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METHOD FOR MANUFACTURING CONVEYANCE DEVICE

Abstract

A method for manufacturing a conveyance device capable of accurately completing the conveyance device imagined by a customer in a relatively short time. One or a plurality of operation confirmation devices that visually confirms an operation of the conveyance device is used. The method includes exhibiting a desired operation of the conveyance device in a video by the operation confirmation device and confirming a required operation of the conveyance device in a specification confirmation step, inputting data for realizing the required operation or realizing an operation similar to the required operation to the operation confirmation device, exhibiting the operation of the conveyance device in a video based on the data that has been input in a virtual operation confirmation step, and inputting the data to an actual individual controller of the conveyance unit in a data input step.

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Background/Summary

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a method for manufacturing a conveyance device such as a conveyer device.

Background Art

[0002] A conveyance device is often installed in a delivery site, a pickup site, a warehouse, or the like.

[0003] As a form of the conveyance device, a distributed-control conveyance device is known (Patent Document 1). In distributed control, a plurality of conveyance units called zone conveyers are arranged in series or in branches to form a series of conveyance paths, and each conveyance unit has an independent drive motor (drive device). Each conveyance unit is provided with a load presence sensor. The load presence sensor is a sensor that detects presence or absence of an article on the conveyance unit. Each conveyance unit is provided with a control device called a zone controller. The controller incorporates a CPU **201** and a storage unit, and the storage unit stores a computer program (data) constituting a logic circuit (control circuit).

[0004] The computer program can be partially or entirely rewritten.

[0005] In many cases, main data such as a traveling speed of a conveyer or a waiting time is input as one parameter, and the conveyance unit is operated.

[0006] In the distributed-control conveyance device, each conveyance unit constitutes a zone, and the zones are connected to each other.

[0007] Then, for example, when a predetermined condition such as an article exists in a certain zone (conveyance unit) and an article (conveyed object) does not exist in the downstream zone is satisfied, a drive motor of the zone (conveyance unit) is activated to send the article to the downstream zone.

[0008] A conveyance device including a zone having a branching function is also known (Patent Literature 2).

[0009] The zone having a branching function includes, for example, a conveyance unit having a function of moving an article straight or discharging an article in a lateral direction.

[0010] An entire design and manufacture of the conveyance device are performed by the following steps: (1) specification determination step; (2) design step; (3) assembly step; and (4) adjustment step.

[0011] The specification determination step is a step in which a manufacturer of the conveyance device and their customer discuss to determine conditions (required specifications) required for the conveyance device.

[0012] For example, a layout of the conveyance device, a size and weight of the conveyed object, a conveyance speed, a conveyance amount per unit time, and the like are determined in the specification determination step. In a related art, studies are conducted with observation of a drawing on paper or a still image of CAD, and required specifications are determined.

[0013] The design step is a step of creating a computer program (data) of each conveyance unit by the manufacturer to meet the required specifications. In some cases, only main data such as parameters are determined.

[0014] The computer program is created on the basis of experience of an engineer.

[0015] The assembling step is a step of actually combining a plurality of conveyance units to construct a conveyance device. Each conveyance unit stores data of the computer program manufactured in the design step.

[0016] The conveyance device may be assembled at an installation site designated by the customer, or may be temporarily installed in a factory of the manufacturer.

[0017] The adjustment step is an operation of adjusting motion of the conveyance device by placing the conveyed object on the conveyance device and actually driving the conveyance device. That is, the operation of each conveyance unit is adjusted by conducting a test run the conveyance device.

[0018] At this time, in many cases, the computer program of the conveyance unit is corrected.

[0019] Patent Document 1: JP 2005-231745 A

[0020] Patent Document 2: JP 2013-230914 A

[0021] The conventional methods for manufacturing a conveyance device have problems that many correction operations are needed after the conveyance device is installed.

[0022] In a method for manufacturing a conveyance device by the prior art, the specification is determined with observation of a drawing on paper or a still image on CAD. However, the customer is not always familiar with a structure or motion of the conveyance device, and it is difficult to understand the motion of the conveyance device.

[0023] For example, even if the manufacturer explains that "the conveyance speed is 200 meters per minute", it is difficult for the customer to understand how fast the conveyance speed is in an actual condition. Therefore, there may be a discrepancy in understanding between the customer and the manufacturer at a stage of specification determination.

[0024] As described above, in the design step, the computer program (data) is created by the manufacturer on the basis of experience of the engineer so as to meet the required specifications. Or alternatively, the parameter (data) required for the operation is determined.

[0025] Here, the designed computer program and parameter are merely designed and selected so as to realize the operation expected by the engineer, and it is not known how the conveyance device actually moves.

[0026] In the prior art, the operation is confirmed by conducting a test run of the conveyance device. That is, at the time of the test run, the operation of the entire conveyance device is revealed for the first time.

[0027] As described above, the computer program (data) or the parameter (data) created in the design step is merely designed to realize the operation expected by the engineer, and when the test run of the conveyance device is conducted, the actual motion may be different from the motion expected by the engineer. Further, when the object is actually conveyed, an unexpected error may occur. Furthermore, as described above, there is a case where a discrepancy occurs between the customer and the manufacturer at the stage of specification determination in the first place, and there is a case where correction is requested from the customer who has seen the motion of the test run.

[0028] Thus, in the prior art method for manufacturing a conveyance device, there need many corrections of the program or the like after the test run, and a considerable period of time may be required until delivery from the manufacturer to the customer.

[0029] After the delivery to the customer, there is a case where the customer requests correction of motion whether an error occurs or not, and it may take a considerable period of time to correct the computer program or the like.

[0030] An object of the present invention is to focus on the above problem of the prior art and to

develop a method for manufacturing a conveyance device capable of accurately completing the conveyance device imagined by a customer in a relatively short time.

SUMMARY OF THE INVENTION

[0031] An embodiment to solve the above problem is a method for manufacturing a conveyance device, wherein the conveyance device includes: a host controller; and a plurality of conveyance units each including an individual controller that controls each of the conveyance units, the individual controller including: a control circuit configured to input data regarding control; and a communication unit that communicates with the host controller, and wherein the method includes: (a) confirming a required operation of the conveyance device by exhibiting a desired operation of the conveyance device in a video using at least one operation confirmation device that is configured to visually confirm an operation of the conveyance device; (b) confirming virtually the operation of the conveyance device by exhibiting the operation of the conveyance device in a video based on the data that has been input into the operation confirmation device, the date being for realizing the required operation or an operation similar to the required operation; and (c) inputting the data into the individual controller each of the actual plurality of conveyance units.

[0032] The conveyance device is, for example, a conveyer device. In the conveyance device, for example, conveyers may be installed in upper and lower stages, and a lift that transfers an article between these conveyers may be included.

[0033] The conveyance device also includes a device that conveys an article in a vertical direction, such as an elevator.

[0034] In the method for manufacturing a conveyance device according to the present aspect, the operation confirmation device is used in the specification confirmation step, and the desired operation of the conveyance device is exhibited in a video. This allows a customer to visually recognize motion of the conveyance device and eliminates a discrepancy in recognition between the manufacturer and the customer.

[0035] An engineer creates a computer program (data) of each conveyance unit so as to meet a requested specification. Further, parameters (data) are selected so as to match the requested specification. The computer program (data) and the parameters (data) may be examined and created one by one by the engineer, or may be automatically created or selected using a computer.

