

US Patent & Trademark Office

Patent Public Search | Text View

United States Patent Application Publication

20250263265

Kind Code

A1

Publication Date

August 21, 2025

Inventor(s)

Takayama; Ryota et al.

POST-PROCESSING APPARATUS AND IMAGE FORMING SYSTEM INCORPORATING THE POST-PROCESSING APPARATUS

Abstract

A post-processing apparatus including a sheet bundle inserter, a movable sheet stacker, and a sheet binder. The sheet bundle inserter inserts a sheet bundle having multiple sheets overlapped on each other. The movable sheet stacker is inserted into and withdrawn from the sheet bundle inserter. The movable sheet stacker has a stacker face on which the sheet bundle is stacked. The sheet binder is in the sheet bundle inserter, and performs a sheet binding operation on the sheet bundle stacked on the movable sheet stacker.

Inventors: Takayama; Ryota (Kanagawa, JP), Shibasaki; Yuusuke (Kanagawa, JP), Hirono; Yusuke (Kanagawa, JP), Shinoda; Atsushi (Kanagawa, JP), Tohkaishi; Shuuto (Kanagawa, JP), Asano; Sho (Kanagawa, JP), Takahashi; Wataru (Kanagawa, JP), Hoshino; Tomomichi (Kanagawa, JP), Kameyama; Kotomi (Kanagawa, JP), Hirata; Satoshi (Kanagawa, JP), Yoshizawa; Shingo (Kanagawa, JP), Fujita; Suzuka (Kanagawa, JP), Yoshida; Naofumi (Kanagawa, JP), Yasukawa; Hirotaka (Kanagawa, JP), Suzuki; Yoshito (Kanagawa, JP), Monma; Shinya (Kanagawa, JP), Watanabe; Takahiro (Kanagawa, JP), Suzuki; Yuji (Kanagawa, JP), Nozaki; Wataru (Kanagawa, JP), Yamada; Jun (Kanagawa, JP), Haraguchi; Yohsuke (Kanagawa, JP), Yoshida; Naohiro (Kanagawa, JP)

Applicant: Takayama; Ryota (Kanagawa, JP); Shibasaki; Yuusuke (Kanagawa, JP); Hirono; Yusuke (Kanagawa, JP); Shinoda; Atsushi (Kanagawa, JP); Tohkaishi; Shuuto (Kanagawa, JP); Asano; Sho (Kanagawa, JP); Takahashi; Wataru (Kanagawa, JP); Hoshino; Tomomichi (Kanagawa, JP); Kameyama; Kotomi (Kanagawa, JP); Hirata; Satoshi (Kanagawa, JP); Yoshizawa; Shingo (Kanagawa, JP); Fujita; Suzuka (Kanagawa, JP); Yoshida; Naofumi (Kanagawa, JP); Yasukawa; Hirotaka (Kanagawa, JP); Suzuki; Yoshito (Kanagawa, JP); Monma; Shinya (Kanagawa, JP); Watanabe; Takahiro (Kanagawa, JP); Suzuki; Yuji (Kanagawa, JP); Nozaki; Wataru (Kanagawa, JP); Yamada; Jun (Kanagawa, JP); Haraguchi; Yohsuke (Kanagawa, JP); Yoshida; Naohiro (Kanagawa, JP)

Family ID: 1000008492804
Assignee: Ricoh Company, Ltd. (Tokyo, JP)
Appl. No.: 19/057665
Filed: February 19, 2025

Foreign Application Priority Data

JP	2024-023613	Feb. 20, 2024
----	-------------	---------------

Publication Classification

Int. Cl.: B65H37/04 (20060101)
U.S. Cl.:
CPC B65H37/04 (20130101); B65H2301/4213 (20130101)

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This patent application is based on and claims priority pursuant to 35 U.S.C. § 119 (a) to Japanese Patent Application No. 2024-023613, filed on Feb. 20, 2024, in the Japan Patent Office, the entire disclosure of which is hereby incorporated by reference herein.

BACKGROUND

Technical Field

[0002] Embodiments of the present disclosure relate to a post-processing apparatus that performs a post-processing operation on a sheet, and an image forming system including the post-processing apparatus and an image forming apparatus.

Background Art

[0003] Various types of post-processing apparatuses are known that perform a sheet binding operation (post-processing operation) on a sheet bundle manually inserted to a sheet bundle inserter in an image forming system (image forming apparatus).

[0004] Specifically, it is disclosed that a post-processing apparatus in the art is disposed adjacent to an image forming apparatus and performs a binding operation on the corner of a sheet bundle the user has manually inserted to the sheet bundle inserter (opening portion).

[0005] On the other hand, the above-described post-processing apparatus in the art discloses a configuration in which a retractable support is disposed on the sheet bundle inserter to support the end face of the sheet bundle in the portrait orientation, for the purpose of stabilizing the binding position of the sheet bundle that is to be inserted into the sheet bundle inserter (opening portion).

SUMMARY

[0006] Embodiments of the present disclosure described herein provide a novel post-processing apparatus including a sheet bundle inserter, a movable sheet stacker, and a sheet binder. The sheet bundle inserter inserts a sheet bundle having multiple sheets overlapped on each other. The movable sheet stacker is inserted into and withdrawn from the sheet bundle inserter. The movable sheet stacker has a stacker face on which the sheet bundle is stacked. The sheet binder is in the sheet bundle inserter. The sheet binder performs a sheet binding operation on the sheet bundle

stacked on the movable sheet stacker.

[0007] Further, embodiments of the present disclosure described herein provide an image forming system including image forming apparatus to form an image on a sheet, and the above-described post-processing apparatus to perform a given operation on the sheet.

[0008] Further, embodiments of the present disclosure described herein provide a post-processing apparatus including a sheet bundle container, a movable sheet stacker, and a sheet binder. The sheet bundle container accommodates an entire set of a sheet bundle. The movable sheet stacker has a stacker face on which the sheet bundle, having a size smaller than an area of the stacker face, is placed. The movable sheet stacker is movable inside or outside the sheet bundle container. The sheet binder performs a sheet binding operation on the sheet bundle in the sheet bundle container.

[0009] Further, embodiments of the present disclosure described herein provide an image forming system including an image forming apparatus to form an image on a sheet, and the above-described post-processing apparatus. The stacker face of the movable sheet stacker is withdrawable to a front side of the image forming apparatus.

Description

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0010] Exemplary embodiments of this disclosure will be described in detail based on the following figures, wherein:

[0011] FIG. 1 is a diagram illustrating an overall configuration of an image forming system according to an embodiment of the present disclosure;

[0012] FIG. 2 is a block diagram illustrating an automatic processing device of a post-processing apparatus in the image forming system of FIG. 1;

[0013] FIG. 3 is a top view of a post-processing apparatus;

[0014] FIG. 4 is an enlarged view of a binding tool of a stapleless binding device;

[0015] FIG. 5 is a schematic perspective view of a post-processing apparatus;

[0016] FIG. 6A is a side view of a post-processing apparatus;

[0017] FIG. 6B is a front view of a post-processing apparatus;

[0018] FIG. 7 is a schematic perspective view of a post-processing apparatus in which a movable sheet stacker is withdrawn from a sheet bundle inserter;

[0019] FIG. 8A is a schematic perspective view of a post-processing apparatus in which a small-size sheet is placed on the movable sheet stacker of FIG. 7;

[0020] FIG. 8B is a schematic perspective view of a post-processing apparatus in which a large-size sheet is placed on the movable sheet stacker of FIG. 7;

[0021] FIG. 9 is a block diagram illustrating a control system of an image forming system;

[0022] FIG. 10 is a schematic perspective view of a post-processing apparatus as Modification 1;

[0023] FIGS. 11A and 11B are schematic perspective views of a post-processing apparatus as Modification 2;

[0024] FIG. 12 is a top view of a movable sheet stacker in a post-processing apparatus according to Modification 3;

[0025] FIGS. 13A and 13B are schematic perspective views of a post-processing apparatus in which the movable sheet stacker of FIG. 12 is inserted to and removed from the post-processing apparatus;

[0026] FIG. 14A is a schematic perspective view of a post-processing apparatus including the movable sheet stacker of FIG. 12, viewing a sheet bundle inserter from the inside of the post-processing apparatus;

[0027] FIG. 14B is a schematic perspective view of a post-processing apparatus including a movable sheet stacker as a comparative example, viewing a sheet bundle inserter from the inside of

the post-processing apparatus;

[0028] FIGS. **15A**, **15B** and **15C** are schematic perspective views of a post-processing apparatus according to Modification 4, illustrating a series of operations from which the movable sheet stacker is withdrawn from the sheet bundle inserter to which the movable sheet stacker is inserted to the sheet bundle inserter;

[0029] FIGS. **16A**, **16B** and **16C** are schematic side views of the movable sheet stacker of FIGS. **15A**, **15B** and **15C**, illustrating a series of operations from which the movable sheet stacker is withdrawn from the sheet bundle inserter to which the movable sheet stacker is inserted to the sheet bundle inserter;

[0030] FIGS. **17A**, **17B** and **17C** are schematic top view of the movable sheet stacker of FIGS. **15A**, **15B** and **15C**, illustrating a series of operations from which the movable sheet stacker is withdrawn from the sheet bundle inserter to which the movable sheet stacker is inserted to the sheet bundle inserter;

