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Yamakawa

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(54) **IMAGE PROCESSING SYSTEM, PROCESS EXECUTION CONTROL APPARATUS, AND IMAGE GENERATION-OUTPUT CONTROL APPARATUS, CONFIGURED TO EXCLUDE DESIGNATED ITEM FROM EXECUTION PROCESS TO GENERATE DRAWING INFORMATION**

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(22) Filed: **Feb. 23, 2016**

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G06K 15/02 (2006.01)
(Continued)

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CPC ***G06K 15/4015*** (2013.01); ***G06F 3/12*** (2013.01); ***G06K 15/1867*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC G06K 15/4015; G06K 15/1867; G06K 15/1894; G06K 2215/0062; G06K 2215/0042; G06K 2215/0077
See application file for complete search history.

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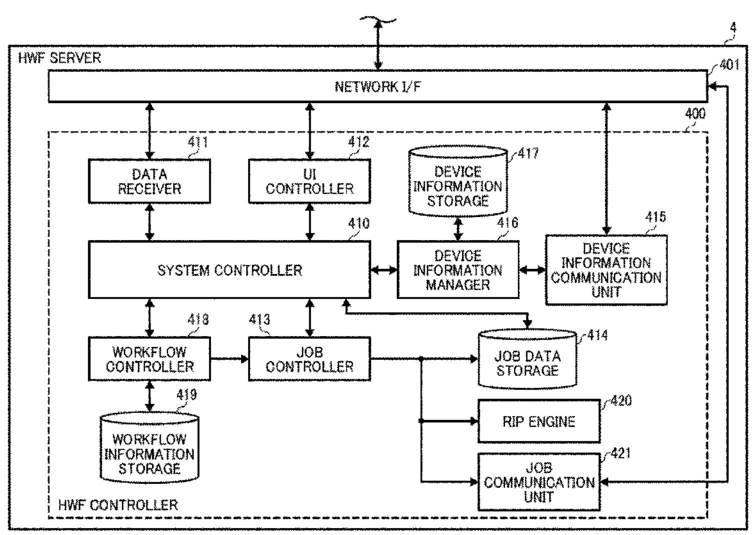
(57) **ABSTRACT**

An image processing system for sequentially executing processes includes a process execution control apparatus to control an execution of the processes, and an image generation-output control apparatus to control an execution of image generation-output operation. The process execution control apparatus includes a control-side drawing information generator to generate drawing information to be referred when an image forming apparatus performs the image generation-output operation. The image generation-output control apparatus includes an output-side drawing information generator corresponding to the control-side drawing information generator. The control-side drawing information generator excludes an execution result of a designated process item from execution results of a plurality of process items, to be executed for generating the drawing information, to generate designated-information-excluded image information. When process contents of the designated process item is set at the image generation-output control apparatus, the output-side drawing information generator executes the plurality of process items based on the designated-information-excluded image information.

26 Claims, 21 Drawing Sheets



(51) **Int. Cl.**
G06F 3/12 (2006.01)
G06T 11/00 (2006.01)

(52) **U.S. Cl.**
CPC ***G06K 15/1894*** (2013.01); ***G06T 11/00*** (2013.01); *G06K 2215/0062* (2013.01)

(56) **References Cited**

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FIG. 1

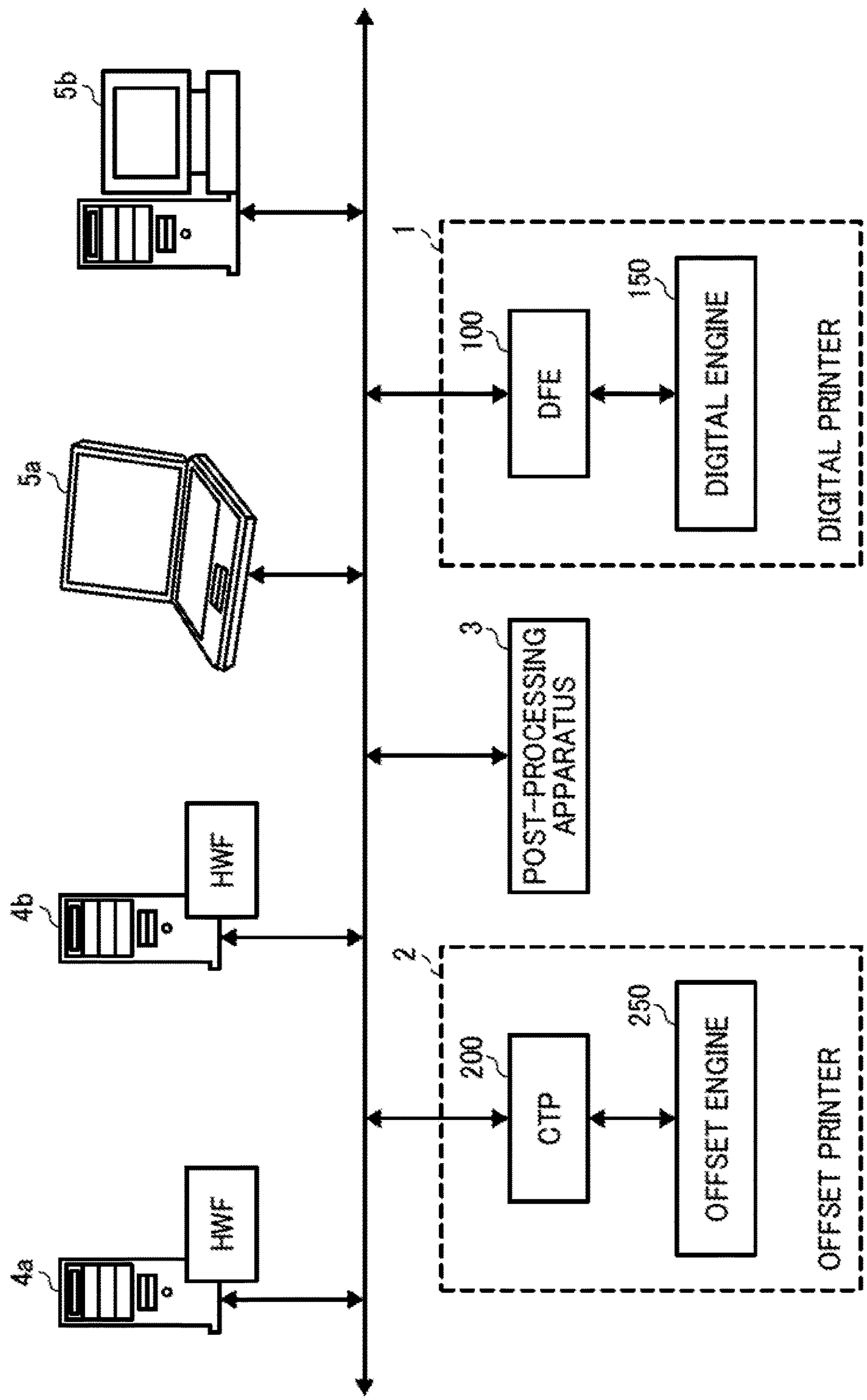

5b
5a
4b
4a
HWF
HWF
1
100
DFE
150
DIGITAL ENGINE
DIGITAL PRINTER
3
POST-PROCESSING APPARATUS
2
200
CTP
250
OFFSET ENGINE
OFFSET PRINTER

FIG. 2

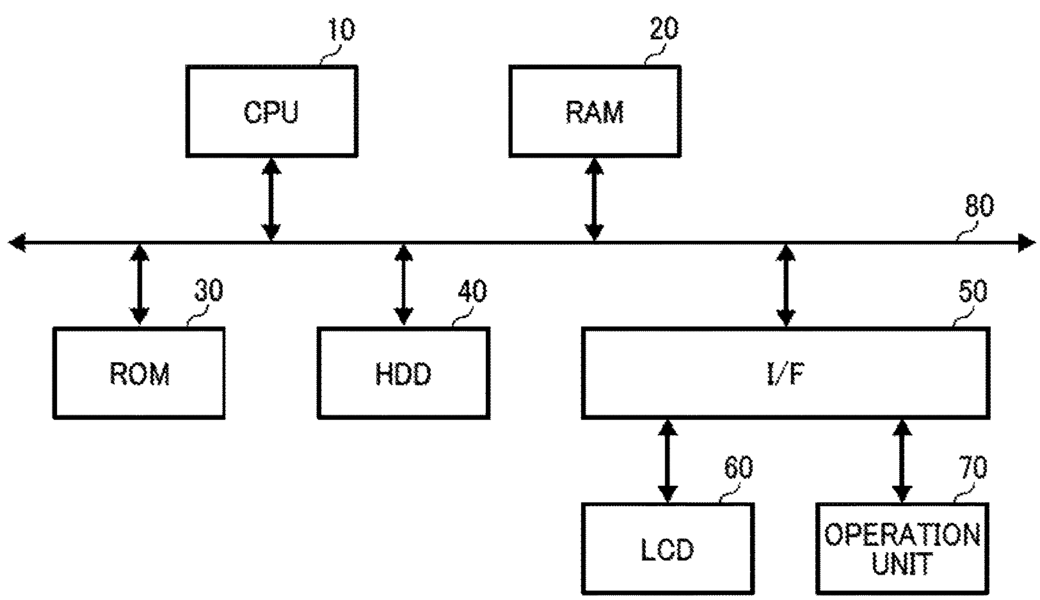


FIG. 3

JDF INFORMATION

JOB INFORMATION
- NUMBER OF COPIES : XX COPIES
- NUMBER OF TOTAL PAGES : XX PAGES
- RIP CONTROL MODE : PAGE MODE

EDIT INFORMATION
- ORIENTATION INFORMATION : PORTRAIT
- PRINT FACE INFORMATION : DUPLEX
- ROTATION : 90 DEGREES
- ENLARGE/REDUCE : 125%
- IMAGE POSITION
  - OFFSET : XX
  - POSITION ADJUSTMENT INFORMATION : XX
- LAYOUT INFORMATION
  - CUSTOM-IN-POSITION : XX
  - NUMBER OF PAGES : 2 IN 1
  - IMPOSITION INFORMATION : LEFT TO RIGHT
  - PAGE SEQUENCE INFORMATION : XX
  - CREEP POSITION INFORMATION : XX
- MARGIN INFORMATION : XX
- CROP MARK INFORMATION
  - CENTER CROP MARK INFORMATION : XX
  - CORNER CROP MARK : XX

FINISHING INFORMATION
- COLLATE INFORMATION : PAGE BY PAGE
- STAPLE/BINDING INFORMATION : STAPLE
- PUNCH INFORMATION : XX
- FOLDING INFORMATION : XX
- TRIMMING : XX
- OUTPUT-TRAY INFORMATION : TRAY XX
- INPUT-TRAY INFORMATION : TRAY XX
- COVER SHEET INFORMATION : XX

. . .

RIP STATUS
- PRE-FRIGHT : NotYet
- NORMALIZE : NotYet
- FONT : NotYet
- LAYOUT : NotYet
- MARK : NotYet
- CMM : NotYet
- TRAPPING : NotYet
- CALIBRATION : NotYet
- SCREENING : NotYet

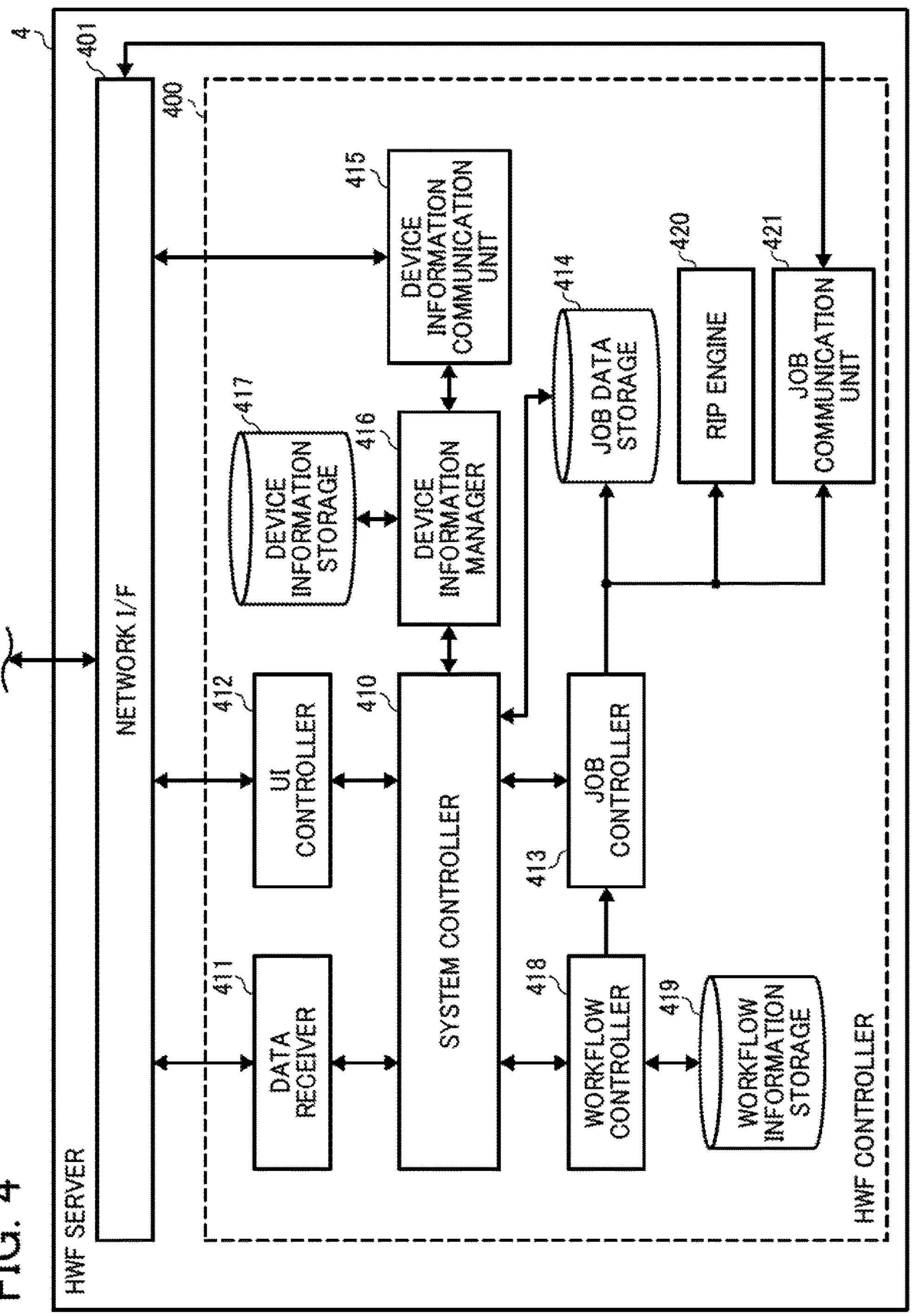
. . .

RIP DEVICE DESIGNATION
- PRE-FRIGHT : HWF SERVER
- NORMALIZE : HWF SERVER
- FONT : DFE (ENGINE A)
- LAYOUT : DFE (ENGINE A)
- MARK : DFE (ENGINE B)
- CMM : DFE (ENGINE A)
- TRAPPING : DFE (ENGINE A)
- CALIBRATION : DFE (ENGINE A)
- SCREENING : DFE (ENGINE A)

. . .

DEVICE DESIGNATION : DIGITAL PRINTER

FIG. 4



4
401
HWF SERVER
NETWORK I/F
400
HWF CONTROLLER
411
DATA RECEIVER
412
UI CONTROLLER
410
SYSTEM CONTROLLER
413
JOB CONTROLLER
418
WORKFLOW CONTROLLER
419
WORKFLOW INFORMATION STORAGE
416
DEVICE INFORMATION MANAGER
417
DEVICE INFORMATION STORAGE
415
DEVICE INFORMATION COMMUNICATION UNIT
414
JOB DATA STORAGE
420
RIP ENGINE
421
JOB COMMUNICATION UNIT

FIG. 5

WORKFLOW INFORMATION

1) INPUT OF DATA

2) HWF SERVER (RIP)

3) PREVIEW

4) TRANSMISSION TO DFE

5) POST PROCESSING

. . .

FIG. 6

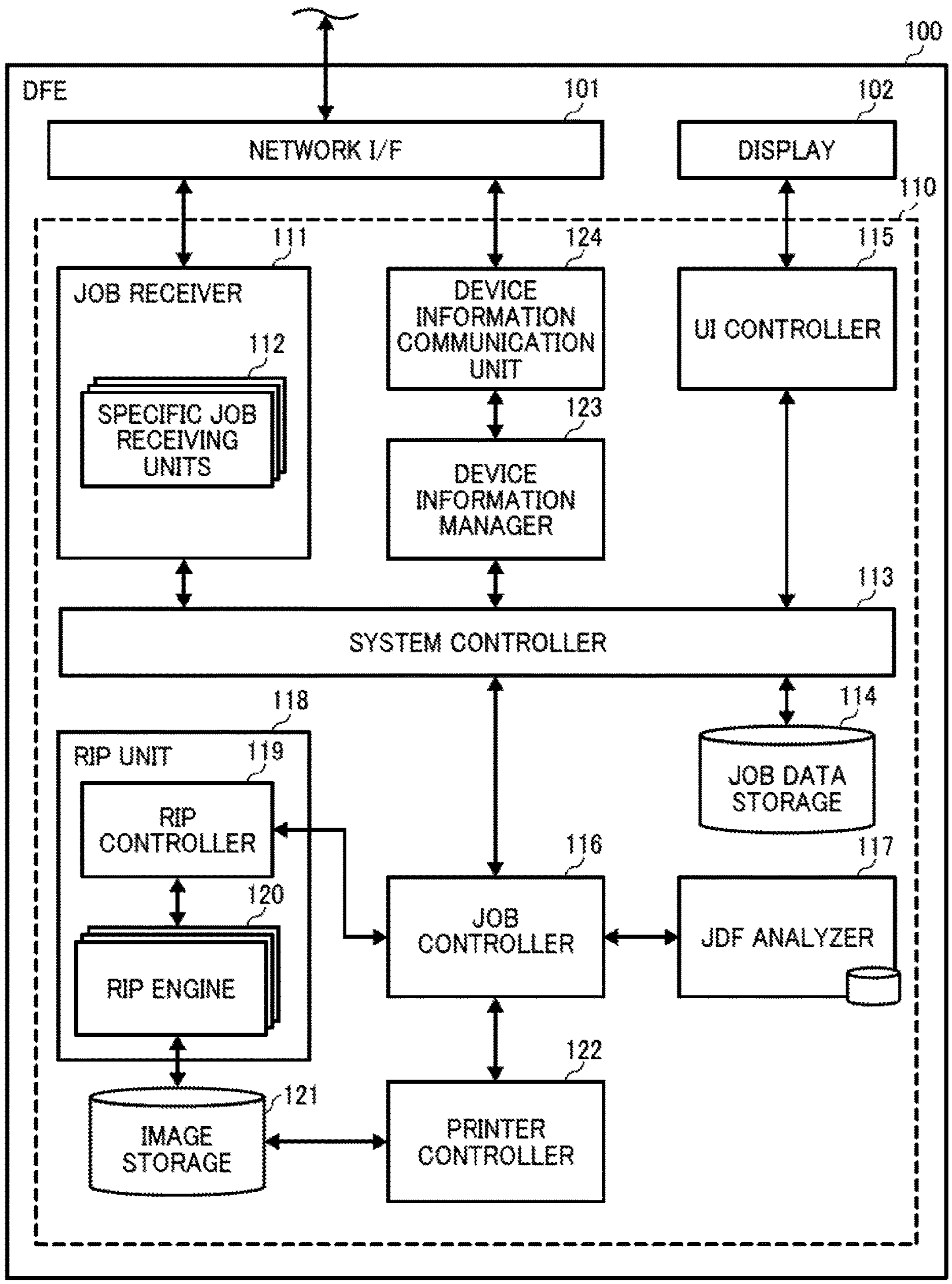

100
DFE
101
NETWORK I/F
102
DISPLAY
110
111
JOB RECEIVER
112
SPECIFIC JOB RECEIVING UNITS
124
DEVICE INFORMATION COMMUNICATION UNIT
115
UI CONTROLLER
123
DEVICE INFORMATION MANAGER
113
SYSTEM CONTROLLER
118
RIP UNIT
119
RIP CONTROLLER
120
RIP ENGINE
114
JOB DATA STORAGE
116
JOB CONTROLLER
117
JDF ANALYZER
122
PRINTER CONTROLLER
121
IMAGE STORAGE

FIG. 7

JDF INFORMATION	JOB ATTRIBUTE IN DFE
A-AMOUNT	NUMBER OF COPIES
A-ROTATE	ROTATION
. . .	

FIG. 8

RIP PARAMETER

TYPE OF INPUT/OUTPUT DATA : JDF, PDL
DATA READING INFORMATION : XXXX
RIP CONTROL MODE : PAGE MODE
. . .

INPUT/OUTPUT IMAGE INFORMATION
INFORMATION OF OUTPUT IMAGE
. . .

INFORMATION OF INPUT IMAGE
. . .

INFORMATION OF IMAGE PROCESSING
. . .

