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• **Toshiba TEC Kabushiki Kaisha**
Tokyo 141-0032 (JP)

(72) Inventor: **IGUCHI, Ken**
Shinagawa-ku, Tokyo 141-8562 (JP)

(74) Representative: **Takeuchi, Maya et al**
Fédit-Loriot
38, avenue Hoche
75008 Paris (FR)

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(71) Applicants:
• **Kabushiki Kaisha Toshiba**
Tokyo
105-8001 (JP)

(54) **SHEET POST-PROCESSING APPARATUS AND SHEET BINDING PROCESSING METHOD**

(57) A sheet post-processing apparatus includes a first sensor, a second sensor and a controller. The first sensor detects whether or not a staple for performing a binding processing is prepared in a stapler. The second sensor detects that an amount of the staples held by the stapler has become not more than a prescribed amount. The controller judges whether or not to transfer an operation mode of the sheet post-processing apparatus to a first operation mode to perform the binding processing by the stapler to the sheets to be manually fed, based on a detection result of the second sensor, and judges whether or not to perform the binding processing by the stapler, based on a detection result of the first sensor, after having transferred the operation mode to the first operation mode.

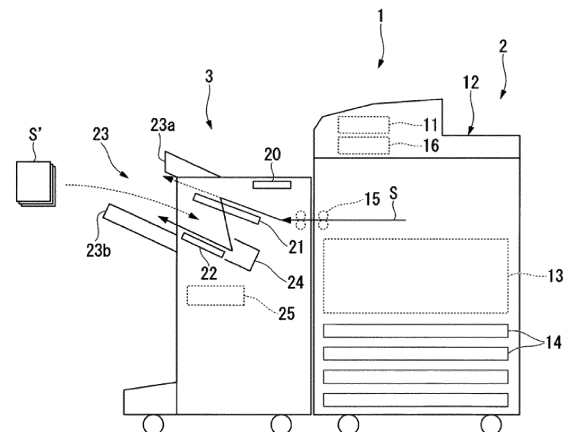


Fig.1

Description

FIELD

[0001] The present invention relates to image forming and post-processing technologies in general, and embodiments described herein relate in particular to a sheet post-processing apparatus and a sheet binding processing method.

BACKGROUND

[0002] To a conventional image forming apparatus, such as an MFP (Multi Function Peripheral), a sheet post-processing apparatus which performs a post-processing such as sorting and stapling to sheets to be conveyed from the MFP is connected. The sheet post-processing apparatus has a stapler which performs a post-processing of stapling to a sheet bundle composed of a plurality of sheets. The sheet post-processing apparatus has a function to perform a staple processing (hereinafter, called a manual staple processing) by a manual operation, as the post-processing of sheets. This manual staple processing is performed in the following procedure, for example. To begin with, a user places a sheet bundle that becomes an object to be stapled on a processing tray of a sheet post-processing apparatus. Next, the user presses a staple execution button of the sheet post-processing apparatus. By this means, the sheet post-processing apparatus drives a staple needle into the sheet bundle placed on the processing tray, to perform a staple processing.

[0003] The manual staple processing in the above-described sheet post-processing apparatus might perform a staple processing (a blank binding processing) to a sheet bundle, even when staple needles are used out in the stapler. That is, there was a problem that a conventional sheet post-processing apparatus might perform a blank binding processing to a sheet bundle, in a manual staple processing.

[0004] To solve such problems, there is provided a sheet post-processing apparatus having a plurality of operation modes, comprising:

a processing tray configured to support sheets;
a stapler configured to hold a plurality of staples and perform a binding processing to the sheets to be supported by the processing tray;
a first sensor configured to detect whether or not the staple for performing the binding processing is prepared ;
a second sensor configured to detect that an amount of the staples held by the stapler has become not more than a prescribed amount; and
a controller configured to judge whether or not to transfer the operation mode to a first operation mode to perform the binding processing to the sheets to be manually fed to the processing tray, based on a

detection result of the second sensor, and judge whether or not to perform the binding processing by the stapler, based on a detection result of the first sensor, after having transferred the operation mode to the first operation mode.

[0005] Alternatively, there is provided a sheet post-processing apparatus which has a plurality of operation modes and is configured to be connected to an image forming apparatus, comprising:

a processing tray configured to support sheets;
a stapler configured to hold a plurality of staples and perform a binding processing to the sheets to be supported by the processing tray;
a first sensor configured to detect whether or not the staple for performing the binding processing is prepared ;
a second sensor configured to detect that an amount of the staples held by the stapler has become not more than a prescribed amount; and
a controller configured to determine presence or absence of the staple based on a detection result of the first sensor, if the operation mode is a first operation mode to perform the binding processing to the sheets to be manually fed to the processing tray, and determine the presence or absence of the staple based on a detection result of the second sensor, if the operation mode is a second operation mode to perform the binding processing to the sheets to be conveyed from the image forming apparatus to the processing tray.

[0006] Preferably, if the amount of the staples is not the prescribed amount or less in the detection result of the second sensor, the controller is configured to judge whether or not to transfer the operation mode to the first operation mode, based on the detection result of the first sensor.

[0007] Preferably still, if the amount of the staples is not more than the prescribed amount in the detection result of the second sensor, the controller is configured to perform notification of an error.

[0008] Preferably yet, if the staple for performing the binding processing is prepared in the detection result of the first sensor, the controller is configured to transfer the operation mode to the first operation mode.

[0009] Suitably, after having transferred the operation mode to the first operation mode, and having made the stapler perform the binding processing, the controller is configured to judge whether or not to continue the first operation mode, based on the detection result of the first sensor.

[0010] Suitably still, if the staple for performing the binding processing is prepared in the detection result of the first sensor, the controller is configured to continue the first operation mode.

[0011] Suitably yet, if the staple for performing the bind-

ing processing is not prepared in the detection result of the first sensor, the controller is configured to finish the first operation mode.

[0012] Typically, if the staple for performing the binding processing is not prepared in the detection result of the first sensor, the controller is configured to perform notification of an error.

[0013] Typically still, when having finished the first operation mode, the controller transfers the operation mode to a second operation mode to perform the binding processing to the sheets which are conveyed from an external device to the processing tray.

[0014] Typically yet, when having finished the first operation mode, the controller performs notification of an error to the external device.

[0015] Conveniently, if the staple for performing the binding processing is prepared in the detection result of the first sensor, the controller is configured to transfer the operation mode to the first operation mode.

[0016] Conveniently still, if the staple for performing the binding processing is not prepared in the detection result of the first sensor, the controller is configured to transfer the operation mode to the second operation mode.

[0017] The invention also relates to a sheet binding processing method in a sheet post-processing apparatus having a plurality of operation modes, comprising:

detecting that an amount of staples held by a stapler has become not more than a prescribed amount by a second sensor;

judging whether or not to transfer the operation mode to a first operation mode to perform a binding processing to sheets to be manually fed, based on a detection result of the second sensor;

detecting whether or not the staple for performing the binding processing is prepared in the stapler, by a first sensor different from the second sensor, after having transferred the operation mode to the first operation mode; and

judging whether or not to perform the binding processing by the stapler, based on a detection result of the first sensor.

[0018] Suitably, the sheet binding processing method further comprises:

judging whether or not to transfer the operation mode to the first operation mode, based on the detection result of the first sensor, if the amount of the staples is not the prescribed amount or less in the detection result of the second sensor.

[0019] Preferably, the sheet binding processing method further comprises:

performing notification of an error, if the amount of the staples is not more than the prescribed amount

in the detection result of the second sensor.

[0020] Preferably further, the sheet binding processing method further comprises:

transferring the operation mode to the first operation mode, if the staple for performing the binding processing is prepared in the detection result of the first sensor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The above and other objects, features and advantages of the present invention will be made apparent from the following description of the preferred embodiments, given as non-limiting examples, with reference to the accompanying drawings, in which:

Fig. 1 is a diagram showing a whole configuration of an image forming system according to an embodiment.

Fig. 2 is a diagram showing a configuration of the image forming apparatus and the sheet post-processing apparatus according to the embodiment.

Fig. 3 is a diagram showing an example of the operation display panel of the sheet post-processing apparatus according to the embodiment.

Fig. 4 is a sectional view showing a configuration of the sheet post-processing apparatus according to the embodiment.

