

DESCRIPTION

INSPECTION PROCESSING DEVICE, INSPECTION SYSTEM,
COMMODITY MASTER REGISTRATION DEVICE,
INSPECTION PROCESSING METHOD, AND PROGRAM

TECHNICAL FIELD

[0001]

The present invention relates to an inspection processing device, an inspection system, a commodity master registration device, an inspection processing method, and a program.

BACKGROUND ART

[0002]

In the process of shipping a distribution commodity handled by a distributor, such as a warehousing business or a wholesaler, before shipping the commodity, there is an operation of confirming whether a commodity to be shipped is the commodity listed in a delivery slip, by comparison with the delivery slip. This operation is referred to as an inspection operation. Inspection operations include an inspection operation in which a plurality of like commodities are collectively inspected, such as “100 units of the same catalog”, or “60 units of the same box”. In the case of such an inspection operation, there exists a technique that uses a camera to capture the surface or the like of a commodity placed at the top of a stack of commodities, and specifies the commodity by collation with a master image of the commodity that has been registered beforehand. Further, there exists

a technique that uses a weight measurement value of a commodity to be inspected and an inspection quantity to calculate a unit weight of the commodity thereof, and specifies the commodity from an image of the commodity and the unit weight (for example, refer to Patent Document 1).

[Prior Art Documents]

[Patent Document]

[0003]

[Patent Document 1] Japanese Unexamined Patent Application, First Publication No. 2015-182825

SUMMARY OF THE INVENTION

Problems to be Solved by the Invention

[0004]

However, in a case where commodities are specified by collation with a master image, because the number of commodities handled by a distributor often exceeds 10,000 types, it requires significant time and effort to register a master image of all of the commodities. Furthermore, among the commodities, three-dimensionally shaped commodities also exist. In the case of such a commodity, master images are often captured from a plurality of sides such that collation can be performed regardless of which surface is captured during the inspection operation. In this case, in addition to the time and effort required for registration, an increase in the collation processing time due to an increase in the number of master images becomes a problem.

[0005]

An exemplary object of the present invention is to provide an inspection processing device, an inspection system, a commodity master registration device, an

inspection processing method, and a program capable of solving the above problems.

Means for Solving the Problem

[0006]

An inspection processing device according to a first exemplary aspect of the present invention includes: a commodity image determination unit that specifies an image for each of at least one inspection commodity, based on first inspection data and a first inspection target image, the first inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the first inspection target image representing a commodity group that matches the first inspection data; a commodity data registration unit that registers the specified image in a storage unit; and a collation unit that specifies, among commodities included in a second inspection target image corresponding to second inspection data, a commodity of the same type as one of the at least one inspection commodity, based on the image stored in the storage unit.

[0007]

An inspection system according to a second exemplary aspect of the present invention includes: an imaging device that captures the commodity group and acquires the first inspection target image; a weight measuring instrument that measures a weight of the commodity group; and the above-described inspection processing device, the inspection processing device acquiring the first inspection target image acquired by the imaging device, and the weight of the commodity group measured by the weight measuring instrument.

[0008]

A commodity master registration device according to a third exemplary aspect of the present invention includes: a commodity image determination unit that specifies an image for each of at least one inspection commodity, based on inspection data and an inspection target image, the inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the inspection target image representing a commodity group that matches the inspection data; and a commodity data registration unit that registers the specified image in a commodity master.

[0009]

An inspection processing method according to a fourth exemplary aspect of the present invention includes: specifying an image for each of at least one inspection commodity, based on first inspection data and a first inspection target image, the first inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the first inspection target image representing a commodity group that matches the first inspection data; registering the specified image in a storage unit; and specifying, among commodities included in a second inspection target image corresponding to second inspection data, a commodity of the same type as one of the at least one inspection commodity, based on the image stored in the storage unit.

[0010]

A program causes a computer to execute: specifying an image for each of at least one inspection commodity, based on first inspection data and a first inspection target image, the first inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the first inspection target image representing a

commodity group that matches the first inspection data; registering the specified image in a storage unit; and specifying, among commodities included in a second inspection target image corresponding to second inspection data, a commodity of the same type as one of the at least one inspection commodity, based on the image stored in the storage unit.

Effect of the Invention

[0011]

According to an exemplary embodiment of the present invention, a registration operation of a master image of a commodity used in an inspection operation can be made more efficient.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a block diagram showing a configuration of an inspection processing device according to a first exemplary embodiment of the present invention.

FIG. 2 is a block diagram showing an example of the configuration of an inspection processing device according to the first exemplary embodiment of the present invention.

FIG. 3 is a diagram showing an example of an inspection system according to the first exemplary embodiment of the present invention.

FIG. 4 is a flowchart showing an example of inspection processing using the inspection processing device according to the first exemplary embodiment of the present invention.

FIG. 5 is a first diagram showing an example of an inspection confirmation screen according to the first exemplary embodiment of the present invention.

FIG. 6 is a second diagram showing an example of an inspection confirmation screen according to the first exemplary embodiment of the present invention.

FIG. 7 is a third diagram showing an example of an inspection confirmation screen according to the first exemplary embodiment of the present invention.

FIG. 8 is a flowchart showing an example of master registration processing in the inspection processing device according to the first exemplary embodiment of the present invention.

FIG. 9A is a first diagram describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 9B is another first diagram describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 10A is a second diagram describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 10B is another second diagram describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 11A is a third diagram describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 11B is another third diagram describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 11C is yet another third diagram describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 12A is a fourth diagram describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 12B is another fourth diagram describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 13 is a block diagram showing an example of the configuration of an inspection processing device according to a second exemplary embodiment of the present invention.

FIG. 14 is a diagram showing an example of an inspection confirmation screen according to the second exemplary embodiment of the present invention.

FIG. 15 is a first diagram describing master registration processing according to the second exemplary embodiment of the present invention.

FIG. 16A is a second diagram describing master registration processing according to the second exemplary embodiment of the present invention.

FIG. 16B is another second diagram describing master registration processing according to the second exemplary embodiment of the present invention.

FIG. 17 is a flowchart showing an example of master registration processing in the inspection processing device according to the second exemplary embodiment of the present invention.

FIG. 18 is a flowchart showing an example of inspection processing using an inspection processing device according to a third exemplary embodiment of the present invention.

FIG. 19 is a diagram showing an example of an inspection confirmation screen according to the third exemplary embodiment of the present invention.

FIG. 20 is a block diagram showing an example of the configuration of a commodity data registration device according to an exemplary embodiment of the present invention.

FIG. 21 is a block diagram showing an example of the hardware configuration of an inspection processing device and a commodity data registration device according to an

exemplary embodiment of the present invention.

EMBODIMENTS FOR CARRYING OUT THE INVENTION

[0013]

<First exemplary embodiment>

Hereunder, an inspection processing device according to a first exemplary embodiment of the present invention will be described with reference to FIG. 1 to FIG. 12B.

FIG. 1 is a diagram showing a minimum configuration of an inspection processing device according to a first exemplary embodiment.

As shown in FIG. 1, the inspection processing device 100 includes at least a commodity data registration unit 109, a commodity image determination unit 110, and a collation unit 115. The inspection processing device 100 is, for example, a computer having a CPU (Central Processing Unit).

The commodity image determination unit 110, specifies an image of each inspection target commodity, based on inspection data (slip data) that includes identification information of a commodity that is the object to be inspected (inspection commodity) and the quantity to be inspected with respect to the commodity thereof (inspection quantity), and an inspection target image that captures a commodity group matching the inspection commodity and the inspection quantity included in the inspection data thereof.

The commodity data registration unit 109 registers the image specified by the commodity image determination unit 110 in a storage unit. The storage unit is a commodity data storage unit 117 to be described later, and corresponds to a commodity master.

The collation unit 115, specifies the commodity included in an inspection target image which corresponds to new inspection data, based on an image stored in the storage unit (commodity master) which registers an image of the commodity specified by the commodity image determination unit 110.

[0014]

FIG. 2 is a block diagram showing an example of the configuration of an inspection processing device according to the first exemplary embodiment.

As shown in FIG. 2, the inspection processing device 100 includes a control determination unit 101, a weight acquisition unit 102, a commodity image acquisition unit 103, an input acceptance unit 104, a display information output unit 105, a feature amount calculation unit 106, an inspection data saving unit 107, a target total weight calculation unit 108, a commodity data registration unit 109, a commodity image determination unit 110, a commodity weight calculation unit 114, a collation unit 115, an inspection data storage unit 116, and a commodity data storage unit 117. A commodity to be inspected that is included in the inspection data is referred to as an inspection commodity. A quantity to be inspected is referred to as an inspection quantity. A commodity taken by an operator performing the inspection operation from a commodity shelf as a candidate of the inspection commodity is referred to as an inspection target commodity. Furthermore, an image in which an inspection target commodity group is captured is referred to as an inspection target image. Moreover, a set image representing a candidate of the inspection commodity, which has been clipped from the inspection target image, is referred to as a commodity image.

[0015]

The control determination unit 101 transmits information and instructs processing to the other functional units.

The weight acquisition unit 102 acquires from a weight measuring instrument, the weight of the inspection target commodity measured by the weight measuring instrument.

The commodity image acquisition unit 103 instructs an imaging device to capture the inspection target commodity, and acquires from the imaging device, the inspection target image that has been captured by the imaging device.

The input acceptance unit 104 accepts an input operation performed by an operator. Furthermore, the input acceptance unit 104 acquires inspection data based on an input operation of inspection data performed by an operator.

The display information output unit 105 generates various information necessary for the inspection operation, and outputs the information on a display device connected to the inspection processing device 100.

The feature amount calculation unit 106 calculates the feature amount of an inspection target image acquired by the commodity image acquisition unit 103 according to a general feature amount calculation method such as the calculation of a graphic feature amount.

The inspection data saving unit 107 records in the inspection data storage unit 116, the inspection data input by an operator as an object of the inspection operation.

The target total weight calculation unit 108 calculates the total weight (target total weight) of an inspection commodity included in the inspection data. Furthermore, the target total weight calculation unit 108 compares the calculated target total weight with the weight of the inspection target commodity acquired by the weight acquisition unit 102, and calculates the difference.

