimentation (51 à 54) lorsque la position détectée n'est pas ladite position prédéterminée.

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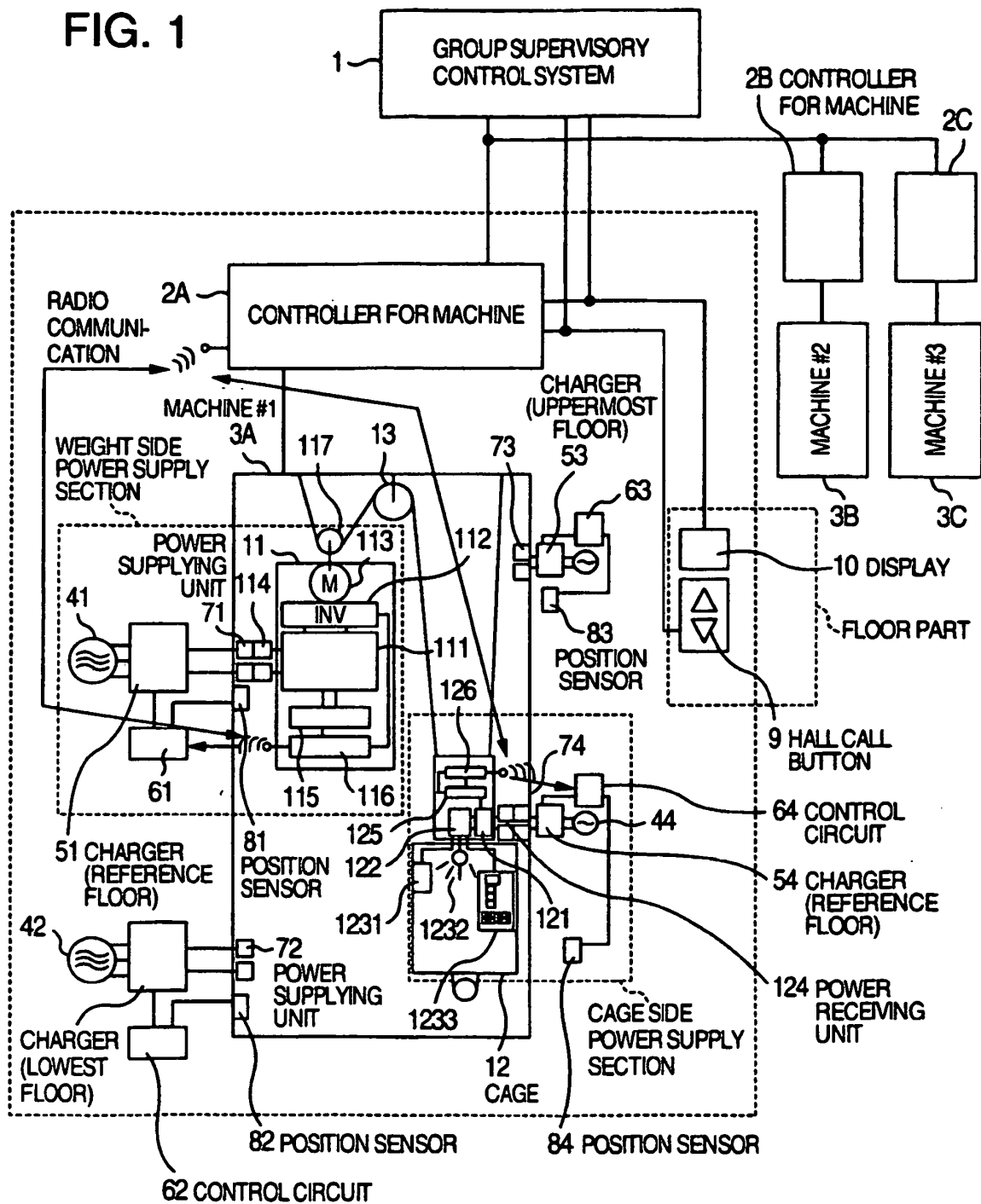
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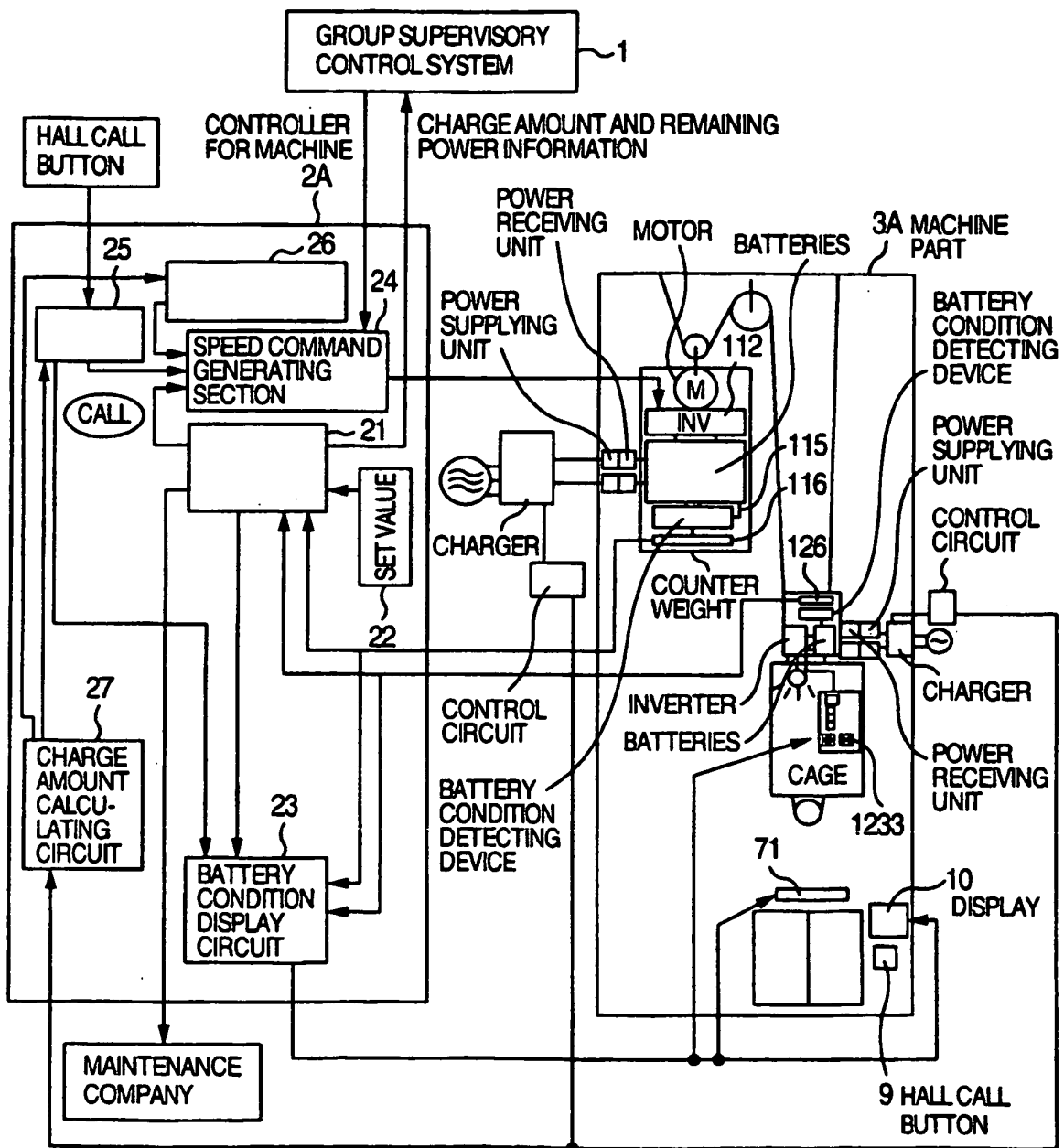
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FIG. 1



