

DESCRIPTION

PIPE DIAGNOSIS HISTORY DISPLAY APPARATUS, PIPE DIAGNOSIS HISTORY DISPLAY METHOD, AND PIPE DIAGNOSIS HISTORY DISPLAY PROGRAM

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Technical Field

[0001] The present invention relates to a pipe diagnosis history display apparatus, a pipe diagnosis history display method, and a pipe diagnosis history display program that can be used to display a diagnosis history or the like regarding pipes laid in a plant.

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Background Art

[0002] Pipes for circulating various kinds of fluids that are to be used in operation of plants such as petrochemical plants and thermal power plants are laid on the premises of the plants. If a pipe is damaged, the fluid cannot flow, and not only the operation of a plant is hindered, but also the leakage of the fluid may cause damage to employees and the environment around the plant. In order to prevent such a situation, regular or irregular diagnosis is performed on the pipes laid in the plant.

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[0003] In general, various kinds of fluids are used in operation of a plant, and such fluids need to be used in various places in the plant. Therefore, a large number of pipes are laid in the plant along a considerable extension distance. In this way, the number of pipes and the extension distance are large, and accordingly the diagnosis history of the pipes can be a considerable amount of information. Therefore, it can be said that how to efficiently manage such diagnosis history information in an organized state is an important issue in plant management.

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[0004] For example, in the information management system disclosed in JP 2008-234483A (Patent Document 1), a large amount of plant drawing data is structured and managed, and pieces of related drawing data are linked to each other. Therefore, it is possible to retrieve necessary relevant information from a database when necessary.

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Prior Art Documents

Patent Documents

[0005] Patent Document 1: JP2008-234483A

Summary of the Invention

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Problems to be Solved by the Invention

[0006] However, with a technique such as that in Patent Document 1, while it is possible

to associate a plurality of pieces of drawing data with each other, it is difficult to grasp the relationship between the pipes laid in the horizontal and vertical directions so as to spread in three dimensions, all at once. In addition, it is difficult to simultaneously grasp information regarding a defect discovered in an area shown in a certain drawing and information regarding a defect discovered in an area that is close to the aforementioned area in the horizontal direction or the vertical direction.

[0007] Therefore, there is a demand for realizing a system that makes it possible to browse the distribution, in the horizontal direction and the vertical direction, of defects discovered in the pipes laid in a plant.

Means for Solving Problems

[0008] A pipe diagnosis history display apparatus according to the present invention is a pipe diagnosis history display apparatus that displays a diagnosis history of pipes that are laid in a plant, the plant having a plurality of pipes laid in a horizontal direction and a vertical direction, positions of the pipes in the horizontal direction being specified based on position indicators that are arranged in a lengthwise direction of the pipes, positions of the pipes in the vertical direction being specified based on tiers in which the pipes are laid, the pipe diagnosis history display apparatus comprising: a diagnosis information storage unit that stores, for each of defects that have been discovered by an inspector based on a result of a diagnosis performed by the inspector on the pipes, diagnosis information that includes horizontal direction information that specifies a position in the horizontal direction of a point at which the defect has been discovered, and vertical direction information that specifies a position in the vertical direction of the point; a display unit that displays a list that contains the horizontal direction information and the vertical direction information as two axes, based on the diagnosis information; a control unit that generates the list; and an input unit that receives an input operation from a user, wherein the horizontal direction information is specified based on the position indicators, the vertical direction information is specified based on the tiers, and a field specified by a combination of the horizontal direction information and the vertical direction information in the list displays the number of defects that have been discovered at a point specified by the combination.

[0009] A pipe diagnosis history display method according to the present invention is a pipe diagnosis history display method for displaying a diagnosis history of pipes that are laid in a plant, the plant having a plurality of pipes laid in a horizontal direction and a vertical direction, positions of the pipes in the horizontal direction being specified based on position indicators that are arranged in a lengthwise direction of the pipes, positions of the pipes in the vertical direction being specified based on tiers in which the pipes are laid, the

pipe diagnosis history display method comprising: a diagnosis information storage step of storing, for each of defects that have been discovered by an inspector based on a result of a diagnosis performed by the inspector on the pipes, diagnosis information that includes horizontal direction information that specifies a position in the horizontal direction of a point at which the defect has been discovered, and vertical direction information that specifies a position in the vertical direction of the point; a display step of causing a display device to display a list that contains the horizontal direction information and the vertical direction information as two axes, based on the diagnosis information; a control step of generating the list; and an input step of receiving an input operation from a user, wherein the horizontal direction information is specified based on the position indicators, the vertical direction information is specified based on the tiers, and a field specified by a combination of the horizontal direction information and the vertical direction information in the list displays the number of defects that have been discovered at a point specified by the combination.