[0036] In the method for manufacturing a conveyance device according to the present aspect, the virtual operation confirmation step is performed. In the virtual operation confirmation step, the data created by the engineer or the automatically created data is input to the operation confirmation device, and the operation of the conveyance device is exhibited in a video on the basis of the input data.

[0037] Therefore, the operation of the conveyance device can be confirmed before test run, and the computer program can be corrected.

[0038] In the above aspect, it is desirable to further include (d) confirming actually the operation of the conveyance device after step (c) by acquiring log data of the individual controller of each of the conveyance units, inputting the log data to the operation confirmation device, and reproducing the operation of the conveyance device.

[0039] The method for manufacturing a conveyance device according the present aspect includes actually operating the conveyance device in a state where the data is input, acquiring log data of the individual controller of each of the conveyance units, and inputting the log data to the operation confirmation device to reproduce the operation of the conveyance device during the test run or operation of the conveyance device in an actual operation confirmation step.

[0040] It is therefore possible to reproduce an error of the conveyance device. The engineer can correct the computer program or the like with reference to the reproduced error.

[0041] In the above aspect, it is desirable to include (e) correcting the data that is confirmed as an error in step (d).

[0042] The present aspect further refines the computer program or the like.

[0043] In each of the aspects, it is desirable that the data is corrected to approximate to the required operation in step (b).

[0044] When the data for realizing the required operation is input to the operation confirmation device and the operation of the conveyance device is exhibited in a video on the basis of the input data, each unit may not move as expected. In addition, an error unexpected in the beginning may occur.

[0045] In the present aspect, the data is corrected so as to approximate to the required operation in the virtual operation confirmation step.

[0046] In each of the aspects, desirably, a final specification creator is used to store a plurality of fixed phrases and display-fields corresponding to the plurality of fixed phrases, information about a layout of the conveyance device to be manufactured and data input in step (c), and/or data corrected in step (e) are input into the final specification creator, and a document in which the layout and a description based on the data are written in the display fields is created.

[0047] The present aspect facilitates creation of a completed specification to be submitted to the customer.

[0048] In each of the aspects, desirably, the individual controller includes a basic control circuit, a parameter required for a specific operation can be input as one of the data, and a parameter for executing the operation of the conveyance device exhibited in step (a) is acquired and is input into the operation confirmation device when step (b) is performed.

[0049] The present aspect facilitates implementation of the virtual operation confirmation step.

[0050] The method for manufacturing a conveyance device of the present invention can accurately complete the conveyance device imagined by the customer in a relatively short time.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0051] FIG. **1** is a flowchart of a working step of a method for manufacturing a conveyance device according to an embodiment of the present invention.

[0052] FIG. **2** is a layout of a conveyance device and a display screen of a display device to which operational check is conducted.

[0053] FIG. **3** is a perspective view of a conveyance unit constituting a linear conveyance zone.

[0054] FIG. **4** is a perspective view of the vicinity of a conveyance redirecting zone formed by a conveyance redirector.

[0055] FIG. **5** is a block diagram of an operation confirmation device.

[0056] FIG. **6** is a block diagram of a specification confirmation device.

[0057] FIG. **7** is a block diagram of a virtual operation confirmation device.

[0058] FIG. **8** is a conceptual diagram of a conveyer system including the operation confirmation device of the conveyance device according to the embodiment of the present invention.

[0059] FIG. **9** is a block diagram of zone controllers and a circuit diagram illustrating a relationship between each of the zone controllers and a log data creation unit.

[0060] FIGS. **10**A, **10**B, and **10**C are explanatory diagrams illustrating a video displayed on the display screen, and illustrate state change over time.

[0061] FIGS. **11**A, **11**B, and **11**C each illustrate a sequence circuit of a zone **12** displayed on the display screen, and illustrate energization states at an identical time to FIGS. **10**A, **10**B, and **10**C, respectively.

[0062] FIGS. **12**A and **12**B each illustrate a display screen of a layout section of a final specification creator, wherein FIG. **12**A illustrates the display screen before data input and FIG. **12**B illustrates the display screen after data input.

[0063] FIGS. **13**A and **13**B each illustrate a display screen of logic display of the final specification

creator, wherein FIG. **13**A illustrates the display screen before data input and FIG. **13**B illustrates the display screen after data input.

[0064] FIGS. **14**A and **14**B each illustrate a display screen of motor specification of the final specification creator, wherein FIG. **14**A illustrates the display screen before data input and FIG. **14**B illustrates the display screen after data input.

[0065] FIG. **15** illustrates a display screen of various specifications of the final specification creator before data input.

[0066] FIG. **16** illustrates the display screen of various specifications of the final specification creator after data input.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0067] Hereinafter, an embodiment of the present invention will be described in detail.

[0068] A method for manufacturing a conveyance device according to the present embodiment completes the conveyance device through the following steps (see FIG. **1**). [0069] (1) Specification confirmation step [0070] a: Layout creation step [0071] b: Operation confirmation step [0072] (2) Virtual operation confirmation step [0073] a: Layout acquisition step [0074] b: Layout input step [0075] c: Parameter acquisition step [0076] d: Parameter input step [0077] e: Operation confirmation step [0078] f: Parameter correction step [0079] (3) Data input step [0080] a: Parameter output step [0081] b: Parameter input step [0082] c: Unit combination step [0083] (4) Actual operation confirmation step [0084] a: Log data acquisition step [0085] b: Log data input step [0086] c: Operation reproduction step [0087] d: Parameter correction step [0088] (5) Data correction step [0089] a: Parameter update step

[0090] Subsequently, the following steps are performed. [0091] (6) Final specification creation step [0092] a: Layout input step [0093] b: Control logic specifying step [0094] c: Parameter input step [0095] That is, (1) a layout and a motion of a conveyed object are simulated on a screen to show a customer for determination of a specification, (2) operation that is closer to actual operation is displayed on the screen using computer software that executes the motion of an individual controller of each zone in a simulation to embody a development logic, (3) each logic is stored in each zone controller, (4) log data of an actual conveyer device is acquired to confirm real operation, and (5) each logic is corrected.

[0096] In addition, a control specification is created as necessary.

[0097] In the method for manufacturing a conveyance device according to the present embodiment, an operation confirmation device **90** is used as a characteristic device. As illustrated in FIG. **5**, the operation confirmation device **90** includes a main device **200** and a display device **53**, displays a layout of the conveyer device **1** on the display device **53**, and exhibits operation of the conveyer device **1** in a video.

[0098] The main device **200** is a known computer, and includes a CPU **201** and a memory **202**. In the present embodiment, a personal computer is used as the main device **200**. In the present embodiment, one personal computer that stores a computer program **203** for specification confirmation step, a computer program **205** for virtual operation confirmation step, and a computer program **206** for actual operation confirmation step is used as the operation confirmation device **90**, but each computer program may be stored in a separate personal computer.

[0099] As illustrated in FIG. **2**, the conveyer device (conveyance device) **1** to be manufactured has a linear part of a conveyance path divided into a plurality of short zones. The conveyer device **1** is a distributed-control device, and includes a host controller **46** that comprehensively controls the operation of the conveyer device and a zone controller (individual controller) **10** that controls each zone (not illustrated in FIG. **2**).