Fig. 5 is a block diagram showing a functional configuration relating to a manual staple mode of the sheet post-processing apparatus according to the embodiment.

Fig. 6 is a flow chart showing transfer to the manual staple mode and a manual staple processing in the sheet post-processing apparatus according to the embodiment.

DETAILED DESCRIPTION

[0022] According to an embodiment, a sheet post-processing apparatus has a plurality of operation modes. Further, the sheet post-processing apparatus has a processing tray, a stapler, a first sensor, a second sensor, and a controller. The processing tray supports sheets. The stapler holds a plurality of staples. The stapler performs a binding processing to the sheets to be supported by the processing tray. The first sensor detects whether or not the staple for performing the binding processing is prepared in the stapler. The second sensor detects that an amount of the staples held by the stapler has become not more than a prescribed amount. The controller judges whether or not to transfer the operation mode to a first operation mode to perform the binding processing to the sheets to be manually fed to the processing tray, based on a detection result of the second sensor. Further, the controller judges whether or not to

perform the binding processing by the stapler, based on a detection result of the first sensor, after having transferred the operation mode to the first operation mode.

[0023] Hereinafter, sheet post-processing apparatuses according to embodiments will be further described with reference to the drawings. In the drawings, the same symbols indicate the same or similar portions.

(Embodiment)

[0024] A sheet post-processing apparatus of an embodiment has a function to perform a staple processing (hereinafter, called a manual staple processing) to sheets to be fed by a manual operation of a user, as a post-processing of sheets. Fig. 1 is a diagram showing a whole configuration example of an image forming system 1 of an embodiment. Fig. 2 is a diagram showing a configuration example of the image forming system 1 shown in Fig. 1. The image forming system 1 includes an image forming apparatus 2 and a sheet post-processing apparatus 3. The image forming apparatus 2 forms an image on a sheet-like medium (hereinafter, referred to as a sheet) such as a form. The sheet post-processing apparatus 3 performs a post-processing to a sheet S to be conveyed from the image forming apparatus 2.

[0025] The image forming apparatus 2 has a control panel 11, a scanner 12, a printer 13, a sheet feeding device 14, a sheet discharge device 15, and an image forming controller 16. The control panel 11 has various keys for accepting an operation of a user. For example, the control panel 11 accepts an input relating to a kind of a post-processing of a sheet S, for example.

[0026] The scanner 12 has a reading unit to read image information of a copy object. The scanner 12 sends the read image information to the printer 13. The printer 13 forms an image (hereinafter, called "a toner image") on a photo conductor using a developer such as toner, based on the image information to be transmitted from the scanner 12 or an external device, for example. The printer 13 transfers the toner image from the photo conductor to the sheet S. The printer 13 applies heat and pressure to the toner image which has been transferred to the sheet S, to make the toner image to be fixed on the sheet S. The sheet feeding device 14 feeds the sheets S to the printer 13 one by one, in accordance with a timing in which the printer 13 forms the toner image on the photo conductor. The sheet discharge device 15 conveys the sheet S to be discharged from the printer 13 to the sheet post-processing apparatus 3.

[0027] The image forming controller 16 controls an operation of the image forming apparatus 2. That is, the image forming controller 16 controls the control panel 11, the scanner 12, the printer 13, the sheet feeding device 14, and the sheet discharge device 15. The image forming controller 16 is formed by a control circuit including a CPU (Central Processing Unit), a ROM (Read Only Memory), and a RAM (Random Access Memory).

[0028] Next, the sheet post-processing apparatus 3

will be described. To begin with, a configuration of the sheet post-processing apparatus 3 will be described. As shown in Fig. 1, the sheet post-processing apparatus 3 is arranged adjacent to the image forming apparatus 2.

5 The sheet post-processing apparatus 3 has an operation display panel 20, a waiting device 21, a processing tray device 22, a discharge device 23, a binding processing device 24, and a post-processing controller 25. The sheet post-processing apparatus 3 has at least two operation modes of a manual staple mode (a first operation mode) and an online mode (a second operation mode). In addition, the manual staple mode is a mode to manually or automatically execute a staple processing to sheets to be fed by a manual operation of a user. In other words, the manual staple mode is a mode to execute a staple processing to sheets fed to the binding processing device, without being accompanied by an image forming operation by the image forming apparatus.

10 [0029] The sheet post-processing apparatus 3 executes a post-processing which has been designated via the control panel 11, to the sheets S to be conveyed from the image forming apparatus 2, in the online mode. The post-processing is a staple processing or a sort processing, for example.

15 [0030] The sheet post-processing apparatus 3 performs a staple processing to a sheet bundle S' that is a bundle of a plurality of the sheets S which a user has placed on the processing tray device 22, in the manual staple mode. In the following description, it is decided that a leading end portion of the sheet bundle S' in an entering direction thereof to the processing tray device 22 is an upper side of the sheet bundle S', and a rear end portion thereof at the opposite side is a lower side of the sheet bundle S'. It is decided that when the sheet bundle S' placed on the processing tray device 22 is seen from the lower side thereof, its right end portion is a right side of the sheet bundle S', and its left end portion at the opposite side is a left side of the sheet bundle S'.

20 [0031] The operation display panel 20 is a panel having buttons with which a user performs a manual staple processing, and LEDs (Light Emitting Diode) for display. The operation display panel 20 is provided at a position of an upper portion of a main body of the sheet post-processing apparatus 3, where a user can visually recognize and operate it. Fig. 3 is a diagram showing an example of the operation display panel 20. As shown in Fig. 3, the operation display panel 20 includes an operation device 201 including an instruction button of a manual staple processing and a setting button thereof, and a display device 202 which displays a state of the manual staple processing and so on by turning on the LEDs.

25 [0032] The operation device 201 has a position setting button 203 for setting a position where a staple processing is to be performed, and an instruction button 204 to instruct transfer to the manual staple mode and execution of the staple processing. The position setting button 203 is a button for switching setting as to whether to perform the staple processing at the upper right corner of the

sheet bundle S', or to perform the staple processing at the upper left corner of the sheet bundle S'. The instruction button 204 is a button for transferring the operation mode of the sheet post-processing apparatus 3 from the on line mode to the manual staple mode. The instruction button 204 is a button for instructing execution of the staple processing, in the manual staple mode.

[0033] The display device 202 has LEDs 205, 206, 207. The LEDs 205 - 207 are turned off until an instruction to transfer the operation mode to the manual staple mode is made. The LED 205 is turned on when the instruction button 204 is pressed, and thereby the operation mode is transferred to the manual staple mode, and the sheet bundle S' exists on the processing tray device 22. The LED 205 starts blinking when the instruction button 204 is pressed while the LED 205 is lighting, and continues blinking during a processing of driving a staple into the sheet bundle S'. The LED 205 is turned off when the sheet bundle S' which has been subjected to the staple processing is discharged from the processing tray device 22.

[0034] The LED 206 or the LED 207 is turned on when the instruction button 204 is pressed, and thereby the operation mode is transferred to the manual staple mode. Which of the LED 206 and the LED 207 is turned on is determined in accordance with the setting of the binding position when the previous manual staple mode was finished, for example. The LED 206 is turned on when performing the staple processing on the upper right corner of the sheet bundle S' is set, and after the execution of the staple processing, it is changed in a blinking state, and when the sheet bundle S' is discharged from the processing tray device 22, it is turned off. The LED 207 is turned on when performing the staple processing on the upper left corner of the sheet bundle S' is set, and after the execution of the staple processing, it is changed in a blinking state, and when the sheet bundle S' is discharged from the processing tray device 22, it is turned off.

[0035] The waiting device 21 makes the sheets S to be conveyed from the image forming apparatus 2 temporarily stay (buffer). For example, while the post-processing of the preceding sheets S is performed on the processing tray device 22, the waiting device 21 makes a plurality of the subsequent sheets S wait. The waiting device 21 is disposed above the processing tray device 22. When the processing tray device 22 becomes vacant, the waiting device 21 drops the sheets S which have been stayed, from above the processing tray device 22 toward the processing tray device 22, for example.

[0036] The processing tray device 22 holds, aligns and discharges the sheets S or the sheet bundle S'. For example, the processing tray device 22 aligns the sheet bundle S'. The processing tray device 22 discharges the sheets S or the sheet bundle S' which has been subjected to the post-processing such as the staple processing to the discharge device 23. The discharge device 23 has a fixed tray 23a and a movable tray 23b. The fixed tray 23a

is disposed at an upper portion of the sheet post-processing apparatus 3. The movable tray 23b is disposed at a side portion of the sheet post-processing apparatus 3. The sheets S which have been subjected to the sort processing are discharged to the fixed tray 23a and the movable tray 23b.

