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(71) Applicant: **Mitsubishi Electric Corporation**
Tokyo 100-8310 (JP)

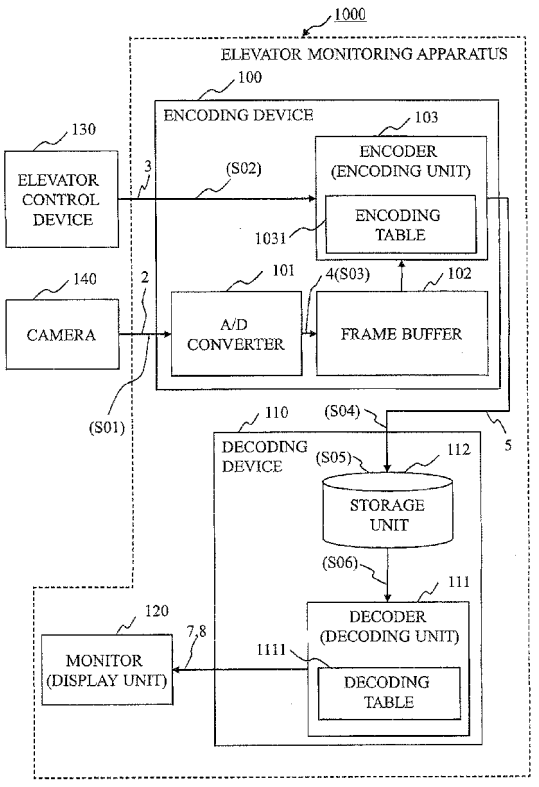
(72) Inventor: **KURODA, Shinichi**
Tokyo 100-8310 (JP)

(74) Representative: **HOFFMANN EITLE**
Patent- und Rechtsanwälte
Arabellastraße 4
81925 München (DE)

(54) ELEVATOR MONITORING DEVICE

(57) An elevator monitoring apparatus 1000 includes an encoding device 100. An encoder 103 of the encoding device 100 inputs, from a frame buffer 102, a digital image signal 4 which is an image sensed by a camera 140 and which is an in-car image, digitized by an A/D converter 101, of an elevator. Simultaneously, the encoder 103 inputs, from an elevator control device 130, elevator information 3 which is a digital signal indicating an operating state of the elevator. The encoder 103 encodes the digital image signal 4 into a bit string in accordance with an image encoding rule such as MPEG4, and encodes the elevator information 3 into a bit string in accordance with a predetermined elevator information encoding rule. The encoder 103 generates encoded bit string data which includes the bit string of the digital image signal 4 and the bit string of the elevator information 3 and in which the bit string of the digital image signal and the bit string of the elevator information are related to each other, and outputs the generated encoded bit string data to a decoding device 110.

Fig. 1



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Description

Technical Field

[0001] The present invention relates to an elevator monitoring apparatus which displays an image from a camera that senses the image of the inside of an elevator car and elevator information indicating an elevator operating state by relating them to each other.

Background Art

[0002]

(1) According to Patent Document 1 (JP 2002-234676), a display controller synthesizes an image from a camera installed in a car and a visual image of elevator information obtained from an elevator control panel. Since a monitor displays the synthetic image of the image from the camera and the elevator information, a portion of the in-car image is concealed by the elevator information. Also, the larger the amount of elevator information to be displayed, the larger the area of the in-car image that is concealed by the elevator information. Then, the in-car image becomes complicated to see.

(2) According to Patent Document 2 (JP 2000-351546), a means for storing the condition of the elevator (elevator condition recording means 103) and a means for recording image data (image recording means 105) are provided separately. To relate the image data and the operating condition of the elevator at the time point the image data is sensed, a clock device is required. When displaying, the operating condition of the elevator and the image data must be displayed by referring to the time and date information output from the clock device as a key.

Patent Document 1: JP 2002-234676

Patent Document 2: JP 2000-351546

Disclosure of the Invention

Problems to be Solved by the Invention

[0003] It is an object of the present invention to provide an elevator monitoring apparatus with a simple arrangement, which displays an in-car image and elevator information on a display device without overlaying the elevator information on the in-car image. It is another object of the present invention to provide an elevator monitoring apparatus which does not require a means for relating the image data and elevator information.

Means to Solve the Problems

[0004] According to the present invention, there is provided an elevator monitoring apparatus comprising an encoding unit which inputs a digital image signal showing a real-time image of an inside of a car of an elevator and elevator information which is a digital signal representing a real-time operating state of the elevator, encodes the digital image signal into a bit string in accordance with a predetermined image encoding rule and encodes the elevator information into a bit string in accordance with a predetermined elevator information encoding rule, and generates encoded bit string data which includes the bit string of the digital image signal and the bit string of the elevator information and in which the bit string of the digital image signal and the bit string of the elevator information are related to each other.

[0005] The encoding unit generates, as the encoded bit string data in which the bit string of the digital image signal and the bit string of the elevator information are related to each other, the encoded bit string data which includes an area including the bit string of the digital image signal and an area of the bit string of the elevator information and in which the area including the bit string of the digital image signal and the area including the bit string of the elevator information are consecutive.

[0006] The elevator monitoring apparatus further comprises

a storage unit which stores the encoded bit string data generated by the encoding unit,

a decoding unit which reads the encoded bit string data stored in the storage unit, decodes the bit string of the image digital signal included in the encoded bit string data in accordance with an image decoding rule which matches the image encoding rule, and decodes the bit string of the elevator information included in the encoded bit string data in accordance with an elevator information decoding rule which matches the elevator information encoding rule, and

a display unit which displays an image indicated by the bit string of the image digital signal decoded by the decoding unit and the operating state indicated by the bit string of the elevator information decoded by the decoding unit, so as not to overlie on each other.

[0007] The encoding unit complies with the image encoding rule of either one of JPEG (Joint Photographic Experts Group) and MPEG4 (Moving Picture Experts Group4), as the predetermined image encoding rule.

[0008] The encoding unit has an encoding table describing the predetermined elevator information encoding rule, and encodes the elevator information by using the encoding table.

[0009] The elevator information includes at least one of information indicating a position of the car, information indicating a moving direction of the car, information indicating a failure of the elevator, and information indicating open/close of a door of the car.

Effect of the Invention

[0010] The present invention can provide an elevator monitoring apparatus which displays an in-car image and elevator information without overlaying the elevator information on the in-car image and which does not require a dedicated means for relating the image data and elevator information.

Best Modes for Currying out the Invention

Embodiment 1

[0011] Fig. 1 shows the configuration of an elevator monitoring apparatus 1000 according to the first embodiment. The elevator monitoring apparatus 1000 is provided with an encoding device 100, a decoding device 110, and a monitor 120 (display unit). The encoding device 100 inputs elevator information 3 output from an elevator control device 130 and an analog image signal 2 output from a camera 140 set in an elevator car, and generates an "image-encoded bit string 5 including the elevator information 3" to be described later. The decoding device 110 decodes "the image-encoded bit string 5 including the elevator information 3" which is generated by the encoding device 100. The monitor 120 displays the decoded image decoded by the decoding device 110, and the content of the elevator information (the operating state of the elevator). The camera 140 to be set in the car may be a digital camera that outputs a digital image signal. In this case, an A/D converter 101 can be omitted.

(Installation Place)

[0012] The elevator control device 130 and encoding device 100 are installed in an elevator machine room or an elevator hoistway. The decoding device 110 and monitor 120 are installed in the building caretaker's room. These locations are merely examples, and the installation locations are not specifically limited to them.

(Configuration of Apparatus)

[0013] As shown in Fig. 1,

(1) the encoding device 100 is provided with the A/D converter 101, a frame buffer 102, and an encoder 103. The encoder 103 is provided with an encoding table 1031. The A/D converter 101 converts the analog image signal 2 output from the camera 140 into a digital image signal 4. The frame buffer 102 is a frame buffer that can buffer at least one-frame image. The encoder 103 encodes the digital image signal 4 in the frame buffer 102 and the elevator information 3 to generate the "image-encodedbit string 5 including the elevator information 3", and outputs the same.