[0100] As illustrated in FIGS. **2** and **9**, the host controller **46** includes a communication unit **63**, an operation instruction unit **210**, a conveyance destination instruction unit **211**, a state monitoring unit **212**, and a data output unit **213** in addition to a log data creation unit **51** to be described later. In addition, the host controller **46** includes a display device **215**.

[0101] The host controller **46** intercommunicates with each zone controller **10** by the communication unit **63**, and exchanges information.

[0102] The operation instruction unit **210** instructs activation and stop of the entire conveyer device **1** and activation and stop of the individual zone controllers **10**.

[0103] The conveyance destination instruction unit **211** instructs a conveyance destination of each article M.

[0104] The state monitoring unit **212** monitors a current operation status of the conveyer device **1**.

[0105] In the present embodiment, the state monitoring unit **212** displays the layout of the conveyer device **1** on the display device **215**, and further displays in which zone the article M exists. Further, a video of a movement state of the article M is displayed on the display device **215**.

[0106] The data output unit **213** stores a parameter of the control logic of each zone controller **10**, and outputs the parameter to each zone controller **10** via the communication unit **63**.

[0107] In the conveyer device **1**, a plurality of linear conveyance zones are connected in series to constitute the linear part of the conveyance path. The conveyer device **1** includes a plurality of conveyance redirecting zones and constitutes a branched conveyance path. Further, there are a plurality of destinations for conveying the article M.

[0108] One conveyance unit **2** or one conveyance unit **20** are disposed in each zone. In the conveyance units **2** and **20**, a mechanical structural part and the zone controller **10** are integrated.

[0109] As illustrated in FIG. **9**, each zone controller **10** is an individual controller having a control circuit **40** that individually controls the conveyance units **2** or **20**. The zone controller (individual controller) **10** incorporates a transmitter and receiver (communication unit) **41** that intercommunicates with the host controller **46**, and also operates in accordance with a command from the host controller **46**.

[0110] The conveyance unit **2** installed in the linear conveyance zone is a representative conveyance unit and is a zone conveyer as illustrated in FIG. **3**. The conveyance unit **20** installed in the conveyance redirecting zone is a transfer device as illustrated in FIG. **4**. The conveyance unit **20** is also one of the conveyance units.

[0111] The conveyance unit **2** is a short roller conveyer in which a plurality of conveyance rollers **5** are pivotally supported at predetermined intervals between a pair of left and right side frames **3** and **3** arranged in parallel. Each of the conveyance rollers **5** includes a freely rotating driven roller **5***b* and a motor-incorporating roller **5***a*. In the present embodiment, only one motor-incorporating roller **5***a* is provided, and the other rollers are all driven rollers **5***b*. A drive motor (not illustrated) is incorporated as a drive device in the motor-incorporating roller **5***a*. The incorporated drive motor has a function of outputting a pulse signal in accordance with rotation. The same applies to the drive motors of the other motor-incorporating rollers. Note that the pulse signal is an example of "information regarding rotation when the drive motor is driven".

[0112] A transmission belt **6** is wound around adjacent conveyance rollers **5** in the conveyance unit **2**. Therefore, a rotational driving force of the motor-incorporating roller **5***a* can be transmitted to all the driven rollers **5***b*.

[0113] As illustrated in FIG. **3**, the conveyance unit **2** is provided with a load presence sensor S. The load presence sensor S is provided on the side frame **3**. The load presence sensor S is located near a downstream end.

[0114] The load presence sensor S detects presence or absence of an article on the conveyance unit **2**.

[0115] As the load presence sensor S, a photoelectric sensor can be used, and a light emitting element (not illustrated) such as a light emitting diode or an infrared diode is provided on the side frame **3** opposite to the load presence sensor S.

[0116] Next, the conveyance redirecting zone will be described. The conveyance unit **20** installed in the conveyance redirecting zone is a transfer device as illustrated in FIG. **4**. The conveyance unit **20** includes a redirecting mechanism that changes a conveyance direction or a receiving direction.

[0117] As illustrated in FIG. **4**, the conveyance unit **20** includes a main transport conveyer **21**, a sub transport conveyer **22**, and a lift (not illustrated).

[0118] The main transport conveyer **21** of the conveyance unit **20** is a belt conveyer in which a plurality of thin belts **25** are arranged at regular intervals. The main transport conveyer **21** is driven by a motor-incorporating roller **28** provided at an end.

[0119] The sub transport conveyer **22** of the conveyance unit **20** is a roller conveyer. In the sub transport conveyer **22**, a plurality of rollers **26** are arranged in parallel, and these rollers are interlocked by a belt **27**. One of the plurality of rollers **26** constituting the sub transport conveyer **22** is a motor-incorporating roller, and all the rollers **26** rotate by driving the motor-incorporating roller.

[0120] As illustrated in FIG. **4**, the sub transport conveyer **22** is arranged such that the rollers **26** exist between the belts **25** of the main transport conveyer **21**.

[0121] In order for the article M placed on the conveyance unit **20** to travel straight, the lift (not illustrated) causes the main transport conveyer **21** to protrude above the sub transport conveyer **22**, and the motor-incorporating rollers **28** of the main transport conveyer **21** are driven to run the belt **25**.

[0122] In order to discharge the article M placed on the conveyance unit **20** in a lateral direction, after the article is drawn into the main transport conveyer **21**, the sub transport conveyer **22** is raised and the main transport conveyer **21** is lowered by the lift (not illustrated) to allow the sub transport conveyer **22** to protrude above the main transport conveyer **21**, and the motor-incorporating roller of the sub transport conveyer **22** is driven to rotate the rollers **26**.

[0123] The conveyance unit **20** is also provided with a load presence sensor (not illustrated). A zone controller (not illustrated) is also attached to the conveyance unit **20**.

[0124] A storage (not illustrated) is built in the zone controller **10**, and a control logic (specifically, a control program) that controls a zone in charge is stored in the storage.

[0125] Further, a parameter required for a specific operation can be input to the zone controller **10** as one datum of data.

[0126] For example, parameters such as a conveyance speed, a timing to start driving, and a timing to stop driving can be input as one of the data.

[0127] The conveyer device (conveyance device) **1** to be manufactured is obtained by joining the conveyance units **2** and **20**.

[0128] In the method for manufacturing a conveyance device according to the present embodiment, a specification confirmation step is first performed. The specification confirmation step is a step of determining a specification of the conveyer device **1** to be manufactured between the manufacturer and the customer. The specification confirmation step includes a layout creation step and an operation confirmation step.

[0129] In the specification confirmation step, the manufacturer listens to the customer, and the layout of the conveyer device **1** as illustrated in FIG. **2** is schematically displayed on the display device **53** using the computer program **203** for specification confirmation step of the operation confirmation device **90** (step **1**). In many cases, a picture of the host controller **46** is not displayed.

[0130] A figure displayed on the display device **53** is an outline figure imitating the conveyer device **1**, and is a connection of rectangular figures imitating the conveyance units **2** and **20**.

[0131] The customer and the manufacturer discuss and first determine the layout of the conveyer device **1** (step **2**). The determined layout of the conveyer device **1** is displayed on the display device **53**.

[0132] Next, the motion of the conveyer device **1** is determined by the operation confirmation step.