[0010] The pipe diagnosis history display program according to the present invention is a pipe diagnosis history display program for displaying a diagnosis history of pipes that are laid in a plant, the plant having a plurality of pipes laid in a horizontal direction and a vertical direction, positions of the pipes in the horizontal direction being specified based on position indicators that are arranged in a lengthwise direction of the pipes, positions of the pipes in the vertical direction being specified based on tiers in which the pipes are laid, the pipe diagnosis history display program causing a computer to execute: a diagnosis information storage function of storing, for each of defects that have been discovered by an inspector based on a result of a diagnosis performed by the inspector on the pipes, diagnosis information that includes horizontal direction information that specifies a position in the horizontal direction of a point at which the defect has been discovered, and vertical direction information that specifies a position in the vertical direction of the point; a display function of causing a display device to display a list that contains the horizontal direction information and the vertical direction information as two axes, based on the diagnosis information; a control function of generating the list; and an input receiving function of receiving an input operation from a user, wherein the horizontal direction information is specified based on the position indicators, the vertical direction information is specified based on the tiers, and a field specified by a combination of the horizontal direction information and the vertical direction information in the list displays the number of defects that have been discovered at a point specified by the combination.

[0011] With these configurations, the number of defects is displayed for each of the areas divided in a horizontal direction and a vertical direction using a predetermined method, on

a list that three-dimensionally shows the positions of the pipes laid in the plant. Therefore, it is easy to grasp the distribution of the defects in the horizontal direction and the vertical direction.

[0012] The following describes preferred embodiments of the present invention.

5 However, the scope of the present invention is not limited by the preferred embodiments described below.

[0013] In one aspect of the pipe diagnosis history display apparatus according to the present invention, it is preferable that the diagnosis information further includes defect information that specifies the content of the defect corresponding to the diagnosis
10 information, and the control unit extracts diagnosis information that includes at least one type of defect information selected by a user through an input operation, to generate the list.

[0014] With this configuration, it is easy to grasp the distribution in the horizontal direction and the vertical direction for each content of the defects, and therefore it is easy to estimate the cause of a defect and formulate a treatment plan.

15 [0015] In one aspect of the pipe diagnosis history display apparatus according to the present invention, it is preferable that pipe diagnosis history display apparatus further includes a pipe storage unit that stores a layout diagram for the pipes laid in the plant, wherein, upon a field specified by a combination of the horizontal direction information and the vertical direction information in the list being selected by the user through an input
20 operation, the layout diagram corresponding to the point specified by the combination, and defect point icons that are respectively associated with the defects discovered in an area corresponding to the layout diagram, are displayed by the display unit, instead of the list, or displayed together therewith side by side, or displayed so as to be superimposed thereon, and each of the defect point icons is displayed at a position on the layout diagram
25 corresponding to a point specified by the combination of the horizontal direction information and the vertical direction information included in the diagnosis information associated with the defect point icon.

[0016] With this configuration, a layout diagram that shows the positions of the discovered defects are displayed for the area corresponding to the field selected by the user.

30 Therefore, it is easy to grasp the distribution of the defects for the area in detail. That is to say, it is easy to grasp defects in a wide area, using the list, and grasp defects in a local area, using the layout diagram, simultaneously.

[0017] In one aspect of the pipe diagnosis history display apparatus according to the present invention, it is preferable that each field in the list is displayed in a mode in which
35 the number of defects displayed in the field can specify a classification corresponding thereto from among predetermined classifications.

[0018] With this configuration, it is easy to grasp whether the number of defects discovered in each of the areas divided in the horizontal direction and the vertical direction is large or small.

[0019] Further features and advantages of the present invention will be further clarified by the following description of exemplary and non-limiting embodiments with reference to the drawings.

Brief Description of the Drawings

[0020] FIG. 1 is a configuration diagram for a pipe diagnosis history display apparatus according to an embodiment of the present invention.

FIG. 2 is a diagram showing how pipes are laid according to an embodiment of the present invention.

FIG. 3 is a diagram showing diagnosis information according to an embodiment of the present invention.

FIG. 4 is a diagram showing a pipe diagnosis history display screen according to an embodiment of the present invention.

FIG. 5 is an enlarged view of a detail window according to an embodiment of the present invention.

FIG. 6 is a defect list screen according to an embodiment of the present invention.

FIG. 7 is a diagram showing a diagnosis information detail display screen according to another embodiment of the present invention.

Description of Embodiments

[0021] Embodiments of a pipe diagnosis history display apparatus, a pipe diagnosis history display method, and a pipe diagnosis history display program according to the present invention will be described with reference to the drawings. The following describes an example in which the history of diagnoses performed on a pipe group 2 (pipes 21) laid on the premises of a plant P such as a petrochemical plant or a thermal power plant is displayed by a pipe diagnosis history display apparatus 1 according to the present embodiment, using a pipe diagnosis history display method according to the present embodiment. Note that a pipe diagnosis history display program according to the present embodiment is installed in the pipe diagnosis history display apparatus 1.

[0022] When the entire petrochemical plant or thermal power plant is regarded as a one important asset, the pipe diagnosis history display apparatus, the pipe diagnosis history display method, and the pipe diagnosis history display program according to the present embodiment are each applicable as an asset management method.

Apparatus Configuration and System Configuration

[0023] First, the pipe diagnosis history display apparatus 1 according to the present embodiment and the pipe group 2 that is a diagnosis subject will be described. As shown in FIG. 1, the pipe diagnosis history display apparatus 1 according to the present embodiment includes a server apparatus 11 and a portable terminal 12 that are configured to be able to communicate with each other. An inspector inspects various parts of the pipe group 2 that includes a large number of pipes 21 laid on the premises of the plant P, and inputs the discovered defect to the portable terminal 12. Defect information input to the portable terminal 12 is transmitted to the server apparatus 11 and is stored therein.