(2) The decoding device 110 is provided with a decoder 111 and a storage unit 112. The decoder 111 is provided with a decoding table 1111. The storage unit 112 accumulates "the image-encoded bit string 5 including the elevator information 3" which is output from the encoding device 100. By using the decoding table 1111, the decoder 111 decodes the "image-encoded bit string 5 including the elevator information 3" accumulated in the storage unit 112.

[0014] In Fig. 1, the encoding device 100 and decoding device 110 are separate devices. However, the encoding device 100 and decoding device 110 may be realized as one device.

(Hardware Configuration)

[0015] Fig. 2 shows an example of the hardware configuration of the encoding device 100 and decoding device 110 of the first embodiment. The encoding device 100 and decoding device 110 are each a computer having hardware resources as shown in Fig. 2. The following description on Fig. 2 is premised on the encoding device 100. The encoding device 100 need not include a display unit 813 or operation keys 814 when it is to be installed in the elevator machine room or elevator hoistway together with the elevator control device 130. In the following explanation, a case will be described in which the encoding device 100 is provided with a display unit 813 and operation keys 814.

[0016] Referring to Fig. 2, the encoding device 100 includes a CPU 810 (Central Processing Unit) which executes a program. The CPU 810 is connected to a ROM (Read Only Memory) 811, a RAM (Random Access Memory) 812, a display unit 813, the operation keys 814, a communication board 816, and a magnetic disk device 820 via a bus 825, and controls these hardware devices. In place of the magnetic disk device 820, a memory device such as a flash memory may be employed.

[0017] The RAM 812 is an example of a volatile memory. The memory media such as the ROM 811 and magnetic disk device 820 are examples of anon-volatile memory. These memories are examples of a storage device or storage unit, or a buffer. The communication board 816, operation keys 814, and the like are examples of an input unit or input device. The communication board 816, display unit 813, and the like are examples of an output unit or output device.

[0018] The magnetic disk device 820 stores an operating system 821 (OS), a program group 823, and a file group 824. The programs of the program group 823 are executed by the CPU 810 and operating system 821.

[0019] The program group 823 stores the programs that execute functions described as an encoder (encoding unit) and a decoder (decoding unit) in the following description of the embodiment. The programs are read and executed by the CPU 810. Namely, the programs serve as the encoder (or decoder) to be described below to cause the computer to function.

[0020] The file group 824 stores information described as a table in the following description of the embodiment and information described as a determination result, a calculation result, an extraction result, a generation result, and a processing result in the following description of the embodiment; and data, signal values, variable values, parameters, and the like, as the respective items of files and data bases. The files and data bases are stored in a recording medium such as a disk or memory. The information, data, signal values, variable values, and parameters stored in the recording medium such as a disk or memory are read in a main memory or cache memory by the CPU 810 via a read/write circuit, and are used for CPU operations such as extraction, retrieval, look-up, comparison, computation, calculation, processing, output, and display. During the CPU operations such as extraction, retrieval, look-up, comparison, computation, calculation, processing, output, and display, the information, data, signal values, variable values, and parameters are temporarily stored in the main memory, cache memory, and buffer memory.

(Explanation on operation)

[0021] The operation will be explained with reference to Fig. 1.

(operation of Encoding Device 100)

[0022] The camera 140 set in the elevator car outputs the analog image signal 2 of the inside of the elevator car image-sensed to the A/D converter 101 of the encoding device 100 (S01). The elevator control device 130 outputs "elevator information 3" to the encoder 103 of the encoding device 100 (S02). The "elevator information 3" is a digital signal representing the real-time operating state of the elevator, and is a signal that includes, e.g.,

(1) information indicating the car position,
(2) information indicating the moving direction of the car,
(3) information indicating a failure of the elevator, and
(4) information indicating opening/closing of the car door. The content to be included in the "elevator information 3" can be set freely. In the following description, the "elevator information 3" is assumed to include four pieces of information, namely, "(1) information indicating the car position" to "(4) information indicating opening/closing of the car donor".

(Process by Encoding Device 100)

[0023] The real-time analog image signal 2 (real-time image) of the inside of the car in the real-time state is input to the A/D converter 101 (S01) and converted into the digital image signal 4. The digital image signal 4 obtained by conversion is input to the frame buffer 102 and temporarily stored in it (S03). The encoder 103 encodes the digital image signal 4 stored in the frame buffer 102 and encodes the elevator information 3, generates an "image-encoded bit string 5 including the elevator information 3" (an example of encodedbit string data), and outputs the generated image-encoded bit string 5 to the decoding device 110 (S04).

(When Encoder 103 Complies with JPEG)

[0024] The encoder 103 (encoding unit) is, e.g., an encoder complying with JPEG (Joint Photographic Experts Group). When complying with JPEG, the encoder 103 performs encoding in accordance with JPEG. First, an "image-encoded bit string 5" (before the bit string of the elevator information 3 is inserted in it) is generated from a digital image signal 4 stored in the frame buffer 102.

[0025] Fig. 3 shows the image-encoded bit string 5 generated by the encoder 103 to comply with JPEG. As shown in Fig. 3, the image-encoded bit string 5 generated to comply with JPEG starts with a start marker 601, continues through a segment 602 and image data 603, and ends with an end marker 604. The image data 603 is a bit string obtained by digitally compressing the digital image signal 4 representing the in-car image sensed by the camera 140. For example, one-frame in-car image is inserted (recorded) in the area of the image data 603.

[0026] The segment 602 includes a comment segment area 6020. The comment segment area 6020 is reserved for the user to use exclusively. The comment segment area 6020 comprises a COM marker 6021, a segment length 6022 ((the number of bites of the codes added to the comment segment) + 2) of the comment segment area, and a comment segment 6023.

(Encoding Table 1031)

[0027] As shown in Fig. 4, the encoder 103 comprises the encoding table 1031 (an example of predetermined elevator information encoding) to encode the elevator information 3. Using the encoding table 1031, the encoder 103 encodes the elevator information 3. More specifically, using the encoding table 1031, the encoder 103 encodes

(1) car position information,
(2) the moving direction,
(3) elevator failure information, and
(4) door open/close information.

The encoder 103 inserts these encoded bit strings in this order into the comment segment 6023 of the image-encoded bit string 5 generated, to generate the "image-encoded bit string 5 including the elevator information 3". In this case, the elevator information 3 inserted as the bit string corresponds to the image bit string inserted in the area of the image data 603. More specifically, the elevator information 3 inserted in the comment segment 6023 is elevator information 3 at a time point the image of the

image data 603 is sensed (the same time point as that the image is sensed, or a time point immediately before/after that) . As shown in Fig. 3, the segment 602 (the area including the bit string of the elevator information) and the image data 603 (the area including the bit string of the digital image signal) are consecutive. Thus, the in-car image and the elevator information obtained at the time point the image is sensed can be related to each other by forming the in-car image and elevator information into the form of bit strings.

"Relating" of the in-car image and the elevator information obtained at the time point the image is sensed can be defined by the syntax of JPEG or JPEG4. According to the first embodiment, as an example of relating, the segment 602 (the area including the bit string of the elevator information) and image data 603 (the area including the bit string of the digital signal) which are consecutive are related to each other, as described above. Consecutive relating is merely an example, and another type of relating is possible based on the syntax of JPEG or MPEG4.

(Insertion Example into Comment Segment in JPEG)

[0028] A practical example will be indicated below. Assume that the following encoded bit strings are input as the elevator information 3, namely,

(1) car position information: building lowermost level,
(2) car moving direction: UP,
(3) elevator failure information: failure cause 1 and failure cause 3, and
(4) car door open/close information: door open

[0029] In this case, if encoded bit strings are obtained using the encoding table 1031 shown in Fig. 4, the following results are obtained, namely,

(1) car position information: "0000 0000" (00 when represented as a hexadecimal number),
(2) moving direction: "0000 0000" (00 when represented as a hexadecimal number),
(3) elevator failure information: "00000101" (05 when represented as a hexadecimal number), and
(4) car door open/close information: "1111 1111" (FF when represented as a hexadecimal number).