[0133] Specifically, as illustrated in FIG. **2**, the article M is virtually placed on the display device **53**, and the article is moved on the screen.

[0134] In the operation confirmation step, the conveyance destination, the conveyance speed, conditions for determining the conveyance destination of the article, and the like are discussed, and

the motion is virtually displayed on the display device **53** (step **3**).

[0135] In this way, the specification of the conveyer device **1** is determined (step **4**).

[0136] Subsequently, a virtual operation confirmation step is performed. The virtual operation confirmation step is a work performed by an engineer, and is performed using the computer program **205** for virtual operation confirmation step of the operation confirmation device **90**.

[0137] The computer program **205** for virtual operation confirmation step of the operation confirmation device **90** includes a program capable of displaying a video of the operation of the conveyance units **2** and **20** in accordance with the control logic of each zone controller **10**. That is, the computer program **205** for virtual operation confirmation step stores a circuit equivalent to the control circuit **40** including a basic control circuit and the individual control logic of each zone controller **10**.

[0138] In addition, it is possible to input parameters required for specific operation of the conveyance units **2** and **20** and display a video of motion according to the parameters on the screen of the display device **53**. For example, parameters such as the conveyance speed, the timing to start driving, and the timing to stop driving can be input to the operation confirmation device **90**, and the motion according to the parameters can be displayed as a video on the screen.

[0139] The virtual operation confirmation step includes a layout acquisition step, a parameter acquisition step, a layout input step, a parameter input step, an operation confirmation step, and a parameter correction step.

[0140] In the layout acquisition step, information on the layout determined in the specification confirmation step as a preceding step is acquired (step **5**) and input to the computer program **205** for virtual operation confirmation step (step **7**). That is, the layout determined in the specification confirmation step is copied to the computer program **205** for virtual operation confirmation step.

[0141] In the parameter acquisition step, parameters necessary for operating the conveyance units **2** and **20** as determined are acquired from the operation determined in the virtual operation confirmation step as a preceding step (step **6**) and copied to the computer program **205** for virtual operation confirmation step.

[0142] Then, the copied parameters are allocated to each zone controller **10** on the computer program **205** for virtual operation confirmation step (step **8**).

[0143] The size, weight, friction coefficient, and the like of the object to be conveyed are input to the computer program **205** for virtual operation confirmation step as other parameters.

[0144] In the operation confirmation step, a video of the operation of each of the conveyance units **2** and **20** is displayed on the screen in accordance with the control logic and the parameters (step **9**).

[0145] Specifically, the article M is virtually placed on the display device **53**, and the article M is moved on the screen. At this time, each zone controller **10** is moved in accordance with the input control logic and parameters.

[0146] The operation determined in the specification confirmation step as the preceding step is a desired operation, and the weight of the article M, the friction coefficient, time from a startup to a steady operation of each of the conveyance units **2** and **20**, time required for a stop, a state of the sensors, a method for controlling each zone controller **10**, and the like are not considered.

[0147] Although the control logic and the parameters obtained in the virtual operation confirmation step are input and displayed in a video for confirmation, the operation determined in the specification confirmation step cannot be mostly reproduced in the operation confirmation step.

[0148] Therefore, in the parameter correction step, the parameter is corrected so as to almost closely reproduce the operation determined in the specification confirmation step as the preceding step (steps **10** and **11**).

[0149] Subsequently, a data input step is performed. The data input step includes a parameter output step (step **12**), a parameter input step (step **13**), and a unit combination step (step **14**).

[0150] The parameter output step is a step of extracting data of the corrected parameter from the operation confirmation device **90**, and the parameter input step is a step of inputting the data to

each individual zone controller **10**. That is, the data of the parameters is copied from the operation confirmation device **90** to each zone controller **10** by the parameter output step and the parameter input step.

[0151] In parallel with this step, the unit combination step is performed, the conveyance units **2** and **20** are connected in accordance with a predetermined layout, and the conveyer device is mechanically assembled.

[0152] The conveyer device **1** may be assembled at a place designated by the customer or at a factory of the manufacturer.

[0153] The parameter input step may be performed before the unit combination step or after the unit combination step.

[0154] For example, at a factory of the manufacturer or the like, parameters may be input to each conveyance units **2** and **20** in a disassembled state one by one, and thereafter, the conveyer device **1** may be mechanically assembled by combining the conveyance units **2** and **20**.

[0155] Alternatively, the conveyer device **1** may be mechanically assembled by combining each conveyance units **2** and **20** first, and the data of the parameters may be input to each zone controller **10** in this state.

[0156] In a case where the data of the parameters is input to each zone controller **10** after the conveyer device **1** is mechanically assembled, it is desirable to use the data output unit **213** of the host controller **46**.

[0157] That is, it is desirable to cause the host controller **46** to store the parameters of the control logic of each zone controller **10**, output the parameters to each zone controller **10** via the communication unit **63**, and input the data of the parameters to each zone controller **10**.

[0158] Subsequently, an actual operation confirmation step is performed.

[0159] The actual operation confirmation step is a work performed by an engineer, and is performed using the computer program **206** for actual operation confirmation step of the operation confirmation device **90**.

[0160] The computer program **206** for actual operation confirmation step of the operation confirmation device **90** includes a program capable of displaying a video of the operation of each zone controller **10**. That is, a circuit equivalent to the basic control circuit of each zone controller **10** is stored in the computer program **206** for actual operation confirmation step.

[0161] Further, the operation of the conveyer device **1** can be schematically reproduced on the basis of the log data. Furthermore, an operation status of each drive motor and an operation status of the load presence sensor S from moment to moment can be expressed by a video.

[0162] That is, the computer program **206** for actual operation confirmation step includes a computer program for creating operation reproduction video data and a computer program for creating energization state reproduction video data.

[0163] The actual operation confirmation step includes a log data acquisition step, a log data input step, an operation reproduction step, and a parameter correction step.

[0164] In the log data acquisition step, the article is actually placed on the conveyer device **1**, the conveyer device **1** is driven, and the article M is actually conveyed. Then, log data at that time is acquired (step **15**). That is, information regarding an on-off status of the drive motor **15** of the conveyance units **2** and **20**, a rotation speed of the drive motor **15**, an energization state of the control circuit, and an on-off status of switches constituting the sequence circuit at a same time is acquired.

[0165] The log data acquisition step is performed for several tens of hours or several days. In some cases, the log data acquisition step is continued even after the conveyer device **1** is delivered from the manufacturer to the customer.

[0166] In the virtual operation confirmation step as the preceding step, a video of an operation close to an actual motion is displayed, but in many cases, when the conveyer device is actually assembled and the article is conveyed, the motion is different from an intended motion.

[0167] In the present embodiment, during the actual operation of the conveyer device **1** in the log data acquisition step, information regarding the on-off status of the drive motor **15** of each of the conveyance units **2** and **20**, the rotation speed of the drive motor **15**, the energization state of the control circuit, and the on-off status of the switches constituting the sequence circuit is acquired.

[0168] The acquired log data is input to the operation confirmation device **90** (step **16**).

[0169] Then, the actual motion of the conveyer device **1** is reproduced in a video on the screen by the operation reproduction step. A display M imitating the article is performed on the basis of the operation status of the load presence sensor S included in the log data. Specifically, in a case where the load presence sensor S of the real conveyer device **1** detects the presence of an article at a specific time and a record of the detection exists in the log data, the display M imitating the article M is displayed in the virtual zone displayed on the display device **53** (step **17**).

