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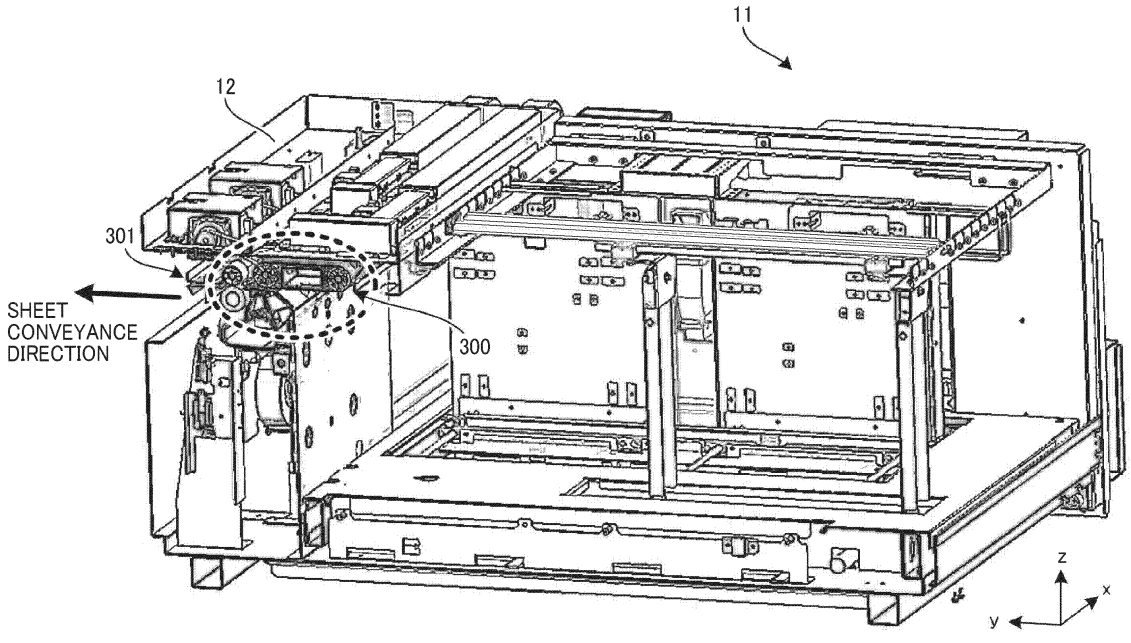
(54) SHEET CONVEYING DEVICE AND IMAGE FORMING APPARATUS INCORPORATING THE SHEET CONVEYING DEVICE

(57) A sheet conveying device (10) includes a housing (10a), a tray (11), a conveyance belt (401), and a separation member (430). The tray (11) is configured to load a sheet bundle (P) having at least a sheet and to be inserted into and pulled out from the housing (10a). The conveyance belt (401) is configured to attract and convey a sheet (P) from the sheet bundle (P) loaded on the tray (11). The separation member (430) is configured to separate the sheet (P) attracted by the conveyance belt (401), from a subsequent sheet (P) of the sheet bundle (P) loaded on the tray (11). The separation member (430) and the conveyance belt (401) are attachable and detachable together relative to the housing (10a).

FIG. 3



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Description

BACKGROUND

Technical Field

[0001] This disclosure relates to a sheet conveying device and an image forming system incorporating the sheet conveying device.

Discussion of the Background Art

[0002] In recent years, digitalization of information is encouraged by preparing or converting information into electronic form, and image forming systems used for outputting digitalized information have been indispensable. Such image forming systems function as a copier to form an image on a sheet supplied from a sheet tray.

[0003] In addition, an image forming system employing technology for feeding a single sheet from the sheet tray includes a sheet attraction and conveyance belt unit. The sheet attraction and conveyance belt unit is disposed on the sheet tray to suck air to attract an uppermost sheet to an attraction conveyance belt, so as to convey the uppermost sheet to be ejected to the outside of the sheet tray (for example, JP 2009-107849-A).

[0004] In the technique disclosed in JP 2009-107849-A, the attraction conveyance belt and a member that separates a plurality of sheets to a single sheet are separately disposed to be attached to and detached from the sheet tray. (Hereinafter, the member is referred to as a sheet separation member.) That is, the positional relationship between the attraction conveyance belt and the sheet separation member varies each time the attraction conveyance belt and the separation member are detached or attached, and the accumulated tolerance of clearance increases between the attraction conveyance belt and the sheet separation member. Due to such an increase in the accumulated tolerance of clearance, the plurality of sheets attracted to the attraction and conveyance belt by air are conveyed altogether without being separated into each single sheet. Therefore, a paper jam occurs. In other words, the known technique such as JP 2009-107849-A cannot stabilize the separation performance of an uppermost sheet.

SUMMARY

[0005] In view of the above-described disadvantages, an object of this disclosure is to provide a sheet conveying device configured to reduce variation of the clearance between an attraction conveyance belt and a sheet separation member, and therefore separate the sheets to a single sheet stably.

[0006] At least one aspect of this disclosure provides a sheet conveying device of this disclosure includes a housing, a tray configured to load a sheet bundle having at least a sheet and to be inserted into and pulled out from the housing, a conveyance belt configured to attract and convey a sheet from the sheet bundle loaded on the tray, and a separation member configured to separate the sheet attracted by the conveyance belt, from a subsequent sheet of the sheet bundle loaded on the tray. The separation member and the conveyance belt are attachable and detachable together relative to the housing.

[0007] Further, at least one aspect of this disclosure provides an image forming system including the above-described sheet conveying device and an image forming device. The sheet conveying device is configured to convey a sheet. The image forming device is configured to form an image on the sheet conveyed by the sheet conveying device.

[0008] According to this disclosure, a sheet conveying device can reduce variation of the clearance between the attraction conveyance belt and the sheet separation member, and therefore separate the sheets to a single sheet stably.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The aforementioned and other aspects, features, and advantages of the present disclosure would be better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

FIG. 1 is a diagram illustrating a schematic configuration of an image forming system according to an embodiment of this disclosure;
FIG. 2 is a perspective view illustrating of an internal structure of a loading and feeding device according to an embodiment of this disclosure;
FIG. 3 is a perspective view illustrating an inner structure of a sheet tray according to an embodiment of this disclosure;
FIGS. 4A and 4B are diagrams illustrating a sheet separation and conveyance mechanism according to an embodiment of this disclosure;
FIG. 5 is a side view illustrating a configuration in which the sheet separation and conveyance mechanism is integrally provided together with the sheet tray; and
FIGS. 6A and 6B are side views illustrating the sheet tray, explaining retreat of an end fence according to an embodiment of this disclosure.

[0010] 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

[0011] 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. Like numbers referred 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.

[0012] 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 describes 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.

[0013] Although the terms first, second, etc. may be used herein to describe various elements, components, regions, layers, and/or sections, it should be understood that these elements, components, regions, layers, and/or sections should not be limited by these terms. These terms are used to distinguish one element, component, region, layer or section from another region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the present disclosure.