[0037] The binding processing device 24 executes a staple processing to the sheet bundle S' which has been aligned by the processing tray device 22. By this means, the sheet bundle S' is bound. That is, the binding processing device 24 performs a staple processing that is an example of a post-processing to the sheet bundle S' held by the processing tray device 22.

[0038] The post-processing controller 25 controls an operation of the whole sheet post-processing apparatus 3 including switching of the operation mode. That is, the post-processing controller 25 controls the operation display panel 20, the waiting device 21, the processing tray device 22, the discharge device 23, and the binding processing device 24. The post-processing controller 25 controls the sheet post-processing apparatus 3, at the time of the on line mode, so that the sheet post-processing apparatus 3 operates in accordance with a control signal from the control panel 11 of the image forming apparatus 2. The post-processing controller 25 includes a control circuit including a CPU, a ROM, and a RAM.

[0039] Next, configurations of the respective units of the sheet post-processing apparatus 3 in the first embodiment will be described in detail. Fig. 4 is a sectional view schematically showing a configuration of the sheet post-processing apparatus 3 in the first embodiment. As shown in Fig. 4, the sheet post-processing apparatus 3 has a conveying path 31 of the sheet S, the waiting device 21 including a waiting tray 32, the processing tray device 22 including a processing tray 33, the binding processing device 24 including a stapler 36.

[0040] In addition, in the following description, "a sheet conveying direction" means a conveying direction D (an entering direction of the sheet S to the waiting tray 32) of the sheet S to the waiting tray 32 of the waiting device 21. In addition, in the present specification, "an upstream side" and "a downstream side" respectively mean an upstream side and a downstream side in the sheet conveying direction D. In addition, in the present specification, "a leading end portion" and "a rear end portion" respectively mean "an end portion at the downstream side" and "an end portion at the upstream side" in the sheet conveying direction D. Further, in the present specification, a direction which is in approximately parallel with an upper surface (a conveying surface) of the waiting tray 32 and is also approximately orthogonal to the sheet conveying direction D is called a sheet width direction W.

[0041] The conveying path 31 is provided inside the sheet post-processing apparatus 3. The conveying path 31 has a sheet supply port 31p and a sheet discharge port 31d. The sheet supply port 31p faces the image forming apparatus 2. The sheet S is supplied to the sheet supply port 31p from the image forming apparatus 2. The

sheet S which has passed through the conveying path 31 is discharged to the waiting tray 32 of the waiting device 21 via the sheet discharge port 31d. The waiting tray 32 makes a plurality of the sheets wait in the stacked manner, while a post-processing is performed in the processing tray device 22.

[0042] Next, the processing tray device 22 will be described. The processing tray device 22 has a processing tray 33, a paddle 34, lateral alignment plates 35. The processing tray 33 aligns and supports the sheet bundle S' to be loaded, while the staple processing is executed to the sheet bundle S' by the stapler 36 that is a processing mechanism for performing a post-processing. The paddle 34 is provided between the waiting tray 32 and the processing tray 33. When the sheets S or the sheet bundle S' moves from the waiting tray 32 toward the processing tray 33, the paddle 34 rotates, to press the sheets S toward the processing tray 33. Further, the paddle 34 has a plurality of paddles, and rotates in a direction of an arrow A, to move the sheets S which have dropped on the processing tray 33 toward the stapler 36 described later.

[0043] The two lateral alignment plates 35 are provided on the processing tray 33 in the width direction of the sheet S. When the sheets S or the sheet bundle S' on the waiting tray 32 drops on the processing tray 33, the lateral alignment plates 35 perform alignment of the sheets S or the sheet bundle S' in the sheet width direction W, so as to prevent that the sheets S or the sheet bundle S' is disordered in the sheet width direction W. The lateral alignment plates 35 are slidably provided in accordance with a width of the sheet S. At the time of the manual staple mode, the lateral alignment plates 35 perform alignment in the sheet width direction W to the sheet bundle S' which a user has placed on the processing tray 33. In addition, when the sheet bundle S' is inserted in the processing tray, a pair of the lateral alignment plates 35 may be arranged at the most distant positions, so that a user can easily insert the sheet bundle S' into the processing tray.

[0044] The processing tray 33 has a conveying roller 33a, a conveying belt 33b, and a sheet detection sensor 33c. The processing tray 33 is provided below the waiting tray 32. A plurality of the sheets S which have moved on the processing tray 33 are subjected to alignment in the sheet width direction W by the lateral alignment plates 35, and also are subjected to alignment in the sheet conveying direction D by being conveyed by the conveying belt 33b. The conveying belt 33b of the processing tray 33 conveys the sheets S between the stapler 36 and the discharge device 23 by bundle claws (not shown) provided on the conveying belt 33b. The stapler 36 is provided at an end portion of the processing tray 33. The stapler 36 performs a staple (binding) processing to a bundle of a prescribed number of the sheets S located on the processing tray 33. The sheet detection sensor 33c detects whether or not the sheets S or the sheet bundle S' exists on the processing tray 33. The sheet

detection sensor 33c outputs detection result to the post-processing controller 25.

[0045] Next, the binding processing device 24 will be described. The binding processing device 24 has the stapler 36, a cue sensor (a first sensor) 37 and a no-staple sensor (a second sensor) 38 which are provided in the stapler 36. The binding processing device 24 adjusts a position of the stapler 36, so as to perform a staple processing to the sheet bundle S' at a position set by the position setting button 203. The stapler 36 houses a staple sheet integrated with a plurality of staples for stapling, and drives the staple(s) into the sheet bundle S'. This staple sheet is integrated with linear staples. For this reason, the stapler 36 performs a cue processing in which a staple to be driven in the next processing is disconnected from a staple sheet, the disconnected staple is folded in a U shape, and is set in a drivable state.

[0046] The cue sensor 37 detects whether or not a staple which is to be driven in the next binding processing has been prepared in the stapler 36. For example, the cue sensor 37 judges the presence or absence of a staple based on a load to be generated at the time of folding a staple, and thereby detects whether or not a staple has been prepared. That is, when a load to be generated at the time of folding a staple is not generated, the cue sensor 37 detects that a staple has not been set. In addition, the cue sensor 37 determines that a staple has been set when the load is generated, and outputs a first detection signal that is a signal indicating the detection result that a staple has been prepared to the post-processing controller 25. When it is detected that a staple has not been prepared by the cue sensor 37, the detection result of the cue sensor 37 indicates that staples have been completely used out or that a staple cue mechanism has failed.

[0047] The no-staple sensor 38 monitors a remaining amount of staples in the staple sheet, and detects that a remaining amount of staples in the staple sheet becomes not more than a prescribed amount (for example, 30 - 40 pieces). That is, the no-staple sensor 38 detects a near empty state indicating that the staple sheet will soon become empty. The no-staple sensor 38 outputs a second detection signal that is a signal indicating the detection result as to whether the remaining amount of staples in the staple sheet has become not more than the prescribed amount, to the post-processing controller 25.

[0048] In the case of the online mode, the sheet post-processing apparatus 3 transmits a signal notifying no-staple to the image forming apparatus 2, based on the detection result of the no-staple sensor 38. When receiving the signal notifying no-staple, the image forming apparatus 2 performs processing up to the image forming operation during processing at present, and halts the subsequent image forming operation. The image forming apparatus 2 halts the image forming operation, displays that staple needles have been used out on the control panel 11, and thereby urges a user to replenish staple needles.

[0049] In the manual staple mode, the post-processing controller 25 of the sheet post-processing apparatus 3 controls the binding processing device 24. Hereinafter, a functional block relating to the manual staple mode in the post-processing controller 25 according to the embodiment will be described.

[0050] Fig. 5 is a diagram showing a functional block relating to the manual staple mode in the post-processing controller 25. As shown in Fig. 5, the post-processing controller 25 has a communication module 251, a control module 252, a sensor information acquisition module 253, a stapler control module 254. The communication module 251 communicates with the control panel 11 of the image forming apparatus 2.