61,63 CONTROL CIRCUIT
73,74 POWER SUPPLYING UNIT
111 BATTERIES
114 POWER RECEIVING UNIT

FIG. 2



- 21 CHARGE REQUEST
DISPLAY REQUEST
REPLACEMENT REQUEST
- 25 OPERATION DETERMINING CIRCUIT
- 26 FREE CAR OPERATION FOR STANDBY OR REFERENCE FLOOR RETURN COMMAND

FIG. 3

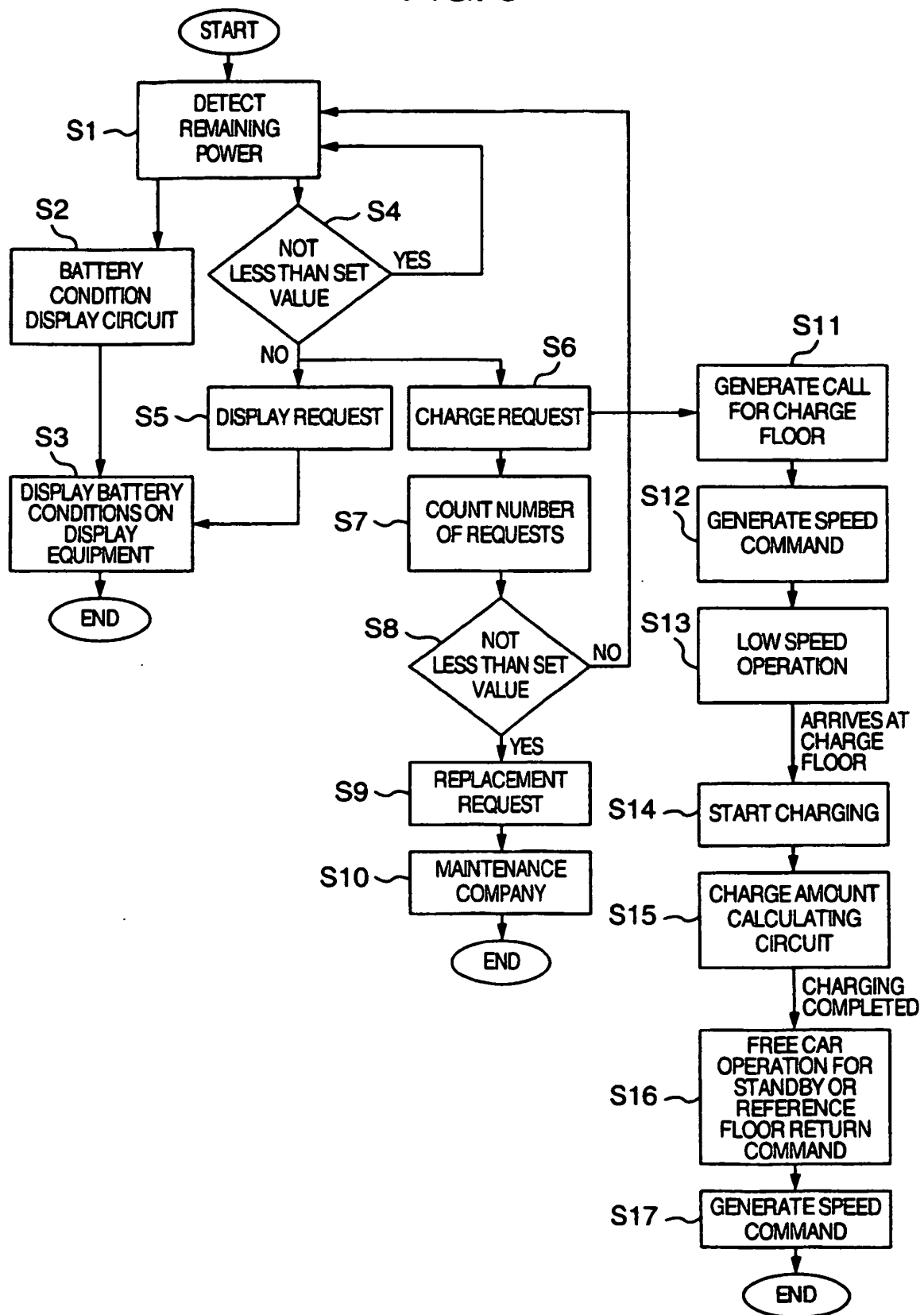


FIG. 4

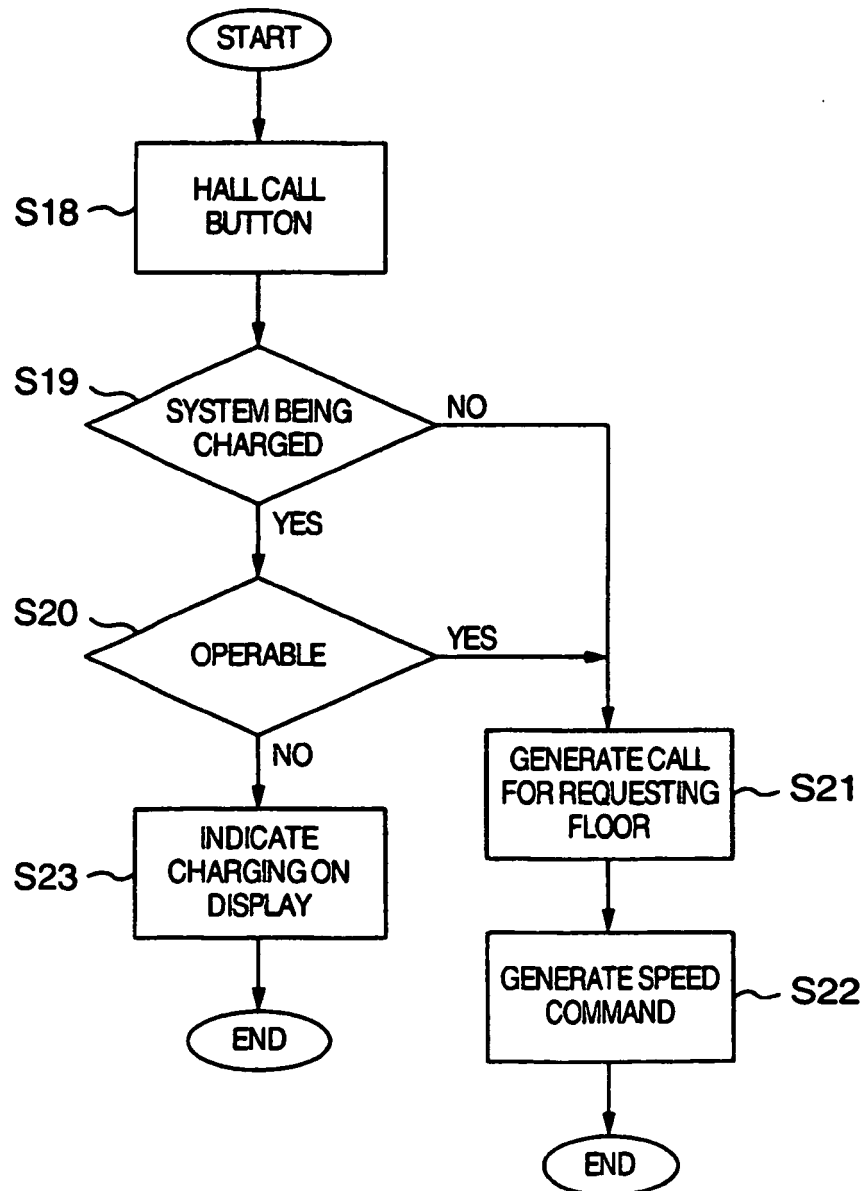


FIG. 5

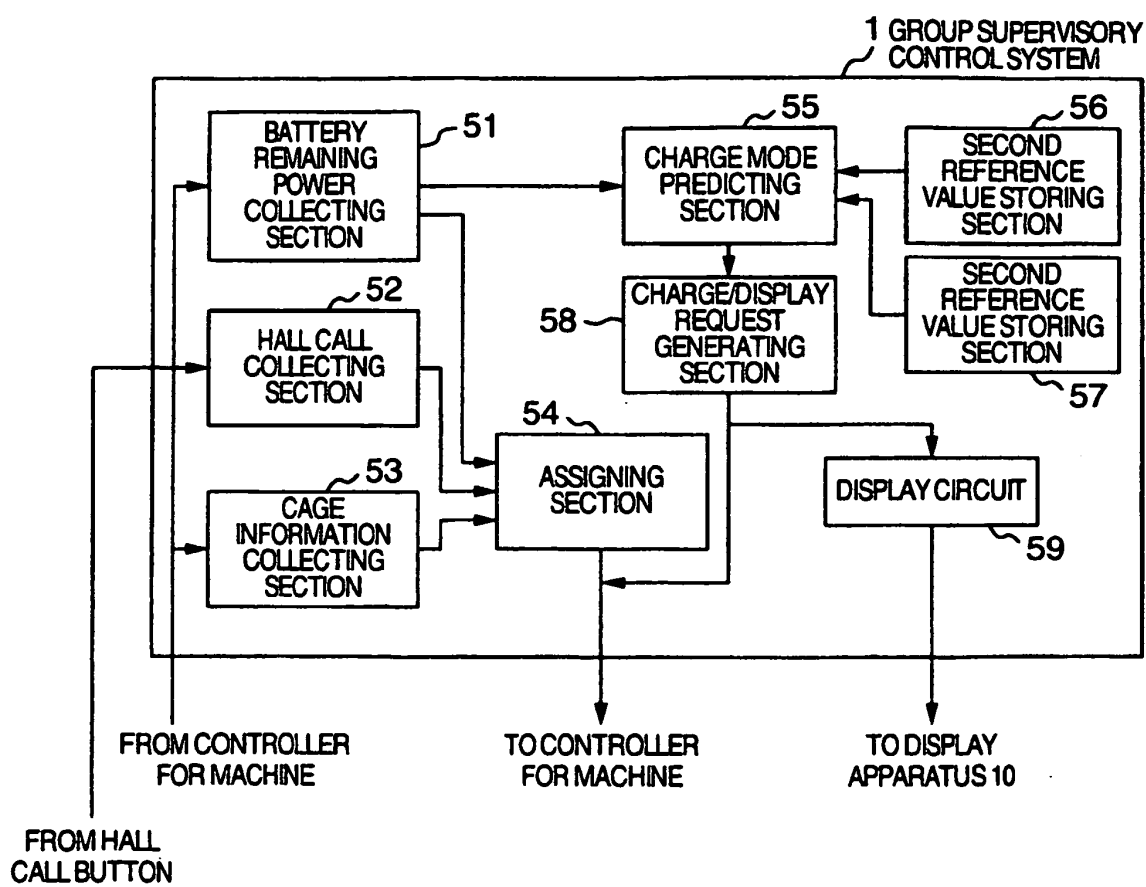