[0014] 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.

[0015] Descriptions are given, with reference to the accompanying drawings, of examples, exemplary embodiments, modification of exemplary embodiments, etc., of a sheet conveying device and an image forming apparatus according to exemplary embodiments of this disclosure. Elements having the same functions and shapes are denoted by the same reference numerals throughout the specification and redundant descriptions are omitted. Elements that do not demand descriptions may be omitted from the drawings as a matter of convenience. Reference numerals of elements extracted from the patent publications are in parentheses so as to be distinguished from those of exemplary embodiments of this disclosure.

[0016] This disclosure is applicable to any sheet conveying device and image forming apparatus and is implemented in the most effective manner in an electrophotographic image forming apparatus.

[0017] In describing preferred embodiments illustrated in the drawings, specific terminology is employed for the sake of clarity. However, the disclosure of this disclosure is not intended to be limited to the specific terminology so selected and it is to be understood that each specific element includes any and all technical equivalents that have the same function, operate in a similar manner, and achieve a similar result.

[0018] Referring now to the drawings, a sheet conveying device and an image forming system according to embodiments of this disclosure are described below. In the drawings for explaining the following embodiments, the same reference codes are allocated to elements (members or components) having the same function or shape and redundant descriptions thereof are omitted below.

[0019] A description is given of a sheet conveying device according to an embodiment of this disclosure.

[0020] FIG. 1 is a diagram illustrating a schematic configuration of an image forming system 1 according to an embodiment of this disclosure.

[0021] The image forming system 1 may include an image forming device that is a copier, a facsimile machine, a printer, a multifunction peripheral or a multifunction printer (MFP) having at least one of copying, printing, scanning, facsimile, and plotter functions, or the like. According to the present example, the image forming device of the image forming system 1 is an electrophotographic copier that forms toner images on recording media by supplying toner to the recording media.

[0022] It is to be noted in the following examples that: the term "image forming system" indicates a system in which an image is formed on a recording medium such as paper, OHP (overhead projector) transparencies, OHP film sheet, thread, fiber, fabric, leather, metal, plastic, glass, wood, and/or ceramic by attracting developer or ink thereto; the term "image formation" indicates an action for providing (i.e., printing) not only an image having meanings such as texts and figures on a recording medium but also an image having no meaning such as patterns on a recording medium.

[0023] It is to be noted that, in the present embodiment, the term "sheet" or "recording medium (media)" is not limited to indicate a paper material but also includes the above-described plastic material (e.g., an OHP sheet), a resin material, a fabric sheet and so forth, and is used to which the developer or ink is attracted. In addition, the "sheet" is not limited to a flexible sheet but is applicable to a rigid plate-shaped sheet and a relatively thick sheet.

[0024] Further, size (dimension), material, shape, and relative positions used to describe each of the components and units are examples, and the scope of this disclosure is not limited thereto unless otherwise specified.

[0025] Further, it is to be noted in the following examples that: the term "sheet conveyance direction" indicates a direction in which a recording medium travels from an upstream side of a sheet conveying path to a downstream side thereof; the term "width direction" indicates a direction basically perpendicular to the sheet conveyance direction.

[0026] It is to be noted that reference sign "x" indicates is a direction from the front side to the rear side of the image forming system 1, reference sign "y" indicates is a direction from the left side to the right side of the image forming system 1, and reference sign "z" indicates is a direction perpendicular to the direction x and the direction y.

[0027] As illustrated in FIG. 1, the image forming system 1 includes a loading and feeding device 10, a printing device 20, a drying device 30, and an ejection device 40. The image forming system 1 feeds a sheet P from the loading and feeding device 10, prints an image on the sheet P by applying liquid to the sheet P in the printing device 20, dries the liquid adhered on the sheet P in the drying device 30, and ejects the sheet P to the ejection device 40.

[0028] The loading and feeding device 10 functions as a sheet conveying device that conveys the sheet P to the printing device 20. The loading and feeding device 10 includes multiple sheet trays 11, multiple pairs of registration rollers 13, and a sheet feeding unit 12. Each of the multiple sheet trays 11 loads a sheet bundle of sheets P. Each of the multiple pairs of registration rollers 13 convey the sheet P to the printing device 20. The sheet feeding unit 12 separates the sheets P one by one from the sheet bundle loaded on a selected one of the multiple sheet trays 11 and conveys each sheet P to the sheet feeding unit 12.

[0029] The sheet feeding unit 12 sucks air to attract the sheet P to an attraction conveyance belt and further conveys the sheet P. Detailed operations of the sheet feeding unit 12 are described below. The sheet feeding unit 12 is not limited to the above-described configuration employing the attraction conveyance. For example, the sheet feeding unit 12 may employ a roller or rollers to convey the sheet P. After the sheet P is fed from a selected one of the sheet trays 11 by the sheet feeding unit 12, the leading end of the sheet P reaches a corresponding one of the multiple pairs of registration rollers 13. Then, as the corresponding one of the multiple pairs of registration rollers 13 is driven at a given timing, the sheet P is conveyed to the printing device 20.

[0030] The printing device 20 functions as an image forming apparatus. The printing device 20 includes a drum 51 and an air suction unit 52. The drum 51 conveys the sheet P. The drum 51 is a rotary body that carries the sheet P on the circumferential surface and rotates the sheet P. The air suction unit 52 is an air drawer that generates suction force on the circumferential surface of the drum 51. The printing device 20 further includes a liquid discharging device 22 that discharges liquid toward the sheet P carried on the drum 51.

[0031] The printing device 20 further includes a transfer cylinder 24 and a transfer cylinder 25. The transfer cylinder 24 receives the sheet P from the loading and feeding device 10 and transfers the sheet P to the drum 51. The transfer cylinder 25 receives the sheet P that is conveyed by the drum 51 and transfers the sheet P to the drying device 30.

[0032] After the sheet P has been conveyed from the loading and feeding device 10 to the printing device 20, the leading end of the sheet P is gripped by one or more sheet grippers. The one or more sheet grippers function as sheet gripping members and are provided on the surface of the transfer cylinder 24. The sheet P is conveyed along with rotation of the transfer cylinder 24. The sheet P conveyed by the transfer cylinder 24 is delivered to the drum 51 at a position where the transfer cylinder 24 faces the drum 51.

[0033] The drum 51 also has one or more sheet grippers that function as sheet gripping members on the surface of the drum 51. With this configuration, the leading end of the sheet P is gripped by the one or more sheet grippers on the surface of the drum 51. Multiple suction holes are dispersedly formed in the surface of the drum 51. The air suction unit 52 generates suction airflow, via a given number of suction ports of the drum 51, toward an inside the drum 51.

[0034] After the sheet P has been transferred from the transfer cylinder 24 to the drum 51, the leading end of the sheet P is gripped by the one or more sheet grippers. At the same time, the sheet P is attracted to and carried on the drum 51 due to suction airflow generated by the air suction unit 52. Accordingly, the sheet P is conveyed along with rotation of the drum 21.