[0031] FIG. **18** is a top view of a movable sheet stacker in a post-processing apparatus according to Modification 5;

[0032] FIG. **19A** is a top view of a movable sheet stacker according to another embodiment of the present disclosure;

[0033] FIG. **19B** is a schematic perspective view of a post-processing apparatus with the movable sheet stacker of FIG. **19A** is withdrawn;

[0034] FIG. **20** is a top view of a movable sheet stacker in a post-processing apparatus according to Modification 6;

[0035] FIG. **21A** is a schematic side view of the movable sheet stacker of FIG. **20** on which a sheet bundle is not stacked;

[0036] FIG. **21B** is a schematic side view of the movable sheet stacker of FIG. **20** on which a sheet bundle is stacked;

[0037] FIGS. **22A**, **22B** and **22C** are schematic side views of a movable sheet stacker in a post-processing apparatus according to Modification 7, illustrating a series of operations of a retractable second contact portion in the movable sheet stacker;

[0038] FIGS. **23A**, **23B** and **23C** are schematic top views of the retractable second contact portion of FIGS. **22A**, **22B** and **22C**, illustrating a series of operations of the retractable second contact portion;

[0039] FIG. **24A** is a schematic side view of the movable sheet stacker of FIGS. **22A**, **22B** and **22C** on which small-size sheets are placed;

[0040] FIG. **24B** is a schematic side view of the movable sheet stacker of FIGS. **22A**, **22B** and **22C** on which large-size sheets are placed;

[0041] FIG. **25A** is a schematic top view of the movable sheet stacker of FIGS. **22A**, **22B** and **22C** on which small-size sheets are placed;

[0042] FIG. **25B** is a schematic top view of the movable sheet stacker of FIGS. **22A**, **22B** and **22C** on which large-size sheets are placed;

[0043] FIG. **26** is a schematic side view of a movable sheet stacker provided with a retractable second contact portion according to another embodiment of the present disclosure;

[0044] FIG. **27A** is a schematic side view of the movable sheet stacker of FIG. **26** on which small-size sheets are placed;

[0045] FIG. **27B** is a schematic side view of the movable sheet stacker of FIG. **26** on which large-size sheets are placed;

[0046] FIG. **28** is a schematic perspective view of a post-processing apparatus according to Modification 8, in which a movable sheet stacker is withdrawn from the post-processing apparatus;

[0047] FIG. **29A** is a schematic side view of the post-processing apparatus of FIG. **28** in which a movable sheet stacker is inserted in a sheet bundle inserter;

[0048] FIG. **29B** is a schematic side view of the post-processing apparatus of FIG. **28** in which the

movable sheet stacker is withdrawn from the sheet bundle inserter;

[0049] FIG. **30** is a schematic top view of a post-processing apparatus according to Modification 9, in which a movable sheet stacker is inserted to a sheet bundle inserter;

[0050] FIG. **31A** is a schematic top view of the post-processing apparatus of FIG. **30** in which a movable sheet stacker is withdrawn from a sheet bundle inserter;

[0051] FIG. **31B** is a schematic top view of the post-processing apparatus of FIG. **30** in which the movable sheet stacker on which a sheet bundle is placed is inserted in the sheet bundle inserter;

[0052] FIG. **32** is a flowchart of a control process performed by the post-processing apparatus of FIG. **30**;

[0053] FIGS. **33A** and **33B** are schematic perspective views of a slide mechanism of a movable sheet stacker included in a post-processing apparatus according to Modification 10;

[0054] FIGS. **34A** and **34B** are schematic front views of the slide mechanism of FIGS. **33A** and **33B**; and

[0055] FIG. **35** is a diagram illustrating an overall configuration of an image forming system according to Modification 11.

[0056] The accompanying drawings are intended to depict embodiments of the present disclosure and should not be interpreted to limit the scope thereof. The accompanying drawings are not to be considered as drawn to scale unless explicitly noted.

DETAILED DESCRIPTION

[0057] It will be understood that if an element or layer is referred to as being “on,” “against,” “connected to” or “coupled to” another element or layer, then it can be directly on, against, connected or coupled to the other element or layer, or intervening elements or layers may be present. In contrast, if an element is referred to as being “directly on,” “directly connected to” or “directly coupled to” another element or layer, then there are no intervening elements or layers present. As used herein, the term “connected/coupled” includes both direct connections and connections in which there are one or more intermediate connecting elements. Like numbers refer to like elements throughout. As used herein, the term “and/or” includes any and all combinations of one or more of the associated listed items.

[0058] Spatially relative terms, such as “beneath,” “below,” “lower,” “above,” “upper” and the like may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as “below” or “beneath” other elements or features would then be oriented “above” the other elements or features. Thus, term such as “below” can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors herein interpreted accordingly.

[0059] The terminology used herein is for describing particular embodiments and examples and is not intended to be limiting of exemplary embodiments of this disclosure. 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. It will be further understood that 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.

[0060] Embodiments of the present disclosure are described below in detail with reference to the drawings. Like reference signs are assigned to identical or equivalent components and a description of those components may be simplified or omitted.

[0061] A description is now given of the configuration and functions of an image forming system **300** according to an embodiment of the present disclosure, with reference to FIG. **1**.

[0062] As illustrated in FIG. **1**, the image forming system **300** according to the present embodiment

includes a post-processing apparatus **1** (sheet processing apparatus) including a function of a binding process. The post-processing apparatus **1** is detachably attached to an in-body space **W** of an image forming apparatus **100**. The in-body space **W** is a space between a document reading device **102** and an image forming device **115**. The in-body space **W** is a space to which a sheet **P** (sheet subjected to a print job) ejected from the image forming apparatus **100** can be ejected. The in-body space **W** is also a space from which the sheet **P** ejected from the image forming apparatus **100** can be removed (taken out). In other words, when the post-processing apparatus **1** is not installed to the image forming system **300**, the in-body space **W** functions as a space (ejection part) in which the sheet **P** is or multiple sheets **P** ejected from the image forming apparatus **100** are stacked.

[0063] The in-body space **W** is open in a + (positive) **x** direction and in a – (negative) **y** direction. When a user uses the image forming system **300**, the user operates an operation display panel **149** or sees a display or operates the post-processing apparatus **1**, from the +**x** direction.

[0064] The image forming apparatus **100** is the part of the image forming system **300** other than the post-processing apparatus **1**. In other words, the image forming system **300** includes the image forming apparatus **100** and the post-processing apparatus **1**. The image forming apparatus **100** includes the image forming device **115**, an apparatus sheet tray **112**, a fixing device **120**, a document feeder **110**, and the document reading device **102**. The image forming apparatus **100** (image forming system **300**) has an exterior to which the operation display panel **149** (operation display) that displays various kinds of information and inputs various kinds of commands for the image forming system **300**.

[0065] Referring to FIGS. **1** to **5**, the post-processing apparatus **1** includes a sheet binding device **30** (stapler binding device), an internal tray **20**, an ejection roller pair **15**, an ejection tray **17**, multiple conveyance roller pairs **11**, **12** and **13**, and a stapleless binding device **40**. The post-processing apparatus **1** is disposed downstream from the image forming apparatus **100** in the sheet conveyance direction (a direction in which the sheet **P** is conveyed). The post-processing apparatus **1** is an apparatus for performing a binding operation (a staple binding operation or a stapleless binding operation) on multiple sheets **P**, on which a print job has been performed, ejected from the image forming apparatus **100** and performing a binding operation (a staple binding operation) on a sheet bundle **PT** set manually, which will be described in detail below.

[0066] A description below is given of the image forming operation (printing operation) in the image forming apparatus **100** of the image forming system **300**, with reference to FIG. **1**.

[0067] In the image forming apparatus **100** with reference to FIG. **1**, multiple pairs of sheet conveying rollers disposed in the document feeder **110** feed an original document **D** from a document loading table and convey the original document **D** in a direction indicated by arrow in FIG. **1**. By so doing, the original document **D** passes over the document reading device **102**. At this time, the document reading device **102** optically reads image data of the original document **D** while the original document **D** is passing over the document reading device **102**.

[0068] The image data optically scanned by the document reading device **102** is converted into electrical signals. The electrical signals are then transmitted to a writing device **103**. The writing device **103** emits laser beams onto the photoconductor drums **105Y**, **105M**, **105C**, and **105K** based on the electrical signals of the image data in each of colors, respectively, performing an exposing process.

[0069] In the image forming apparatus **100**, a charging process, the exposing process, and a developing process are sequentially executed on the photoconductor drums **105Y**, **105M**, **105C**, and **105K** of respective image forming units **104Y**, **104M**, **104C**, and **104K** to form desired images on the photoconductor drums **105Y**, **105M**, **105C**, and **105K**, respectively.

[0070] The images formed on the photoconductor drums **105Y**, **105M**, **105C**, and **105K** are transferred and superimposed onto the intermediate transfer belt **178** to form a color image. The color image formed on the intermediate transfer belt **178** is transferred onto the surface of the sheet

P fed and conveyed by a sheet feed roller **197** from the apparatus sheet tray **112** (second sheet feeder) at a position at which the intermediate transfer belt **178** faces a secondary transfer roller **189**.