[0051] The control module 252 controls the respective modules in the post-processing controller 25 in the manual staple mode. The control module 252 communicates with the control panel 11 of the image forming apparatus 2 via the communication module 251. The control module 252 receives an input signal from the operation device 201 of the operation display panel 20, to control a processing relating to the manual staple. The control module 252 controls the display (turning on, blinking, turning off of the LEDs 205 - 207) in the display device 202 of the operation display panel 20, based on a state of the processing relating to the manual staple.

[0052] The sensor information acquisition module 253 receives the first and second detection signals respectively from the cue sensor 37 and the no-staple sensor 38 of the binding processing device 24, to acquire the detection results in the cue sensor 37 and the no-staple sensor 38. The control module 252 controls the stapler control module 254 in accordance with the detection results which the sensor information acquisition module 253 has acquired. The stapler control module 254 controls an operation of the stapler 36 in accordance with an instruction from the control module 252.

[0053] Hereinafter, processings of the control module 252 in accordance with specific operations (1) - (3) of a user will be described.

[0054] Operation (1): When the sheet post-processing apparatus 3 is in the online mode, a user presses the instruction button 204, and then places the sheet bundle S' on the processing tray 33. When receiving an input signal indicating that the instruction button 204 has been pressed by the operation (1) from the operation display panel 20, the control module 252 starts transferring the operation mode from the online mode to the manual staple mode. The control module 252 determines whether or not to transfer the operation mode of the sheet post-processing apparatus 3 from the online mode to the manual staple mode, based on the following three conditions 1 - 3. In addition, the example described below is an example, and the control module 252 may determine whether or not to transfer the operation mode to the manual staple mode by only the condition 1. And as another example, the control module 252 may make the order of determining the conditions 1 - 3 to be an arbitrary order.

[0055] Condition 1: That a remaining amount of staples in the staple sheet is not a prescribed amount or less. If a signal (detection result) from the no-staple sensor 38 is ON (a remaining amount of staples is not more than a prescribed amount), the control module 252 does not transfer the operation mode of the sheet post-processing apparatus 3 to the manual staple mode. If the signal (detection result) from the no-staple sensor 38 is ON, the control module 52 notifies the image forming apparatus 2 of a no-staple error. By this means, the image forming apparatus 2 displays a message or an icon indicating that a no-staple error has occurred, on the control panel 11, for example. If the detection result from the no-staple sensor 38 is OFF (a remaining amount of staples is more than a prescribed amount), the control module 252 determines a condition 2 described below.

[0056] Condition 2: To obtain permission to stop the online mode from the image forming apparatus 2. The control module 252 inquires whether or not the online mode may be stopped, to the control panel 11 of the image forming apparatus 2 via the communication module 251, and acquires its result. If receiving a result (an NG signal) that the online mode cannot be stopped from the control panel 11, the control module 252 does not transfer the operation mode of the sheet post-processing apparatus 3 to the manual staple mode. If receiving a result (an OK signal) that the online mode may be stopped from the control panel 11, the control module 252 determines a condition 3 described below.

[0057] Condition 3: That a signal from the cue sensor 37 is ON. If a signal from the cue sensor 37 is ON, the control module 252 transfers the operation mode of the sheet post-processing apparatus 3 to the manual staple mode. Here, the case in which a signal from the cue sensor 37 is ON is a case in which a staple to be driven in the next processing has been set in the stapler 36. If the signal from the cue sensor 37 is OFF, the control module 252 performs a cue processing for making the stapler 36 perform blank driving. Here, the case in which the signal from the cue sensor 37 is OFF is a case in which a staple to be driven in the next processing has not been set in the stapler 36. In particular, If the signal of the cue sensor 37 becomes OFF during the binding operation, a possibility that the staples in the stapler 36 have been completely used out is high (a possibility of failure is low).

[0058] The control module 252 acquires again a signal of ON or OFF from the cue sensor 37, after the cue processing. If the signal acquired again from the cue sensor 37 is ON, the control module 252 transfers the operation mode of the sheet post-processing apparatus 3 to the manual staple mode. If the signal acquired again from the cue sensor 37 is OFF, the control module 252 does not transfer the operation mode of the sheet post-processing apparatus 3 to the manual staple mode. If the signal from the cue sensor 37 is OFF, the control module 252 informs the image forming apparatus 2 of a cue error.

[0059] If the sheet post-processing apparatus 3 transfers in the manual staple mode, the control module 252

sets the positions of the waiting tray 32, the processing tray 33, the paddle 34, the lateral alignment plates 35, and the stapler 36 to the respective waiting positions. That is, the control module 252 moves the waiting tray 32, the processing tray 33, the paddle 34, the lateral alignment plates 35, and the stapler 36 to the respective waiting positions. The waiting positions of the lateral alignment plates 35 and the stapler 36 are respective positions where they stopped when the manual staple mode was finished at the previous time. The control module 252 transmits an instruction of turning on the LED 206 or the LED 207 to the display device 202, in accordance with the waiting position of the stapler 36. After the operation mode has been transferred to the manual staple mode, the control module 252 instructs turning on the LED 205 to the display device 202, in accordance with detection of the sheet bundle S' by the sheet detection sensor 33c. While the LED 205 is lighting during the manual staple mode, the LED 205 indicates that the sheet bundle S' exists on the processing tray 33.

[0060] Operation (2): When the sheet post-processing apparatus 3 is in the manual staple mode, a user presses the position setting button 203. When receiving an input signal indicating that the position setting button 203 has been pressed by the operation (2) from the operation display panel 20, the control module 252 controls switching of the binding position. In accordance with this control, if the LED 206 is lighting, the control module 252 transmits a control signal to turn off the LED 206 and turn on the LED 207, to the display device 202. If the LED 207 is lighting, the control module 252 transmits a control signal to turn off the LED 207 and turn on the LED 206, to the display device 202. When the position setting button 203 is pressed by the operation (2), the control module 252 instructs the stapler control module 254 so as to switch the position of the stapler 36 to the sheet bundle S'. The control module 252 controls lighting of the LED 206 or the LED 207, in accordance with the control of the position of the stapler 36, to display the binding position of the stapler 36.

[0061] Operation (3): When the sheet post-processing apparatus 3 is in the manual staple mode, a user presses the instruction button 204. When receiving an input signal indicating that the instruction button 204 has been pressed by the operation (3) from the operation display panel 20, the control module 252 makes the staple processing to be executed. In accordance with the execution of this staple processing, the control module 252 transmits a control signal to make the LED 205 during lighting to be blinked to the display device 202. The control module 252 instructs the stapler control module 254 so as to make the stapler 36 execute staple processing to the sheet bundle S'. The stapler control module 254 makes the stapler 36 perform the staple processing to the sheet bundle S', in accordance with the instruction from the control module 252. The stapler control module 254 notifies that the stapler 36 has finished the execution of the staple processing to the control module 252. By

this means, the control module 252 makes the LED 206 or the LED 207 to be blinked, and informs a user of the completion of the staple processing.

[0062] When receiving a signal indicating that the stapler 36 has finished the execution of the staple processing, the control module 252 acquires the detection result of the cue sensor 37 from the sensor information acquisition module 253. When a signal (detection result) from the cue sensor 37 is ON (a state in which a staple has been set), the control module 252 continues the manual staple mode in preparation for the further staple processing. When the detection result of the cue sensor 37 is OFF (a state in which a staple has not been set), the control module 252 performs a home position processing. This home position processing is a processing which transfers the operation mode of the sheet post-processing apparatus 3 to the online mode, and finishes the manual staple mode.

[0063] Next, transfer of the operation mode to the manual staple mode and the manual staple processing in the sheet post-processing apparatus 3 will be described. Fig. 6 is a flow chart showing transfer of the operation mode to the manual staple mode and the manual staple processing in the sheet post-processing apparatus 3. A processing of Fig. 6 is started when a user has pressed the instruction button 204 while the sheet post-processing apparatus 3 is in the online mode. In addition, it is assumed that after having pressed the instruction button 204, the user has placed the sheet bundle S' to become an object to be stapled on the processing tray 33 of the sheet post-processing apparatus 3.

[0064] As shown in Fig. 6, in ACT10, the control module 252 of the post-processing controller 25 determines whether or not a signal (detection result) from the no-staple sensor 38 is ON.

