

[DESCRIPTION]

[TITLE OF INVENTION]

PLANT APPARATUS INFORMATION MANAGEMENT SYSTEM

[Technical Field]

5 [0001]

The present invention relates to a plant apparatus information management system.

Priority is claimed on Japanese Patent Application No. 2018-081803, filed April 20, 2018, the content of which is incorporated herein by reference.

10 [Background Art]

[0002]

In plants such as garbage incinerators, there is much information regarding facilities, apparatuses, and components included in the plants (hereinafter referred to as “apparatus information”) and there is also much information regarding work necessary to operate and maintain the plants (hereinafter referred to as “work information”). To manage the apparatus information or the work information, a management scheme such as a bill of materials (BOM) or a work breakdown structure (WBS) is used. The BOM is a list of information in which each type of the apparatus information is set into one of hierarchical layers in a hierarchical structure, and the WBS is a list of information in which each type of the work information is set into one of hierarchical layers in a hierarchical structure. In this way, the BOM and the WBS seem to be different lists which are not related to each other. However, in a scenario in which a plant operates, for example, the apparatus information of a certain hierarchical layer of the BOM can be associated with the work information of a certain hierarchical layer of the WBS to manage the plant. For example, in Patent Literature 1, it is proposed that a management

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apparatus manages information necessary to operate a plant (hereinafter referred to as “plant information” which includes at least the apparatus information and the work information), based on the apparatus information managed in conformity with the BOM and the work information managed in conformity with the WBS, both of that are
5 associated with each other.

[Citation List]

[Patent Literature]

[0003]

[Patent Literature 1]

10 Japanese Unexamined Patent Application, First Publication No. 2012-128761

[Summary of Invention]

[Technical Subject to be solved]

[0004]

In general, when the BOM and the WBS are electronically managed by a
15 computer, codes (hereinafter referred to as “apparatus codes”) are set in the apparatus information corresponding to each of the hierarchical layers of the BOM, and codes (hereinafter referred to as “work codes”) are set in the work information corresponding to each of the hierarchical layers of the WBS. When a worker inputs the apparatus information or the work information, the apparatus codes corresponding to the apparatus
20 information or the work codes corresponding to the work information are automatically set.

Here, each of the hierarchical layers of the BOM is sequentially numbered as BOM level 1, BOM level 2, BOM level 3, and the like, from the upper side to the lower side to indicate a specific hierarchical layer (a specific BOM level). Similarly, each of
25 the hierarchical layers of the WBS is sequentially numbered as WBS level 1, WBS level

2, WBS level 3, and the like, from the upper side to the lower side to indicate a specific hierarchical layer (a specific WBS level).

As in the management apparatus of Patent Literature 1, the plant information can be managed by using retrieval codes based on the apparatus codes corresponding to the BOM levels and the work codes corresponding to the WBS levels. When such retrieval codes are set, desired plant information can be retrieved and extracted from the plant information of plants to be compared to each other.

However, when the plant information of plants which are geographically separated or have different functions, is managed in the same way, the numbers of the hierarchical layers of the BOM and the WBS of a certain plant (hereinafter referred to as “Plant 1”) may differ from the numbers of the hierarchical layers of the BOM and the WBS of another plant (hereinafter referred to as a “Plant 2”). For example, there could be a case in which the number of the hierarchical layers of the BOM of the Plant 1 is five and the number of the hierarchical layers of the BOM of the Plant 2 is three. The same situation could be applied to the WBS levels. In this case, in order to manage the plant information of all plants and retrieve and extract desired plant information, in the related art, it is necessary to input all pieces and types of the plant information corresponding to a plant, that has the largest number of the hierarchical layers among the all plants, to the other plants, even when some of the hierarchical layers set in the plant having the largest number are not necessary to the other plants. For example, when the largest number of hierarchical layers in all the plants is five as in the Plant 1, because the number of hierarchical layers of the Plant 2 is three, the plant information of the Plant 1 and the plant information of the Plant 2 cannot be retrieved and extracted simultaneously, unless the apparatus codes (for example, codes indicating “not applicable” or the like), which are corresponding to the remaining two hierarchical layers and intrinsically useless in the

Plant 2, are set in the Plant 2. Therefore, in order to set the apparatus codes which are intrinsically useless and are corresponding to the two hierarchical layers, a worker needs to input some pieces as information corresponding thereto as the plant information.

That is, since it is necessary to set intrinsically unnecessary hierarchical layers, in which

5 the number of hierarchical layers of the BOM and the WBS is the largest, and to set the apparatus codes or the work codes corresponding to the apparatus information or the work information of all the hierarchical layers including the unnecessary hierarchical layers, some kinds of plant information have to be input to all the layers, and thus

information is excessively input. Therefore, it is necessary for a worker to execute

10 input work for a long time, and thus cost increases. Accordingly, even when there are plants in which the numbers of hierarchical layers of the BOM and the WBS are different, development of a management system capable of reducing an input load of a worker and executing retrieval, extraction, and comparison of desired plant information is required.

15 When information is excessively input in this way, there is a high risk of a worker erroneously inputting the apparatus information or the work information. As a result, there is a high probability of a problem occurring in the retrieval, extraction, and comparison of the plant information. For example, as described above, when the retrieval codes are set based on the apparatus codes corresponding to the BOM levels and

20 the work codes corresponding to the WBS levels, and when a worker erroneously inputs the apparatus information of a certain BOM level or the work information of a certain WBS level, a retrieval code different from the original retrieval code is set erroneously. Therefore, all the desired plant information may not be extracted and compared.

Accordingly, development of a management system capable of reducing a probability of

25 a problem occurring in retrieval, extraction, and comparison of the plant information due

to an erroneous input of a worker, is required.

