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TITLE OF THE INVENTION

ELEVATOR APPARATUS WITH CONNECTOR FOR INDICATING CURRENT
CHARACTERISTICS WHILE ELEVATOR CAR IS BEING DRIVEN

5 BACKGROUND OF THE INVENTION

The present invention relates to an elevator apparatus,
which is capable of inspecting current characteristics of
various kinds of devices provided in an elevator.

In order to check operation of various kinds of components
10 composing an elevator, electric current characteristics of
various kinds of the devices provided in the elevator have been
measured. A electric current measuring equipment is used for
the above electric current characteristic measurement, and at
the time when the installation of an elevator is completed,
15 during the time when an elevator is undergoing scheduled
maintenance and inspection, or in a case where an elevator is
tested by the government officer to be transferred to the
customer, the elevator car is moved and current characteristics
of various kinds of the components need to be measured under
20 running conditions using the electric current measuring
equipment.

In the first conventional elevator apparatus, when
measuring the current, a person carrying out the measurement
measures the current characteristics by leaning out toward the
25 hoistway from a landing entrance, by directly entering in the
hoistway, or by riding on the top of the car.

In the second conventional elevator apparatus, for example,
Japanese Patent Laid-open No. 1-281277 (1989), a microprocessor
provided in the elevator apparatus stores the driving data of



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the car, and the driving data is read out from an elevator floor. Such elevator apparatus is shown in Japanese Patent Laid-open No. 60-244782 (1985).

In the third conventional elevator apparatus, for example,
5 Japanese Patent Laid-open No. 8-239179 (1996), a device dedicated for the maintenance having a sensor and a microprocessor, is provided.

In the above first conventional elevator apparatus, the inspection of the current characteristic using the conventional
10 current measuring equipment is not preferable from a safety viewpoint because it is necessary to lean out toward the hoistway from a landing entrance, direct enter the hoistway, or ride on the top of the car. Particularly in the case of an elevator for a private house, the person carrying out the measurement is
15 obliged to measure the current characteristics in the hoistway since various kinds of the components are installed inside the hoistway. Further, in the case of an oil-hydraulic driven elevator, the person carrying out the measurement measures characteristics of the temperature or oil pressure by riding
20 on top of the car. Therefore, the person carrying out the measurement is in danger when the elevator is moved upward because the upper portion of the hoistway is narrow.

In the above second conventional elevator apparatus, the driving data for its previous operations may be obtained; however
25 the present data while the elevator is being driven can not be obtained.

In the above third conventional elevator apparatus, plural measuring equipment should be provided according to the data to be measured, and as all of the function, need to be prepared

in the device dedicated for the maintenance after sensing the data, the device becomes large and heavy.

SUMMARY OF THE INVENTION

The object of the present invention is to provide an
5 elevator, which is capable of measuring the electric current characteristics etc. of a motor safely and easily while the elevator is being driven.

One aspect of the present invention relates to an elevator apparatus comprising an electric power converter, a motor
10 controlled by said electric converter and driving an elevator car, a microprocessor for controlling the elevator and a current detecting means for detecting a current of the motor; said elevator apparatus being characterized by further comprising a data processing means for processing the current detected by
15 the current detecting means using the microcomputer, an input/output interface for inputting or outputting current data after being processed by the data processing means and a connector which is connected to the input/output interface and installed in an elevator floor, in an elevator machine room or
20 on a place for measuring safely.

Another aspect of the present invention relates to an oil hydraulic driven elevator apparatus comprising a plurality of temperature detecting means and a plurality of pressure detecting means for detecting temperature and pressure in the
25 oil of various kinds of components of the oil hydraulic driven elevator; said oil hydraulic driven elevator apparatus being characterized by further comprising a data processing means for processing the current detected by the current detecting means using the microcomputer, an input/output interface for

inputting or outputting current data after being processed by the data processing means and a connector which is connected to the input/output interface and installed in an elevator floor, in an elevator machine room or in a place for safe measurement
5 of the electric current.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram showing the overall construction of an elevator system as an embodiment of the
10 present invention.

FIG. 2 is a detailed block diagram of a current measuring means in a microprocessor in accordance with the present invention.

FIG. 3 is a flow chart showing the input processing
15 operation on current data from the current measuring means in accordance with the present invention.

FIG. 4 is a view showing the arrangement of an elevator car and the various kinds of components composing the elevator in accordance with the present invention seen from above.
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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention will be described below in detail, referring to the drawings.

