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INSPECTION SYSTEM, INSPECTION APPARATUS, INSPECTION METHOD, AND NON-TRANSITORY RECORDING MEDIUM

Abstract

An inspection apparatus includes circuitry. The circuitry generates printing data from design data including a variable area and record information of variable input data. The circuitry inspects whether data read from the variable area of the printing data includes an error, based on the record information of the variable input data. The circuitry controls printing of the printing data in accordance with a result of inspecting the error.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application is based on and claims priority pursuant to 35 U.S.C. § 119 (a) to Japanese Patent Application No. 2024-018924, filed on Feb. 9, 2024, in the Japan Patent Office, the entire disclosure of which is hereby incorporated by reference herein.

BACKGROUND

Technical Field

[0002] The present disclosure relates to an inspection system, an inspection apparatus, an inspection method, and a non-transitory recording medium.

Related Art

[0003] Variable printing prints different contents on a part of a printed material such as the postal code and address of a destination, according to the contents of records of input data. Further, a print inspection apparatus reads a printed material on which a printing apparatus has performed variable printing, and compares the read printed material with each record of original input data to inspect whether printing is normally performed.

SUMMARY

[0004] According to an embodiment of the present disclosure, an inspection apparatus includes circuitry. The circuitry generates printing data from design data including a variable area and record information of variable input data. The circuitry inspects whether data read from the variable area of the printing data includes an error, based on the record information of the variable input data. The circuitry controls printing of the printing data in accordance with a result of inspecting the error.

[0005] According to an embodiment of the present disclosure, an inspection method performed by one or more computers includes generating printing data from design data including a variable area and record information of variable input data. The inspection method includes whether data read from the variable area of the printing data includes an error, based on the record information of the variable input data. The inspection method includes controlling printing of the printing data in accordance with a result of the inspecting the error.

[0006] According to an embodiment of the present disclosure, a non-transitory recording medium storing a plurality of instructions which, when executed by one or more processors, causes the one or more processors to perform an inspection method. The inspection method includes generating printing data from design data including a variable area and record information of variable input data. The inspection method includes whether data read from the variable area of the printing data includes an error, based on the record information of the variable input data. The inspection method includes controlling printing of the printing data in accordance with a result of the inspecting the error.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] A more complete appreciation of embodiments of the present disclosure and many of the attendant advantages and features thereof can be readily obtained and understood from the following detailed description with reference to the accompanying drawings, wherein:

[0008] FIG. **1** is a diagram illustrating an example of a system configuration of an inspection system;

[0009] FIG. **2** is a diagram illustrating an overview of processing according to an embodiment;

[0010] FIG. **3** is a block diagram illustrating an example of a hardware configuration of a

computer;
[0011] FIG. **4** is a diagram illustrating an example of a functional configuration of an inspection system;
[0012] FIG. **5** is a flowchart illustrating an example of processing performed by an inspection system according to a first embodiment;
[0013] FIG. **6**A is a diagram illustrating an example of a UI screen, and FIG. **6**B is a diagram illustrating another example of a UI screen;
[0014] FIG. **7** is a diagram illustrating an example of a UI screen;
[0015] FIG. **8** is a diagram illustrating an example of variable input data;
[0016] FIG. **9** is a diagram illustrating an example of a UI screen;
[0017] FIG. **10** is a flowchart illustrating an example of first inspection processing according to the first embodiment;
[0018] FIG. **11** is a diagram illustrating an example of an inspection result of first inspection processing according to the first embodiment;
[0019] FIG. **12** is a diagram illustrating an example of a display screen of an inspection result according to the first embodiment;
[0020] FIG. **13** is a flowchart illustrating an example of second inspection processing according to the first embodiment;
[0021] FIG. **14** is a diagram illustrating an example of a display screen of an inspection result according to the first embodiment;
[0022] FIG. **15** is a flowchart illustrating an example of processing performed by an inspection system according to a second embodiment;
[0023] FIG. **16** is a diagram for illustrating an overview of processing according to a third embodiment;
[0024] FIG. **17**A is a diagram illustrating an example of data according to the third embodiment, and FIG. **17**B is a diagram illustrating an example of data according to the third embodiment; and
[0025] FIG. **18** is a flowchart illustrating an example of first inspection processing according to the third embodiment.
[0026] The accompanying drawings are intended to depict embodiments of the present disclosure and should not be interpreted to limit the scope thereof. The accompanying drawings are not to be considered as drawn to scale unless explicitly noted. Also, identical or similar reference numerals designate identical or similar components throughout the several views.

DETAILED DESCRIPTION

[0027] In describing embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the disclosure of this specification is not intended to be limited to the specific terminology so selected and it is to be understood that each specific element includes all technical equivalents that have a similar function, operate in a similar manner, and achieve a similar result.
[0028] Referring now to the drawings, embodiments of the present disclosure are described below. As used herein, the singular forms “a,” “an,” and “the” are intended to include the plural forms as well, unless the context clearly indicates otherwise.
[0029] Embodiments of the present disclosure are described below with reference to drawings.