[0005]

The present invention provides a plant apparatus information management system capable of reducing a load on a worker inputting plant information and executing
5 retrieval, extraction, and comparison of desired plant information with high accuracy even when the plant information is erroneously input, in a case in which there are plants.

[Solution to Subject]

[0006]

According to an aspect of the present invention, a plant apparatus information
10 management system manages pieces of apparatus information of plants in conformity with BOM in which an apparatus code corresponding to each of the pieces of apparatus information input in correspondence with a plurality of hierarchical layers of the BOM is set and manages pieces of work information regarding works to be executed on the plants in conformity with a WBS in which a work code corresponding to each of the pieces of
15 work information input in correspondence with a plurality of hierarchical layers of the WBS is set. The plant apparatus information management system includes: a maintenance code generation unit configured to generate a maintenance code only corresponding to an apparatus code corresponding to apparatus information of the lowermost layer of hierarchical layers in which the pieces of the apparatus information
20 are necessarily input for all the plants among hierarchical layers of the BOM and a work code corresponding to work information of a hierarchical layer of the WBS directly associated with the apparatus information of the lowermost layer among hierarchical layers of the WBS; and a job application configured to execute a process related to management work of a plant of the plants using the maintenance code, and the apparatus
25 information and the work information corresponding to the maintenance code. The job

application extracts and displays the pieces of the apparatus information and the work information of the plants corresponding to the same maintenance code.

In this configuration, since the maintenance code for extracting plant information is generated in correspondence with only two codes, the apparatus code
5 corresponding to the apparatus information of the lowermost layer of the hierarchical layers of the BOM in which the pieces of the apparatus information are necessarily input in all the plants and the work code corresponding to the work information of the hierarchical layer of the WBS directly associated with the apparatus information, it is possible to avoid a situation in which information is excessively input, as described in
10 Technical Subject to be solved. For example, when the number of hierarchical layers of a certain plant is 5 and the number of hierarchical layers of another plant is 3, the maintenance code is generated only in correspondence with the apparatus code corresponding to the apparatus information of BOM level 3 and the work code corresponding to the work information (for example, the work information of WBS level
15 1) of the WBS level directly associated with the apparatus information. Therefore, a worker may input the apparatus information corresponding to three hierarchical layers rather than five hierarchical layers with regard to the other plant.

When the worker inputs the apparatus information or the work information, the worker may pay sufficient attention to only the lowermost layer of the BOM level and a
20 layer of one WBS level directly associated with the lowermost layer of the BOM level, both of which are necessary to generate the maintenance code. Even when information is erroneously input in layers of other BOM levels or WBS levels, desired plant information can be extracted. The plant information extracted herein includes partially erroneous information but is mostly correct plant information. Therefore, the worker
25 can efficiently execute management work of the plants using the job application.

That is, it is possible to provide the plant apparatus information management system capable of reducing a load on the worker inputting the plant information and executing retrieval, extraction, and comparison of desired plant information with high accuracy even when plant information is erroneously input in a case in which there are
5 many plants.

[0007]

According to the aspect of the present invention, the plant apparatus information management system may further include a database configured to store the maintenance code, and the apparatus information and the work information corresponding to the
10 maintenance code. The database may include a first database and a second database. The job application may include a first job application executing a process related to first work and obtaining first work information and a second job application executing second work different from the first work and obtaining second work information. The first job application may add the first work information to the apparatus information and the work
15 information and store the apparatus information and the work information in the first database. The second job application can copy the maintenance code, the apparatus information, the work information, and the first work information stored in the first database to the second database, execute a process related to the second work, and store the second work information in the second database in association with the maintenance
20 code.

In this configuration, individual databases (the first database and the second database) are provided for a first job application and a second job application, and the second job application copies content of the first database to the second database and executes the second work. Accordingly, for example, when maintenance work such as
25 periodic inspection is executed on the first database, a process of the second job

application can be executed using the second database. Therefore, it is possible to improve convenience of the plant apparatus information management system.

[0008]

In the plant apparatus information management system according to the aspect
5 of the present invention, the apparatus code may include a furnace number code.

In this configuration, when the same types of apparatuses are disposed in a certain plant, it is possible to execute retrieval, extraction, and comparison on the apparatuses separately.

[0009]

10 In the plant apparatus information management system according to the aspect of the present invention, the lowermost layer may be BOM level 3.

[Advantageous Effects of Invention]

[0010]

The plant apparatus information management system mentioned above, can
15 reduce a load of a worker inputting plant information, and can retrieve, extract, and compare desired plant information with high accuracy even when the plant information is erroneously input in a case in which plants are management targets.

[Brief Description of Drawings]

[0011]

20 Fig. 1 is a block diagram illustrating a plant apparatus information management system which is an embodiment of the present invention.

Fig. 2 is a diagram illustrating a job process of the plant apparatus information management system in Fig. 1.

Fig. 3 is a diagram illustrating a method of generating maintenance codes
25 according to the present invention.

Fig. 4 is a list table illustrating apparatus information, work information, relevant information used in each processing unit of a job application unit 12 in Fig. 1.

Fig. 5 is a first diagram illustrating a display example of plant information and the like of a comparison target according to the present invention.

5 Fig. 6 is a second diagram illustrating a display example of plant information and the like of a comparison target according to the present invention.

Fig. 7 is a third diagram illustrating a display example of plant information and the like of a comparison target according to the present invention.

Fig. 8 is a fourth diagram illustrating a display example of plant information and
10 the like of a comparison target according to the present invention.

[Description of Embodiments]

[0012]

<Embodiment>

Hereinafter, a plant apparatus information management system according to an
15 embodiment of the present invention will be described with reference to Figs. 1 to 8.

Fig. 1 is a block diagram illustrating a plant apparatus information management system which is an embodiment of the present invention.