Therefore, (1) to (4) can be represented as "0000 05FF" in hexadecimal notation.

[0030] The encoded bit string of the COM marker 6021 is "FFEE" (specified by JPEG). Hence, the elevator information 3 added to the comment segment area 6020 in this case is the comment segment area 6020 of Fig. 6.

[0031] The encoder 103 transmits the "image-encoded bit string 5 including the elevator information 3" to the decoding device 110 in the building caretaker's room via a LAN (Local Area Network) or the like.

(Process by Decoding Device 110)

[0032] The decoding device 110 receives the "image-encoded bit string 5 including the elevator information 3" from the encoding device 100 and stores it in the storage unit 112 (S05). The decoder 111 reads the "image-encoded bit string 5 including the elevator information 3" stored in the storage unit 112 and decodes it (S06). In this case, as the decoding result, the decoder 111 outputs a decoded image 7 and elevator information 8 (information of the elevator information 3 after decoding) to the monitor 120. When the encoder 12 complies with JPEG, the decoder 111 decodes the bit string of the image in accordance with the standard (an example of an "image decoding rule that matches a predetermined image encoding rule") complying with JPEG.

(Decoding of Elevator Information 3)

[0033] In this case, the decoder 111 generates the decoded image 7 by executing decoding as specified by, e.g., JPEG. The decoder 111 has the decoding table 1111 (an example of an "elevator information decoding rule that matches a predetermined elevator information encoding rule") identical to the encoding table 1031 shown in Fig. 4. By looking up the decoding table 1111, the decoder 111 decodes the encoded bit string of the elevator information 3 included in the comment segment 6023 in the "image-encoded bit string 5 including the elevator information 3", and outputs the elevator information 8 (the elevator information decoded) to the monitor 120. More specifically, when decoding the encoded bit string of the elevator information 3, the decoder 111 performs decoding using the decoding table 1111 in the order of

(1) car position information,
(2) moving direction,
(3) elevator failure information, and
(4) door open/close information.

(Monitor Operation)

[0034] The decoded image 7 and the elevator information 8 are output from the decoding device 110 to the monitor 120. Fig. 5 shows an example of a screen displayed on the monitor 120. As shown in Fig. 5, the decoded image 7 and the elevator information 8 are displayed on the screen of the monitor 120 separately without being overlaid. In Fig. 5, a display 201 indicates the floor level, and a figure 202 shows three pieces of information, namely,

(1) car position information: 1st floor,
(2) moving direction: UP, and
(3) door closed.

Also, as failure information, the display 203 shows that

"failure cause 1" and " failure cause 3" occur. An image 204 shows the present in-car scene of the inside of the car. In this display, the in-car scene is not concealed by the display of the elevator information (elevator operating state) and can be seen easily. Also, by only decoding the "image-encoded bit string 5 including the elevator information 3", the decoder 111 can obtain the decoded image 7 and the elevator information 8 linked to the decoded image 7 easily without requiring a dedicated means that relates the image data and elevator information to each other. In this manner, the decoded image 7 and the elevator information 8 linked to it can be displayed easily with a simple structure.

(When Encoder 103 Complies with MPEG4)

[0035] Alternatively, the encoder 103 can be one complying with MPEG4 (Moving Picture Experts Group4). Fig. 7 shows an "image-encoded bit string 5" generated when the encoder 103 executes an encoding process as specified by MPEG4 (an example of a predetermined image coding rule). The "image-encoded bit string 5" of Fig. 7 shows (n-1)th image data 401 and (n) th image data 402. The (n-1) th image data 401 is sensed before the (n) th image data 402. For example, the (n) th image data 402 is formed of header information 801 (an example of an area including the bit string of elevator information) and image data 802 (an example of an area including the bit string of a digital image signal). The header information 801 and image data 802 are consecutive areas. For example, one-frame in-car image is inserted (recorded) in the area of the image data 802. Alternatively, a plurality of frames may be recorded in the area of the image data 802. The number of frames inserted in the area of the image data 802 depends on implementation. In the same manner as in the case of JPEG, the encoder 103 has an encoding table 1031 (an example of the elevator information encoding rule) shown in Fig. 4. By using the encoding table 1031, the encoder 103 encodes input elevator information 3. The encoder 103 inserts the respective encoded bit strings in the area of user data 8022 of a user data area 8020 present in the image-encoded bit string 5 (Fig. 7) already-generated, in the order of

(1) car position information,
(2) moving direction,
(3) elevator failure information, and
(4) door open/close information

to generate the "image-encoded bit string 5 including the elevator information 3". In this case, the encoded bit string of the elevator information 3 inserted in the area of the user data 8022 corresponds to the image bit string inserted in the area of the image data 802. More specifically, the elevator information 3 inserted in the user data 8022 is elevator information 3 at a time point the image of the image data 802 is sensed (the same time point as that the image is sensed, or a time point immediately before/after that). Similarly, elevator information 3 inserted in header information 701 is elevator information 3 at a time point the image of image data 702 is sensed (the same time point as that the image is sensed, or a time point immediately before/after that).

[0036] Fig. 8 shows a practical example of the "image-encoded bit string 5 including the elevator information 3" in the user data area 8020. The user data area 8020 is an area included in the header information 801 and can be used by the user exclusively. The user data area 8020 is an area in which the user data 8022 is added consecutively to a user data start code 8021. Assume that the elevator information 3 includes

(1) car position information: building lowermost level,
(2) car moving direction: UP,
(3) elevator failure information: failure cause 1 and failure cause 3, and
(4) car door open/close information: door close is input.

In this case, since the encoded bit string of the user data start code is "000001B2" (specified by MPEG4), the user data area 8020 in this case is a signal as shown in Fig. 8.

(Relating of Image Information and Elevator Information)

[0037] Fig. 9 is a view explaining how the "image-encoded bit string 5 including the elevator information 3" is generated by the encoder 103. The camera 140 serially outputs to the A/D converter 101 analog image signals 2 which are the present video signals (real-time images) obtained by sensing the image of the inside of the car. The A/D converter 101 converts the serially output analog image signals 2 into digital image signals 4 sequentially and outputs them to the encoder 103. The elevator control device 130 successively outputs the present elevator information 3 which are digital signals to the encoder 103. The elevator information 3 is information indicating the present operating condition of the elevator (information indicating the real-time operating condition). Fig. 9 shows that pieces of information in the direction of arrows are input to the encoder 103 first. As shown in Fig 9, the analog image signals 2 are converted into digital image signals 4 and input to the encoder 103. The encoder 103 converts the successively input digital image signals 4 into an image-encoded bit string 5, and inserts information obtained by converting the elevator information 3 into a bit string, in a predetermined area of the image-encoded bit string 5. In Fig. 9, (n-1) 401 and (n) 402 indicate a portion of the digital image signal 4 and a portion of the elevator information 3 which are to be encoded as the image data 401 and image data 402, respectively, of Fig. 7. More specifically, in (n-1) 401, the digital image signals 4 and the elevator information 3 obtained at almost the same time form bit strings. What has been said for (n-1) 401 applies to (n) 402, which is a next in-car

image. More specifically, the present real-time information is successively input to the encoding device 100 as the elevator information 3 and analog image signal 2. The analog image signal 2 is converted into the digital image signal 4 instantaneously. Accordingly, by encoding the digital image signal 4 and elevator information 3 into bit strings at a timing shown in Fig. 9, the encoder 103 can relate the time point (time) at which the in-car image is sensed and the elevator information at this time point (i.e., the operating state of the elevator) to each other without requiring a special device.

