

APPARATUS FOR EMERGENCY OPERATION IN ELEVATOR SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an emergency operation for an elevator system, and more particularly to an improved apparatus for an emergency operation in an elevator system capable of efficiently operating elevator cars during a power failure.

2. Description of the Prior Art

In a general elevator system, there is provided an extra device to guide an elevator car to the nearest floor for a safe rescue of passengers aboard the car in case in which there happens an electrical power failure during its operation. Such an extra device is referred to as ALP (Automatic Landing for Power failure) which varies to an internal type ALP for employing a preset elevator control system, and an external type ALP for utilizing an extra elevator control system.

As shown in Figure 1, a conventional apparatus for an emergency operation in an elevator system includes: a converter 100 for converting a three-phase alternating voltage to a direct voltage; a first inverter 101 for inverting the direct voltage outputted from the converter 100 back to the three-phase alternating voltage for thereby facilitating the drive of an induction motor M; a control circuit 102 for controlling the first inverter 101; a three-phase transformer 103 for providing a supply voltage to the control circuit 102; a second inverter 104 for providing a direct voltage to the three-phase transformer 103 during an

electrical power failure; and a battery 105 for providing the direct voltage to the second inverter 104 during the power failure. Here, reference numeral 10 denotes power nodes which become connected during a normal operation of the elevator system. Reference numeral 11 denotes a filter condenser. Reference numerals 12, 13 respectively denote a resistance and a transistor for consuming a revival power from the induction motor M. Reference numeral 14 denotes a power node which becomes disconnected when the supply voltage detected from the control circuit 102 proves less than a reference voltage. Reference numeral 15 denotes nodes which become disconnected during power failure. Reference numeral 16 denotes nodes which become connected after a predetermined time if there occurs a power failure. Reference numeral 17 is a node which becomes connected when power is failed. Reference numeral 18 denotes a diode.

The operation of the thusly constituted conventional apparatus for an emergency operation in an elevator system will now be described.

During a normal operation of the elevator system, the nodes 16, 17 are respectively disconnected, and the nodes 10, 15 are connected, whereby the supply voltage is only provided to the converter 100 and the three-phase transformer 103. At this time, the current voltage rectified in the converter 100 and filtered in the filter condenser 11 is applied to the first inverter 101, and the three-phase transformer 103 serves to provide the supply voltage to the control circuit 102.

The control circuit 102 controls a variable voltage and a variable frequency in the first inverter 101 via the connected node 14, and accordingly the torque and rotation of the induction motor M is controlled and the elevator system is driven.

Meanwhile, when there occurs a sudden power failure during the normal

operation of the elevator system, the nodes 10, 15 are disconnected and the node 17 is connected, so that the output voltage of the battery 105 is applied through the diode 18 to the first inverter 101. The output voltage from the battery 105 is applied to the second inverter 104 and is converted to a three-phase alternating voltage in the second inverter 104. The converted three-phase alternating voltage is outputted to the three-phase transformer 103, whereby the supply voltage is provided to the control circuit 102.

When the node 14 is connected as time lapses, the control circuit 102 controls the first inverter 101 through the node 14, and the torque and rotation of the induction motor M are controlled for appropriately driving the elevator system. At this time, the node 14 is disconnected for a certain time after the power failure for thereby preventing breakdown of the first inverter 101.

In the normal operation of the elevator system, when a car of the elevator system is on a descending operation with passengers packed therein or on an ascending operation without any load therein, and when the induction motor M is operated in a revival range during the power failure, the revival power is generated in the induction motor M. The thusly generated revival power is fed back via the first inverter 101 to a circuit portion that is operated by the direct voltage, for thereby raising the voltage therein.

In order to prevent a device between the converter 100 and the first inverter 101 from being damaged by the raised voltage, the control circuit 102 turns on a transistor 13 and consumes the revival power.

However, the conventional apparatus for an emergency operation in an elevator system unnecessarily requires an overvoltage retraining member such as a control algorithm in order for the induction motor not to be driven during a

power failure, thereby protecting respective devices in the circuit portion where the direct voltage is induced.

Further, when there occur problems with regard to the revival power consumption circuit or the overvoltage retraining member, the diode connected between the battery 105 and the direction voltage circuit portion is broke down by the high voltage raised by the revival power, thereby incurring breakdown in such a high cost battery.

Also, during the power failure, a direct voltage induced from the battery is employed to drive the induction motor, so that the driving speed of the elevator is not appropriately set sufficiently high that may be proportional to a preset voltage/frequency (V/F) ratio.

SUMMARY OF THE INVENTION

Accordingly, it is a first object of the present invention to provide an apparatus for an emergency operation in an elevator system capable of overcoming a speed restriction of elevator cars which may be caused by a revival power consumption and a low battery voltage.

To achieve the above-described object, an apparatus for an emergency operation in an elevator system according to the present invention provided with a converter for converting a supply voltage to a direct voltage, a first inverter for converting the direct voltage outputted from the converter to a three-phase alternating voltage so as to drive an induction motor, a control circuit for controlling the first inverter, a first three-phase transformer for providing the supply voltage to the control circuit, includes a battery for outputting an alternating

voltage when an electrical power is failed in the elevator system, a second inverter for converting the direct voltage outputted from the battery to the three-phase alternating voltage, and a second three-phase transformer for providing the three-phase alternating voltage outputted from the second inverter to the first three-phase transformer and an input terminal of the converter.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become better understood with reference to the accompanying drawings which are given only by way of illustration and thus are not limitative of the present invention, wherein:

Figure 1 is a block diagram illustrating an apparatus for an emergency operation in an elevator system according to a conventional art; and

Figure 2 is a block diagram illustrating an apparatus for an emergency operation in an elevator system according to the present invention.