A plant apparatus information management system 10 (hereinafter referred to as a “management system 10”) is a system that electronically manages the plant information
20 of a garbage incinerator (the apparatus information, the work information, or other information related thereto (hereinafter referred to as “relevant information”)). The management system 10 is configured by a computer such as one or a plurality of personal computers (PCs) or server apparatuses.

The management system 10 manages the apparatus information of plants which
25 are management targets in conformity with the BOM, and it manages the work

information in conformity with the WBS. The management system 10 manages the BOM and the WBS in association with each other.

Further, the management system 10 uniformly manages the plant information of plants which are geographically separated or have different functions. Therefore, the numbers of hierarchical layers of the BOM and the WBS of a certain plant may differ from the numbers of hierarchical layers of the BOM and the WBS of another plant.

In the embodiment, the management system 10 will be described on the assumption that, among all the exemplified plants, a plant, in which the number of hierarchical layers of the BOM is the largest, is a plant in which there is the apparatus information of up to five BOM levels, and a plant, in which the number of hierarchical layers of the WBS is the largest, is a plant in which there is the work information of up to three WBS levels. In a list table of Fig. 4 to be described below, for the same reason, the BOM is described up to BOM level 5 and the WBS is described up to WBS level 3.

[0013]

The management system 10 includes an input/output unit 11, a job application unit 12, and a storage unit 13.

The input/output unit 11 includes at least a keyboard used for a worker to input the plant information and a monitor that outputs and displays the plant information.

The input/output unit 11 may be integrated with the monitor as a touch panel. The input/output unit 11 may include a printer that outputs and prints the plant information.

[0014]

The plant is operated and managed, as will be described below, by executing a series of job processes (see Fig. 2), that is, a client apparatus book generation process of initially registering the plant information, which is a start process, a process table generation process of making plans for inspections and maintenance works, and an

installation report generation process of actually executing the maintenance work or the like and inputting the record. Therefore, the job application unit 12 includes processing units that execute processes in accordance with the work process. Specifically, the job application unit 12 includes, as the processing units, a maintenance code generation unit 120, a client apparatus book generation unit 121, a process table generation unit 122, an estimate generation unit 123, an installation specification form generation unit 124, an installation report generation unit 125, an installation daily report generation unit 126, a preservation history generation unit 127, and a preservation plan generation unit 128. The details of the processes of each processing unit will be described later again after the storage unit 13 is described.

[0015]

The storage unit 13 stores the plant information processed by the job application unit 12. The storage unit 13 includes a “client BOM and WBS DB 131” that stores and conserves the plant information processed by the client apparatus book generation unit 121 and a maintenance code generated by the maintenance code generation unit 120; an installation schedule DB 132 that stores and conserves the plant information or the like processed by the process table generation unit 122, an estimate DB 133 that stores and conserves the plant information or the like processed by the estimate generation unit 123, an order cost DB 134 that stores and conserves the plant information or the like processed by the installation specification form generation unit 124; an apparatus inspection measurement and recording DB 135 that stores and conserves the plant information or the like processed by the installation report generation unit 125; an installation record DB 136 that stores and conserves plant information or the like processed by the installation daily report generation unit 126; an installation history DB 137 that stores and conserves the plant information or the like processed by the

preservation history generation unit 127; and a future installation plan DB 138 that stores and conserves the plant information or the like processed by the preservation plan generation unit 128. That is, databases individually corresponding to each processing unit of the job application unit 12 are provided.

5 “DB” stands for “database.” The DBs 131 to 138 may be individual storage devices or may be different storage areas inside one storage device. The DBs 131 to 138 may be geographically or spatially separated from each other, as long as the job application unit 12 and the input/output unit 11 are connected to the DBs 131 to 138 via the Internet or the like, by cable transmissions or wireless transmissions.

10 [0016]

A process of each processing unit of the job application unit 12 will be described in detail with reference to Figs. 1, 2, 3, and 4. Fig. 2 is a diagram illustrating a job process of the plant apparatus information management system in Fig. 1. Fig. 3 is a diagram illustrating a method of generating maintenance codes. Fig. 4 is a table
15 illustrating pieces and types of the apparatus information and pieces and types of the work information used by each processing unit for each corresponding BOM level or WBS level. Fig. 4 illustrates pieces and types of relevant information to be input or used in each processing unit.

In Fig. 4, since an item, in which “-” is shown, is an item which is not used by a
20 corresponding processing unit, the item and an input field used to input the item are not displayed on a monitor of the input/output unit 11. However, in the DB provided to individually correspond to each processing unit, when the plant information or the like is input in an upstream job process, the plant information or the like of the item in which “-” is shown is also stored and conserved in the DB. Therefore, when a worker desires
25 to display the item, the worker can appropriately select the item to display the item.

The client apparatus book generation unit 121 first displays a “client apparatus book screen” on the monitor of the input/output unit 11. The client apparatus book generation unit 121 executes a process S11 of generating a client apparatus book for a new plant of which the plant information is not stored and conserved in the storage unit

5 13. Input fields of items input in the process S11 of generating the client apparatus book are displayed on the “client apparatus book screen.”