(Decoder in MPEG4)

[0038] In this case, the decoder 111 of the decoding device 110 complies with MPEG4. Namely, the decoder 111 decodes the image-encoded bit string in accordance with the provision (an example of an "image decoding rule that matches a predetermined image encoding rule") complying with MPEG4. In the same manner as in the case of JPEG, using the decoding table 1111 (an example of an "elevator information decoding rule that matches a predetermined elevator information encoding rule"), the decoder 111 decodes the encoded bit string of the elevator information 3. In this manner, the decoder 111 decodes an image as specified by MPEG4, and outputs the decoded image 7. In addition, using the encoding table 1031, the decoder 111 decodes the encoded bit string of the elevator information 3 included in the user data 8022 in the "image-encoded bit string 5 including the elevator information 3", and outputs the elevator information 8 to the monitor 120. The monitor 120 operates in the same manner as in the case of JPEG.

(Reproduction of Previous Image)

[0039] Referring to Fig. 10 a case will be described in which a previous image is reproduced by the decoding device 110. Fig. 10 is premised on the use of MPEG4. When compared to Fig. 1, in Fig. 10, the encoding device 100 includes a clock unit 104, and the decoding device 110 includes a data extraction unit 113.

(Encoding Device 100)

[0040] The clock unit 104 has a clock function of measuring the present time and date. The clock unit 104 outputs to the encoder 103 time and date information which is a digital signal representing the present time and date. For example, the clock unit 104 outputs "2007. 11. 17, 14:32:56" (representing year of 2007, month of November, date of 17, 14 o'clock, 32 minutes, 56 seconds) as the time and date information. Upon input of the time and date information from the clock unit 104, the encoder 103 inserts the time and date information when it generates the "image-encoded bit string 5 including the elevator information 3" described above. For example, in the case of MPEG4, the encoder 103 inserts the time and date information into the header information such as the header information 701 or header information 801 shown in Fig. 7. Then, the image data inserted in the image data 702 matches the time and date information inserted in the header information 701, and the image data recorded on the image data 802 matches the time and date information recorded on the header information 801. The encoder 103 outputs to the decoding device 110 the "image-encoded bit string 5 including the elevator information 3" in which the time and date information is inserted (to be also referred to as a time and date information-added bit string).

(Decoding Device 110)

[0041] In the decoding device 110, the storage unit 112 accumulates the time and date information-added bit string which is output from the encoder 103. In this case, when time and date are input to the data extraction unit 113, the data extraction unit 113 extracts the time and date information-added bit string which matches the input time and date, from the storage unit 112, and outputs the extracted bit string to the decoder 111. When the time and date information-added bit string is input to the decoder 111, the decoder 111 decodes the "image-encoded bit string 5 including the elevator information 3" in which the time and date information is inserted, in the same manner as in the case of Fig. 1, and displays it on the monitor 120.

[0042] Fig. 11 shows a case in which a time information-added decoded bit string is displayed on the monitor 120. As shown in Fig. 11, time and date 205 when the image 204 is sensed are displayed on the screen of the monitor 120, like "2007. 11. 17, 14:32". Thus, an in-car image obtained at a past time point and elevator information of the time point when the in-car image was sensed can be searched easily, and displayed on the monitor 120.

[0043] As described above, in the elevator monitoring apparatus 1000, the encoder 103 generates the "image-encoded bit string 5 including the elevator information 3". Thus, the elevator information and the in-car image can be displayed on the monitor 120 without overlying on each other.

[0044] In the elevator monitoring apparatus 1000, the encoder 103 generates the "image-encoded bit string 5 including the elevator information 3" by relating the bit string of the digital image signals and the bit string of the elevator information to each other. Hence, anymeans to relate the image data and elevator information is unnecessary.

[0045] In the elevator monitoring apparatus 1000, the decoder 111 decodes the "image-encoded bit string 5 including the elevator information 3" and displays it on the monitor 120. Hence, the elevator information and the in-car image can be displayed without overlying on each other.

[0046] In the elevator monitoring apparatus 1000, the

encoder 103 and decoder 111 conform to either the JPEG rule or the MPEG4 rule. Hence, by employing an existing rule, the apparatus can be realized with a simple structure.

[0047] In the elevator monitoring apparatus 1000, the encoder 103 encodes the elevator information by using the encoding table 1031. Hence, the elevator information can be flexibly set by the encoding table 1031.

[0048] In the elevator monitoring apparatus 1000, the elevator information 3 includes at least any one of information indicating the car position, information indicating the car moving direction, information indicating an elevator failure, and information indicating open/close of the car door. Hence, these pieces of information which are important for monitoring the elevator can be displayed on the monitor 120 without overlying on the in-car image.

[0049] An elevator monitoring apparatus which displays an image from a camera 140 while displaying the operating condition of an elevator, the camera 140 being set in an elevator car, has been described, wherein the elevatormonitoring apparatus includes

the encoding device 100 which, after an image sensed by the camera 140 is digitized, when encoding image data digitized by using an image compression technique, encodes information (elevator information) obtained from the elevator control panel as well, thereby outputting an encoded bit string including the elevator information and image data,

a decoding device which decodes the image data and elevator information simultaneously from the encoded bit string, and

a display unit which displays a decoded image and elevator information as a decoding result.

[0050] With the above arrangement,

(1) the encoded bit string of the elevator information is inserted in an area which is specified by the image compression technique and which does not influence the image quality of the decoded image, so that the image data and elevator information at a time point the image data is sensed are related to each other. Therefore, the elevator information need not be overlaid on the decoded image to be displayed on the display unit. As a result, the building caretaker can check the state of the inside of the car entirely.

(2) Image data and elevator information at a time point the image data is sensed can be obtained simultaneously by decoding one encoded bit string. Therefore, a dedicated means to relate the image data and elevator information to each other becomes unnecessary. Hence, the image data and the elevator information at the time point the image data is sensed can be displayed easily with a simple structure.

Grief Explanation of the Drawings

[0051]

[Fig. 1] Fig. 1 shows a configuration of the elevator monitoring apparatus 1000 according to the first embodiment.

[Fig. 2] Fig. 2 shows an example of the hardware configuration of the encoding device 100 or decoding device 110 according to the first embodiment.

[Fig. 3] Fig. 3 shows the image-encoded bit string 5 generated to comply with JPEG according to the first embodiment.

[Fig. 4] Fig. 4 shows the encoding table 1031 according to the first embodiment.

[Fig. 5] Fig. 5 shows an example of the screen displayed by the monitor 120 according to the first embodiment.

[Fig. 6] Fig. 6 shows practical example of the comment segment area 6020 according to the first embodiment.

[Fig. 7] Fig. 7 shows the image-encoded bit string 5 generated to comply with MPEG4 according to the first embodiment.

[Fig. 8] Fig. 8 shows a practical example of the user data area 8020 according to the first embodiment.

[Fig. 9] Fig. 9 explains encoding of the image signal and elevator information according to the first embodiment.

[Fig. 10] Fig. 10 shows another configuration of the elevator monitoring apparatus 1000 according to the first embodiment.

[Fig. 11] Fig. 11 shows an example of the screen of the monitor 120 according to the first embodiment, which displays the sensing time and date of the displayed image.

Explanation of Signs

[0052] 2 analog image signals, 3 elevator information, 4 digital image signal, 5 image-encoded bit string, 7 decoded image, 8 elevator information, 100 encoding device, 101 A/D converter, 102 frame buffer, 103 encoder, 104 clock unit, 110 decoding device, 111 decoder, 112 storage unit, 113 data extraction unit, 120 monitor, 130 elevator control device, 140 camera, 1000 elevator monitoring apparatus, 1031 encoding table, 1111 decoding table, 301 COM marker, 302 segment length, 303 encoded elevator information, 401 (n-1) th image data, 402 (n)th image data, 501 user data start code, 502 encoded elevator information

Claims

1. An elevator monitoring apparatus comprising
an encoding unit which inputs a digital image signal showing a real-time image of an inside of a car of an elevator and elevator information which is a digital signal representing a real-time operating state of the elevator, encodes the digital image signal into a bit string in accordance with a predetermined image en-

coding rule and encodes the elevator information into a bit string in accordance with a predetermined elevator information encoding rule, and generates encoded bit string data which includes the bit string of the digital image signal and the bit string of the elevator information and in which the bit string of the digital image signal and the bit string of the elevator information are related to each other.