DETAILED DESCRIPTION OF THE INVENTION

As shown in Figure 2, the apparatus for an emergency operation in an elevator system according to the present invention includes a converter 200, a first inverter 201, a control circuit 202, a first three-phase transformer 203, a second inverter 204, and a battery 205, as in the conventional art, and further includes a second three-phase transformer 206 between the first three-phase transformer 203 and the second inverter 204, whereby an alternating voltage outputted from the second inverter 204 is supplied via the transformer 206 to an

input terminal of the converter 200. Here, reference numeral 20 denotes nodes that are to be connected during a normal operation of the elevator system. Reference numeral 21 denotes a filter condenser. Reference numerals 22, 23 respectively denote a resistance and a transistor for consuming a revival power from an induction motor M.

The operation of the thusly composed apparatus for an emergency operation in an elevator system according to the present invention will now be described.

During a normal operation of the elevator system, a supply voltage is rectified in the converter 200 via the connected nodes 20, and is filtered in the filter condenser 21. The filtered voltage is applied to the first inverter 201 and at the same time is applied to the control circuit 202 through the first three-phase transformer 203.

As a result, the first inverter 201 generates a variable voltage and a three-phase alternating voltage with a variable frequency in accordance with the control of the control circuit 202 which serves to control the torque and rotation of the induction motor M, for thereby driving the elevator car. The control circuit 202 detects a revival power generated from the induction motor M and accordingly turns on the transistor 23, for thereby consuming the revival power received via the resistance 12.

When there occurs a power failure during a normal operation of the elevator system, the nodes 20 are disconnected so as to prevent the supply voltage from flowing therethrough. Instead, the supply voltage is induced from the battery 205.

That is, in the state of power failure, the direct voltage from the battery 205

is converted to the three-phase alternating voltage in the second inverter 204, and applied to the second three-phase transformer 206, whereby the second three-phase transformer 206 provides the alternating voltage to the respective input terminals of the first three-phase transformer 203 and the converter 200.

Consequently, the alternating voltage supplied to the input terminal of the converter 200 is rectified in the converter 200 and filtered in the filter condenser 21 for thereby being applied to the first inverter 201. The first three-phase transformer 203 outputs the alternating voltage to the control circuit 202, thereby obtaining a control operation identical to that of the normal operation when the supply voltage is applied.

The control circuit 202 during the power failure serves to set a driving direction of the elevator car so that the induction motor M becomes operable in a revival range, for thereby minimizing the capacity of the battery 205. Accordingly, the torque and rotation of the induction motor M are controlled by driving the first inverter 201 and by driving the first inverter 201 at a speed pattern appropriate to an emergency state.

That is, in the present invention, the direct voltage from the battery 205 is not directly supplied to the direct voltage circuit portion of the first inverter 201 to provide the direct voltage at the normal operation to the direct voltage circuit portion of the first inverter 201. Instead, the alternating voltage outputted from the second inverter 204 is applied to the input terminal of the converter 200 so as to be converted to the direct voltage, whereby a modification of the revival power consumption circuit or an overvoltage restraining member is not required.

As a result, a battery breakdown is prevented which may occur by an error operation of the overvoltage restraining member as well as overcoming a speed

limitation of the elevator car that may result from a low voltage of the battery.

As described above, the present invention does not require a revival power consumption circuit modification or an overvoltage restraining member by providing the alternating voltage outputted from the second inverter to an input terminal of the converter and modifying the same to the direct voltage, so as to provide such a direct voltage as in the normal operation to the direct voltage circuit portion of the first inverter.

Also, the output alternating voltage from the second inverter is supplied to the input terminal of the converter for thereby preventing the battery breakdown that may be caused by an error operation of the overvoltage restraining member, and further the speed limit of the elevator car may be overcome by the low voltage from the battery.



What is claimed is:

1. An apparatus for an emergency operation in an elevator system which includes a converter for converting a supply voltage to a direct voltage, a first inverter for converting the direct voltage outputted from the converter to a three-phase alternating voltage so as to drive an induction motor, a control circuit for controlling the first inverter, a first three-phase transformer for providing the supply voltage to the control circuit, comprising:

a battery for outputting an alternating voltage when an electrical power is failed in the elevator system;

a second inverter for converting the direct voltage outputted from the battery to the three-phase alternating voltage; and

a second three-phase transformer for providing the three-phase alternating voltage outputted from the second inverter to the first three-phase transformer and an input terminal of the converter.

2. The apparatus of claim 1, wherein between the supply voltage and the converter there is provided a node which serves to interrupt a provision of the supply voltage when the electrical power is failed in the elevator system.

3. The apparatus of claim 1, wherein the control circuit minimizes a capacity of the battery by controlling the first inverter in order for the induction motor to be driven toward a portion of the elevator system for an electrical revival.