[0071] After the color image is transferred onto the surface of the sheet P, the sheet P is conveyed to the position of the fixing device **120**. The fixing device **120** fixes the transferred color image formed on the surface of the sheet P, to the sheet P.

[0072] Subsequently, based on the user's selection of the printing mode, the sheet P is ejected from the image forming apparatus **100** by a first ejection roller pair **131** to be conveyed to the post-processing apparatus **1** or is ejected from the image forming apparatus **100** by a second ejection roller pair **132** to be stacked on an ejection tray **135**.

[0073] In the present embodiment, the post-processing apparatus **1** is coupled (installed) to the in-body space W of the image forming apparatus **100**, and the sheet P ejected from the image forming apparatus **100** is conveyed to the post-processing apparatus **1** based on the user's selection, and the post-processing apparatus **1** performs a post-processing operation on the sheet P conveyed from the image forming apparatus **100**.

[0074] By installing the post-processing apparatus **1** in the in-body space W of the image forming apparatus **100**, the in-body space W is effectively used, and the image forming system **300** can be downsized.

[0075] Referring to FIG. 2, the post-processing apparatus **1** (automatic processing device **39**) in the present embodiment conveys a sheet P conveyed from the image forming apparatus **100** to a conveyance path in which a post-processing operation, such as a sheet binding operation, is performed on the sheet P or the sheet P is ejected without the sheet binding operation. The conveyance path is a conveyance path indicated by a dotted line in FIG. 2 and is defined by three conveyance roller pairs, which are a first conveyance roller pair **11**, a second conveyance roller pair **12**, and a third conveyance roller pair **13**.

[0076] Specifically, when a mode in which the post-processing operation is not performed on a sheet or sheets is selected, the sheet P conveyed by the first conveyance roller pair **11**, the second conveyance roller pair **12**, and the third conveyance roller pair **13** is ejected by the ejection roller pair **15** to be placed on the ejection tray **17**.

[0077] When a "sorting mode (sorting processing mode)" is selected, the sheet P is conveyed while being shifted in the width direction of the sheet P by a given amount for each sheet P by the ejection roller pair **15** that is movable in the width direction (that is a direction orthogonal to the drawing sheet of FIG. 2), and multiple sheets P are sequentially stacked on the ejection tray **17**.

[0078] When the "binding mode (stapling mode)" is selected, the sheets P conveyed by the first conveyance roller pair **11**, the second conveyance roller pair **12**, and the third conveyance roller pair **13** are sequentially stacked on the internal tray **20** without being ejected by the ejection roller pair **15**. At this time, each time a sheet P is placed on the internal tray **20**, a tapping roller **14** and a return roller **16** both disposed above the internal tray **20** move from the standby position to a position where the tapping roller **14** and the return roller **16** contact the sheet P (the uppermost sheet P of the sheet bundle PT), and the tapping roller **14** and the return roller **16** are driven and rotated in the counterclockwise direction in FIG. 2. By so doing, the sheet P is conveyed (moved) toward an end fence **21**. Thus, the trailing end (the trailing end in the sheet conveyance direction) of the multiple sheets P (the sheet bundle PT) contacts the end fence **21**, and the positions of the multiple sheets P (sheet bundle PT) in the sheet conveyance direction are aligned.

[0079] At this time, referring to FIG. 3, each time a sheet P is placed on the internal tray **20** (or after a desired number of sheets P are placed on the internal tray **20**), jogger fences **22** (side fences) disposed at both ends of the internal tray **20** in the width direction move in the width direction to sandwich the sheet P (sheet bundle PT). By so doing, the position of the sheet P (the sheet bundle PT) in the width direction is aligned. Then, a sheet binding operation is performed on the trailing end of the sheets P (sheet bundle PT) aligned in the sheet conveyance direction and the width

direction by the sheet binding device **30** (stapler binding device) and the stapleless binding device **40**.

[0080] Thereafter, the sheets P (sheet bundle PT) subjected to the sheet binding process are moved obliquely upward along the tray surface of the internal tray **20** by the reverse rotation (the rotation in the clockwise direction in FIG. 2) of the return roller **16**, and are ejected onto the ejection tray **17** by the ejection roller pair **15**.

[0081] The post-processing apparatus **1** according to the present embodiment includes two binding devices (the sheet binding device **30** and the stapleless binding device **40**), and the user can select the sheet binding operation with either of the two binding devices.

[0082] The sheet binding device **30** (stapler binding device) as a sheet binder performs a sheet binding operation (with stapler) with a staple or staples (made of metal) on the sheet bundle PT, and a known stapler binding device can be employed.

[0083] In the present embodiment, the sheet binding device **30** (stapler binding device) is movable in the width direction (a direction orthogonal to the drawing sheet of FIG. 2 and a vertical direction in FIG. 3) along a guide rail **31** extending in the width direction by a movement assembly. With this configuration, the sheet binding operation can be performed on the sheet bundle PT placed on the internal tray **20**, at a desired position in the width direction of the sheet bundle PT.

[0084] In particular, the sheet binding device **30** (stapler binding device) is movable to the position of a sheet bundle inserter **41**, which will be described below. Due to this configuration, the sheet binding device **30** (stapler binding device) can perform a sheet binding operation on the sheet bundle PT in the sheet bundle inserter **41**.

[0085] On the other hand, the stapleless binding device **40** performs the sheet binding operation by a binding tool **400** without using a staple (metal staple).

[0086] Specifically, referring to FIG. 4, the stapleless binding device **40** includes the binding tool **400** including two members, which are a first member **400a** having a tooth-shaped serrated portions **400a1** and a second member **400b** having a tooth-shaped serrated portions **400b1**.

[0087] For performing the sheet binding operation, the binding tool **400** is used to press the tooth-shaped serrated portions **400a1** and **400b1** on a corner PTx (see FIGS. 8A, 8B, and 9) of the sheet bundle PT inserted in the sheet bundle inserter **41**, so that a convex and concave portion is formed in the sheet bundle PT in the thickness direction to bind the multiple sheets P of the sheet bundle PT with each other.

[0088] In the binding tool **400**, the first member **400a** and the second member **400b** are arranged substantially in the vertical direction. The first member **400a** has the tooth-shaped serrated portion **400a1** on the upper face.

[0089] The second member **400b** has the tooth-shaped serrated portion **400b1** on the lower face. The tooth-shaped serrated portion **400b1** is engaged with the tooth-shaped serrated portion **400a1** of the first member **400a**. The second member **400b** is relatively movable to the first member **400a** so that the sheet bundle PT is sandwiched by the first member **400a** and the second member **400b**. Then, the sheet binding operation is performed with the sheet bundle PT sandwiched by the first member **400a** and the second member **400b**.

[0090] In the present embodiment, the stapleless binding device **40** is movable in the width direction between a standby position (a position illustrated in FIG. 3) and a processing position (a position of a corner portion of the sheet bundle PT placed on the internal tray **20**) by a movement assembly. According to such a configuration, the sheet binding process can be performed on the corner portion of the sheet bundle PT placed on the internal tray **20**.

[0091] A detailed description is given below of the configuration and operations of the post-processing apparatus **1** according to the present embodiment.

[0092] As described above with reference to FIGS. 1 to 3, the post-processing apparatus **1** according to the present embodiment includes the automatic processing device **39** that performs the sheet binding operation (stapling binding operation or stapleless binding operation) on a sheet

bundle PT that is prepared by overlapping multiple sheets P that are ejected from the image forming apparatus **100** and conveyed to the post-processing apparatus **1**.

[0093] The post-processing apparatus **1** according to the present embodiment includes, in addition to the automatic processing device **39** described above, a sheet bundle inserter **41** (manual sheet binder) to perform a sheet binding operation on a sheet bundle PT that is manually set by a user. In other words, the sheet bundle inserter **41** is a portion into which a part of the whole sheet bundle PT of multiple sheets P is inserted.

[0094] Specifically, the sheet bundle inserter **41** is a portion to which the user inserts the sheet bundle PT from the front side (the side that can face the operation display panel **149**) in the post-processing apparatus **1** disposed in the in-body space W of the image forming system **300**, so as to perform the sheet binding operation on the corner of the sheet bundle PT.

[0095] The sheet bundle inserter **41** according to the present embodiment is provided with a movable sheet stacker **45** that is detachably attachable to the sheet bundle inserter **41** (drawable from the sheet bundle inserter **41**). The detailed description will be given below with reference to FIGS. 5 to 8B.

[0096] As described above, the sheet binding device **30** (stapler binding device) performs the sheet binding operation on the corner of the sheet bundle PT with the sheet bundle PT manually inserted in the sheet bundle inserter **41**.

[0097] When the sheet binding operation is performed in the sheet bundle inserter **41**, the sheet binding device **30** according to the present embodiment moves to the position of the sheet bundle inserter **41** (the position illustrated in FIG. 3) along the guide rail **31**, as described above with reference to FIG. 3. This position is detected by a stapler HP (home position) sensor **78** (see FIG. 3).

[0098] As described above, the post-processing apparatus **1** according to the present embodiment includes the sheet bundle inserter **41** to which the sheet bundle PT in which multiple sheets P are overlapped on each other is inserted. The sheet bundle inserter **41** has a recessed portion in a + (positive) y direction and a - (negative) x direction, with respect to an exterior cover **1a** (see FIG. 5) of the post-processing apparatus **1**.