[0035] The liquid discharging device 22 includes a liquid discharging unit 23 (to be more specific, liquid discharging units 23A through 23F). For example, the liquid discharging unit 23A discharges liquid of cyan (C), the liquid discharging unit 23B discharges liquid of magenta (M), the liquid discharging unit 23C discharges liquid of yellow (Y), and the liquid discharging unit 23D discharges liquid of black (K), respectively. Further, the liquid discharging units 23E and 23F are used to discharge any one of yellow, magenta, cyan, and black or special liquid such as white and gold (or silver). Further, the liquid discharging device 22 may further include a liquid discharging unit to discharge processing liquid such as surface coating liquid.

[0036] Respective discharging operations of the liquid discharging units 23A through 23F of the liquid discharging device 22 are individually controlled by respective drive signals according to print information. When the sheet P carried on the surface of the drum 51 passes through a region facing the liquid discharging device 22,

liquid of each color is discharged from the respective liquid discharging units 23A through 23F, and an image corresponding to the printing information is printed on the sheet P.

[0037] The drying device 30 includes a drying mechanism 31 and a suction and conveyance mechanism 32. The drying mechanism 31 dries the liquid on the sheet P adhered to the sheet P in the printing device 20. The suction and conveyance mechanism 32 conveys the sheet P while attracting the sheet P that is conveyed from the printing device 20.

[0038] After being conveyed from the printing device 20, the sheet P is received by the suction and conveyance mechanism 32. Then, the sheet P is conveyed to pass through the drying mechanism 31 and is delivered to the ejection device 40.

[0039] When the sheet P passes through the drying mechanism 31, the liquid on the sheet P is subjected to a drying process. According to the drying process performed by the drying mechanism 31, moisture such as water in the liquid on the sheet P evaporates. Consequently, the colorant contained in the liquid on the sheet P is fixed to the sheet P, and therefore the sheet P is restrained from being curled.

[0040] The ejection device 40 includes a sheet ejection tray 41 to stack a plurality of sheets P. The plurality of sheets P conveyed from the drying device 30 is sequentially stacked and held on the sheet ejection tray 41.

[0041] It is to be noted that the image forming system 1 may include, for example, a pre-processing device, a post-processing device, or both. The pre-processing device may be disposed upstream from the printing device 20 in the sheet conveyance direction to perform pre-processing to the sheet P. The post-processing device may be disposed between the drying device 30 and the ejection device 40 to perform post-processing to the sheet P to which liquid is attached.

[0042] For example, the pre-processing device may perform a pre-application process that applies a treatment liquid on the sheet P before the image formation. The treatment liquid reacts with liquid to be attached to the sheet P so as to reduce bleeding of the liquid on the sheet P. However, the content of the pre-processing is not particularly limited to the process as described above. Further, the post-processing device may perform a sheet reversing process and a binding process, for example. The sheet reversing process reverses the sheet P, on which image is printed by the printing device 20, and conveys the reversed sheet P again to the printing device 20 to print images on both sides of the sheet P. The binding process binds a plurality of sheets P.

[0043] Further, the present embodiment provides the printing device that includes a liquid discharging device, as an example of a printing device. However, a printing device to be applied to this disclosure is not limited to the above-described printing device but any device or unit other than the liquid discharging device may be used for printing.

[0044] Next, a detailed description is given of the loading and feeding device 10 according to the present embodiment of this disclosure.

[0045] FIG. 2 is a perspective view illustrating of an inner structure of the loading and feeding device 10 according to an embodiment of this disclosure. FIG. 3 is a perspective view illustrating an inner structure of any one of the sheet trays 11 according to an embodiment of this disclosure. The sheet trays 11 basically have respective configurations identical to each other, and therefore are hereinafter referred to occasionally in a singular form, that is, the sheet tray 11. The sheet tray 11 is detachably attached to the loading and feeding device 10.

[0046] The loading and feeding device 10 stores one or more sheet trays 11. A user pulls out the sheet tray 11 when loading a sheet bundle onto the sheet tray 11. With this pull-out operation of the sheet tray 11, the sheet tray 11 is drawn out from the loading and feeding device 10 following guidance of guide rails 15. Contact target portions 16 that contact the corresponding guide rails 15 are disposed on a bottom face of the sheet tray 11. As the contact target portions 16 slide on the respective guide rails 15, the sheet tray 11 is pulled out from a housing 10a of the loading and feeding device 10, in a drawing direction that is a direction indicated by arrow in FIG. 2. Then, after loading the sheet bundle onto the sheet tray 11, the user pushes the sheet tray 11 to store the sheet tray 11 to the loading and feeding device 10.

[0047] The sheet feeding unit 12 according to the present embodiment is different from a comparative sheet feeding unit. Specifically, the sheet feeding unit 12 according to the present embodiment is an integral part of the sheet tray 11, as illustrated in FIGS. 2 and 3. According to this configuration, as a user pulls out the sheet tray 11, the sheet feeding unit 12 is pulled out together with the sheet tray 11.

[0048] The sheet feeding unit 12 is disposed above a sheet ejection port 301 of the sheet tray 11, as illustrated in FIG. 3. The sheet feeding unit 12 includes a sheet separation and conveyance mechanism 300 disposed upstream from the sheet ejection port 301 in the sheet conveyance direction (that is, in an area indicated by the circle of a broken line in FIG. 3). The sheet separation and conveyance mechanism 300 separates the sheet P from the sheet bundle loaded on the sheet tray 11 and further conveys the sheet P. The sheet separation and conveyance mechanism 300 separates, for example, an uppermost sheet P that is placed on top of the sheet bundle including the plurality of sheets P.

[0049] FIG. 4A is a diagram illustrating details of the sheet separation and conveyance mechanism 300.

[0050] The sheet separation and conveyance mechanism 300 includes a sheet attraction and conveyance belt unit 400, a sheet separation member 430, and a pair of sheet rollers 440. The sheet attraction and conveyance belt unit 400 includes two rollers 410. The two rollers 410 stretch an attraction conveyance belt 401 that is an endless belt. In other words, the attraction conveyance belt

401 that functions as an endless belt is stretched by the two rollers 410. The sheet attraction and conveyance belt unit 400 further includes an air suction unit 420 disposed on a back side (inside the loop) of the attraction conveyance belt 401, in other words, between the two rollers 410.

[0051] FIG. 4B is a diagram illustrating the attraction conveyance belt 401 having a plurality of ventilation holes 402 that functions as a plurality of openings. As illustrated in 4B, the plurality of ventilation holes 402 are dispersedly formed over an entire region of a belt surface of the attraction conveyance belt 401.

[0052] The air suction unit 420 drives an inner fan to cause air to pass through the attraction conveyance belt 401 via the plurality of ventilation holes 402 formed over the entire region of the belt surface (sheet conveyance face) of the attraction conveyance belt 401, in an air suction direction that is a direction indicated by arrows in FIG. 4A.