[0016]

The commodity data registration unit 109 registers the captured image of the inspection commodity, the unit weight, and the like in the commodity data storage unit 117.

The commodity data registration unit 109 includes a commodity image determination unit 110 and a commodity weight calculation unit 114.

The commodity image determination unit 110 includes an image extraction unit 111, an image analysis unit 112, and a commodity specification unit 113.

The image extraction unit 111 clips from an inspection target image set images (commodity images) as candidates of the inspection target commodity. The set images may represent images that are each taken with respect to a different region.

The image analysis unit 112 collates the clipped commodity images with each other and calculates the quantity of each type of commodity image included in the inspection target image.

The commodity specification unit 113 compares the quantity of each type of commodity image with the inspection quantity of each inspection commodity included in the inspection data to specify the commodity indicated by each commodity image.

The commodity image determination unit 110 associates the commodity image specified by the commodity specification unit 113 with the inspection commodity, and records them in the commodity data storage unit 117 (commodity master).

[0017]

The commodity weight calculation unit 114 calculates the unit weight of each inspection commodity based on an equation that describes the relationship between; the unit weight of each inspection commodity and the inspection quantity of each inspection commodity that are included in the inspection data, and the weight data which measures the weight of the commodity group matching the inspection commodity and the inspection quantity included in the inspection data.

The collation unit 115 uses a master image of the commodity recorded in the commodity data storage unit 117 to specify the commodity appearing in the inspection

target image by means of collation with the inspection target image, in which the inspection commodity has been captured, and determines whether or not the specified commodity matches the inspection commodity included in the inspection data.

[0018]

The inspection data storage unit 116 is a database that stores a commodity name of an inspection commodity, an inspection quantity, and the like, included in the inspection data to be inspected.

The commodity data storage unit 117 is a database that stores, for each commodity, a commodity name, a commodity image (master image), a feature amount of the commodity image, a unit weight, and the like.

The functions of the control determination unit 101, the weight acquisition unit 102, the commodity image acquisition unit 103, the input acceptance unit 104, the display information output unit 105, the feature amount calculation unit 106, the inspection data saving unit 107, the commodity data registration unit 109, the commodity image determination unit 110, the image extraction unit 111, the image analysis unit 112, the commodity specification unit 113, the commodity weight calculation unit 114, and the collation unit 115 are at least provided in part by a CPU included in the inspection processing device 100 reading and executing a program from a storage unit, such as a hard disk.

[0019]

FIG. 3 is a diagram showing an example of an inspection system according to the first exemplary embodiment of the present invention.

Hereunder, with reference to FIG. 3, the inspection system of the present exemplary embodiment will be described.

As shown in FIG. 3, the inspection system 1 includes an inspection processing device 100, an imaging device 200, a weight measuring instrument 300, a display device 400, and an input device 500. Furthermore, one or more of an inspection target commodity (inspection target commodity 600) is placed on the weight measuring instrument 300. A known pattern having features such as a grid pattern is drawn on the surface of the weight measuring instrument 300 (the surface on which the inspection target commodity is placed).

[0020]

The imaging device 200 is, for example, a camera that images the inspection target commodity. The weight measuring instrument 300 is a device that measures the weight of the inspection target commodity. In FIG. 3, the imaging device 200 is attached to a support 302 with the lens facing the ground such that the inspection target commodity placed on the weight measuring instrument 300 can be imaged from directly above. The support 302 is secured by a base 301. The weight measuring instrument 300 is installed on the base 301. The mounting position of the imaging device 200 is not limited to the example in FIG. 3. The inspection processing device 100 is connected to the imaging device 200, and acquires an image of the inspection target commodity captured by the imaging device 200. The inspection processing device 100 is connected to the weight measuring instrument 300, and acquires the weight of the inspection target commodity measured by the weight measuring instrument 300.

[0021]

The display device 400 is for example, a display. The display device 400 is connected to the inspection processing device 100 and displays information generated by the inspection processing device 100 that is necessary for the inspection operation.

The input device 500 is a keyboard, a mouse, or an arbitrary data reading means (such as a storage medium reading device). The operator performs the inspection operation by operating the inspection processing device 100 using the input device 500, while referring to the information displayed on the display device 400.

[0022]

Next, with reference to FIG. 3, an approximate flow of the inspection operation will be described. Firstly, the operator takes one or more of an inspection commodity candidate listed on a single slip that is the object of the inspection operation from a commodity shelf or the like, and places the commodity on the weight measuring instrument 300. The inspection target commodity 600 placed on the weight measuring instrument 300 can sometimes be a similar commodity that has been erroneously selected by the operator. A plurality of types of commodities is often included on a single slip, and in that case, the inspection target commodity 600 includes a plurality of types of commodities. When the operator places the inspection target commodity 600 on the weight measuring instrument 300, the weight measuring instrument 300 measures the weight of the inspection target commodity 600, and transmits the measured weight data to the inspection processing device 100. The inspection processing device 100 transmits an imaging instruction signal to the imaging device 200 at the timing of receiving the weight data. Upon receiving the imaging instruction signal, the imaging device 200 images the inspection target commodity 600 from above, and transmits the captured inspection target image to the inspection processing device 100.

Furthermore, in parallel with this processing, the operator inputs the inspection data (the name of the inspection commodity, the inspection quantity, and the like) included on the single slip using the input device 500. For example, the slip data is a digitized file, and the operator inputs the file thereof, which is stored in the storage medium, to the

inspection processing device 100 via a storage medium reading device. The individual descriptions included in the inspection data are referred to as description information.

[0023]

Upon acquiring the inspection target image, the inspection processing device 100 performs collation processing with the master image of the commodity stored in the commodity data storage unit 117, and specifies the commodity included in the inspection target image. Furthermore, the inspection processing device 100 determines, as a result of collation processing, whether or not the specified commodity appearing in the image matches the inspection commodity included in the inspection data. The inspection processing device 100 performs collation processing and determination processing with respect to all of the inspection commodities included in the inspection data. Furthermore, the inspection processing device 100 calculates the total weight of all of the inspection commodities included in the inspection data, and compares the weight with the weight data measured by the weight measuring instrument 300.

Then, the inspection processing device 100 displays on the display device 400, a collation processing result and a comparison result with the weight data for all of the inspection target commodities. Furthermore, the inspection processing device 100 displays a list of inspection data on the display device 400.

[0024]

The operator visually confirms the list of inspection data, the collation processing result, and weight data comparison result displayed on the display device 400, and comprehends the inspection result. The operator adjusts the quantity of the inspection target commodity 600 by placing or removing a quantity of an excess or deficiency from the weight measuring instrument 300. As a result of the above operation and processing, when the quantity of the commodity displayed on the display device 400 becomes the same

as the inspection data, the operator completes the inspection operation with respect to the inspection data thereof.

[0025]

The commodities handled by a distributor may exceed 10,000 items. Further, for example, when a new commodity is developed and provided to the market, a master image of the new commodity thereof must be newly registered in the commodity data storage unit 117. The need to register a master image every time a new commodity is released is time consuming. In particular, when the new commodity thereof is a three-dimensional object, it is unknown to the operator which face is to be facing upward when the commodity is placed on the weight measuring instrument 300. Therefore, it is necessary to register master images for all of the sides, which requires even more time and effort to be spent. Furthermore, if many master images are registered, there is also a problem that the collation processing takes a correspondingly longer time.

[0026]

Therefore, in the present exemplary embodiment, a method is provided for recording information resulting from performing a visual inspection with respect to a commodity that is not registered in the commodity data storage unit 117, such as a new commodity, and automatically registering a master image and a unit weight of an unregistered commodity in the commodity data storage unit 117 based on the recorded information.

Next, registration processing of a commodity image of an unregistered commodity and a unit weight, in the present exemplary embodiment will be described.

[0027]

FIG. 4 is a flowchart showing an example of inspection processing using the inspection processing device according to the first exemplary embodiment of the present invention.

FIG. 5 is a first diagram showing an example of an inspection confirmation screen according to the first exemplary embodiment of the present invention.

Firstly, the operator inputs a certain single inspection data to the inspection processing device 100. In the inspection processing device 100, the input acceptance unit 104 acquires the inspection data thereof, and outputs the data to the control determination unit 101. Then, the target total weight calculation unit 108 calculates the target total weight based on an instruction from the control determination unit 101 (step S11). Specifically, the target total weight calculation unit 108 calculates, with respect to the input inspection data, a weight corresponding to the inspection quantity (referred to as an inspection weight) for each inspection commodity, by multiplying the unit weight of the inspection commodity thereof stored in the commodity data storage unit 117 by the inspection quantity of the inspection commodity thereof. The target total weight calculation unit 108 calculates the target total weight by adding all of the inspection weights, and records the target total weight in a memory. If the inspection commodity included in the inspection data is unregistered, the unit weight information cannot be obtained. Therefore, the inspection weight of the inspection commodity thereof becomes zero (0).

[0028]

Then, the operator refers to the inspection data input to the inspection processing device 100 and takes an inspection target commodity 600 from a commodity shelf or the like, and places the commodity on the weight measuring instrument 300. When the inspection target commodity 600 is placed on the weight measuring instrument 300, the

weight acquisition unit 102 acquires the weight data of the inspection target commodity 600 measured by the weight measuring instrument 300 (step S12). The weight acquisition unit 102 outputs the acquired weight data to the control determination unit 101. The control determination unit 101 records the weight data in a memory.

Next, the control determination unit 101 is triggered by the acquisition of the weight data, and outputs an imaging instruction signal to the commodity image acquisition unit 103. Then, the commodity image acquisition unit 103 issues an imaging instruction to the imaging device 200, and the imaging device 200 captures an inspection target image of the inspection target commodity 600. The commodity image acquisition unit 103 acquires the inspection target image captured by the imaging device 200 (step S13), and stores the image in a memory.

[0029]

When the image is stored in the memory, the control determination unit 101 instructs the feature amount calculation unit 106 to calculate a feature amount of the stored image. The feature amount calculation unit 106 reads the inspection target image from the memory, calculates a feature amount by a predetermined and known feature calculation method (step S14), and outputs the calculation result to the control determination unit 101. The calculation result includes a distribution of the feature amount on the inspection target image. Furthermore, the feature amount distribution includes the feature amount of all of the commodities of the inspection target commodity 600 placed on the weight measuring instrument 300. The control determination unit 101 records the feature amount in a memory.