PDL INFORMATION
DATA AREA : XXXX
SIZE INFORMATION : XXXX
DATA ARRANGEMENT : XXXX

RIP ENGINE IDENTIFICATION INFORMATION : ENGINE A

FIG. 9

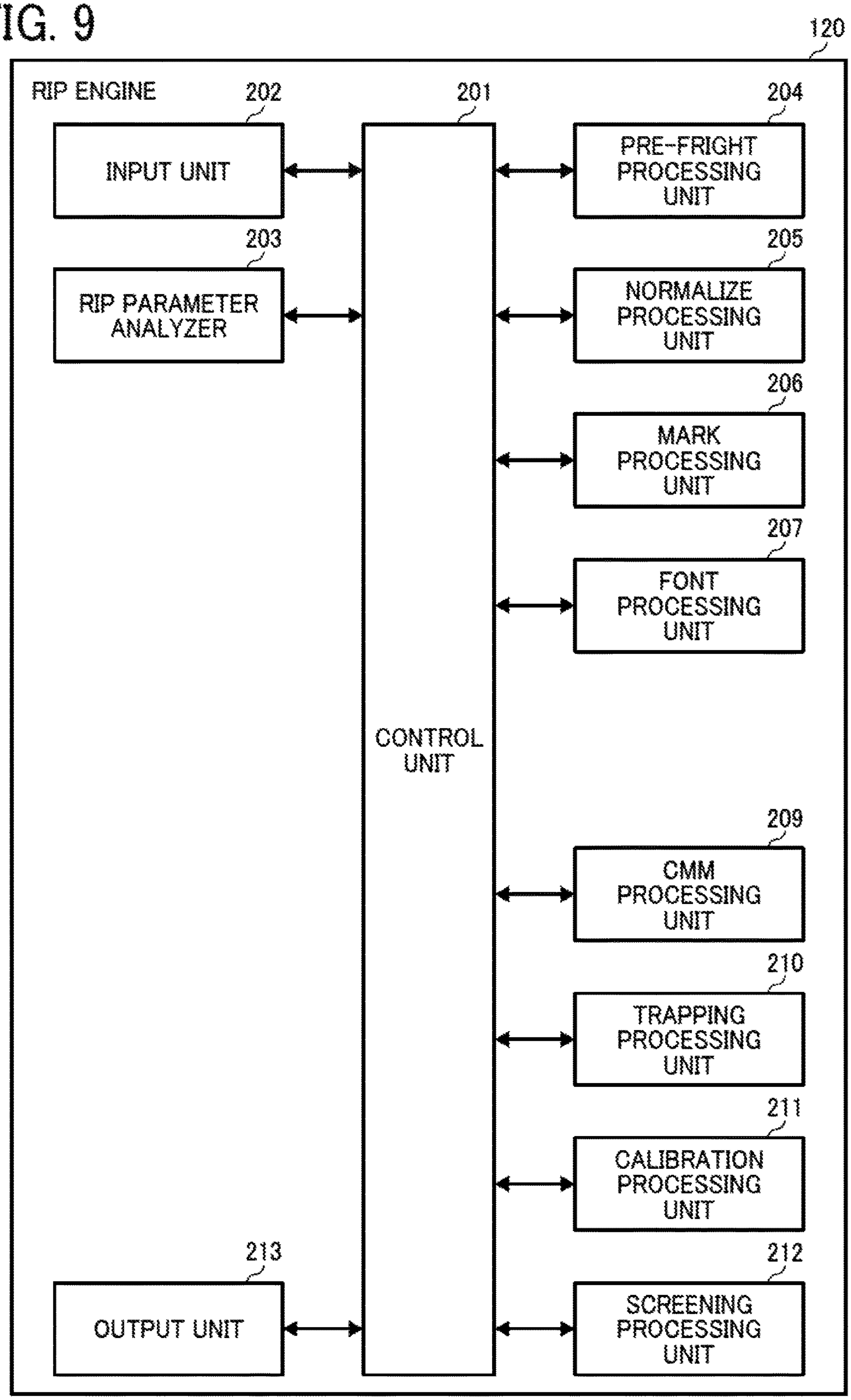

120
RIP ENGINE
202
INPUT UNIT
201
204
PRE-FRIGHT PROCESSING UNIT
203
RIP PARAMETER ANALYZER
205
NORMALIZE PROCESSING UNIT
206
MARK PROCESSING UNIT
207
FONT PROCESSING UNIT
CONTROL UNIT
209
CMM PROCESSING UNIT
210
TRAPPING PROCESSING UNIT
211
CALIBRATION PROCESSING UNIT
213
OUTPUT UNIT
212
SCREENING PROCESSING UNIT

FIG. 10

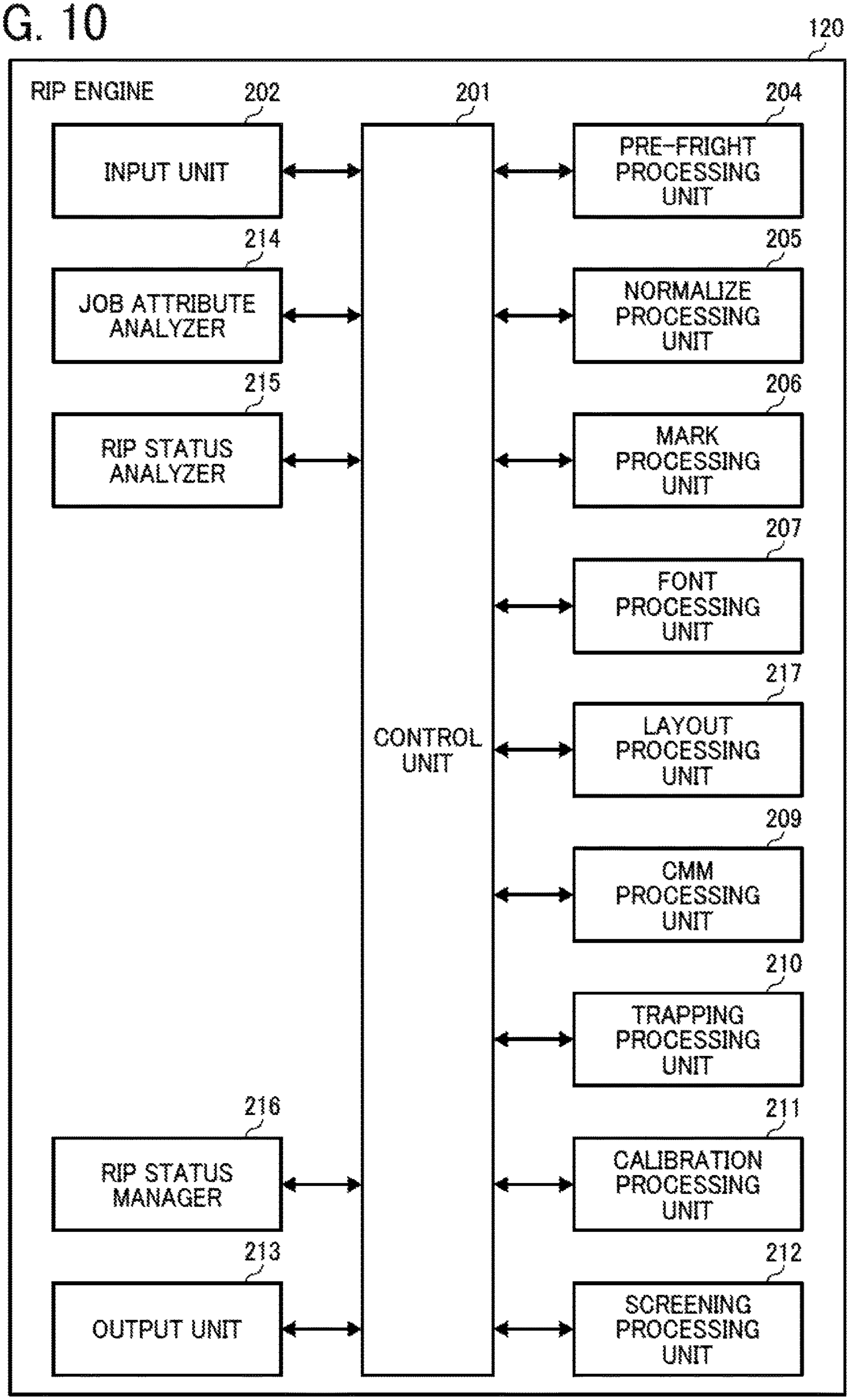
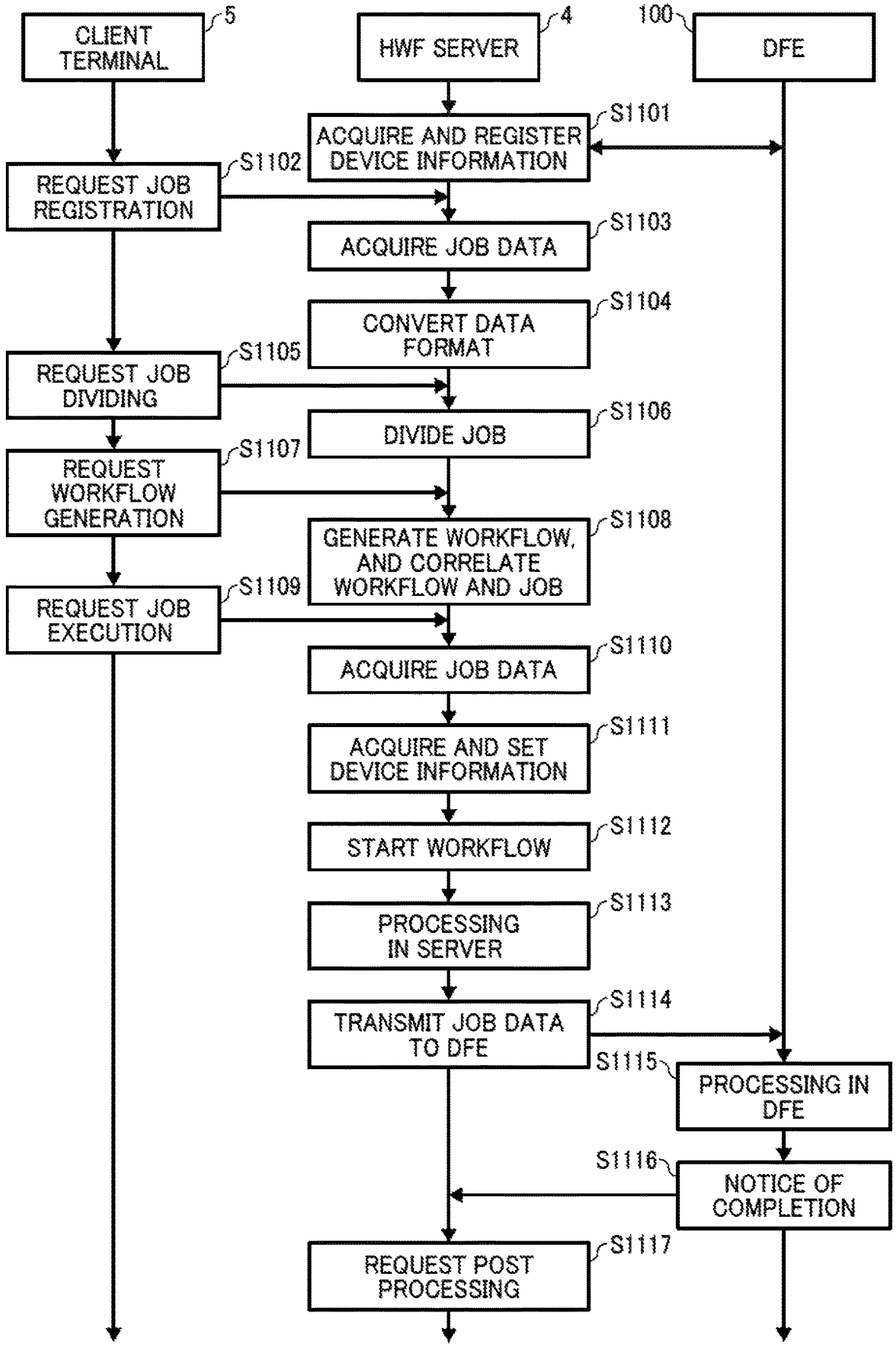

120
RIP ENGINE
202
INPUT UNIT
214
JOB ATTRIBUTE ANALYZER
215
RIP STATUS ANALYZER
216
RIP STATUS MANAGER
213
OUTPUT UNIT
201
CONTROL UNIT
204
PRE-FRIGHT PROCESSING UNIT
205
NORMALIZE PROCESSING UNIT
206
MARK PROCESSING UNIT
207
FONT PROCESSING UNIT
217
LAYOUT PROCESSING UNIT
209
CMM PROCESSING UNIT
210
TRAPPING PROCESSING UNIT
211
CALIBRATION PROCESSING UNIT
212
SCREENING PROCESSING UNIT

FIG. 11



5
CLIENT TERMINAL
4
HWF SERVER
100
DFE
S1101
ACQUIRE AND REGISTER DEVICE INFORMATION
S1102
REQUEST JOB REGISTRATION
S1103
ACQUIRE JOB DATA
S1104
CONVERT DATA FORMAT
S1105
REQUEST JOB DIVIDING
S1106
DIVIDE JOB
S1107
REQUEST WORKFLOW GENERATION
S1108
GENERATE WORKFLOW, AND CORRELATE WORKFLOW AND JOB
S1109
REQUEST JOB EXECUTION
S1110
ACQUIRE JOB DATA
S1111
ACQUIRE AND SET DEVICE INFORMATION
S1112
START WORKFLOW
S1113
PROCESSING IN SERVER
S1114
TRANSMIT JOB DATA TO DFE
S1115
PROCESSING IN DFE
S1116
NOTICE OF COMPLETION
S1117
REQUEST POST PROCESSING

FIG. 12

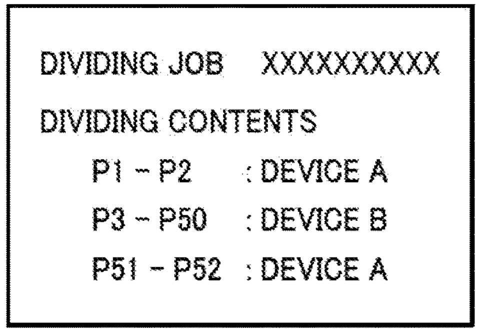

DIVIDING JOB XXXXXXXXXX
DIVIDING CONTENTS
P1 - P2 : DEVICE A
P3 - P50 : DEVICE B
P51 - P52 : DEVICE A

FIG. 13

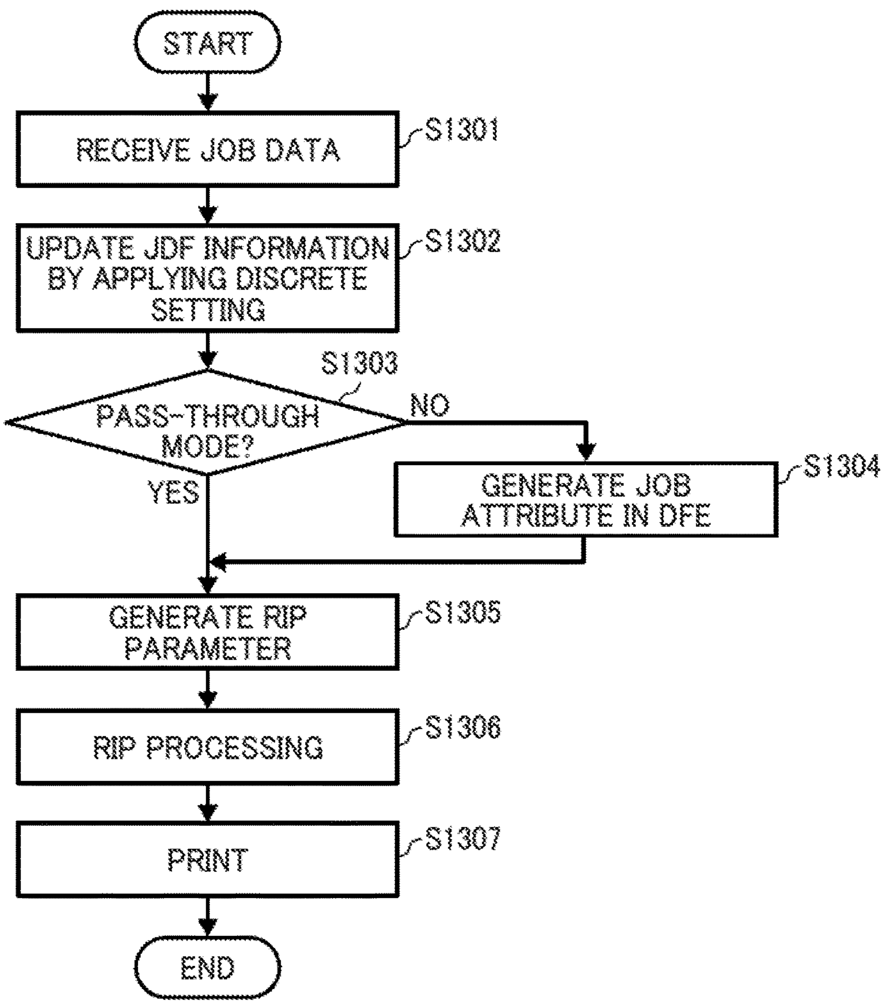

START
RECEIVE JOB DATA
S1301
UPDATE JDF INFORMATION BY APPLYING DISCRETE SETTING
S1302
PASS-THROUGH MODE?
S1303
NO
YES
GENERATE JOB ATTRIBUTE IN DFE
S1304
GENERATE RIP PARAMETER
S1305
RIP PROCESSING
S1306
PRINT
S1307
END

FIG. 14

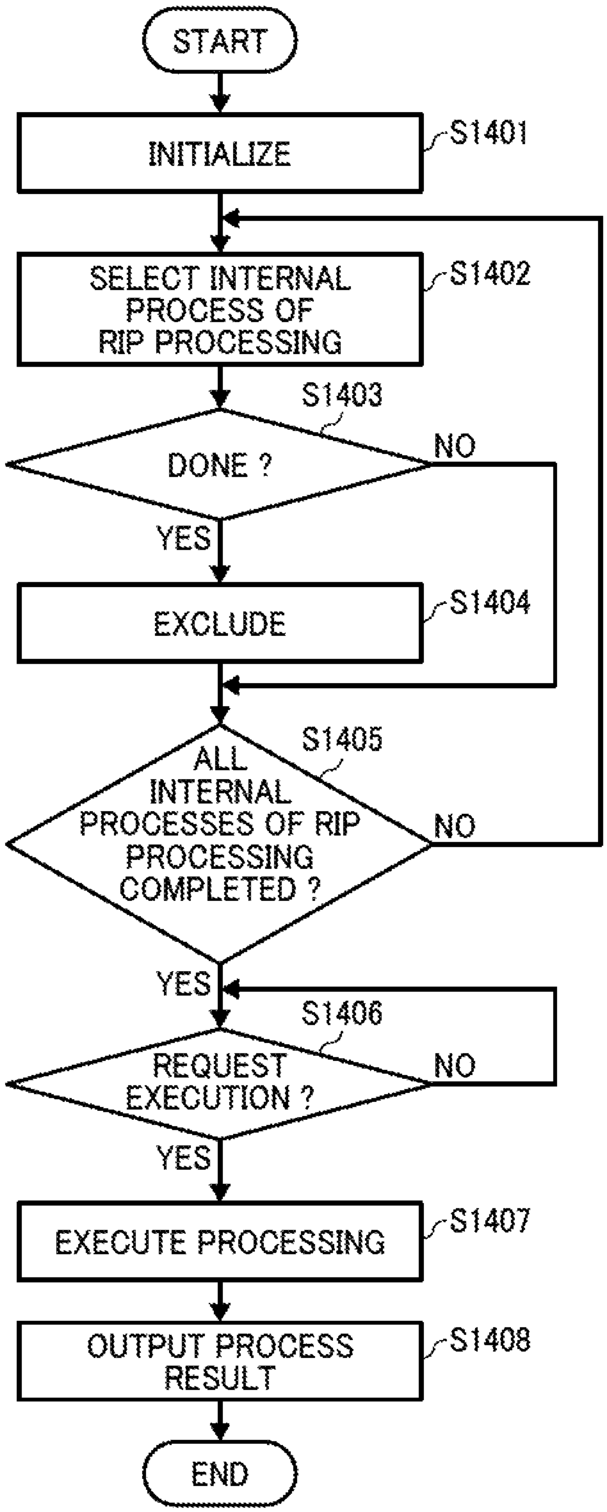

START
INITIALIZE
S1401
SELECT INTERNAL PROCESS OF RIP PROCESSING
S1402
S1403
DONE ?
NO
YES
EXCLUDE
S1404
S1405
ALL INTERNAL PROCESSES OF RIP PROCESSING COMPLETED ?
NO
YES
S1406
REQUEST EXECUTION ?
NO
YES
EXECUTE PROCESSING
S1407
OUTPUT PROCESS RESULT
S1408
END