System Configuration

[0030] FIG. **1** is a diagram illustrating an example of a system configuration of an inspection system. The inspection system **1** is a system that inspects printing data used for variable printing, which prints different contents on a part of a printed material such as the postal code and address of a destination, according to contents of each record of input data, and the printed material. As illustrated in FIG. **1**, the inspection system **1** includes an information terminal **10**, an information processing apparatus (inspection apparatus) **100**, a digital front end (DFE) **21**, and a printing apparatus **22**. The DFE **21** and the printing apparatus **22** are examples of a printing system **20** that

prints printing data.
[0031] The information terminal **10** is a computer connected to the information processing apparatus **100** to communicate with the information processing apparatus **100**. As an example, the information terminal **10** is a personal computer (PC) used by a client who orders the variable printing. In this case, the information terminal **10** transmits submission data used for performing the variable printing to the information processing apparatus **100**. The inspection system **1** may acquire the submission data from a server apparatus that manages submission data used for performing the variable printing, instead of the information terminal **10**. In this case, the information processing apparatus **100** acquires the submission data used for performing the variable printing from the server apparatus as needed.
[0032] The submission data used for performing the variable printing includes, for example, design data and variable input data. The design data is data used for printing a common portion of the variable printing. Examples of the design data include, but not limited to, image data such as portable document format (PDF) data. The variable input data is data used for printing a variable portion of the variable printing. Examples of the variable input data include, but not limited to, text data such as comma separated values (CSV) data.
[0033] The information processing apparatus (inspection apparatus) **100** is, for example, a computer connected to the information terminal **10** and the printing system **20** to communicate with the information terminal **10** and the printing system **20**. The information processing apparatus **100** generates printing data (e.g., PDF data) used for the variable printing based on the submission data acquired from the information terminal **10**, and performs, for example, inspection of the printing data, control of printing, and inspection of the printed material.
[0034] The DFE **21** is an information processing apparatus that performs raster image processor (RIP) processing to convert the printing data generated by the information processing apparatus **100** into a raster image printable by the printing apparatus **22**. The printing apparatus **22** or the information processing apparatus **100** may have the function of the DFE **21**.
[0035] The printing apparatus **22** is an image forming apparatus that performs printing on a sheet of paper as a recording medium based on the data generated by the DFE **21**. The printing apparatus **22** according to the present embodiment has a function of acquiring read image data obtained by reading a printed material printed by the printing apparatus **22**. Further, the printing apparatus **22** may be connected to a post-processing apparatus such as a stacker that stacks the printed material printed by the printing apparatus **22** on a tray.
Overview of Operation
[0036] FIG. **2** is a diagram illustrating an overview of processing according to an embodiment. The information processing apparatus **100** includes a generation unit **201** that generates printing data (e.g., a PDF file) from, for example, input design data (e.g., a PDF file) having a variable area and record information of variable input data (a CSV file).
[0037] An operator performs, for example, design of a printed material, imposition, setting of a variable area, and print setting using a predetermined application program installed in the information processing apparatus **100**. In response to this, the generation unit **201** performs, for example, variable processing and imposition processing, and generates printing data for the variable printing.
[0038] The information processing apparatus **100** further includes a first inspection unit **202** that inspects the presence of an error in data read from the variable area of the printing data generated by the generation unit **201** based on the record information of the variable input data. The first inspection unit **202** performs, for example, data extraction processing of extracting the record information from the variable area of the printing data, and data comparison processing of comparing the record information of the variable input data with the extracted record information to inspect the presence of an error in the variable area of the printing data. In addition, when there is no error in the variable area of the printing data, the first inspection unit **202** performs print-

image generation processing of generating print image data (master data) obtained by imaging the printing data.

[0039] The information processing apparatus **100** further includes a print control unit **203** that controls printing of the printing data in accordance with the result of the inspection performed by the first inspection unit **202**. For example, when the data read from the variable area of the printing data includes no error, the print control unit **203** transmits, for example, the printing data and print-setting information to the printing system **20** and controls the printing system **20** to start printing the printing data. On the other hand, when the data read from the variable area of the printing data includes an error, the print control unit **203** controls the printing system **20** to cancel printing the printing data. For example, when the data read from the variable area of the printing data includes an error, the print control unit **203** does not transmit, for example, the printing data and the print-setting information to the printing system **20**.

[0040] The printing system **20** performs the RIP processing and printing processing on the printing data based on the printing data and the print-setting information received from the information processing apparatus **100**, to generate a printed material. Additionally, the printing system **20** performs reading processing on the printed material and transmits the read image data to the information processing apparatus **100**.

[0041] The information processing apparatus **100** further includes a second inspection unit **204** that inspects a defect of a printed material by performing image comparison processing of comparing the print image data generated by the first inspection unit **202** with the acquired read image data.

[0042] By the above-described configuration, the inspection system **1** does not transmit the printing data and the print-setting information to the printing system **20** when the printing data of the variable printing includes an error, and thus prevents an unnecessary printed material from being generated. In addition, the inspection system **1** performs each inspection at an appropriate timing in a process of inspection processing of consistently performing the inspection from the printing data to the printed material.

Hardware Configuration

Hardware Configuration of Information Processing Apparatus

[0043] For example, the information processing apparatus **100** has a hardware configuration of a computer **300** as illustrated in FIG. **3**. Alternatively, the information processing apparatus **100** is implemented by a plurality of computers **300**. For example, the information terminals **10** and the DFE **21** also have the hardware configuration of the computer **300** as illustrated in FIG. **3**.

[0044] FIG. **3** is a block diagram illustrating an example of the hardware configuration of the computer **300**. The computer **300** includes, for example, a central processing unit (CPU) **301**, a read-only memory (ROM) **302**, a random-access memory (RAM) **303**, a hard disk (HD) **304**, a hard disk drive (HDD) controller **305**, a display **306**, an external device connection interface (I/F) **307**, a network I/F **308**, a keyboard **309**, a pointing device **310**, a digital versatile disc rewritable (DVD-RW) drive **312**, a media I/F **314**, and a bus line **315**, as illustrated in FIG. **3**.

[0045] Among these, the CPU **301** controls the entire operation of the computer **300**. The ROM **302** stores a program used for starting the computer **300**, such as an initial program loader (IPL). The RAM **303** is used as, for example, a work area for the CPU **301**. For example, the HD **304** stores programs such as an operating system (OS), an application program, and a device driver and various data. For example, the HDD controller **305** controls reading or writing various data from or to the CPU **301** in accordance with the control of the HD **304**. The HD **304** and the HDD controller **305** are examples of storage devices included in the computer **300**.