[0024] As shown in FIG. 2, the pipes 21 are laid in the state of being supported by a plurality of racks 22 provided in the lengthwise direction of the pipes 21 so as to be separate from each other. The racks 22 each have a width in the horizontal direction that is larger than the diameter of the pipes 21, and can receive a plurality of pipes 21 arranged in the horizontal direction. The racks 22 have a plurality of tiers arranged in the vertical direction, and the plurality of pipes 21 can be received in each of the plurality of tiers. That is to say, in order to effectively use the premises, the pipes 21 are laid in the horizontal direction and the vertical direction in a centralized manner.

[0025] Specific parts of the pipes 21 in the plant P are specified by pipe names 21a (examples of the position indicators) respectively assigned to the pipes 21, rack numbers 22a (examples of the position indicators) respectively assigned to the racks 22, and tier numbers 22b respectively assigned to the tiers of each of the racks 22. For example, the part assigned a reference sign Ex1 in FIG. 2 is specified by the pieces of information indicating “pipe number 51”, “immediately above rack 34”, and “tier 2F”. Similarly, the part assigned a reference sign Ex2 in FIG. 2 is specified by the pieces of information indicating “pipe number 61”, “between rack 34 and rack 35”, and “tier 1F”.

[0026] As shown in FIG. 1, the pipe diagnosis history display apparatus 1 includes the server apparatus 11 and the portable terminal 12. The server apparatus 11 includes a pipe storage unit 11a, a diagnosis information storage unit 11b, and a server communication unit 11c. The portable terminal 12 includes a control unit 12a, a touch panel 12b (an example of the display unit and the input unit), and a terminal communication unit 12c. The server apparatus 11 and the portable terminal 12 are configured to be able to communicate with each other via the server communication unit 11c and the terminal communication unit 12c. Known methods such as wired LAN communication, wireless LAN communication, communication through a mobile phone network, and communication through a satellite can be used for such communication. However, it is preferable to use a method with which

wireless communication is available because such a method improves convenience.

[0027] The pipe storage unit 11a stores a layout diagram 31 for pipes 21, for each part of the pipe group 2. The portable terminal 12 can receive the layout diagram 31 from the server apparatus 11 and display it on the touch panel 12b.

5 [0028] The diagnosis information storage unit 11b stores diagnosis information 32 for each of the defects that have been discovered by the inspector, based on the result of the diagnosis performed by a diagnostician on the pipe group 2. The diagnosis information 32 includes a point information 321 that specifies the location of a defect discovered by the inspector in the pipes 21, defect information 322 that specifies the details of the defect, and
10 treatment information 323 that specifies the state of the treatment given to the defect.

[0029] The point information 321 is specified using, in addition to an area name in the plant P of the point at which the defect has been discovered, a pipe name 21a (an example of the horizontal direction information), a rack number 22a (an example of the horizontal direction information), and a tier number 22b (an example of the vertical direction
15 information). For example, the diagnosis information 32 according to the example shown in FIG. 3 includes point information 321 that is specified by pieces of information indicating “area 13-05”, “pipe number 51”, “rack 34”, and “tier 3F”, and indicates that the defect has been discovered at the point.

[0030] The defect information 322 specifies the specific content of the defect. For
20 example, the diagnosis information 32 according to the example shown in FIG. 3 includes defect information 322 indicating that the specific content of the defect is “corrosion A”. This example employs a configuration with which the fact that the type of the defect is corrosion, and the fact that the corrosion is classified into “corrosion A”, which has the highest degree of three degrees of corrosion, namely “corrosion A”, “corrosion B”, and
25 “corrosion C” are stored as the defect information 322. The defect information 322 may also include, in addition to the specific content of the defect, the date and time when the defect was discovered (discovery date), the name of the inspector who discovered the defect (discoverer), a photo of the defect part, the size of the defect part, the fluid flowing through the pipe where the defect was discovered, an observation memo regarding the defect part,
30 and so on.

[0031] The treatment information 323 includes pieces of information corresponding to all the treatments that are to be carried out from when the defect was discovered to when the final treatment, and classified into treatment stages. First, a piece of treatment information 323 corresponding to a treatment carried out before the treatment most recently carried out
35 of the treatments that have been completed are classified as completed treatment information 323a. Note that, in this specification, the treatment most recently carried out is

referred to as the most recent treatment. Second, a piece of treatment information 323 corresponding to the most recent treatment is classified as most recent treatment information 323b. Third, a piece of treatment information 323 corresponding to the treatment to be carried out next in the current situation is classified as awaited treatment information 323c. Note that, in this specification, the treatment to be carried out next in the current situation is referred to as the awaited treatment. Fourth, a piece of treatment information 323 corresponding to a treatment that is to be carried out after the awaited treatment is classified as scheduled treatment information 323d. For example, in the case of the diagnosis information 32 according to the example shown in FIG. 3, the pieces of treatment information 323 are classified into the first stage to the seventh stage. The treatments in the first stage and the second stage carried out in the past are classified as completed treatment information 323a, the treatment in the third stage most recently carried out is classified as most recent treatment information 323b, the treatment in the fourth stage that is to be carried out next is classified as awaited treatment information 323c, and treatments in the fifth stage to the seventh stage that are to be carried out in the future are classified as scheduled treatment information 323d.