[0099] Referring to FIGS. 5 to 8B, the post-processing apparatus **1** according to the present embodiment has a stacker face **45s** on which a sheet bundle PT can be placed (placeable and removable) and includes the movable sheet stacker **45** (movable tray) that is detachably attachable to the sheet bundle inserter **41** in the positive or negative congruential direction. The sheet binding device **30** performs the sheet binding operation in the sheet bundle inserter **41**, on the sheet bundle PT placed on the movable sheet stacker **45**.

[0100] Specifically, two apparatus-side sliders **47** are disposed in the sheet bundle inserter **41** at a given interval in the positive or negative y direction, extending in the positive or negative x direction.

[0101] On the other hand, two tray-side sliders **46** are disposed on the bottom of the movable sheet stacker **45**. The tray-side sliders **46** are engaged with the apparatus-side sliders **47**.

[0102] Due to such a configuration as described above, the movable sheet stacker **45** on which the sheet bundle PT can be placed can be withdrawn from the sheet bundle inserter **41** in a direction indicted by white arrow (+x direction) in FIG. 6B or inserted into the sheet bundle inserter **41** in a direction opposite to the direction indicted by white arrow (-x direction) in FIG. 6B.

[0103] The movable sheet stacker **45** is designed so as not to be projected outward from the sheet bundle inserter **41** (post-processing apparatus **1**) when the movable sheet stacker **45** is inserted in the sheet bundle inserter **41** (as illustrated in FIG. 5).

[0104] In the present embodiment, when the sheet binding operation is performed on a sheet bundle PTs of small-size sheets having the size fitting within the stacker face **45s**, the sheet bundle PTs of small-size sheets is first placed on the movable sheet stacker **45d** as illustrated in FIG. 8A with the movable sheet stacker **45** withdrawn from the sheet bundle inserter **41** as illustrated in FIG. 7, and

then the sheet binding device **30** performs the sheet binding operation on the sheet bundle PTs of small-sized sheets placed on the movable sheet stacker **45** with the movable sheet stacker **45** inserted in the sheet bundle inserter **41**, as illustrated in FIG. **8A**. In other words, when the sheet binding operation is performed on the sheet bundle PTs of small-sized sheets that are placed within the stacker face **45s**, after the sheet bundle PTs of small-sized sheets is placed on the movable sheet stacker **45** that is withdrawn from the sheet bundle inserter **41**, the sheet binding device **30** performs the sheet binding operation on the sheet bundle PTs of small-size sheets placed on the movable sheet stacker **45** with the movable sheet stacker **45** inserted to the sheet bundle inserter **41**. The sheet bundle PTs of small-sized sheets has an area smaller than the area of the stacker face **45s**, for example, a business card or a receipt paper.

[0105] On the other hand, when the sheet binding operation is performed on a sheet bundle PTd of large-sized sheets that are larger than the stacker face and are not fitted to the stacker face **45s**, the sheet bundle PTd of large-sized sheets is placed on the movable sheet stacker **45** as illustrated in FIG. **8B** with the movable sheet stacker **45** withdrawn from the sheet bundle inserter **41** (as illustrated in FIG. **7**), and the sheet binding device **30** performs the sheet binding operation on the sheet bundle PTd placed on the stacker face **45s** with the large-sized sheets over the stacker face **45s**.

[0106] In the present embodiment, when the sheet binding operation is performed on the sheet bundle PT placed on the movable sheet stacker **45**, the user presses a manual stapling button **5** (see FIG. **2**) provided on the ceiling of the exterior cover **1a**. By so doing, the sheet binding device **30** is moved to the position of the sheet bundle inserter **41**, and then is driven to perform the sheet binding operation on the sheet bundle PT.

[0107] As described above, since the post-processing apparatus **1** according to the present embodiment includes the movable sheet stacker **45**, even when the sheet bundle PTs includes small-size sheets completely accommodated in the sheet bundle inserter **41** and it is difficult to manually insert the sheet bundle PTs of small-sized sheets as it is to the sheet bundle inserter **41**, the sheet binding operation can be easily and preferably performed on the sheet bundle PTs of small-sized sheets after the sheet bundle PTs of small-sized sheets is set on the movable sheet stacker **45** that is withdrawn from the sheet bundle inserter **41** and the movable sheet stacker **45** is inserted to the sheet bundle inserter **41**.

[0108] Further, when the sheet bundle PTd includes large-size sheets not fitting to but exceeding the sheet bundle inserter **41** and the sheet bundle PTd of large-sized sheets is manually inserted to the sheet bundle inserter **41** even if the exceeding portion of the sheet bundle PTd of large-sized sheets exceeding from the sheet bundle inserter **41** is to be supported, a part of the exceeding portion of the sheet bundle PTd of large-sized sheets can be supported by the movable sheet stacker **45** withdrawn from the sheet bundle inserter **41**. Accordingly, the manual operation on the sheet bundle PTd of large-sized sheets to the sheet bundle inserter **41** can be easily performed.

[0109] The post-processing apparatus **1** having the configuration described above is controlled by the controller **200** illustrated in FIG. **9** (and FIG. **1**).

[0110] As illustrated in FIG. **9**, the controller **200** of the post-processing apparatus **1** is connected to a controller **350** of the image forming apparatus **100** via an interface **70**. The controller **350** of the image forming apparatus **100** is connected, via the interface **360**, to the operation display panel **149** and various drive members and sensors of the image forming apparatus **100**. The controller **200** of the post-processing apparatus **1** is connected, via an interface **72**, to, for example, a conveyance motor **73** that drives and rotates the first conveyance roller pair **11**, the second conveyance roller pair **12**, and the third conveyance roller pair **13**, the tapping roller **14**, and the return roller **16**; an ejection motor **74** that drives and rotates the ejection roller pair **15**; a stapling drive motor **75** that drives the sheet binding device **30** and the stapleless binding device **40**; a conveyance sensor **76** disposed on the conveyance path, an ejection sensor **77** disposed at an ejection port, the stapler HP sensor **78** that detects the reference position of the sheet binding device **30**; and the manual stapling

button **5**.

[0111] The overall control system of the image forming system **300** having the configuration described above executes various operations in the image forming system **300** described above.

Modification 1

[0112] As illustrated in FIG. **10**, the post-processing apparatus **1** according to Modification 1 includes the movable sheet stacker **45** (movable tray) that is detachably attached to the post-processing apparatus **1** in the +y direction, which is different from the post-processing apparatus **1** illustrated in FIGS. **5**, **6A** and **6B** in which the movable sheet stacker **45** is detachably attached to the post-processing apparatus **1** in the +x direction.

[0113] The post-processing apparatus **1** having the configuration described above can easily and preferably perform the sheet binding operation on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41**.

Modification 2

[0114] As illustrated in FIGS. **11A** and **11B**, the movable sheet stacker **45** of the post-processing apparatus **1** according to Modification 2 includes retractable trays (a first retractable tray **45a** and a second retractable tray **45b**) that can extend the area of the stacker face **45s** with the movable sheet stacker **45** withdrawn from the sheet bundle inserter **41**.

[0115] Specifically, first, the movable sheet stacker **45** having the first retractable tray **45a** and the second retractable tray **45b** both at the closed position is withdrawn from the sheet bundle inserter **41** in the +x direction. The first retractable tray **45a** and the second retractable tray **45b** are withdrawn together in the -y direction from the movable sheet stacker **45** that is withdrawn in the +x direction. Then, the second retractable tray **45b** is further withdrawn from the first retractable tray **45a** in the -x direction (as illustrated in FIG. **11A**).

[0116] Due to such a configuration, as illustrated in FIG. **11B**, when the sheet bundle PTd of large-sized sheets is placed on the movable sheet stacker **45**, the area to place the sheet bundle PTd of large-sized sheets can be extended to support the sheet bundle PTd of large-sized sheets.

Accordingly, the manual operation on the sheet bundle PTd of large-sized sheets to the sheet bundle inserter **41** can be further facilitated.

[0117] The post-processing apparatus **1** having the configuration described above can easily and preferably perform the sheet binding operation on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41** by placing the sheet bundle PTs of small-sized sheets on the movable sheet stacker **45** with the first retractable tray **45a** and the second retractable tray **45b** retracted at the closed position.

Modification 3

[0118] As illustrated in FIGS. **12**, **13A**, **13B**, **14A** and **14B**, in the post-processing apparatus **1** according to Modification 3, the movable sheet stacker **45** has a cutout portion **45x** at the position that corresponds to the corner (in the -x direction and the +y direction) of the sheet bundle inserter **41** with the movable sheet stacker **45** inserted in the sheet bundle inserter **41**.

[0119] The sheet binding device **30** performs the sheet binding operation on the sheet bundle PT placed on the movable sheet stacker **45**, at the position that corresponds to the cutout portion **45x** of the movable sheet stacker **45** with the movable sheet stacker **45** inserted in the sheet bundle inserter **41**.

[0120] Due to such a configuration as described above, when compared with the configuration of a post-processing apparatus **500** without a cutout portion in the movable sheet stacker **45**, as illustrated in FIG. **14B** as a comparative example, the post-processing apparatus **1** according to Modification 3 can provide a configuration in which the movable sheet stacker **45** and the sheet binding device **30** with a part of which inserted in the sheet bundle inserter **41** do not interfere with each other. Accordingly, the post-processing apparatus **1** according to Modification 3 can be designed such that the movable sheet stacker **45** can be pushed to the far side (in the -x direction) of the sheet bundle inserter **41**, and the function of the movable sheet stacker **45** is further

enhanced.