[0046] The display **306** displays various information such as a cursor, a menu, a window, a character, and an image. The display **306** may be disposed external to the computer **300**. The external device connection I/F **307** is an interface for connecting various external devices to the computer **300**. The network I/F **308** is an interface for connecting the computer **300** to a communication network N to communicate with other devices.

[0047] The keyboard **309** is an example of an input device having a plurality of keys that allow a user to input characters, numerals, or various instructions. The pointing device **310** is an example of the input device that allows a user to select or perform various instructions, select a target for processing, or move the cursor being displayed. The keyboard **309** and the pointing device **310** may be disposed external to the computer **300**.
[0048] The DVD-RW drive **312** controls reading and writing various data from and to a DVD-RW **311**, which is an example of a removable storage medium. The removable storage medium is not limited to a DVD-RW such as the DVD-RW **311**, and may be any other type of removable recording media. The media I/F **314** controls reading or writing (storing) various data from or to a medium **313** such as a flash memory. The bus line **315** includes an address bus and a data bus. The bus line **315** electrically connects the above-described components to each other and transmits, for example, various control signals.
[0049] The printing system **20** may have any hardware configuration as long as the printing system **20** has a printing function that prints printing data, a reading function that reads a printed material on which the printing data is printed, and a communication function.
Functional Configuration
[0050] FIG. **4** is a diagram illustrating an example of a functional configuration of the inspection system **1**.
Functional Configuration of Information Processing Apparatus
[0051] The information processing apparatus (inspection apparatus) **100** performs a predetermined program in the CPU **301** to implement, for example, each functional configuration as illustrated in FIG. **4**. As illustrated in FIG. **3**, the information processing apparatus **100** implements each functional configuration of, for example, a reception unit **401**, a printing-data modification unit **402**, an image acquisition unit **403**, a display control unit **404**, an output unit **405**, and a storage unit **406**, in addition to the generation unit **201**, the first inspection unit **202**, the print control unit **203**, and the second inspection unit **204** described with reference to FIG. **2**. At least a part of each functional configuration may be implemented by hardware.
[0052] The reception unit **401** performs receiving processing of receiving, for example, input of design data (e.g., a PDF file) including a variable area and variable input data (a CSV file), and a setting operation by an operator on a user interface (UI) screen to be described later. For example, the reception unit **401** receives a setting operation such as setting of the design data and the variable input data, imposition setting, setting of the variable area, and print setting.
[0053] The generation unit **201** performs generation processing of generating printing data from the input design data and the record information of the variable input data, as illustrated with reference to FIG. **2**. For example, the generation unit **201** generates the printing data for generating the printed material including the variable area based on, for example, the setting of the design data and the variable input data, the imposition setting, the setting of the variable area, and the print setting received by the reception unit **401**.
[0054] The first inspection unit **202** performs first inspection processing of inspecting the presence of an error in data read from the variable area of the printing data generated by the generation unit **201**, based on the record information of the variable input data, as illustrated with reference to FIG. **2**. For example, the first inspection unit **202** extracts the record information from the variable area of the printing data, compares the record information of the variable input data with the extracted record information, and inspects the presence of the error in the variable area of the printing data. When there is no error in the variable area of the printing data, the first inspection unit **202** generates the print image data (master data) obtained by imaging the printing data.
[0055] As illustrated with reference to FIG. **2**, the print control unit **203** performs printing control processing of controlling printing of the printing data in accordance with the inspection result obtained from the first inspection unit **202**. For example, when there is no error in the data read from the variable area of the printing data, the print control unit **203** transmits, for example, the

printing data and the print-setting information to the printing system **20** and controls the printing system **20** to start printing the printing data. On the other hand, when there is an error in the data read from the variable area of the printing data, the print control unit **203** controls the printing system **20** to cancel printing the printing data instead of transmitting, for example, the printing data and the print-setting information to the printing system **20**.

[0056] As an option, when there is an error in the data read from the variable area of the printing data, the print control unit **203** may modify the portion of the error in the variable area of the printing data, and may control the printing system **20** to start printing the modified printing data.

[0057] For example, the printing-data modification unit **402** performs printing-data modifying processing of modifying the portion of the error in the variable area of the printing data in accordance with the control of the print control unit **203**. For example, the printing-data modification unit **402** modifies the portion of the error in the variable area of the printing data to a non-printing area so that erroneous information is not printed. The function of the printing-data modification unit **402** may be included in the print control unit **203**.

[0058] The image acquisition unit **403** performs read-image acquisition processing of acquiring read image data acquired by reading a printed material printed by the printing system **20**. For example, the image acquisition unit **403** receives read image data transmitted by the printing system **20** after the print control unit **203** instructs the printing system **20** to perform printing. The function of the image acquisition unit **403** may be included in the second inspection unit **204**.

[0059] As illustrated with reference to FIG. **2**, the second inspection unit **204** inspects a defect in the printed material by comparing the print image data (master data) generated by the first inspection unit **202** with the read image data acquired by the image acquisition unit **403**. For example, the second inspection unit **204** performs comparison processing between the read image data and the print image data by image matching processing, and determines that the read image data includes a defect when a matching rate calculated by matching processing is equal to or less than a predetermined value.

[0060] The display control unit **404** performs display control processing of controlling display of various display screens. For example, the display control unit **404** performs display control processing of displaying various UI screens to be described later on a display unit such as the display **306**.

[0061] The output unit **405** performs output processing of outputting a processing result such as an inspection result or a printing result output by the information processing apparatus **100**. An output destination of the output result may be, for example, the information terminal **10**, the display unit such as the display **306** included in the information processing apparatus **100**, or an external server that communicates via the communication network N.

[0062] The storage unit **406** stores, for example, various information, data, or programs including the design data, the variable input data, setting information, the inspection result received by the reception unit **401**.