[0053] As the air suction unit 420 sucks air via the plurality of ventilation holes 402, one or more sheets are attracted to a sheet conveyance face of the attraction conveyance belt 401 in a sheet attraction direction that corresponds to the air suction direction. Then, the one or more sheets P attracted to the attraction conveyance belt 401 are conveyed to the position where the sheet separation member 430 is located, along with rotation of the two rollers 410 in a direction indicated by arrow in FIG. 4A.

[0054] When a plurality of sheets P are conveyed, the sheet separation member 430 separates the plurality of sheets P one by one to convey a single sheet, for example. It is to be noted that the sheet separation member 430 of the present embodiment has a claw-shaped separation portion to separate a single sheet P from the other sheets of a sheet bundle. However, the shape of the separation portion of the sheet separation member 430 is not limited to the above-described shape. For example, any separation portion of the sheet separation member 430 may be applied to this disclosure as long as the shape of the separation portion has a projection or a convex portion at the tip of the sheet separation member 430. After being separated from the other sheets of the plurality of sheets P by the sheet separation member 430, the single sheet P is conveyed to the outside of the housing 10a of the loading and feeding device 10 via the pair of sheet rollers 440.

[0055] The dimension of the clearance L between the attraction conveyance belt 401 and the sheet separation member 430 illustrated in FIG. 4A affects the separation performance of a sheet. Specifically, if the clearance L is large, multiple feeding failure occurs. On the other hand, if the clearance L is small, no sheet is conveyed, resulting in a paper jam. It is to be noted that "multiple feeding failure" is a failure in which a plurality of sheets is conveyed at one time without being separated.

[0056] A comparative sheet attraction and conveyance belt unit, for example, is fixed to the frame of a loading and feeding device and a comparative sheet separation member is an integral part of a sheet tray. Due to this configuration, when the sheet tray is pulled out, the comparative sheet attraction and conveyance belt unit is separated from the comparative sheet separation member. Therefore, when the sheet tray is pulled out and inserted to the loading and feeding device repeatedly, the dimension of the clearance L varies, and therefore the specified size is not met between the comparative sheet attraction and conveyance belt unit and the comparative sheet separation member. In order to avoid this inconvenience, there may be a case in which a jig is used to adjust the height of attachment of a conveyance belt, which results in an increase in costs.

[0057] In the present embodiment, each of the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 is an integral part of the sheet tray 11. With this configuration, when the sheet tray 11 is pulled out, the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 are drawn together with the sheet tray 11. To be more specific, the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 are included in the sheet tray 11 and are configured to be pulled out from the housing 10a of the loading and feeding device 10 together with the sheet tray 11 as an integral part when the sheet tray 11 is drawn from the housing 10a of the loading and feeding device 10. As described above, in the present embodiment, the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 are assembled in the sheet tray 11. Therefore, the accumulated tolerance value is relatively small, the precision of the clearance L is maintained, and therefore the frequency of adjusting the height of attachment of the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 is reduced. Further, when compared with a case in which the configuration to pull out the sheet tray 11 and the configuration to pull out the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 are provided separately, the loading and feeding device 10 according to the present embodiment has a smaller and simpler configuration.

[0058] FIG. 5 is a side view illustrating a part of the sheet tray 11 for explaining the configuration in which the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 are provided to the sheet tray 11 as an integral part of the sheet tray 11.

[0059] A tray face plate 510 and a side frame 501 are mounted on the upper face of a base frame 520 of the sheet tray 11. The tray face plate 510 aligns a sheet bundle loaded on the tray face plate 510, at the leading end of the sheet bundle in the sheet conveyance direction. The side frame 501 functions as a frame side face of the sheet tray 11. The sheet separation member 430 is mounted on the upper end of the tray face plate 510. The sheet attraction and conveyance belt unit 400 is fixed to the side frame 501, at a position indicated by a broken line in FIG. 5. As described above, the sheet separation

member 430 and the sheet attraction and conveyance belt unit 400 are integrally provided to the sheet tray 11, via the tray face plate 510, the base frame 520, and the side frame 501.

[0060] When the sheet tray 11 is pulled out from the housing 10a of the loading and feeding device 10, the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 are drawn together with the sheet tray 11 as an integral part. According to this configuration, the sheet attraction and conveyance belt unit 400 is exposed to the outside from the loading and feeding device 10, which makes it easier for a person such as a service representative or a maintenance person to access the parts and components in the loading and feeding device 10 for maintenance. In other words, a maintenance person can easily perform maintenance work, for example, replacement of the sheet attraction and conveyance belt unit 400 to a new unit, replacement of parts such as the attraction conveyance belt 401 and the two rollers 410 provided in the sheet attraction and conveyance belt unit 400, and cleaning of these parts. Further, according to the present embodiment, maintenance of the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 and supply of the sheets P to the sheet tray 11 are performed in one operation.

[0061] FIGS. 6A and 6B are side views illustrating the sheet tray 11, explaining retreat of an end fence 610 according to an embodiment of this disclosure.

[0062] In the present embodiment, the sheet feeding unit 12 is located on the upper part of the sheet tray 11 and is pulled out together with the sheet tray 11. For this reason, as illustrated in FIG. 6A, when the sheet bundle is loaded onto the sheet tray 11, a width L1 of a sheet loading port of the sheet tray 11 is too narrow for the sheets to be inserted from the sheet loading port. Therefore, the sheets of the sheet bundle are divided into small groups appropriately to be inserted into the sheet tray 11.

[0063] In order to address the above-described inconvenience, as illustrated in FIG. 6B, the end fence 610 that aligns the trailing end of the sheet bundle in the sheet conveyance direction is retreated, so that the sheet bundle is easily loaded onto the sheet tray 11 in a sheet loading direction. The end fence 610 is retreated by removing or rotating the end fence 610.

[0064] In the present embodiment, the loading and feeding device 10 has a configuration in which the sheet tray 11 includes the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 as an integral part of the sheet tray 11. However, the configuration of the sheet tray 11 is not limited to the above-described configuration. For example, the loading and feeding device 10 may have a configuration in which the sheet attraction and conveyance belt unit 400 and the sheet separation member 430 are an integral part and detachably attachable with respect to the loading and feeding device 10.

[0065] As described above, the configuration of the present embodiment includes a sheet separation member and a sheet attraction and conveyance belt unit that are an integral part to be detachably attached to a housing of a loading and feeding device together. Accordingly, even when the sheet separation member and the sheet attraction and conveyance belt unit are detached from the loading and feeding device for maintenance work, the configuration of the present embodiment maintains the positional relation between the sheet separation member and the sheet attraction and conveyance belt unit, restrains multiple feeding failure of sheets, and prevents a paper jam.

[0066] The above-described embodiments are illustrative and do not limit the present invention. Thus, numerous additional modifications and variations are possible in light of the above teachings. For example, elements and/or features of different illustrative embodiments may be combined with each other and/or substituted for each other within the scope of this disclosure.