Specifically, as illustrated in Fig. 4, the input fields, used to input a client facility name (BOM level 1), a client apparatus name or an apparatus specification (BOM level 2), an apparatus specification classification, a detailed client apparatus name, a detailed

10 apparatus specification, a series (BOM level 3), a client apparatus part name or part specification (BOM level 4), or a client apparatus component name or component specification (BOM level 5), which are pieces and types of the apparatus information, and a work attribute or client execution item name (WBS level 1) and a detailed client work name (WBS level 2), which are pieces and types of the work information, are

15 displayed on the monitor of the input/output unit 11 by the client apparatus book generation unit 121. The worker appropriately executes inputting in the input fields using the keyboard of the input/output unit 11 to electronically generate a book (master data) of the plant information of the new plant. In the book, as will be described below, a maintenance code, the apparatus information of the BOM, the work information of the

20 WBS, and the relevant information are associated with each other.

Here, in the “client apparatus book screen,” input fields corresponding to the apparatus information from BOM levels 1 to 5 and the work information of WBS levels 1 and 2 are displayed as items input in the process S11 of generating the client apparatus book. However, it is assumed that the apparatus information from BOM levels 1 to 3

25 are necessarily input for all the handled plants and the work information of WBS level 1

is necessarily input for all the handled plants in the following description. That is, among all the handled plants, there can be a plant for which it is not necessary to input the apparatus information of BOM levels 4 and 5 and a plant for which it is not necessary to input the work information of WBS level 2.

5 The client apparatus book generation unit 121 stores and conserves the plant information input on the “client apparatus book screen” by the worker in the client BOM and WBS DB 131.

[0017]

 The series (BOM level 3) is information for distinguishing the same types of
10 apparatuses from each other when the same types of apparatuses are disposed.
Regarding a series of furnaces, “furnace number” information (BOM level 3) is provided corresponding to each of furnaces, and an apparatus code corresponding thereto is also referred to as a furnace number code. For example, when one garbage incinerator plant includes a plurality of garbage incinerators (furnaces), each of the garbage incinerators
15 has different furnace number codes to be distinguished each other.

[0018]

 The maintenance code generation unit 120 generates a maintenance code which is a type of retrieval code in correspondence with a specific combination of the apparatus code and the work code corresponding to the apparatus information and the work
20 information input on the “client apparatus book screen.” Specifically, the maintenance code generation unit 120 generates a maintenance code only in correspondence with an apparatus code corresponding to the apparatus information (an apparatus code corresponding to the apparatus information of BOM level 3 in the embodiment) of the lowermost layer of hierarchical layers in which pieces and types of the apparatus
25 information are necessarily input for all the plants among hierarchical layers of the BOM

and a work code corresponding to the work information (a work code corresponding to the work information of WBS level 1 in the embodiment) of a hierarchical layer of the WBS directly associated with the apparatus information of the lowermost layer, among hierarchical layers of the WBS.

5 The generated maintenance code is displayed on the “client apparatus book screen” on the monitor, and the client apparatus book generation unit 121 stores and conserves the maintenance code in the client BOM and WBS DB 131 in association with the plant information input in the “client apparatus book screen.”

 The details will be described below.

10 [0019]

 Fig. 3 is a simple diagram illustrating a method of generating the maintenance codes. Fig. 3(a) illustrates an example of apparatus information in each hierarchical layer of the BOM regarding a plant of which name is “PLANT α .”

 For example, PLANT α includes “FACILITY 1” and “FACILITY 2” which are
15 the apparatus information of BOM level 1. “FACILITY 1” is associated with “APPARATUS A” and “APPARATUS B” which are the apparatus information of BOM level 2. “FACILITY 2” is associated with “APPARATUS C” which is the apparatus information of BOM level 2.

 “APPARATUS A” is associated with “APPARATUS DETAILS 1” and
20 “APPARATUS DETAILS 2” which are the apparatus information of BOM level 3. “APPARATUS B” is associated with “APPARATUS DETAILS 3” which is the apparatus information of BOM level 3. “APPARATUS C” is associated with “APPARATUS DETAILS 4” which is the apparatus information of BOM level 3.

 “APPARATUS DETAILS 1” is associated with “PART 1” which is the apparatus
25 information of BOM level 4, and “PART 1” is associated with “COMPONENT 1” which

is the apparatus information of BOM level 5.

There is no apparatus information of BOM level 4 or deeper hierarchical layers in association with “APPARATUS DETAILS 2”, “APPARATUS DETAILS 3”, and “APPARATUS DETAILS 4”.

5 Here, the apparatus information of BOM levels 1 to 3 is information which is necessarily input to any plant managed by the management system 10. The apparatus information of BOM levels 4 and 5 is information of which an input may be necessary or unnecessary, depending on a piece and a type of the apparatus information input in BOM levels 1 to 3 or depending on characteristics of the plant. The hierarchical layers of the
10 BOM in which it is compulsory for the worker to input information are assumed to be BOM levels 1 to 3 herein, but the hierarchical layers are exemplary and the number of hierarchical layers in which it is compulsory to input information may be appropriately set depending on the specifications of the management system 10. For example, two layers of BOM levels 1 and 2 may be set as hierarchical layers in which it is compulsory
15 to input information. The BOM may include hierarchical layers deeper than BOM level 5 (for example, BOM levels 6 and 7 and the like).

[0020]

Fig. 3(b) illustrates an example of the work information of each hierarchical layer of the WBS regarding PLANT α . “WORK 1”, which is the work information of
20 WBS level 1, is associated with “WORK DETAILS A” and “WORK DETAILS B” which are the work information of WBS level 2. “WORK 2”, which is the work information of WBS level 1, is associated with “WORK DETAILS C” which is the work information of WBS level 2. “WORK DETAILS A” is associated with “WORK DETAILS 1” which is the work information of WBS level 3. There is no work
25 information of WBS level 3 associated with “WORK DETAILS B” and “WORK

DETAILS C” or deeper hierarchical layers.

Here, the work information of WBS level 1 is information that is necessarily input in any plant managed by the management system 10. The work information of WBS levels 2 and 3 is information of which an input may be necessary or unnecessary, depending on a piece and a type of the work information input in WBS level 1 or depending on characteristics of the plant. The hierarchical layer of the WBS which is necessarily input by the worker is assumed to be WBS level 1 herein, but the hierarchical layer is exemplary and the number of hierarchical layers in which it is compulsory to input information may be set appropriately depending on the specifications of the management system 10. For example, two layers of WBS levels 1 and 2 may be set as hierarchical layers in which it is compulsory to input information. The WBS may include hierarchical layers (for example, WBS levels 4 and 5 and the like) deeper than WBS level 3.