[0063] The functional configuration of the information processing apparatus **100** illustrated with reference to FIG. **4** is an example. For example, a part or all of the functional units of the functional configuration of the information processing apparatus **100** illustrated in FIG. **4** may be included in the DFE **21** or the printing apparatus **22** of the printing system **20**. The functional units of the functional configuration of the information processing apparatus **100** may be distributed among a plurality of apparatuses. In other words, in the inspection system **1**, each of the functional units of the functional configuration of the information processing apparatus **100** illustrated in FIG. **4** is included in any one of the apparatuses in the inspection system **1**.

Flow of Processing

[0064] A flow of processing of an inspection method will be described.

Processing by Inspection System

[0065] FIG. **5** is a flowchart illustrating an example of processing performed by the inspection

system **1** according to a first embodiment.
[0066] For example, the processing is an example of print inspection processing performed by the information processing apparatus (inspection apparatus) **100** having the functional configuration described with reference to FIG. **4**.
[0067] In step S**501**, the reception unit **401** of the information processing apparatus **100** receives, for example, the printing target data to be printed and inspected and the setting information. For example, the reception unit **401** displays a print-setting screen **610** as illustrated in FIG. **6**A using the display control unit **404**, and accepts, for example, designation of design data **611**, designation of variable input data **612**, and print setting **613** input by the operator. The print-setting information may be included in the submitted data.
[0068] The reception unit **401** displays, for example, an imposition information setting screen **620** as illustrated in FIG. **6**B using the display control unit **404**, and accepts, for example, settings of the number of impositions **621**, a moving distance **622**, or an imposition order **623**. The moving distance **622** is a distance in a horizontal direction and a distance in a vertical direction between a plurality of imposed printed materials. FIG. **6**A is a diagram illustrating an example of a UI screen. FIG. **6**B is a diagram illustrating another example of a UI screen.
[0069] When these settings are executed, the reception unit **401** uses the display control unit **404** to display "Do you want to print the PDF on both sides?," for example, and accepts selection of "Yes" or "No" input by the operator. In response to this, the reception unit **401** displays, for example, a UI screen **700** as illustrated in FIG. **7**, using the display control unit **404**, and accepts setting of the variable area.
[0070] FIG. **7** is a diagram illustrating an example of a UI screen. As illustrated in FIG. **7**, on the UI screen **700**, for example, a preview image **710** of the front side of the printing data, a preview image **720** of the back side of the printing data, and an area-data association table **730** are displayed. Further, on the UI screen **700**, for example, an "add area (front)" button **701**, an "add area (back)" button **702**, and an "execute" button **703** are displayed. When printing is to be performed on a single side, the preview image **720** of the back side and the "add area (back)" button **702** are not displayed on the UI screen **700**.
[0071] As illustrated in FIG. **7**, in the preview image **710** of the front side, four imposed printed-material images (front sides) **711** of a printed material are displayed. Similarly, in the preview image **720** of the back side, four imposed printed-material images (back sides) **721** are displayed.
[0072] For example, when an operator selects an "add area (front)" button **701** on the UI screen **700**, a variable area can be set in the preview image **710** of the front side. For example, the operator performs, for example, a drag operation or a drag-and-drop operation from the upper left coordinates to the lower right coordinates in the preview image **710** on the front side to designate the variable area **712**. When the variable area **712** is set by the operator, the reception unit **401** adds information of the set variable area to the area-data association table **730** of the UI screen **700**.
[0073] As illustrated in FIG. **7**, the area-data association table **730** includes information such as "area," "coordinates," "size," and "data" as items. The "area" is information such as an area name or an area ID for identifying the variable area. The "coordinates" and the "size" are information indicating the coordinates and the size of the variable area set by the operator. The "data" is information indicating data corresponding to each variable area, and for example, the data are selected by, for example, a pull-down menu. When a plurality of variable areas is displayed, an operator may add the plurality of variable areas to the area-data association table **730** by similar processing. Accordingly, the reception unit **401** associates the set variable area with the variable input data.
[0074] FIG. **8** is a diagram illustrating an example of the variable input data. As illustrated in FIG. **8**, the variable input data **800** includes four records **801**, **802**, **803**, and **804** in one row. Each record includes three pieces of record information, that is, an address, a postal code (zip code), and a name. In this case, the variable area and the variable input data may be also associated with each

other for another imposed printed-material image (front side) **711** in the same way. For example, the area **1** of the second printed-material image (front side) **711** is associated with “postal code **2**” of the variable input data **800**. Similarly, the area **1** of the third printed-material image (front side) **711** is associated with “postal code **3**” of the variable input data **800**.

[0075] The format of the variable input data **800** illustrated in FIG. **8** is not required. For example, the variable input data may be data in which a record including three pieces of record information of an address, a postal code (postal code number), and a name is stored in each row. In this case, for example, the display control unit **404** displays an area-data association table **910** in which “data” are set for each imposed printed-material image (front side) **711** as in a UI screen **900** illustrated in FIG. **9**.

[0076] As illustrated in FIG. **9**, the UI screen **900** may further display a “Copy for imposed matter” button **901**. When the “Copy for imposed matter” button **901** is selected, the reception unit **401** reflects the setting of the variable area set for one printed-material image (front side) **711** on the other printed-material images. For example, the reception unit **401** calculates a relative coordinate position based on the setting of the variable area set for one printed-material image (front side) **711**. Additionally, based on the calculation result of the relative coordinate position, the reception unit **401** calculates a relative coordinate position with respect to another imposed printed-material image based on the setting information **911** of the variable area set for the one printed-material image (front side) **711**. Additionally, the reception unit **401** automatically sets the setting information **912** of the variable area of the other printed-material image based on the calculation result of the relative coordinate position.

[0077] An operator may cause the information processing apparatus **100** to execute the print processing and the inspection processing by selecting the “execute” button **703** illustrated in FIG. **7** or FIG. **9**.