FIG. 1 is a schematic diagram showing the overall
25 construction of a conventional elevator system. Referring to FIG. 1, reference character 1 indicates an elevator car, reference character 2 indicates a counter weight for reducing load of a traction machine, and reference character 3 indicates a rope being wound around a traction sheave 4 of which one end

is connected to the elevator car 1 and the other end is connected to the counter weight 2. Reference character 5 indicates an induction motor driving the traction sheave 4, reference character 6A indicates a detector for detecting current flowing the induction motor 5, reference character 6B indicates a detector for detecting current flowing a main circuit of an electric power converter, and 6C indicates a detector for detecting current flowing a door motor of the elevator car, reference character 7 indicates detected data output from the current detector 6A, reference character 8 indicates a microprocessor for controlling the elevator by receiving the detected data output from the current detector 6A-6C and the other various kinds of data (not shown), reference character 9 indicates a three-phase alternating current power source, and reference character 10 indicates an electric power converter for converting three-phase alternating current to an electric power suitable for operating the elevator.

In the microprocessor 8, an electric current measuring means 8' for processing the detected current into indicated data is provided and connected to an input/output interface 17 and an external indicator 19.

As the detected data output from the current detectors 6A-6C and the other various kinds of data are input to the microprocessor 8, the microprocessor 8 controls the driving of the elevator by appropriately controlling the torque and the rotating speed of the induction motor 5.

In this embodiment, when operating the induction motor 5, the electric power converter 10 and the door motor 20 are checked, and the detected current from each of the current

detectors 6A, 6B, 6C is input to the current measuring means 8' in the microprocessor 8 to calculate the current data. The current data is displayed on the external indicator 19 through the input/output interface 17.

5 FIG. 2 is a detailed block diagram showing the current measuring means 8' in the microprocessor 8. The current measuring means 8' is composed of analog-digital (A/D) converters 12A, 12B and 12C, a controlling means (CPU) 13 for controlling the overall operation, a program storing memory (ROM) 14 for storing
10 the operating program of the CPU, a processed data writing memory (RAM) 15 for temporarily writing processed data and an indicator 16. The analog-digital (A/D) converters 12A, 12B and 12C are connected to the current detectors 6A, 6B and 6C respectively, and the analog-digital (A/D) converters 12A, 12B, 12C, the CPU
15 13, the ROM 14, the RAM 15, the indicator 16 and the input/output interface 17 for interfacing with an external circuit are connected to a common control bus 18, and the external indicator 19 is connected to the input/output interface 17. The indicator 16 and the externally connected external indicator 19 display
20 the current data previously calculated by the CPU 13. At that time, the current data is displayed by being converted to character codes so as to be easily understood by a person carrying out the measurement.

FIG. 3 is a flow chart showing the input processing of
25 current data performed in the CPU 13. The input processing of current data is performed by the following operating process. Initially, in Step S1, the CPU 13 detects the data from each of the respective components detected by each of the current detectors 6A, 6B and 6C keeping a certain cycle. In Step S2,

the CPU 13 acquires the detected data digitized by each of the A/D converters 12A, 12B and 12C. Next in Step S3, the CPU 13 calculates the current data to be displayed based on the acquired detected data. Then, in Step S4, the CPU 13 supplies the
 5 calculated current data to the indicator 16 and the external indicator 19 to be displayed. After displaying the current data on the indicator 16 and the external indicator 19, the process returns to Step S1 to continue the operation repetitively.

FIG. 4 is a view showing the arrangement of an elevator
 10 car and the various kinds of components composing the elevator seen from above. Referring to FIG. 4, the elevator car 1 traveling upward and downward is arranged in a machine room surrounded by walls 24 of a building, and the door motor 20 for opening and closing a door is provided in the elevator car 1. Further,
 15 the counter-weight 2, the traction sheave 3, the induction motor 5, the electric power converter 10 and the microprocessor 8 are arranged inside the walls 24. Therein, the detector 6A for detecting the current of the induction motor 5, the detector 6B for detecting the current of the electric power converter
 20 10 and the detector 6C for detecting the current of the door motor 20 characterizing the present embodiment are arranged respectively among the components, and each of the current detectors is connected to the microprocessor 8 through the line 21. Further, the input/output interface 17 is arranged inside
 25 the hall button portion 22 installed in the elevator floor, and the input/output interface 17 is connected to the microprocessor 8 through the common control bus 18. Furthermore, the portable external indicator 19 is detachably connected to the input/output interface 17.