[0170] Further, in a zone in which the drive motor **15** of the real conveyer device **1** is energized, a video with motion such as wavy motion is displayed in the virtual zone.

[0171] When the drive motor **15** in the zone where the article is placed in the real conveyer device **1** is energized, a video in which the virtual display M is moving is exhibited. A moving speed and a moving distance are determined by an interval and a total number of pulses transmitted by the drive motor **15**.

[0172] Further, with a click on a specific zone, a video of the energization state of the conveyance units **2** and **20** constituting the zone is displayed.

[0173] Further, the energization state of each of the conveyance units **2** and **20** from moment to moment is displayed on the display device **53**.

[0174] Even in a case where there is some kind of error in the real conveyer device **1**, the load presence sensor S, a driving status of the drive motor **15**, and the like at that time are recorded in the log data. It is therefore possible to reproduce an occurrence situation of the error virtually. Further, a state of an electric circuit at that time can be confirmed. Thus, a cause of the error can be easily found.

[0175] During test run, some kind of error is often found. When the reproduced operation is unacceptable for such a reason that an error is found (step **18**), the electric circuit of the zone controller is checked, and the parameters are corrected (step **19**).

[0176] Then, the parameter of each zone controller **10** is rewritten to the parameter corrected in the parameter correction step (step **20**).

[0177] Then, the actual motion of the conveyer device **1** is reproduced in a video on the screen of the display device **53** again by the operation reproduction step. When the reproduced operation is acceptable (step **18**), the work is terminated.

[0178] A final specification creation step is a step of creating a control specification and the like to be delivered to the customer.

[0179] The final specification creation step is a step of creating a control specification or creating an auxiliary material for creating the control specification by capturing the data created in the specification confirmation step or the virtual operation confirmation step.

[0180] Hereinafter, devices used in the specification confirmation step, the operation confirmation step, the virtual operation confirmation step, and the final specification creation step will be described.

Specification Confirmation Step

[0181] The specification confirmation step is performed using a specification confirmation device **106** as illustrated in FIG. **6**. The specification confirmation device **106** is a part of a function of the operation confirmation device **90**, and FIG. **6** is obtained by extracting necessary software and the memory **202** from the operation confirmation device **90** and displaying the extraction more in detail.

[0182] As illustrated in FIG. **6**, the computer program **203** for specification confirmation step includes a layout creation program **220** and a video creation program **221**. The specification

confirmation device **106** includes a unit model storage unit **222** and a layout-operation storage unit **223**.

[0183] The unit model storage unit **222** stores a figure (hereinafter, a model diagram) imitating the conveyance units **2** and **20**, and a model diagram imitating an article receipt section and an article removal section. In the present embodiment, a rectangular figure is stored as the model diagram imitating the conveyance units **2** and **20**.

[0184] The model diagram has any shape, and for example, a model diagram representing a linear conveyance path and a model diagram representing a branch may be different from each other.

[0185] The layout creation program **220** is a drawing program, and creates a layout of the conveyer device **1** using a known mouse or keyboard. To create a layout, the above-described model diagram is copied to an arbitrary position to create a diagram.

[0186] Then, the created layout of the conveyer device **1** is displayed on the display device **53**.

[0187] In the operation confirmation step, the video creation program **221** is used, the article M is virtually placed on a drawing of the display device **53**, the article M is moved on the screen, the conveyance speed and the like are visually confirmed, and the layout and motion of the conveyer device **1** are determined after consultation between the customer and the manufacturer.

[0188] The determined layout and operation are stored in the layout-operation storage unit **223**.
Virtual Operation Confirmation step and Data Correction Step

[0189] The virtual operation confirmation step and a data correction step are performed using a virtual operation confirmation device **107** as illustrated in FIG. **7**. The virtual operation confirmation device **107** is a part of the function of the operation confirmation device **90**, and FIG. **7** is obtained by extracting necessary software and the memory **202** from the operation confirmation device **90** and displaying the extraction more in detail.

[0190] The computer program **205** for virtual operation confirmation step includes an automatic parameter assignment program **230**, a parameter correction program **231**, and a video creation program **232**. The automatic parameter assignment program **230** further includes an appropriate parameter selection program **235** and a parameter assignment program **236**.

[0191] The virtual operation confirmation device **107** includes a conveyance unit circuit storage unit **237** and a determined parameter storage unit **238**.

[0192] The virtual operation confirmation device **107** includes a layout input unit **240**, a conveyance speed input unit **241**, and a conveyed object information input unit **242** as input units, and includes a parameter output unit **243** as output unit.

[0193] The conveyance unit circuit storage unit **237** stores a control circuit (actually, a control program) incorporated in each zone controller **10**.

[0194] The layout input unit **240** receives information on the determined layout from the layout-operation storage unit **223** of the specification confirmation device **106** described above.

[0195] The conveyance speed input unit **241** receives the conveyance speed required for each of the conveyance units **2** and **20** from the layout-operation storage unit **223** of the specification confirmation device **106**.

[0196] Furthermore, the size, weight, friction coefficient, and the like of the object to be conveyed are input by the conveyed object information input unit **242**.

[0197] In the virtual operation confirmation device **107**, the conveyance units **2** and **20** are virtually disposed in accordance with the layout input by the layout input unit. An actual circuit of each of the conveyance units **2** and **20** is virtually stored in each of the conveyance units **2** and **20**.

[0198] The automatic parameter assignment program **230** is a program that implements the parameter acquisition step. By the appropriate parameter selection program **235** included in the automatic parameter assignment program **230**, an appropriate parameter to be input to each of the conveyance unit **2** and **20** is selected or calculated from the input conveyance speed required for each of the conveyance units **2** and **20**, the size, weight, friction coefficient, and the like of the object to be conveyed.

[0199] Then, by the parameter assignment program **236**, the selected parameter is assigned to the circuit of each of the conveyance units **2** and **20** that are virtually arranged.

[0200] Then, by the virtual operation confirmation device **107**, the motion of each of the conveyance units **2** and **20** in a state where the selected parameter is assigned is specifically exhibited in a video.

[0201] As described above, even if the parameters obtained in the virtual operation confirmation step are input and displayed in a video, in many cases, the operation determined in the specification confirmation step cannot be reproduced. The virtual operation confirmation device according to the present embodiment includes the parameter correction program **231**, and the parameters can be manually corrected using the parameter correction program **231**.

[0202] The corrected parameters are stored in the determined parameter storage unit **238**.

[0203] Then, the parameter is output to each real zone controller **10** by the parameter output unit **243** as necessary.

Actual Operation Confirmation Step

[0204] The actual operation confirmation step is performed using an actual operation confirmation device **50** illustrated in FIG. **8**. FIG. **8** conceptually illustrates a conveyer system **100** including the actual operation confirmation device **50** of the conveyance device and the conveyer device **1** to be confirmed.

[0205] As illustrated in FIG. **8**, the actual operation confirmation device **50** according to the present embodiment includes the log data creation unit **51** and an external device **48**. In the present embodiment, the log data creation unit **51** is incorporated in the host controller **46** of the conveyer device **1**.