[0032] The control unit 12a controls the content to be displayed on the touch panel 12b based on the layout diagram 31 received from the server apparatus 11 and the diagnosis information 32. The touch panel 12b is configured to be able to display a display screen that is based on at least either the layout diagram 31 or the diagnosis information 32, and receive input operation from a user. The specific content to be displayed on the touch panel 12b will be described later.

[0033] The inspector diagnoses the presence or absence of a defect in each of the pipes 21 belonging to the pipe group 2 through visual inspection or another method. If a defect is discovered, the inspector uses the touch panel 12b to input point information 321 regarding the location in which the defect is discovered, and defect information 322 regarding the defect. The point information 321 and defect information 322 thus input are transmitted to the server apparatus 11, and are stored in the diagnosis information storage unit 11b.

30 Pipe Diagnosis History Display Screen

[0034] Next, a pipe diagnosis history display screen 40 of the display screens to be displayed on the touch panel 12b will be described. As shown in FIG. 4, the pipe diagnosis history display screen 40 includes a layout diagram display portion 41 that displays the layout diagram 31, an area information display portion 42 that displays information that specifies the position of the layout diagram 31 in the plant P, displayed on the layout diagram display portion 41, and a detail window 43 that shows the defect information 322

and the treatment information 323.

[0035] The layout diagram display portion 41 displays, for each of the defects discovered in the area shown in the layout diagram 31, a defect point icon 44 that is associated with the diagnosis information 32 regarding the defect, together with the layout diagram 31. The position where the defect point icon 44 is to be displayed is determined based on the point information 321 included in the diagnosis information 32 associated with the defect point icon 44. That is to say, it is possible to grasp the position of the defect in the actual pipes 21 by seeing the position of the displayed defect point icon 44 on the layout diagram 31.

[0036] The defect point icon 44 is displayed in different colors depending on the content of the defect specified by the defect information 322 included in the diagnosis information 32 associated with the defect point icon 44. For example, the defect point icon 44 associated with the diagnosis information 32 that include the defect information 322 indicating "corrosion A" is displayed in the color red. Similarly, "corrosion B" is displayed in the color orange, and "corrosion C" is displayed in the color yellow. That is to say, the defect point icon 44 is displayed in a mode in which the defect point icon 44 can specify the content of the defect specified by the defect information 322 included in the diagnosis information 32 associated with the defect point icon 44. With such a configuration, it is possible to easily specify the point at which a defect with a high degree of importance and urgency was discovered.

[0037] Furthermore, the defect point icon 44 is displayed in a mode in which the defect point icon 44 includes a number that indicates the stage of the most recent treatment specified by the most recent treatment information 323b included in the diagnosis information 32 associated with the defect point icon 44. In the example shown in FIG. 4, a defect point icon 44a indicating that the most recent treatment is a treatment in the second stage, and a defect point icon 44b indicating that the most recent treatment is a treatment in the fourth stage, are displayed. That is to say, the defect point icon 44 is displayed in a mode in which the defect point icon 44 can specify the stage of the most recent treatment specified by the most recent treatment information included in the diagnosis information 32 associated with the defect point icon 44. With such a configuration, it is possible to grasp the progress of the treatment for each defect at a glance.

[0038] The area information display portion 42 includes a layout diagram number display portion 42a, a plant map display portion 42b, and a rack diagram display portion 42c.

[0039] The layout diagram number display portion 42a displays pieces of information that are to be used by the administrator of the plant P to specify the position in the layout diagram 31 in the plant P displayed in the layout diagram display portion 41, such as a diagram number, a page number, and a rack number. In addition, if information specifying

a layout diagram 31 that is different from the layout diagram 31 displayed in the layout diagram display portion 41 is input to the display fields that display these pieces of information, the layout diagram 31 displayed in the layout diagram display portion 41 can be changed to the layout diagram 31 specified by the input information.

5 [0040] The plant map display portion 42b displays a smaller scale map compared to the layout map 31 displayed in the layout map display portion 41. Using such a map, the user can visually understand the position of the area indicated by the layout diagram 31 in the plant P.

10 [0041] The rack diagram display portion 42c displays a schematic view, the rack number 22a, and the tier number 22b of the rack 22 included in the layout diagram 31 displayed in the layout diagram display portion 41. The user can easily grasp which tier of the rack 22 the area indicated by the layout diagram 31 is located in, from the schematic view, the rack number 22a, and the layer number 22b.

15 [0042] The detail window 43 associated with the defect point icon 44 is displayed to show the diagnosis information 32 corresponding to the defect point icon 44 displayed in the layout diagram display portion 41. As shown in FIG. 5, the detail window 43 is divided in three portions in the horizontal direction, and a central portion 43b thereof shows the most recent treatment information 323b. A left portion 43a shows the completed treatment information 323a corresponding to the treatment carried out before the most recent treatment, and a right portion 43c shows the awaited treatment information 323c
20 corresponding to the awaited treatment. That is to say, the detail window 43 shows the pieces of treatment information 323 corresponding to the treatments in the three consecutive stages in which the awaited treatment is located in the middle. FIG. 5 shows an example in which, when the defect point icon 44a for which the awaited treatment is the treatment in the second stage is selected, the detail window 43 shows, from left to right, the
25 completed treatment information 323a corresponding to the treatment in the first stage, the most recent treatment information 323b corresponding to the treatment in the second stage, and the awaited treatment information 323c corresponding to the treatment in the third stage. Also, the most recent treatment information 323b is highlighted in a thick frame, and
30 therefore it is easy for the user to grasp the progress of the treatments. Note that the detail window 43 may be configured such that the detail window 43 associated with the defect point icon 44 selected by the user through a touch operation is displayed.