[0067] 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.

Claims

1. A sheet conveying device (10) comprising:

a housing (10a);
a tray (11) configured to load a sheet bundle (P) having at least a sheet (P) and to be inserted into and pulled out from the housing;
a conveyance belt (401) configured to attract and convey the sheet (P) from the sheet bundle (P) loaded on the tray; and
a separation member (430) configured to separate the sheet (P) attracted by the conveyance belt (401), from a subsequent sheet (P) of the sheet bundle (P) loaded on the tray (11),
the separation member (430) and the conveyance belt (401) being attachable and detachable together relative to the housing (10a).

2. The sheet conveying device (10) according to claim 1,
wherein the conveyance belt (401) and the separation member (430) are included in the tray (11) as integral parts of the tray (11), and
wherein the conveyance belt (401) and the separation member (430) are detachable from the housing (10a), together with the tray (11).

3. The sheet conveying device (10) according to claim 2,
wherein the tray (11) includes a face plate (510) configured to align a leading end of the sheet bundle (P) loaded on the tray (11) in a sheet conveyance direction,

wherein the conveyance belt (401) is disposed on a side frame (501) of the tray (11), and
wherein the separation member (430) is disposed at an upper end of the face plate (510) of the tray (11).

4. The sheet conveying device (10) according to any one of claims 1 to 3, further comprising an end fence (610) configured to align a trailing end of the sheet bundle (P) loaded on the tray (11), in the sheet conveyance direction,
wherein the end fence (610) is retractable from the tray (11).

5. The sheet conveying device (10) according to any one of claims 1 to 4, further comprising a conveyance belt unit (400) including:

a plurality of rollers (410);
the conveyance belt (401) that is an endless belt stretched by the plurality of rollers (410) and having a plurality of openings (402) in a circumferential surface of the endless belt; and
an air suction unit (420) disposed inside a loop of the conveyance belt (401) and configured to suck air via the plurality of openings (410) in a direction in which the sheet (P) is attracted to the conveyance belt (401).

6. The sheet conveying device (10) according to claim 5,
wherein the conveyance belt unit (400) and the separation member (430) are included in the tray (11) as integral parts of the tray (11), and
wherein the conveyance belt unit (400) and the separation member (430) are detachable from the housing (10a), together with the tray (11).

7. An image forming system (1) comprising:

the sheet conveying device (10) according to any one of claims 1 to 6, configured to convey the sheet (P); and
an image forming device (20) configured to form an image on the sheet (P) conveyed by the sheet conveying device (10).

FIG. 1

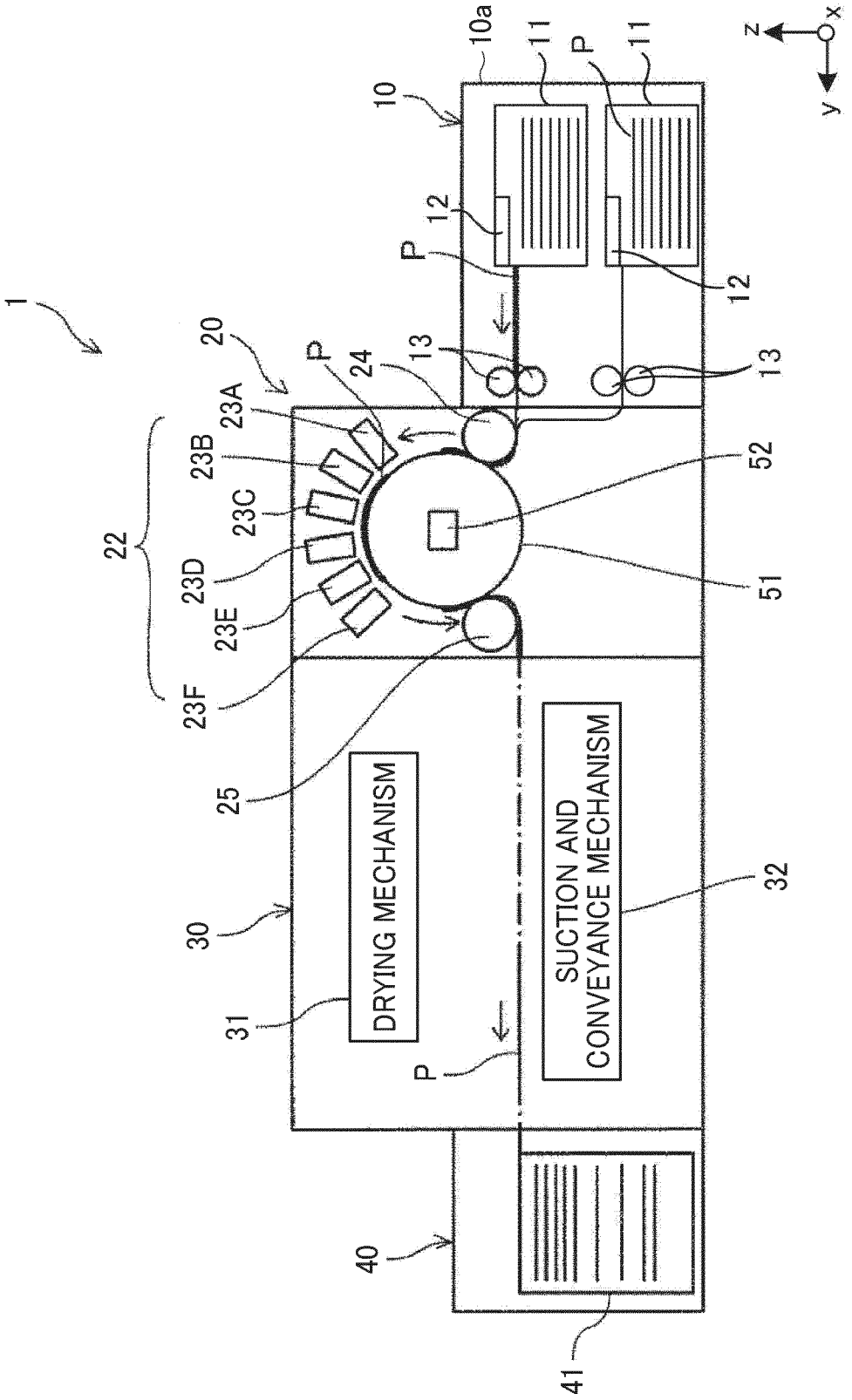

1
10
10a
11
11
P
12
12
P
13
13
20
P
24
23A
23B
23C
23D
23E
23F
22
52
51
25
30
31
DRYING MECHANISM
P
SUCTION AND CONVEYANCE MECHANISM
32
40
41
z
x
y