[0121] The post-processing apparatus **1** having the configuration described above can also easily and preferably perform the sheet binding operation on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41**.

Modification 4

[0122] As illustrated in FIGS. **15A**, **15B**, **15C**, **16A**, **16B**, **16C**, **17A**, **17B** and **17C**, the movable sheet stacker **45** of the post-processing apparatus **1** according to Modification 4 includes an opening member **45z** that moves from an open position at which the cutout portion **45x** is released when the movable sheet stacker **45** is withdrawn from the sheet bundle inserter **41** to a closed position.

[0123] Specifically, the movable sheet stacker **45** according to Modification 4 also includes the cutout portion **45x** at the corner, which is the same as the movable sheet stacker **45** illustrated in FIGS. **12**, **13A**, **13B** and **14A**. The movable sheet stacker **45** according to Modification 4 includes the opening member **45z** to open and close the cutout portion **45x**, and a compression spring **49** to bias the opening member **45z** in the closing direction (the $-x$ direction). On the other hand, a stopper **48** that can contact the opening member **45z** is disposed on the bottom of the sheet bundle inserter **41** such that the stopper **48** stands in the $+z$ direction.

[0124] As illustrated in FIGS. **15A**, **16A** and **17A**, the movable sheet stacker **45** that is withdrawn from the sheet bundle inserter **41** is moved to the position at which the opening member **45z** closes the cutout portion **45x** due to the biasing force of the compression spring **49**. In other words, the stacker face **45s** of the movable sheet stacker **45** according to Modification 4 has a substantially rectangular shape without a cutout portion. Due to such a configuration, the sheet bundle PT can be easily set on the stacker face **45s**.

[0125] Then, as illustrated in FIGS. **15B**, **16B** and **17B**, as the movable sheet stacker **45** is inserted into the sheet bundle inserter **41**, the opening member **45z** in the closed state eventually contacts the stopper **48**. Then, as illustrated in FIGS. **15C**, **16C** and **17C**, as the movable sheet stacker **45** is further inserted into the sheet bundle inserter **41**, the movement of the opening member **45z** is restricted by the stopper **48**, and the opening member **45z** is brought to be relatively released to move against the biasing force of the compression spring **49**. When the insertion of the movable sheet stacker **45** to the sheet bundle inserter **41** is finally completed, the opening member **45z** is completely moved to the open position to open the cutout portion **45x**. As a result, the movable sheet stacker **45** and the sheet binding device **30** at the position of the cutout portion **45x** are prevented from interfering each other.

[0126] The post-processing apparatus **1** having the configuration described above can also easily and preferably perform the sheet binding operation on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41**.

Modification 5

[0127] As illustrated in FIG. **18**, the movable sheet stacker **45** of the post-processing apparatus **1** according to Modification 5 has a marking line **45m** as a guide mark that indicates the position at which the sheet bundle PT (especially the sheet bundle PTs of small-sized sheets) is placed on the stacker face **45s**.

[0128] Due to such configurations as described above, the user can set the sheet bundle PTs of small-sized sheets following the marking line **45m** as a guide mark, on the movable sheet stacker **45** that is withdrawn from the sheet bundle inserter **41**. Accordingly, a failure in setting the sheet bundle PTs can be reduced or prevented.

[0129] As illustrated in FIGS. **19A** and **19B**, the movable sheet stacker **45** may have a recess **45n** that indicates the position at which the sheet bundle PT (especially the sheet bundle PTs of small-sized sheets) is placed on the stacker face **45s**. Due to such configurations as described above, the user can set the sheet bundle PTs of small-sized sheets along the recess **45n**, on the movable sheet stacker **45** that is withdrawn from the sheet bundle inserter **41**. Accordingly, a failure in setting the

sheet bundle PTs can be reduced or prevented.

[0130] The marking line **45m** (guide mark) and the recess **45n** may be multiple marking lines and multiple recesses according to various sizes of the sheet bundles PTs of small-sized sheets.

[0131] The post-processing apparatus **1** having the configuration described above can also easily and preferably perform the sheet binding operation on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41**.

Modification 6

[0132] As illustrated in FIGS. **20**, **21A** and **21B**, the movable sheet stacker **45** of the post-processing apparatus **1** according to Modification 6 includes a pressing member **50** to be movable in the vertical direction to press down the sheet bundle PT placed on the stacker face **45s** from above.

[0133] Specifically, the pressing member **50** is designed to press the sheet bundle PT in an area other than an area on which the sheet binding operation is performed (cutout portion **45x**) between the pressing member **50** and the stacker face **45s** from above, by the biasing force of the tension spring **51**.

[0134] Due to such a configuration, the sheet binding device **30** preferably preforms the sheet binding operation on the sheet bundle PT fixed by the pressing member **50** on the movable sheet stacker **45**.

[0135] In Modification 6, the user manually operates the pressing member **50** to move in the vertical direction but the configuration of the pressing member is not limited to this configuration. For example, the pressing member may be automatically movable in the vertical direction.

[0136] The post-processing apparatus **1** having the configuration described above can also easily and preferably perform the sheet binding operation on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41**.

Modification 7

[0137] As illustrated in FIGS. **22A**, **22B**, **22C**, **23A**, **23B**, **23C**, **24A**, **24B**, **25A** and **25B**, the movable sheet stacker **45** of the post-processing apparatus **1** according to Modification 7 includes a first contact portion **42** and a second contact portion **53**. The first contact portion **42** is a portion to which one end face (an end face in the $-x$ direction) of either of the sheet bundle PTs of small-sized sheets or the sheet bundle PTd of large-sized sheets is brought to contact. The second contact portion **53** is a retractable portion to which one end face (an end face in the $+y$ direction) orthogonal to the end face of the sheet bundle PTs of small-sized sheets is brought to contact.

[0138] Specifically, the second contact portion **53** is automatically rotatable about a support shaft **53a** on an end of the movable sheet stacker **45** (the right end as illustrated in FIGS. **22A** to **25B**) and a portion other than the portion (cutout portion **45x**) on which the sheet binding operation is performed. The second contact portion **53** has a rotatable range from the position where an arc-shaped projection **53b** on the second contact portion **53** contacts a first engagement portion **54** on the movable sheet stacker **45** (see FIGS. **22A**, **23A**, **24A** and **25A**) to the position where the arc-shaped projection **53b** contacts a second engagement portion **45r** on the movable sheet stacker **45** (see FIGS. **22C**, **23C**, **24B** and **25B**).

[0139] As illustrated in FIGS. **24A** and **25A**, when the sheet bundle PTs of small-sized sheets is set on the movable sheet stacker **45**, the second contact portion **53** is brought to contact the first engagement portion **54** to an upright position. By so doing, the sheet bundle PTs of small-sized sheets is set, with one end face in contact with and positioned by the first contact portion **42** and another end face, which is orthogonal to the one end face, in contact with and positioned by the second contact portion **53**. Due to such a configuration, the sheet binding operation is performed with a good positional accuracy on the sheet bundle PTs that is accurately positioned on the movable sheet stacker **45**.

[0140] On the other hand, as illustrated in FIGS. **24A** and **25A**, when the sheet bundle PTd of large-sized sheets is set on the movable sheet stacker **45**, the second contact portion **53** is brought

to contact the second engagement portion **45r** to a horizontal position. By so doing, the sheet bundle PTd of large-sized sheets is set, with one end face in contact with and positioned by the first contact portion **42**. Since the second contact portion **53** at the horizontal position functions to extend the area of the stacker face **45s**, the sheet bundle PTd of large-sized sheets can be easily supported.

[0141] The movable sheet stacker **45** illustrated as another embodiment in FIGS. **26**, **27A** and **27B** includes a tension spring **55** that is coupled to an attachment end face **45f** of the movable sheet stacker **45** and the second contact portion **53**. As illustrated in FIGS. **26** and **27A**, the tension spring **55** applies the biasing force to the second contact portion **53** in a direction toward the upright position when the second contact portion **53** is at the upright position. In contrast, as illustrated in FIG. **27B**, the tension spring **55** releases the biasing force to the second contact portion **53** in the direction toward the upright position (changes the posture so that the spring force does not act in the direction toward the upright position) when the second contact portion **53** is at the horizontal position. With this configuration, the function of the second contact portion **53** described above is more sufficiently exhibited.

[0142] The post-processing apparatus **1** having the configuration described above can also easily and preferably perform the sheet binding operation on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41**.

Modification 8

[0143] As shown in FIGS. **28**, **29A** and **29B**, the post-processing apparatus **1** according to Modification 8 has the configuration in which the inside of the sheet bundle inserter **41** is not exposed when the movable sheet stacker **45** is inserted in the sheet bundle inserter **41**.

[0144] Specifically, the exterior cover of the movable sheet stacker **45** closely contacts the exterior cover **1a** of the post-processing apparatus **1** substantially without any gap, with the movable sheet stacker **45** inserted in the sheet bundle inserter **41**, so as to cover the opening of the sheet bundle inserter **41**. With this configuration, a failure that, for example, any foreign material enters in the post-processing apparatus **1** through the opening of the sheet bundle inserter **41** can be reduced or prevented.