[0021]

The BOM and the WBS of PLANT α illustrated in Figs. 3(a) and 3(b) are associated with each other, as illustrated in Fig. 3(c). That is, the work information of WBS level 1, which is in a hierarchical layer directly associated with the apparatus information of BOM level 3 among hierarchical layers of the WBS (in this example, only WBS level 1) in which each piece or type of the work information is necessary to be input respectively, is associated with the apparatus information of BOM level 3, which is the lowermost layer among hierarchical layers of the BOM (in this example, BOM levels 1 to 3) in which each piece or type of the apparatus information is necessary to be input respectively in all the plants managed by the management system 10. In Fig.3(c), “APPARATUS DETAILS 1” which is the apparatus information of BOM level 3 is associated with “WORK 1” which is the work information of WBS level 1.

In the hierarchical layers of the WBS, the work information of the hierarchical layer “directly associated” with the apparatus information of BOM level 3, is the work information of the uppermost layer of the hierarchical layers in which there are pieces and types of the work information to be executed for the apparatus information of BOM level 3 which is the lowermost layer. Accordingly, when there is only one piece and type of the work information of WBS level 1 for the pieces of the apparatus information of BOM level 3, WBS level 1 is not the “directly associated” hierarchical layer. For example, in Fig. 3(b), when there is only “WORK 1” as the work information of WBS level 1 and there is no “WORK 2”, the hierarchical layer directly associated with the apparatus information of BOM level 3 among the hierarchical layers of the WBS may not be WBS level 1 but WBS level 2.

Subsequently, as illustrated in Fig. 3(c), since the BOM and the WBS in Figs. 3(a) and 3(b) are related to the plant information of the plant of which name is “PLANT α ,” PLANT α is associated with the BOM and the WBS.

Further, as illustrated in Fig. 3(c), a maintenance code COM (COM is an abbreviation for “code of maintenance”), only corresponding to “APPARATUS DETAILS 1” which is the apparatus information of PLANT α and “WORK 1” which is the work information of PLANT α , is generated by the maintenance code generation unit 120 and is associated similarly. For example, when the worker inputs “APPARATUS DETAILS 1” and an apparatus code automatically set by the job application unit 12 in correspondence with “APPARATUS DETAILS 1” is “123XA”, and when the worker inputs “WORK 1” and a work code automatically set by the job application unit 12 in correspondence with “WORK 1” is “089X”, the maintenance code COM is generated as “123XA089X” in correspondence with only the two codes.

The case in which the apparatus code is “123XA” and the work code is “089X

has been described as an example, but the digits of the codes are not limited thereto and can be equal to or more or fewer digits in accordance with specifications or the like.

Further, the maintenance code generation unit 120 may generate the maintenance code COM using the automatically generated apparatus code and work code without change.

- 5 In the storage unit 13, a conversion list of two inputs and one output or a conversion table of two inputs and one output, may be included and the maintenance code generation unit 120 may generate the maintenance code COM using the conversion list or the conversion table. For example, when the apparatus code is “123XA” and the work code is “089X,” the maintenance code generation unit 120 may generate the maintenance code COM such
- 10 as “123XA089X” or “089X123XA” by juxtaposing the apparatus code and the work code, or may generate the maintenance code COM such as “102839XXA” (alternate arrangement) by mixing the apparatus code and the work code. The maintenance code generation unit 120 may input the apparatus code “123XA” and the work code “089X” into the conversion table and may generate a code output from the conversion table
- 15 (which is a code that has a value or digits not related to the apparatus code or the work code and corresponds to only to the two codes) as the maintenance code COM.

[0022]

- Referring back to Fig. 1, the description will be made. The process table generation unit 122 first copies all the maintenance code COM stored and conserved in
- 20 the client BOM and WBS DB 131 by the client apparatus book generation unit 121 and the plant information associated with the maintenance code COM to the installation schedule DB 132. The process table generation unit 122 displays a “process table generations screen” on the monitor of the input/output unit 11 and executes a process S12 of generating the process table using the installation schedule DB 132. In the “process
- 25 table generation screen,” input fields of items input in the process S12 of generating the

process table are displayed. Specifically, as illustrated in Fig. 4, input fields used to input a client facility name (BOM level 1), apparatus specification classification, a detailed client device name, a detailed apparatus specification, or a series (BOM level 3), which are pieces and types of the apparatus information, and a work attribute or a client execution item name (WBS level 1), a detailed client work name (WBS level 2), a scheduled process or scheduled manhours (WBS level 3), which are pieces and types of work information, and a scheduled furnace pause or a scheduled inspection, which are pieces and types of relevant information, are displayed on the monitor of the input/output unit 11 by the process table generation unit 122.

At this time, the maintenance code COM and the plant information stored and conserved in the client BOM and WBS DB 131 are copied to the installation schedule DB 132. Accordingly, with regard to the plant information or the like which has already been copied and are items to be necessarily input in the process S12 of generating the process table, the process table generation unit 122 displays the information or the like along with the plant information at the time when the input fields are displayed. In the example of Fig. 4, the plant information or the like to be necessarily input are the same in BOM level 1, BOM level 3, WBS level 1, and WBS level 2 in the client apparatus book generation unit 121 and the process table generation unit 122. Accordingly, it is not necessary for the worker to re-input the same pieces of the information on the “process table generation screen.” Here, the worker can correct the information in the input fields of the “process table generation screen.”