[0206] The external device **48** is a part of the function of the operation confirmation device **90** described above, and the external device **48** in FIG. **8** extracts necessary software and the memory **202** from the operation confirmation device **90** and displays the extraction more in detail.

[0207] That is, the external device **48** is a known personal computer, a mobile terminal, or the like, and includes the controller **52** and the display device **53**.

[0208] Further, a storage unit **70**, a communication unit **72**, and an operation reproduction unit **71** are incorporated in the controller **52**.

[0209] The actual operation confirmation device **50** according to the present embodiment can create log data individually recording an operation state of each of the conveyance units **2** and **20** in the real conveyer device **1**, and confirm the operation of the article when each conveyance unit is operated in accordance with the log data and the state of the electric circuit at that time by displaying the operation on the display device **53**.

[0210] To supplement the above description of the conveyer device **1**, a specific address is set for each zone of the conveyer device **1** to be manufactured. For convenience, it is assumed that addresses of 1 to 88 are assigned as illustrated in FIG. **2**. In the present embodiment, the address of a first zone is 1, and the address of a second zone is 2. Hereinafter, addresses are sequentially assigned.

[0211] The address of each zone is stored in the zone controller (individual controller) **10** of each zone.

[0212] As described above, each zone includes the zone controller **10** and the load presence sensor S. The zone controller **10** supplies power to the drive motor **15** of the conveyance units **2** and **20** in each zone, and drives and stops the drive motor **15** of the conveyance units **2** and **20** in each zone. That is, the zone controller **10** includes a control circuit **40** that controls the drive motor **15** as illustrated in FIG. **9**, and the control circuit **40** includes a drive circuit **42**. A part or all of the control circuit **40** is a sequence circuit.

[0213] The transmitter and receiver (communication unit) **41** is incorporated in the zone controller **10**.

[0214] The zone controller **10** is an individual controller that individually controls each conveyance

unit.

[0215] The zone controllers **10** are provided in all the zones, and the adjacent zone controllers **10** are connected to each other by a signal line **43**. Further, a signal of the load presence sensor S of each zone is input to each zone controller **10**.

[0216] The conveyer device **1** includes the host controller **46**, and the host controller **46** is also connected to the zone controller **10** by a signal line.

[0217] In the present embodiment, each zone controller **10** and the host controller **46** intercommunicate by a communication unit. By the communication unit, the information on the load presence sensor S and the information on a driving status of the zone are input from each zone controller **10** to the host controller **46**.

[0218] Specifically, the on-off status of the drive motor **15** of each of the conveyance units **2** and **20**, the rotation speed of the drive motor **15**, the energization state of the control circuit **40**, and the like are input to the host controller **46**. In the present embodiment, since the zone controller **10** includes a sequence circuit, an on-off status and an energization state of a switch, a timer, and others in the circuit are all input to the host controller **46**. Pulse signals generated in accordance with the rotation of the drive motor **15** are also all input to the host controller **46**.

[0219] Information regarding the on-off status of the drive motor **15** of the conveyance units **2** and **20**, the rotation speed of the drive motor **15**, the energization state of the control circuit **40**, and the on-off status of the switches constituting the sequence circuit at the same time is input to the host controller **46**.

[0220] That is, every information at the same time in each zone is input to the host controller **46**.

[0221] Next, the actual operation confirmation device **50** will be described.

[0222] The actual operation confirmation device **50** according to the present embodiment includes the log data creation unit **51** incorporated in the host controller **46** and the external device **48** installed at a separate position.

[0223] The log data creation unit **51** includes an information acquisition unit **60**, a time determination unit **61**, a storage unit **62**, and the communication unit **63**.

[0224] The time determination unit **61** is a clock.

[0225] The information acquisition unit **60** is realized by a computer program, and acquires all the information of the load presence sensor S transmitted from the zone controller **10** of each of the conveyance units **2** and **20** to the host controller **46** and the driving status of each zone.

[0226] The information acquisition unit **60** acquires information regarding the on-off status of the drive motor **15** of the conveyance units **2** and **20**, the rotation speed of the drive motor **15**, the energization state of the control circuit **40**, and the on-off status of switches constituting the sequence circuit at the same time.

[0227] Then, the information acquired by the information acquisition unit **60** is stored in the storage unit **62** as log data together with a time of the acquisition of the information.

[0228] The information in the storage unit **62** is continuously accumulated. Further, the information in the storage unit **62** is organized and stored for each operation period of the conveyer device **1**. For example, the information is sorted out as "information on the conveyer device **1** on May 20, 2020" and "information on the conveyer device **1** on May 21, 2020" and stored as individual files.

[0229] When a memory capacity is insufficient, past information is automatically erased.

[0230] The information accumulated in the storage unit **62** is transmitted to the external device **48** via the communication unit **63**. The communication unit **63** may use, for example, an Internet line.

[0231] Next, the external device **48** will be described. In the present embodiment, the operation confirmation device **90** also serves as the external device **48**. The external device **48** illustrated in FIG. **8** is obtained by extracting a part functioning as the external device **48** of the operation confirmation device **50** from the actual operation confirmation device **90**.

[0232] The external device **48** includes the controller **52** and the display device **53**.

[0233] The controller **52** includes the storage unit **70**, the operation reproduction unit **71**, and the

communication unit **72**.

[0234] The communication unit **72** communicates with the communication unit **63** of the log data creation unit **51**, and the external device **48** acquires the log data stored in the storage unit **62** of the log data creation unit **51**. The log data acquired by the communication unit **72** is stored in the storage unit **70**.

[0235] The operation reproduction unit **71** is realized by a program including the computer program **206** for actual operation confirmation step and a storage unit, and creates operation reproduction video data that schematically reproduces the operation of the conveyer device **1** and energization state reproduction video data that expresses the operation state of each drive motor and the operation status of the load presence sensor S from moment to moment in a video on the basis of the log data.

[0236] That is, the operation reproduction unit **71** includes, as the computer program **206** for actual operation confirmation step, a computer program as an operation video creation unit **80** that creates operation reproduction video data and a computer program as a circuit video creation unit **81** that creates energization state reproduction video data.

[0237] In addition, the operation reproduction unit **71** includes a form storage unit **73** and a circuit storage unit **75**.

[0238] The form storage unit **73** stores a configuration of the conveyance units **2** and **20** constituting the conveyer device **1** and a connection between the conveyance units **2** and **20**.

[0239] The form storage unit **73** is a memory that stores the layout of the conveyer device **1** as illustrated in FIG. **2** and what the conveyance units **2** and **20** in each zone are.

[0240] The circuit storage unit **75** stores the control circuit **40** incorporated in each of the conveyance units **2** and **20**. The circuit storage unit **75** stores at least a part or all of the sequence circuit included in the control circuit **40** of each of the conveyance units **2** and **20**.

[0241] Next, a function of the actual operation confirmation device **50** according to the present embodiment will be described.

[0242] For convenience of description, the real conveyer device **1** is referred to as "real conveyer device **1**", and an adjective "real" is attached to an event that has occurred to the real conveyer device **1**. Things reproduced by the actual operation confirmation device **50** are distinguished by adding an adjective "virtual".

[0243] In the actual operation confirmation device **50** according to the present embodiment, the operation reproduction video data and the energization state reproduction video data are created by the operation reproduction unit **71** on the basis of the log data input from the log data creation unit **51** to the external device **48**, and the video is displayed on the display device **53**.