[0145] The sheet bundle inserter **41** is provided with a second apparatus-side slider **57** that is engaged with a second tray-side slider **56** of the movable sheet stacker **45** to cause the movable sheet stacker **45** to slide in a +z direction, in addition to the apparatus-side sliders **47** that are engaged with the tray-side sliders **46** of the movable sheet stacker **45** to cause the movable sheet stacker **45** to slide in the x direction.

[0146] As illustrated in FIGS. **29A** and **29B**, when the user grabs a handle **45w** and withdraws the movable sheet stacker **45** from the sheet bundle inserter **41**, the movable sheet stacker **45** horizontally moves in the +x direction along the apparatus-side sliders **47**, and then vertically moves in the -z direction along the second apparatus-side slider **57**. In this state, the sheet bundle PT is placed on the stacker face **45s** of the movable sheet stacker **45**.

[0147] When the movable sheet stacker **45** is inserted into the sheet bundle inserter **41**, an operation opposite to the operation when the movable sheet stacker **45** is withdrawn is performed.

[0148] The post-processing apparatus **1** having the configuration described above can also easily and preferably perform the sheet binding operation on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41**.

Modification 9

[0149] As illustrated in FIGS. **30**, **31A** and **31B**, the post-processing apparatus **1** according to Modification 9 automatically performs the sheet binding operation on the sheet bundle PT when a sensor detects that the movable sheet stacker **45** on which the sheet bundle PT is placed is inserted in the sheet bundle inserter **41**.

[0150] Specifically, as illustrated in FIGS. **30**, **31A** and **31B**, the sheet bundle inserter **41** is provided with a tray detection sensor **58** that optically detects whether the movable sheet stacker **45**

is inserted in the sheet bundle inserter **41**. On the other hand, the movable sheet stacker **45** is provided with a sheet bundle detection sensor **59** that optically detects whether the sheet bundle PT is set on the stacker face **45s** of the movable sheet stacker **45**. The tray detection sensor **58** and the sheet bundle detection sensor **59** may employ a reflective photosensor.

[0151] When the tray detection sensor **58** detects that the movable sheet stacker **45** is inserted in the sheet bundle inserter **41** and the sheet bundle detection sensor **59** detects that the sheet bundle PT is set on the stacker face **45s** of the movable sheet stacker **45**, it is determined that the sheet bundle PT is normally set at the sheet binding position of the sheet binding device **30**, and the sheet binding device **30** performs the sheet binding operation on the sheet bundle PT. By so doing, the user can skip a cumbersome action, for example, to press a manual stapling button **5** (see FIG. 2) in a manual sheet binding operation.

[0152] As an example of such control, as illustrated in the flowchart of FIG. 32, the controller **200** first causes the operation display panel **149** (see FIG. 1) to display the selection of the option “end manual stapling” (step S1). Then, the controller **200** determines whether the movable sheet stacker **45** is inserted in the sheet bundle inserter **41** (step S2). In other words, the controller **200** determines whether the tray detection sensor **58** is turned on.

[0153] When the controller **200** determines that the movable sheet stacker **45** is not inserted in the sheet bundle inserter **41** (NO in step S2), step S2 is repeated until the movable sheet stacker **45** is inserted in the sheet bundle inserter **41**. On the other hand, the controller **200** determines that the movable sheet stacker **45** is inserted in the sheet bundle inserter **41** (YES in step S2), the controller **200** then determines whether the sheet bundle PT is set (placed) on the movable sheet stacker **45** (step S3). In other words, the controller **200** determined whether the sheet bundle detection sensor **59** is turned on.

[0154] As a result, when the controller **200** determines that the sheet bundle PT is set (placed) on the movable sheet stacker **45** (YES in step S3), the controller **200** then drives the sheet binding device **30** to perform the sheet binding operation (step S4). Then, the controller **200** determines whether the option “end manual stapling” is selected on the operation display panel **149** (step S5). When the option “end manual stapling” is selected (YES in step S5), the flow of this process ends. On the other hand, when the option “end manual stapling” is not selected (NO in step S5), the process goes back to step S2 to repeat steps from step S2. Further, when the controller **200** determines that the sheet bundle PT is not set (placed) on the movable sheet stacker **45** (NO in step S3), the process is skipped to step S5.

[0155] The post-processing apparatus **1** having the configuration described above can also easily and preferably perform the sheet binding operation on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41**.

Modification 10

[0156] As illustrated in FIGS. 33A, 33B, 34A and 34B, the post-processing apparatus **1** includes a limitation mechanism and a releasing mechanism. The limitation mechanism performs a limitation of the withdrawal range of the movable sheet stacker **45** from the sheet bundle inserter **41**. The releasing mechanism can release the limitation by the limitation mechanism.

[0157] Specifically, in the slide mechanism to cause the movable sheet stacker **45** to slide on the sheet bundle inserter **41**, the apparatus-side sliders **47** include movable stoppers **47x** that are movable in the +y direction and the tray-side sliders **46** include contact portions **46x** that are contactable to the movable stoppers **47x** on the far side in the -x direction.

[0158] As illustrated in FIGS. 33B and 34B, in a case where the movable stoppers **47x** are moved to be protruded toward the slide path, the contact portions **46x** contact the movable stoppers **47x** when the movable sheet stacker **45** is withdrawn from the sheet bundle inserter **41**, and the movable sheet stacker **45** may not be withdrawn further. This configuration can prevent a failure that the movable sheet stacker **45** is withdrawn from the sheet bundle inserter **41** too much to fall from the sheet bundle inserter **41**.

[0159] On the other hand, as illustrated in FIGS. 33A and 34A, in a case where the movable stoppers **47x** are retracted from the slide path, the contact portions **46x** do not contact the movable stoppers **47x** when the movable sheet stacker **45** is withdrawn from the sheet bundle inserter **41**, and the movable sheet stacker **45** may be withdrawn from the sheet bundle inserter **41** for maintenance of the movable sheet stacker **45**.

[0160] In other words, the movable stoppers **47x** and the contact portions **46x** function as the limitation mechanism that limits a withdrawal range of the movable sheet stacker **45** from the sheet bundle inserter **41** and the releasing mechanism that can release the limitation by the limitation mechanism.

[0161] The post-processing apparatus **1** having the configuration described above can also easily and preferably perform the sheet binding operation on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41**.

Modification 11

[0162] As illustrated in FIG. 35, the image forming system **300** according to Modification 11 includes a hole puncher **90** as a second post-processing apparatus (optional apparatus). The hole puncher **90** is installed in the in-body space W of the image forming apparatus **100** and is disposed upstream (the upstream side in the sheet conveyance direction) from the post-processing apparatus **1** (first post-processing apparatus).

[0163] The hole puncher **90** includes a punch unit **91** therein. When a punching mode is selected by the user, the hole puncher **90** performs a punching operation on the sheet P that is inserted from the image forming apparatus **100**.

[0164] Regardless of whether the punching operation is performed or not, the hole puncher **90** is to convey the sheet P ejected from the image forming apparatus **100**, toward the post-processing apparatus **1**.

[0165] Further, also in Modification 11, the post-processing apparatus **1** has the same configuration as the configuration described with reference to, for example, FIGS. 2 to 9.

[0166] In the image forming system **300** having the configuration described above, the post-processing apparatus **1** can be relatively downsized and reduced in cost.

[0167] In Modification 11, the hole puncher **90** is installed as a second post-processing apparatus capable of executing the punching operation, but any device capable of executing another operation may be process may be installed as a second post-processing apparatus.

[0168] In Modification 11, the hole puncher **90** as the second post-processing apparatus is disposed upstream from the post-processing apparatus **1** as the first post-processing apparatus in the sheet conveyance direction. However, the hole puncher **90** as the second post-processing apparatus may be disposed downstream from the post-processing apparatus **1** as the first post-processing apparatus in the sheet conveyance direction.

[0169] As described above, the post-processing apparatus **1** according to the above-described embodiments includes the sheet bundle inserter **41** to which the sheet bundle PT in which multiple sheets P are overlapped on each other is inserted. Further, the post-processing apparatus **1** according to the above-described embodiments includes the movable sheet stacker **45** that has the stacker face **45s** on which the sheet bundle PT can be placed and that is detachably attachable to the sheet bundle inserter **41**. Further, the post-processing apparatus **1** according to the above-described embodiments includes the sheet binding device **30** that performs a sheet binding operation in the sheet bundle inserter **41** with the sheet bundle PT placed on the movable sheet stacker **45**.

[0170] Accordingly, the post-processing apparatus **1** having the configuration described above can easily and preferably perform the sheet binding operation even on the sheet bundle PTs of small-size sheets that can be completely accommodated in the sheet bundle inserter **41**.