[0030]

Then, the collation unit 115 searches for the commodity included in the inspection target image based on the master images recorded in the commodity data storage unit 117

(step S15). Specifically, the collation unit 115 reads, among the master images of all of the commodities registered in the commodity data storage unit 117, the master images of the inspection commodity included in the inspection data, compares the master images with the inspection target image, and specifies the commodity that appears in the inspection target image. For example, based on the commodity name included in the inspection data, the collation unit 115 reads the feature amount of the commodity thereof from the commodity data storage unit 117. Then, the commodity specification unit 113 compares the feature amount of the collated commodity that has been read, with the feature amount distribution of the inspection target image, and performs searching processing that collates whether or not the feature amount of the inspection commodity is included in the feature amount distribution of the inspection target image. If the degree of similarity between the feature amount of the inspection commodity and the feature amount included in the inspection target image is a predetermined threshold or more, the collation unit 115 determines that the inspection commodity appears in the inspection target image. The collation unit 115 performs searching processing with respect to each inspection commodity included in the inspection data, and outputs the search result thereof (the quantity that was found) to the control determination unit 101.

[0031]

Upon receiving the search result from the collation unit 115, the control determination unit 101 outputs the search result thereof to the display information output unit 105, and issues an instruction to display the inspection confirmation screen. Then, the display information output unit 105 reads a “description number”, a “commodity code”, and an “inspection quantity” recorded in the inspection data storage unit 116, and a “unit weight” recorded in the commodity data storage unit 117. Furthermore, the display information output unit 105 requests the target total weight from the control determination

unit 101, and the weight data and total weight error information acquired by the weight acquisition unit 102. The total weight error is the difference between the target total weight calculated by the target total weight calculation unit 108 and the weight data acquired by the weight acquisition unit 102. The control determination unit 101 instructs the target total weight calculation unit 108 to calculate the total weight error. The target total weight calculation unit 108 reads the previously calculated target total weight and the weight data acquired by the weight acquisition unit 102 from a memory, and calculates the total weight error. The target total weight calculation unit 108 outputs the target total weight, the weight data, and the calculated total weight error to the control determination unit 101. The control determination unit 101 outputs the information to the display information output unit 105. Furthermore, the display information output unit 105 acquires the inspection target image from a memory.

The display information output unit 105 uses data such as the determination result of the collation unit 115, the inspection data acquired from the inspection data storage unit 116, and the total weight error output by the target total weight calculation unit 108, as well as the inspection target image, to generate an image of the inspection confirmation screen used by the operator in the inspection operation, and displays the image thereof on the display device 400 (step S16).

[0032]

Here, with reference to FIG. 5, the inspection confirmation screen will be described. FIG. 5 is a diagram showing an example of the inspection confirmation screen. As shown in FIG. 5, the inspection confirmation screen includes an inspection data display panel 61, an inspection target image display panel 62, an image collation result display panel 63, a weight comparison result display panel 64, and an OK button 65. The display information output unit 105 displays in the inspection data display panel 61, the inspection

data (the columns “slip number”, “commodity code”, “inspection quantity”, and “unit weight”) acquired from the inspection data storage unit 116 and the like, and the search result (the column “inspection record”) acquired from the collation unit 115. The display information output unit 105 displays the acquired inspection target image in the inspection target image display panel 62. Furthermore, the display information output unit 105 displays the determination result from the commodity specification unit 113, in the image collation result display panel 63. For example, if the search result acquired from the collation unit 115 indicates a match with respect to all of the commodities included in the inspection data, then the display information output unit 105 displays “image OK” or the like, and if even a single determination result indicating no matches with the commodities included in the inspection data is included, then “image NG” or the like is displayed. Moreover, the display information output unit 105 displays the weight comparison result display panel 64 based on data such as the total weight error acquired from the target total weight calculation unit 108. For example, if the total weight error is zero, then the display information output unit 105 displays “weight OK” or the like in the weight comparison result display panel 64. Furthermore, if the total weight error is not “0”, then the display information output unit 105 displays “weight NG” or the like in the weight comparison result display panel 64. Also, the display information output unit 105 displays the target total weight, the weight data, and the total weight error in the weight comparison result display panel 64. The display information output unit 105 displays the OK button 65. The OK button 65 is a button that is pressed when the operator completes the inspection operation for the inspection data that is currently displayed.

[0033]

The operator confirms whether or not the all of the commodities were able to be specified (step S17). For example, the operator can confirm whether all of the

commodities were able to be specified according to whether or not “image OK” is displayed in the image collation result display panel 63. If not specified (step S17: No), then the display information output unit 105 generates an image of a visual inspection screen (not shown in the figure), and displays the image on the display device 400 (step S18). The visual inspection screen is a screen for visually confirming each inspection target commodity 600 placed on the weight measuring instrument 300. The inspection target commodities may be displayed enlarged in the visual inspection screen. The operator views the inspection confirmation screen and visually confirms the image of the displayed commodity, the commodity name, and the like. If an excess or deficiency exists in the inspection target commodity, the quantity and the like, the operator adjusts the excess or deficiency of the commodity. The inspection is completed if, as a result of the visual inspection, all of the inspection target commodities have been correctly placed on the weight measuring instrument 300. When a commodity is exchanged, added or removed, the imaging device 200 captures a new inspection target image, and the commodity image acquisition unit 103 acquires the image thereof. Furthermore, the weight measuring instrument 300 re-measures the weight, and the weight acquisition unit 102 acquires the re-measured new weight data. The layout of the visual confirmation screen can be arbitrarily chosen as long as the inspection target commodity can be visually confirmed. However, the layout may also be equivalent to the inspection confirmation screen exemplified in FIG. 5 and the like.

[0034]

On the other hand, if they were specified (step S17: Yes), then the operator confirms whether or not the total weight error is within an allowed range (step S19). If the total weight error is not within the allowed range (step S19: No), the operator adjusts the excess or deficiency of the commodity. When the quantity of the commodity placed on the

weight measuring instrument 300 changes, the weight acquisition unit 102 acquires new weight data. Furthermore, the target total weight calculation unit 108 recalculates the total weight error. Then, the display information output unit 105 updates the display of the weight comparison result display panel 64. The inspection is completed when, as a result of such an adjustment operation by the operator, the total weight error falls within the allowed range (step S19).

[0035]

When the inspection is completed, the inspection data saving unit 107 associates the inspection target image, the weight data, and the inspection data, and records them in the inspection data storage unit 116 (step S20). The inspection target image and the weight data are from the time of completion of the inspection (that is to say, the inspection target image and the weight data of an inspection target commodity group matching the content of the inspection data). Furthermore, if description information that has been visually inspected is included in the current inspection data, the inspection data saving unit 107 associates the inspection data with information indicating that a visual inspection was performed, and records them in the inspection data storage unit 116. Then, the inspection processing device 100 performs master registration processing (step S21). The master registration processing is processing that is not necessary in a case where all of the commodities were able to be specified in step S17, that is to say, master images of the commodities were recorded in the commodity data storage unit 117. Next, with reference to FIG. 5 to FIG. 12, the master registration processing will be described.

[0036]

FIG. 6 is a second diagram showing an example of the inspection confirmation screen according to the first exemplary embodiment of the present invention.

FIG. 7 is a third diagram showing an example of the inspection confirmation screen according to the first exemplary embodiment of the present invention.

In the master registration processing that will be described with reference to FIG. 8, a case where the inspection processing described in FIG. 4 is performed in the sequence of a “delivery slip 1” to a “delivery slip 3” will be described with respect to inspection data that includes commodities having the commodity codes “A”, “B”, and “C”, which are not recorded in the commodity data storage unit 117 (FIG. 5 to FIG. 7). Furthermore, the inspection target image or the like recorded in step S20 is assumed to be only for the three inspection data exemplified in FIG. 5 to FIG. 7.

Specifically, inspection processing is firstly performed with respect to the inspection data of “delivery slip 1” exemplified in FIG. 5. The “delivery slip 1” includes description information representing an inspection quantity of “2” for a commodity having the commodity code “A” (commodity A), an inspection quantity “1” for a commodity having the commodity code “B” (commodity B), and an inspection quantity “1” for a commodity having the commodity code “C” (commodity C). As a result of the inspection processing described with reference to FIG. 4, for the inspection data of the “delivery slip 1”, an inspection target image confirmed on the visual inspection screen and weight data measured in the state represented by the inspection target image are recorded in the inspection data storage unit 116.

[0037]

Next, inspection processing is performed with respect to the inspection data of “delivery slip 2” exemplified in FIG. 6. The “delivery slip 2” includes description information representing an inspection quantity of “2” for commodity A, and an inspection quantity “2” for commodity B. As a result of the inspection processing described with reference to FIG. 4, for the inspection data of the “delivery slip 2”, an inspection target

image confirmed on the visual inspection screen and the corresponding weight data are recorded in the inspection data storage unit 116. The master image registration processing of step S39 to step S42 described below will be described assuming a scenario in which inspection processing is performed with respect to the “delivery slip 2”, an inspection target image or the like is recorded in step S20, and master registration processing is then performed.

Then, inspection processing is performed with respect to the inspection data “delivery slip 3” exemplified in FIG. 7. The “delivery slip 3” includes description information representing an inspection quantity of “2” for commodity B, and an inspection quantity “1” for commodity C. As a result of the inspection processing described with reference to FIG. 4, for to the inspection data of the “delivery slip 2”, an inspection target image confirmed on the visual inspection screen and the weight data corresponding to the image thereof are recorded in the inspection data storage unit 116. The unit weight registration processing of step S43 to step S45 described below will be described assuming a scenario in which inspection processing is performed with respect to the “delivery slip 3”, an inspection target image or the like is recorded in step S20, and master registration processing is then performed.

[0038]

FIG. 8 is a flowchart showing an example of master registration processing in the inspection processing device according to the first exemplary embodiment of the present invention.