[0043] A piece of treatment information 323 to be shown in the detail window 43 can be selected through an input operation by the user. In the example shown in FIG. 5, when a
35 scroll bar 43d displayed at the bottom of the detail window 43 is slid to the right, the piece of treatment information 323 corresponding to the treatment in the stage higher than the

shown piece of treatment information 323 is displayed one after another. Conversely, when the scroll bar 43d is slid to the left, the piece of treatment information 323 corresponding to the treatment in the stage lower than the shown piece of treatment information 323 is displayed one after another. Here, no matter how the scroll bar 43d is operated, the pieces of treatment information 323 to be shown in the detail window 43 are the pieces of treatment information 323 respectively corresponding to the treatments in the three consecutive stages. This configuration enables the user to check the treatments to be carried out from the discovery of the defect associated with the selected defect point icon 44 to the completion of the treatments, together with the order in which the treatments should be carried out.

[0044] The user can input various kinds of information in response to the pieces of treatment information 323 shown in the detail window 43. For example, in a state where the awaited treatment information 323c is shown in the central portion 43b, if the user selects an item included in the awaited treatment information 323c by touching it, the user can input information related to the item. As a result, for example, the user can input the result of the awaited treatment that has been carried out, to update the diagnosis information 32 stored in the diagnosis information storage unit 11b.

Defect List Screen

[0045] Next, a defect list screen 50 of the display screens to be displayed on the touch panel 12b will be described. The defect list screen 50 includes a defect list 51 (an example of the list) and an extraction condition selection portion 55.

[0046] As shown in FIG. 6, the defect list 51 is formed using two axes, namely a rack number axis 52 and a tier axis 53, and a defect number display fields 54 classified by the items indicated by these two axes. The rack numbers 22a are written in the fields of the rack number axis 52 in order of the rack numbers 22a, one number in every two fields, and a vertical bar is written in each of the fields in which a rack number 22a is not written. The tier numbers 22b are written in the fields of the tier axis 53 in order of the tier numbers 22b.

[0047] Each of the defect number display fields 54 shows the number of the existing defects discovered in the area specified by the rack number 22a written in the field of the rack number axis 52 located at the end on the left side of the defect number display field 54 and the tier numbers 22b written in the field of the tier axis 53 located at the end on the upper side of the defect number display field 54. For example, in the example shown in FIG. 6, a defect number display field 54a shows that two defects were discovered at a point that is in “tier 2F” and is “immediately above rack 36”. Similarly, a defect number display fields 54b shows that six defects were discovered at a point that is “between rack 41 and

rack 42” and is in “tier 3F”. With such a configuration, the distribution of defects can be grasped three-dimensionally. Therefore, it is easy to formulate an efficient repair plan, such as a plan to repair adjacent defects all at once. In addition, when defects are concentrated in a plurality of defect number display fields 54 that are adjacent to each other, it is possible
5 to recognize that a cause of the defects is likely to be present in the vicinity of a point specified by these defect number display fields 54, the cause being specific to the point. Examples of such a cause of defects include the fact that the point is likely to be affected by wind and rain, and the fact that the point is likely to be affected by equipment installed in the vicinity of the point. As described above, the defect list 51 provides the user with
10 information that can be used to estimate the cause of a defect, and therefore the user can easily take effective measures.

[0048] In addition, each defect number display field 54 is colored with a different color according to the value of the number of defects displayed in the defect number display field 54. For example, in the example shown in FIG. 6, fields in which the number of defects is
15 zero are colored white, fields in which the number of defects is one or two are colored blue, fields in which the number of defects is three to six are colored yellow, and fields in which the number of defects is seven or greater are colored red. That is to say, each of the defect number display fields 54 is displayed in a mode in which the number of defects displayed in the defect number display field 54 can specify the classification corresponding thereto
20 from among predetermined classifications.

[0049] Upon the user specifying an extraction condition by operating the extraction condition selection portion 55 (an example of the input operation), the control unit 12a generates a defect list 51 that only gathers defects that match the specified condition, and displays it on the touch panel 12b. Examples of such extraction conditions include an area
25 classification in the plant P, the layout state (a pipe diameter, a heat retention state, etc.) of a pipe 21, a piece of defect information 322, a piece of treatment information 323, and so on. With such a configuration, for example, it is easy to grasp the distribution of defects with a high degree of urgency, and it is easy to prioritize treatments.