[0171] The image forming apparatus **100** and the image forming system **300** according to an embodiment of the present disclosure employs a color image forming apparatus but the configuration of the image forming apparatus and the image forming system are not limited to the

above-described configurations. For example, a monochrome image forming apparatus and a monochrome image forming system are also applicable to achieve the effect of the present disclosure. In the present embodiment, the image forming apparatus **100** is an electrophotographic image forming apparatus and the image forming system **300** includes the image forming apparatus **100** as an electrophotographic image forming apparatus. However, the embodiments of the present disclosure are not limited to the electrophotographic image forming apparatus. In some embodiment, for example, the image forming apparatus may be an image forming apparatus of another system (for example, an image forming apparatus of an inkjet system or a stencil printer). [0172] Further, in the present embodiment, the post-processing apparatus **1** coupled to the image forming apparatus **100** is applicable to the present disclosure. However, a standalone post-processing apparatus that is not coupled to an image forming apparatus may be also applicable to the present disclosure.

[0173] Further, in the present embodiment, the sheet binding device **30** is movably disposed and can be shared the automatic processing device **39** and the sheet bundle inserter **41** but the configuration of the sheet binding device is not limited to the above-described configuration. For example, a dedicated sheet binding device may be installed in each of the automatic processing device and the sheet bundle inserter.

[0174] Any of the cases described above exhibits substantially the same advantages as the advantages of the present embodiment.

[0175] The present disclosure is not limited to the above-described embodiments and modifications, and it is apparent that the above-described embodiments and modifications can be appropriately modified within the scope of the technical idea of the present disclosure in addition to what is suggested in the above-described embodiments and modifications.

[0176] Further, features of components of the embodiments, such as the number, the position, and the shape are not limited to the embodiments and thus may be preferably set to be applied to the present disclosure.

[0177] The present disclosure may be applicable to, for example, a combination of the following aspects.

Aspect 1

[0178] In Aspect 1, a post-processing apparatus includes a sheet bundle inserter, a movable sheet stacker, and a sheet binding device. The sheet bundle inserter is a device to which a sheet bundle of multiple sheets overlaid on each other. The movable sheet stacker has a stacker face on which the sheet bundle is stacked and is detachably attachable to the sheet bundle inserter. The sheet binding device performs a sheet binding operation, inside the sheet bundle inserter, on the sheet bundle stacked on the movable sheet stacker.

Aspect 2

[0179] In Aspect 2, in the post-processing apparatus according to Aspect 1, when the sheet binding operation is performed on the sheet bundle of small-sized sheets that are stacked within the stacker face, after the sheet bundle of small-sized sheets is stacked on the movable sheet stacker that is withdrawn from the sheet bundle inserter, the sheet binding device performs the sheet binding operation on the sheet bundle stacked on the movable sheet stacker with the movable sheet stacker inserted to the sheet bundle inserter. When the sheet binding operation is performed on the sheet bundle of large-sized sheets that are larger than the stacker face and are not stacked on the stacker face, the sheet bundle of large-sized sheets is stacked on the movable sheet stacker with the movable sheet stacker withdrawn from the sheet bundle inserter, and the sheet binding device performs the sheet binding operation on the sheet bundle stacked on the stacker face with the large-sized sheets over the stacker face.

Aspect 3

[0180] In Aspect 3, in the post-processing apparatus according to Aspect 2, the movable sheet stacker includes a first contact portion and a second contact portion. The first contact portion is a

portion to which one end face of the sheet bundle of small-sized sheets or the sheet bundle of large-sized sheets contacts. The second contact portion is a retractable portion to which another end face orthogonal to the one end face of the sheet bundle of small-sized sheets.

Aspect 4

[0181] In Aspect 4, in the post-processing apparatus according to any one of Aspects 1 to 3, the movable sheet stacker has a cutout portion at a position that corresponds to a corner of the sheet bundle inserter with the movable sheet stacker being inserted to the sheet bundle inserter. The sheet binding device performs the sheet binding operation at a position that corresponds to the cutout portion of the movable sheet stacker with the movable sheet stacker being inserted to the sheet bundle inserter.

Aspect 5

[0182] In Aspect 5, in the post-processing apparatus according to Aspect 4, the movable sheet stacker includes an open-close member to move the cutout portion from an open position to a closed position when the movable sheet stacker is withdrawn from the sheet bundle inserter.

Aspect 6

[0183] In Aspect 6, in the post-processing apparatus according to any one of Aspects 1 to 5, the movable sheet stacker has a mark or a recess that indicates a position at which the sheet bundle is stacked on the stacker face.

Aspect 7

[0184] In Aspect 7, in the post-processing apparatus according to any one of Aspects 1 to 6, the movable sheet stacker includes a pressing member movably disposed to press a sheet bundle stacked on the stacker face from above.

Aspect 8

[0185] In Aspect 8, in the post-processing apparatus according to any one of Aspects 1 to 7, an inside of the sheet bundle inserter is not exposed when the movable sheet stacker is inserted in the sheet bundle inserter.

Aspect 9

[0186] In Aspect 9, in the post-processing apparatus according to any one of Aspects 1 to 8, when a state where the movable sheet stacker on which the sheet bundle is stacked is inserted to the sheet bundle inserter is detected, the sheet binding device automatically performs the sheet binding operation on the sheet bundle.

Aspect 10

[0187] In Aspect 10, the post-processing apparatus according to any one of Aspects 1 to 9 further includes a limitation mechanism and a releasing mechanism. The limitation mechanism limits a withdrawal range of the movable sheet stacker from the sheet bundle inserter. The releasing mechanism is capable of releasing the limitation by the limitation mechanism.

Aspect 11

[0188] In Aspect 11, in the post-processing apparatus according to any one of Aspects 1 to 10, the movable sheet stacker includes a retractable tray that extends an area of the stacker face with the movable sheet stacker withdrawn from the sheet bundle inserter.

Aspect 12

[0189] In Aspect 12, an image forming system includes an image forming apparatus to form an image on a sheet, the post-processing apparatus according to any one of Aspects 1 to 11.

Aspect 13

[0190] In Aspect 13, in the image forming system according to Aspect 12, the image forming apparatus has an in-body space to which the sheet with the image is ejected and from which the sheet ejected from the image forming apparatus is removed. The post-processing apparatus is disposed in the in-body space of the image forming apparatus.

Aspect 14

[0191] In Aspect 14, a post-processing apparatus includes a sheet bundle inserter, a movable sheet

stacker, and a sheet binder. The sheet bundle inserter inserts a sheet bundle having multiple sheets overlapped on each other. The movable sheet stacker is inserted into and withdrawn from the sheet bundle inserter. The movable sheet stacker has a stacker face on which the sheet bundle is stacked. The sheet binder is in the sheet bundle inserter. The sheet binder performs a sheet binding operation on the sheet bundle stacked on the movable sheet stacker.

Aspect 15

[0192] In Aspect 15, in the post-processing apparatus according to Aspect 14, the stacker face of the movable sheet stacker is stackable the sheet bundle including a first sheet bundle having a first size smaller than an area of the stacker face, and a second sheet bundle having a second size larger than an area of the stacker face. The movable sheet stacker is drawn from the sheet bundle inserter to stack the first sheet bundle. The movable sheet stacker stacking the first sheet bundle is inserted into the sheet bundle inserter. The sheet binder performs the sheet binding operation on the first sheet bundle on the movable sheet stacker inside the sheet bundle inserter.

Aspect 16

[0193] In Aspect 16, in the post-processing apparatus according to Aspect 14, the stacker face of the movable sheet stacker is stackable the sheet bundle including a first sheet bundle having a first size smaller than an area of the stacker face, and a second sheet bundle having a second size larger than an area of the stacker face. The movable sheet stacker is drawn from the sheet bundle inserter to stack a part of the second sheet bundle. The movable sheet stacker, disposed outside the sheet bundle inserter, supports the second sheet bundle. The sheet binder performs the sheet binding operation on the second sheet bundle in the sheet bundle inserter while the movable sheet stacker outside the sheet bundle inserter supports the second sheet bundle.

Aspect 17

[0194] In Aspect 17, in the post-processing apparatus according to Aspect 15 or Aspect 16, the movable sheet stacker includes a first contact portion to contact one end face of the first sheet bundle or the second sheet bundle, and a second contact portion having a retractable portion to contact another end face of the first sheet bundle orthogonal to the one end face.

Aspect 18

[0195] In Aspect 18, in the post-processing apparatus according to any one of Aspects 14 to 17, the movable sheet stacker has a cutout portion at a position corresponding to a corner of the sheet bundle inserter when the movable sheet stacker is inserted into the sheet bundle inserter. The sheet binder performs the sheet binding operation at the position where the cutout portion of the movable sheet stacker is disposed.

Aspect 19

[0196] In Aspect 19, in the post-processing apparatus according to any one of Aspects 14 to 18, the movable sheet stacker includes an open-close member to move the cutout portion from an open position to a closed position when the movable sheet stacker is withdrawn from the sheet bundle inserter.

Aspect 20

[0197] In Aspect 20, in the post-processing apparatus according to any one of Aspects 14 to 19, the movable sheet stacker has a mark or a recess that indicates a position at which the sheet bundle is stacked on the stacker face.

Aspect 21

[0198] In Aspect 21, in the post-processing apparatus according to any one of Aspects 14 to 20, the movable sheet stacker includes a movable pressing member to press the sheet bundle stacked on the stacker face from above.

Aspect 22

[0199] In Aspect 22, the post-processing apparatus according to any one of Aspects 14 to 21 further includes a cover to cover an opening of the sheet bundle inserter. The cover is placed on the opening of the sheet bundle inserter when the movable sheet stacker is inserted in the sheet bundle

inserter.