2. The elevator monitoring apparatus according to claim 1,
wherein the encoding unit generates, as the encoded bit string data in which the bit string of the digital image signal and the bit string of the elevator information are related to each other, the encoded bit string data which includes an area including the bit string of the digital image signal and an area of the bit string of the elevator information and in which the area including the bit string of the digital image signal and the area including the bit string of the elevator information are consecutive.

3. The elevator monitoring apparatus according to claim 1 or 2, further comprising
a storage unit which stores the encoded bit string data generated by the encoding unit,
a decoding unit which reads the encoded bit string data stored in the storage unit, decodes the bit string of the image digital signal included in the encodedbit string data in accordance with an image decoding rule which matches the image encoding rule, and decodes the bit string of the elevator information included in the encoded bit string data in accordance with an elevator information decoding rule which matches the elevator information encoding rule, and
a display unit which displays an image indicated by the bit string of the image digital signal decoded by the decoding unit and the operating state indicated by the bit string of the elevator information decoded by the decoding unit, so as not to overlie on each other.

4. The elevator monitoring apparatus according to claim 3,
wherein the encoding unit complies with the image encoding rule of either one of JPEG (Joint Photographic Experts Group) and MPEG4 (Moving Picture Experts Group4), as the predetermined image encoding rule.

5. The elevator monitoring apparatus according to claim 4,
wherein the encoding unit has an encoding table describing the predetermined elevator information encoding rule, and encodes the elevator information by using the encoding table.

6. The elevator monitoring apparatus according to claim 4 or 5,
wherein the elevator information includes at least one of information indicating a position of the car, information indicating a moving direction of the car, information indicating a failure of the elevator, and information indicating open/close of a door of the car.

Fig. 1

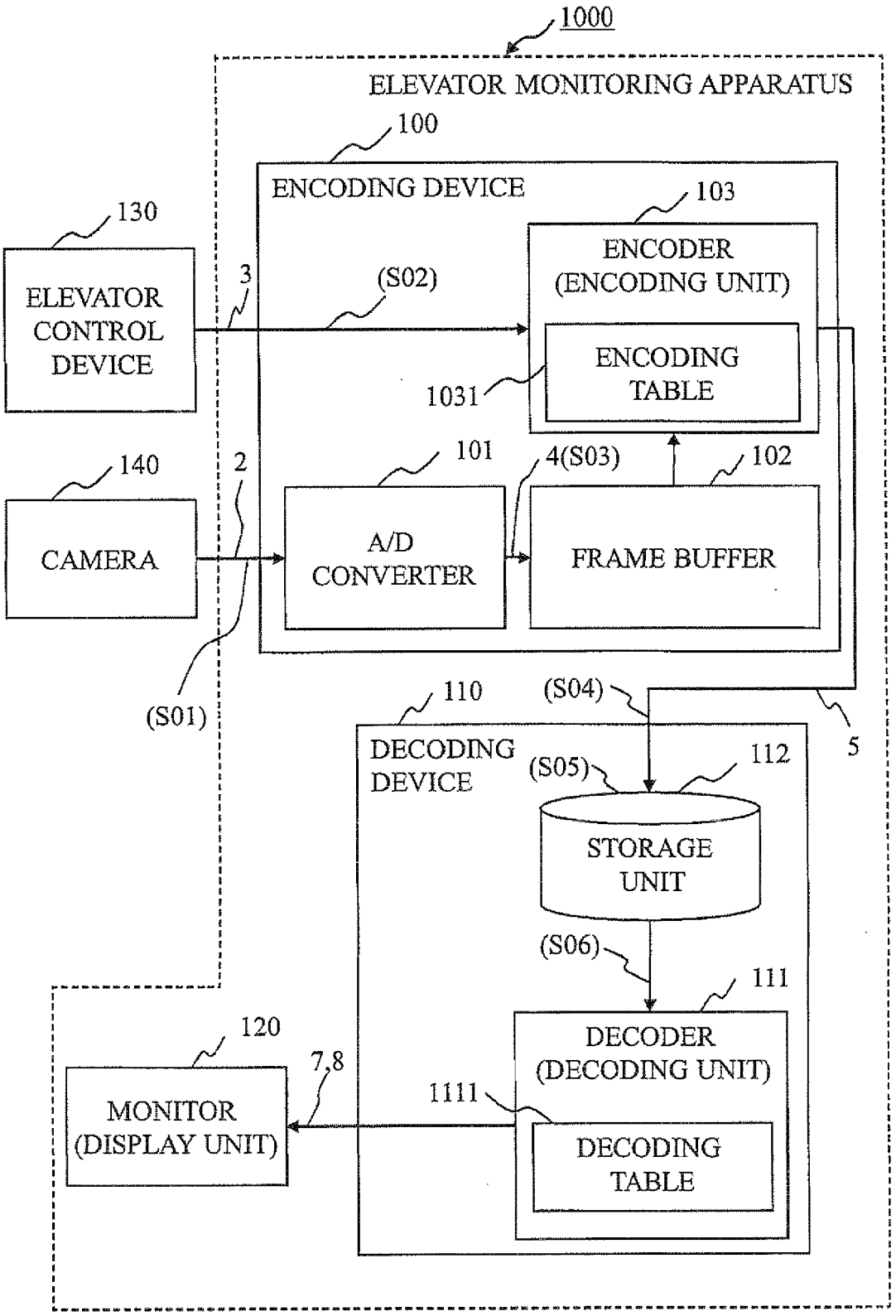

1000
ELEVATOR MONITORING APPARATUS
100
ENCODING DEVICE
103
ENCODER
(ENCODING UNIT)
130
ELEVATOR
CONTROL
DEVICE
3
(S02)
ENCODING
TABLE
1031
140
2
101
4(S03)
102
CAMERA
A/D
CONVERTER
FRAME BUFFER
(S01)
110
(S04)
5
DECODING
DEVICE
(S05)
112
STORAGE
UNIT
(S06)
111
120
7,8
DECODER
(DECODING UNIT)
1111
MONITOR
(DISPLAY UNIT)
DECODING
TABLE