Accordingly, information which is necessary for the worker to newly input in the process S12 of generating the process table is at most two items, the scheduled process or scheduled manhours (WBS level 3) and the relevant information. Therefore, it is possible to reduce the input time and effort of the worker inputting the information.

When the process S12 of generating the process table for a specific plant is executed, the process table generation unit 122 can retrieve and extract the plant information or the like of the plants associated with the same maintenance code COM, and can display the extracted information on the monitor of the input/output unit 11 in a form in which the extracted information can be compared to those of other plants. Thus, since the worker can perform inputting with reference to other plant information with regard to a specific plant, input work becomes efficient (working hours are reduced and an effort is reduced) and a result is obtained by comparing the plant information based on a record. Therefore, the process table with high reliability can be generated.

[0023]

The estimate generation unit 123 first copies all of the maintenance codes COM and all of the plant information associated with the maintenance code COM, that are stored and conserved in the installation schedule DB 132 by the process table generation unit 122, to the estimate DB 133. Since all the plant information or the like stored and conserved in the installation schedule DB 132 are copied, the plant information of BOM level 2, BOM level 4, and BOM level 5 which have not been used in the process S12 of generating the process table in the process table generation unit 122 and have not been displayed on the monitor, are also copied to the estimate DB 133. The plant information of BOM level 2, BOM level 4, and BOM level 5 are the same as the plant information stored and conserved in the client BOM and WBS DB 131.

The estimate generation unit 123 displays the “estimate generation screen” on the monitor of the input/output unit 11 and performs a process S13 of generating an estimate using the estimate DB 133. In the “estimate generation screen,” the input fields of the items input in the process S13 of generating the estimate are displayed. Specifically, as illustrated in Fig. 4, input fields used to input a client facility name (BOM

level 1), a client apparatus name (BOM level 2), apparatus specification classification, a detailed client apparatus name, or a series (BOM level 3), a client apparatus component name, a component specification, the number of components, or an estimate unit price (BOM level 5), which are pieces and types of the apparatus information, a work attribute or a client execution item name (WBS level 1), a detailed client work name, estimate manhours, or an estimate unit price (WBS level 2), which are pieces and types of the work information, and an expense which is the relevant information, are displayed on the monitor of the input/output unit 11 by the estimate generation unit 123.

At this time, the maintenance code COM, the plant information, and the like stored and conserved in the installation schedule DB 132, are copied to the estimate DB 133. Accordingly, with regard to the plant information or the like which has already been copied and are items to be necessarily input in the process S13 of generating the estimate, the estimate generation unit 123 displays these pieces of the information along with the input fields.

Here, in Fig. 4, while information of BOM level 2 to be necessarily input in the client apparatus book generation unit 121 is a client apparatus name or an apparatus specification, information of BOM level 2 to be necessarily input in the estimate generation unit 123 is a client apparatus name, and it is not necessary to input the apparatus specification. In this case, the estimate generation unit 123 displays the client apparatus name copied from the installation schedule DB 132 to the estimate DB 133 in the input field of the “estimate generation screen”, so that the worker can correct the client apparatus name as necessary, but it is not necessary to display the similarly copied apparatus specification. In Fig. 4, while information of BOM level 5 to be necessarily input in the client apparatus book generation unit 121 is a client apparatus component name or a component specification, information of BOM level 5 to be necessarily input

in the estimate generation unit 123 is a client apparatus component name, a component specification, the number of components, or an estimate unit price, and an amount of information increases. In this case, the estimate generation unit 123 displays the client apparatus component name or the component specification copied from the installation schedule DB 132 to the estimate DB 133 in the input field of the “estimate generation screen”, so that the worker can correct the client apparatus component name or the component specification as necessary. Further, an input field corresponding to information (herein, the number of components or the estimate unit price) increased in the same BOM level is newly displayed in the “estimate generation screen” to prompt the worker to input the information.

Similarly to the process table generation unit 122, when the process S13 of generating the estimate for the specific plant is executed, the estimate generation unit 123 can retrieve and extract the plant information or the like of the plants associated with the same maintenance code COM, and can display the extracted information on the monitor of the input/output unit 11 in a form in which the extracted information can be compared to those of other plants. Thus, since it is able for the worker to perform inputting information about a specific plant with reference to the other plant information, input work becomes efficient (working hours are reduced and an effort is reduced) and a result is obtained by comparing the plant information based on a record. Therefore, it is possible to generate an estimate with high reliability.

[0024]

The other processing units, that is, the installation specification form generation unit 124 to the preservation plan generation unit 128, execute the same operations as the process table generation unit 122 or the estimate generation unit 123. Therefore, the operations will be described below in brief. The processing units can retrieve and

extract the plant information or the like of the plants associated with the same maintenance code COM and can display the plant information on the monitor of the input/output unit 11 in a form in which the plant information can be compared to those of other plants.

5 The installation specification form generation unit 124 first copies all of the maintenance codes COM and all pieces of the plant information and the like associated with the maintenance code COM, which are stored and conserved in the estimate DB 133 by the estimate generation unit 122, to the order cost DB 134. Then, an “installation specification form generation screen” is displayed on the monitor of the input/output unit
10 11 and a process S14 of generating an installation specification form is executed using the order cost DB 134.

 The installation report generation unit 125 first copies all of the maintenance codes COM and all pieces of the plant information and the like associated with the maintenance code COM, which are stored and conserved in the order cost DB 134 by the
15 installation specification form generation unit 124, to the apparatus inspection measurement recording DB 135. Then, an “installation report generation screen” is displayed on the monitor of the input/output unit 11 and a process S15 of generating an installation report is executed using the apparatus inspection measurement recording DB
135.