FIG. 15

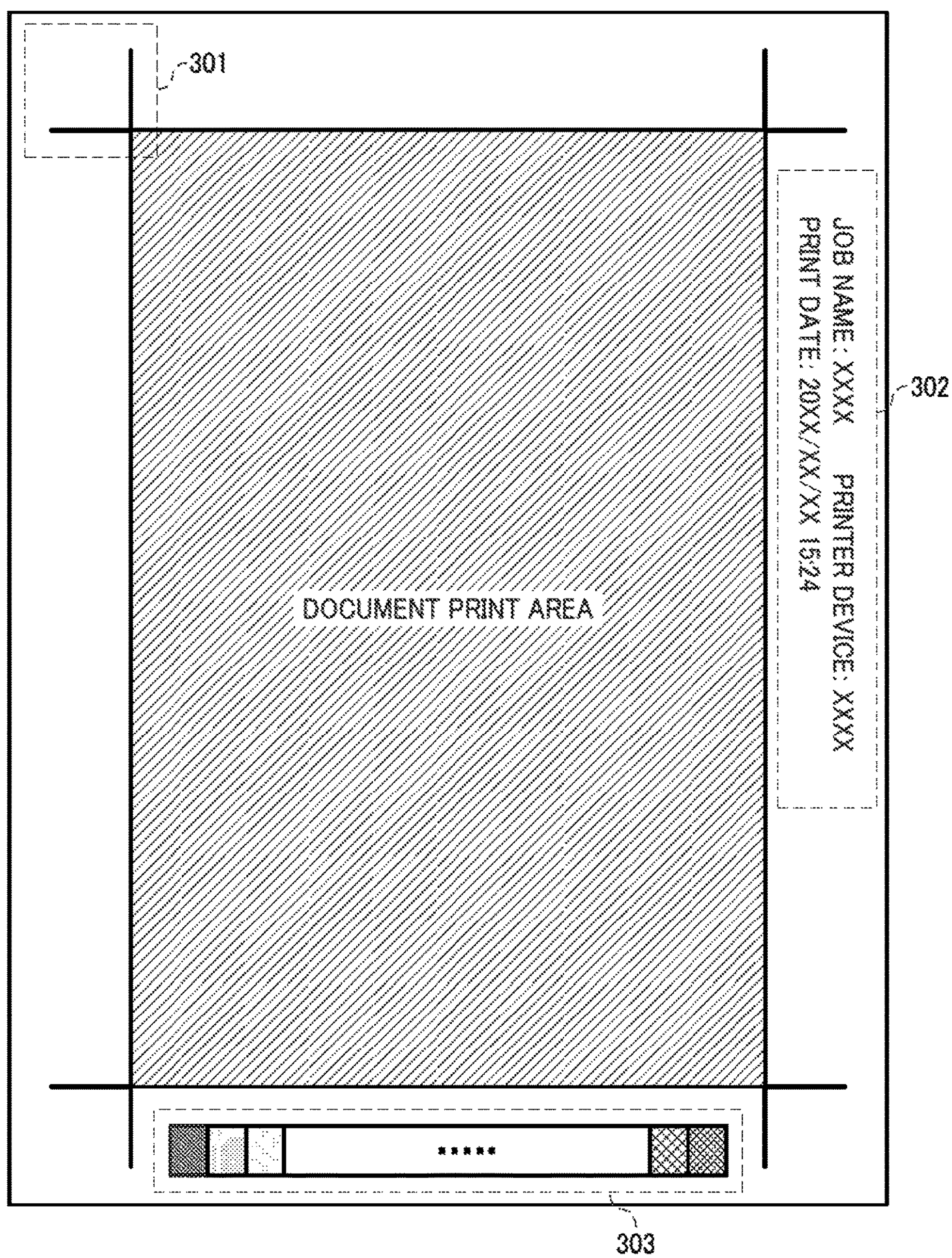

301
302
JOB NAME: XXXX PRINTER DEVICE: XXXX
PRINT DATE: 20XX/XX/XX 1524
DOCUMENT PRINT AREA
*****
303

FIG. 16A

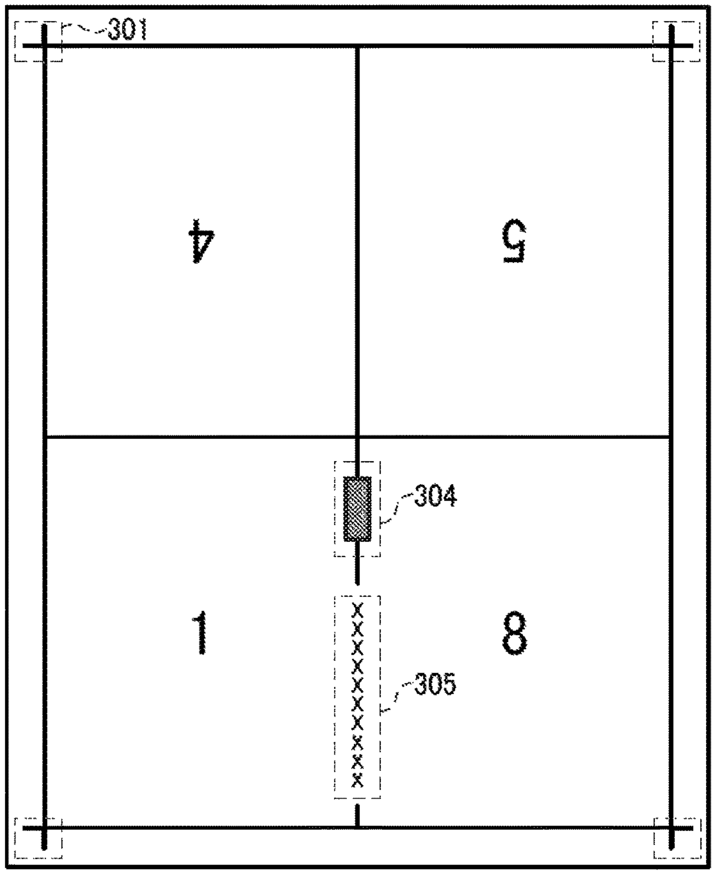


FIG. 16B

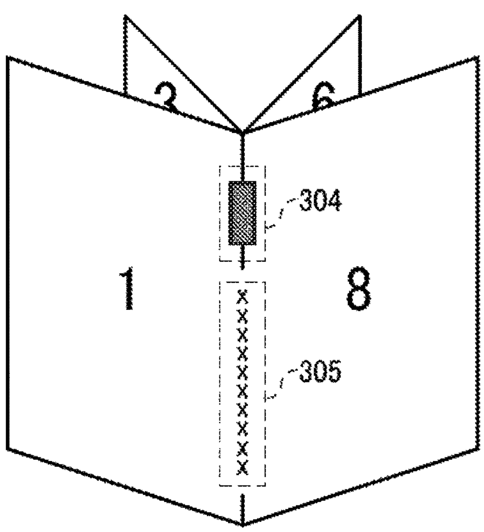


FIG. 17

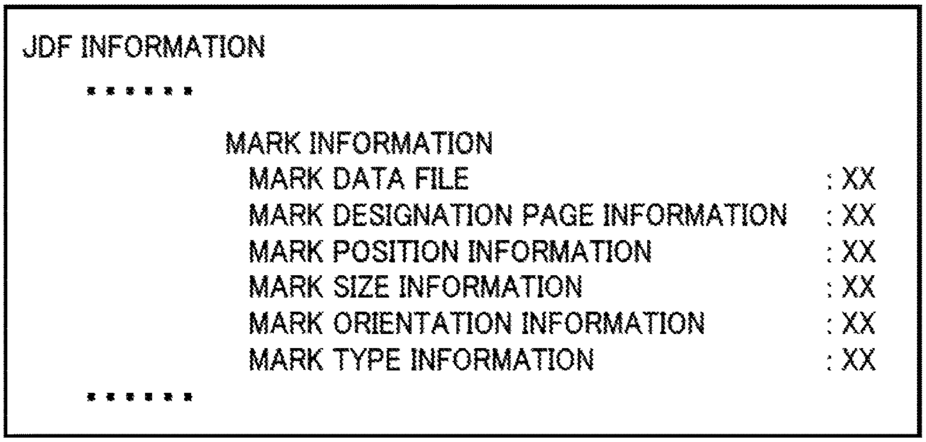


FIG. 18

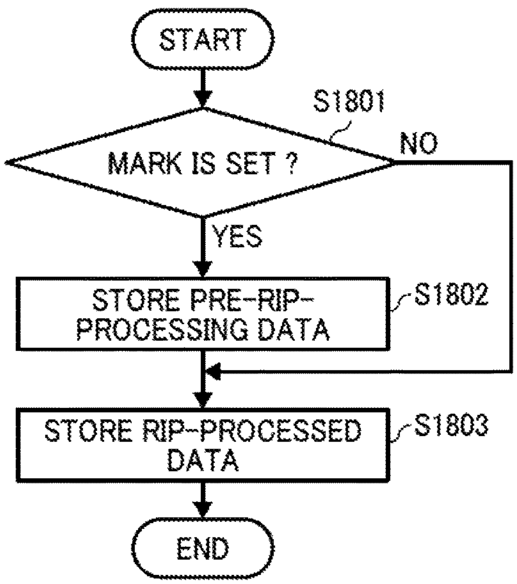


FIG. 19

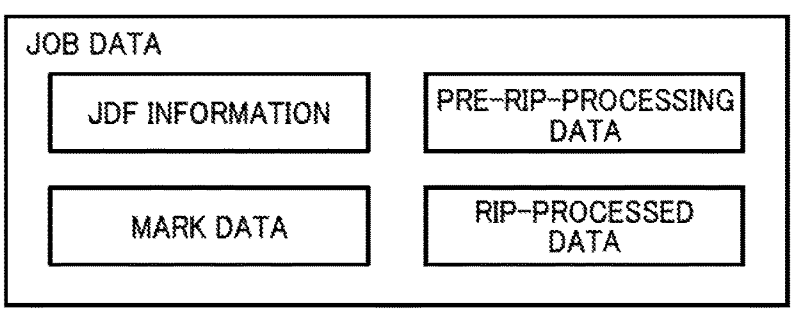


FIG. 20A

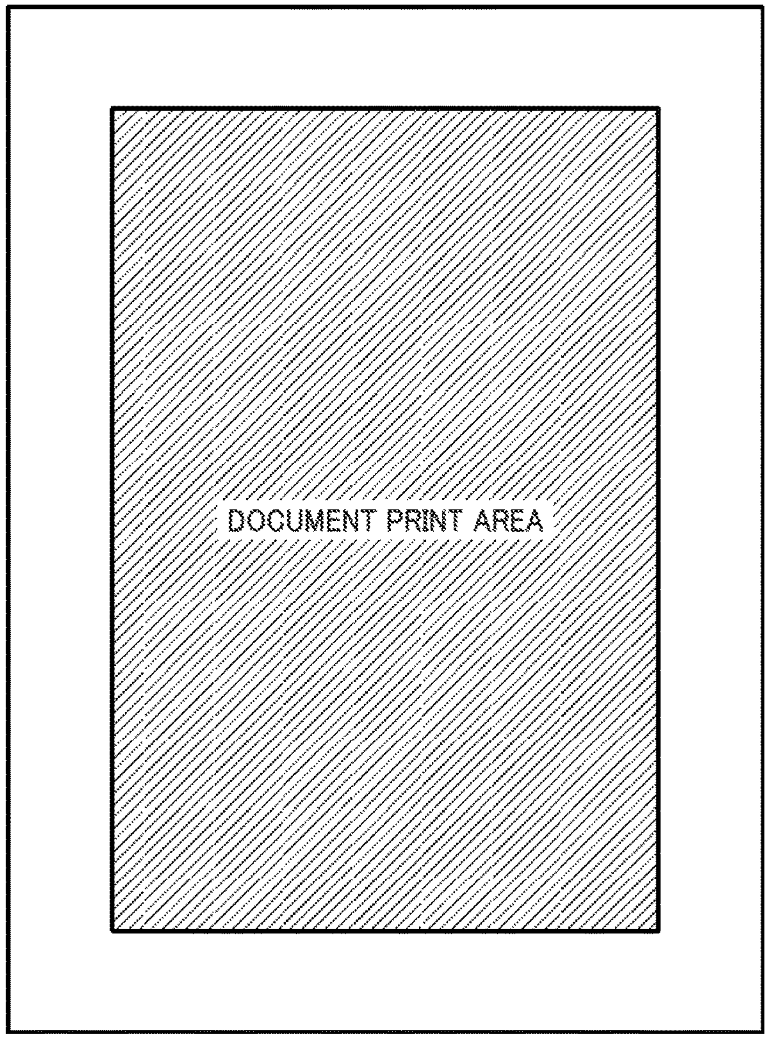


FIG. 20B

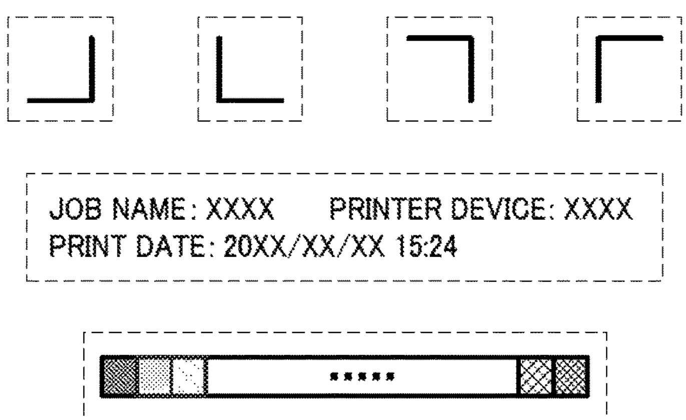


FIG. 21

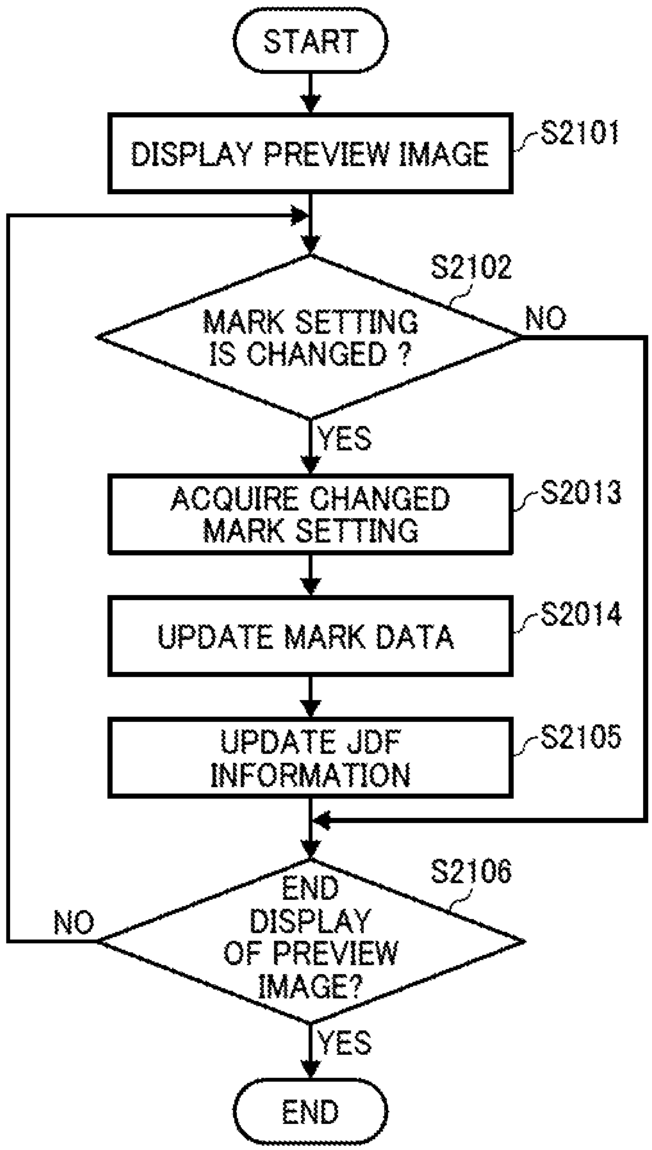

START
DISPLAY PREVIEW IMAGE
S2101
S2102
MARK SETTING IS CHANGED ?
NO
YES
ACQUIRE CHANGED MARK SETTING
S2013
UPDATE MARK DATA
S2014
UPDATE JDF INFORMATION
S2105
S2106
END DISPLAY OF PREVIEW IMAGE?
NO
YES
END

FIG. 22

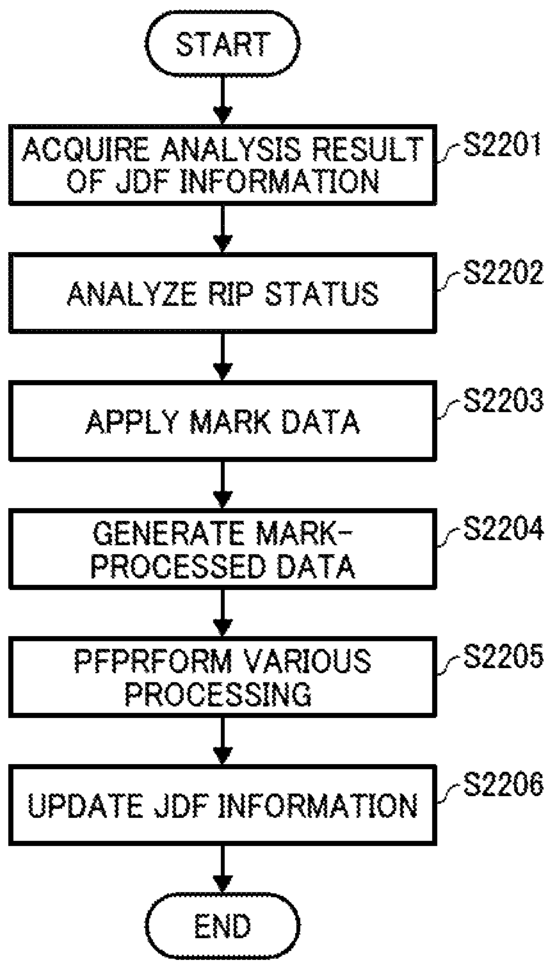

START
ACQUIRE ANALYSIS RESULT OF JDF INFORMATION
S2201
ANALYZE RIP STATUS
S2202
APPLY MARK DATA
S2203
GENERATE MARK-PROCESSED DATA
S2204
PFPRFORM VARIOUS PROCESSING
S2205
UPDATE JDF INFORMATION
S2206
END