[0078] Returning to FIG. **5**, the description of the flowchart illustrated in FIG. **5** is continued. In step S**502**, the generation unit **201** of the information processing apparatus **100** generates printing data from design data including a variable area and record information of variable input data, for example, based on a setting operation by an operator.

[0079] In step S**503**, the first inspection unit **202** of the information processing apparatus **100** performs the first inspection processing of inspecting the consistency of the variable area of the printing data generated by the generation unit **201**.

[0080] FIG. **10** is a flowchart illustrating an example of the first inspection processing according to the first embodiment. For example, this processing is an example of the first inspection processing in which the first inspection unit **202** inspects the consistency of the variable area of the printing data in step S**503** illustrated in FIG. **5**.

[0081] In step S**1001**, the first inspection unit **202** acquires record information from an uninspected variable area of the printing data.

[0082] In step S**1002**, the first inspection unit **202** compares the acquired record information with the record information of variable input data. For example, as illustrated in FIG. **9**, it is assumed that the data corresponding to the variable area “area **1**” is set to “postal code **1**” in the area-data association table **910**. In this case, the first inspection unit **202** compares the record information acquired from the variable area “area **1**” with the record information acquired from “postal code **1**” of the variable input data **800**.

[0083] For example, in step S**1003**, the first inspection unit **202** compares the record information acquired from the variable area with the record information of the variable input image, and determines whether the character codes match. When the character codes match, the first inspection unit **202** moves the processing to step S**1004**. On the other hand, when the character codes do not match, the first inspection unit **202** moves the processing to step S**1005**.

[0084] When the processing proceeds to step S**1004**, the first inspection unit **202** determines that the inspection result of the variable area is “PASS” (there is no problem). On the other hand, when

the processing proceeds to step S**1005**, the first inspection unit **202** determines that the inspection result of the variable area is "FAIL" (there is a problem). In step S**1006**, the first inspection unit **202** stores the inspection result of the variable area in, for example, the storage unit **406**.
[0085] In step S**1007**, the first inspection unit **202** determines whether an uninspected variable area is present. When an uninspected variable area is present, the first inspection unit **202** performs the processing in step S**1001** and subsequent steps again. On the other hand, when no uninspected variable area is present, the first inspection unit **202** ends the processing illustrated in FIG. **10**.
[0086] By the processing illustrated in FIG. **10**, for example, the first inspection unit **202** creates an inspection result **1100** as illustrated in FIG. **11**.
[0087] FIG. **11** is a diagram illustrating an example of the inspection result of the first inspection processing according to the first embodiment. As illustrated in FIG. **11**, the inspection result **1100** includes record information (an address, a postal code, and a name) **1101** acquired from the variable input data, record information (area **1**, area **2**, and area **3**) **1102** acquired from the variable area, and an inspection result **1103**. As illustrated in FIG. **11**, the inspection result **1100** includes "error information" for specifying record information of which the inspection result is "FAIL" in addition to the inspection result (PASS or FAIL).
[0088] Returning to FIG. **5**, the description of the flowchart of FIG. **5** is continued. In step S**504**, the first inspection unit **202** determines whether there is an error in the variable area of the printing data, for example, from the inspection result **1100** of the first inspection processing as illustrated in FIG. **11**. When there is an error in the variable area of the printing data, the first inspection unit **202** moves the processing to step S**505**. On the other hand, when there is no error in the variable area of the printing data, the first inspection unit **202** moves the processing to step S**506**.
[0089] When the processing proceeds from step S**504** to step S**505**, the output unit **405** of the information processing apparatus **100** outputs an error notification. For example, the output unit **405** displays an error notification screen **1200** as illustrated in FIG. **12**. As illustrated in FIG. **12**, the error notification screen **1200** displays an inspection result **1201** indicating that an error has been detected in the printing data.
[0090] On the other hand, when the processing proceeds from step S**504** to step S**506**, the first inspection unit **202** generates the print image data (master data) representing an image when the printing data is printed.
[0091] In step S**507**, the print control unit **203** instructs the printing system **20** to print the printing data. For example, the print control unit **203** transmits, for example, the printing data generated by the generation unit **201** and the print-setting information received by the reception unit **401** to the printing system **20**.
[0092] In response to this, the RIP processing unit **411** of the printing system **20** converts the printing data received from the information processing apparatus **100** into the raster image printable by a print unit **412**, and the print unit **412** prints the converted printing data. The printing system **20** includes a reading unit **413**, and the reading unit **413** reads the printed material printed by the print unit **412** and outputs the read image data to the information processing apparatus **100**.
[0093] In step S**508**, the image acquisition unit **403** of the information processing apparatus **100** acquires the read image data from the printing system **20**.
[0094] In step S**509**, the second inspection unit **204** of the information processing apparatus **100** performs second inspection processing of inspecting the presence of a defect in the printed material on which the printing data is printed.
[0095] FIG. **13** is a flowchart illustrating an example of the second inspection processing according to the first embodiment. For example, the processing is an example of the second inspection processing in which the second inspection unit **204** inspects the presence of a defect in the printed material in step S**509** illustrated in FIG. **5**.
[0096] In step S**1301**, the second inspection unit **204** performs comparison processing of comparing the print image data with the read image data by image matching processing. The print

image data and the read image data are, for example, black-and-white binary image data. However, this is an example, and the print image data and the read image data may be in various other data formats as long as the image comparison processing is performed.

[0097] In step S**1302**, the second inspection unit **204** determines whether the matching rate compared between the print image data and the read image data in the image matching processing is equal to or less than a predetermined value. When the matching rate is equal to or less than the predetermined value, the second inspection unit **204** moves the processing to step S**1304**. On the other hand, when the matching rate is not equal to or less than the predetermined value, the second inspection unit **204** moves the processing to step S**1303**.