20 The installation daily report generation unit 126 first copies all of the maintenance codes COM and all pieces of the plant information associated with the maintenance code COM and the like, which are stored and conserved in the apparatus inspection measurement recording DB 135 by the installation report generation unit 125, to the installation record DB 136. Then, an “installation daily report generation screen”
25 is displayed on the monitor of the input/output unit 11 and a process S16 of generating an

installation daily report is executed using the installation record DB 136.

The preservation history generation unit 127 first copies all of the maintenance code COM and all pieces of the plant information and the like associated with the maintenance code COM, which are stored and conserved in the installation record DB 136 by the installation daily report generation unit 126, to the installation history DB 137. Then, a “preservation history screen” is displayed on the monitor of the input/output unit 11 and a process S17 of generating a preservation history is executed using the installation history DB 137.

The preservation plan generation unit 128 first copies all of the maintenance code COM and all pieces of the plant information and the like associated with the maintenance code COM, which are stored and conserved in the installation history DB 137 by the preservation history generation unit 127, to the future installation plan DB 138. Then, a “preservation plan generation screen” is displayed on the monitor of the input/output unit 11 and a process S18 of generating a preservation plan is executed using the future installation plan DB 138.

After the process S18 of generating the preservation plan, the job process in the management system 10 returns the process S12 of generating the process table and the job process sequentially continues. When the job process returns to the process S12 of generating the process table, the process table generation unit 122 first copies all of the maintenance codes COM and all pieces of the plant information and the like associated with the maintenance code COM, which are stored and conserved in the future installation plan DB 138 by the preservation plan generation unit 128, to the installation schedule DB 132. And further, the process table generation unit 122 copies all of the maintenance codes COM and all pieces of the plant information associated with the maintenance code COM, which are newly stored and conserved in the client BOM and

WBS DB 131 by the client apparatus book generation unit 121, to the installation schedule DB 132.

As described above, the databases DB individually corresponding to each processing unit of the job application unit 12 are provided in the management system 10.

5 Accordingly, for example, when maintenance work such as a periodic inspection is executed on the DB corresponding to the immediately previous job process, the processing unit corresponding to the job process to be executed at the present time can perform an own process using the DB individually corresponding to the own processing unit. Accordingly, it is possible to improve convenience of the management system 10.

10 [0025]

Next, a display example on the monitor at the time of retrieval and extraction of the pieces of plant information or the like with the same maintenance code COM will be described with reference to Figs. 5 to 8. When the installation daily report generation unit 126 executes the process S16 of generating the installation daily report, record
15 manhours (the work information of WBS level 2) is input in the “installation daily report generation screen.” However, the display example is an example, in which other plant information to be referred to at this time is retrieved and extracted with the same maintenance code COM and is displayed on the monitor. In the management system 10, for example, the worker can select any display form of Figs. 5 to 8 using even the
20 same plant information.

Here, as an example, “No. 1 Furnace Boiler Tube” is input as the apparatus information of BOM level 3 which is the lowermost layer of the hierarchical layers in which the apparatus information is necessarily input in all the plants among the hierarchical layers of the BOM, and “boiler tube cleaning” is input as the work
25 information of WBS level 1 which is the hierarchical layer of the WBS directly

associated with the apparatus information of the lowermost layer of the BOM. This example is an example, in which a product code corresponding to “No. 1 Furnace Boiler Tube” is “103AA01,” a work code corresponding to “boiler tube cleaning” is “0201,” and the maintenance code COM is “103AA010201” generated by using the product code
5 and the work code without change.

As described above, the digits such as the product code can be appropriately set in accordance with specifications or the like. Here, the digits greater than the digits of the product code described in Fig. 3 is set as the product code herein. This example is an example in which the product code is “103AA01” and a furnace number code “01”
10 (meaning No. 1 Furnace) is specially inserted in the product code.

In Figs. 5 to 7, as the relevant information, either presence or absence of a record is displayed by displaying “√” when there is a record, and by displaying “-” when there is no record.

Here, the example in which the installation daily report generation unit 126
15 executes the process S16 of generating the installation daily report has been described, but the worker can select a display form of the other processing units in the job application unit 12 similarly.

[0026]

Fig. 5 illustrates an example in which pieces and types of the plant information,
20 indicating that “boiler tube cleaning” of “No.1 Furnace Boiler Tube” is executed or scheduled to be executed, are retrieved or extracted with the maintenance code COM “103AA010201” from all the plant information stored and conserved in the storage unit 13, to be displayed on the monitor for comparison.

It can be known that BOM level 3 of the enumerated pieces of the plant
25 information is all “No.1 Furnace Boiler Tube” and WBS level 1 is “boiler tube cleaning.”

It can be known that there are two different pieces of the apparatus information, “furnace left wall pipe of No.1 Furnace Boiler Tube” and “furnace right wall pipe of No.1 Furnace Boiler Tube,” in BOM level 4, and there are three different pieces of the work information, “cleaning,” “thickness measurement part polishing,” and “thickness measurement” in WBS level 2. Further, in WBS level 3, it can be known that there are seven different pieces of the work information, “1-path cleaning,” “2-paths cleaning,” “cleaning ash discharge,” “measurement part marking,” “measurement part polishing,” “thickness measurement A,” and “thickness measurement B.”

In the fields of the record manhours and the record (YES/NO), there is a record of work in “furnace left wall pipe of No.1 Furnace Boiler Tube” and the manhours are also displayed. On the other hand, it can be known that since there is no record of work in “furnace right wall pipe of No.1 Furnace Boiler Tube,” the manhours are not displayed.

In the plant information or the like displayed as in Fig. 5, it is not easy to understand how many record manhours there are with only “cleaning” of WBS level 2 at a glance. Accordingly, a display example of Fig. 6 shows that the total number, of which the record manhours are added, is displayed using three different pieces of the work information, “cleaning,” “thickness measurement part polishing,” and “thickness measurement” of WBS level 2. It can be easily understood that the record manhours of “cleaning” is “4,” the record manhours of “thickness measurement part polishing” is “4,” and the record manhours of “thickness measurement” is “2.”