FIG. 6

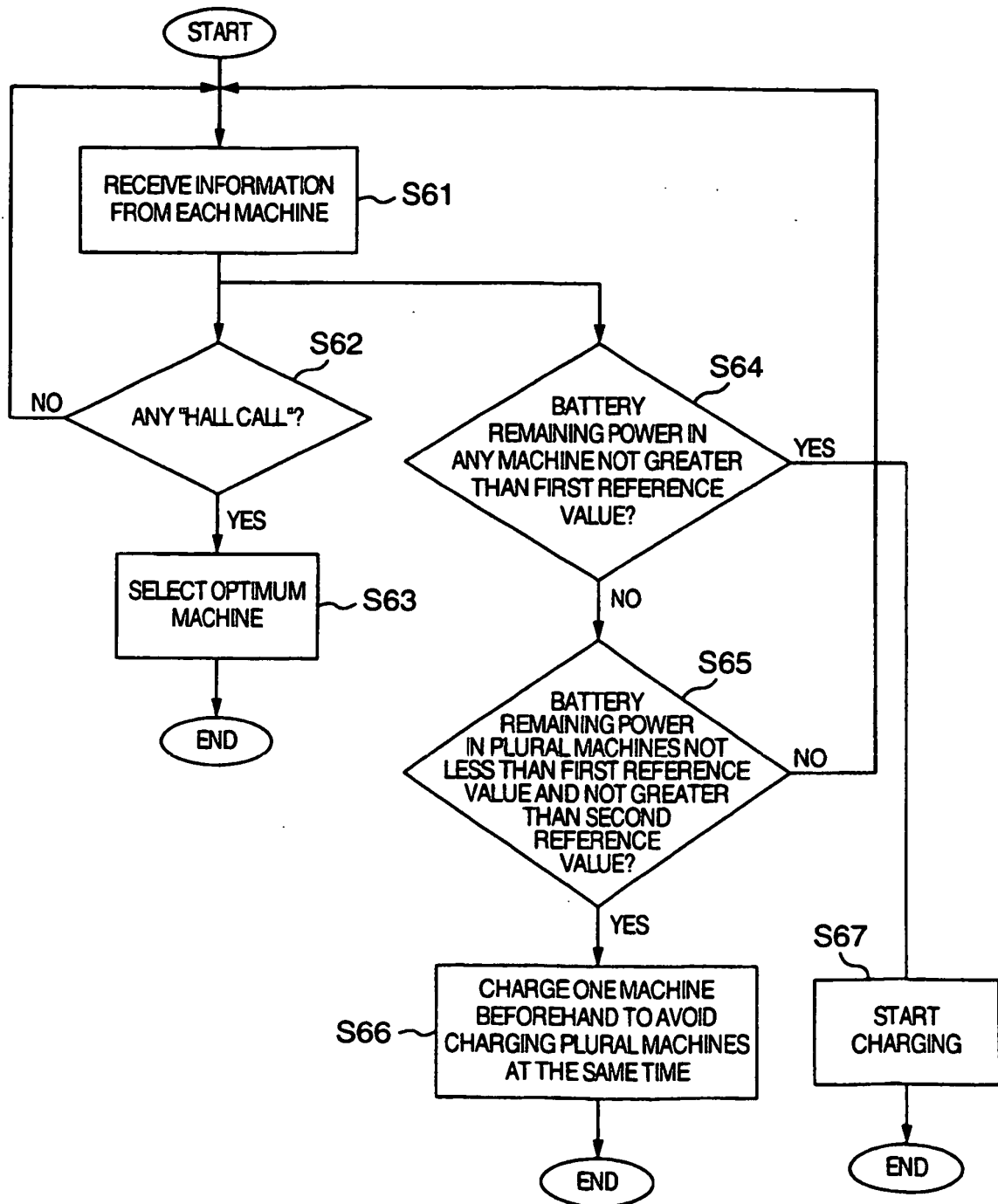


FIG. 7

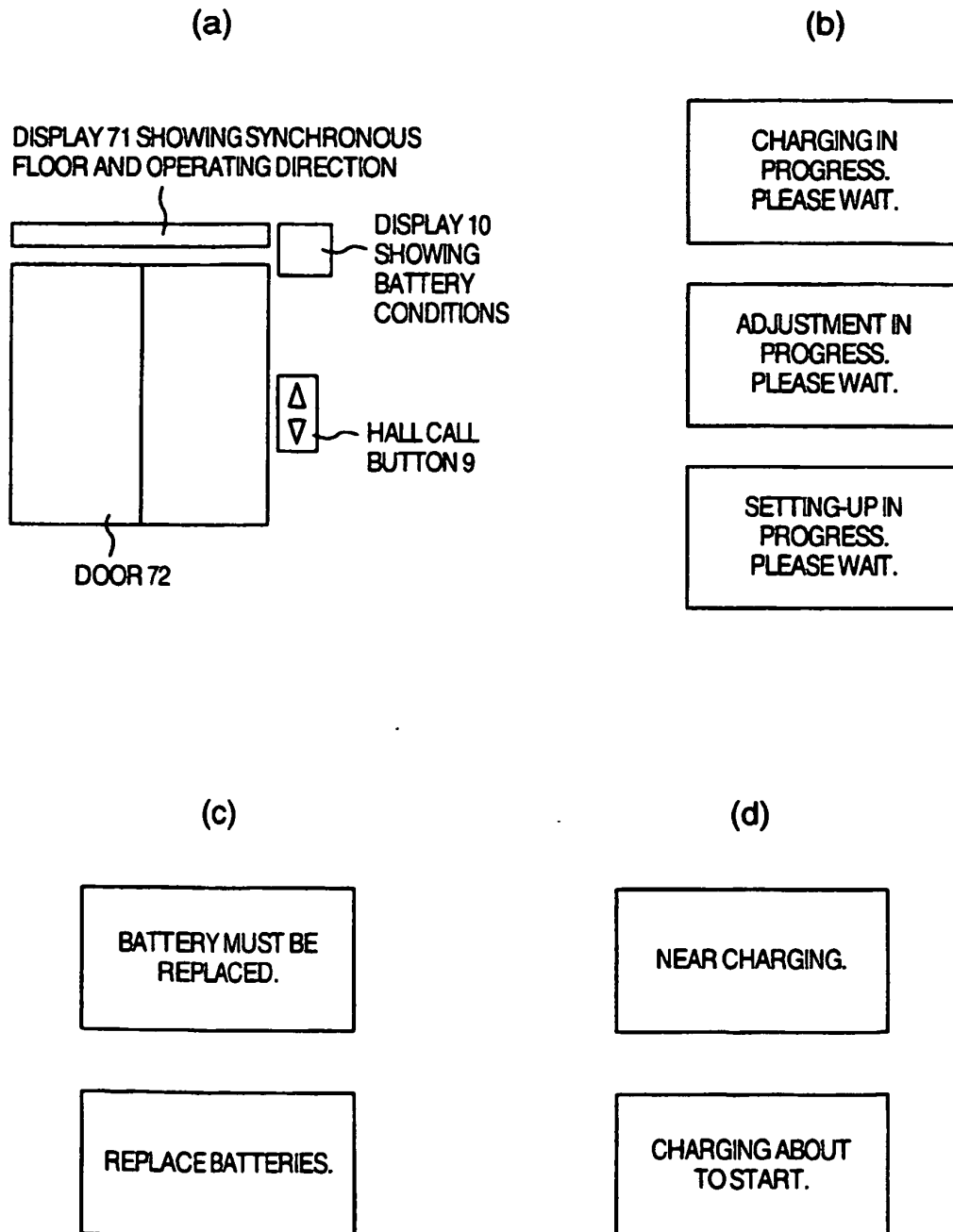
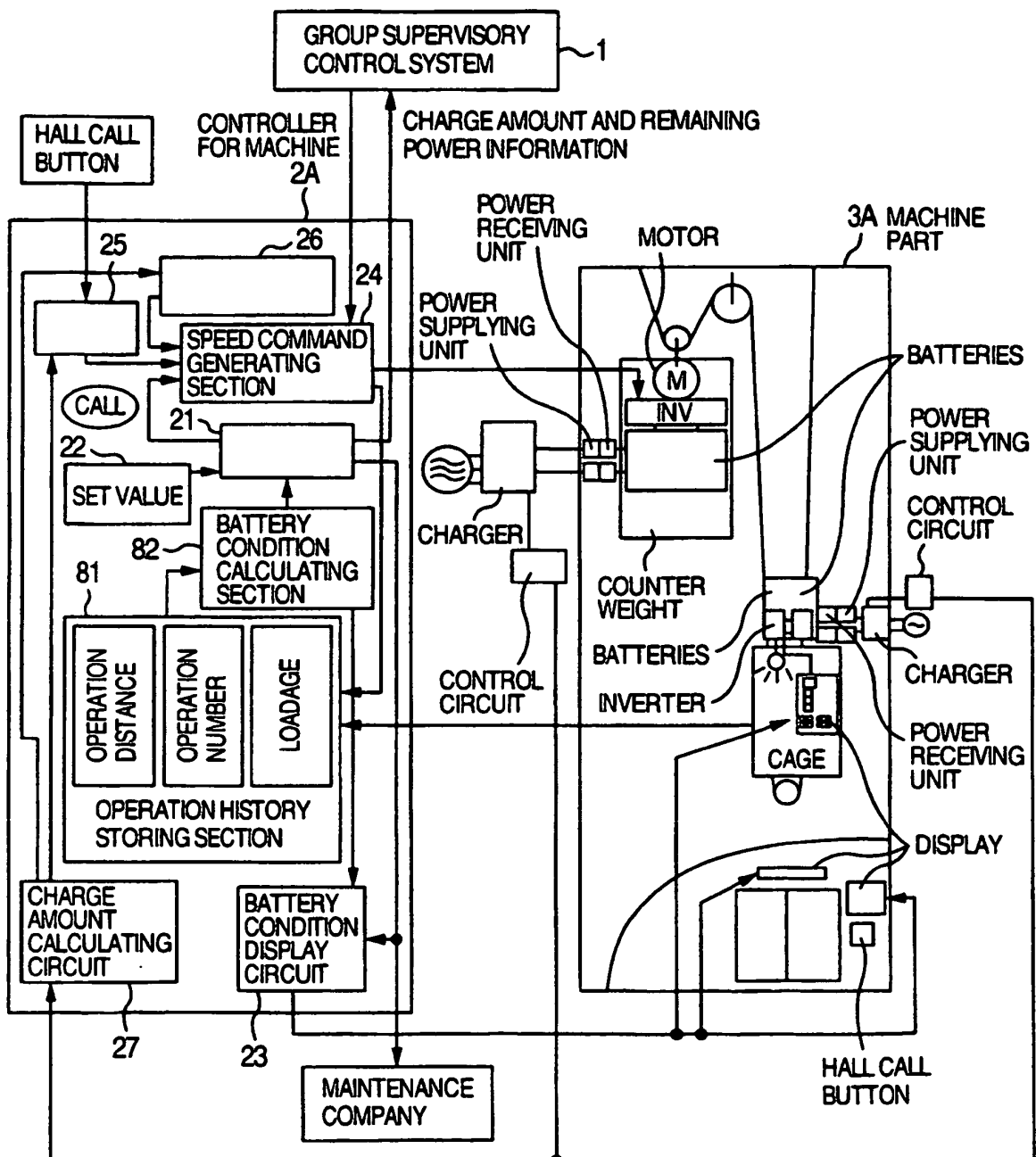