[0098] When the processing proceeds to step S**1303**, the second inspection unit **204** determines that the printed material includes no defect. On the other hand, when the processing proceeds to step S**1304**, the second inspection unit **204** determines that the printed material includes a defect.

[0099] Returning to FIG. **5** again, the description of the flowchart of FIG. **5** is further continued. In step S**510**, when the printed material has a defect, the output unit **405** moves the processing to step S**505**. On the other hand, when the printed material has no defect, the output unit **405** moves the processing to step S**511**. In step S**505**, the output unit **405** displays another error notification screen other than the error notification screen **1200** as illustrated in FIG. **12**, indicating that the printed material has a defect.

[0100] When the processing proceeds to step S**511**, the output unit **405** outputs a print completion notification indicating that the printing is completed. For example, the output unit **405** displays a print completion screen **1400** as illustrated in FIG. **14**. As illustrated in FIG. **14**, a printing result **1401** indicating that printing is completed is displayed on the print completion screen **1400**.

[0101] By the processing illustrated in FIG. **5**, the inspection system **1** does not transmit, for example, the printing data and the print-setting information to the printing system **20** when the printing data of the variable printing includes an error, and thus prevents an unnecessary printed material from being generated.

Second Embodiment

[0102] In the first embodiment, the information processing apparatus **100** outputs, for example, the printing data to the printing system **20** when the inspection results of all the variable areas are PASS in the first inspection processing. As another example, the information processing apparatus **100** may output, for example, the printing data to the printing system **20** even when the inspection result of a predetermined variable area is FAIL in the first inspection processing.

Processing by Inspection System

[0103] FIG. **15** is a flowchart illustrating an example of processing performed by the inspection system **1** according to a second embodiment. For example, the processing is another example of print inspection processing performed by the information processing apparatus (inspection apparatus) **100** having the functional configuration described with reference to FIG. **4**. In the processing illustrated in FIG. **15**, the processes of steps S**501** to S**504** and S**506** to S**509** are the same as or similar to the processes performed by the inspection system **1** according to the first embodiment described in FIG. **5**, and thus the description thereof will be omitted here.

[0104] When it is determined that there is an error in the variable area of the printing data in step S**504**, in step S**1501**, the print control unit **203** determines whether there is an error in an area other than a predetermined variable area. Here, it is assumed that, as the predetermined variable area, a variable area in which an error of the record information is allowed is set in advance.

[0105] When there is an error in an area other than the predetermined variable area, the print control unit **203** moves the processing to step S**1512**. On the other hand, when there is no error in an area other than the predetermined variable area, the print control unit **203** moves the processing to step S**1502**.

[0106] When the processing proceeds to step S**1502**, the print control unit **203** modifies the variable area having the error to a blank area using, for example, the printing-data modification unit

402. This is because when the variable area having the error is printed as it is, there is a possibility that erroneous information is printed. The print control unit **203** moves the processing to step S**506** to print the modified printing data.

[0107] After the processing in steps S**506** to S**509** is performed, in step S**1511**, the output unit **405** determines whether there is a defect in the printed material based on the inspection result performed by the second inspection unit **204**. When there is a defect in the printed material, the output unit **405** moves the processing to step S**1512**. On the other hand, when there is no defect in the printed material, the output unit **405** moves the processing to step S**1513**.

[0108] When the processing proceeds to step S**1512**, the output unit **405** outputs an error notification indicating, for example, whether there is an error in the printing data or in the printed material.

[0109] On the other hand, when the processing proceeds to step S**1513**, the output unit **405** outputs a print completion notification indicating that the printing is completed. In step S**1502**, when the variable area having an error is modified to a blank area, it is desirable that the print completion notification include information specifying the area modified to the blank area.

[0110] As described above, the inspection system **1** instructs the printing system **20** to perform printing a printed material even when the inspection result of a predetermined variable area is FAIL in the first inspection processing.

Third Embodiment

[0111] In the above-described embodiments, the first inspection unit **202** inspects the consistency between the record information of the variable input data and the record information read from the variable area of the printing data. However, this is an example, and the present embodiment may be modified or applied in various ways.

[0112] In a third embodiment, an example is described in which the first inspection unit **202** inspects the consistency between data corresponding to the record information of the variable input data and data read from the variable area of the printing data.

[0113] In recent years, personalization has been increased in sending direct mails that companies send to their customers. For example, systems are widely used that include an appropriate advertisement content in a direct mail in accordance with the preference of a customer, which is the destination of the direct mail, and send the direct mail to the customer. The inspection system **1** may also inspect personalized data included in the variable area of the printing data.

[0114] FIG. **16** is a diagram for illustrating an overview of processing according to the third embodiment. In FIG. **16**, a personalized data DB **1601** stores, for example, personalized data **1701** that stores image data to be printed on a direct mail for each customer of the destination of the direct mail as illustrated in FIG. **17**A.

[0115] As illustrated in FIG. **17**A, an example of the personalized data **1701** includes information such as “customer ID,” “name,” and “image data” as items. The “customer ID” is identification information for identifying a customer. The “name” is information indicating, for example, the name of the customer. The “image data” is image data to be printed in the variable area of the direct mail to be sent to each customer. As illustrated in FIG. **17**A, as an example of image data, a campaign image or link information for specifying a campaign image is stored.

[0116] The variable input data **1702** according to the third embodiment includes, for example, “customer ID” as illustrated in FIGS. **17**A and **17**B. As illustrated in FIG. **17**B, an example of the variable input data **1702** includes information such as “customer ID,” “name,” “postal code,” and “address” as items. The customer ID is identification information for identifying a customer, and corresponds to the “customer ID” of the personalized data **1701**. The “name” is information indicating, for example, the name of the customer. The “postal code” is information indicating the zip code of the customer. The “address” is information indicating the address of the customer.