FIG. 23A

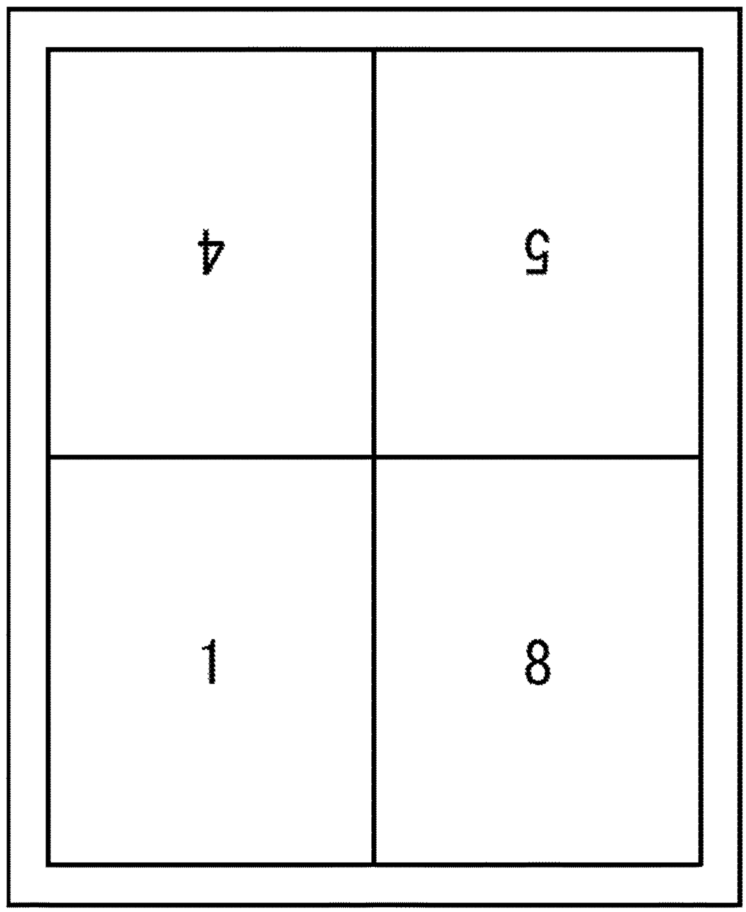


FIG. 23B

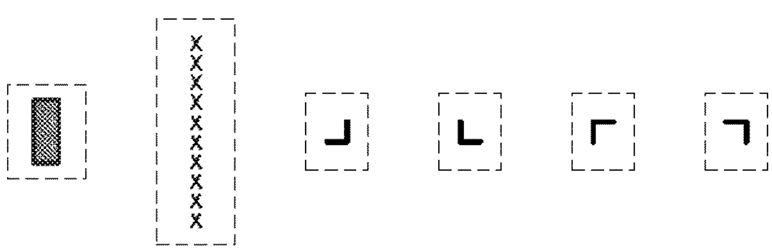


FIG. 24

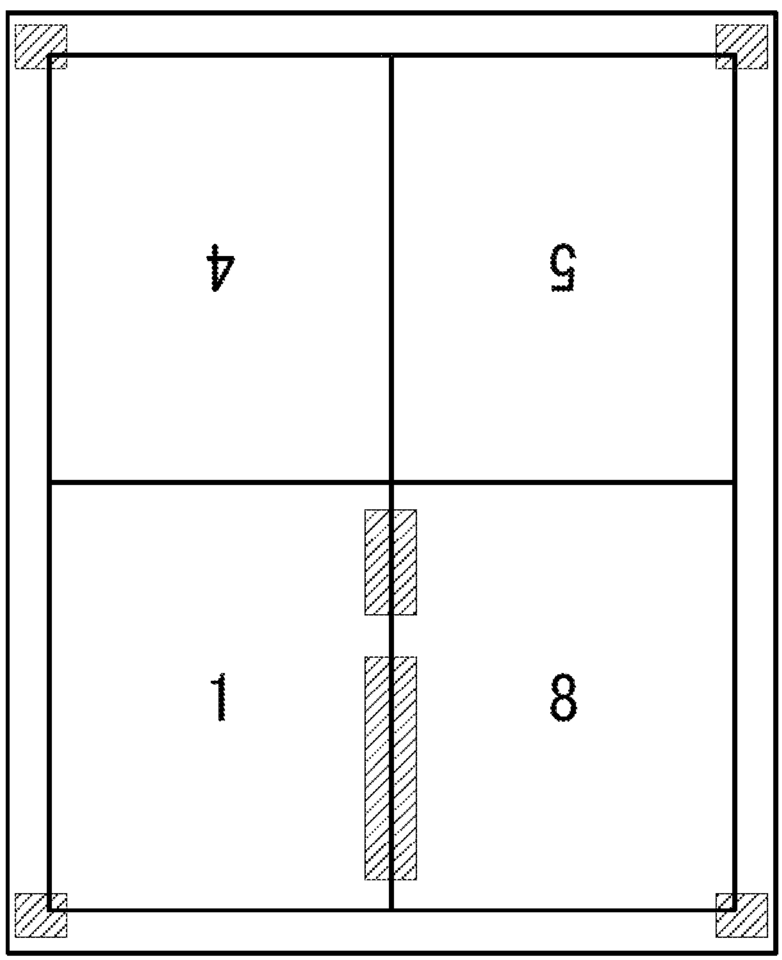


FIG. 25

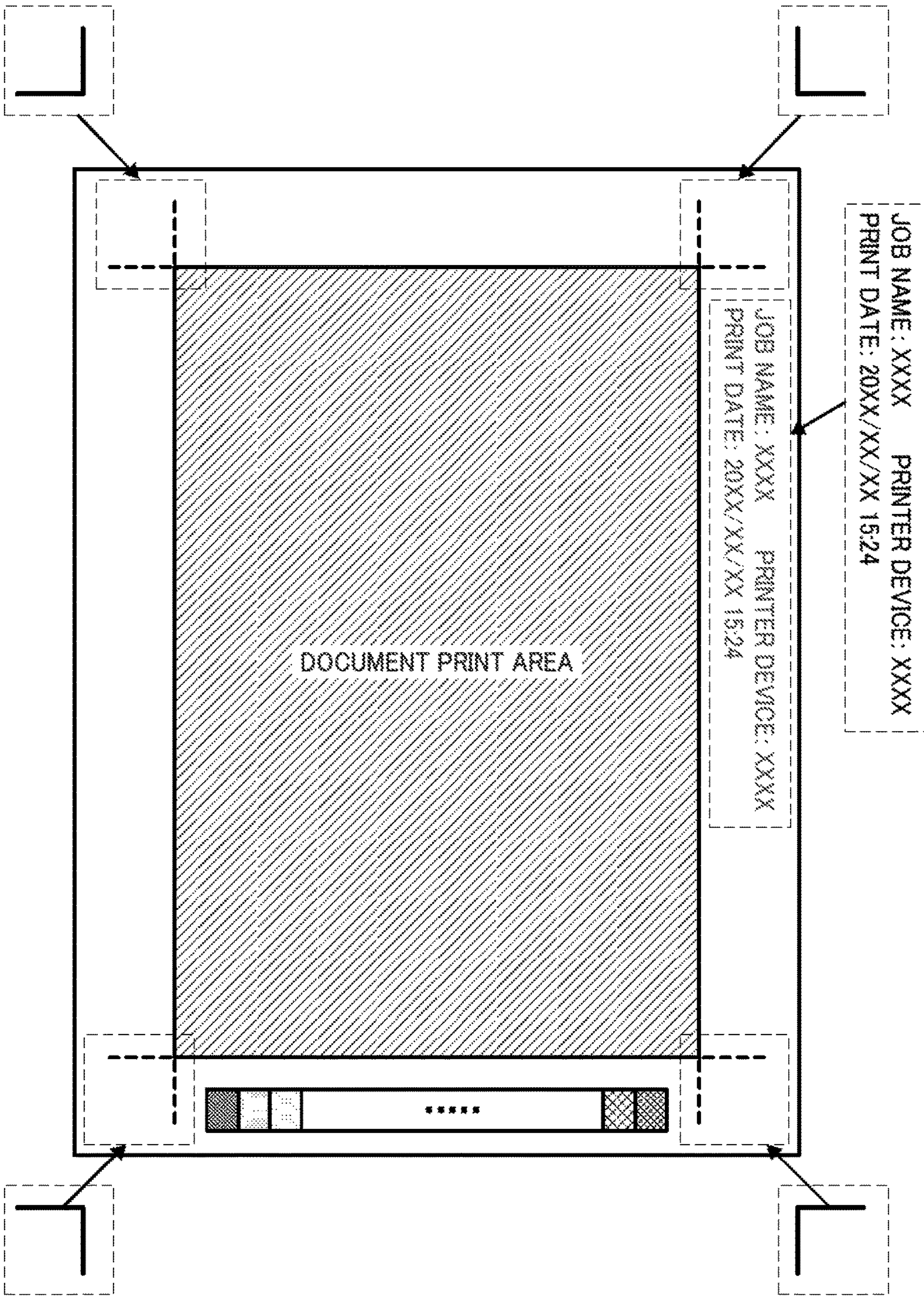

JOB NAME: XXXX PRINTER DEVICE: XXXX
PRINT DATE: 20XX/XX/XX 15:24
JOB NAME: XXXX PRINTER DEVICE: XXXX
PRINT DATE: 20XX/XX/XX 15:24
DOCUMENT PRINT AREA
.....

IMAGE PROCESSING SYSTEM, PROCESS EXECUTION CONTROL APPARATUS, AND IMAGE GENERATION-OUTPUT CONTROL APPARATUS, CONFIGURED TO EXCLUDE DESIGNATED ITEM FROM EXECUTION PROCESS TO GENERATE DRAWING INFORMATION

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority pursuant to 35 U.S.C. §119(a) to Japanese Patent Application No. 2015-040760, filed on Mar. 2, 2015 in the Japan Patent Office, the disclosure of which is incorporated by reference herein in its entirety.

BACKGROUND

Technical Field

The present invention relates to an image processing system, a process execution control apparatus, and an image generation-output control apparatus.

Background Art

Systems that can define and control various processes for generating a printed product by using a data format such as job definition format (JDF) are known. This system can control various types of printers such as offset printers and digital printers collectively. This system can be referred to a hybrid work flow (HWF) system, and a server that controls the HWF system can be referred to a HWF server.

As to the HWF system, when the offset printer and the digital printer independently perform a printing operation based on the same print data, it is required to print the same image having no difference of font, color tone, layout or the like between an image printed by the offset printer and an image printed by the digital printer. Therefore, the same raster image processor (RIP) engine that generates raster data based on print data is disposed in each one of the offset printer and the digital printer. In this description, a term of the "same RIP engine" is used to indicate that one same type of RIP engine is disposed in each of different apparatuses. The raster data is data that is referred at a final stage when a printing operation is performed.

Typically, the RIP engine is disposed in the HWF server. When the offset printer performs a printing operation, the RIP engine in the HWF server generates raster data (hereinafter, "RIP processing"), and the raster data is transferred to a computer-to-plate (CTP) that generates a plate for the offset printer.

In this configuration of the HWF system, when the digital printer performs a printing operation, the RIP engine in the HWF server generates raster data, and transfers the raster data to the digital printer to execute the printing operation. Specifically, a digital front end (DFE) of the digital printer receives print data, and performs the RIP processing to execute the printing operation by using a printer engine.

When the digital printer performs the printing operation in the HWF system, the DFE receives data from the HWF server, and the DFE controls the printer engine of the digital printer to execute the printing operation. Therefore, as described above, the same RIP engine is disposed in the offset printer and also in the DFE.

Further, when the print output operation is executed at each of the plurality of printers, graphic data of fonts are embedded in print data so that printout results by the plurality of printers have no differences due to differences of font data installed to each of the plurality of printers.

As to the RIP processing, various processing can be performed to print data. For example, a mark processing that applies one or more designated marks to the print data, and an embedding process that embeds graphic data of font to the print data can be performed. The raster data processed by the RIP processing is generated as one data integrating these process results. Therefore, it cannot be identified which part is applied with which mark in the raster data. Therefore, when the raster data, processed by the RIP processing by the RIP engine disposed in the HWF server, is transferred to the digital printer, some processing processed by the RIP processing at the HWF server cannot be changed at the digital printer.

In another case, the font processing cannot be changed at other printer because print data embedded with the graphic data of fonts for one printer is transmitted to other printer.

Further, the above described issue also occurs when the distributed processing is performed between the HWF server and DFE, in which the HWF server performs the RIP processing to the middle of the processing, and intermediate data generated by the RIP processing is transferred to the digital printer to perform the remaining RIP processing.

SUMMARY

As one aspect of the present invention, an image processing system for sequentially executing a plurality of processes is devised. The image processing system applicable includes a process execution control apparatus to control an execution of the plurality of processes, and an image generation-output control apparatus to control an execution of image generation-output operation. The process execution control apparatus includes a control-side drawing information generator to generate drawing information to be referred by an image forming apparatus when the image forming apparatus performs the image generation-output operation based on information of a target image to be used for the image generation-output operation. The image generation-output control apparatus includes an output-side drawing information generator corresponding to the control-side drawing information generator. The control-side drawing information generator excludes an execution result of a designated process item from execution results of a plurality of process items, to be executed for generating the drawing information, to generate designated-information-excluded image information based on the information of the target image. When process contents of the designated process item is set at the image generation-output control apparatus, the output-side drawing information generator executes the plurality of process items based on the generated designated-information-excluded image information.

As one aspect of the present invention, a process execution control apparatus employable for an image processing system for sequentially executing a plurality of processes is devised. The process execution control apparatus is capable of controlling an execution of the plurality of processes. The process execution control apparatus includes a control-side drawing information generator to generate drawing information to be referred by an image forming apparatus when the image forming apparatus performs an image generation-output operation based on information of a target image to be used for the image generation-output operation. The control-side drawing information generator excludes an execution result of a designated process item from execution results of a plurality of process items to be executed for generating the drawing information to generate designated-information-excluded image information based on the information of the target image, and outputs the designated-information-excluded image information.

As another aspect of the present invention, an image generation-output control apparatus employable for an image processing system for sequentially executing a plurality of processes is devised. The image generation-output control apparatus is capable of controlling an execution of an image generation-output operation. The image processing system includes a process execution control apparatus capable of controlling an execution of the plurality of processes. The process execution control apparatus includes a control-side drawing information generator useable for generating drawing information to be referred by an image forming apparatus when the image forming apparatus performs an image generation-output operation based on information of a target image to be used for the image generation-output operation. The image generation-output control apparatus includes an output-side drawing information generator corresponding to the control-side drawing information generator. When the control-side drawing information generator excludes an execution result of a designated process item from execution results of a plurality of process items to be executed for generating the drawing information to generate designated-information-excluded image information based on the information of the target image, and outputs the designated-information-excluded image information, the output-side drawing information generator acquires the designated-information-excluded image information, and the output-side drawing information generator executes the plurality of process items based on the generated designated-information-excluded image information when process contents of the designated process item is set at the image generation-output control apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the 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:

FIG. **1** is a schematic configuration of a system of one or more example embodiments of the present invention;

FIG. **2** is a schematic hardware configuration of an information processing apparatus of one or more example embodiments of the present invention;

FIG. **3** is an example of JDF information of one or more example embodiments of the present invention;

FIG. **4** is a functional configuration of a HWF server of one or more example embodiments of the present invention;

FIG. **5** is an example of workflow information of one or more example embodiments of the present invention;

FIG. **6** is a functional configuration of a DFE of one or more example embodiments of the present invention;

FIG. **7** is an example of a conversion table of one or more example embodiments of the present invention;

FIG. **8** is an example of RIP parameter of one or more example embodiments of the present invention;

FIG. **9** is a functional configuration of a RIP engine of one or more example embodiments of the present invention;

FIG. **10** is another functional configuration of a RIP engine of one or more example embodiments of the present invention;

FIG. **11** is a sequential chart for an operation flow of a HWF system of one or more example embodiments of the present invention;

FIG. **12** is an example of information includable in a job dividing request of one or more example embodiments of the present invention;

FIG. **13** is a flow chart showing the steps of processing in the DFE of one or more example embodiments of the present invention;

FIG. **14** is flow chart showing the steps of RIP processing of one or more example embodiments of the present invention;

FIG. **15** illustrates an example of a recording medium set with one or more marks;

FIGS. **16**A and **16**B illustrate another example of a recording medium set with one or more marks;

FIG. **17** is an example of JDF information including information of marks of one or more example embodiments of the present invention;

FIG. **18** is a flowchart showing the steps of a process of storing RIP-processed data by a job controller of one or more example embodiments of the present invention;

FIG. **19** is an example of job data input to a job communication unit when mark setting is performed at the HWF server of one or more example embodiments of the present invention;

FIGS. **20**A and **20**B are an example of pre-RIP-processing data and mark image data included in job data of one or more example embodiments of the present invention;

FIG. **21** is a flowchart showing the steps of a process of controlling a change of mark setting by a system controller of a DFE of one or more example embodiments of the present invention;

FIG. **22** is a flowchart showing the steps of a process related to processing of mark by a RIP engine of the DFE of one or more example embodiments of the present invention;

FIGS. **23**A and **23**B are an example of partially-RIP-processed data and mark image data includable in job data of one or more example embodiments of the present invention;

FIG. **24** illustrates an example of a sheet having areas processed by mark processing of one or more example embodiments of the present invention; and

FIG. **25** illustrates an example of preview data generated from pre-RIP-processing data and mark image data of one or more example embodiments of the present invention.

DETAILED DESCRIPTION

A description is now given of exemplary embodiments of the present invention. It should be noted that although such terms as first, second, etc. may be used herein to describe various elements, components, regions, layers and/or sections, it should be understood that such elements, components, regions, layers and/or sections are not limited thereby because such terms are relative, that is, used only to distinguish one element, component, region, layer or section from another region, layer or section. Thus, for example, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the present invention.

In addition, it should be noted that the terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of the present invention. Thus, for example, 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. Moreover, the terms "includes" and/or "including", when used in this specification, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

Furthermore, although in describing views illustrated in the drawings, specific terminology is employed for the sake of clarity, the present disclosure is not limited to the specific terminology so selected and it is to be understood that each specific element includes all technical equivalents that operate in a similar manner and achieve a similar result. Referring now to the drawings, one or more apparatuses or systems according to one or more example embodiments are described hereinafter.

A description is given of an image processing system of one or more example embodiments of the present invention with reference to drawings. The image processing system includes, for example, an offset printer, and a digital printer, and a server, in which both of the offset printer and the digital printer can be controlled by the same server. Hereinafter, this image processing system is referred to a hybrid work flow (HWF) system.

FIG. **1** is a schematic configuration of the HWF system of one or more example embodiments of the present invention. As illustrated in FIG. **1**, the HWF system includes, for example, a digital printer **1**, an offset printer **2**, a post-processing apparatus **3**, HWF servers **4***a* and **4***b* (hereinafter, collectively referred to HWF server **4** as required), and client terminals **5***a* and **5***b* (hereinafter, collectively referred to client terminal **5** as required) connectable with one to another via a network.

The digital printer **1** is an example of printers that can generate and output images using an electrophotography method and an inkjet method without using a plate. The digital printer **1** includes, for example, a digital front end (DFE) **100**, and a digital engine **150**. The DFE **100** can be used as an image generation-output control apparatus, which is a controller to control the digital engine **150** to perform a print output operation. Further, the digital engine **150** can be used as an image forming apparatus. Therefore, the DFE **100** includes a raster image processor (RIP) engine that generates raster data. The raster data is image data that is referred or used by the digital engine **150** when performing the print output operation. The raster data is used as drawing information or image drawing information.

The offset printer **2** is an example of printers that can generate and output images by using a plate. The offset printer **2** includes, for example, a computer-to-plate (CTP) **200**, and an offset engine **250**. The CTP **200** generates a plate based on raster data. The offset engine **250** can perform an offset printing by using the plate generated by the CTP **200**.

The post-processing apparatus **3** can perform various post-processing such as punch, staple, and bookbinding to printed sheets output from the digital printer **1** and/or the offset printer **2**. The HWF server **4** is a server installed with an HWF software program that is used to manage an image processing operation including inputting of job data including target image data of a print output operation, processing of the print output operation, and post-processing. The HWF server **4** manages the above mentioned various processing using information generated with a job definition format (JDF) (hereinafter, JDF information). The HWF server **4** can be used as a process execution control apparatus.

The HWF server **4** further includes a raster image processor (RIP) engine in the HWF server **4**. When the offset printer **2** performs an offset printing operation (i.e., print output operation), the RIP engine generates raster data, and transmits the generated raster data to the CTP **200**.

Further, when the digital printer **1** performs a printing operation (i.e., print output operation), the HWF server **4** transmits data to the DFE **10**. Since the DFE **100** has the RIP engine as described above, the digital printer **1** can perform the print output operation even when the HWF server **4** transmits print data not processed by the RIP processing in the HWF server **4** to the DFE **100**.

As to the HWF system, the same print data can be used for the print output operation by the digital printer **1** and the print output operation by the offset printer **2**, in which the print output operation by the digital printer **1** and the print output operation by the offset printer **2** are performed independently. In this case, if the print output operation result by the digital printer **1** and the print output operation result by the offset printer **2** become different, a user feels oddness on a printed product. Therefore, it is preferable that the print output operation result by the digital printer **1** and the print output operation result by the offset printer **2** become substantially the same one.

The differences of print output operation results by using different devices or apparatuses may occur due to the RIP processing. Therefore, by using the same RIP engine for data or information processing at the digital printer **1** and data or information processing at the offset printer **2**, the differences between the print output operation result by the digital printer **1** and the print output operation result by the offset printer **2** can be reduced.

Specifically, the RIP engine disposed in the HWF server **4** is an engine that can process data or information for both of the digital printer **1** and the offset printer **2**, and the RIP engine disposed in the HWF server **4** can perform common processes for the digital printer **1** and the offset printer **2**. Further, the RIP engine disposed in the DFE **100** and the RIP engine disposed in the HWF server **4** employ the same type of RIP engine.

With this configuration, the HWF server **4** and the DFE **100** are disposed with the same RIP engine having the same processing capability. Therefore, when a print output operation by the digital printer **1** is to be performed, the RIP processing by the HWF server **4** and the RIP processing by the DFE **100** can be combined, and performed preferably.

An operator of the HWF system can operate the HWF server **4** by using the client terminal **5** (i.e., information processing terminal). The client terminal **5** can be any terminal devices or apparatuses such as a general personal computer (PC), but not limited hereto. The operator operates the client terminal **5** to display a graphic user interface (GUI) used for operating the HWF server **4**, in which the GUI can be used to input data and setting the JDF information. The JDF information is used as a process setting information.

A description is given of a hardware configuration of the DFE **100**, the HWF server **4**, and the client terminal **5** known as information processing apparatuses with reference to FIG. **2**. As illustrated in FIG. **2**, the information processing apparatus of the one or more example of the present invention has a configuration similar to general servers and personal computers (PC). Specifically, the information processing apparatus includes a central processing unit (CPU) **10**, a random access memory (RAM) **20**, a read only memory (ROM) **30**, a hard disk drive (HDD) **40**, and an interface (I/F) **50** that are connectable or couplable by a bus **80**. Further, a liquid crystal display (LCD) **60** and an operation unit **70** are connectable or couplable to the interface (I/F) **50**.

The CPU **10** is a computing unit such as circuitry that controls operations of the information processing apparatus as a whole. The RAM **20** is a volatile memory, to which information can be read and written with high speed, and the CPU **10** uses the RAM **20** as a working area when processing information or data. The ROM **30** is a non-volatile memory used as a read only memory, in which various programs such as firmware are stored. The HDD **40** is a non-volatile memory, to which information can be read and written. For example, the HDD **40** stores an operating system (OS), various control programs, and application programs.

The I/F **50** is connected or coupled to the bus **80**, various units and networks, and controls the connection or coupling. The LCD **60** is a user interface that a user can check the status of the information processing apparatus visually. The operation unit **70** is a user interface such as a key board and a mouse that a user can input information to the information processing apparatus. Since the HWF server **4** is used as a server, a user interface such as LCD **60** and operation unit **70** can be omitted for the HWF server **4**.

As to the above described hardware configuration of the information processing apparatus, the CPU **10** performs computing by loading programs stored in the ROM **30**, the HDD **40**, and/or an external memory such as an optical disk on the RAM **20** to configure a software control unit. With a combination of the software control unit and hardware, functional blocks can be devised for the DFE **100**, the HWF server **4**, and the client terminal **5**.

A description is given of JDF information with reference to FIG. **3**. FIG. **3** is an example of the JDF information. As illustrated in FIG. **3**, the JDF information includes, for example, "job information" related to a job execution, "edit information" related to raster data, and "finishing information" related to post-processing. Further, the JDF information includes, for example, information of "RIP status," "RIP device designation," and "device designation."

As illustrated in FIG. **3**, the "job information" includes information of, for example, "number of copies," "number of total pages," and "RIP control mode." The "number of copies" is information that designates the number of copies of an output target print data to be output as a printed product. The "number of total pages" is information that designates the number of total pages included in one printed product. The "RIP control mode" indicates a control mode of the RIP processing, in which a "page mode" and a "sheet mode" can be designated for the "RIP control mode."

The "edit information" includes, for example, "orientation information," "print face information," "rotation," "enlarge/reduce," "image position," "layout information," "margin information," and "crop mark information." The "orientation information" is information that designates a printing orientation of a sheet such as "portrait (vertical)" and "landscape (horizontal)." The "print face information" is information that designates a to-be-printed face such as "duplex" and "one face."

The "rotation" is information that designates a rotation angle of an image of an output target data. The "enlarge/reduce" is information that designates a size change ratio of an image of an output target data. As to the "image position," "offset" is information that designates an offset of an image of an output target data, and "position adjustment information" is information that designates a position adjustment value of an image of an output target data.

The "layout information" includes, for example, "custom imposition arrangement," "number of pages," "page sequence information," and "creep position information." The "custom imposition arrangement" is information that designates an arrangement on a custom face. The "number of pages" is information that designates the number of pages printed in one sheet. For example, when images of two pages are condensed and printed on one face of a single sheet, information of "2 in 1" is designated. The "page sequence information" is information that designates a sequence of pages to be printed. The "creep position information" is information that designates a value related to an adjustment of a creep position.

The "margin information" is information that designates a value related to a margin such as a fit box and a gutter. The "crop mark information" includes, for example, "center crop mark information" and "corner crop mark information." The "center crop mark information" is information that designates a value related to a center crop mark. The "corner crop mark information" is information that designates a value related to a corner crop mark.

The "finishing information" includes, for example, "Collate information," "staple/binding information," "punch information," "folding information," "trimming," "output-sheet size," "output tray information," "input tray information," and "cover sheet information." The "Collate information" is information that designates a page-by-page printing or a document-by-document printing when one document is to be printed with a plurality of numbers of copies.