[0065] Here, when the signal from the no-staple sensor 38 is ON (YES in ACT10), the processing of the post-processing controller 25 proceeds to ACT11. In ACT11, the control module 252 of the post-processing controller 25 notifies the image forming apparatus 2 of a no-staple error. After the processing of ACT11, the control module 252 finishes the processing to transfer to the manual staple mode, and does not transfer the operation mode of the sheet post-processing apparatus 3 to the manual staple mode.

[0066] When a signal (detection result) from the no-staple sensor 38 is OFF (NO in ACT10), the processing of the post-processing controller 25 proceeds to ACT12. In ACT12, the control module 252 of the post-processing controller 25 inquires of the image forming apparatus 2 about whether or not the online mode may be stopped. Next, in ACT12, the control module 252 acquires an OK signal indicating that the online mode may be stopped, or an NG signal indicating that the online mode cannot be stopped, which is the inquiry result, from the image forming apparatus 2.

[0067] When the NG signal is received (NO in ACT12), the control module 252 of the post-processing controller

25 does not transfer the operation mode of the sheet post-processing apparatus 3 to the manual staple mode. When the control module 252 does not transfer the operation mode of the sheet post-processing apparatus 3 to the manual staple mode, it finishes the transfer processing of the operation mode to the manual staple mode.

[0068] When the OK signal is received (YES in ACT12), the processing of the post-processing controller 25 proceeds to ACT13. In ACT 13, the control module 252 of the post-processing controller 25 acquires a signal from the cue sensor 37, and determines whether the signal from the cue sensor 37 is ON or OFF. When the signal from the cue sensor 37 is ON (YES in ACT 13), the processing of the post-processing controller 25 proceeds to ACT16. In ACT16, the control module 252 of the post-processing controller 25 transfers the operation mode of the sheet post-processing apparatus 3 to the manual staple mode. When the signal from the cue sensor 37 is OFF (NO in ACT 13), the processing of the post-processing controller 25 proceeds to ACT14. In ACT14, the control module 252 of the post-processing controller 25 makes the stapler 36 perform blank driving, to perform the cue processing. Next, in ACT15, the control module 252 of the post-processing controller 25 acquires the signal indicating that the cue sensor 37 is ON or OFF again, and determines whether the signal from the cue sensor 37 is ON or OFF. When the signal from the cue sensor 37 which has been acquired again is ON (YES in ACT 15), the processing of the post-processing controller 25 proceeds to ACT16. In ACT 16, the control module 252 of the post-processing controller 25 transfers the operation mode of the sheet post-processing apparatus 3 to the manual staple mode. When the signal from the cue sensor 37 which has been acquired again is OFF (NO in ACT 15), the processing of the post-processing controller 25 proceeds to ACT23. In ACT 23, the control module 252 of the post-processing controller 25 notifies the image forming apparatus 2 of a cue error. After the processing of ACT23, the control module 252 finishes the transfer processing to the manual staple processing, and does not transfer the operation mode of the sheet post-processing apparatus 3 to the manual staple mode.

[0069] The post-processing controller 25 in the first embodiment judges whether or not to transfer the operation mode to the manual staple mode, based on whether or not an amount of staple needles is equal or greater than a prescribed amount. If the post-processing controller 25 judges that the amount of staple needles is equal or greater than the prescribed amount, the post-processing controller 25 performs control for transferring the operation mode to the manual staple mode. If the post-processing controller 25 judges that the amount of staple needles is not equal or greater than the prescribed amount, the post-processing controller 25 controls the operation mode so as not to transfer the operation mode to the manual staple mode. Further, when the operation mode is the manual staple mode, the post-processing

controller 25 judges whether or not to continue the manual staple mode, based on whether or not a staple to become an object of the next staple processing is prepared. When judging that a staple to become an object of the next staple processing is prepared, the post-processing controller 25 controls the operation mode so as to continue the manual staple mode. When judging that a staple to become an object of the next staple processing is not prepared, the post-processing controller 25 controls the operation mode so as not to continue the manual staple mode. By this means, the sheet post-processing apparatus 3 can prevent that a blank binding processing is performed to the sheet bundle S', in the manual staple processing. When the operation mode is once transferred to the manual staple mode, the sheet post-processing apparatus 3 can continue the staple processing until the whole staples are used out.

[0070] In ACT 17, when the operation mode of the sheet post-processing apparatus 3 is transferred to the manual staple mode, the control module 252 of the post-processing controller 25 sets positions of the lateral alignment plates 35 and the stapler 36 and so on to waiting positions. The control module 252 turns on the LED 206 or the LED 207, in accordance with the waiting position of the stapler 36. When the sheet detection sensor 33c detects the sheet bundle S' at the time of the manual staple mode, the control module 252 turns on the LED 205.

[0071] When a user has pressed the position setting button 203 after the processing of ACT 17, in ACT18, the control module 252 of the post-processing controller 25 controls the switching of a binding position. In accordance with this switching control, the control module 252 controls the display of the display device 202. In addition, when a user has not pressed the position setting button 203, the control module 252 does not perform the processing of ACT18, but performs the processing of ACT 19.

[0072] In ACT 19, the control module 252 of the post-processing controller 25 judges whether or not to make the staple processing to be executed, based on whether a user has pressed the instruction button 204 after the processing of ACT 17 or ACT18. When the user has pressed the instruction button 204, the processing of the post-processing controller 25 proceeds to ACT20. In ACT20, the control module 252 instructs the stapler control module 254 so as to make the stapler 36 execute the staple processing to the sheet bundle S'. The stapler control module 254 makes the stapler 36 execute the staple processing to the sheet bundle S', in accordance with the instruction from the control module 252.

[0073] After the processing of ACT20, in ACT21, the control module 252 of the post-processing controller 25 acquires a signal from the cue sensor 37 from the sensor information acquisition module 253, and judges whether or not the signal (detection result) from the cue sensor 37 is ON. When the detection result of the cue sensor 37 is ON (YES in ACT21), the processing of the post-

processing controller 25 returns to ACT19. In ACT19, the control module 252 continues the manual staple mode in preparation for the following staple processing. When the detection result of the cue sensor 37 is OFF (NO in ACT21), the processing of the post-processing controller 25 proceeds to ACT22. In ACT22, the control module 252 of the post-processing controller 25 executes a home position processing. After the processing of ACT22, in ACT23, the control module 252 notifies the image forming apparatus 2 of a cue error. In addition, when it is detected that the instruction button 204 has been pressed in the state that there is no sheet on the processing tray 33, or when it is detected that a predetermined time has passed after the operation mode was transferred to the manual staple mode, the post-processing controller 25 may finish the manual staple mode.

[0074] In this manner, the sheet post-processing apparatus 3 performs the home position processing, and thereby can return to the online mode without being accompanied by a further operation by the user when the manual staple mode is finished. In addition, when detecting a no-staple error, at the time of transferring the operation mode to the manual staple mode, or at the time of executing the manual staple processing, the sheet post-processing apparatus 3 can notify the image forming apparatus 2 of the no-staple error. In addition, when detecting a cue error, at the time of transferring the operation mode to the manual staple mode, or at the time of executing the manual staple processing, the sheet post-processing apparatus 3 can notify the image forming apparatus 2 of the cue error.

[0075] The sheet post-processing apparatus 3 determines the presence or absence of a staple, based on the detection result of the cue sensor 37, during the manual staple mode. The sheet post-processing apparatus 3 determines the presence or absence of a staple based on the detection result of the no-staple sensor 38, during the online mode. That is, the sheet post-processing apparatus 3 determines whether or not replenishment of staples is necessary, based on the detection result of the no-staple sensor 38. An amount of the sheet bundles S' which a user processes in the manual staple mode might be small (for example, not more than 10 bundles). Accordingly, the sheet post-processing apparatus 3 determines the presence or absence of a staple, based on the detection result of the cue sensor 37 in which the staples can be used up to the last staple, in the case of the manual staple mode. In addition, in the online mode in which there is a possibility that a large amount of the sheet bundles S' are processed, the sheet post-processing apparatus 3 determines the presence or absence of a staple based on the detection result of the no-staple sensor 38. The sheet post-processing apparatus 3 notifies a user of the above-described determination of the presence or absence of a staple, and thereby can urge the user to effectively replenish staples.