[0244] The video can be paused, stepped forward, fast forwarded, rewound, played slow, enlarged, and the like.

[0245] The display device **53** schematically displays a layout of the real conveyer device **1** as illustrated in FIG. **2**.

[0246] A figure displayed on the display device **53** is an outline figure imitating the conveyer device **1**, and is a connection of rectangular figures imitating the conveyance units **2** and **20**.

[0247] The virtual layout can be enlarged at any position as illustrated in FIG. **10**. Further, in the zone where the article is placed on the real conveyer device **1**, the display M imitating the article is exhibited in the virtual layout. FIG. **10**A illustrates a state in which an article exists at the positions of the addresses **10** and **11**. On the display screen, the date and time are displayed to clarify a point of time of the state.

[0248] A display M imitating the article is performed on the basis of the operation status of the load presence sensor S included in the log data. Specifically, in the case where the load presence sensor S of the real conveyer device **1** detects the presence of an article at a specific time and a record of the detection exists in the log data, the display M imitating the article is displayed in the virtual zone.

[0249] Further, in a zone in which the drive motor of the real conveyer device **1** is energized, a video with motion such as wavy motion is displayed in the virtual zone.

[0250] When the drive motor **15** in the zone where the article is placed in the real conveyer device **1** is energized, a video in which the virtual display M is moving is exhibited. A moving speed and a moving distance are determined by an interval and a total number of pulses transmitted by the drive motor **15**.

[0251] Further, with a click on a specific zone, a video of the energization state of the conveyance units **2** and **20** constituting the zone is displayed.

[0252] For example, when there is an article in zones **10** and **11** at a specific time at which the real conveyer device **1** is operating, and load presence sensors S**10** and S**11** are turned on, the fact is recorded in the log data.

[0253] When there is a record that load presence sensors S**10** and S**11** are turned on, the operation video creation unit **80** of the operation reproduction unit **71** displays the display M in the virtual zones **10** and **11** as illustrated in FIG. **10**A.

[0254] Further, in the real conveyer device **1**, when the articles in the zones **10** and **11** are conveyed to a zone **12**, a record remains that the drive motor **15** in the zones **10**, **11**, and **12** is turned on and energized in the log data.

[0255] When the load presence sensors S**10** and S**11** are turned on and there is a record that the drive motor of the zones is turned on and energized, the operation video creation unit **80** of the operation reproduction unit **71** moves the display M of the virtual zones **10** and **11** as illustrated in FIG. **10**B.

[0256] In the real conveyer device **1**, when the article M in each of the zones **10** and **11** has been moved to the zones **11** and **12**, a record that the load presence sensors S**11** and S**12** are turned on remains in the log data.

[0257] When there is a record that the load presence sensors S**11** and S**12** are turned on, the operation video creation unit **80** displays the display M in the virtual zones **11** and **12** as illustrated in FIG. **10**C.

[0258] Further, in the actual operation confirmation device **50** according to the present embodiment, the energization state of each of the conveyance units **2** and **20** is displayed on the display device **53**. The display can be displayed on the same screen as the layout described above, or can be displayed by switching screens.

[0259] Furthermore, the actual operation confirmation device **50** can perform individual reproduction of reproducing the operation of the sequence circuit of the control circuit **40** that designates the zone controller (conveyance unit) **10** by specifying the zone and controls the zone, and can perform multiple reproduction of simultaneously reproducing the operation of the sequence circuit of the control circuit **40** that designates a plurality of zones and controls the zones.

[0260] FIGS. **11**A to **11**C each illustrate a video showing an energization state of the conveyance unit **2** in the zone **12**.

[0261] In accordance with the above example, at a specific time, in the real conveyer device **1**, the article M exists in the zones **10** and **11**, but the article M does not exist in the zone **12** as a display target.

[0262] Therefore, the load presence sensor S**12** is turned off. Further, the drive motor **15** of the conveyance unit **2** in the zone **12** is turned off and stopped, and the drive motor **15** is not energized. These facts are recorded in the log data.

[0263] FIG. **11**A corresponds to FIG. **10**A. The load presence sensor S**12** is turned off, and the drive motor **15** is also turned off in the virtually displayed circuit.

[0264] In accordance with the above example, in the real conveyer device **1**, when the article in the zones **10** and **11** is conveyed to the zone **12**, a record that the drive motor **15** in the zone **12** is energized remains in the log data.

[0265] FIG. **11**B corresponds to FIG. **10**B. In the circuit displayed on the display device **53**, the

load presence sensor S**12** is turned off and the drive motor **15** is turned on.

[0266] In the real conveyer device **1**, when the article in the zone **11** has been moved to the zone **12**, a record that the load presence sensor S**12** is turned on, the drive motor **15** is turned off, and the energization is stopped remains in the log data.

[0267] FIG. **11**C corresponds to FIG. **10**C. In the circuit displayed on the display device **53**, the load presence sensor S**12** is turned on, and the drive motor **15** is turned off.

[0268] Even in a case where there is some kind of error in the real conveyer device **1**, the load presence sensor S, the driving status of the drive motor, and the like at that time are recorded in the log data.

[0269] It is therefore possible to reproduce an occurrence situation of the error virtually. Further, a state of an electric circuit at that time can be confirmed. Thus, a cause of a failure or the like can be easily found.

Final Specification Creation Step

[0270] The final specification creation step is performed using a final specification creator. The final specification creator includes computer software capable of capturing a figure, processing the figure, and inputting characters.

[0271] As illustrated in FIGS. **12**A, **13**A, **14**A, and **15**, the final specification creator stores a plurality of preset fixed phrases and display fields **300**, **301**, **303**, and **305** corresponding to the fixed phrases.

[0272] Examples of the fixed phrases include phrases indicating an outline of a device such as "layout", phrases indicating a communication line such as "network configuration", and phrases indicating a position of a zone such as "IP address setting".

[0273] As illustrated in FIG. **12**A, the display field **300** to which characters and figures for "layout" are applied is secured.

[0274] In addition, a table including characters such as "logic name", "third octet", and "node number" as illustrated in FIG. **13**A is stored. The "node number" is an identification number of the zone controller **10**, and is the same as the number of the zone in the present embodiment. A specific logic name is stored. The table has the display field **301** in which characters are filled.

[0275] FIG. **14**A illustrates an example in which a set speed of the motor is posted on the final specification creator. In FIG. **14**A, a table including characters such as "speed", "set speed 1, 2, 3, 4", and "node number" is stored. The table has the display field **303** in which characters are filled.

[0276] In the present embodiment, the speed of each motor can be changed in four stages, and the set speed at each stage is posted on the final specification creator. For example, there is a case where the rotation speed is switched for each situation, for example, when each motor is rotated at a low speed immediately after activation and rotated at a high speed after a certain period of time, and the set speed at each stage is posted in the final specification creator.

[0277] FIG. **15** illustrates an example when various settings, types of constituent members, and the like are posted on the final specification creator, and a table having "node number" and "item" fields is stored. In FIG. **15**, characters such as "sensor setting", "sensor alarm setting", "motor type", "rotation direction switching", "special function", "number of gear stages", "mechanical brake", "brake", "motor and motor port setting switching", "motor lock timeout", "servo brake current limit", "motor current limit", "substrate thermal generation temperature", and "substrate thermal release temperature" are indicated in the field of "item". In addition, a table including characters such as "node number" is also stored in the table in FIG. **15**. The table has the display field **305** in which characters are filled.