[0117] As described above, in the third embodiment, the customer (destination) of the variable input data **1702** and the customer of the personalized data **1701** are associated with each other by

the “customer ID.”

Overview of Processing

[0118] In FIG. **16**, the generation unit **201** of the information processing apparatus **100** generates the printing data based on, for example, the submission data that includes the design data including the variable area, the variable input data **1702**, and the personalized data **1701**.

[0119] The first inspection unit **202** acquires, for example, the personalized data **1701** as illustrated in FIG. **17**A from the personalized data DB **1601**, and inspects the presence of an error in the data read from the variable area of the printing data. In the third embodiment, the data read from the variable area of the printing data may include not only a character but also an image such as a campaign image.

[0120] For example, when the data extracted from the variable area of the printing data is image data, the first inspection unit **202** acquires image data such as a campaign image from the personalized data **1701** based on the customer ID. The first inspection unit **202** compares the image data extracted from the variable area with the image data acquired from the personalized data **1701**, to inspect the presence of an error in the data read from the variable area. When there is no error in the data of the variable area of the printing data, the first inspection unit **202** generates print image data obtained by imaging the printing data.

[0121] When there is no error in the data read from the variable area of the printing data, the print control unit **203** transmits, for example, the printing data and the print-setting information to the printing system **20** and controls the printing system **20** to start printing the printing data. On the other hand, when there is an error in the data read from the variable area of the printing data, the print control unit **203** controls the printing system **20** to cancel printing the printing data.

[0122] The printing system **20** performs the RIP processing and the printing processing on the printing data based on the printing data and the print-setting information received from the information processing apparatus **100**, to generate a printed material. Additionally, the printing system **20** performs reading processing on the printed material and transmits the read image data to the information processing apparatus **100**.

[0123] The second inspection unit **204** performs image comparison processing of comparing the print image data generated by the first inspection unit **202** with the acquired read image data, to perform the second inspection processing of inspecting a defect of a printed material.

[0124] By the above-described configuration, the inspection system **1** does not transmit the printing data and the print-setting information to the printing system **20** when the data of the variable area of the printing data includes an error, and thus prevents an unnecessary printed material from being generated.

Flow of Processing

[0125] A flow of the first inspection processing according to the third embodiment will be described. FIG. **18** is a flowchart illustrating an example of the first inspection processing according to the third embodiment. The basic processing details are the same as or similar to those of the first inspection processing according to the first embodiment described with reference to FIG. **10**, and thus a detailed description of the same or similar to processing as that of the first embodiment will be omitted here.

[0126] In step S**1801**, the first inspection unit **202** acquires data from an uninspected variable area of the printing data.

[0127] In step S**1802**, the first inspection unit **202** determines whether the variable area from which the data is acquired is a personalized advertisement area. When the variable area from which the data is acquired is the personalized advertisement area, the first inspection unit **202** moves the processing to step S**1803**. On the other hand, when the variable area from which the data is acquired is not the personalized advertisement area, the first inspection unit **202** moves the processing to step S**1804**.

[0128] When the processing proceeds to step S**1803**, the first inspection unit **202** compares the data

acquired from the variable area with the image data corresponding to the record information of the variable input data **1702**.

[0129] As an example, when the area "area **1**" is set as the personalized advertisement area in the area-data association table **730** of the UI screen **700** as illustrated in FIG. **7**, the "data" is set as the "customer ID" by, for example, a pull-down menu. In this case, when the record information of the variable input data **1702** is the customer ID "1" in step S**1803**, the "campaign image **1**" corresponding to the customer ID "1" in the personalized data **1701** is the image data corresponding to the record information.

[0130] On the other hand, when the processing proceeds to step S**1804**, the first inspection unit **202** compares the record information read from the acquired data with the record information of the variable input data.

[0131] In step S**1805**, the first inspection unit **202** determines whether the comparison result in step S**1803** or step S**1804** matches. When the comparison result matches, the first inspection unit **202** moves the processing to step S**1806**. On the other hand, when the comparison result does not match, the first inspection unit **202** moves the processing to step S**1807**.

[0132] When the processing proceeds to step S**1806**, the first inspection unit **202** determines that the inspection result of the variable area is "PASS" (there is no problem). On the other hand, when the processing proceeds to step S**1807**, the first inspection unit **202** determines that the inspection result of the variable area is "FAIL" (there is a problem). In step S**1808**, the first inspection unit **202** stores the inspection result of the variable area in, for example, the storage unit **406**.

[0133] In step S**1809**, the first inspection unit **202** determines whether an uninspected variable area is present. When an uninspected variable area is present, the first inspection unit **202** performs the processing in step S**1801** and subsequent steps again. On the other hand, when no uninspected variable area is present, the first inspection unit **202** ends the processing illustrated in FIG. **18**.

[0134] By the processing illustrated in FIG. **18**, the inspection system **1** according to the third embodiment also inspects an error of the image data such as a personalized advertisement included in the printing data of the variable printing before printing.

[0135] As described above, according to one or more embodiments of the present disclosure, the inspection system **1** is provided that prevents an unnecessary printed material from being generated is provided when the printing data of the variable printing includes an error.

[0136] Each function of each embodiment described above may be implemented by one or more processing circuits or circuitry. The term "processing circuits or circuitry" in the present specification includes a processor programmed to perform each function by software, such as a processor implemented by using an electronic circuit. The term "processing circuits or circuitry" further includes an application specific integrated circuit (ASIC), a digital signal processor (DSP), or a field programmable gate array (FPGA), designed to perform each described-above function. The term "processing circuits or circuitry" further includes a device such as a conventional circuit module.

[0137] The functional configuration of the inspection system **1** illustrated in FIG. **4** is an example. For example, in FIG. **4**, the functional units of the functional configuration of the information processing apparatus **100** may be distributed among a plurality of apparatuses. At least a part of the functional units of the functional configuration of the information processing apparatus **100** may be implemented by, for example, a program executed by a virtual machine on a cloud.