Fig.2

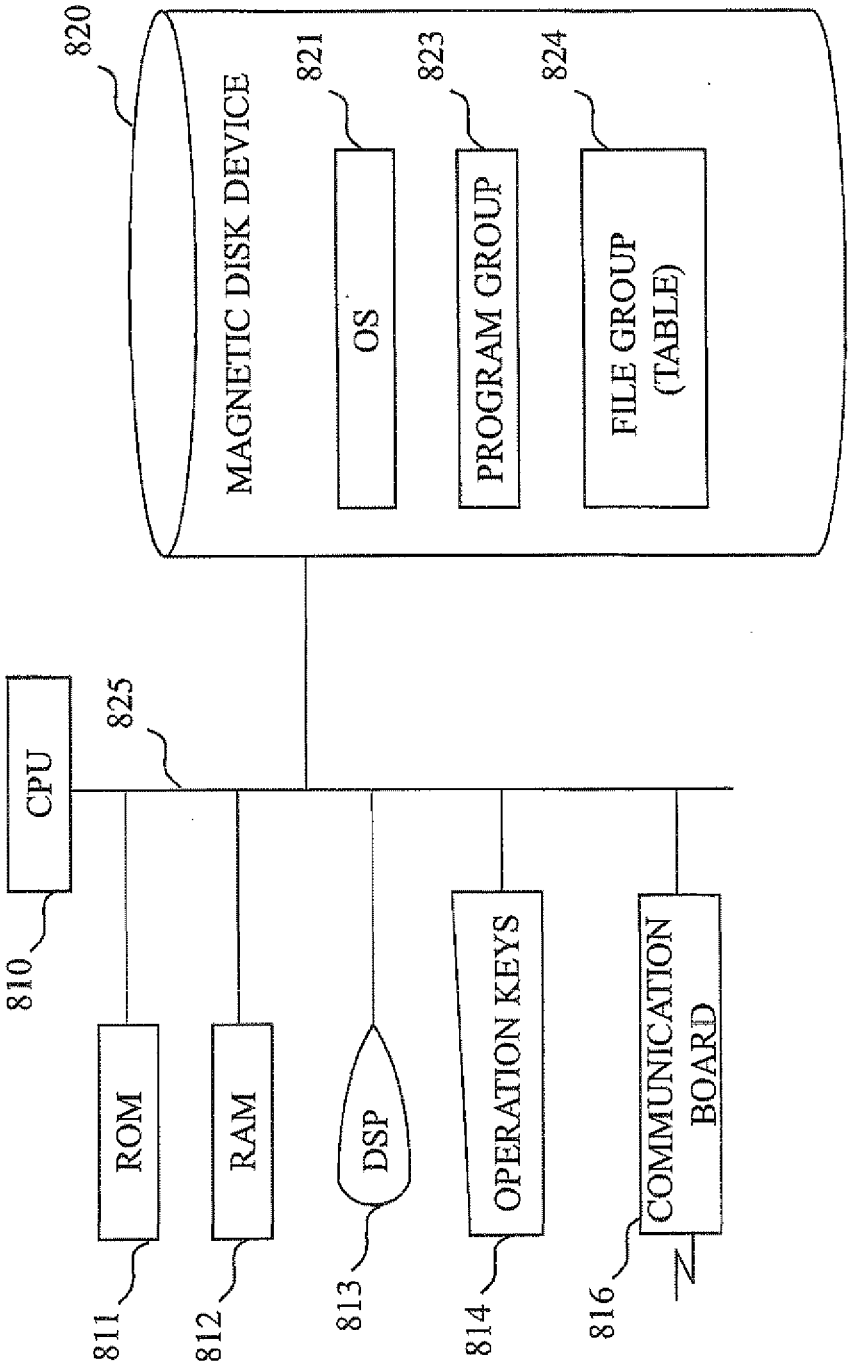

100,110
820
MAGNETIC DISK DEVICE
821
OS
823
PROGRAM GROUP
824
FILE GROUP (TABLE)
825
CPU
810
ROM
811
RAM
812
DSP
813
OPERATION KEYS
814
COMMUNICATION BOARD
816

Fig. 3

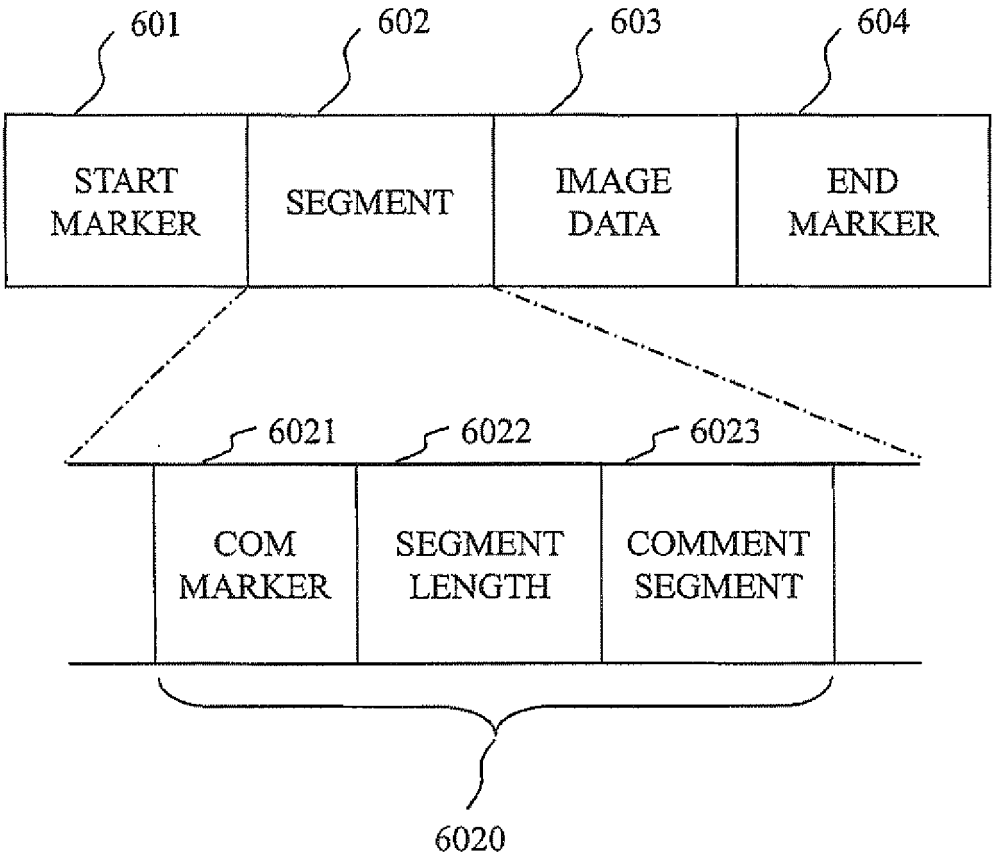

601
602
603
604
START MARKER
SEGMENT
IMAGE DATA
END MARKER
6021
6022
6023
COM MARKER
SEGMENT LENGTH
COMMENT SEGMENT
6020

Fig. 4

1031

ENCODING TABLE

CAR POSITION INFORMATION TABLE	
FLOOR LEVEL	ENCODED BIT STRING
BUILDING LOWERMOST LEVEL	00000000
BUILDING LOWERMOST LEVEL+1	00000001
BUILDING LOWERMOST LEVEL+2	00000010
...	...

MOVING DIRECTION TABLE	
MOVING DIRECTION	ENCODED BIT STRING
UP	00000000
DOWN	11111111

ELEVATOR FAILURE INFORMATION TABLE	
FAILURE CAUSE	ENCODED BIT STRING
NO FAILURE	00000000
FAILURE CAUSE 1	00000001
FAILURE CAUSE 2	00000010
FAILURE CAUSE 3	00000100
FAILURE CAUSE 4	00001000