The "staple/binding information" is information that designates a process related to staple/binding. The "punch information" is information that designates a process related to punch. The "folding information" is information that designates a process related to folding of sheets. The "trimming" is information that designates a process related to trimming of sheets.

The "output tray information" is information that designates an output tray. The "input tray information" is information that designates an input tray. The "cover sheet information" is information that designates a process related to a cover sheet.

The "RIP status" is used as execution status information indicating whether each of internal processes included in the RIP processing is already executed. In an example case of FIG. **3**, the internal processes of RIP processing includes items such as "pre-fright," "normalize," "font," "layout," "mark," "CMM," "Trapping," "Calibration," and "Screening," and a processing status is set for each of the internal processes of RIP. In the example case of FIG. **3**, the processing status of "NotYet" is set for the "RIP status" to indicate that "a concerned process is not yet processed". When each of the internal processes of RIP is executed, the status is updated to "Done" to indicate that "the concerned process is already processed."

The "RIP device designation" is information that designates a device to perform each of the internal processes of RIP processing. In the example case of FIG. **3**, the "RIP device designation" designates the HWF server **4** or the DFE **100** to perform each of the internal processes of RIP processing. As illustrated in FIG. **3**, each one of the internal processes of RIP processing is performed by setting any one of the "HWF server" and "DFE" for each of the internal processes of RIP processing. Further, when the "DFE" is set, information designating one of a plurality of RIP engines installed in the DFE **100** can be also designated such as "DFE (engine A)".

The "device designation" is information that designates a device that executes a print job. In the example case of FIG. **3**, the "digital printer" is designated to execute a print job. The JDF information is used as process setting information including information of setting process contents for executing an image generation and output operation. Further, the JDF information can include various information other than information shown in FIG. **3**. The above mentioned information will be described in detail later.

The JDF information shown in FIG. **3** can be generated by an operator. For example, the operator operates the client terminal **5** to display a GUI of the HWF server **4**, and then the operator sets various items of the JDF information by using the GUI. The RIP engine installed in the HWF server **4** and the RIP engine installed the DFE **100** can perform the RIP processing based on the JDF information. Further, the post-processing apparatus **3** can perform the post-processing based on the JDF information.

A description is given of a functional configuration of the HWF server **4** with reference to FIG. **4**. As illustrated in FIG. **4**, the HWF server **4** includes, for example, a HWF controller **400**, and a network interface (I/F) **401**. The network I/F **401** is an interface used for communicating information between the HWF server **4** and other devices or apparatuses available for use via a network.

The HWF controller **400** manages various processing such as an acquisition of job data of a print target, a generation of a print job, a management of a workflow, and an allocation of job data to the digital printer **1** and the offset printer **2**. A process that job data of a print target is input to the HWF server **4**, and acquired by the HWF controller **400** is a process of inputting data to the HWF system. The HWF controller **400** can be implemented by installing a specific software program such as a HWF software program in an information processing apparatus.

As illustrated in FIG. **4**, the HWF controller **400** includes, for example, a system controller **410**, a data receiver **411**, a user interface (UI) controller **412**, a job controller **413**, a job data storage **414**, a device information communication unit **415**, a device information manager **416**, a device information storage **417**, a workflow controller **418**, a workflow information storage **419**, a RIP engine **420**, and a job communication unit **421**. The system controller **410** controls the HWF controller **400** as a whole. Therefore, the system controller **410** transmits commands to each of the units in the HWF controller **400** to implement each of the above described functions or capabilities of the HWF controller **400**. The data receiver **411** receives job data to be printed from other system, or job data input by an operation of an operator.

The UI controller **412** controls an operation operable by an operator via the client terminal **5**. For example, a graphical user interface (GUI) for operating the HWF server **4** is displayed on the client terminal **5**, and the UI controller **412** acquires information of an operation work to the GUI displayed on the client terminal **5** via a network.

The UI controller **412** reports information of the operation acquired via the network to the system controller **410**. The display of GUI on the client terminal **5** can be implemented by executing a software program installed in the client terminal **5**, or by supplying information to the client terminal **5** from the UI controller **412** via the network.

The operator operates the GUI displayed on the client terminal **5** to select job data to be input as a print target. Then, the client terminal **5** transmits the selected job data to the HWF server **4**, and then the data receiver **411** acquires the selected job data. The system controller **410** registers the job data acquired by the data receiver **411** to the job data storage **414**.

When the job data is to be transmitted from the client terminal **5** to the HWF server **4**, the job data is generated in the client terminal **5** based on document data and/or image data selected at the client terminal **5**, and then the job data is transmitted to the HWF server **4**. The job data is described, for example, by page description language (PDL) format such as portable document format (PDF) and PostScript, and is used as a command information for generating and outputting image. The job data includes image information that becomes a target of image generation and output.

Further, the client terminal **5** can transmit job data of a print target to the HWF server **4** by using an application specific data format or a general image data format. In this configuration, the system controller **410** instructs the job controller **413** to generate job data based on the acquired data. The job controller **413** generates the job data based on the data of print target by using the RIP engine **420**.

As described above, the data of print target registered in the job data storage **414** is PDL information. The PDL information can be, for example, primary data generated from the data of print target, or intermediate data, which is processed to the middle of the RIP processing. These information can be used as output-target image information, which is also referred to target image information of image generation-output operation. For example, the intermediate data may be stored in the job data storage **414** when the job data is processed to the middle of the RIP processing that is started in the HWF server **4**, or when the job data is registered in the HWF server **4** with a condition of the intermediate data. Hereinafter, the "PDL information" indicates primary data that is not yet processed by the RIP processing, and the intermediate data, which is processed to the middle of the RIP processing (i.e., processing-not-completed data) in this description.

Further, as described above, the JDF information shown in FIG. **3** can be set and generated by an operation of an operator to the GUI displayed on the client terminal **5**. The generated JDF information can be received by the data receiver **411** with the PDL information as the job data. The system controller **410** correlates the acquired JDF information and PDL information, and registers the JDF information and PDL information to the job data storage **414**.

In this description, attribution information indicating job contents is described by using the JDF information, bun not limited hereto. For example, the attribution information indicating job contents can be described by using other format such as print production format (PPF).

Further, the system controller **410** can divide the received job data as required based on an operation of an operator to a GUI displayed on the client terminal **5**. For example, the system controller **410** can divide the received job data into a discrete unit of printing portion such as a unit of "page," and each one of the divided job data can be registered in the job data storage **414** as sub job data, in which the job data is configured by the plurality of the sub-job data.

When an output-destination device is selected for each of the sub job data by an operation of an operator to a GUI displayed on the client terminal **5**, the operator's selection result is correlated with the sub-job data, and then stored in the job data storage **414**. The output-destination device can be set selectively for each of the sub-job data. For example, the digital printer **1** can be selected for printing sub job data corresponding to a cover of the received job data, and the offset printer **2** can be selected for printing sub-job data corresponding to a main contents of the received job data.

The device information manager **416** acquires information of available devices or apparatuses included in the HWF system such as the digital printer **1**, the offset printer **2**, the post-processing apparatus **3** or the like, and the device information manager **416** stores information of the available devices or apparatuses in the device information storage **417**, and manages the information of the available device or apparatuses. The information of available devices includes, for example, a network address allocated to each device when the device is connected or coupled to the network, and device capability information of each device. The device capability information includes, for example, printing speed, available post-processing capability, and operational condition.

The device information communication unit **415** can acquire information of the available devices included in the HWF system at regular intervals via the network I/F **401**. With this configuration, the device information manager **416** can update information of the available devices stored in the device information storage **417** at regular intervals. Therefore, even if the information of the available devices changes over the time, information stored in the device information storage **417** can be updated and maintained at the latest or up-to-date status.

The workflow controller **418** determines an execution sequence of a plurality of processes to be executed for the job data registered in the job data storage **414** in the HWF system, and stores information of the execution sequence in the workflow information storage **419**. Based on the execution sequence set for each of processes in a workflow in advance, the workflow controller **418** can control the execution sequence, in which when one process completes, the sequence proceeds to the next process.

The workflow information stored in the workflow information storage **419** specifies the execution sequence of each of processes executable in the HWF system, in which the processes are sequentially arranged based on the designated execution sequence. FIG. **5** is an example of workflow information. Further, parameters, which are used when each of the processes is executed, can be designated as the JDF information as above described. The workflow information storage **419** registers the workflow information in advance based on an operation of an operator to the GUI displayed on the client terminal **5**.

An execution instruction of the job data, registered in the HWF server **4**, is reported to the system controller **410** via the UI controller **412** based on an operation of an operator to the GUI displayed on the client terminal **5**. With this configuration, the system controller **410** can select the above described output-destination device.

When the output-destination device is selected by using the GUI displayed on the client terminal **5** as described above, the system controller **410** selects the output-destination device based on a designation of the output-destination device. Further, the output-destination device can be selected automatically based on a comparison of job contents and a device property.

When the output-destination device is selected automatically based on the comparison of job contents and the device property, the system controller **410** acquires information of device available for use from the device information manager **416**. When the output-destination device is determined as above described, the system controller **410** assigns information indicating the determined output-destination device to the JDF information.

After determining the output-destination device, the system controller **410** instructs the workflow controller **418** to execute a job. In this process, the workflow information, registered in the workflow information storage **419** in advance based on an operation of an operator, can be used. Further, a new workflow information can be generated and then used based on contents set by the operator.

After receiving the execution instruction from the system controller **410**, the workflow controller **418** instructs the job controller **413** to execute each of the processes based on the designated execution sequence of the designated workflow information of the newly generated workflow information. Therefore, the workflow controller **418** can be used as a process execution controller.

After receiving the execution instruction, the job controller **413** inputs the above described PDL information and JDF information to the RIP engine **420** to execute the RIP processing. The JDF information includes information that indicates which one of the HWF server **4** and the DFE **100** is used for processing each of internal processes of the RIP processing by using the RIP engine.

The job controller **413** refers or checks allocation information of the RIP processing included in the JDF information. If one process designated by the workflow controller **418** is a process to be executed by the HWF server **4**, the job controller **413** instructs the RIP engine **420** to execute the designated one process. Based on the instruction from the job controller **413**, the RIP engine **420** executes the RIP processing based on parameters designated in the JDF information.

After executing the RIP processing, the RIP engine **420** updates the RIP status of each of the processes executed by the RIP processing. With this configuration, the status of each of the internal processes of the RIP processing executed by the HWF server **4** is changed from "NotYet" to "Done." The RIP engine **420** can be used as a control-side image drawing information generator or control-drawing information generator (or first image information generator).

The RIP-executed result data generated by executing the RIP processing is any one of PDL information, intermediate data, and raster data. Any one of the PDL information, intermediate data, or raster data are generated depending on the internal process of the RIP processing. Specifically, as the sequence proceeds, the intermediate data is generated from primary data such as PDL information, and the raster data is generated as final data from the intermediate data. The RIP-executed result data is correlated with a being-executed job, and stored in the job data storage **414**.

When each one of the internal processes of RIP processing is completed, the RIP engine **420** reports the completion of each one of the internal processes to the job controller **413**, and the job controller **413** reports the completion of each one of the internal processes to the workflow controller **418**. With this configuration, the workflow controller **418** starts to control a subsequent or next process based on the workflow information.

If the job contents received from the workflow controller **418** is a request to the other system, the job controller **413** inputs job data, compatible to other system, to the job communication unit **421**, and instructs the job communication unit **421** to transmit the job data. If the job data is to be transmitted to the offset printer **2**, the job data of a print target is converted to raster data, and then transmitted to the offset printer **2** as the job data.

Further, if the job data is to be transmitted to the digital printer **1**, the job controller **413** inputs the job data to the job communication unit **421** while designating a RIP engine that can respond with the RIP engine **420** from a plurality of the RIP engines included in the DFE **100**. With this configuration, the job communication unit **421** transmits the job data to the DFE **100** by designating the RIP engine that is the same type of the RIP engine **420**.

The job communication unit **421** transmits the job data such as a package of PDL information and JDF information or a package of intermediate data and JDF information to the DFE **100**. Further, the PDL information or intermediate data can be transmitted to the DFE **100** separately from the JDF information, in which the PDL information or intermediate data can be prepared as external resource data, and the JDF information can include universal resource locators (URL) indicating a storage area of the PDL information or a storage of intermediate data. In this configuration, the DFE **100** that receives the JDF information can access the storage area specified by the URL to acquire the PDL information or intermediate data.

A description is given of a functional configuration of the DFE **100** with reference to FIG. **6**. When the DFE **100** receives job data from the HWF server **4**, the DFE **100** controls the received job, an execution of the RIP processing, and the digital engine **150**. The HWF server **4** transmits the job data to the DFE **100** and instructs the DFE **100** to execute a print output operation by using the digital engine **150**. Therefore, the DFE **100** can be used as a device to provide digital printing capability to the HWF server **4**.

The job control performable by the DFE **100** is a process of controlling a series of processes such as a reception of job data, an analysis of JDF information, a generation of raster data, and a print output operation by the digital engine **150**. The execution control of the RIP processing is a process of controlling the RIP engine to execute the RIP processing based on information generated by the analysis of the JDF information.

The information generatable by analyzing the JDF information means that information used for the RIP processing is extracted from the JDF information (FIG. **3**), and is then converted to a data format processable by the DFE **100**, which is referred to "job attribute in DFE" in this description. By executing the RIP processing by using the job attribute in DFE, the intermediate data and raster data can be generated.

The control of the digital engine **150** is a process of transmitting raster data and at least a part of the above described job attribute in DFE to the digital engine **150**, and executing the print output operation by the digital engine **150**. These capabilities can be implemented by each of units shown in FIG. **6**. Each of the units shown in FIG. **6** can be implemented by activating the hardware (FIG. **2**) by loading programs stored in the ROM **30** on the RAM **20** and executing the loaded programs by the CPU **10**.

The DFE **100** can include a plurality of RIP engines therein, and each of the plurality of RIP engines can respond to each of RIP engines of other available devices. Specifically, each of the plurality of RIP engines of the DFE **100** can respond to each of RIP engines of other available devices that may transmit job data to the DFE **100** in the HWF system. Since the HWF servers **4***a* and **4***b* include different RIP engines, a plurality of the RIP engines that can respond to the RIP engines of HWF servers **4***a* and **4***b* is disposed in the DFE **100**.

As illustrated in FIG. **6**, the DFE **100** includes, for example, a network I/F **101**, a DFE controller **110**, and a display **102**. The DFE controller **110** includes, for example, a job receiver **111** including a plurality of specific job receiving units **112**, a system controller **113**, a job data storage **114**, a UI controller **115**, a job controller **116**, a JDF analyzer **117**, a RIP unit **118**, a RIP controller **119**, a RIP engine **120**, an image storage **121**, a printer controller **122**, a device information manager **123**, a device information communication unit **124**, and an imposition converter **125**.

In this configuration, each of the specific job receiving units **112** receives job data from the HWF server **4** via the network I/F **101**, and each of the plurality of specific job receiving units **112** corresponds to each of the plurality of RIP engines disposed in the DFE **100**. In this configuration, the specific job receiving unit **112** can be used as a specific receiver.

As described above, when job data is transmitted from the HWF server **4** to the DFE **100**, the corresponding RIP engine is designated, and the job data is transmitted to the corresponding RIP engine. Therefore, the specific job receiving unit **112** in the job receiver **111**, corresponding to the designated RIP engine, can receive the job data.

In the above described configuration, the job data can be input to the DFE **100** from the HWF server **4** via a network. Further, the job data can be input to the DFE **100** via a portable memory such as a USB memory. In this description, the JDF information is included in the job data. If the JDF information is not included in the job data, the job receiver **111** generates dummy JDF information, and assigns the dummy JDF information to the job data.

The specific job receiving units **112** can be disposed for each of the above described RIP engines. Further, each of the specific job receiving unit **112** can be used as a virtual printer set with job contents in advance. Specifically, each of the specific job receiving units **112** can be set for the corresponding RIP engine disposed in the DFE **100** and job contents, and then, by designating any one of the plurality of specific job receiving units **112**, the corresponding job can be executed with the contents set in advance.

Further, as to the one or more example embodiment of the present invention, the specific job receiving unit **112** can be set with a "pass-through mode." As illustrated in FIG. **6**, the DFE **100** can include the JDF analyzer **117**, independently from the RIP engine, to perform an analysis of JDF information. However, when the "pass-through mode" is activated, the RIP engine performs an analysis of the JDF information while the analysis of JDF information by the JDF analyzer **117** is not activated.

By employing this configuration having the "pass-through mode," JDF information using a format not processable by the JDF analyzer **117** can be used, a RIP engine that is difficult to include JDF analysis capability outside the RIP engine can be employed for the HWF server **4** and the DFE **100**. As to the one or more example embodiments, the "pass-through mode" can be used when a plurality of processes is distributed between the RIP engine **420** disposed in the HWF server **4** and the RIP engine **120** disposed in the DFE **100**, in which the RIP engine **120** and the RIP engine **420** employs the same type of engine having the same capability. The RIP engine **120** can be used as an output-side image drawing information generator or output-side drawing information generator (or second image information generator).

When the RIP processing is performed by the HWF server **4** and the DFE **100** as the distributed processing, it is preferable that the RIP processing is performed as one sequential processing as much as possible without being perceived as separate processing by the HWF server **4** the DFE **100**. Therefore, when data that is processed to the middle of the entire processing by the HWF server **4** is input to the DFE **100**, it is preferable that the processing is performed by the DFE **100** as a process being continued from the HWF server **4** while omitting the JDF analysis process that is performed when unprocessed job data is input.

As to the one or more example embodiments, the RIP engine having the same capability is disposed in each of the

HWF server **4** and the DFE **100**, with which the above described RIP processing can be controlled and performed preferably. Further, in this configuration, it is preferable that data processed by one RIP engine is transferred to another RIP engine as it is, which can be preferably implemented by using the "pass-through mode.

The system controller **113** stores the job data received by the specific job receiving unit **112** in the job data storage **114**, or transfers the job data received by the specific job receiving unit **112** to the job controller **116**. If the DFE **100** is devised to store the job data, the system controller **113** stores the job data in the job data storage **114**. Further, if the JDF information includes a description whether the job data is to be stored in the job data storage **114** or not, the system controller **113** perform the processing in line with the description.

The job data can be stored in the job data storage **114**, for example, when a preview of print contents is performed by the DFE **100**. In this case, the system controller **113** acquires data of a print target included in the job data, which is PDL information and intermediate data, from the job data storage **114** to generate preview data, and transfers the preview data to the UI controller **115**. With this configuration, the UI controller **115** controls the display **102** to display a preview of the print contents.

When the preview data is to be generated, the system controller **113** transfers the data of print target to the job controller **116**, and requests the job controller **116** to generate the preview data. The job controller **116** transfers the data of print target to the RIP unit **118** to generate the preview data, and the job controller **116** receives the generated preview data, and transfers the generated preview data to the system controller **113**.

Further, when an operator changes the JDF information for the DFE **100**, the job data is stored in the job data storage **114**. In this case, the system controller **113** acquires the JDF information from the job data storage **114**, and transfers the JDF information to the UI controller **115**. With this configuration, the JDF information of the job data is displayed on the display **102**, and the operator can change the JDF information.

When the operator changes the JDF information by operating the DFE **100**, the UI controller **115** receives the changed information, and reports the changed information to the system controller **113**. The system controller **113** applies the received changed information to the target JDF information to update the target JDF information, and stores the updated target JDF information in the job data storage **114**.

Then, when the system controller **113** receives a job execution instruction, the system controller **113** transfers the job data stored in the job data storage **114** to the job controller **116**. The job execution instruction can be input from the HWF server **4** via a network, or can be input by an operation of an operator to the DFE **100**. For example, if a job execution time is set in the JDF information, the system controller **113** transfers the job data stored in the job data storage **114** to the job controller **116** when the set time comes.

The job data storage **114** is a memory or a storage area to store the job data, which can be devised, for example, by the HDD **40** shown in FIG. **2**. Further, the job data can be stored in a memory or a storage area connected to the DFE **100** via a universal serial bus (USB) interface, or can be stored in a memory device connected or coupled via a network.

As described above, the UI controller **115** controls the display **102** to display information, and receives an operation of an operator to the DFE **100**. When the above described editing process is performed to the JDF information, the UI controller **115** interprets the JDF information, and displays contents of the print job on the display **102**.

The job controller **116** controls the job execution when the job execution instruction is transmitted from the system controller **113**. Specifically, the job controller **116** controls the JDF analysis process by the JDF analyzer **117**, the RIP processing by the RIP unit **118**, and the control of the digital engine **150** by the printer controller **122**.

When the job controller **116** receives the job execution instruction from the system controller **113**, the job controller **116** inputs the JDF information included in the job data to the JDF analyzer **117** to request a conversion of JDF. The JDF conversion request is a request of converting the JDF information described by a format used by an original or initial generator of the JDF information to a format decodable or processable by the RIP unit **118**. Therefore, the JDF analyzer **117** can be used as a process setting information converter.

By contrast, when the above described "pass-through mode" is designated, the job controller **116** acquires the JDF information included in the job data from the system controller **113**, and inputs the JDF information at it is to the RIP unit **118**. The designation of "pass-through mode" can be described in the JDF information by using the specific job receiving unit **112**.

The JDF analyzer **117** converts the JDF information described with the format used by the original generator to the format decodable or processable by the RIP unit **118**. Therefore, the JDF analyzer **117** can be used as a command information converter that converts a format of command information received by the DFE **100** to a format decodable or processable by the DFE **100**. The JDF analyzer **117** retains a conversion table therein, and extracts information required for the RIP unit **118** from information included in the JDF information, and converts a description format of the extracted information based on the conversion table. With this configuration, the above described job attribute in DFE can be generated.

FIG. **7** is an example of a conversion table retainable by the JDF analyzer **117**. As illustrated in FIG. **7**, the conversion table correlates a description format of JDF information and a description format of job attribute in DFE. For example, information of "number of copies" shown in FIG. **3** is described as "A-Amount" in the original or initial JDF information, and "A-Amount" is converted to a description of "number of copies" when generating the job attribute in DFE.