[0278] "Sensor setting" and "sensor alarm setting" indicate a relationship between a detection status of the load presence sensor S and the like and the output signal, and "dark-on" is a setting in which an H signal is output when a photo-sensor does not detect light.

[0279] The "number of gear stages" is the number of stages of a reduction gear of the motor-incorporating roller. The "brake" is a type of brake of the motor-incorporating roller.

[0280] The "motor lock timeout" is a time during which energization continues to stop when the motor is forcibly stopped by an external force.

[0281] The "servo brake current limit" is an upper limit of a current applied to a servo brake, and the "motor current limit" is an upper limit of a current applied to the motor-incorporating roller.

[0282] The "substrate thermal generation temperature" is a temperature at which power supply is stopped when a temperature of the substrate excessively rises. The "substrate thermal release temperature" is a temperature at which power supply is restarted.

[0283] Then, the information regarding the layout of the conveyance device **1** to be manufactured and the data input in the input step and the data corrected in the correction step are input to the final specification creator. Further, a type of control logic of the zone controller **10** of each zone, various setting values, and information for specifying the zone controller **10** are input.

[0284] As the information regarding the layout of the conveyance device **1**, data output from the computer used in the specification confirmation step and the virtual operation confirmation step is captured.

[0285] Then, as illustrated in FIG. **12**B, the figure of the layout is filled in a predetermined position.

[0286] Explanatory notes and the like are added as necessary.

[0287] The data input in the input step, the data corrected in the correction step, the type of the control logic of the zone controller of each zone, and the information specifying the zone controller are obtained from the data output from the computer used in the virtual operation confirmation step.

[0288] Then, as illustrated in FIGS. **13**B, **14**B, and **16**, necessary items are written in predetermined places.

[0289] The contents and items described in the final specification are arbitrary. In addition to a normal layout, a drawing illustrating a distribution destination of the conveyed object, a drawing illustrating a position of a sensor, a switch, or the like, a drawing illustrating a communication path, and a drawing illustrating an IP address may be included.

[0290] The information after data input is stored and printed out as necessary.

[0291] In the embodiment described above, two representative conveyance units are exemplified, but the structure and form of the conveyance unit are not limited to these two types.

[0292] For example, the conveyance units may form a curved path or guide a course of an article with a bar or the like.

[0293] The simple control circuit **40** has been described above as an example in order to facilitate understanding. However, the actual control circuit **40** is more complex.

[0294] Further, some actual conveyer devices have a zone without a load presence sensor, and other actual conveyer devices have a zone that is constantly driven. However, the present invention does not exclude conveyer devices including such zones.

[0295] The circuit displayed on the display device **53** may be a still image.

[0296] In the embodiment described above, it has been described that the load presence sensor S is turned on when an article is detected, but may be turned off when an article is detected.

[0297] In the embodiment described above, the parameter acquisition step is performed in the virtual operation confirmation step. That is, although the virtual operation confirmation device **107** includes the appropriate parameter selection program **235**, the specification confirmation device **106** may include the appropriate parameter selection program **235**.

EXPLANATION OF REFERENCE NUMBERS

[0298] **1**: conveyer device [0299] **2**: conveyance unit [0300] **10**: zone controller [0301] **20**: conveyance unit [0302] **40**: control circuit [0303] **46**: host controller [0304] **48**: external device [0305] **50**: actual operation confirmation device [0306] **51**: log data creation unit [0307] **52**: controller [0308] **53**: display device [0309] **71**: operation reproduction unit [0310] **72**: communication unit [0311] **80**: operation video creation unit [0312] **81**: circuit video creation unit

[0313] **90**: operation confirmation device [0314] **100**: conveyer system [0315] **106**: specification confirmation device [0316] **107**: virtual operation confirmation device [0317] **203**: computer program for specification confirmation step [0318] **205**: computer program for virtual operation confirmation step [0319] **206**: computer program for actual operation confirmation step [0320] **210**: operation instruction unit [0321] **211**: conveyance destination instruction unit [0322] **212**: state monitoring unit [0323] **220**: layout creation program [0324] **221**: video creation program [0325] **230**: automatic parameter assignment program [0326] **231**: parameter correction program [0327] **235**: appropriate parameter selection program [0328] **236**: parameter assignment program [0329] **242**: conveyed object information input unit [0330] **300**: display field [0331] **301**: display field [0332] **303**: display field [0333] **305**: display field

Claims

1. A method for manufacturing a conveyance device, wherein the conveyance device comprises: a host controller; and a plurality of conveyance units each including: a load presence sensor detecting presence or absence of an article on the conveyance unit; a drive device driving the conveyance unit; and an individual controller that controls each of the conveyance units, the individual controller including: a control circuit configured to input data regarding control; and a communication unit that communicates with the host controller, and wherein the method comprises: (a) confirming a required operation of the conveyance device by exhibiting a desired operation of the conveyance device in a video using at least one operation confirmation device that is configured to visually confirm an operation of the conveyance device; (b) confirming virtually the operation of the conveyance device by exhibiting the operation of the conveyance device in a video based on the data that has been input into the operation confirmation device, the date being for realizing the required operation or an operation similar to the required operation; and (c) inputting the data into the individual controller of the actual plurality of conveyance units.
2. The method according to claim 1, comprising (d) confirming actually the operation of the conveyance device after step (c) by acquiring log data of the individual controller of each of the conveyance units, inputting the log data to the operation confirmation device, and reproducing the operation of the conveyance device.
3. The method according to claim 2, comprising (e) correcting the data that is confirmed as an error in step (d).
4. The method according to claim 1, wherein the data is corrected to approximate to the required operation in step (b).
5. The method according to claim 1, wherein a final specification creator is used to store a plurality of fixed phrases and display-fields corresponding to the plurality of fixed phrases, wherein information about a layout of the conveyance device to be manufactured and data input in step (c) are input into the final specification creator, and wherein a document in which the layout and a description based on the data are written in the display fields is created.
6. The method according to claim 2, wherein a final specification creator is used to store a plurality of fixed phrases and display-fields corresponding to the plurality of fixed phrases, wherein information about a layout of the conveyance device to be manufactured and data input in step (c) are input into the final specification creator, and wherein a document in which the layout and a description based on the data are written in the display fields is created.
7. The method according to claim 3, wherein a final specification creator is used to store a plurality of fixed phrases and display-fields corresponding to the plurality of fixed phrases, wherein information about a layout of the conveyance device to be manufactured and data input in step (c), and/or data corrected in step (e) are input into the final specification creator, and wherein a document in which the layout and a description based on the data are written in the display fields is created.

8. The method according to claim 1, wherein the individual controller includes a basic control circuit, wherein a parameter required for a specific operation can be input as one of the data, and wherein a parameter for executing the operation of the conveyance device exhibited in step (a) is acquired and is input into the operation confirmation device when step (b) is performed.

9. The method according to claim 1, wherein the individual controller includes a basic control circuit, wherein a parameter required for a specific operation can be input as one of the data, and wherein a parameter acquired from the data used in step (b) is input into the individual controller in step (c).