FIG. 9A and 9B are first diagrams describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 10A and 10B are second diagrams describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 11A to 11C are third diagrams describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 12A and 12B are fourth diagrams describing inspection processing according to the first exemplary embodiment of the present invention.

FIG. 8 is a diagram for describing the master registration processing of step S21 in detail.

Firstly, the commodity data registration unit 109 initializes a variable N that counts the inspection data by setting “N” to “1” (step S31). The commodity data registration unit 109 reads and acquires from the inspection data storage unit 116 the inspection data, the inspection target image, and the weight data registered in step S20 of the Nth cycle of inspection processing (step S32). Currently, since “N=1”, the commodity data registration unit 109 acquires the inspection data, the inspection target image, and the weight data of the first cycle as exemplified in FIG. 5.

[0039]

Next, the commodity data registration unit 109 determines whether or not even one case of a visual inspection result is included in the inspection data of the first cycle (step S33). Whether or not even one case of a visual inspection result is included refers to whether or not a commodity is included in which the inspection was performed using the visual inspection screen in the processing shown in FIG. 4. For example, if the inspection data is recorded in the inspection data storage unit 116 such that it is associated with information indicating that a visual inspection was performed, the commodity data registration unit 109 determines that there is one case of a visual inspection result included (at least one case of a visual inspection result is included). If the inspection data of the Nth cycle does not include a visual inspection (not even one case of a visual inspection result is included), the processing proceeds to the determination of step S37 (step S33: No). If the

inspection data of the Nth cycle includes a visual inspection result (step S33: Yes), the commodity data registration unit 109 instructs the image extraction unit 111 to perform clipping of an image. The image extraction unit 111 performs clipping of a commodity image with respect to the read inspection target image (step S34). As mentioned above, for example, a grid pattern is drawn on the weight measuring instrument 300. The image extraction unit 111 uses the known background pattern to clip a portion of the image in which a set of objects appear that are candidate commodities (commodity image) using image processing such as the background subtraction method. When “N=1”, the left image in FIG. 9A represents an example of a state after clipping. The left image in FIG. 9A indicates that, after clipping by the image extraction unit 111, commodity images numbered 11, 12, 13, and 14 have been clipped. Here, even for images that capture the same commodity A, in a case such as where commodity A has a three-dimensional shape, the commodity images can differ depending on which face of commodity A is placed facing upward. However, in the description below, it is assumed that the same face is captured for the same inspection target commodities.

[0040]

Then, the commodity data registration unit 109 instructs the feature amount calculation unit 106 to calculate the feature amount of each commodity image clipped by the image extraction unit 111. The feature amount calculation unit 106 calculates the feature amount with respect to the clipped commodity images (step S35), and outputs the values thereof to the commodity data registration unit 109. The commodity data registration unit 109 associates the feature amounts with the commodity images in the memory and records them in a memory. For example, if the feature amount of the clipped image “11” in FIG. 9A is “AAA”, the commodity data registration unit 109 records “11” and “AAA” in the memory such that they are associated.

[0041]

Next, the commodity data registration unit 109 instructs the commodity weight calculation unit 114 to generate an equation.

The commodity weight calculation unit 114 mathematically expresses the relationship between the weight data and the inspection data by using the inspection data of the Nth cycle and the weight data of the Nth cycle (step S36). For example, FIG. 11A is a diagram showing the inspection data and the weight data of the first cycle. The relationship between the inspection data and the weight data calculated from the data in FIG. 11A is “ W_a (unit weight of the commodity A) $\times$ 2 (items) + W_b (unit weight of the commodity B) $\times$ 1 (item) + W_c (unit weight of the commodity C) $\times$ 1 (item) = 450 (total weight)”. The commodity weight calculation unit 114 generates such an equation (a line in the delivery slip 1 in FIG. 12A) and records it in the memory.

[0042]

Next, the commodity data registration unit 109 determines whether the variable N is equal to the number inspection data that have been recorded in the inspection data storage unit 116 (step S37). If the variable N is not equal to the number of inspection data that have been recorded (step S37: No), the commodity data registration unit 109 adds “1” to the variable N (step S38), and repeats the processing from step S32. Specifically, the image extraction unit 111 clips with respect to the inspection data of the “delivery slip 2” in which “N=2”, the commodity images 21 to 24 as shown in the left image of FIG. 9B. Furthermore, the feature amount calculation unit 106 calculates the feature amounts of the commodity images 21 to 24. Moreover, the commodity weight calculation unit 114 generates the equation “ $W_a \times 2 + W_c \times 2 = 300$ ” (the delivery slip 2 in FIG. 12A) from the data in FIG. 11B. If the number of inspection data that has been recorded is two, the processing proceeds to step S39. If the number of inspection data that has been recorded is “3”, the

commodity data registration unit 109 adds “1” to the variable N, and then performs the same processing with respect to the inspection data of “delivery slip 3” in which “N=3”.

For example, the commodity weight calculation unit 114 generates the equation “ $W_b \times 2 + W_c \times 1 = 450$ ” (the delivery slip 3 in FIG. 12A) from the data in FIG. 11C.

[0043]

If the variable N is equal to the number of recorded inspection data (step S37: Yes), the commodity data registration unit 109 instructs the image analysis unit 112 to collate the clipped images with each other.

The image analysis unit 112 collates the commodity images clipped by the image extraction unit 111 with each other (step S39). Specifically, the image analysis unit 112 performs collation processing, which compares the feature amounts of all of the respective commodity images acquired in step S32 to step S37 with those of the other commodity images. Here, a case will be described where “N=2”, that is to say, the case where the inspection data of the delivery slip 1 and the delivery slip 2 is currently recorded in the inspection data storage unit 116. The image analysis unit 112 performs, with respect to the commodity image 11 in FIG. 9A, collation of the commodity image 11 and the respective commodity images 12, 13, 14, 21, 22, 23 and 24. Similarly, the image analysis unit 112 performs collation of the commodity image 12 and the respective commodity images 11, 13, 14, 21, 22, 23 and 24. This also applies to the other commodity images 13, 14, 21, 22, 23 and 24.

[0044]

Next, the image analysis unit 112 determines, among all of the clipped images, whether or not there are images of commodities having a matching feature amount (step S40). For example, if the degree of similarity between the feature amount of the commodity image 11 and the feature amount of the commodity image 14 is within a

predetermined range, the image analysis unit 112 determines that both images are of a matching commodity. FIG. 10A shows an example of a collation result according to the image analysis unit 112. According to FIG. 10A, as a result of the collation processing, the image analysis unit 112 indicates that the commodity image 11, the commodity image 14, the commodity image 22, and the commodity image 23 are determined to be images of a matching commodity. Similarly, the image analysis unit 112 indicates that the commodity image 12, the commodity image 21, and the commodity image 24 are images of a matching commodity (images of the same type of commodity), the commodity image 14, the commodity image 22, and the commodity image 23 are images of a matching commodity, the commodity image 21 and the commodity image 24 are images of a matching commodity, and the commodity image 22 and the commodity image 23 are images of a matching commodity. When images of commodities having a matching feature amount exist (step S40: Yes), the image analysis unit 112 calculates the quantity of each type of commodity image included in the inspection target image in which collation was performed, for each inspection target image (for each inspection data). In the example of FIG. 10A, since the commodity image 11 and the commodity image 14 are matching, the image analysis unit 112 calculates that the inspection target image of the delivery slip 1 includes two commodity images of the same type as the commodity image 11 (the commodity image 11 and the commodity image 14). Furthermore, the image analysis unit 112 calculates that one commodity image of the same type as the commodity image 12 (the commodity image 12 itself) and one commodity image of the same type as the commodity image 13 (the commodity image 13 itself) are included. The image analysis unit 112 similarly also calculates with respect to the delivery slip 2 that two commodity images of the same type as the commodity image 11 (the commodity image 22 and the commodity image 23) are included. Moreover, the image analysis unit 112 calculates that two

commodity images of the same type as the commodity image 12 (the commodity image 21 and the commodity image 24), and no commodity images of the same type as the commodity image 13 are included. On the other hand, if there are no images of commodities having a matching feature amount (step S40: No), the processing proceeds to the processing of step S43.

[0045]

If there are images of commodities having a matching feature amount, the commodity specification unit 113 then determines whether or not there is a commodity in which the number of images having a matching feature amount matches the inspection quantity on the slip (step S41). Specifically, the commodity specification unit 113 compares the quantity of each type of commodity image for each inspection target image (for each inspection data) from the image analysis unit 112, with the inspection quantity of the inspection commodity included in the inspection data, and specifies the inspection commodity indicated by each of the commodity images. This will be described in more detail with reference to FIG. 10B. The column “matching image”, the column “delivery slip 1”, and the column “delivery slip 2” in FIG. 10B are such that the calculation results from the image analysis unit 112 have been summarized in a table. The commodity specification unit 113 compares the quantity of each type of commodity image for each inspection target image (FIG. 10B), with the delivery slip 1 (right image of FIG. 9A) and the delivery slip 2 (right image of FIG. 9B). According to FIG. 10B, for example, it can be seen that the commodity images 11, 14, 22 and 23 are of the same type, and that two items are included in delivery slip 1, and two items are included in delivery slip 2. Since the only such commodity is commodity A, the commodity specification unit 113 specifies that the commodity image 11 or the like represent commodity A. Furthermore, with respect to the commodity images 12, 21 and 24, upon comparison with the inspection data, since the

commodity in which one item is included in the delivery slip 1, and two items are included in the delivery slip 2 is commodity C, the commodity specification unit 113 specifies that the commodity image 12 and the like represent commodity C. Moreover, with respect to the commodity image 13, upon comparison with the inspection data, since the commodity in which one item is included in the delivery slip 1, and no items are included in the delivery slip 2 is commodity B, the commodity specification unit 113 specifies that the commodity image 13 is an image in which commodity B has been captured. If there are commodities that have been specified, the item identifying unit 113 determines that there are commodities in which the number of images having a matching feature amount matches the inspection quantity on the slip. If it is determined that there are matching commodities (step S41), the commodity specification unit 113 outputs the specified result to the commodity data registration unit 109. Next, the commodity data registration unit 109 registers the commodity images in which the number of commodity images included in the inspection target image matches the inspection quantity included in the inspection data in the commodity data storage unit 117 such that they are associated with the commodity thereof (step S42). In this manner, according to the present exemplary embodiment, it is possible to automatically perform master registration of an image of a commodity in the flow of an inspection operation without performing master registration of an image beforehand.