FIG. 8

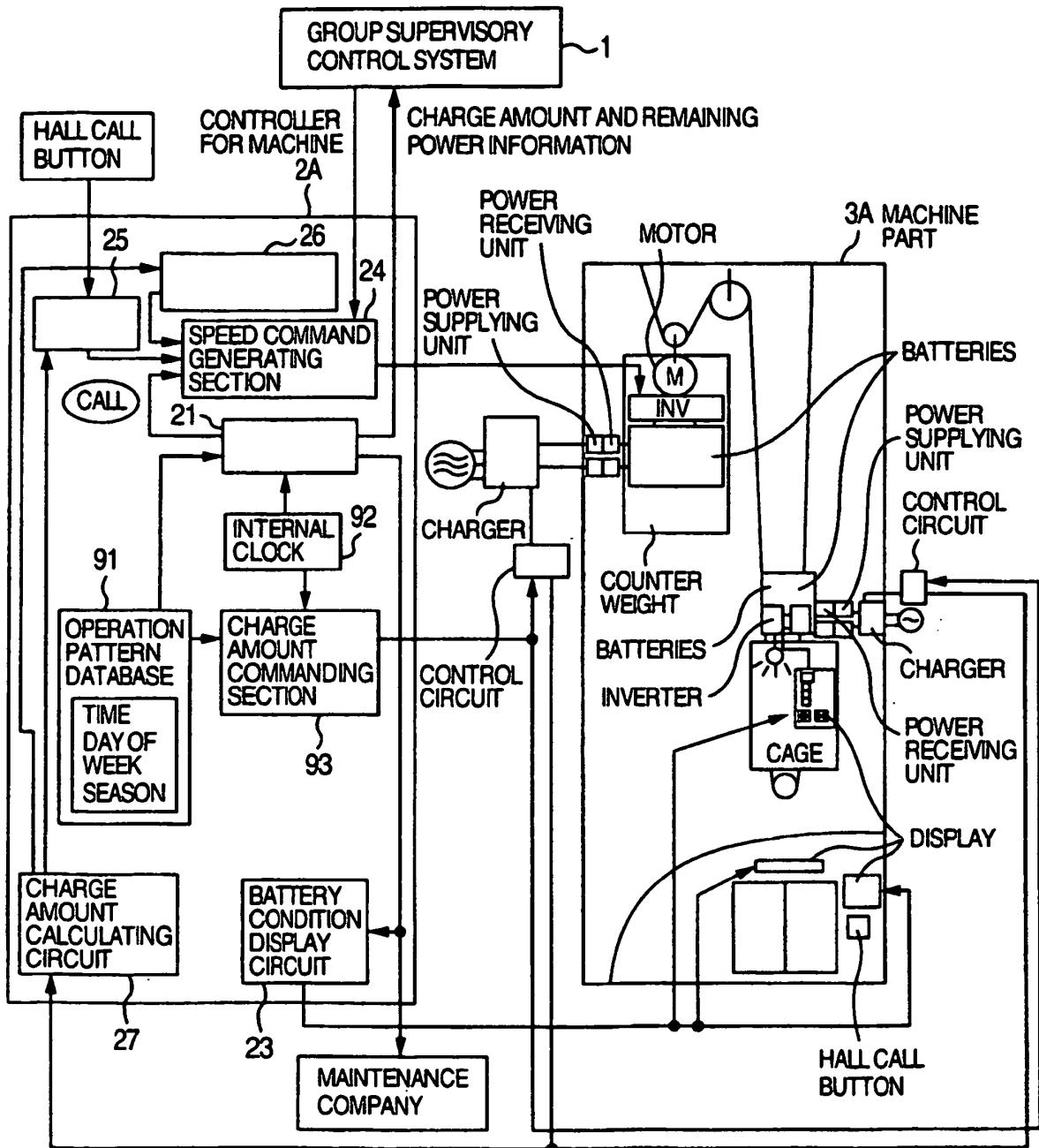


21 CHARGE REQUEST
DISPLAY REQUEST
REPLACEMENT REQUEST

25 OPERATION DETERMINING CIRCUIT

26 FREE CAR OPERATION FOR STANDBY OR REFERENCE FLOOR RETURN COMMAND

FIG. 9



- 21 CHARGE REQUEST
 DISPLAY REQUEST
 REPLACEMENT REQUEST
- 25 OPERATION DETERMINING CIRCUIT
- 26 FREE CAR OPERATION FOR STANDBY OR REFERENCE FLOOR RETURN COMMAND