[0050] Note that the content to be displayed on the pipe diagnosis history display screen
30 40 and the contents to be displayed on the defect list screen 50 can be interchanged with each other. The present embodiment is configured such that, upon the user performing an input operation to select a specific defect number display field 54 on the defect list screen 50, the pipe diagnosis history display screen 40 for the area corresponding to the selected defect number display fields 54 is displayed, replacing the defect list screen 50. The present
35 embodiment is also configured such that a transition can be made from the pipe diagnosis history display screen 40 to the defect list screen 50 that includes the area shown in the

layout diagram 31 displayed on the pipe diagnosis history display screen 40, via a menu screen (not shown). That is to say, the present embodiment is configured to be able to switch between the pipe diagnosis history display screen 40, which is suitable for grasping the details of the defects discovered in a specific area, and the defect list screen 50, which is
5 suitable for grasping the distribution of the defects in a larger area. Therefore, it is easy to comprehensively grasp the defects discovered in the plant P in detail.

Other Embodiments

[0051] The following describes other embodiments of a pipe diagnosis history display apparatus, a pipe diagnosis history display method, and a pipe diagnosis history display
10 program according to the present invention with reference to the drawings. Note that the configurations disclosed in the following embodiments can be applied in combination with the configurations disclosed in other embodiments as long as no contradiction arises.

[0052] The above embodiment describes, as an example, a configuration with which, in
15 the initial state of the detail window 43, the completed treatment information 323a is shown in the left portion 43a, the most recent treatment information 323b is shown on the central portion 43b, and the awaited treatment information 323c is shown in the right portion 43c. However, the present invention is not limited to such a configuration, and it is possible to employ a configuration with which the defect information 322 included in the diagnosis
20 information 32 associated with the defect point icon 44 is displayed in the left portion 43a instead of the completed treatment information 323a or together with the completed treatment information 323a side by side. With such a configuration, it is possible to list information regarding the discovered defects and the treatments to be carried out for the defects, and therefore it is easy to grasp the defects and the state of the treatment.

[0053] Also, in this case, it is possible to employ a configuration with which, even if the
25 scroll bar 43d is operated to change the treatment information 323 that is shown, the left portion 43a invariably shows the defect information 322. With such a configuration, it is possible to list information regarding the discovered defects, the treatments that have been carried out and the treatments to be carried out for the defects, and therefore it is easy to
30 grasp the defects and the state of treatment.

[0054] The above embodiment describes, as an example, a configuration with which the
most recent treatment information 323b is highlighted. However, the present invention is not limited to such a configuration. For example, it is possible to employ a configuration with which any piece of defect information 322 or treatment information 323 selected by
35 the user performing an input operation.

[0055] The above embodiments including the other embodiments describe, as an example,

a configuration with which the detail window 43 is divided into three portions in the horizontal direction. However, the present invention is not limited to such a configuration, and the detail window 43 may be divided into two or four or more portions, or may not be divided. Also, the dividing direction is not limited to the horizontal direction, and may be the vertical direction. Furthermore, the pieces of information to be displayed in the left portion 43a, the central portion 43b, and the right portion 43c are not limited to those described in the above embodiments, and may be any information.

[0056] The above embodiments including the other embodiments describe, as an example, a configuration with which the diagnosis information 32 is displayed on the pipe diagnosis history display screen 40 together with the layout diagram 31. However, as shown in FIG. 7, it is possible to employ a configuration with which a diagnosis information detail display screen 60 for only showing the diagnosis information 32 can be displayed. The diagnosis information detail display screen 60 shows pieces of treatment information 323 in a larger number of classifications compared to the detail window 43. Therefore, it is easy to grasp the progress of the treatments. The diagnosis information detail display screen 60 may be displayed on the touch panel 12b instead of the pipe diagnosis history display screen 40, or displayed together therewith side by side, or displayed so as to be superimposed thereon.

[0057] In addition to the above configurations, an account may be assigned to each of a plurality of users, and information that can be displayed and the display mode may be restricted for each account. With such a configuration, for example, information is displayed in the manner that is suitable for work of each of the administrator and the inspector, and therefore efficiency of their work can be improved for each. In addition, by restricting their authority for each, it is possible to prevent them from inputting incorrect information.

[0058] The above embodiment describes, as an example, a configuration with which pieces of treatment information 323 are divided into four classifications, namely, the completed treatment information 323a, the most recent treatment information 323b, the awaited treatment information 323c, and the scheduled treatment information 323d. However, the present invention is not limited to such a configuration, and treatment information according to the present invention may be or may not be classified, and may be classified into any number of classifications when classified.

[0059] The above embodiment describes, as an example, a configuration with which, upon the user performing an input operation to select a specific defect number display field 54 on the defect list screen 50, the pipe diagnosis history display screen 40 is displayed, replacing the defect list screen 50. However, the present invention is not limited to such a configuration, and the pipe diagnosis history display screen 40 and the defect list screen 50

may be displayed side by side, or displayed so as to be superimposed on each other.

[0060] The above embodiment describes, as an example, a configuration with which the pipe diagnosis history display apparatus 1 includes the server apparatus 11 and the portable terminal 12. However, the present invention is not limited to such a configuration, and it is possible to employ a configuration with which one terminal includes all of the pipe storage unit, the diagnosis information storage unit, the display unit, the control unit, and the input unit. Also, the number of server apparatuses 11 and the number of portable terminals 12 are not necessarily the same. For example, it is possible to employ a configuration in which a plurality of portable terminals 12 can communicate with one server apparatus 11.