(Modification)

[0076] In the above-described embodiment, the cue sensor 37 and the no-staple sensor 38 are provided for the stapler 36, but embodiments are not limited to this. The cue sensor 37 and the no-staple sensor 38 may be incorporated in the stapler 36. The cue sensor 37 detects whether or not a staple for the next binding processing is prepared, based on a load for bending the staple, but embodiments are not limited to the above embodiment. The cue sensor 37 has only to detect whether or not a staple is set at a prescribed position and in a prescribed shape.

[0077] The sheet post-processing apparatus 3 of at least one of the embodiments described above has the post-processing controller 25. The post-processing controller 25 has functions of the sensor information acquisition module 253, the stapler control module 254, and the control module 252. Accordingly, the sheet post-processing apparatus 3 can prevent a blank binding processing from being performed to the sheet bundle S' in the manual staple mode.

[0078] The function of the sheet post-processing apparatus 3 in the above-described embodiments may be realized by a computer. In this case, a program for realizing this function is recorded in a computer readable recording medium. The program recorded in this recording medium may be read and executed by a computer system. Here, "the computer system" called here shall include an OS and a hardware such as peripheral devices. In addition, "the computer readable recording medium" includes a portable medium such as a flexible disk, a magneto-optical disk, a ROM, a CO-ROM, and a storage device such as a hard disk drive to be incorporated in a computer system. Further, "the computer readable recording medium" may include one which dynamically holds a program for a short time, such as a communication line, in the case of transmitting a program via a network such as Internet, or a communication line such as a telephone line. Further, "the computer readable recording medium" may include one which holds a program for a prescribed time, such as a volatile memory in a computer system which serves as a server or a client, in the case of transmitting a program via a network such as Internet, or a communication line such as a telephone line. In addition, the above-described program may be one which realizes a part of the above-described function, and may be one which realizes the above described function in combination with the program which has already been recorded in a computer system.

[0079] While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions. Indeed, the novel embodiments described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the embodiments described herein may be made without departing from the framework of

the inventions. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and framework of the inventions.

Claims

1. A sheet post-processing apparatus having a plurality of operation modes, comprising:

a processing tray configured to support sheets;
 a stapler configured to hold a plurality of staples and perform a binding processing to the sheets to be supported by the processing tray;
 a first sensor configured to detect whether or not the staple for performing the binding processing is prepared ;
 a second sensor configured to detect that an amount of the staples held by the stapler has become not more than a prescribed amount; and
 a controller configured to judge whether or not to transfer the operation mode to a first operation mode to perform the binding processing to the sheets to be manually fed to the processing tray, based on a detection result of the second sensor, and judge whether or not to perform the binding processing by the stapler, based on a detection result of the first sensor, after having transferred the operation mode to the first operation mode.

2. A sheet post-processing apparatus which has a plurality of operation modes and is configured to be connected to an image forming apparatus, comprising:

a processing tray configured to support sheets;
 a stapler configured to hold a plurality of staples and perform a binding processing to the sheets to be supported by the processing tray;
 a first sensor configured to detect whether or not the staple for performing the binding processing is prepared ;
 a second sensor configured to detect that an amount of the staples held by the stapler has become not more than a prescribed amount; and
 a controller configured to determine presence or absence of the staple based on a detection result of the first sensor, if the operation mode is a first operation mode to perform the binding processing to the sheets to be manually fed to the processing tray, and determine the presence or absence of the staple based on a detection result of the second sensor, if the operation mode is a second operation mode to perform the binding processing to the sheets to be conveyed from the image forming apparatus to the processing tray.

3. The sheet post-processing apparatus according to claim 1 or 2, wherein: if the amount of the staples is not the prescribed amount or less in the detection result of the second sensor, the controller is configured to judge whether or not to transfer the operation mode to the first operation mode, based on the detection result of the first sensor.

4. The sheet post-processing apparatus according to claim 1 or 2, wherein: if the amount of the staples is not more than the prescribed amount in the detection result of the second sensor, the controller is configured to perform notification of an error.

5. The sheet post-processing apparatus according to any one of claims 1 to 4, wherein: if the staple for performing the binding processing is prepared in the detection result of the first sensor, the controller is configured to transfer the operation mode to the first operation mode.

6. The sheet post-processing apparatus according to claim 5, wherein: after having transferred the operation mode to the first operation mode, and having made the stapler perform the binding processing, the controller is configured to judge whether or not to continue the first operation mode, based on the detection result of the first sensor.

7. The sheet post-processing apparatus according to any one of claims 1 to 6, wherein: if the staple for performing the binding processing is prepared in the detection result of the first sensor, the controller is configured to continue the first operation mode.

8. The sheet post-processing apparatus according to any one of claims 1 to 6, wherein: if the staple for performing the binding processing is not prepared in the detection result of the first sensor, the controller is configured to finish the first operation mode.

9. The sheet post-processing apparatus according to any one of claims 1 to 6, wherein: if the staple for performing the binding processing is not prepared in the detection result of the first sensor, the controller is configured to perform notification of an error.

10. The sheet post-processing apparatus according to any one of claims 1 to 9, wherein: when having finished the first operation mode, the controller transfers the operation mode to a second operation mode to perform the binding processing to the sheets which are conveyed from an external device to the processing tray.

11. The sheet post-processing apparatus according to any one of claims 1 to 9, wherein when having finished the first operation mode, the controller per-

forms notification of an error to the external device.

12. The sheet post-processing apparatus according to any one of claims 1 to 11, wherein: if the staple for performing the binding processing is prepared in the detection result of the first sensor, the controller is configured to transfer the operation mode to the first operation mode. 5
13. The sheet post-processing apparatus according to any one of claims 1 to 11, wherein: if the staple for performing the binding processing is not prepared in the detection result of the first sensor, the controller is configured to transfer the operation mode to the second operation mode. 10 15
14. A sheet binding processing method in a sheet post-processing apparatus having a plurality of operation modes, comprising: 20
detecting that an amount of staples held by a stapler has become not more than a prescribed amount by a second sensor;
judging whether or not to transfer the operation mode to a first operation mode to perform a binding processing to sheets to be manually fed, based on a detection result of the second sensor; 25
detecting whether or not the staple for performing the binding processing is prepared in the stapler, by a first sensor different from the second sensor, after having transferred the operation mode to the first operation mode; and 30
judging whether or not to perform the binding processing by the stapler, based on a detection result of the first sensor. 35
15. The sheet binding processing method according to claim 14, further comprising: 40
judging whether or not to transfer the operation mode to the first operation mode, based on the detection result of the first sensor, if the amount of the staples is not the prescribed amount or less in the detection result of the second sensor. 45

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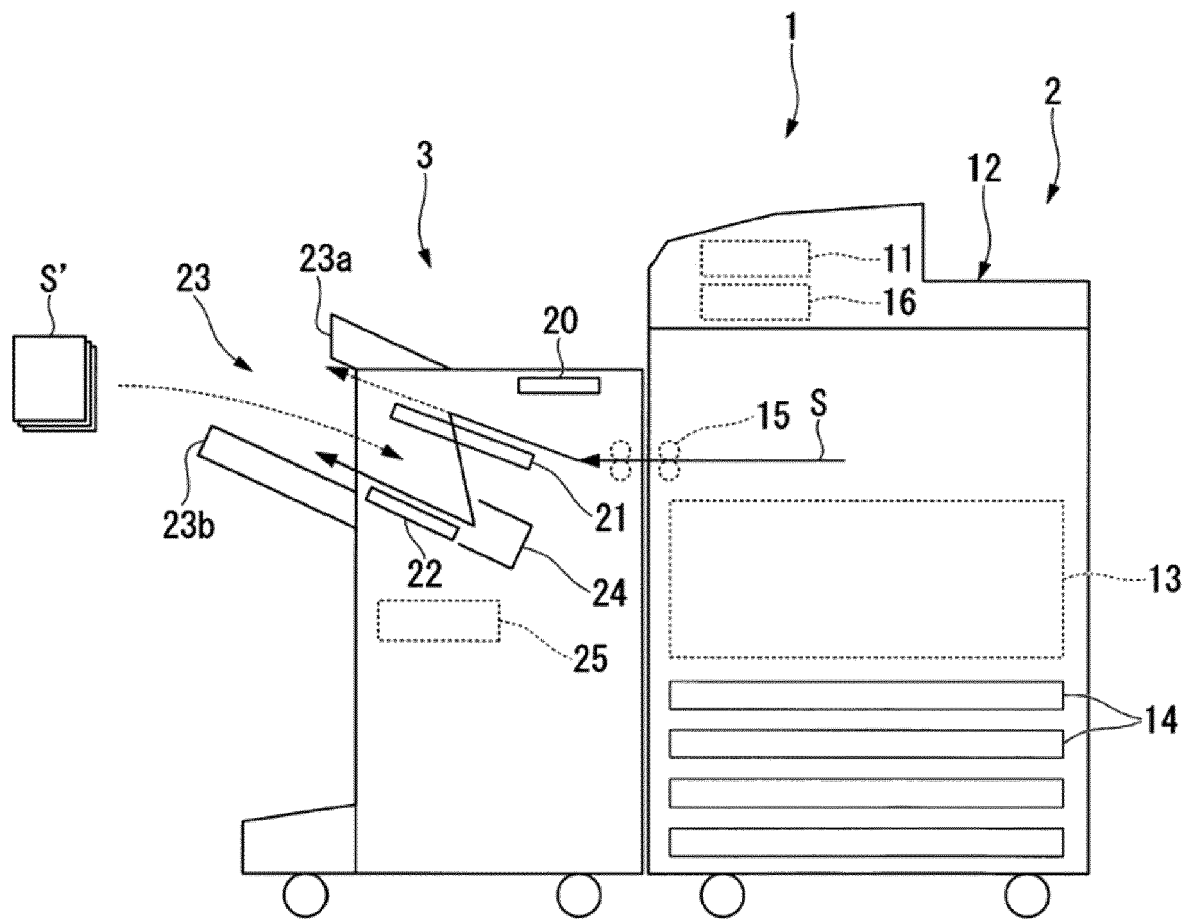