If it is determined that there is not a single matching commodity (step S41: No), the processing proceeds to step S43.

[0046]

Next, the commodity weight calculation unit 114 simultaneously solves all of the equations generated in step S36 (step S43). Here, the case where “ $N=3$ ”, that is to say, the case where the inspection data of the delivery slip 1, the delivery slip 2, and the delivery

slip 3 is currently recorded in the inspection data storage unit 116 will be described. The equations generated by the commodity weight calculation unit 114 are shown in FIG. 12A. In FIG. 12A, W_a represents the unit weight of commodity A, W_b represents the unit weight of commodity B, and W_c represents the unit weight of commodity C. Here, since there are three types of variables to be calculated (W_a , W_b , and W_c) and three equations, W_a , W_b , and W_c can be calculated by solving the simultaneous equations. When these are actually solved, the weight of commodity A is “100”, the weight of commodity B is “200”, and the weight of commodity C is “50”. The unit weights of the commodities A to C obtained by solving the simultaneous equations are shown in FIG. 12B. The commodity weight calculation unit 114 outputs the solution of the simultaneous equations (unit weights) to the commodity data registration unit 109 such that it is associated with the commodities. Furthermore, if the commodity weight calculation unit 114 cannot solve the simultaneous equations, it outputs information indicating that there is no solution and the like, to the commodity data registration unit 109.

[0047]

The commodity data registration unit 109 determines whether or not there is a solution to the simultaneous equations based on the information acquired from the commodity weight calculation unit 114 (step S44). If there is a solution to the simultaneous equations (step S44: Yes), the commodity data registration unit 109 registers the unit weights acquired from the commodity weight calculation unit 114 in the commodity data storage unit 117 such that they are associated with the commodities (step S45). If there is no solution to the simultaneous equations, (step S44: No), the master registration processing is completed.

In this manner, according to the present exemplary embodiment, it is possible to automatically perform master registration of a unit weight in the flow of an inspection operation without performing master registration of a unit weight beforehand.

In the above example, with respect to registration of the commodity image, registration of the commodity image is possible in the master registration processing following inspection processing of the delivery slip 2. Furthermore, registration of the unit weight is possible during the master registration processing following inspection processing of the delivery slip 3. That is to say, the master registration processing of the commodity image and the master registration processing of the unit weight may be performed at independent timings. Moreover, in the above description, in step S32, processing is performed by reading all of the inspection data stored in the inspection data storage unit 116. However, it is not limited to such a case. It is possible to read only the inspection data that includes, in the description information, the inspection target commodity included in the inspection data used in the last inspection processing.

[0048]

According to the inspection processing device of the present exemplary embodiment, even when the collation unit 115 cannot specify the commodity appearing in an image that captures a target commodity by using the master image recorded in the commodity data storage unit 117, based on the recorded inspection data and the inspection target image that are recorded while the inspection operation is repeated several times, it is possible to automatically register the inspection commodity and the master image of the inspection commodity thereof in the commodity data storage unit 117 such that they are associated. Furthermore, based on the recorded inspection data and the weight data that are recorded while the inspection operation is repeated several times, it is possible to automatically register the inspection commodity and the unit weight of the inspection

commodity thereof in the commodity data storage unit 117 such that they are associated. Therefore, it is not necessary to perform master registration of the master image and unit weight of the commodity beforehand, and it is possible to reduce the effort associated with master registration. Furthermore, since master registration is performed using the captured image at the time of the inspection, the master image of only the side that is actually placed facing upward is registered, and images of the other sides are never registered. Therefore, since the number of images to be collated is limited solely to the side that is actually used in the inspection operation, the collation time can be shortened.

[0049]

<Second exemplary embodiment>

Hereunder, an inspection processing device according to a second exemplary embodiment of the present invention will be described with reference to FIG. 13 to FIG. 17.

When there are many inspection target commodities, the inspection target commodities placed on the weight measuring instrument 300 can overlap with each other. In such a case, it is difficult to individually clip the commodity images for each commodity. Therefore, it is difficult to automatically perform master registration of the commodity image using the same processing as in the first exemplary embodiment.

In the second exemplary embodiment, even in a case where commodities are placed overlapping with each other, the respective commodity images are registered in the commodity data storage unit 117 by dividing the images of the overlapping commodities.

FIG. 13 is a block diagram showing an example of the configuration of an inspection processing device according to the second exemplary embodiment of the present invention.

As shown in FIG. 13, the inspection processing device 100A according to the second exemplary embodiment differs from the first exemplary embodiment in the aspect that it includes a display information output unit 105A and a commodity data registration unit 109A in place of the display information output unit 105 and the commodity data registration unit 109 of the first exemplary embodiment. The display information output unit 105A provides an input means for the operator to perform an association operation with respect to the inspection commodity and the section in an inspection target image in which the inspection commodity thereof appears. The commodity data registration unit 109A includes a commodity image determination unit 110A and a commodity weight calculation unit 114. The commodity image determination unit 110A includes, in the same manner as the first exemplary embodiment, an image extraction unit 111, an image analysis unit 112, and a commodity specification unit 113, and further includes a partial image selection unit 118, which is a feature of the second exemplary embodiment. The remaining configuration of the inspection processing device 100A according to the second exemplary embodiment is the same as the first exemplary embodiment.

[0050]

The partial image selection unit 118 performs the following processing when the number of clipped sets images (commodity images) in the inspection target image is smaller than the total inspection quantity included in the inspection data. That is to say, the partial image selection unit 118 collates, based on an operation that associates the inspection commodity included in the inspection data with the section of the image in which the inspection commodity thereof appears, an image including a certain inspection commodity (for example, commodity A), which is an image among the set images including a plurality of commodities, and another set image containing the same inspection commodity (commodity A). The partial image selection unit 118, as a result of collation,

selects an image in a range having a matching feature amount as a partial image of the inspection commodity thereof (commodity A).

Furthermore, the commodity data registration unit 109A registers the image in the range selected by the partial image selection unit 118 and information indicating that the associated commodity and the image thereof are incomplete, in the commodity data storage unit 117 such that they are associated. Moreover, if a set image is obtained with respect to a certain commodity (for example, commodity A), which has a registered partial image, wherein the contour of the commodity thereof is successfully clipped (a commodity image of the commodity A unit), the commodity data registration unit 109A registers the image thereof in place of the partial image.

[0051]

Next, with reference to FIG. 14 to FIG. 16B, processing specific to the second exemplary embodiment will be described.

FIG. 14 is a diagram showing an example of an inspection confirmation screen according to the second exemplary embodiment of the present invention.

FIG. 14 shows an example of an inspection confirmation screen displayed when inspection processing is performed with respect to a “delivery slip 4”. The “delivery slip 4” includes two of commodity A, one of commodity B, and three of commodity C. Furthermore, it is assumed that commodity A, commodity B, and commodity C are not registered in the commodity data storage unit 117. Therefore, the image collation result display panel 63 displays “image NG”, and the weight comparison result display panel 64 displays “weight NG”. In the inspection processing with respect to the “delivery slip 4”, commodity A to commodity C are placed on the weight measuring instrument 300 as shown in the inspection target image display panel 62. That is to say, a portion of one commodity A is placed such that it overlaps with commodity C, and a portion of the other

commodity A is placed such that it overlaps with commodity B. If the commodities are placed overlapping with each other in this manner, when the image extraction unit 111 performs clipping of the commodity images, the overlappingly placed commodity A and commodity C are clipped as a single set commodity image (the commodity image 41 enclosed by the dashed line). Furthermore, the overlappingly placed commodity A and commodity B are clipped as a single set commodity image (the commodity image 44 enclosed by the dashed line). That is to say, in reality, despite a scenario where six commodities are placed on the weight measuring instrument 300, only four commodities are able to be clipped by image processing according to the background difference method and the like. Therefore, in the second exemplary embodiment, the partial image selection unit 118 divides the images of the overlappingly placed commodities for each commodity, and realizes semiautomatic master registration processing. More specifically, in the visual inspection screen (step S18 in FIG. 4), the input acceptance unit 104 accepts an operation by the operator that associates an inspection commodity included in the inspection data with a partial image in the inspection target image in which the inspection commodity thereof appears. The partial image selection unit 118 divides the commodity image based on this operation. In the second exemplary embodiment, the visual inspection screen may be an arbitrary image as long as it displays the inspection target image, and has an input means that associates a partial image in which a certain commodity appears in the inspection target image, with the commodity thereof. Here, the following description will be made assuming that the visual inspection screen is the same screen as the inspection confirmation screen exemplified in FIG. 14.

[0052]

FIG. 15 is a first diagram describing master registration processing according to the second exemplary embodiment of the present invention.

The left image in FIG. 15 is an example of the inspection target image display panel 62 after the operator has performed an operation associating a commodity and a partial image in which the commodity thereof appears. The right image in FIG. 15 is description data of the “delivery slip 4”. The operator, for example, performs an operation in a visual inspection confirmation screen equivalent to the inspection confirmation screen in FIG. 14, in which the first line in the inspection data display panel 61 is selected by a mouse or the like, and commodity A appearing in the inspection target image display panel 62 is further selected by a mouse or the like (points 41A and 44A in FIG. 15). Further, the operator presses a pointing confirmation button 66. This is an example of the operation that associates an inspection commodity (commodity A) included in the inspection data and a partial image in the inspection target image in which the inspection commodity thereof (commodity A) appears. When the operator performs the association operation, the input acceptance unit 104 accepts the operation, and outputs the identification information of commodity A and the coordinate information of the partial image selected by the operator, to the commodity data registration unit 109A via the control determination unit 101. In the commodity data registration unit 109A, the partial image selection unit 118 receives the information. Furthermore, the partial image selection unit 118 acquires the commodity image 41 and the commodity image 44 after clipping by the image extraction unit 111. Moreover, the partial image selection unit 118 acquires the feature amount of the commodity image 41 and the commodity image 44 calculated by the feature amount calculation unit 106. The partial image selection unit 118 uses the information to perform processing that divides the images of the overlapping commodities. Similarly, the operator may perform an operation with respect to commodity B and commodity C that associates the commodities and the partial images in which the commodities thereof appear. In that case, the partial image selection unit 118 acquires identification

information of commodity B and coordinate information of commodity B, and identification information of commodity C and coordinate information of commodity C.