[0061] The above embodiment describes, as an example, a configuration with which the portable terminal 12 includes the touch panel 12b that functions as a display unit and an input unit. However, the present invention is not limited to such a configuration, and it is possible to employ a configuration with which the display unit and the input unit are provided as separate devices.

[0062] The above embodiment describes, as an example, a configuration with which the positions of the pipes 21 and defects in the plant P are specified using the pipe name 21a, the rack number 22a, and the tier number 22b. However, the present invention is not limited to such a configuration, and the positions of the pipes and defects may be specified by coordinate information that is provided by a global navigation satellite system represented by the GPS, for example. In this case, the layout diagram may be specified by the coordinate information, and the point information may include the coordinate information.

[0063] The above embodiments describe, as an example, a configuration with which the defect information 322 is information regarding the point actually specified by the inspector as a point having a defect. However, the present invention is not limited to such a configuration, and the defect information according to the present invention may include information regarding points that are suspected to have defects, for example. For example, after defect information is stored in the diagnostic information storage unit for each of the points suspected to have defects through a simple diagnosis, a treatment for determining whether or not the defects are actually present at the points through a detailed diagnosis may be included in the treatments to be carried out for the defect.

[0064] The above embodiment describes the defect information 322 and the treatment information 323 as clearly separated pieces of information. However, it is possible to employ a configuration with which the discovery of a defect is regarded as one treatment and the defect information is regarded as treatment information for the first stage.

[0065] The above embodiment describes, as an example, a configuration with which the defect point icon 44 is displayed in different colors depending on the content of the defect

specified by the defect information 322 included in the diagnosis information 32 associated with the defect point icon 44. However, the present invention is not limited to such a configuration, and it is possible to employ a configuration with which the defect information included in the diagnosis information associated with each defect point icon
5 can be specified by the shape or size of the defect point icon, a character or sign assigned to the defect point icon, the movement of the defect point icon, and so on. Also, each defect point icon may be in a mode in which the defect point icon cannot specify the defect information included in the diagnosis information associated with the defect point icon.

[0066] The above embodiment describes, as an example, a configuration with which the
10 defect point icon 44 is displayed in a mode in which the defect point icon 44 includes a number that indicates the stage of the awaited treatment specified by the most recent treatment information 323b included in the diagnosis information 32 associated with the defect point icon 44. However, the present invention is not limited to such a configuration, and it is possible to employ a configuration with which the awaited treatment information
15 included in the diagnosis information associated with each defect point icon can be specified by the color, shape, or size of the defect point icon, a character or sign assigned to the defect point icon, the movement of the defect point icon, and so on. Also, each defect point icon may be in a mode in which the defect point icon cannot specify the most recent treatment information included in the diagnosis information associated with the defect point
20 icon.

[0067] The above embodiment describes, as an example, a configuration with which each defect number display field 54 is colored with a different color according to the value of the number of defects displayed in the defect number display field 54. However, the present invention is not limited to such a configuration, and it is possible to employ a configuration
25 with which the classification of the number of defects displayed in each field of the list can be specified by the character size, typeface, character modification, a character or symbol noted in the field, and so on. In addition, each field of the list maybe in a mode in which the field cannot specify the classification of the number of defects displayed in the field.

[0068] The above embodiment describes, as an example, a configuration with which the
30 position in the horizontal direction at which a defect was discovered is specified in the defect list 51 based on the rack number 22a. However, the present invention is not limited to such a configuration, and the horizontal direction information according to the present invention may be specified based on the area classification in the plant P, coordinate information, or the like.

[0069] It should be understood that, with respect to other configurations, the
35 embodiments disclosed herein are exemplary in all respects and the scope of the invention

is not limited thereto. A person skilled in the art will be able to easily understand that modifications can be made as appropriate without departing from the spirit of the present invention. Therefore, other embodiments modified without departing from the spirit of the present invention are naturally included in the scope of the present invention.

5

Industrial Applicability

[0070] The present invention can be used to diagnose pipes laid on the premises of, for example, a petrochemical plant or a thermal power plant.

10 Description of Reference Signs

	[0071]	P	Plant
		1	Pipe Diagnosis History Display Apparatus
		11	Server Apparatus
		11a	Pipe storage Unit
15		11b	Diagnosis Information Storage Unit
		11c	Server Communication Unit
		12	Portable Terminal
		12a	Control Unit
		12b	Touch Panel
20		12c	Terminal Communication Unit
		2	Pipe Group
		21	Pipe
		21a	Pipe Name
		22	Rack
25		22a	Rack Number
		22b	Tier Number
		31	Layout Diagram
		32	Diagnosis Information
		321	Point Information
30		322	Defect Information
		323	Treatment Information
		323a	Completed Treatment Information
		323b	Most Recent Treatment Information
		323c	Awaited Treatment Information
35		323d	Scheduled Treatment Information
		40	Pipe Diagnosis History Display Screen