[0138] The present specification includes an inspection system, an inspection apparatus, an inspection method, and a program described in the following aspects.

Aspect 1

[0139] An inspection system includes a generation unit, a first inspection unit, and a print control unit. The generation unit generates printing data from design data including a variable area and record information of variable input data. The first inspection unit inspects whether data read from the variable area of the printing data includes an error, based on the record information of the

variable input data. The print control unit controls printing of the printing data in accordance with a result of inspection performed by the first inspection unit.

Aspect 2

[0140] The inspection system according to Aspect 1 further includes a second inspection unit to inspect whether a printed material on which the printing data is printed includes a defect.

Aspect 3

[0141] In the inspection system according to Aspect 2, the second inspection unit compares print image data of the printing data with read image data obtained by reading of the printed material to inspect whether the printed material includes a defect.

Aspect 4

[0142] In the inspection system according to any one of Aspects 1 to 3, when the data read from the variable area of the printing data includes no error, the print control unit controls to start the printing of the printing data.

Aspect 5

[0143] In the inspection system according to any one of Aspects 1 to 4, when the data read from the variable area of the printing data includes no error, the printing control unit controls to cancel the printing of the printing data.

Aspect 6

[0144] In the inspection system according to any one of Aspects 1 to 4, when the data read from the variable area of the printing data includes an error, the print control unit modifies a portion of the error in the variable area of the printing data, and controls to start printing of the modified printing data.

Aspect 7

[0145] In the inspection system according to any one of Aspects 1 to 6, the first inspection unit compares character codes to inspect whether the data read from the variable area of the printing data includes an error.

Aspect 8

[0146] An inspection apparatus includes a generation unit, a first inspection unit, and a print control unit. The generation unit generates printing data from design data including a variable area and record information of variable input data. The first inspection unit inspects whether data read from the variable area of the printing data includes an error, based on the record information of the variable input data. The print control unit controls printing of the printing data in accordance with the result of the inspection performed by the first inspection unit.

Aspect 9

[0147] An inspection method performed by one or more computers includes generating printing data from design data including a variable area and record information of variable input data. The inspection method further includes inspecting whether data read from the variable area of the printing data includes an error, based on the record information of the variable input data. The inspection method further includes controlling printing of the printing data in accordance with a result of the inspecting.

Aspect 10

[0148] A program which, when executed by one or more computers, causes the one or more computers to perform the inspection method according to Aspect 9.

[0149] The above-described embodiments are illustrative and do not limit the present invention. Thus, numerous additional modifications and variations are possible in light of the above teachings. For example, elements and/or features of different illustrative embodiments may be combined with each other and/or substituted for each other within the scope of the present invention. Any one of the above-described operations may be performed in various other ways, for example, in an order different from the one described above.

[0150] The functionality of the elements disclosed herein may be implemented using circuitry or

processing circuitry which includes general purpose processors, special purpose processors, integrated circuits, application-specific integrated circuits (ASICs), field-programmable gate arrays (FPGAs), and/or combinations thereof which are configured or programmed, using one or more programs stored in one or more memories, to perform the disclosed functionality. Processors are considered processing circuitry or circuitry as they include transistors and other circuitry therein. In the disclosure, the circuitry, units, or means are hardware that carry out or are programmed to perform the recited functionality. The hardware may be any hardware disclosed herein which is programmed or configured to carry out the recited functionality.

[0151] There is a memory that stores a computer program which includes computer instructions. These computer instructions provide the logic and routines that enable the hardware (e.g., processing circuitry or circuitry) to perform the method disclosed herein. This computer program can be implemented in known formats as a computer-readable storage medium, a computer program product, a memory device, a record medium such as a CD-ROM or DVD, and/or the memory of an FPGA or ASIC.

Claims

1. An inspection apparatus comprising: circuitry configured to: generate printing data from design data including a variable area and record information of variable input data; inspect whether data read from the variable area of the printing data includes an error, based on the record information of the variable input data; and control printing of the printing data in accordance with a result of inspecting the error.

2. The inspection apparatus according to claim 1, wherein the circuitry inspects whether a printed material on which the printing data is printed includes a defect.

3. The inspection apparatus according to claim 2, wherein the circuitry compares print image data of the printing data with read image data obtained by reading of the printed material, to inspect whether the printed material includes a defect.

4. The inspection apparatus according to claim 1, wherein, when the data read from the variable area of the printing data includes no error, the circuitry controls to start the printing of the printing data.

5. The inspection apparatus according to claim 1, wherein, when the data read from the variable area of the printing data includes an error, the circuitry controls not to start the printing of the printing data.

6. The inspection apparatus according to claim 1, wherein, when the data read from the variable area of the printing data includes an error, the circuitry modifies a portion of the error in the variable area of the printing data, and controls to start printing the printing data modified.

7. The inspection apparatus according to claim 1, wherein the circuitry compares character code of the record information acquired from the variable area with character code of the record information of the variable input image to inspect whether the data read from the variable area of the printing data includes an error.

8. An inspection system comprising: the inspection apparatus according to claim 1; and a printer to perform printing of the printing data.

9. An inspection method performed by one or more computers, the method comprising: generating printing data from design data including a variable area and record information of variable input data; inspecting whether data read from the variable area of the printing data includes an error, based on the record information of the variable input data; and controlling printing of the printing data in accordance with a result of inspecting the error.

10. A non-transitory recording medium storing a plurality of instructions which, when executed by one or more processors, causes the one or more processors to perform an inspection method, the inspection method comprising: generating printing data from design data including a variable area

and record information of variable input data; inspecting whether data read from the variable area of the printing data includes an error, based on the record information of the variable input data; and controlling printing of the printing data in accordance with a result of inspecting the error.