[0053]

FIG. 16A and 16B are second diagrams describing master registration processing according to the second exemplary embodiment of the present invention.

With reference to FIG. 16A and 16B, clipping processing by the partial image selection unit 118 will be described. The partial image selection unit 118 performs image processing such as movement and rotation with respect to the commodity image 41 and the commodity image 44, performs collation of both images, and searches for a positional relationship in which the feature amount of both images become superimposed. Then, as shown in FIG. 16A, a positional relationship is found in which the regions in which commodity A appears are sectionally matched. The partial image selection unit 118 clips only the regions in a range having the matching feature amount from images that are superimposed with a positional relationship such that the feature amount becomes matched as exemplified in FIG. 16A. Then, the partial image selection unit 118 obtains a sectional image of commodity A as exemplified in FIG. 16B. At this time, if commodity A is partially hidden under other commodities in the manner of FIG. 16A, the other commodities can sometimes appear in the image of commodity A. Therefore, the partial image selection unit 118 is unable to recognize an accurate contour of commodity A from the image exemplified in FIG. 16A, and can sometimes only obtain a partial image. However, if the feature amount of commodity A is sufficiently included in the clipped partial image, collation processing of commodity A can be performed in the inspection processing. Therefore, in the second exemplary embodiment, the sectional image (partial image) clipped by the partial image selection unit 118 is registered in the commodity data storage unit 117 as the image of commodity A.

[0054]

Next, with reference to FIG. 17, master registration processing in the second exemplary embodiment will be described. In a case of No in step S17 in FIG. 4, it is assumed that in the visual inspection screen (which may be equivalent to the inspection confirmation screen in FIG. 14 for example), the input acceptance unit 104 receives an operation by the operator that associates an inspection commodity and a partial image in which the inspection commodity thereof appears. The input acceptance unit 104 outputs identification information of the associated inspection commodity and the coordinate information of the partial image selected by the operator, to the control determination unit 101. The control determination unit 101 records the information in a memory. Furthermore, in step S20, the control determination unit 101 associates the inspection target image, the weight data, the inspection data, the identification information of the commodity, and the coordinate information of the partial image selected by the operator, and records them in the inspection data storage unit 116.

An example of the display information output unit 105A outputting the visual inspection screen will be described. For example, the image extraction unit 111 performs clipping processing of the commodity from the inspection target image. The commodity data registration unit 109A compares the total inspection quantity included in the inspection data and the number of clipped commodity images. If both quantities do not match, the commodity data registration unit 109A displays a message such as “commodities are placed stacked, please perform an operation that associates the inspection commodity and the partial image in which the inspection commodity thereof appears” on the display information output unit 105A. The display thereof prompts the operator to perform an association operation.

[0055]

FIG. 17 is a flowchart showing an example of master registration processing in the inspection processing device according to the second exemplary embodiment of the present invention.

Of the processing shown in FIG. 17, the processing equivalent to that of FIG. 8 will be briefly described. Firstly, the commodity data registration unit 109A sets the variable N to “1” (step S31). The commodity data registration unit 109A reads and acquires the inspection data, the inspection target image, and the weight data registered in the Nth cycle, from the inspection data storage unit 116 (step S32). Next, the commodity data registration unit 109A determines whether or not even one case of a visual inspection result is included in the inspection data of the Nth cycle (step S33). If the inspection data of the Nth cycle does not include a visual inspection (step S33: No), the processing proceeds to the determination of step S37. If a visual inspection result is included (step S33: Yes), the image extraction unit 111 clips a commodity image from the inspection target image (step S34). Next, the feature amount calculation unit 106 calculates a feature amount with respect to the clipped commodity image (step S35). The commodity data registration unit 109A acquires the commodity image clipped by the image extraction unit 111 and the feature amount of the commodity image thereof. Next, the commodity data registration unit 109A determines whether or not the number of clipped commodity images matches the number of all inspection commodities included in the inspection data of the Nth cycle (step S351). In the case these match (step S351: Yes), the processing proceeds to step S36.

[0056]

In the case these do not match (step S351: No), the control determination unit 101 reads the identification information of the commodity and the coordinate information of the partial image of the commodity thereof recorded in the inspection data storage unit 116

(step S352), and outputs the information to the commodity data registration unit 109A. Next, in the commodity data registration unit 109A, the partial image selection unit 118 performs clipping processing of a partial image (step S353). Specifically, as described with reference to FIG. 16A and 16B, the partial image selection unit 118 performs image processing that superimposes a plurality of images including the same commodity such that the distribution of the feature amount included in the image thereof is matched. Further, the partial image selection unit 118 clips only the range of the section in which the feature amount matches (commodity A in the example of FIG. 16A and 16B). If there is a plurality of types of commodities that appear overlapped in the manner of commodity A, the partial image selection unit 118 performs clipping processing of a partial image with respect to each of the plurality of types of commodities. Furthermore, the partial image selection unit 118 also performs clipping from commodity images that include a plurality of commodities with respect to the sections of the image other than those of the clipped image (in the example of FIG. 15, the section in which commodity C appears in the commodity image 41 and the section in which commodity B appears in the commodity image 44). In the processing of step S353, the partial image selection unit 118 obtains two images including the feature amount of commodity A, and one image including the feature amount of commodity B and one image including the feature amount of commodity C after clipping of commodity A.

[0057]

Next, the commodity weight calculation unit 114 uses the inspection data of the Nth cycle and the weight data corresponding to the same, to mathematically express the relationship between the weight data and the inspection data (step S36). Then, the commodity data registration unit 109A determines whether or not the variable N is equal to the number of inspection data that have been recorded (step S37). If the variable N is not

equal to the number of inspection data that have been recorded (step S37: No), the commodity data registration unit 109A adds “1” to the variable N (step S38), and repeats the processing from step S32. If the variable N is equal to the number of inspection data that have been recorded (step S37: Yes), the image analysis unit 112 collates the clipped images from the image extraction unit 111 and the partial image selection unit 118 (including a commodity image in which one commodity appears and a partial image that has been clipped from a commodity image in which a plurality of commodities appear) with each other (step S39). If an inspection target image as shown in FIG. 15 is obtained, the image analysis unit 112 uses two images of commodity C clipped by the image extraction unit 111, two images of commodity A clipped by the partial image selection unit 118, the remaining one image of commodity B and one image of commodity C clipped by the partial image selection unit 118, and the commodity images clipped from the inspection target images of the other delivery slips, to perform collation processing in a round-robin to determine whether or not there are images having feature quantities that match with each other. Then, the image analysis unit 112 determines whether or not there are images of matching commodities among all of the clipped images (step S40). If there is no images of matching commodities (step S40: No), the processing proceeds to the processing of step S43.

[0058]

If there are images of matching commodities (step S40: Yes), the image analysis unit 112 calculates the quantity of each type of commodity image and partial image included in the inspection target image in which collation was performed, for each inspection target image. Then, the commodity specification unit 113 determines whether or not there is a commodity in which the number of images having a matching feature amount matches the inspection quantity of the inspection data (step S41). If there is a

matching commodity (step S41: Yes), the commodity data registration unit 109A associates the commodity image or partial image of the commodity, in which the number of commodity images included in the inspection target image and the like matches the inspection quantity included in the inspection data, with the commodity thereof, and registers them in the commodity data storage unit 117 (step S42). At this time, commodities in which the registered image is a partial image wherein the contour of the commodity are unclear are registered by the commodity data registration unit 109A such that they are associated with information indicating that the image is incomplete. If there are no commodities in which the number of images having a matching feature amount matches the inspection quantity of the inspection data (step S41: No), the processing proceeds to the processing of step S43.

[0059]

Next, the commodity weight calculation unit 114 simultaneously solves all the equations generated in step S36 (step S43). If there is a solution to the simultaneous equations (step S44: Yes), the commodity data registration unit 109A registers the unit weights calculated by the commodity weight calculation unit 114 in the commodity data storage unit 117 such that they are associated with the commodities (step S45). If there is no solution to the simultaneous equations (step S44: No), the processing proceeds to step S46.

Then, the commodity data registration unit 109A determines, with respect to a commodity in which a partial image is registered, whether or not an image including the contour can be obtained (step S46). A commodity in which a partial image is registered, for example, refers to a commodity such as commodity A in the “delivery slip 4” described above. Here, it is assumed that inspection processing of a “delivery slip 5” has been performed after the “delivery slip 4”. In that case, the commodity data registration unit 109A searches the commodity data storage unit 117 for the commodities included in the

inspection data of the delivery slip 5, and confirms whether or not there is a registered master image that has been registered such that it is associated with information indicating that the image is incomplete. For example, if commodity A is included in the inspection data of the “delivery slip 5”, the commodity data registration unit 109A searches the commodity data storage unit 117 and determines that there is a commodity registered with a partial image included in the inspection data. Next, the commodity data registration unit 109A determines whether or not commodity A appears in the inspection target image of the “delivery slip 5” in a form in which the contour can be recognized. For example, the image extraction unit 111 clips all of the commodities from the inspection target image, and determines whether or not the number of commodity images clipped by the commodity data registration unit 109A matches the total inspection quantity included in the inspection data. In the case of a match, the image analysis unit 112 collates the images clipped by the image extraction unit 111 and the partial image of commodity A registered in the commodity data storage unit 117. As a result of collation, if an image having a feature amount matching that of the partial image of commodity A is found in the commodity image, the commodity image thereof can be considered to be an image including the feature amount of commodity A in which the contour of commodity A can be recognized. In this case, the commodity data registration unit 109A determines that an image including the contour can be obtained. If it is determined that an image including the contour can be obtained (step S46: Yes), the image analysis unit 112 outputs the commodity image including the contour to the commodity data registration unit 109A. The commodity data registration unit 109A updates the partial image of commodity A that has been registered with the commodity image thereof (step S47). For example, the commodity data registration unit 109A registers the commodity image of commodity A, which has been determined by the image analysis unit 112 to be matching as a result of

collation, in the commodity data storage unit 117 such that it is associated with commodity A. Furthermore, the partial image of commodity A that has been registered and the information associated with commodity A indicating that the image is an incomplete image are removed from the commodity data storage unit 117. If it is determined that an image including the contour cannot be obtained (step S46: No), the master registration processing is completed.