	41	Layout Diagram Display Portion
	42	Area Information Display Portion
	42a	Layout Diagram Number Display Portion
	42b	Plant Map Display Portion
5	42c	Rack Diagram Display Portion
	43	Detail Window
	43a	Left Portion of Detail Window
	43b	Central Portion of Detail Window
	43c	Right Portion of Detail Window
10	43d	Scroll Bar
	44	Defect Point Icon
	50	Defect List Screen
	51	Defect List
	52	Rack Number Axis
15	53	Tier Axis
	54	Defect Number Display Field
	55	Extraction Condition Selection Portion
	60	Diagnosis Information Detail Display Screen

CLAIMS

1. A pipe diagnosis history display apparatus that displays a diagnosis history of pipes that are laid in a plant,
5 the plant having a plurality of pipes laid in a horizontal direction and a vertical direction,
positions of the pipes in the horizontal direction being specified based on position indicators that are arranged in a lengthwise direction of the pipes,
positions of the pipes in the vertical direction being specified based on tiers in
10 which the pipes are laid,
the pipe diagnosis history display apparatus comprising:
a diagnosis information storage unit that stores, for each of defects that have been discovered by an inspector based on a result of a diagnosis performed by the inspector on the pipes, diagnosis information that includes horizontal direction information that specifies
15 a position in the horizontal direction of a point at which the defect has been discovered, and vertical direction information that specifies a position in the vertical direction of the point;
a display unit that displays a list that contains the horizontal direction information and the vertical direction information as two axes, based on the diagnosis information;
a control unit that generates the list; and
20 an input unit that receives an input operation from a user,
wherein the horizontal direction information is specified based on the position indicators,
the vertical direction information is specified based on the tiers, and
a field specified by a combination of the horizontal direction information and the
25 vertical direction information in the list displays the number of defects that have been discovered at a point specified by the combination.
2. The pipe diagnosis history display apparatus according to claim 1,
wherein the diagnosis information further includes defect information that
30 specifies the content of the defect corresponding to the diagnosis information, and
the control unit extracts diagnosis information that includes at least one type of defect information selected by a user through an input operation, to generate the list.
3. The pipe diagnosis history display apparatus according to claim 1 or 2, further
35 comprising:
a pipe storage unit that stores a layout diagram for the pipes laid in the plant,

wherein, upon a field specified by a combination of the horizontal direction information and the vertical direction information in the list being selected by the user through an input operation, the layout diagram corresponding to the point specified by the combination, and defect point icons that are respectively associated with the defects
5 discovered in an area corresponding to the layout diagram, are displayed by the display unit, instead of the list, or displayed together therewith side by side, or displayed so as to be superimposed thereon, and

each of the defect point icons is displayed at a position on the layout diagram corresponding to a point specified by the combination of the horizontal direction
10 information and the vertical direction information included in the diagnosis information associated with the defect point icon.

4. The pipe diagnosis history display apparatus according to any one of claims 1 to 3,

15 wherein each field in the list is displayed in a mode in which the number of defects displayed in the field can specify a classification corresponding thereto from among predetermined classifications.

5. A pipe diagnosis history display method for displaying a diagnosis history of pipes
20 that are laid in a plant,

the plant having a plurality of pipes laid in a horizontal direction and a vertical direction,

positions of the pipes in the horizontal direction being specified based on position indicators that are arranged in a lengthwise direction of the pipes,

25 positions of the pipes in the vertical direction being specified based on tiers in which the pipes are laid,

the pipe diagnosis history display method comprising:

a diagnosis information storage step of storing, for each of defects that have been discovered by an inspector based on a result of a diagnosis performed by the inspector on
30 the pipes, diagnosis information that includes horizontal direction information that specifies a position in the horizontal direction of a point at which the defect has been discovered, and vertical direction information that specifies a position in the vertical direction of the point;

a display step of causing a display device to display a list that contains the horizontal direction information and the vertical direction information as two axes, based
35 on the diagnosis information;

a control step of generating the list; and

an input step of receiving an input operation from a user,
wherein the horizontal direction information is specified based on the position
indicators,

the vertical direction information is specified based on the tiers, and
5 a field specified by a combination of the horizontal direction information and the
vertical direction information in the list displays the number of defects that have been
discovered at a point specified by the combination.

6. A pipe diagnosis history display program for displaying a diagnosis history of
10 pipes that are laid in a plant,

the plant having a plurality of pipes laid in a horizontal direction and a vertical
direction,

positions of the pipes in the horizontal direction being specified based on position
indicators that are arranged in a lengthwise direction of the pipes,

15 positions of the pipes in the vertical direction being specified based on tiers in
which the pipes are laid,

the pipe diagnosis history display program causing a computer to execute:

a diagnosis information storage function of storing, for each of defects that have
been discovered by an inspector based on a result of a diagnosis performed by the inspector
20 on the pipes, diagnosis information that includes horizontal direction information that
specifies a position in the horizontal direction of a point at which the defect has been
discovered, and vertical direction information that specifies a position in the vertical
direction of the point;

a display function of causing a display device to display a list that contains the
25 horizontal direction information and the vertical direction information as two axes, based
on the diagnosis information;

a control function of generating the list; and

an input receiving function of receiving an input operation from a user,

wherein the horizontal direction information is specified based on the position
30 indicators,

the vertical direction information is specified based on the tiers, and

a field specified by a combination of the horizontal direction information and the
vertical direction information in the list displays the number of defects that have been
discovered at a point specified by the combination.