In this embodiment, since each of the currents of the induction motor 5, the electric power converter 10 and the door motor 20 can be read by arranging the input/output interface 17 connected to the microprocessor 8 inside the hall button
5 portion 22 and connecting the portable external indicator 19 to the input/output interface 17, the danger of the conventional method can be removed and the measurement can be performed safely and easily.

Although the input/output interface 17 in this embodiment
10 is installed inside the hall button portion 22, the measurement can be performed when the input/output interface 17 is installed in the machine room or any other place where it is not dangerous.

Further, although this embodiment has been described on the premise that the measurement of current characteristics is
15 performed on the following elevator components: the induction motor 5, the electric power converter 10 and the door motor 20, the present invention can be applied to the inspection of the current characteristics of the other elevator components.

Furthermore, the present invention can be applied to an
20 oil hydraulic driven elevator. In this case, temperatures and pressures of oil can be measured and displayed safely and easily by inputting the detected data from temperature detectors and pressure detectors into the microprocessor 8 to perform the data conversion as described above.

25 As described in detail above, according to the present invention, because the detected data obtained from the current detectors of the plurality of elevator components can be displayed on the portable external indicator installed in a non-dangerous place such as the elevator floor, the machine room

or the like, the current characteristics of each of the components can be measured safely and easily.

Further, in the case of the oil hydraulic driven elevator, since the detected temperatures and oil pressures data are
5 displayed on the portable external indicator installed in the non-dangerous place, the characteristics of the temperature and pressure can be measured safely and easily.

What is claimed is:

1. An elevator apparatus comprising an electric power converter, a motor controlled by an electric current fed from the converter and driving an elevator car, and an electric
5 current detecting means for detecting said electric current, said elevator apparatus being characterized by further comprising

a data processing means for processing said electric current detected by said electric current detecting means,

10 a connector which is installed on an elevator floor, in an elevator machine room or in a place for measuring said electric current safely and is detachable to an external indicator, and

a signal wire for feeding an electric current data from said data processing means to said connector after said electric
15 current is processed by the data processing means.

2. An elevator apparatus comprising an electric power converter, a motor controlled by said electric converter and driving an elevator car, a microprocessor for controlling said
20 elevator and an electric current detecting means for detecting an electric current of said motor; said elevator apparatus being characterized by further comprising

a data processing means for processing said current detected by said current detecting means using said
25 microcomputer,

a connector which is installed in an elevator floor, in an elevator machine room or in a place for measuring said electric current safely and is detachable to an external indicator, and

a signal wire for feeding an electric current data from

said data processing means after said electric current is processed by the data processing means.

3. An elevator apparatus comprising an electric power
5 converter, a motor controlled by said electric converter and driving an elevator car, a microprocessor for controlling said elevator and an electric current detecting means for detecting an electric current of said motor; said elevator apparatus being characterized by further comprising
10 a data processing means for processing said current detected by said current detecting means using said microcomputer,
an input/output interface for inputting/outputting an electric current data after being processed by said data
15 processing means and
a connector which is connected to said input/output interface and installed in an elevator floor, in an elevator machine room or in a place for safe measurement.

- 20 4. An elevator apparatus comprising an electric power converter, a motor controlled by an electric current fed from the converter and driving an elevator car, and an electric current detecting means for detecting said electric current, said elevator apparatus being characterized by further
25 comprising

a data processing means for processing said electric current detected by said electric current detecting means,

a connector which is installed on a hall button portion of an elevator floor and is detachable to an external indicator,

and

a signal wire for feeding electric current data from said data processing means to said connector after said electric current is processed by the data processing means.

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5. An elevator apparatus comprising an electric power converter provided in an elevator hoistway, a motor controlled by an electric current fed from the converter and driving an elevator car, said elevator apparatus being characterized by
10 further comprising

an electric current detecting means provided in said elevator hoistway for detecting said electric current,

a data processing means provided in said elevator hoistway for processing said electric current detected by said electric
15 current detecting means,

a connector which is installed in an elevator floor and is detachable to an external indicator, and

a signal wire for feeding electric current data from said data processing means to said connector after said electric
20 current is processed by the data processing means.

6. An elevator apparatus comprising a plurality of temperature detecting means and a plurality of pressure detecting means for detecting temperature and pressure of oil
25 of various kinds of oil hydraulic driven components of the elevator apparatus; said elevator apparatus being characterized by further comprising

a data processing means for processing said current detected by said current detecting means using said

microcomputer,

an input/output interface for inputting/outputting electric current data after being processed by said data processing means and

- 5 a connector which is connected to said input/output interface and installed in an elevator floor, in an elevator machine room or in a place for safe measurement.