[0060]

According to the second exemplary embodiment, in addition to obtaining the advantageous effects of the first exemplary embodiment, even under a scenario in which commodities are placed such that they overlap with each other, it is possible to semi-automatically register a master image in the commodity data storage unit 117 in the flow of an inspection operation without performing master registration of the image beforehand. Furthermore, as the inspection operation continues, with respect to the inspection commodities in which a partial image has been registered, if a commodity image that has been captured in a non-overlapping state is included in an inspection target image, by performing processing that replaces the master image with the commodity image thereof, it is possible to correct a master image that has been registered in a state where it is overlapping with other commodities, and the collation accuracy can be further improved.

[0061]

<Third exemplary embodiment>

Hereunder, an example of inspection processing according to a third exemplary embodiment of the present invention will be described with reference to FIG. 18.

In the third exemplary embodiment, if an image of a commodity is not registered in the commodity data storage unit 117, a commodity image of the commodity thereof can

be registered in the commodity data storage unit 117 by a pointing confirmation operation by the operator. A pointing confirmation operation is an operation that associates an inspection commodity and a partial image in which the commodity thereof appears. The configuration of the third exemplary embodiment is, for example, the same as the inspection processing device 100A in the second exemplary embodiment. Next, with reference to FIG. 18, inspection processing and registration processing of a commodity image in the third exemplary embodiment will be described.

[0062]

FIG. 18 is a flowchart showing an example of inspection processing using the inspection processing device according to the third exemplary embodiment of the present invention.

FIG. 19 is a diagram showing an example of an inspection confirmation screen according to the third exemplary embodiment of the present invention.

Of the processing in FIG. 19, the processing equivalent to that in FIG. 4 of the first exemplary embodiment will be briefly described.

It is assumed that inspection data has been input to the inspection processing device 100A. Then, the target total weight calculation unit 108 calculates a target total weight using the unit weight of the inspection commodity and the inspection quantity included in the inspection data (step S11). Next, the operator places the inspection target commodity 600 on the weight measuring instrument 300. Then, the weight measuring instrument 300 measures the weight, and the weight acquisition unit 102 acquires the weight data (step S12). The imaging device 200 then captures an inspection target image of the inspection target commodity 600, and the commodity image acquisition unit 103 acquires the inspection target image thereof (step S13). Then, the feature amount calculation unit 106 calculates the feature amount of the inspection target image (step S14).

Next, the collation unit 115 searches for whether or not the inspection commodity appears in the inspection target image using the master image registered in the commodity data storage unit 117 (step S15). The display information output unit 105A then generates an image of the inspection confirmation screen exemplified in FIG. 19, and displays the image on the display device 400 (step S16).

[0063]

Next, the operator confirms whether or not all of the commodities have been specified (step S17). For example, if any of the commodities could not be specified (step S17: No), a visual confirmation screen (which may be equivalent to the inspection confirmation screen exemplified in FIG. 19) is displayed on the display information output unit 105A (step S18). The operator adjusts the commodities placed on the weight measuring instrument 300 until the completion of the visual inspection on the visual confirmation screen. If the inspection commodity included in the inspection data is placed on the weight measuring instrument 300 without excess or deficiency, the operator performs a registration operation of the unregistered commodities. The registration operation will be described assuming that the visual confirmation screen is equivalent to the screen exemplified in FIG. 19. Firstly, the operator performs an operation that associates the inspection commodity with the partial image in which the inspection commodity thereof appears. For example, the operator performs an operation that selects the first line of the inspection data display panel 61, and further performs an operation that selects the position of two sections in which commodity A appears in the inspection target image display panel 62. Further, the operator presses the pointing confirmation button 66. The operator also performs the same operation with respect to commodity B and commodity C. The input acceptance unit 104 accepts an operation by the operator that associates the inspection commodity with the partial image in which the inspection

commodity thereof appears (step S22). The input acceptance unit 104 outputs the identification information of the associated inspection commodity and the coordinate information of the partial image selected by the operator, to the commodity data registration unit 109A via the control determination unit 101. Next, the commodity data registration unit 109A registers the image of the commodity in the commodity data storage unit 117 (step S23). Specifically, the image extraction unit 111 performs processing that clips the commodity images from the inspection target image, and the commodity data registration unit 109A registers, among the clipped commodity images, the commodity image that includes the coordinate information of the section selected by the operator, in the commodity data storage unit 117, such that the image is associated with the inspection commodity that the operator has associated with the commodity image thereof. As a result, the inspection is completed.

[0064]

On the other hand, if all of the commodities have been specified (step S17: Yes), the operator confirms whether or not the total weight error is within the allowed range (step S19). If it is not within the allowed range (step S19: No), the operator adjusts the excess or deficiency of the commodity. When the total weight error falls within the allowed range as a result of the adjustment operation by the operator (step S19), the inspection is completed. Upon completion of the inspection, the control determination unit 101 associates the inspection target image, the weight data, and the inspection data and records them in the inspection data storage unit 116 (step S20). Next, the inspection processing device 100 performs master registration processing (step S24). In the master processing of the third exemplary embodiment, the registration processing of the master image is completed by an operation by the operator. Therefore, the commodity weight calculation unit 114

calculates the unit weight, and the commodity data registration unit 109A registers the unit weight for each commodity in the commodity data storage unit 117.

[0065]

According to the third exemplary embodiment, if an inspection commodity exists in which a master image is not registered in the commodity data storage unit 117, the operator can register a master image by simply performing an operation during the inspection operation that associates the inspection commodity thereof to the image of the inspection commodity thereof. As a result, it becomes unnecessary to register the master image beforehand, which saves effort. Furthermore, in the visual inspection screen, as a result of the operator performing pointing confirmation with respect to the commodity images appearing in the inspection target image and the inspection commodity included in the inspection data, an effect in which errors in the inspection operation are reduced can be anticipated.

[0066]

<Modified Example>

The commodity data registration unit 109 in the first exemplary embodiment and the commodity data registration unit 109A in the second exemplary embodiment can each be configured as independent devices and used as a commodity master registration device.

FIG. 20 is a block diagram showing an example of the configuration of a commodity master registration device according to an exemplary embodiment of the present invention.

As shown in FIG. 20, the commodity master registration device 150 includes a control determination unit 101, an input acceptance unit 104, and a commodity data registration unit 109.

In the commodity master registration device 150, the input acceptance unit 104 acquires a plurality of inspection data, and an inspection target image and weight data that have been inspected with respect to the inspection data thereof. The commodity data registration unit 109, for example, based on a master registration instruction operation by the operator, uses the data acquired by the input acceptance unit 104 to obtain a master image of the commodity and a unit weight that are included in the inspection data, according to the processing described with reference to FIG. 8, and registers the information in the commodity master 151. According to the commodity master registration device 150, registration of the master image and the like in the commodity master 151 can be performed by using the inspection data, the inspection target image, and the weight data obtained in the inspection operation.

[0067]

FIG. 21 is a block diagram showing an example of the hardware configuration of an inspection processing device and a commodity data registration device according to an exemplary embodiment of the present invention.

As shown in FIG. 21, the inspection processing devices 100 and 100A are realized by a computer device including a CPU 901, a memory 902, a storage device 903 such as a hard disk, and a communication IF 904 (communication interface) for network connection. However, the configuration of the inspection processing devices 100 and 100A is not limited to the computer device shown in FIG. 21. For example, the inspection processing devices 100 and 100A may transmit images or weight data to the outside via the communication IF 904, externally collate the commodities to be inspected, and receive the result thereof. The same applies to the commodity master registration device 150.

[0068]

The block diagrams used in each exemplary embodiment represent blocks of functional units rather than hardware unit configurations. The functional blocks are realized by arbitrary combinations of hardware and software. Furthermore, the inspection processing devices 100 and 100A and the commodity master registration device 150 may be realized by a single physically coupled device, or may be realized by a plurality of devices in which two or more physically separated devices are connected by wired or wireless connections.

[0069]

The inspection processing devices 100 and 100A and the commodity master registration device 150 mentioned above have an internal computer. Further, the steps in the processing of the inspection processing devices 100 and 100A and the commodity master registration device 150 mentioned above are stored in a computer-readable recording medium in the form of a program, and the processing described above is performed by the computer reading and executing the program. Here, the computer-readable recording medium refers to a magnetic disk, a magneto-optical disk, a CD-ROM, a DVD-ROM, a semiconductor memory, or the like. Furthermore, the computer program may be transmitted to the computer by means of a communication line, and the computer receiving the transmission may execute the program.

[0070]

Moreover, the program described above may be one for realizing a portion of the functions mentioned above. Further, the program described above may be one that realizes the functions mentioned above by being combined with a program already stored in the computer system, as a so-called difference file (difference program).

[0071]

In addition, it is possible to appropriately replace the constituent elements in the exemplary embodiments described above with known constituent elements without departing from the scope of the present invention. Furthermore, the technical scope of the present invention is not limited to the exemplary embodiments described above, and various modifications can be made without departing from the spirit of the present invention.

[0072]

The exemplary embodiments described above may also be described entirely or in part by the following supplementary notes, without being limited to the following.

[0073]

(Supplementary Note 1)

An inspection processing device comprising:

a commodity image determination unit that specifies an image for each of at least one inspection commodity, based on first inspection data and a first inspection target image, the first inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the first inspection target image representing a commodity group that matches the first inspection data;

a commodity data registration unit that registers the specified image in a storage unit; and

a collation unit that specifies, among commodities included in a second inspection target image corresponding to second inspection data, a commodity of the same type as one of the at least one inspection commodity, based on the image stored in the storage unit.