The job attribute in DFE can be generated based on a process by the JDF analyzer **117** using the conversion table shown in FIG. **7**. Information described in the job attribute in DFE includes, for example, "job information," "edit information," "finishing information" or the like shown in FIG. **3**.

The JDF analyzer **117** sets the "RIP control mode" to the job attribute in DFE when generating the job attribute in DFE. The "RIP control mode" includes a "page mode" and a "sheet mode." The JDF analyzer **117** assigns or allocates the "RIP control mode" based on a type of the specific job receiving unit **112** that has received the job data, job contents, and HWF software program installed in the HWF server **4** used as a transmission source of the job data.

In the configuration described in this specification, condensed printing for a print job can be set by using the "page mode." The "RIP control mode" will be described later in detail.

Based on the job attribute in DFE generated by the JDF analyzer **117**, the job controller **116** generates "RIP parameter," and transfers the RIP parameter" to the RIP controller **119** in the RIP unit **118** to execute the RIP processing. With this configuration, the RIP unit **118** can execute the RIP processing based on the "RIP parameter."

FIG. **8** is an example of one set of RIP parameters of one or more example embodiments. The RIP parameters include, for example, "type of input/output data," "data reading information," and "RIP control mode" as header information. The "type of input/output data" designates the type of input/output data such as JDF, PDL or the like. The designatable format is, for example, JDF, PDL, text format, extension of image data, and intermediate data.

The "data reading information" includes information of a designation method and a designation position of reading position and writing position of the input/output data. The "RIP control mode" is information that designates the "page mode" and "sheet mode." The header information further includes, for example, information of "unit" used in the RIP parameter, and information of compression method of data.

The "input/output image information" includes, for example, "information of output image," "information of input image," and "information of image processing." The "information of output image" includes information of, for example, format, resolution, size, color separation, color shift, and page orientation of output image data. The "information of input image" includes information of, for example, format, resolution, page area, and color settings of input image data. Further, the "information of image processing" includes information of, for example, an offset of enlargement/reduction algorism, an object area, and an offset of halftone.

The "PDL information" is information related to PDL information used for the RIP parameter. The "PDL information" includes information of, for example, "data area," "size information," and "data arrangement method." In this description, the PDL information is data of print target in a job, and includes intermediate data. The "data area" designates information of an area where the PDL information is stored. The "size information" designates a data size of the PDL information. The "data arrangement method" designates a data arrangement pattern in a memory storing the PDL information such as "little big endian" and "big endian."

When the "pass-through mode" is used, the job controller **116** generates the RIP parameter based on the JDF information, and PDL information or intermediate data. In this case, each of items configuring the RIP parameter is set with information useable for referring corresponding items in JDF information.

As illustrated in FIG. **8**, the RIP parameter includes the "RIP control mode." The RIP controller **119** controls the RIP engine **120** based on the "RIP control mode." Therefore, the sequence is set based on the "RIP control mode." As above described, the "page mode" and "sheet mode" can be set as the "RIP control mode."

The "page mode" and "sheet mode" are performed to a plurality of pages to generate raster data. As to the "page mode," the RIP processing is performed for each page of the plurality of pages, and then raster data condensing the plurality of RIP-processed pages on the single sheet is generated. As to the "sheet mode," a plurality of pages are condensed on a single sheet at first, and then the RIP processing is performed for each part (i.e., each page) of the single sheet to generate raster data condensing the plurality of pages on the single sheet.

Further, when the "pass-through mode" is set, the "pass-through mode" can be designated in the "RIP control mode." However, this is just one example. The "pass-through mode" can be described in an item other than the "RIP control mode."

Further, the job controller **116** sets "RIP engine identification information" in the RIP parameter. The "RIP engine identification information" is information for identifying each of a plurality of the RIP engines **120** included in the RIP unit **118**. In this configuration, the same RIP engine is used in the HWF server **4** as the RIP engine **420**, and in the DFE **100** as the RIP engine **120**.

Therefore, the JDF information includes information for designating the specific job receiving unit **112** as described above, and the designated specific job receiving unit **112** receives the job data. Each one of the specific job receiving units **112** corresponds to any one of the RIP engines **120**, and identification information of the corresponding RIP engine **120** is added to the received JDF information. Based on the identification information of the RIP engine **120** added to the JDF information, the job controller **116** adds the "RIP engine identification information" to the RIP parameter.

As to the RIP unit **118**, the RIP controller **119** controls the plurality of RIP engines **120** to perform each of the internal processes of RIP processing based on the input RIP parameter to generate raster data. The capability of the RIP engine **120** will be described later in detail.

The image storage **121** is a memory or a storage area to store raster data generated by the RIP engine **120**. The image storage **121** can be devised, for example, by the HDD **40** shown in FIG. **2**. Further, the image storage **121** can be a memory or a storage area connected to the DFE **100** via a universal serial bus (USB) interface, or can be a memory device connected or coupled via a network.

The printer controller **122** is connected or coupled to the digital engine **150**. The printer controller **122** reads raster data stored in the image storage **121**, and transmits the raster data to the digital engine **150** to execute a print output operation. Further, the printer controller **122** acquires the finishing information included in the job attribute in DFE from the job controller **116** to control a finishing process.

The printer controller **122** communicates information with the digital engine **150** to acquire information of the digital engine **150**. For example, when CIP4 standard is used, DevCaps standard is defined as the JDF information standard for communicating device property information with a printer. Further, printer information can be collected by using a communication protocol such as simple network management protocol (SNMP) and a database such as management information base (MIB).

The device information manager **123** manages the device information such as information of the DFE **100** and the digital engine **150**. The device information includes, for example, information of the RIP engines **120** included in the RIP unit **118**, and information of the specific job receiving units **112** in the job receiver **111**. Further, the information of the specific job receiving units **112** includes information of the above described "pass-through mode."

The device information communication unit **124** communicates the device information with the HWF server **4** via the network I/F **101** using a compatible format such as MIB and job messaging format (JMF). With this configuration, the device information communication unit **415** of the HWF server **4** can acquire the device information from the DFE **100**, with which information of the RIP engines **120** and information of the specific job receiving units **112** included in the DFE **100** can be set to a GUI settable and displayable on the client terminal **5**.

As to the DFE **100**, when the printer controller **122** controls the digital engine **150**, and then the print output operation is completed, the system controller **113** recognizes the completion of the print output operation via the job controller **116**. Then, the system controller **113** reports the completion of a job to the HWF server **4** via the job receiver **111**. With this configuration, the job communication unit **421** of the HWF server **4** receives a report of the completion of the job.

As to the HWF server **4**, the job communication unit **421** transfers the report of the completion of the job to the job controller **413**, and then the job controller **413** reports the completion of the job to the workflow controller **418**. The transmission of the job data from the HWF server **4** to the DFE **10** is executed by the workflow controller **418** based on a workflow information.

When the completion of the job by the DFE **100** is recognized, the workflow controller **418** controls a next process based on the workflow information. A process to be performed after performing the print output operation by the DFE **100** is, for example, a post-processing by the post processing apparatus **3**.

A description is given of a functional configuration of the RIP engine of the one or more example embodiments. FIG. **9** is a functional configuration of the RIP engine **120** having the JDF analyzer **117** used for the JDF analysis process. As above described, the RIP engine **120** can be a software module that executes each of the internal processes of RIP processing to generate raster data based on the RIP parameter shown in FIG. **8**. The RIP engine **120** can be, for example, an Adobe systems PDF printing engine (APPE) provided by Adobe systems, but not limited hereto.

As illustrated in FIG. **9**, the RIP engine **120** is configured by a control unit **201** and other units. The other units can be employed as extended units, which can be extended by a vendor. The control unit **201** executes the RIP processing by using various capabilities that can be devised as the extended units. Specifically, as illustrated in FIG. **9**, the RIP engine **120** includes the control unit **201** and the extended units such as an input unit **202**, a RIP parameter analyzer **203**, a pre-fright processing unit **204**, a normalize processing unit **205**, a mark processing unit **206**, a font processing unit **207**, a color management module (CMM) processing unit **209**, a trapping processing unit **210**, a calibration processing unit **211**, a screening processing unit **212**, and an output unit **213**.

The input unit **202** receives an initialization request, and an execution request of the RIP processing, and reports the request to the control unit **201**. When the initialization request is received, the above described RIP parameter is also input to the control unit **201**. When the control unit **201** receives the initialization request, the control unit **201** inputs the RIP parameter, received at the same time with the initialization request, to the RIP parameter analyzer **203**. Then, the control unit **201** acquires an analysis result of the RIP parameter, computed by the RIP parameter analyzer **203**, and determines an activation sequence of each of the extended units included in the RIP engine **120** when the RIP processing is performed. Further, the control unit **201** determines a data format generatable by performing the RIP processing, in which the data format can be any one of the raster image, preview image, PDF, and intermediate data.

Further, when the control unit **201** receives the execution request of the RIP processing from the input unit **202**, the control unit **201** activates each of the extended units included in the RIP engine **120** based on the activation sequence that is determined when the control unit **201** receives the initialization request. The pre-fright processing unit **204** checks validity of input PDL data contents. If the pre-fright processing unit **204** detects an illegal PDL attribute, the pre-fright processing unit **204** reports the illegal PDL attribute to the control unit **201**. When the control unit **201** receives this report, the control unit **201** reports the illegal PDL attribute to an external module such as the RIP controller **119** and the job controller **116** via the output unit **213**.

The pre-fright processing checks whether attribute information that disenables a processing by other modules included in the RIP engine **120** is included in the received data. For example, the pre-fright processing checks whether a font unable to be processed is designated or not.

The normalize processing unit **205** converts the input PDL data to PDF if the input PDL data is not PDF but PostScript. The mark processing unit **206** applies graphic information of a designated mark, and superimposes the graphic information at a designated position on a target print image.

The font processing unit **207** extracts font data, and embeds the font to PDL data, and outlines the font. The color management module (CMM) processing unit **209** converts a color space of an input image to cyan, magenta, yellow, black (CMYK) based on a color conversion table set by International Color Consortium (ICC) profile. The ICC profile includes color ICC information, and device ICC information.

The trapping processing unit **210** performs trapping processing. When different color areas are adjacent at boundaries, a gap may occur at the boundaries when a positional error occurs. The trapping processing expands each of the color areas to fill the gap.

The calibration processing unit **211** adjusts fluctuation of generated color balance, caused by aging and individual difference of an output device, to enhance precision of color conversion by the CMM processing unit **209**. Further, the process by the calibration processing unit **211** can be performed outside the RIP engine **120**.

The screening processing unit **212** generates halftone dots in view of a final output such as printed sheet. Further, the process by the screening processing unit **212** can be performed outside the RIP engine **120** similar to the calibration processing unit **211**. The output unit **213** transmits a RIP processing result to the outside. The RIP processing result is any one of raster image, preview image, PDF, and intermediate data that are determined when the initialization is performed.

A description is given of another functional configuration of the RIP engine **120** with reference to FIG. **10**. FIG. **10** is another functional configuration of the RIP engine **120** without using JDF analysis process by the JDF analyzer **117**. As above described, a case that the JDF analyzer **117** does not perform the JDF analysis process means that the internal processes of RIP processing are performed by the HWF server **4** and the DFE **100** as the distributed processing. Therefore, the HWF server **4** includes the RIP engine **420** having the same configuration of the RIP engine **120** shown in FIG. **10**.

As illustrated in FIG. **10**, most of the functional configuration of the RIP engine **120** not using JDF analysis process by the JDF analyzer **117** are same as the functional configuration of the RIP engine **120** of FIG. **9**. Hereinafter, portions different from the configuration of FIG. **9** are described. Similar to FIG. **9**, the units other than the control unit **201** can be used as the extended units. Specifically, as illustrated in FIG. **10**, the RIP engine **120** includes the control unit **201** and the extended units such as the input unit **202**, the pre-fright processing unit **204**, the normalize processing unit **205**, the mark processing unit **206**, the font processing unit **207**, the color management module (CMM) processing unit **209**, the trapping processing unit **210**, the calibration processing unit **211**, the screening processing unit **212**, the output unit **213**, a job attribute analyzer **214**, a RIP status analyzer **215**, a RIP status manager **216**, and a layout processing unit **217**.

As to the configuration of FIG. **10**, when the control unit **201** receives an initialization request from the input unit **202**, the control unit **201** acquires the initialization request and the JDF information. Then, the control unit **201** analyzes the JDF information and PDL information by using the job attribute analyzer **214**, and the control unit **201** determines a process sequence of the extended units, and a data format to be generated as a process result of each of the extended units same as the configuration of FIG. **9**.

As to the RIP engine **120** disposed in the DFE **100**, data format obtained as a process result by the RIP engine **120** often becomes raster data to be input to the printer controller **122**. By contrast, as to the RIP engine **420** disposed in the HWF server **4**, data format obtained as a process result by the RIP engine **420** becomes different depending on patterns of the distributed processing by the HWF server **4** and the DFE **100**. Therefore, the control unit **201** of the RIP engine **420** determines the data format (e.g., PDL information, intermediate data) of the process result based on an analysis result by the job attribute analyzer **214**.

Further, the control unit **201** analyzes the RIP status information included in the JDF information by using the RIP status analyzer **215** to check whether one or more already-executed internal processes of RIP processing exist. If the already-executed internal process of the RIP processing unit exists, the corresponding extended unit is excluded from the target processing units of the RIP processing.

Further, the RIP status analyzer **215** can analyze the RIP status included in the JDF information, and the RIP status analyzer **215** can similarly analyze the RIP status based on PDL information. In a case of analyzing the PDL information, since the attribute information such as parameter is erased for the already-executed internal processes of RIP processing, it can determine which one of the internal processes of RIP processing is not yet performed based on the remaining attribute information.

The layout processing unit **217** performs the imposition process. Under the control of the control unit **201**, the RIP status manager **216** changes the RIP status corresponding to each of the internal processes of RIP processing already performed by each of the extended units to "Done". The output unit **213** transmits a RIP result to outside the RIP engine. The RIP result is data having the data format that is determined when the initialization is performed.

Further, as described above, the plurality of the RIP engines **120** disposed in the DFE **100** such as "DFE (engine A)" and "DFE (engine B)" can be selectively used depending on information of the "RIP device designation" included in the JDF information. Since the control unit **201** cannot consign the processing to the extended units of other RIP engine, the job controller **116** can be used to consign the processing.

As described above, the job controller **116** adds the "RIP engine identification information" to the RIP parameter. In this case, the job controller **116** generates different RIP parameters for each of the different internal processes of RIP processing designated with different RIP engines. In an example case of FIG. **3**, the RIP parameter of "engine A" is generated or designated for executing the "font" and "layout," the RIP parameter of "engine B" is generated or designated for executing the "mark," and the RIP parameter of "engine A" is generated or designated for the subsequent processes after the "mark" as shown in FIG. **3**.

Then, the job controller **116** requests the RIP unit **118** to perform the RIP processing based on each of the generated RIP parameters with a process sequence set for each of the internal processes of RIP processing. With this configuration, each of the internal processes of RIP processing can be performed by selectively using the different RIP engines such as "engine A" and "engine B."

In this process, each of the engines can perform only the designated process by referring the "RIP status" information. Specifically, by setting the status of to-be-processed items as "NotYet" and the status of other items as "Done," only the designated process can be performed.

A description is given of an operation of the HWF system of the one or more example embodiments with reference to FIG. **11**. FIG. **11** is a sequential chart of an operation flow of the HWF system. FIG. **11** is an example of a sequential chart when the digital printer **1** executes a print output operation. As illustrated in FIG. **11**, the device information communication unit **415** of the HWF server **4** acquires device information from the DFE **100** and the CTP **200** via a network, and the device information manager **416** registers the device information in the device information storage **417** (S**1101**). The process of S**1101** can be performed at regular intervals.

When a registration of job data is performed by an operation of an operator to a GUI of the HWF system, the client terminal **5** transmits a job registration request to the HWF server **4** (S**1102**), in which the UI controller **412** of the HWF server **4** acquires the job registration request. With this configuration, the data receiver **411** acquires job data under the control of the system controller **410** (S**1103**).

When the data receiver **411** acquires the job data, the system controller **410** controls the job controller **413** to convert a format of the acquired job data to PDL format (S**1104**), and the format-converted job data is registered in the job data storage **414**. As to the GUI that the registration of job data is performed at S**1102**, an interface such as a file path for designating a registration target data, and an input section for designating each of information items in the JDF information (FIG. **3**) can be displayed.

Further, by performing the process at step S**1101**, the HWF server **4** can acquire information of the type of the RIP engine disposed in the DFE **100**. Therefore, the information of the "RIP device designation" (FIG. **3**) can be selectively input to the input section on the GUI of the client terminal **5**, in which when the DFE **100** is to perform the processing, a specific RIP engine to perform the concerned processing can be selected.

Further, when a process of dividing the job data is performed in response to an operation of the operator to the GUI of the HWF system, the client terminal **5** transmits a job dividing request to the HWF server **4** (S**1105**). FIG. **12** is an example of information includable in the job dividing request transmitted at S**1105**. As illustrated in FIG. **12**, information indicating a dividing target job and information indicating dividing contents are transmitted as the job dividing request. In this example case, the information indicating dividing contents is specifically correlated with a device to execute a print output operation of each of the dividing contents. In an example case of FIG. **12**, one device is correlated for executing a print output operation of some pages, and another device is correlated for executing a print output operation of other pages, in which the devices are correlated with the unit of "page."

When the HWF server **4** receives the job dividing request, the system controller **410** divides the dividing target job (i.e., job data) page-by-page based on the information indicating the dividing contents (FIG. **12**) to generate a plurality of sub job data configuring the dividing target job (S**1106**). In this process, the device designated for each of the divided area can be used as information of "device designation" in the JDF information (FIG. **3**). When the job data is divided to generate the plurality of the sub-job data, each of the sub job data is stored in the job data storage **414** as a discrete job.

Further, when a process of generating a workflow is performed in response to an operation of the operator to the GUI of the HWF system, the client terminal **5** transmits a workflow generation request to the HWF server **4** (S**1107**). When the workflow generation request is transmitted, information designating the workflow contents and information identifying one or more jobs to be processed in line with the workflow (FIG. **5**) are transmitted.

When the HWF server **4** receives the workflow generation request, the system controller **410** inputs the information received with the workflow generation request to the workflow controller **418**. With this configuration, the workflow controller **418** generates a new workflow information based on the received information, and stores the new workflow information in the workflow information storage **419**, and correlates the new workflow information and the job identified by the workflow generation request (S**1108**). The workflow and the job can be correlated by adding, for example, an identifier identifying the workflow to the JDF information.

When the job execution operation is performed in response to an operation of an operator to the GUI on the client terminal **5** after S**1108**, the client terminal **5** transmits a job execution request to the HWF server **4** (S**1109**). Further, steps S**1102**, S**1105**, S**1107**, and S**1109** can be performed as different processes, or steps S**1102**, S**1105**, S**1107**, and S**1109** can be performed as one-time process for performing the job registration request, job dividing request, workflow generation request, and job execution request at one time.

When the HWF server **4** receives the job execution request, the system controller **410** acquires the designated job data from the job data storage **414** based on information for identifying the job data received with the job execution request (S**1110**). Further, the system controller **410** acquires the latest information of the device designated in the acquired job data from the device information manager **416**, and sets the acquired latest device information to the job (S**1111**).

Then, the system controller **410** transfers the job data to the workflow controller **418** to start an execution of the workflow (S**1112**). The workflow controller **418** acquires the workflow information correlated to the acquired job data from the workflow information storage **419**, and executes the processes in line with the workflow information.

As to the workflow processing, the processing in the server to be performed by the RIP engine **420** disposed in the HWF server **4** is executed at first (S**1113**). At S**1113**, under the control of the workflow controller **418**, the job controller **413** controls the RIP engine **420** to execute the processes as described above.

When the workflow processing proceeds to a stage to transfer the workflow processing to the DFE **100**, under the control of the workflow controller **418**, the job controller **413** controls the job communication unit **421** to transmit the job data to the DFE **100** (S**1114**). At S**1114**, the job controller **413** designates a specific job receiving unit **112** from the plurality of specific job receiving units **112** based on information designated in the JDF information.

When the job data is transmitted to the DFE **100**, any one of the plurality of specific job receiving units **112** is designated, with which the specific job receiving unit **112** matched to the job data receives the job data in the DFE **100**. When the job data is input into the DFE **100**, the RIP processing and the output processing by the digital engine **150** are performed in the DFE **100** as described above (S**1115**).

When the DFE **100** completes the designated processes, the job receiver **111** reports the completion notice of the processes to the HWF server **4** (S**1116**). When the job controller **413** receives the completion notice of the processes from the DFE **100** via the job communication unit **421**, the job controller **413** reports the completion notice of the processes to the workflow controller **418**. Then, the workflow controller **418** transmits a post processing request to the post processing apparatus **3** to execute a post-processing designated in the workflow executable after the processing at the DFE **100** (S**1117**).

At S**1117**, under the control of the workflow controller **418**, the job controller **413** controls the job communication unit **421** to transmit the post processing request to the post-processing apparatus **3**. By performing the above described processing, the operation of the HWF system completes.

A description is given of a detail of the internal processing of the DFE **100** at S**1115** in FIG. **11** with reference to FIG. **13**, which is a flow chart showing the steps of the processing in the DFE **100**. A shown in FIG. **13**, when the HWF server **4** transmit the job data to the DFE **100**, the designated specific job receiving unit **112** receives the job data (S**1301**). After receiving the job data, the specific job receiving unit **112** updates the JDF information to apply the discrete setting, set to the specific job receiving unit **112**, to the job data (S**1302**).

The above described "pass-through mode" can be also applied at S**1302**. The job data applied with the discrete setting is input to the system controller **113**, and then the system controller **113** stores the input job data in the job data storage **114** depending on the discrete setting, and performs a preview processing via the UI controller **115** depending on an operation of an operator.