FIG. 10

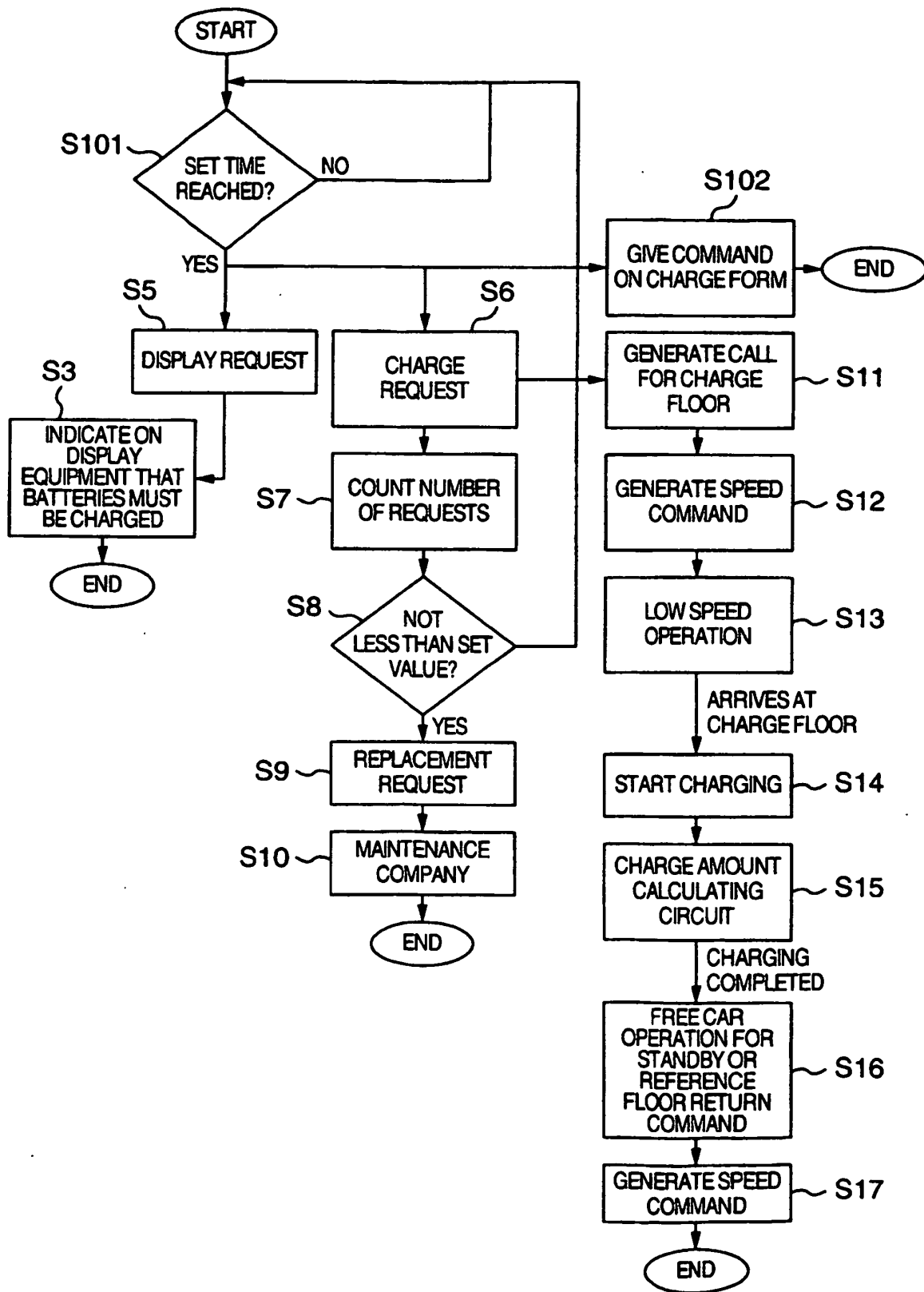


FIG. 11

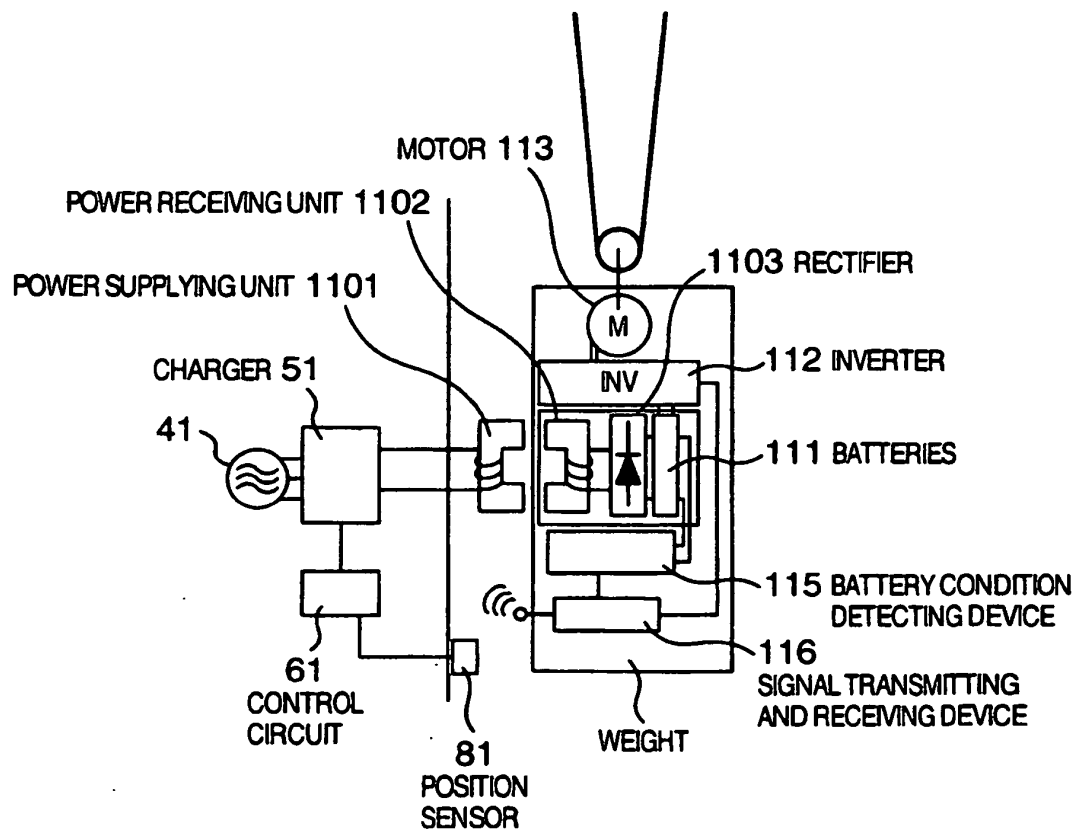


FIG. 12

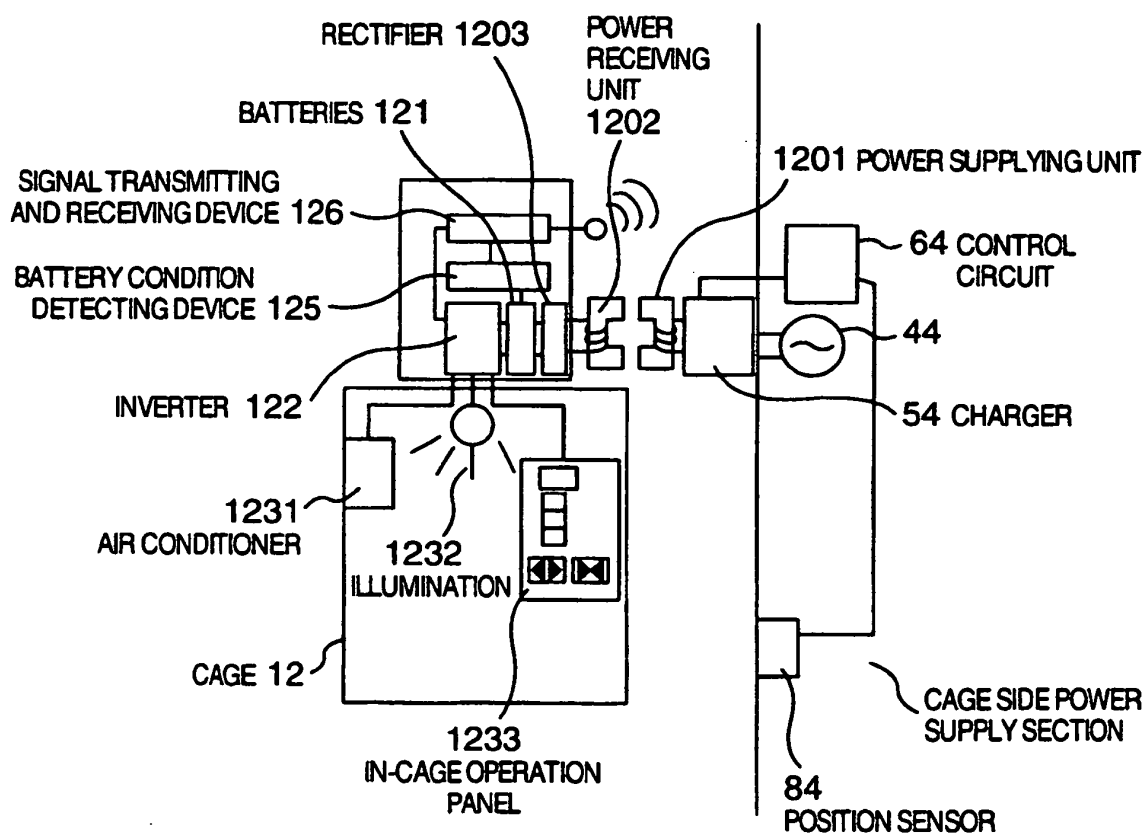