FIG. 2

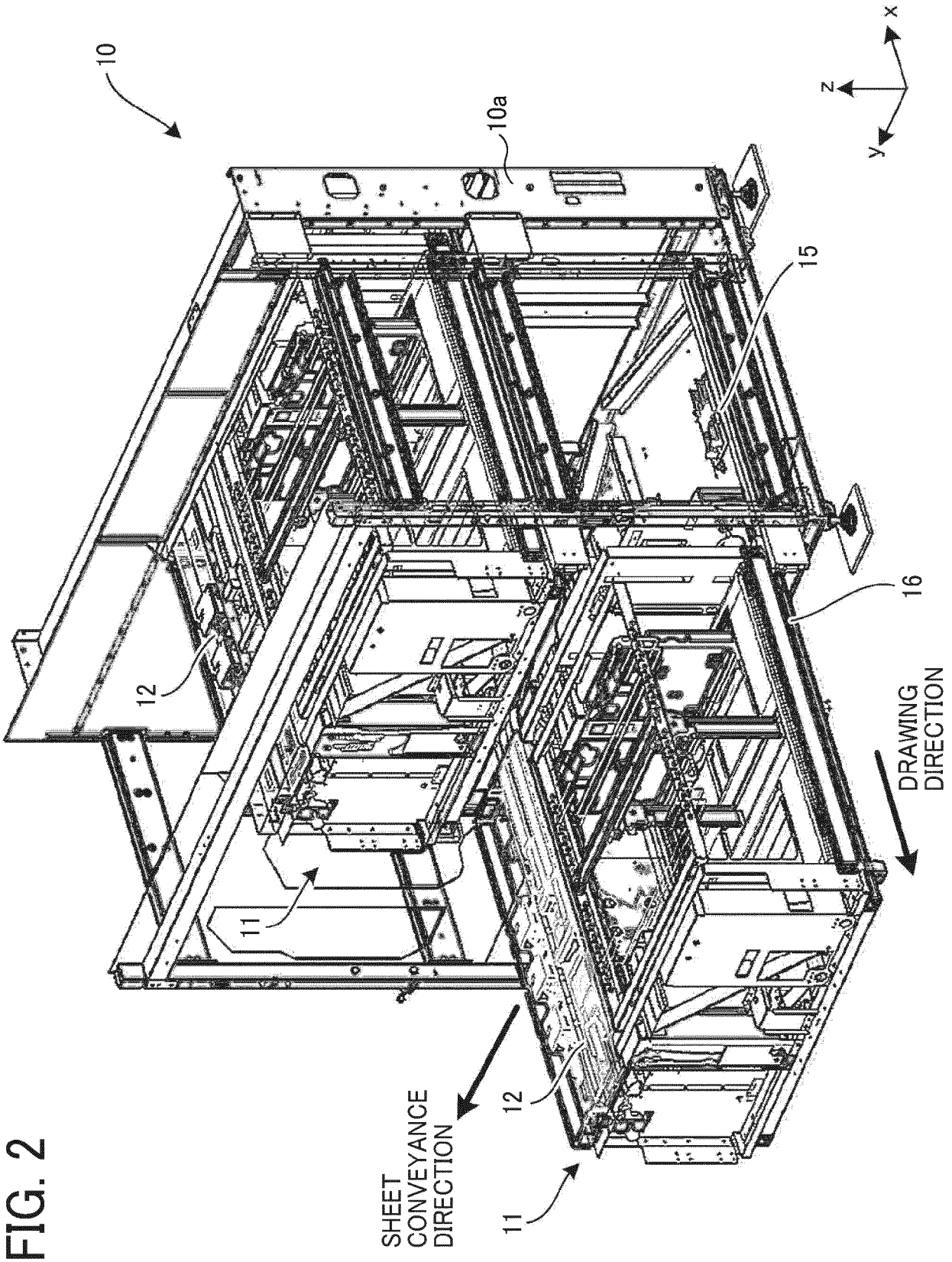

10
10a
x
z
y
15
16
12
11
DRAWING DIRECTION
SHEET CONVEYANCE DIRECTION

FIG. 3

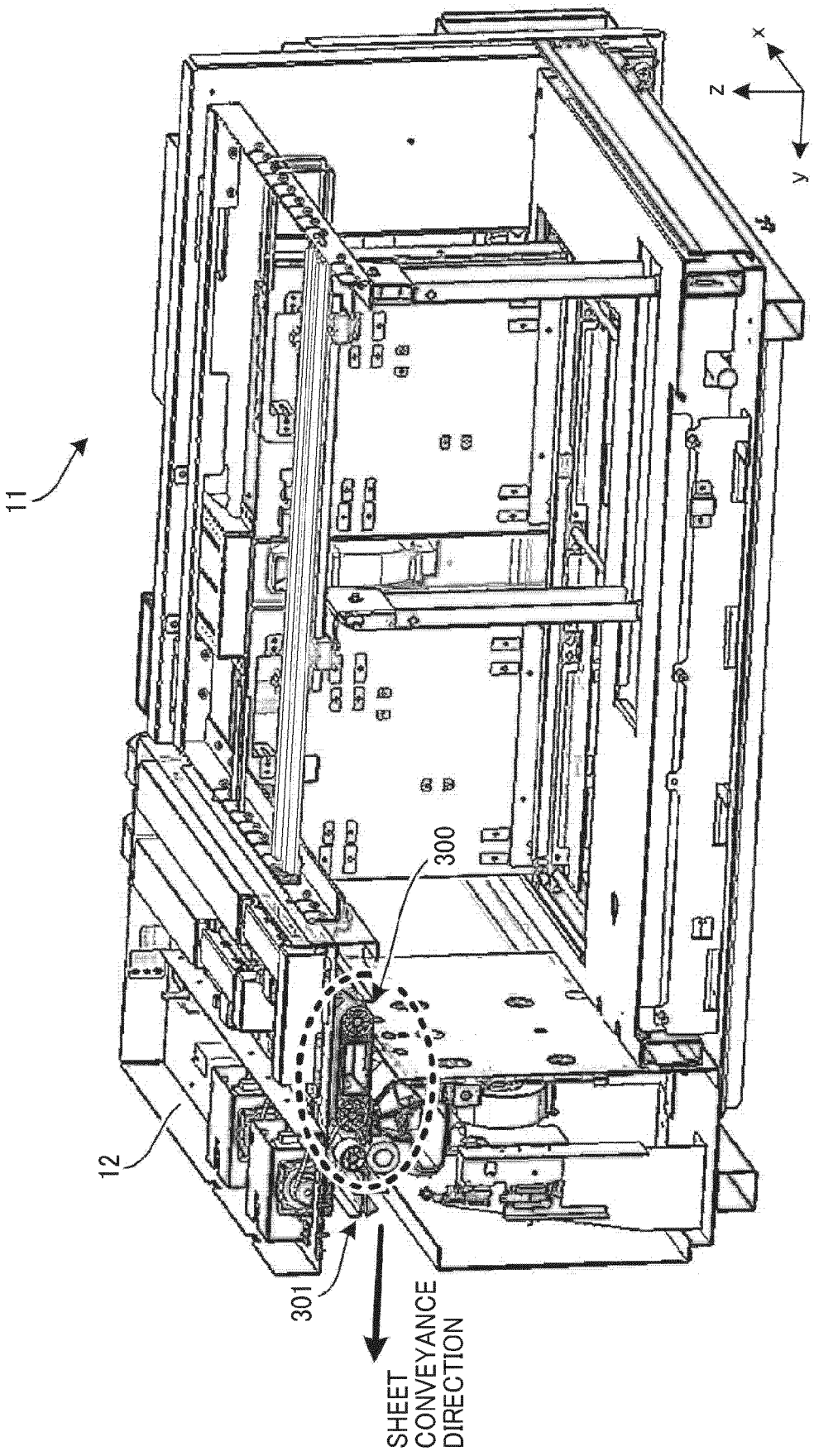


FIG. 4A