The system controller **113** inputs the job data to the job controller **116** when the job execution timing comes at the DFE **100**. For example, the system controller **113** inputs the job data to the job controller **116** when the job execution of the DFE **100** is requested by an operation of the operator, or when a timer counts the execution time set in advance. Then, the job controller **116** checks whether the pass-through mode is set by referring the input job data (S**1303**). If the result is not the pass-through mode (S**1303**: NO), the job controller **116** outputs the job data to the JDF analyzer **117** to generate the job attribute in DFE (S**1304**).

If the result is the pass-through mode (S**1303**: YES) or the job attribute in DFE is generated by perfuming the JDF conversion (S**1304**), the job controller **116** generates the RIP parameter (S**1305**). If the result is not the pass-through mode (S**1303**: NO), the RIP parameter shown in FIG. **8** is generated at S**1305**. By contrast, if the result is the pass-through mode (S**1303**: YES), the RIP parameter is generated for information other than "input/output image information" (FIG. **8**), and the JDF information is referred for the "input/output image information."

When the job controller **116** generates the RIP parameter, the job controller **116** inputs required information to the RIP unit **118** to execute the RIP processing (S**1306**). With this configuration, the raster data can be generated by the RIP engine **120**.

At S**1305**, as described above, based on information of the "RIP device designation" shown in FIG. **3**, the RIP parameter is generated for each of the RIP engines. At S**1306**, the RIP processing is executed for each of the generated RIP parameter with a given process sequence to generate the raster data.

When the raster data is generated, and the job controller **116** acquires the raster data from the RIP unit **118**, the job controller **116** inputs the raster data to the printer controller **122** to execute a print output operation by the digital engine **150** (S**1307**). With this processing configuration, the internal processing of the DFE **100** is completed.

A description is given of a detail of the RIP processing at S**1306** of FIG. **13** with reference to FIG. **14**. As shown in FIG. **14**, based on the initialization request input to the input unit **202**, the control unit **201** performs an initialization process (S**1401**). In an example case of FIG. **9**, at S**1401**, the RIP parameter analyzer **203** receives and analyzes the RIP parameter, and determines one or more extended units to be used for executing one or more processes among the extended units included in the RIP engine **120**, and a process sequence of processing of the extended units as described above. Further, the RIP parameter analyzer **203** determines a data format of data to be generated as a process result when the processing is performed.

Further, in another example case of FIG. **10**, the job attribute analyzer **214** receives and analyzes JDF information and PDL information to determine one or more extended units to be used for executing one or more processes among the extended units included in the RIP engine **120**, and a process sequence of processing of the extended units. Further, the job attribute analyzer **214** determines a data format of data to be generated as a process result when the processing is performed. Then, in another example case of FIG. **10**, the control unit **201** instructs the RIP status analyzer **215** to execute the status analysis.

As to the RIP status analysis, the RIP status analyzer **215** refers or checks the "RIP status" (FIG. **3**), and selects one item of the internal processes of RIP processing (S**1402**). If the status of the selected item is "Done" (S**1403**: YES), the corresponding extended unit is excluded from the extended units determined as the execution targets at S**1401** (S**1404**). If the status of the selected item is "NotYet" (S**1403**: NO), the sequence proceeds to S**1405**.

The RIP status analyzer **215** repeats steps from S**1402** to S**1405** until all of the items of the internal processes of RIP processing are processed (S**1405**). When the RIP status analyzer **215** completes steps from S**1402** to S**1405** for all of the items of the internal processes of RIP processing (S**1405**: YES), and the input unit **202** acquires an execution request of the RIP processing (S**1406**: YES), the control unit **201** controls each of the extended units to execute the RIP processing with a given process sequence (S**1407**).

At S**1407**, the RIP processing is requested to one or more extended units determined at step S**1401** and not excluded by the process at step S**1404**. Further, the RIP processing is requested to perform in line with the process sequence determined at step S**1401**. When the one or more extended units perform the RIP processing and the raster data is generated, the output unit **213** outputs a process result (S**1408**). With this processing configuration, the RIP processing by the RIP unit **118** completes.

In another example case of FIG. **10**, steps S**1402** to S**1405** (i.e., status analysis) is performed only for the RIP engine **120** compatible to the pass-through mode because the RIP status analysis is required when the RIP processing is divided or assigned between the HWF server **4** and the DFE **100** as described above.

Since the RIP engine disposed in the HWF server **4** and the RIP engine disposed in the DFE **100** use the RIP engine having the same capability, the RIP processing can be performed as one processing without recognizing a boundary of the HWF server **4** and the DFE **100**. Therefore, it is preferable to input data processed by the RIP engine **420** of the HWF server **4** to the RIP engine **120** of the DFE **100** as they are, in which the pass-through mode is suitable for the RIP processing because the JDF analyzer **117** disposed outside of the RIP engine **120** is not used.

However, this is just one example. Even if the pass-through mode is not used, the RIP status analysis is required when the RIP processing is divided or assigned between the HWF server **4** and the DFE **100**. Specifically, when the RIP processing is divided or assigned between the HWF server **4** and the DFE **100**, the RIP processing already executed at the HWF server **4** is required to be excluded from the RIP processing when the RIP processing is executed at the DFE **100**.

Therefore, even if the RIP engine **120** is not compatible to the pass-through mode, the RIP status analyzer **215** can be disposed to divide or assign the RIP processing between the HWF server **4** and the DFE **100**. Specifically, when the RIP processing is divided or assigned between the HWF server **4** and the DFE **100**, the JDF analysis can be performed by the JDF analyzer **117** at the DFE **100**, and then the RIP status analysis can be performed by the RIP status analyzer **215** to determine which internal process of RIP processing is required to be processed.

As to the above described HWF system, under the control of the workflow controller **418**, the processing in the HWF server **4** can be executed by the RIP engine **420** of the HWF server **4**. By executing the processing in the HWF server **4**, RIP-processed data such as any one of PDL information, intermediate data, and raster data can be generated and transmitted to the DFE **100**.

The processing in the HWF server **4** means, for example, the RIP processing including various processes such as the above described mark processing and font processing. If RIP-processed data is intermediate data or raster data, the RIP-processed data becomes one data integrally including the processed results. Therefore, it cannot be identified which mark is applied to which part in the RIP-processed data. Therefore, when the raster data processed by the RIP processing by the RIP engine disposed in the HWF server **4** is transferred to the DEF **100**, the processed results obtained by the RIP processing at the HWF server **4** cannot be changed at the DFE **100**.

As to one or more example embodiments of the present invention, the processed results obtained by the RIP processing on the HWF server **4** can be changed at the DFE **100**. A description is given of changing of process items at the DFE **100** by using a mark processing as one example of the process items, in which the contents of the mark processing processed at the HWF server **4** can be changed at the DFE **100**.

FIG. **15** illustrates an example of a recording medium such as a sheet set with one or more marks, and FIGS. **16**A and **16**B illustrates another example of a recording medium such as a sheet set with one or more marks. The recording medium can be paper sheet, film sheet, plastic sheet or the like, which can be used as the recording medium to form an image by performing an image forming operation. In this description, a paper sheet is used as one example of the recording medium.

The mark is an image data printable on a given area or portion of a sheet. For example, as illustrated in FIG. **15**, target image data is printed on a hatched area (hereinafter, "document print area") of the sheet, and the mark is printed on the given area on the sheet, which is outside the "document print area." The given area is, for example, a bleed area to be cut by a trimmer, and thereby a printed product does not include the bleed area when the printed product is finally prepared.

As illustrated in FIG. **15**, the mark printed in the bleed area includes, for example, a crop mark **301**, a text mark **302**, and a color bar **303**. The crop mark **301** is printed at each of four corners of the sheet as a mark to indicate a cutting position of the sheet, with which the sheet can be cut to generate a printed product with a finishing size.

The text mark **302** is text information such as information of system contents used for generating job data, and information of date/time of the executed print output operation. The color bar **303** is used as information to check color tone. Further, as illustrated in FIGS. **16**A and **16**B, the mark includes, for example, the crop mark **301**, a collation **304**, and a back signature **305**. Therefore, the mark is added on the sheet as "added information" to indicate information of various processing executed in the HWF system, and the mark processing is performed to add the mark on the sheet having formed with an image.

The marks indicated in FIGS. **15** and **16** are encircled by dot lines for clarifying positions of the marks, but the dot lines may not be printed on the sheet when a print output operation is performed.

For example, when the client terminal **5** generates job data as described above, and the marks shown in FIGS. **15** and **16** are added to the job data, the client terminal **5** generates JDF information including information of the marks set to the job data.

FIG. **17** is an example of JDF information including information of the marks. The JDF information of FIG. **17** can be generated by adding "mark information" to the JDF information shown in FIG. **3**. As illustrated in FIG. **17**, the "mark information" includes, for example, "mark data file," "mark designation page information," "mark position information," "mark size information," "mark orientation information," and "mark type information (or mark identification information)."

The "mark data file" is list information to acquire image data of the set marks, in which mark type information (or mark identification information) for identifying the marks and information of storage areas storing image data of the marks are correlated for each of the marks.

The "mark designation page information" is list information that designates each of pages where each of the marks is added. The "mark position information" is list information that designates position information on each of pages where each of the marks is added. The "mark size information" is list information that designates size information of each of the marks. The "mark orientation information" is list information that designates an orientation of each of the marks. The "mark type information" is list information that designates a type of each of the marks. For example, the "mark type information" designates whether a mark is the crop mark or the text mark.

Further when the mark setting is performed at the HWF server **4**, the image data of the set mark is correlated with job data, and then stored in the job data storage **414**. Therefore, the storage area of each of the marks designated by the "mark data file" in the JDF information indicates a storage area in the job data storage **414**.

A description is given of a process of storing RIP-processed data by the job controller **413**. FIG. **18** is a flowchart showing the steps of a process of storing the RIP-processed data by the job controller **413**. As to the one or more example embodiments, when the mark setting is performed at the HWF server **4**, it is assumed that the mark processing is performed by the RIP engine **420** of the HWF server **4**.

As illustrated in FIG. **18**, the job controller **413** determines whether the mark setting is performed at the HWF server **4** (S**1801**). Specifically, when the mark image data correlated to the job data is stored in the job data storage **414**, the job controller **413** determines that the mark setting is already performed. Further, for example, the job controller **413** can determine that the mark setting is already performed when the JDF information includes the "mark information."

When the mark setting is already performed (S**1801**: YES), the job controller **413** stores data not yet processed by the RIP processing by the RIP engine **420** (hereinafter, "pre-RIP-processing data") in the job data storage **414** (S**1802**). After storing the pre-RIP-processing data in the job data storage **414**, the job controller **413** stores RIP-processed data generated by performing the RIP processing by the RIP engine **420** in the job data storage **414** (S**1803**).

By contrast, when the mark setting is not yet performed (S**1801**: NO), the job controller **413** stores the RIP-processed data in the job data storage **414** without storing the pre-RIP-processing data in the job data storage **414** (S**1803**). When the mark setting is already performed (S**1801**: YES), steps S**1802** and S**1803** can be performed with a sequence of from S**1802** to S**1803**, a sequence from S**1803** to S**1802**, or steps S**1802** and S**1803** can be performed concurrently.

Further, the job controller **413** inputs job data, generated from the data stored in the job data storage **414**, to the job communication unit **421**. FIG. **19** is an example of job data input to the job communication unit **421** when the mark setting is performed at the HWF server **4**. As illustrated in FIG. **19**, the job data includes, for example, JDF information, pre-RIP-processing data, mark data, and RIP-processed data. In this case, the pre-RIP-processing data and the mark data can be external resource data, and the job data can include the JDF information having universal resource locators (URL) indicating a storage of the pre-RIP-processing data and a storage of the mark data, in which a device or apparatus (i.e., receiver side) that receives the JDF information can access the storages specified by the URL to acquire the RIP processing data and the mark data.

FIGS. **20**A and **20**B are an example of the pre-RIP-processing data and the mark image data included in the job data of FIG. **19**. FIG. **20**A is an example of the pre-RIP-processing data, which is data before performing the RIP processing such as the mark processing. FIG. **20**B is an example of the mark data such as the crop mark, the text information, and the color bar, which are image data added by the mark setting, in which each of the marks is included in the job data as separate or different image data.

A description is given of a process of changing the mark setting at the DFE **100**. FIG. **21** is a flowchart showing the steps of a process of controlling a change of the mark setting by the system controller **113** of the DFE **100**. As illustrated in FIG. **21**, the system controller **113** displays a preview image of print contents on the display **102** (S**2101**).

Specifically, the system controller **113** acquires the mark processing-executed RIP-processed data included in job data from the job data storage **114**, and transfers the mark processing-executed RIP-processed data to the job controller **116**, and then the system controller **113** requests the job controller **116** to generate preview data. The job controller **116** transfers the RIP-processed data to the RIP unit **118** to generate the preview data by using the RIP unit **118**, and the job controller **116** transfers the generated preview data to the system controller **113**.

The system controller **113** transfers the generated preview data to the UI controller **115**. Then, the UI controller **115** displays a preview image added with the mark set at the HWF server **4** on the display **102** (S**2101**). An operator of the DFE **100** refers the preview image displayed on the display **102** when to perform the changing of the mark setting, in which the operator adds a new mark as required, and instructs updating of the position and size of the added new mark.

When the changing of the mark setting is performed, the UI controller **115** receives the changed contents, and outputs mark setting changing information indicating the changed contents of the mark setting to the system controller **113**. Therefore, the system controller **113** can be used as a process contents information acquiring unit that acquires information indicating process contents set by the mark processing based on the preview image.

After displaying the preview image, the system controller **113** determines whether the changing of the mark setting is performed. Specifically, the system controller **113** determines whether the mark setting changing information is input from the UI controller **115** (S**2102**). When the changing of the mark setting is performed (S**2102**: YES), the system controller **113** acquires the mark setting changing information input from the UI controller **115** (S**2103**).

When the system controller **113** acquires the mark setting changing information (S**2103**), the system controller **113** updates the mark image data based on the acquired mark setting changing information (S**2104**). Specifically, when a new mark is added, the system controller **113** stores image data of the added new mark in the job data storage **114** by correlating the image data of the added new mark to the job data stored in the job data storage **114**. Further, for example, when the updating of the added mark is instructed, the system controller **113** updates the position and size of the mark stored in the job data storage **114** based on the updated contents.

After updating the mark image data (S**2104**), the system controller **113** updates the JDF information (S**2105**). Specifically, based on the mark setting changing information acquired at S**2103**, the system controller **113** adds information of the new added mark to each information included in "mark information" or updates information of the updated mark. Further, the system controller **113** updates the "RIP status" of all of items set in the JDF information to "NotYet." Further, the system controller **113** updates information designating data that becomes a print target of the JDF information to information designating the pre-RIP-processing data.

After updating the JDF information (S**2105**), the system controller **113** determines whether the preview image display operation is completed (S**2106**). For example, the preview image display operation can be completed when an operator instructs a completion of the preview image display operation or an execution of job start, or when a pre-set execution time comes. When the preview image display operation is completed (S**2106**: YES), the system controller **113** ends the sequence. By contrast, when the preview image display operation is not completed (S**2106**: NO), the sequence returns to S**2102**, and then the system controller **113** determines whether the changing of the mark setting is to be performed.

By contrast, when the changing of the mark setting is not performed (S**2102**: NO), the system controller **113** determines whether the preview image display operation is completed without updating the JDF information (S**2106**). FIG. **21** describes an example case that the system controller **113** performs the above described processing when the mark setting is updated at the DFE **100**, but the system controller **410** can also perform the above described processing when the mark setting is updated at the HWF server **4**.

A description is given of a process related to processing of the mark by the RIP engine **120** when the changing of the mark setting is performed at the DFE **100**. FIG. **22** is a flowchart showing the steps of a process related to processing of the mark by the RIP engine **120** of the DFE **100**. As illustrated in FIG. **22**, the control unit **201** of the RIP engine **120** acquires an analysis result of the JDF information (S**2201**).

Specifically, if the above described "pass-through mode" is set, the control unit **201** uses the job attribute analyzer **214** to analyze the JDF information, and acquires the analysis result. By contrast, if the "pass-through mode" is not set, the control unit **201** instructs the job controller **116** to control the JDF analyzer **117** to analyze the JDF information, and the control unit **201** acquires the analysis result from the JDF analyzer **117**.

After acquiring the analysis result of the JDF information (S**2201**), the control unit **201** instructs the RIP status analyzer **215** to analyze the RIP status information included in in JDF information (S**2202**). Further, it is assumed that the RIP status analyzer **215** is also disposed in the RIP engine **120** not compatible to the "pass-through mode." Since the mark update setting is performed in the above described example case, the "RIP status" of all of items are set "NotYet," and thereby the RIP engine **120** is required to execute each of the processing.

After analyzing the RIP status information (S**2202**), the control unit **201** activates the mark processing unit **206** to apply graphic information of the mark designated in the "mark information" included in the JDF information to the pre-RIP-processing data (S**2203**). After applying the graphic information of the mark to the pre-RIP-processing data, the mark processing unit **206** generates data applied with the graphic information of the mark as mark-processed data (S**2204**).

When the mark-processed data is generated, the control unit **201** activates each of the extended units to execute various processing other than the mark processing to the mark-processed data (S**2205**). FIG. **22** describes an example case when the various processing are executed after the mark processing, but this is just one example, and not limited hereto. For example, other cases can be assumed such as the various processing are executed in line with a process sequence determined by the analysis result of the JDF information and the RIP parameter.

When the various processing is executed by using the extended units (S**2205**), the RIP status manager **216** updates the JDF information (S**2206**). Specifically, under the control of the control unit **201**, the RIP status manager **216** updates the "RIP status" of the items executed by the extended units to "Done." In this description, it is assumed that the RIP status manager **216** is also disposed in the RIP engine **120** not compatible to the "pass-through mode."

When the process shown in FIG. **22** is performed or executed, the RIP engine **120** generates raster data applied with the mark setting changed at the DFE **100**, and then stores the raster data in the image storage **121**. Then, the printer controller **122** reads out the raster data stored in the image storage **121**, and transmits the raster data to the digital engine **150** to execute a print output operation.

As to the above described HWF system of the one or more example embodiments, when the mark setting is performed at the HWF server **4**, job data including the RIP-processed data and the pre-RIP-processing data are transmitted to the DFE **100**. Therefore, when the changing of the mark setting is performed at the DFE **100**, the RIP engine **120** of the DFE **100** can perform the RIP processing applying the changed contents of the mark setting by using the pre-RIP-processing data transmitted from the HWF server **4**.

In the above described one or more example embodiments, the changing of the mark setting is performed when the mark processing, which is an example of the designated process item, is performed at the DFE **100**. Further, the above described one or more example embodiments can be also applied when process contents is changed for another process item such as the font processing performable as the RIP processing at the DFE **100**. Therefore, as to the described one or more example embodiments, when one device executes a print output operation based on data processed by the RIP processing by other device, the one device can change the process performed by the RIP processing at the other device.

In the above described example one or more example embodiments, the job data including the RIP-processed data and the pre-RIP-processing data, not processed by the RIP processing at the HWF server **4**, is transmitted to the DFE **100**. Further, instead of the job data including the pre-RIP-processing data, job data including "partially-RIP-processed data" can be transmitted to the DFE **100**. The pre-RIP-processing data indicates data not processed by the RIP processing while the partially-RIP-processed data indicates data processed by the RIP processing partially. Specifically, the partially-RIP-processed data can be generated by executing one or more processes, other than the designated processing (i.e., mark processing), by the RIP engine **420** of the HWF server **4**.

In this case, for example, the job controller **413** divides target image data to be output as a print included in the job data into a first portion of image data to be processed by various processing including the mark processing, and a second portion image data processed by various processing not including the mark processing, and instructs the RIP engine **420** to perform various processing to each of the first portion of image data and second portion of image data. By performing this RIP processing to each of the first portion of image data and second portion of image data, the RIP-processed data processed by the various processing including the mark processing, and the partially-RIP-processed data processed by the various processing not including the mark processing can be generated.

The job controller **413** stores the RIP-processed data and the partially-RIP-processed data to the job data storage **414**, and inputs job data including these data to the job communication unit **421**.

FIG. **23** illustrates an example of partially-RIP-processed data and mark image data includable in job data. FIG. **23**A illustrates an example of the partially-RIP-processed data, to which processing such as imposition processing other than the mark processing is performed. FIG. **23**B illustrates an example of the mark image-data such as collation, back signature, crop mark added by the mark setting.

Further, when the job data includes the partially-RIP-processed data, the system controller **113** of the DFE **100** updates only the RIP status of the mark processing to "NotYet" when the updating process of JDF information is performed at step **S2105** (FIG. **21**). Therefore, among the processes executed by the RIP engine **420** of the HWF server **4**, the RIP engine **120** of the DFE **100** executes only the mark processing again based on the changed contents of the mark setting.

The partially-RIP-processed data can be obtained by excluding an execution result of a designated process item (e.g., mark processing) from the execution results of the entire process items executed by the RIP engine **420**, which can be referred to "designated-execution-result-excluded information." The pre-RIP-processing data and the partially-RIP-processed data can be used as designated-information-excluded image information, which excludes the execution result of the designated process item (e.g., mark processing).

With employing this configuration, when the DFE **100** performs the changing of the mark setting, the RIP engine **120** of the DFE **100** is required to execute only the mark processing again among the processes executed by the RIP engine **420** of the HWF server **4**. Therefore, the processing load of the DFE **100** can be reduced compared to a case using the pre-RIP-processing data. Further, this configuration can be applied to the mark processing and also to other processes such as when contents of other processes to be executed by the RIP processing is to be changed.

Further, image data of an area processed by the mark processing and information for identifying a position of the area (hereinafter, "position identifying information") can be used as the pre-RIP-processing data or the partially-RIP-processed data. The position identifying information is, for example, coordinate information for identifying a position of an area on a sheet, and information for identifying mark image data added to an area on a sheet. When the position identifying information is the information for identifying the mark image data, a position of the mark image data on the sheet can be identified based on the "mark information" in the JDF information.