Fig.1

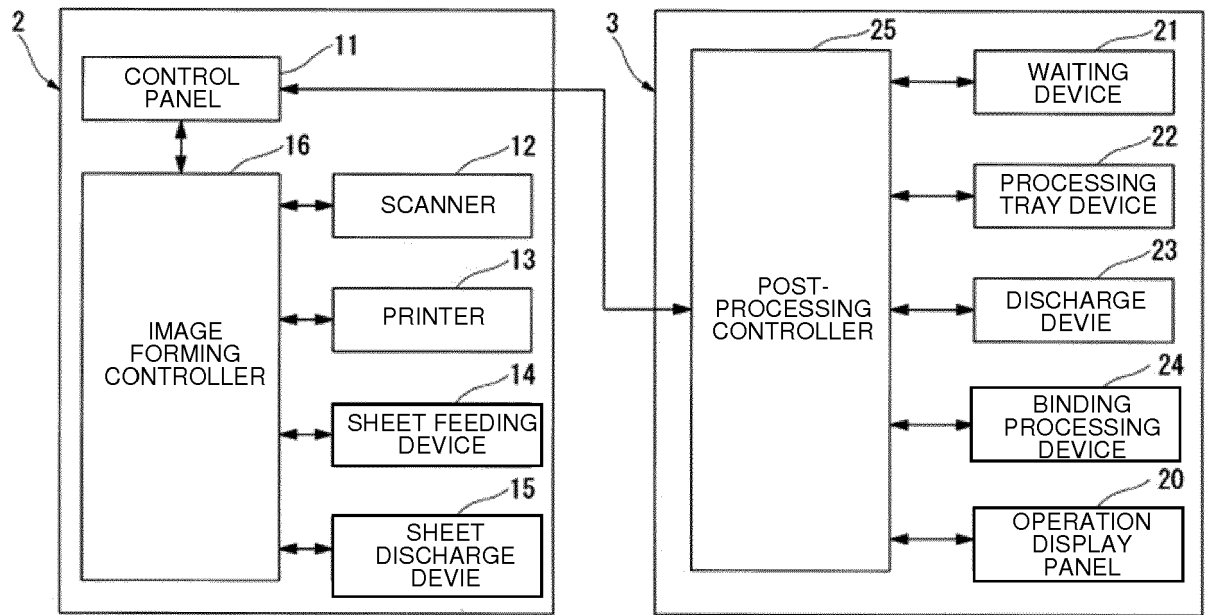


Fig.2

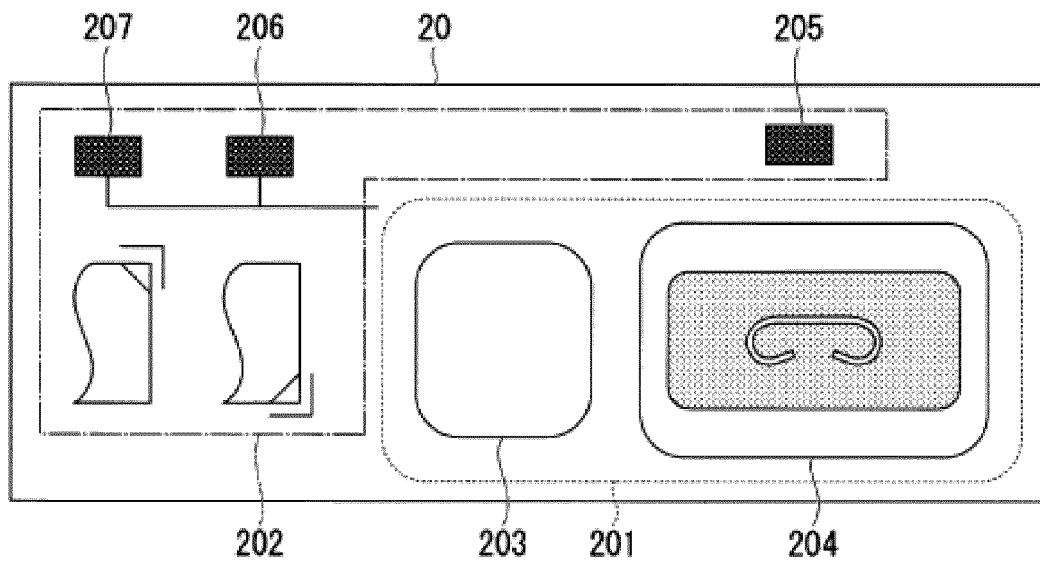


Fig.3

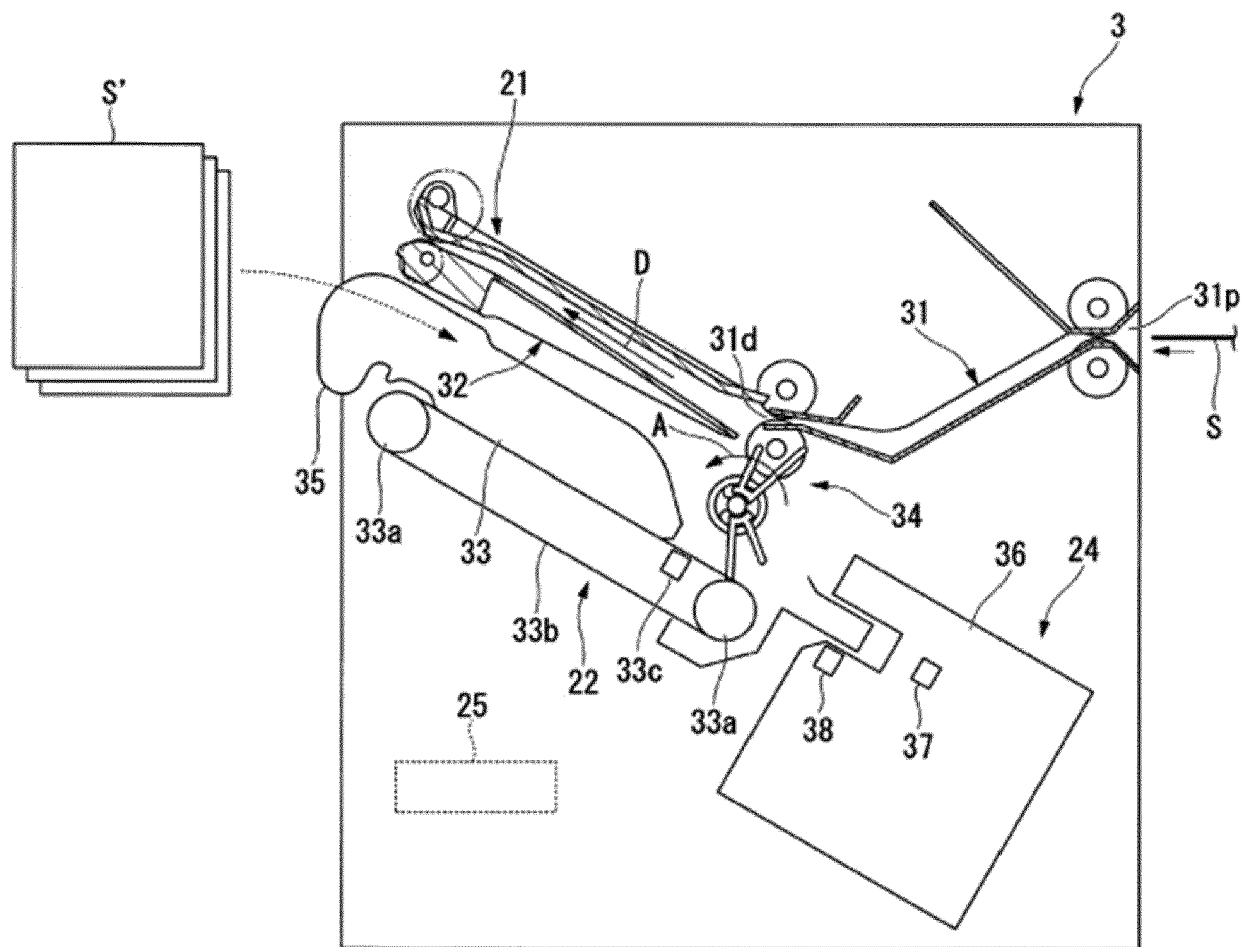