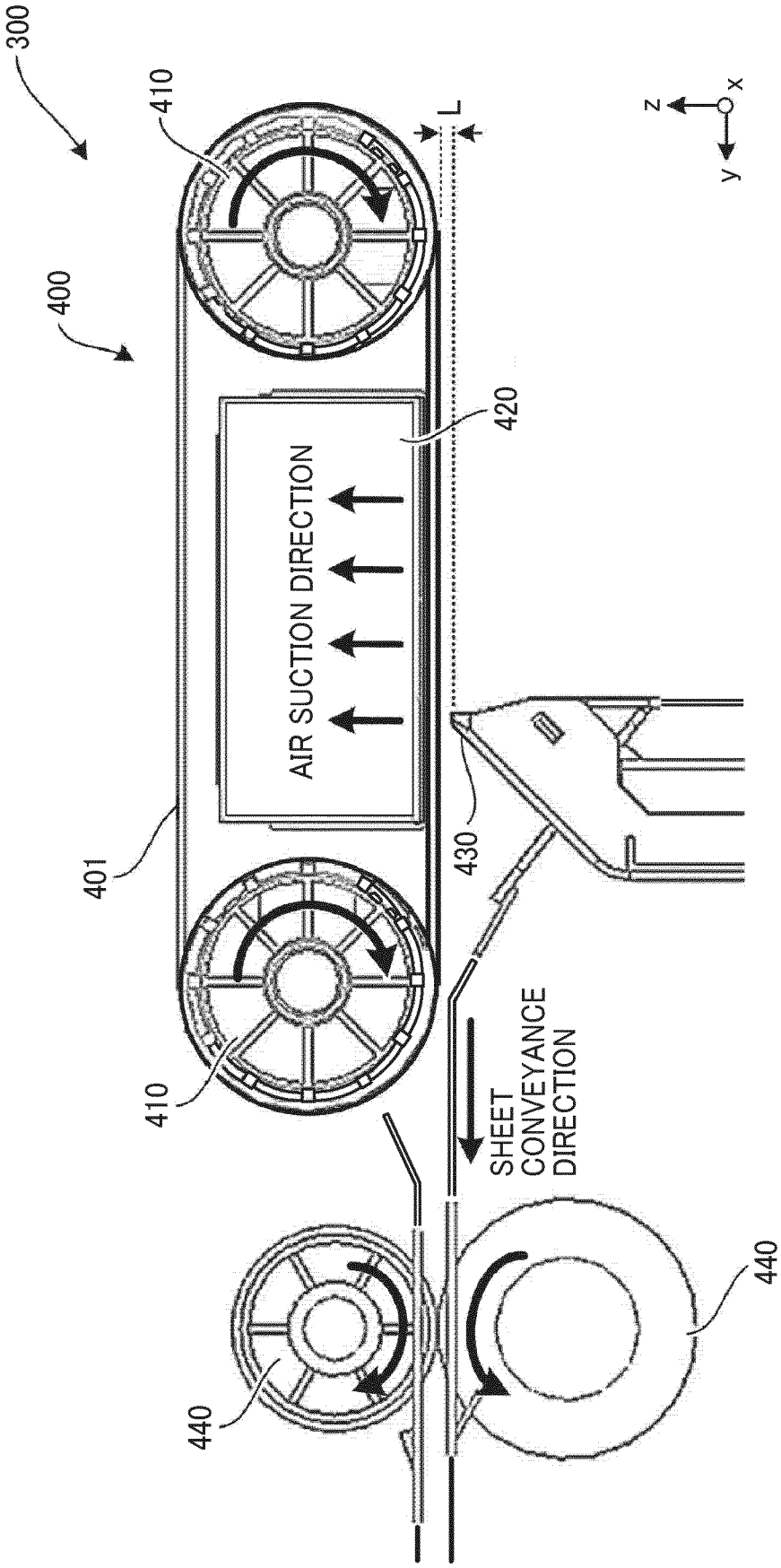

300
400
410
410
L
z
x
y
420
AIR SUCTION DIRECTION
401
430
SHEET CONVEYANCE DIRECTION
440
440

FIG. 4B

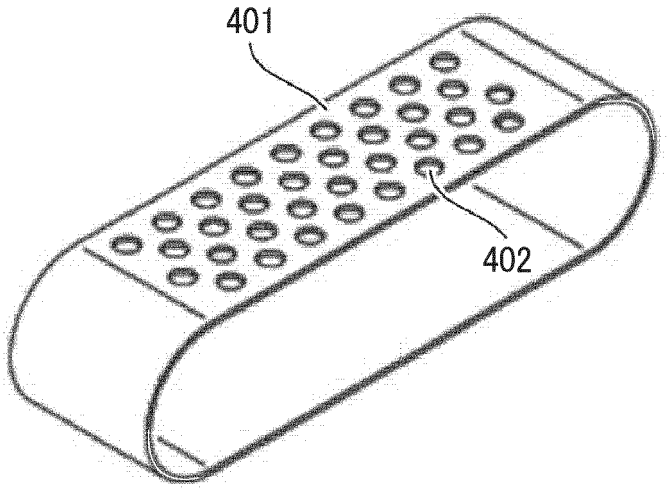