Aspect 23

[0200] In Aspect 23, the post-processing apparatus according to any one of Aspects 14 to 22 further includes a sensor to detect whether the movable sheet stacker is inserted in the sheet bundle inserter. The sheet binder automatically performs the sheet binding operation on the sheet bundle when the sensor detects that the movable sheet stacker with the sheet bundle stacked is inserted in the sheet bundle inserter.

Aspect 24

[0201] In Aspect 24, the post-processing apparatus according to any one of Aspects 14 to 23 further includes a limitation mechanism and a releasing mechanism. The limitation mechanism gives a limitation to a withdrawal range of the movable sheet stacker from the sheet bundle inserter. The releasing mechanism releases the limitation by the limitation mechanism.

Aspect 25

[0202] In Aspect 25, in the post-processing apparatus according to any one of Aspects 14 to 24, the movable sheet stacker includes a retractable tray extending an area of the stacker face with the movable sheet stacker withdrawn from the sheet bundle inserter.

Aspect 26

[0203] In Aspect 26, an image forming system includes an image forming apparatus to form an image on a sheet, and the post-processing apparatus according to any one of Aspects 14 to 25 to perform a given operation on the sheet.

Aspect 27

[0204] In Aspect 27, in the image forming system according to Aspect 26, the image forming apparatus has an in-body space to which the sheet with the image is ejected and from which the sheet ejected from the image forming apparatus is removed. The post-processing apparatus is disposed in the in-body space of the image forming apparatus.

Aspect 28

[0205] In Aspect 28, a post-processing apparatus includes a sheet bundle container, a movable sheet stacker, and a sheet binder. The sheet bundle container accommodates an entire set of a sheet bundle. The movable sheet stacker has a stacker face on which the sheet bundle, having a size smaller than an area of the stacker face, is placed. The movable sheet stacker is movable inside or outside the sheet bundle container. The sheet binder performs a sheet binding operation on the sheet bundle in the sheet bundle container.

Aspect 29

[0206] In Aspect 29, in the post-processing apparatus according to Aspect 28, the stacker face of the movable sheet stacker stacks the sheet bundle, when the movable sheet stacker is outside the sheet bundle container, or when the movable sheet stacker is inside the sheet bundle container.

Aspect 30

[0207] In Aspect 30, in the post-processing apparatus according to Aspect 28, the stacker face of the movable sheet stacker is withdrawable in a direction orthogonal to a direction of gravity.

Aspect 31

[0208] In Aspect 31, an image forming system includes an image forming apparatus to form an image on a sheet, and the post-processing apparatus according to Aspect 28. The stacker face of the movable sheet stacker is withdrawable to a front side of the image forming apparatus.

[0209] The present disclosure is not limited to specific embodiments described above, and numerous additional modifications and variations are possible in light of the teachings within the technical scope of the appended claims. It is therefore to be understood that the disclosure of this patent specification may be practiced otherwise by those skilled in the art than as specifically described herein, and such, modifications, alternatives are within the technical scope of the appended claims. Such modifications are also included in the technical scope of the present disclosure.

[0210] The present disclosure is not limited to specific embodiments described above, and numerous additional modifications and variations are possible in light of the teachings within the technical scope of the appended claims. It is therefore to be understood that, the disclosure of this patent specification may be practiced otherwise by those skilled in the art than as specifically described herein, and such, modifications, alternatives are within the technical scope of the appended claims. Such embodiments and variations thereof are included in the scope and gist of the embodiments of the present disclosure and are included in the embodiments described in claims and the equivalent scope thereof.

[0211] The effects described in the embodiments of this disclosure are listed as the examples of preferable effects derived from this disclosure, and therefore are not intended to limit to the embodiments of this disclosure.

[0212] The embodiments described above are presented as an example to implement this disclosure. The embodiments described above are not intended to limit the scope of the invention. These novel embodiments can be implemented in various other forms, and various omissions, replacements, or changes can be made without departing from the gist of the invention. These embodiments and their variations are included in the scope and gist of this disclosure and are included in the scope of the invention recited in the claims and its equivalent.

[0213] Any one of the above-described operations may be performed in various other ways, for example, in an order different from the one described above.

[0214] 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), digital signal processor (DSP), field programmable gate array (FPGA), and conventional circuit components arranged to perform the recited functions.

Claims

1. A post-processing apparatus comprising: a sheet bundle inserter configured to insert a sheet bundle having multiple sheets overlapped on each other; a movable sheet stacker configured to be inserted into and withdrawn from the sheet bundle inserter, the movable sheet stacker having a stacker face on which the sheet bundle is stacked; and a sheet binder in the sheet bundle inserter, the sheet binder configured to perform a sheet binding operation on the sheet bundle stacked on the movable sheet stacker.
2. The post-processing apparatus according to claim 1, wherein the stacker face of the movable sheet stacker is stackable, the sheet bundle including: a first sheet bundle having a first size smaller than an area of the stacker face, and a second sheet bundle having a second size larger than the area of the stacker face, the movable sheet stacker is drawn from the sheet bundle inserter to stack the first sheet bundle, the movable sheet stacker stacking the first sheet bundle is inserted into the sheet bundle inserter, and the sheet binder performs the sheet binding operation on the first sheet bundle on the movable sheet stacker inside the sheet bundle inserter.
3. The post-processing apparatus according to claim 1, wherein the stacker face of the movable sheet stacker is stackable, the sheet bundle including: a first sheet bundle having a first size smaller than an area of the stacker face, and a second sheet bundle having a second size larger than the area of the stacker face, and the movable sheet stacker is drawn from the sheet bundle inserter to stack a part of the second sheet bundle, the movable sheet stacker, disposed outside the sheet bundle inserter, supports the second sheet bundle, and the sheet binder performs the sheet binding operation on the second sheet bundle in the sheet bundle inserter while the movable sheet stacker outside the sheet bundle inserter supports the second sheet bundle.
4. The post-processing apparatus according to claim 2, wherein the movable sheet stacker includes: a first contact portion to contact one end face of the first sheet bundle or the second sheet bundle;

and a second contact portion having a retractable portion to contact another end face of the first sheet bundle orthogonal to the one end face.

5. The post-processing apparatus according to claim 1, wherein the movable sheet stacker has a cutout portion at a position corresponding to a corner of the sheet bundle inserter when the movable sheet stacker is inserted into the sheet bundle inserter, and the sheet binder performs the sheet binding operation at the position where the cutout portion of the movable sheet stacker is disposed.

6. The post-processing apparatus according to claim 5, wherein the movable sheet stacker includes an open-close member to move the cutout portion from an open position to a closed position when the movable sheet stacker is withdrawn from the sheet bundle inserter.

7. The post-processing apparatus according to claim 1, wherein the movable sheet stacker has a mark or a recess that indicates a position at which the sheet bundle is stacked on the stacker face.

8. The post-processing apparatus according to claim 1, wherein the movable sheet stacker includes a movable pressing member to press the sheet bundle stacked on the stacker face from above.

9. The post-processing apparatus according to claim 1, further comprising a cover to cover an opening of the sheet bundle inserter, wherein the cover is placed on the opening of the sheet bundle inserter when the movable sheet stacker is inserted in the sheet bundle inserter.

10. The post-processing apparatus according to claim 1, further comprising a sensor to detect whether the movable sheet stacker is inserted in the sheet bundle inserter, wherein the sheet binder automatically performs the sheet binding operation on the sheet bundle when the sensor detects that the movable sheet stacker with the sheet bundle stacked is inserted in the sheet bundle inserter.

11. The post-processing apparatus according to claim 1, further comprising: a limitation mechanism to give a limitation to a withdrawal range of the movable sheet stacker from the sheet bundle inserter; and a releasing mechanism to release the limitation by the limitation mechanism.

12. The post-processing apparatus according to claim 1, wherein the movable sheet stacker includes a retractable tray extending an area of the stacker face with the movable sheet stacker withdrawn from the sheet bundle inserter.

13. An image forming system comprising: an image forming apparatus to form an image on a sheet; and the post-processing apparatus according to claim 1 to perform a given operation on the sheet.

14. The image forming system according to claim 13, wherein the image forming apparatus has an in-body space to which the sheet with the image is ejected and from which the sheet ejected from the image forming apparatus is removed, and the post-processing apparatus is disposed in the in-body space of the image forming apparatus.

15. A post-processing apparatus comprising: a sheet bundle container to accommodate an entire set of a sheet bundle; a movable sheet stacker having a stacker face on which the sheet bundle, having a size smaller than an area of the stacker face, is placed, the movable sheet stacker being movable inside or outside the sheet bundle container; and a sheet binder to perform a sheet binding operation on the sheet bundle in the sheet bundle container.

16. The post-processing apparatus according to claim 15, wherein the stacker face of the movable sheet stacker stacks the sheet bundle, when the movable sheet stacker is outside the sheet bundle container, or when the movable sheet stacker is inside the sheet bundle container.

17. The post-processing apparatus according to claim 15, wherein the stacker face of the movable sheet stacker is withdrawable in a direction orthogonal to a direction of gravity.

18. An image forming system comprising: an image forming apparatus to form an image on a sheet; and the post-processing apparatus according to claim 15, wherein the stacker face of the movable sheet stacker is withdrawable to a front side of the image forming apparatus.