Fig.4

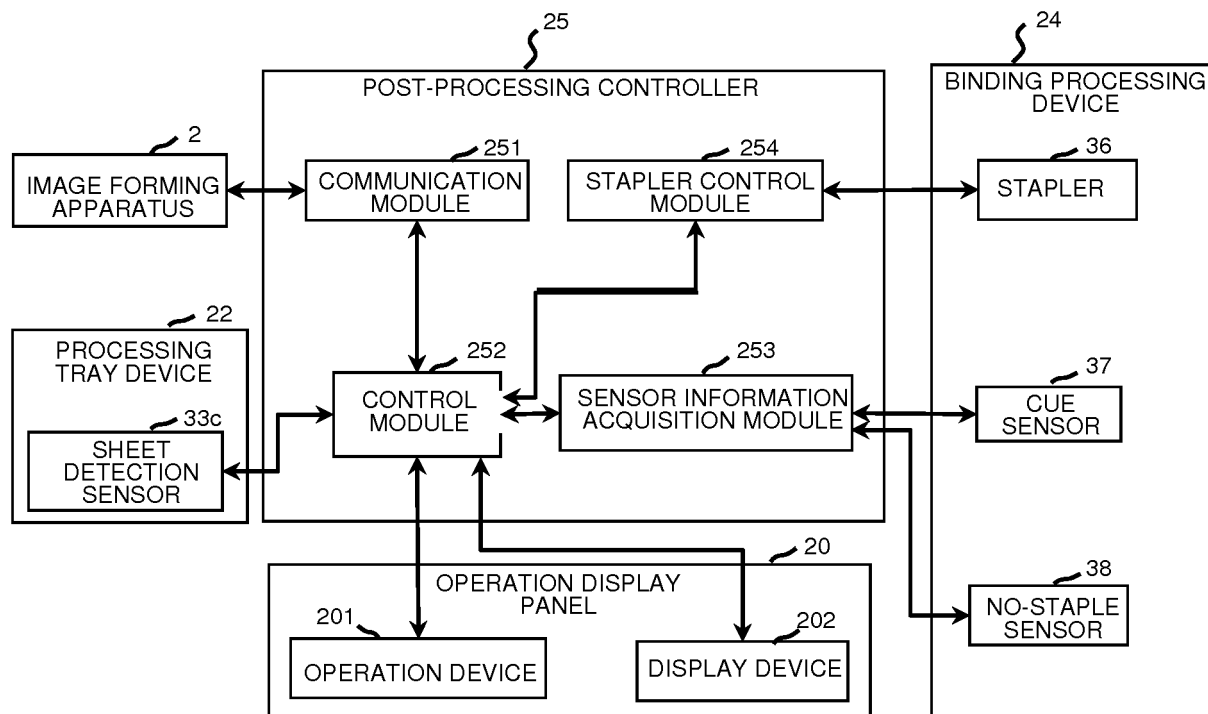


Fig.5

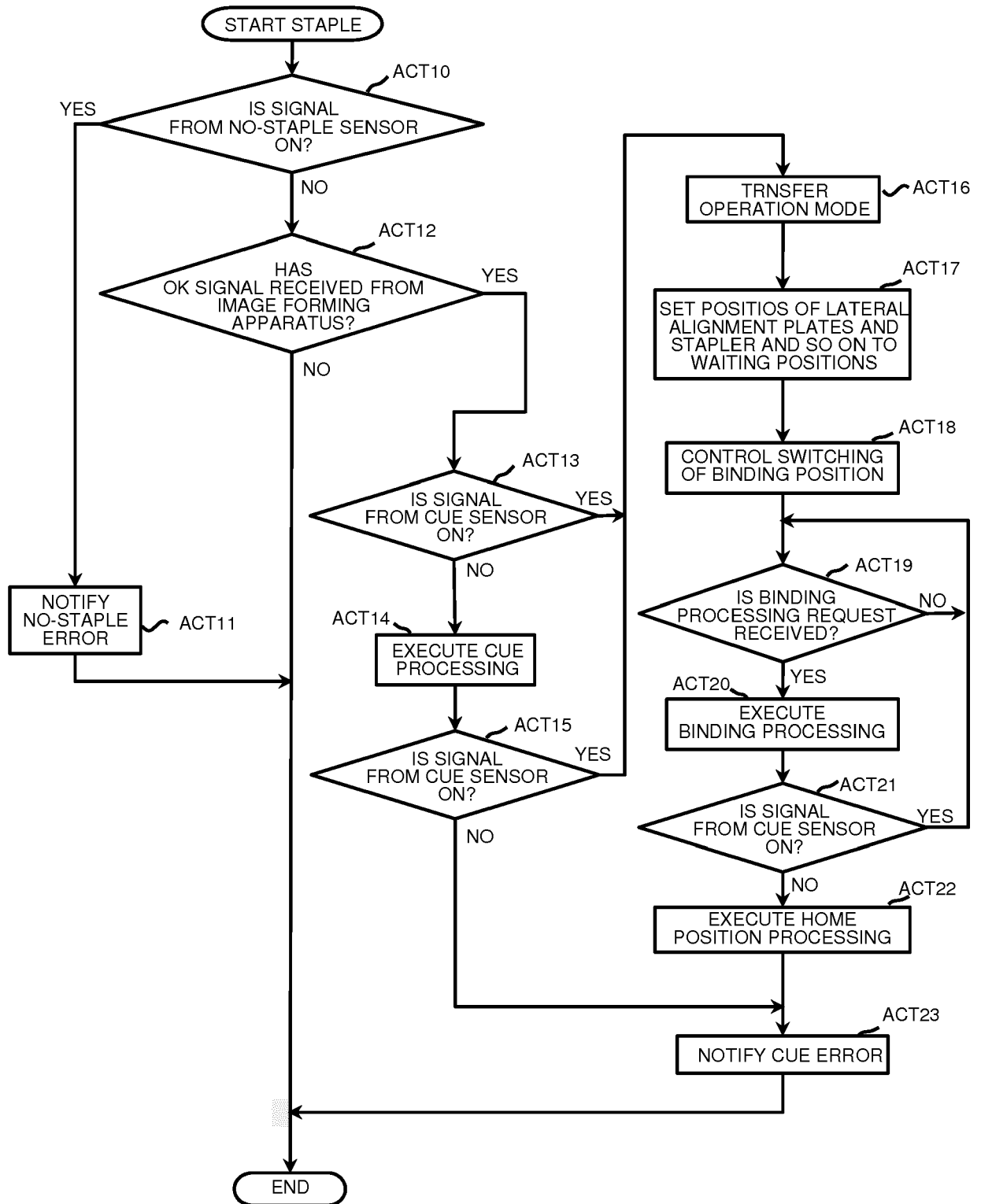


Fig.6