FIG. **24** illustrates an example of a sheet having one or more areas processed by the mark processing. Hereinafter, the partially-RIP-processed data is used as an example of data, but the pre-RIP-processing data can be also used as data. As illustrated in FIG. **24**, a hatching area (i.e., slanted lines) indicates an area processed by the mark processing on the sheet. Image data on the area (i.e., hatching area), and position identifying information identifying a position of the area (i.e., hatching area) can be generated as the partially-RIP-processed data, and the partially-RIP-processed data is generated for each of the area (i.e., hatching area), and the area (i.e., hatching area) is overwritten with the mark image data by performing the mark processing. Therefore, the image data of the area (i.e., hatching area) is image information changeable by executing the mark processing, which can be referred to "changeable image information."

When the changed contents of the mark setting is the deletion and updating of the mark added on the area, the RIP engine **120** of the DFE **100** executes the mark processing again to the area previously processed by the mark processing by using the partially-RIP-processed data to apply the changing of the mark setting. By contrast, when the changed contents of the mark setting is an addition of a new mark to a new area other than the already-mark-added area, the RIP engine **120** of the DFE **100** executes the mark processing again to the new area by using the RIP-processed data to apply the changing of the mark setting.

With employing this configuration, the size of the job data to be transmitted to the DFE **100** can be reduced compared to a configuration that the image data of the entire page is used as the pre-RIP-processing data or the partially-RIP-processed data. Further, when the deletion and update of the added mark is executed, the RIP engine **120** of the DFE **100** is required to execute the mark processing again only to the area where the mark processing is already performed, and thereby the processing load can be reduced.

As to the above described one or more example embodiments, the preview data is generated based on the RIP-processed data. Further, the preview data can be generated from the pre-RIP-processing data and the mark image data. FIG. **25** illustrates an example of preview data generated from the pre-RIP-processing data and the mark image data.

In response to a generation request of the preview data received from the system controller **113**, the job controller **116** transfers the received pre-RIP-processing data and mark image data to the RIP unit **118** to generate the preview data by using the RIP unit **118**. For example, as illustrated in FIG. **25**, the RIP unit **118** superimposes mark images at areas on the pre-RIP-processing data, which are indicated by the dot lines, to generate the preview data based on the PDF information.

The preview data is display image data to be displayed on a display device such as the display **102**. Further, the mark image data is image information that is used when the mark processing is executed, and thereby the mark image data can be referred to "designated-processing image information." Further, the RIP unit **118** can be used as a display image generator that generates a display image used as the preview data based on the pre-RIP-processing data and the mark image data.

By using the above described image as the preview image, the mark image data can be moved and edited freely, which is different from a configuration that uses the RIP-processed data generated as one image data integrally including the execution result of the mark processing as the preview image. Therefore, the changed contents of the mark setting can be applied to the preview image display promptly, with which usability of an operator can be enhanced.

Further, when the RIP processing target data is used, the RIP unit **118** can generate the preview data by superimposing the RIP-processed data, the RIP processing target data, and the mark image data, with which the same effect can be attained.

Further, as to the above described one or more example embodiments, when the changing of the mark setting is performed at the DFE **100**, the system controller **113** can transmit the updated mark image data and JDF information to the HWF server **4** as feedback information, in which the system controller **113** can be used as an information output unit that outputs information for executing the updated mark processing based on process contents of the changed setting to the HWF server **4**. With employing this configuration, job data applied with the feed backed contents can be easily generated.

Further, as to the above described one or more example embodiments, when the mark setting is performed, it is assumed that the mark processing is executed at the RIP engine **420** of the HWF server **4**, and the pre-RIP-processing data or the partially-RIP-processed data are transmitted to the DFE **100**, but not limited hereto. For example, the distributed processing of the RIP processing performable by using both of the HWF server **4** and the DFE **100** can be performed with various patterns depending on the settings, in which it is determined whether the pre-RIP-processing data is transmitted to the DFE **100** depending on contents processed at the HWF server **4**. For example, when the mark processing is not executed at the HWF server **4**, the job controller **413** determines that the pre-RIP-processing data is not required to be transmitted to the DFE **100**.

Further, even if processed contents other than the mark processing is to be changed in the DFE **100**, the job controller **413** determines whether the pre-RIP-processing data is to be transmitted to the DFE **100** depending on the contents processed at the HWF server **4**. For example, the pre-fright processing only checks validity of the PDL information, and does not change the PDL information. Therefore, when the pre-fright processing is executed at the HWF server **4**, the job controller **413** determines that the pre-RIP-processing data is not required to be transmitted to the DFE **100**.

Further, as to the font processing, when information designating the fonts is to be embedded in PDL information (i.e., font embedding), image information of PDL information is not required to be changed. Therefore, when the font processing such as font embedding is executed at the HWF server **4**, the job controller **413** determines that the pre-RIP-processing data is not required to be transmitted to the DFE **10**. By contrast, when the font processing such as overwriting of font data for imaging process (i.e., outlining) is executed at the HWF server **4**, the image information of PDL information is changed. Therefore, when the font processing such as outlining is executed at the HWF server **4**, the job controller **413** determines that the pre-RIP-processing data is required to be transmitted to the DFE **100**.

Since processes, which are other than the font embedding and outlining, processed by the RIP engine **420** change the image information of PDL information, the job controller **413** determines that the pre-RIP-processing data and the data used for the processing are required to be transmitted to the DFE **100**. If the data used for the processing is also stored in the DFE **100**, the job controller **413** determines that the data used for the processing is not required to be transmitted to the DFE **100**. Further, in a case of using the partially-RIP-processed data, the job controller **413** instructs the RIP engine **420** to generate the partially-RIP-processed data by processing one or more processes other than the target process (e.g., font embedding, outlining). Therefore, the RIP engine **420** determines whether the pre-RIP-processing data or the partially-RIP-processed data is generated based on each of the contents processed by the RIP processing.

With employing this configuration, it is determined whether the pre-RIP-processing data is to be transmitted based on the contents processed at the HWF server **4**. Therefore, data amount transmitted to the DFE **100** can be reduced compared to a configuration of transmitting the pre-RIP-processing data to the DFE **100** constantly.

As to the one or more example embodiments of the present invention, when one device (first device) is to execute a print output operation, the one device (first device) can change data processed by the RIP processing at other device (second device) to data that can be processed by the one device (first device).

Each of the functions of the described embodiments may be implemented by one or more processing circuits or circuitry. Processing circuitry includes a programmed processor, as a processor includes circuitry. A processing circuit also includes devices such as an application specific integrated circuit (ASIC) and conventional circuit components arranged to perform the recited functions.

The present invention can be implemented in any convenient form, for example using dedicated hardware, or a mixture of dedicated hardware and software. The present invention may be implemented as computer software implemented by one or more networked processing apparatuses. The network can comprise any conventional terrestrial or wireless communications network, such as the Internet. The processing apparatuses can compromise any suitably programmed apparatuses such as a general purpose computer, personal digital assistant, mobile telephone (such as a WAP or 3G-compliant phone) and so on. Since the present invention can be implemented as software, each and every aspect of the present invention thus encompasses computer software implementable on a programmable device. The computer software can be provided to the programmable device using any storage medium for storing processor readable code such as a floppy disk, hard disk, CD ROM, magnetic tape device or solid state memory device.

The hardware platform includes any desired kind of hardware resources including, for example, a central processing unit (CPU), a random access memory (RAM), and a hard disk drive (HDD). The CPU may be implemented by any desired kind of any desired number of processor. The RAM may be implemented by any desired kind of volatile or non-volatile memory. The HDD may be implemented by any desired kind of non-volatile memory capable of storing a large amount of data. The hardware resources may additionally include an input device, an output device, or a network device, depending on the type of the apparatus. Alternatively, the HDD may be provided outside of the apparatus as long as the HDD is accessible. In this example, the CPU, such as a cache memory of the CPU, and the RAM may function as a physical memory or a primary memory of the apparatus, while the HDD may function as a secondary memory of the apparatus.

Numerous additional modifications and variations are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the disclosure of the present invention may be practiced otherwise than as specifically described herein. 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 this disclosure and appended claims.

What is claimed is:

1. An image processing system for sequentially executing a plurality of processes comprising:

a process execution control apparatus to control execution of the plurality of processes; and

an image generation-output control apparatus to control execution of an image generation-output operation,

wherein the process execution control apparatus includes a control-side drawing information generator to generate drawing information to which an image forming apparatus refers when the image forming apparatus performs the image generation-output operation based on information of a target image to be used for the image generation-output operation,

wherein the image generation-output control apparatus includes an output-side drawing information generator corresponding to the control-side drawing information generator,

wherein the control-side drawing information generator excludes an execution result of a designated process item from execution results of a plurality of process items, to be executed for generating the drawing information, to generate designated-information-excluded image information based on the information of the target image,

wherein when process contents of the designated process item is set at the image generation-output control apparatus, the output-side drawing information generator executes the plurality of process items based on the generated designated-information-excluded image information,

wherein the control-side drawing information generator excludes information of the execution result of the designated process item from execution results of the plurality of process items, to generate designated-execution-result-excluded information as the designated-information-excluded image information,

wherein when the process contents of the designated process item is set at the image generation-output control apparatus, the output-side drawing information generator executes the designated process item based on setting of the process contents and the designated-execution-result-excluded information, and the output-side drawing information generator executes the plurality of process items based on an execution status of each of the plurality of process items controllable by the control-side drawing information generator.

2. The image processing system of claim **1**,

wherein the image generation-output control apparatus further comprising a display image generator, and a process contents information acquiring unit,

wherein the display image generator generates a display image to be displayed on a display device based on the designated-information-excluded image information, and designated-processing image information to be used when executing the designated process item,

wherein the process contents information acquiring unit acquires information of the process contents of the designated process item that is set based on the display image displayed on the display device,

wherein when the information of process contents of the designated process item is acquired, the output-side drawing information generator executes the plurality of process items based on the generated designated-information-excluded image information.

3. The image processing system of claim **1**, wherein the image generation-output control apparatus further includes an information output unit, wherein when the process contents is set for the designated process item, the information output unit outputs information for executing the designated process item, updated based on the process contents, to the process execution control apparatus.

4. The image processing system of claim **1**, wherein the control-side drawing information generator determines whether the designated-information-excluded image information is generated depending on the process contents of the designated process item.

5. The image processing system of claim **1**, wherein the designated process item is a process of adding information on a recording medium having processed by the image generation-output operation to add information related to each of the plurality of processes.

6. An image processing system for sequentially executing a plurality of processes comprising:

a process execution control apparatus to control execution of the plurality of processes; and an image generation-output control apparatus to control execution of an image generation-output operation,

wherein the process execution control apparatus includes a control-side drawing information generator to generate drawing information to which an image forming apparatus refers when the image forming apparatus performs the image generation-output operation based on information of a target image to be used for the image generation-output operation,

wherein the image generation-output control apparatus includes an output-side drawing information generator corresponding to the control-side drawing information generator,

wherein the control-side drawing information generator excludes an execution result of a designated process item from execution results of a plurality of process items, to be executed for generating the drawing information, to generate designated-information-excluded image information based on the information of the target image,

wherein when process contents of the designated process item is set at the image generation-output control apparatus, the output-side drawing information generator executes the plurality of process items based on the generated designated-information-excluded image information,

wherein the control-side drawing information generator generates changeable image information and position identifying information for the designated process item, the changeable image information corresponds to changeable image data settable on an area by executing the designated process item, and the position identifying information identifies a position of the area where the changeable image information is settable, and

wherein when the process contents of the designated process item is set at the image generation-output control apparatus, the output-side drawing information generator executes the designated process item based on the set process contents, the changeable image information, and the position identifying information.

7. The image processing system of claim **6**, wherein the image generation-output control apparatus further includes an information output unit, wherein when the process contents is set for the designated process item, the information output unit outputs information for executing the designated process item, updated based on the process contents, to the process execution control apparatus.

8. The image processing system of claim **6**, wherein the control-side drawing information generator determines whether the designated-information-excluded image information is generated depending on the process contents of the designated process item.

9. The image processing system of claim **6**, wherein the designated process item is a process of adding information on a recording medium having processed by the image generation-output operation to add information related to each of the plurality of processes.

10. An image generation-output control apparatus employable for an image processing system for sequentially executing a plurality of processes, the image generation-output control apparatus capable of controlling an execution of an image generation-output operation, the image processing system including a process execution control apparatus capable of controlling an execution of the plurality of processes, the process execution control apparatus including a control-side drawing information generator useable for generating drawing information to be referred by an image forming apparatus when the image forming apparatus performs an image generation-output operation based on information of a target image to be used for the image generation-output operation, the image generation-output control apparatus comprising:

an output-side drawing information generator corresponding to the control-side drawing information generator,

wherein when the control-side drawing information generator excludes an execution result of a designated process item from execution results of a plurality of process items to be executed for generating the drawing information to generate designated-information-excluded image information based on the information of the target image, and outputs the designated-information-excluded image information, the output-side drawing information generator acquires the designated-information-excluded image information, and the output-side drawing information generator executes the plurality of process items based on the generated designated-information-excluded image information when process contents of the designated process item is set at the image generation-output control apparatus;

a display image generator that generates a display image to be displayed on a display device based on the designated-information-excluded image information, and designated-processing image information to be used when executing the designated process item; and

a process contents information acquiring unit that acquires information of the process contents of the designated process item that is set based on the display image displayed on the display device,

wherein when the information of process contents of the designated process item is acquired, the output-side drawing information generator executes the plurality of process items based on the generated designated-information-excluded image information.

11. The image generation-output control apparatus of claim **10**, further comprising:

an information output unit, wherein when the process contents is set for the designated process item, the information output unit outputs information for executing the designated process item, updated based on the process contents, to the process execution control apparatus.

12. The image generation-output control apparatus of claim **10**, wherein the designated process item is a process of adding information on a recording medium having processed by the image generation-output operation to add information related to each of the plurality of processes.

13. An image generation-output control apparatus to control execution of an image generation-output operation in an image processing system that sequentially executes a plurality of processes and includes a process execution control apparatus that controls execution of the plurality of processes, the process execution control apparatus including a control-side drawing information generator for generating drawing information to which an image forming apparatus refers when the image forming apparatus performs the image generation-output operation based on information of a target image to be used for the image generation-output operation, the image generation-output control apparatus comprising:

an output-side drawing information generator corresponding to the control-side drawing information generator, the output-side drawing information generator including an acquiring unit, an execution command generator, an execution command controller, and an execution unit,

wherein when the control-side drawing information generator excludes an execution result of a designated process item from execution results of a plurality of process items to be executed for generating the drawing information, to generate designated-information-excluded image information based on the information of the target image, and outputs the designated-information-excluded image information to the image generation-output control apparatus, the acquiring unit acquires the designated-information-excluded image information, the execution command generator generates an execution command to execute the plurality of process items by using the execution unit in the output-side drawing information generator based on the generated designated-information-excluded image information when process contents of the designated process item are set at the image generation-output control apparatus, and the execution command controller outputs the generated execution command to the execution unit in the output-side drawing information generator.

14. The image generation-output control apparatus of claim **13**,

wherein the control-side drawing information generator excludes information of the execution result of the designated process item from the execution results of the plurality of process items to generate designated-execution-result-excluded information as the designated-information-excluded image information,

wherein when the process contents of the designated process item are set at the image generation-output control apparatus, the execution command generator generates the execution command to execute the designated process item by using the execution unit in the output-side drawing information generator based on setting of the process contents of the designated process item and based on the designated-execution-result-excluded information, and

the execution command generator generates another execution command to execute each of the plurality of process items by using the execution unit in the output-side drawing information generator based on an execution status of each of the plurality of process items, as controlled by the control-side drawing information generator.

15. The image generation-output control apparatus of claim **13**,

wherein the control-side drawing information generator generates changeable image information and position identifying information for the designated process item as the designated-information-excluded image information, the changeable image information corresponds to changeable image data settable on an area by executing the designated process item, and the position identifying information identifies a position of the area where the changeable image information is settable,

wherein when the process contents of the designated process item are set at the image generation-output control apparatus, the execution command generator generates the execution command to execute the designated process item by using the execution unit in the output-side drawing information generator based on the set process contents of the designated process item, the changeable image information, and the position identifying information.

16. The image generation-output control apparatus of claim **13** further comprising

a display image generator, and

a process contents information acquiring unit,

wherein the display image generator generates a display image to be displayed on a display device based on the designated-information-excluded image information and based on designated-processing image information to be used when executing the designated process item,

wherein the process contents information acquiring unit acquires information of the process contents of the designated process item that are set based on the display image displayed on the display device, and

wherein when the information of the process contents of the designated process item is acquired by the process contents information acquiring unit, the execution command generator generates the execution command based on the generated designated-information-excluded image information to execute the plurality of process items by using the execution unit in the output-side drawing information generator.

17. The image generation-output control apparatus of claim **13** further comprising:

an information output unit, wherein when the process contents are set for the designated process item, the information output unit outputs information for executing the designated process item, updated based on the process contents, to the process execution control apparatus.

18. The image generation-output control apparatus of claim **13**, wherein when the designated process item indicates a process of adding information on a recording medium, specific information related to each of the plurality of processes is added in said process on the recording medium in the image generation-output operation.

19. A non-transitory storage medium storing a program that, when executed by a computer, causes the computer to execute a method for controlling an image generation-output control apparatus to control execution of an image generation-output operation in an image processing system that sequentially executes a plurality of processes and includes a process execution control apparatus that controls execution of the plurality of processes, the process execution control apparatus including a control-side drawing information generator for generating drawing information to which an image forming apparatus refers when the image forming apparatus performs the image generation-output operation based on information of a target image to be used for the image generation-output operation, the method comprising:

(a) acquiring designated-information-excluded image information generated by the control- side drawing information generator based on the information of the target image and based on excluding an execution result of a designated process item from execution results of a plurality of process items to be executed for generating the drawing information;

(b) generating an execution command, based on the generated designated-information-excluded image information when process contents of the designated process item are set at the image generation-output control apparatus; and

(c) outputting the execution command to an execution unit in the output-side drawing information generator to execute the plurality of process items.

20. The non-transitory storage medium of claim **19**, wherein the method further comprises:

executing the designated process item by the execution unit in the output-side drawing information generator in response to the execution command, based on setting of the process contents of the designated process item and based on designated-execution-result-excluded information corresponding to the designated-information-excluded image information; and

generating another execution command to execute each of the plurality of process items by the execution unit in the output-side drawing information generator, based on an execution status of each of the plurality of process items, as controlled by the control-side drawing information generator.

21. The non-transitory storage medium of claim **19**, wherein the method further comprises:

executing the designated process item by the execution unit in the output-side drawing information generator in response to the execution command, based on

(i) the set process contents of the designated process item,

(ii) changeable image information, generated by the control-side drawing information generator and corresponding to changeable image data settable on an area by executing the designated process item, and

(iii) position identifying information, generated by the control-side drawing information generator and identifying a position of the area where the changeable image information is settable.

22. The non-transitory storage medium of claim **19**, wherein the method further comprises:

(d) generating a display image to be displayed on a display device based on the designated- information-excluded image information and based on designated-processing image information to be used when executing the designated process item; and

(e) acquiring information of the process contents of the designated process item that are set based on the display image displayed on the display device, wherein

when the information of the process contents of the designated process item is acquired (e), the execution command is generated in (b) based on the generated designated-information-excluded image information, to be output to the execution unit in the output-side drawing information generator to execute the plurality of process items.

23. The non-transitory storage medium of claim **19**, wherein the method further comprises:

when the process contents are set for the designated process item, outputting information for executing the designated process item, updated based on the process contents, to the process execution control apparatus.

24. The non-transitory storage medium of claim **19**,

wherein when the designated process item indicates a process of adding information on a recording medium, adding specific information related to each of the plurality of processes in said process on the recording medium in the image generation-output operation.

25. A method for controlling an image generation-output control apparatus to control execution of an image generation-output operation in an image processing system that sequentially executes a plurality of processes and includes a process execution control apparatus that controls execution of the plurality of processes, the process execution control apparatus including a control- side drawing information generator for generating drawing information to which an image information apparatus refers when the image forming apparatus performs the image generation-output operation based on information of a target image to be used for the image generation-output operation, the method comprising:

(a) acquiring designated-information-excluded image information generated by the control- side drawing information generator based on the information of the target image and based on excluding an execution result of a designated process item from execution results of a plurality of process items to be executed for generating the drawing information;

(b) generating an execution command, based on the generated designated-information- excluded image information when process contents of the designated process item are set at the image generation-output control apparatus; and

(c) outputting the execution command to an execution unit in the output-side drawing information generator to execute the plurality of process items.

26. An image processing system that sequentially executes a plurality of processes comprising:

a process execution control apparatus to control an execution of the plurality of processes;

an image generation-output control apparatus to control an execution of an image generation- output operation;

a control-side drawing information generator for generating drawing information to which an image forming apparatus refers when the image forming apparatus performs the image generation- output operation based on information of a target image to be used for the image generation-output operation;

an output-side drawing information generator corresponding to the control-side drawing information generator, the output-side drawing information generator including an acquiring unit, an execution command generator, an execution command controller, and an execution unit,

wherein when the control-side drawing information generator excludes an execution result of a designated process item from execution results of a plurality of process items to be executed for generating the drawing information, to generate designated-information-excluded image information based on the information of the target image, and outputs the designated-information-excluded image information to the image generation-output control apparatus, the acquiring unit acquires the designated-information-excluded image information, the execution command generator generates an execution command to execute the plurality of process items by using the execution unit in the output-side drawing information generator based on the generated designated-information-excluded image information when process contents of the designated process item are set at the image generation-output control apparatus, and the execution command controller outputs the generated execution command to the execution unit in the output-side drawing information generator.

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