[0074]

(Supplementary Note 2)

The inspection processing device according to supplementary note 1, wherein the commodity image determination unit includes:

an image extraction unit that clips, from the first inspection target image, a plurality of set images that are a candidate for an image of any one of the at least one inspection commodity;

an image extraction unit that compares the plurality of clipped images with each other and calculates a quantity of each type of the plurality of clipped images; and

a commodity specification unit that compares the quantity of each type of the plurality of clipped images with the at least one inspection quantity, and specifies a commodity indicated by each of the plurality of clipped images.

[0075]

(Supplementary Note 3)

The inspection processing device according to supplementary note 1 or 2, wherein the commodity image determination unit specifies each inspection commodity included in at least one inspection data, based on the at least one inspection data and at least one inspection target image, the at least one inspection data including the first inspection data, the at least one inspection target image respectively matching the at least one inspection data.

[0076]

(Supplementary Note 4)

The inspection processing device according to any one of supplementary notes 1 to 3, further comprising:

a commodity weight calculation unit that calculates a unit weight of each type of the at least one inspection commodity based on an equation that describes a relationship between the unit weight of each type of the at least one inspection commodity and the at

least one inspection quantity, and weight data representing a measured weight of the commodity group.

[0077]

(Supplementary Note 5)

The inspection processing device according to supplementary note 4, wherein the commodity weight calculation unit calculates a unit weight of each type of an inspection commodity included in the at least one inspection data, based on the at least one inspection data and weight data of at least one commodity group, the at least one inspection data including the first inspection data, the at least one commodity group respectively matching the at least one inspection data.

[0078]

(Supplementary Note 6)

The inspection processing device according to any one of supplementary note 1 and supplementary notes 3 to 5, further comprising wherein the commodity image determination unit includes:

an image extraction unit that clips, from the first inspection target image, a plurality of set images that are a candidate for an image of any one of the at least one inspection commodity; and

a partial image selection unit that, in a case where the plurality of clipped images include a first set image that represents an image in which a portion of one commodity is overlapped by another commodity, selects as a partial image of the one commodity a section representing the one commodity among the first set image, based on at least a feature amount of the other commodity.

[0079]

(Supplementary Note 7)

The inspection processing device according to supplementary note 6, wherein the commodity data registration unit registers the partial image in the storage unit such that the partial image is associated with information indicating that the partial image is an incomplete image.

[0080]

(Supplementary Note 8)

The inspection processing device according to supplementary note 7, wherein the commodity data registration unit replaces the partial image with an image obtained by capturing a commodity of the same type as the one commodity in a state where it is not overlapping with another commodity.

[0081]

(Supplementary Note 9)

The inspection processing device according to any one of supplementary notes 1 to 8, wherein the commodity data registration unit registers, based on an operation that associates a first inspection commodity among the at least one inspection commodity with one set image clipped from the first inspection target image, the one set image as an image representing the first inspection commodity in the storage unit.

[0082]

(Supplementary Note 10)

An inspection system comprising:

an imaging device that captures the commodity group and acquires the first inspection target image;

a weight measuring instrument that measures a weight of the commodity group;

and

the inspection processing device according to any one of supplementary notes 1 to

9, the inspection processing device acquiring the first inspection target image acquired by the imaging device, and the weight of the commodity group measured by the weight measuring instrument.

[0083]

(Supplementary Note 11)

A commodity master registration device comprising:

a commodity image determination unit that specifies an image for each of at least one inspection commodity, based on inspection data and an inspection target image, the inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the inspection target image representing a commodity group that matches the inspection data; and

a commodity data registration unit that registers the specified image in a commodity master.

[0084]

(Supplementary Note 12)

An inspection processing method comprising:

specifying an image for each of at least one inspection commodity, based on first inspection data and a first inspection target image, the first inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the first inspection target image representing a commodity group that matches the first inspection data;

registering the specified image in a storage unit; and

specifying, among commodities included in a second inspection target image corresponding to second inspection data, a commodity of the same type as one of the at least one inspection commodity, based on the image stored in the storage unit.

[0085]

(Supplementary Note 13)

A program that causes a computer to execute:

specifying an image for each of at least one inspection commodity, based on first inspection data and a first inspection target image, the first inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the first inspection target image representing a commodity group that matches the first inspection data;

registering the specified image in a storage unit; and

specifying, among commodities included in a second inspection target image corresponding to second inspection data, a commodity of the same type as one of the at least one inspection commodity, based on the image stored in the storage unit.

[0086]

This application is based upon and claims the benefit of priority from Japanese patent application No. 2016-069899, filed March 31, 2016, the disclosure of which is incorporated herein in its entirety by reference.

INDUSTRIAL APPLICABILITY

[0087]

The present invention may be applied to an inspection processing device, an inspection system, a commodity master registration device, an inspection processing method, and a program.

Reference Symbols

[0088]

- 1 Inspection system
- 100 Inspection processing device
- 101 Control determination unit
- 102 Weight acquisition unit
- 103 Commodity image acquisition unit
- 104 Input acceptance unit
- 105, 105A Display information output unit
- 106 Feature amount calculation unit
- 107 Inspection data saving unit
- 108 Target total weight calculation unit
- 109 Commodity data registration unit
- 110 Commodity image determination unit
- 111 Image extraction unit
- 112 Image analysis unit
- 113 Commodity specification unit
- 114 Commodity weight calculation unit
- 115 Collation unit
- 116 Inspection data storage unit
- 117 Commodity data storage unit

- 118 Partial image selection unit
- 150 Commodity master registration device
- 151 Commodity master
- 200 Imaging device
- 300 Weight measuring instrument
- 301 Base
- 302 Support
- 400 Display device
- 500 Input device
- 600 Inspection target commodity
- 901 CPU
- 902 Memory
- 903 Storage device
- 904 Communication IF

CLAIMS

1. An inspection processing device comprising:
 - a commodity image determination unit that specifies an image for each of at least one inspection commodity, based on first inspection data and a first inspection target image, the first inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the first inspection target image representing a commodity group that matches the first inspection data;
 - a commodity data registration unit that registers the specified image in a storage unit; and
 - a collation unit that specifies, among commodities included in a second inspection target image corresponding to second inspection data, a commodity of the same type as one of the at least one inspection commodity, based on the image stored in the storage unit.
2. The inspection processing device according to claim 1, wherein the commodity image determination unit includes:
 - an image extraction unit that clips, from the first inspection target image, a plurality of set images that are a candidate for an image of any one of the at least one inspection commodity;
 - an image extraction unit that compares the plurality of clipped images with each other and calculates a quantity of each type of the plurality of clipped images; and
 - a commodity specification unit that compares the quantity of each type of the plurality of clipped images with the at least one inspection quantity, and specifies a commodity indicated by each of the plurality of clipped images.

3. The inspection processing device according to claim 1 or 2, wherein the commodity image determination unit specifies each inspection commodity included in at least one inspection data, based on the at least one inspection data and at least one inspection target image, the at least one inspection data including the first inspection data, the at least one inspection target image respectively matching the at least one inspection data.

4. The inspection processing device according to any one of claims 1 to 3, further comprising:

a commodity weight calculation unit that calculates a unit weight of each type of the at least one inspection commodity based on an equation that describes a relationship between the unit weight of each type of the at least one inspection commodity and the at least one inspection quantity, and weight data representing a measured weight of the commodity group.

5. The inspection processing device according to claim 4, wherein the commodity weight calculation unit calculates a unit weight of each type of an inspection commodity included in the at least one inspection data, based on the at least one inspection data and weight data of at least one commodity group, the at least one inspection data including the first inspection data, the at least one commodity group respectively matching the at least one inspection data.

6. The inspection processing device according to any one of claim 1 and claims 3 to 5, further comprising wherein the commodity image determination unit includes:

an image extraction unit that clips, from the first inspection target image, a plurality of set images that are a candidate for an image of any one of the at least one inspection commodity; and

a partial image selection unit that, in a case where the plurality of clipped images include a first set image that represents an image in which a portion of one commodity is overlapped by another commodity, selects as a partial image of the one commodity a section representing the one commodity among the first set image, based on at least a feature amount of the other commodity.

7. The inspection processing device according to claim 6, wherein the commodity data registration unit registers the partial image in the storage unit such that the partial image is associated with information indicating that the partial image is an incomplete image.

8. The inspection processing device according to claim 7, wherein the commodity data registration unit replaces the partial image with an image obtained by capturing a commodity of the same type as the one commodity in a state where it is not overlapping with another commodity.

9. The inspection processing device according to any one of claims 1 to 8, wherein the commodity data registration unit registers, based on an operation that associates a first inspection commodity among the at least one inspection commodity with one set image clipped from the first inspection target image, the one set image as an image representing the first inspection commodity in the storage unit.

10. An inspection system comprising:
 - an imaging device that captures the commodity group and acquires the first inspection target image;
 - a weight measuring instrument that measures a weight of the commodity group;
 - and
 - the inspection processing device according to any one of claims 1 to 9, the inspection processing device acquiring the first inspection target image acquired by the imaging device, and the weight of the commodity group measured by the weight measuring instrument.
11. A commodity master registration device comprising:
 - a commodity image determination unit that specifies an image for each of at least one inspection commodity, based on inspection data and an inspection target image, the inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the inspection target image representing a commodity group that matches the inspection data; and
 - a commodity data registration unit that registers the specified image in a commodity master.
12. An inspection processing method comprising:
 - specifying an image for each of at least one inspection commodity, based on first inspection data and a first inspection target image, the first inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection

commodity, the first inspection target image representing a commodity group that matches the first inspection data;

registering the specified image in a storage unit; and

specifying, among commodities included in a second inspection target image corresponding to second inspection data, a commodity of the same type as one of the at least one inspection commodity, based on the image stored in the storage unit.

13. A program that causes a computer to execute:

specifying an image for each of at least one inspection commodity, based on first inspection data and a first inspection target image, the first inspection data including the at least one inspection commodity which is an object to be inspected and at least one inspection quantity that represents a quantity of each of the at least one inspection commodity, the first inspection target image representing a commodity group that matches the first inspection data;

registering the specified image in a storage unit; and

specifying, among commodities included in a second inspection target image corresponding to second inspection data, a commodity of the same type as one of the at least one inspection commodity, based on the image stored in the storage unit.