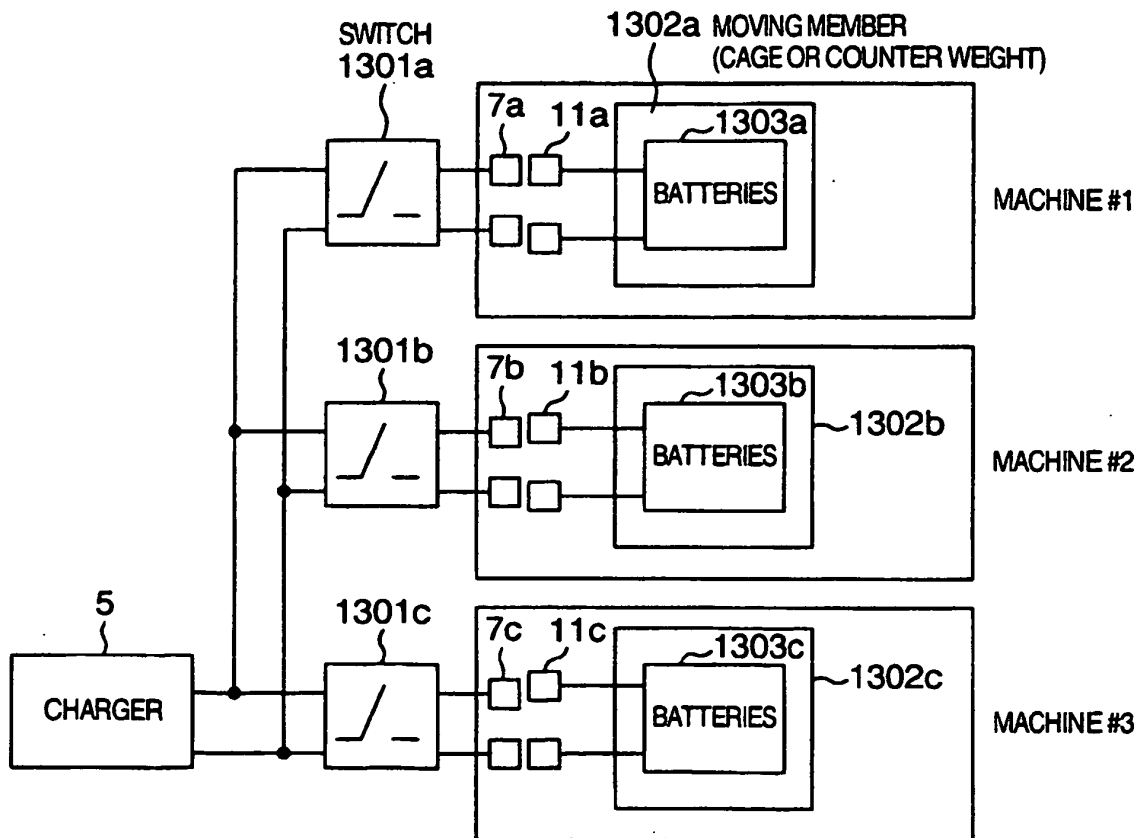


FIG. 13



REFERENCES CITED IN THE DESCRIPTION

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