DOOR OPEN/CLOSE INFORMATION TABLE	
DOOR OPEN/CLOSE INFORMATION	ENCODED BIT STRING
DOOR OPEN	00000000
DOOR CLOSE	11111111

Fig. 5

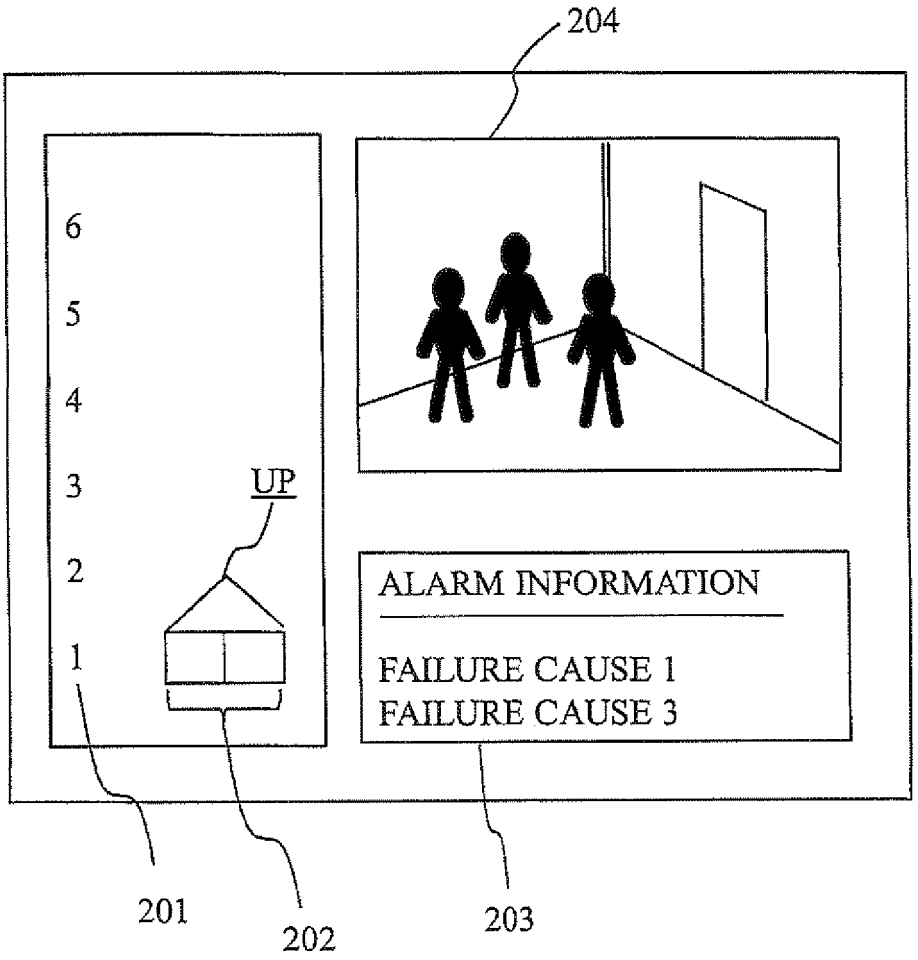

204
6
5
4
3
2
1
UP
ALARM INFORMATION
FAILURE CAUSE 1
FAILURE CAUSE 3
201
202
203

Fig. 6

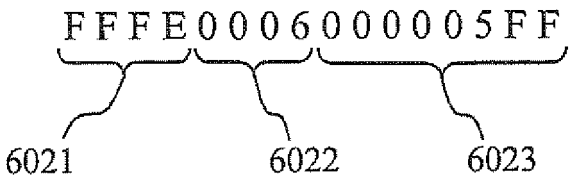

FFFE0006000005FF
6021
6022
6023

Fig. 7

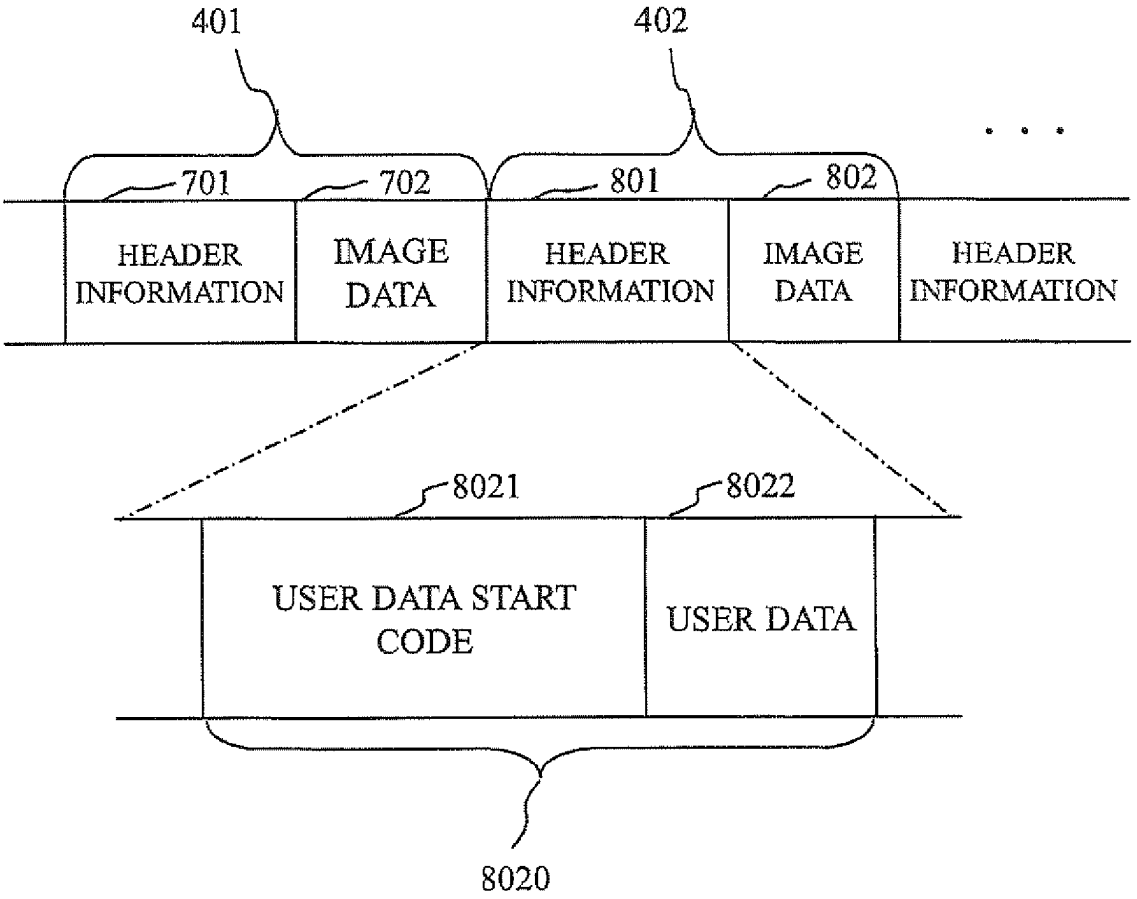

401
402
701
702
801
802
HEADER INFORMATION
IMAGE DATA
HEADER INFORMATION
IMAGE DATA
HEADER INFORMATION
8021
8022
USER DATA START CODE
USER DATA
8020