Further, when it is desired to know the total sum of the record manhours at the present time, a table can be displayed as in Fig. 7. Here, since “cleaning” (record manhours: 4), “thickness measurement part polishing” (record manhours: 4), and “thickness measurement (record manhours: 2)” of “furnace left wall pipe of No.1

Furnace Boiler Tube” are shown as the records, these numbers are added and a total sum “10” at the present time of the record manhours is displayed.

It is possible to simplify Fig. 7 more simply and display the total sum “10” at the present time of the record manhours of “boiler tube cleaning” in Fig. 7 as in Fig. 8.

5 As described above, the maintenance code COM corresponding to the product code corresponding to the apparatus information of a specific BOM level (the lowermost layer of the hierarchical layers in which the apparatus information is necessarily input in all the plants among the hierarchical layers of the BOM) and the work code corresponding to the work information of a specific WBS level (the hierarchical layer of the WBS directly associated with the apparatus information of the lowermost layer
10 among the hierarchical layers of the WBS) is associated with all the plant information managed by the management system 10. Therefore, when the worker executes retrieving in the management system 10 using the maintenance code COM, the worker can extract other plant information or the like to be compared for reference at the time of
15 input work. Further, the worker can appropriately select and compare the display forms of the other plant information or the like, and thus it is possible to reduce the working hours and the effort of the input work by the worker.

 Since the maintenance code COM is a code corresponding to the plant information of both the specific BOM level and the specific WBS level in this way, the
20 information to be extracted can be considerably narrowed down, as compared with the case in which a code corresponding to only the specific BOM level or the specific WBS level is used for retrieval. Further, the specific BOM level is the lowermost layer of the hierarchical layers in which the apparatus information is necessarily input in the plants among the hierarchical layers of the BOM and the specific WBS level is the hierarchical
25 layer of the WBS directly associated with the apparatus information of the lowermost

layer, among the hierarchical layers of the WBS. Therefore, when the worker inputs the plant information or the like, it is possible to retrieve and extract correctly all the other plant information or the like to be compared with high accuracy, despite erroneous input in another hierarchical layer.

5 [0027]

As described above in detail, the foregoing plant apparatus information management system 10 can reduce a load of inputting the plant information by a worker and can retrieve, extract, and compare desired plant information with high accuracy even when the plant information is erroneously input in a case in which many plants are

10 management targets.

[0028]

In addition, the constituent elements in the foregoing embodiment can be appropriately substituted with known constituent elements within the scope of the present invention without departing from the gist of the present invention. The technical scope of the present invention is not limited to the foregoing embodiment and various changes can be made within the scope of the present invention without departing from the gist of the present invention.

15

[Industrial Applicability]

[0029]

20 The foregoing plant apparatus information management system can reduce a load of inputting the plant information by a worker and can retrieve, extract, and compare the desired plant information with high accuracy even when the plant information is erroneously input in a case in which plants are management targets.

[Reference Signs List]

25 [0030]

	10 Plant apparatus information management system
	11 Input/output unit
	12 Job application unit
	120 Maintenance code generation unit
5	121 Client apparatus book generation unit
	122 Process table generation unit
	123 Estimate generation unit
	124 Installation specification form generation unit
	125 Installation report generation unit
10	126 Installation daily report generation unit
	127 Preservation history generation unit
	128 Preservation plan generation unit
	13 Storage unit
	131 Client BOM and WBS DB
15	132 Installation schedule DB
	133 Estimate DB
	134 Order cost DB
	135 Apparatus inspection measurement recording DB
	136 Installation record DB
20	137 Installation history DB
	138 Future installation plan DB

[CLAIMS]

[Claim 1]

A plant apparatus information management system which manages pieces of apparatus information of plants in conformity with BOM in which an apparatus code
5 corresponding to each piece of the apparatus information input in correspondence with a plurality of hierarchical layers of the BOM is set, and manages pieces of work information regarding works to be executed on the plants in conformity with WBS, in which a work code corresponding to each of the pieces of work information input in correspondence with a plurality of hierarchical layers of the WBS is set, comprising:

10 a maintenance code generation unit configured to generate a maintenance code only corresponding to an apparatus code corresponding to apparatus information of the lowermost layer of hierarchical layers in which the pieces of the apparatus information are necessarily input for all the plants among hierarchical layers of the BOM and a work code corresponding to work information of a hierarchical layer of the WBS directly
15 associated with the apparatus information of the lowermost layer among hierarchical layers of the WBS; and

a job application configured to execute a process related to management work of a plant of the plants using the maintenance code, and the apparatus information and the work information corresponding to the maintenance code,

20 wherein the job application extracts and displays the pieces of the apparatus information and the work information of the plants corresponding to the same maintenance code.

[Claim 2]

The plant apparatus information management system according to claim 1,
25 further comprising:

a database configured to store the maintenance code, and the apparatus
information and the work information corresponding to the maintenance code,
wherein the database includes a first database and a second database,
wherein the job application includes a first job application executing a process
5 related to a first work and obtaining first work information and a second job application
executing a second work different from the first work and obtaining second work
information,

wherein the first job application adds the first work information to the apparatus
information and the work information and stores the apparatus information and the work
10 information in the first database,

wherein the second job application copies the maintenance code, the apparatus
information, the work information, and the first work information stored in the first
database to the second database, executes a process related to the second work, and stores
the second work information in the second database in association with the maintenance
15 code.

[Claim 3]

The plant apparatus information management system according to claim 1 or 2,
wherein the apparatus code includes a furnace number code.

[Claim 4]

20 The plant apparatus information management system according to claim 3,
wherein the lowermost layer is BOM level 3.