Fig. 8

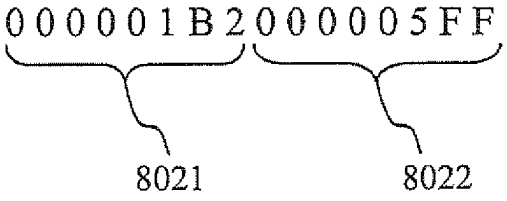

000001B2000005FF
8021
8022

Fig. 9

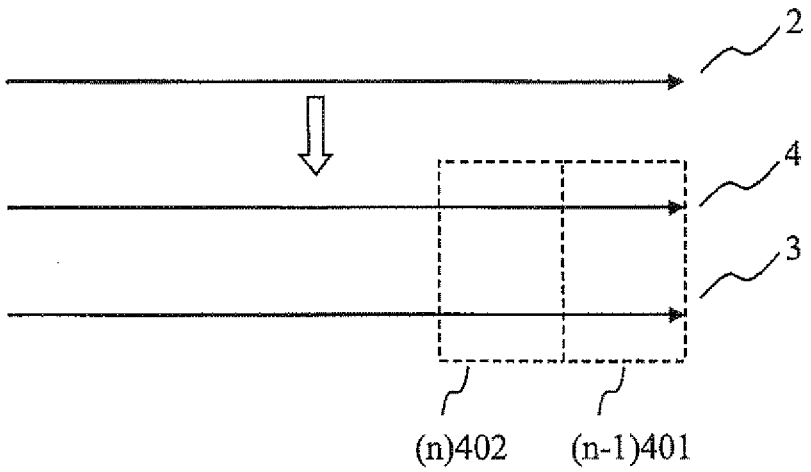


Fig. 10

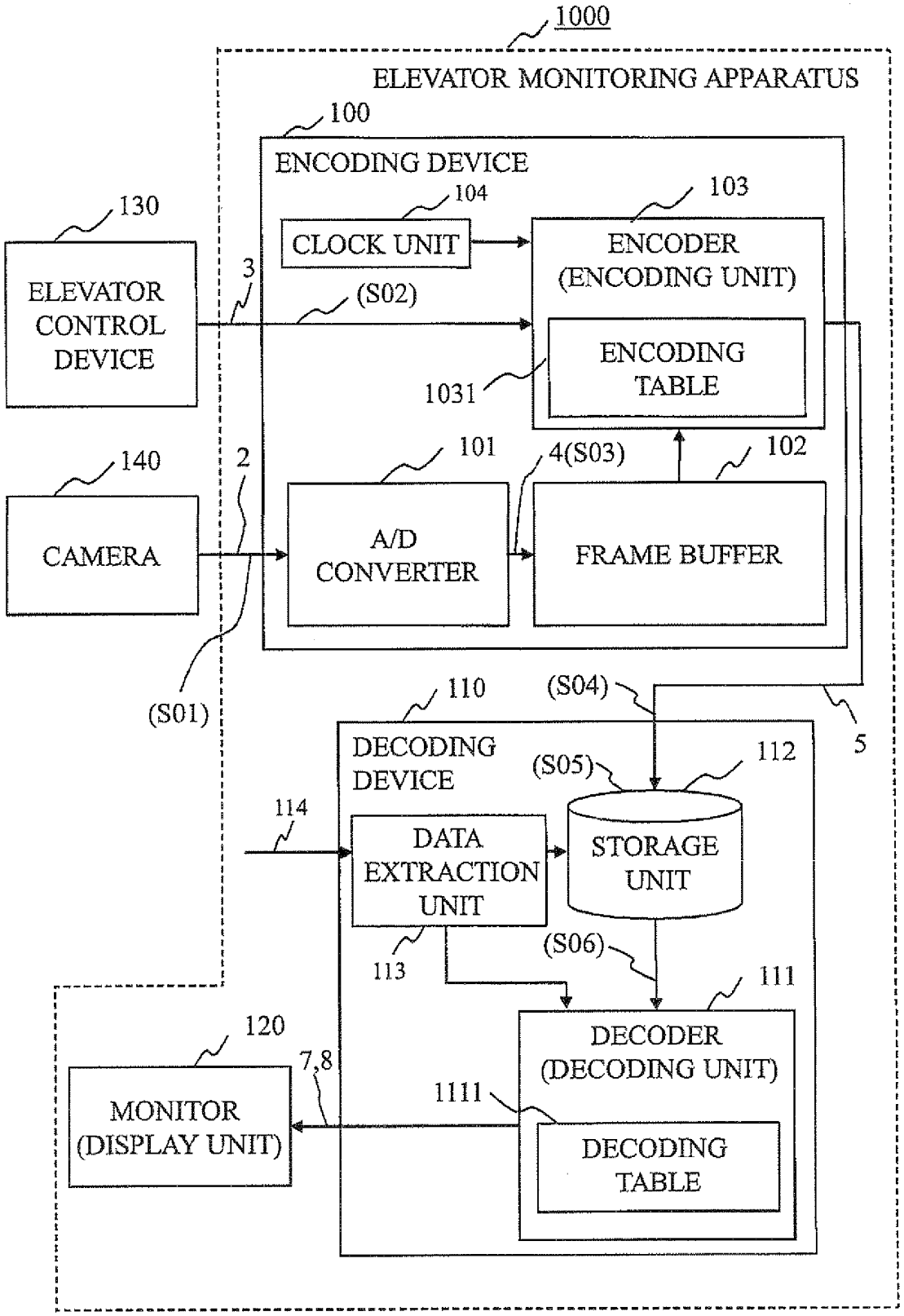
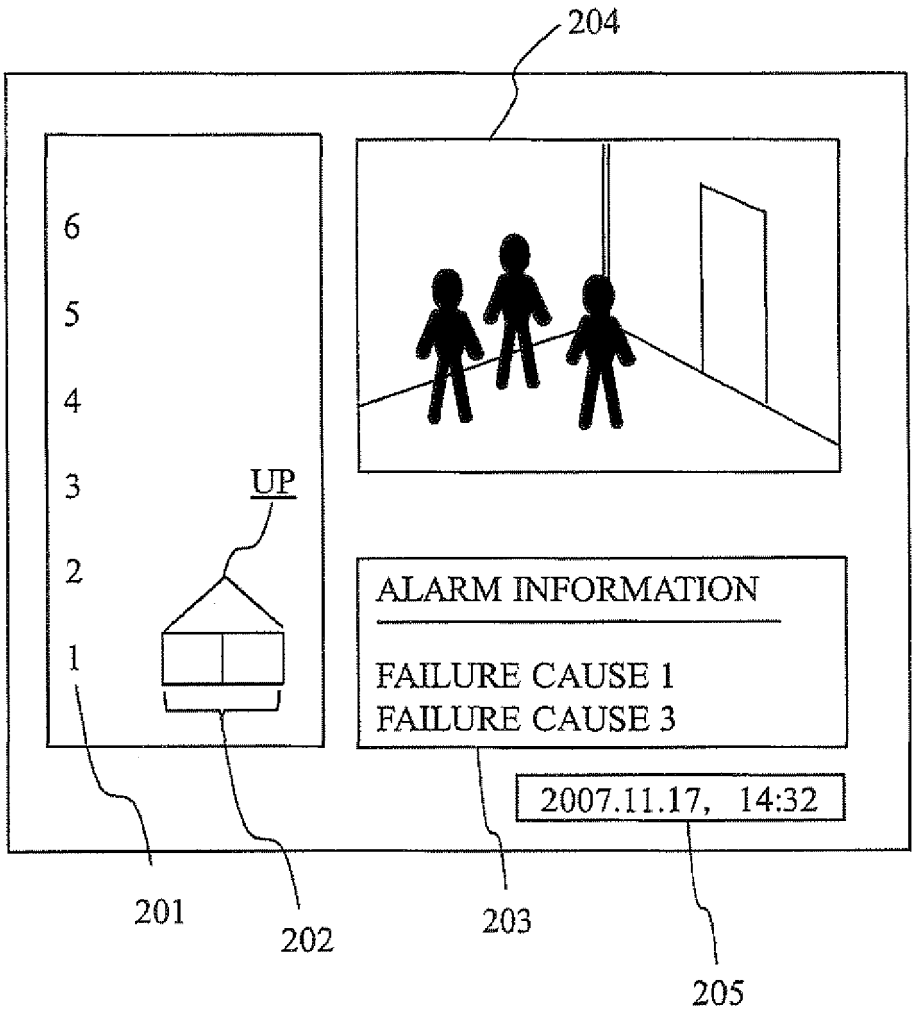

1000
ELEVATOR MONITORING APPARATUS
100
ENCODING DEVICE
104
CLOCK UNIT
103
ENCODER
(ENCODING UNIT)
130
ELEVATOR
CONTROL
DEVICE
3
(S02)
ENCODING
TABLE
1031
140
2
101
4(S03)
102
CAMERA
A/D
CONVERTER
FRAME BUFFER
(S01)
110
(S04)
5
DECODING
DEVICE
(S05)
112
114
DATA
EXTRACTION
UNIT
STORAGE
UNIT
113
(S06)
111
120
DECODER
(DECODING UNIT)
7,8
1111
MONITOR
(DISPLAY UNIT)
DECODING
TABLE

Fig. 11


204
6
5
4
3
2
1
UP
ALARM INFORMATION
FAILURE CAUSE 1
FAILURE CAUSE 3
2007.11.17, 14:32
201
202
203
205

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/065265

A. CLASSIFICATION OF SUBJECT MATTER
B66B3/00(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B66B3/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2009
Kokai Jitsuyo Shinan Koho 1971-2009 Toroku Jitsuyo Shinan Koho 1994-2009

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2007-235668 A (Toshiba Elevator and Building Systems Corp.), 13 September, 2007 (13.09.07), Par. Nos. [0054] to [0055] (Family: none)	1-6
Y	JP 2001-111959 A (Hitachi, Ltd.), 20 April, 2001 (20.04.01), Par. Nos. [0054] to [0074]; all drawings & US 6842540 B1	1-6

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 April, 2009 (01.04.09)	14 April, 2009 (14.04.09)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

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Patent documents cited in the description

- JP 2002234676 A **[0002]**
- JP 2000351546 A **[0002]**

Non-patent literature cited in the description

- *clock unit 104 outputs,* 17 November 2007, vol. 14 (32), 56 **[0040]**