FIG. 5

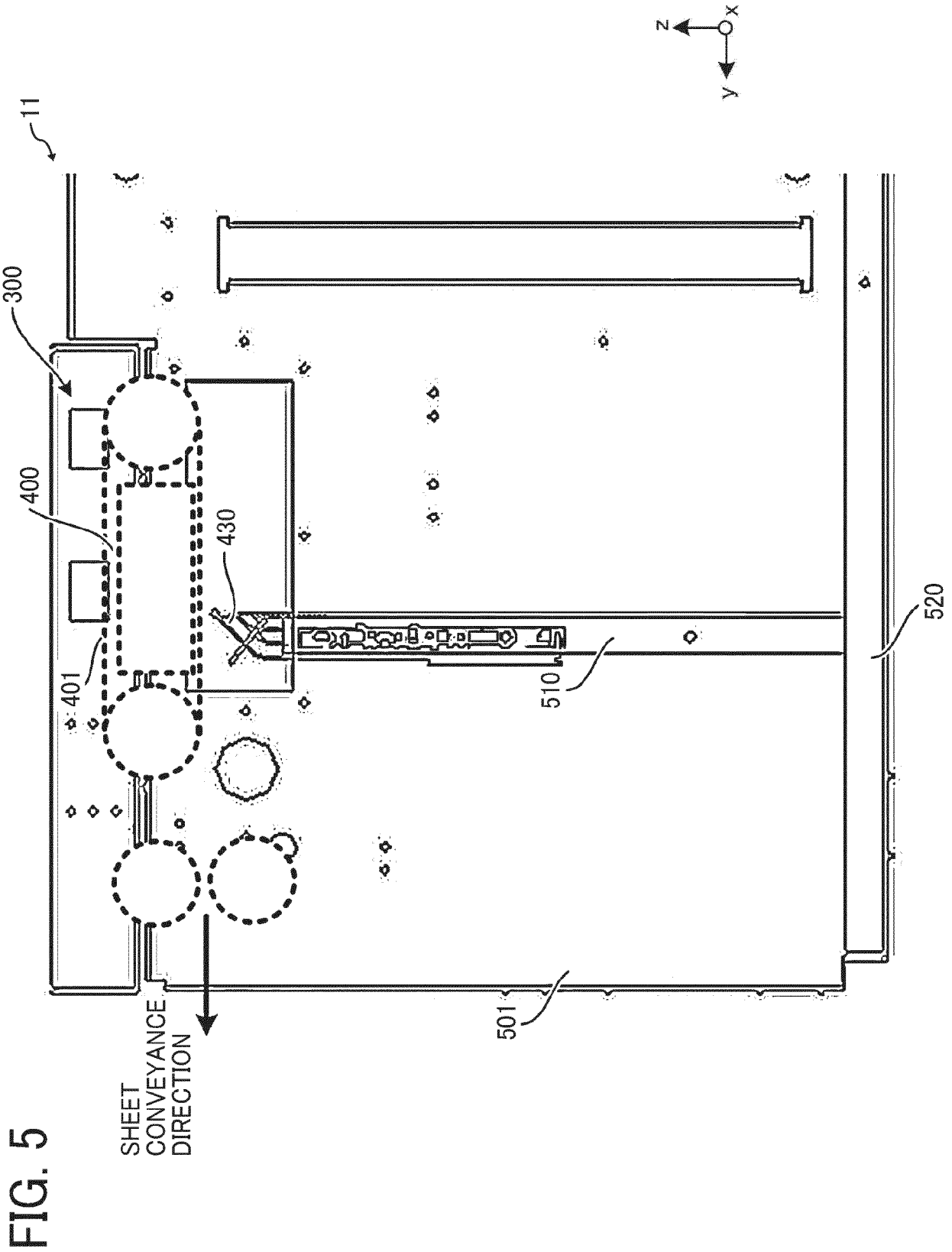

Z
X
Y
11
300
400
401
430
510
520
501
SHEET CONVEYANCE DIRECTION

FIG. 6A

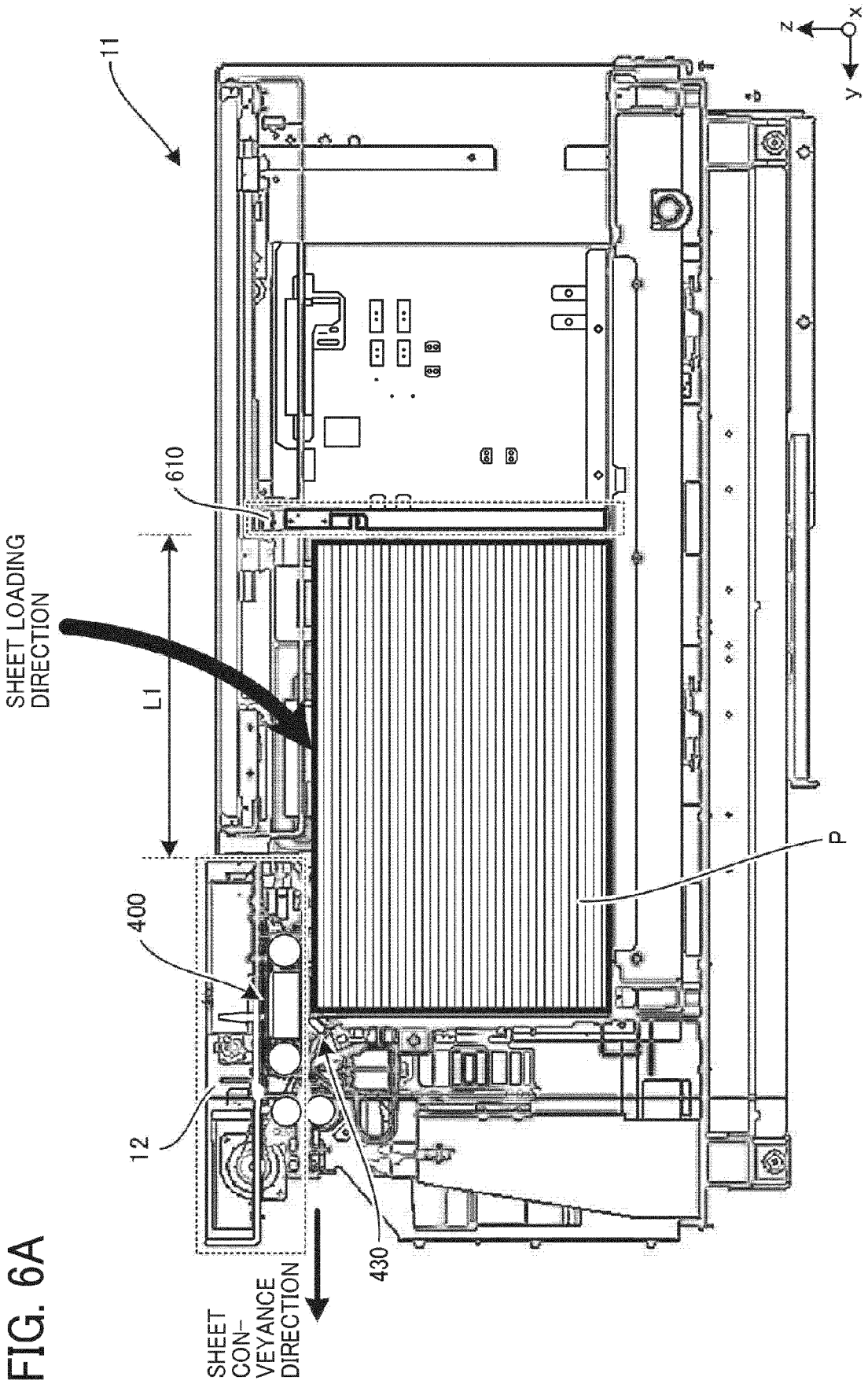
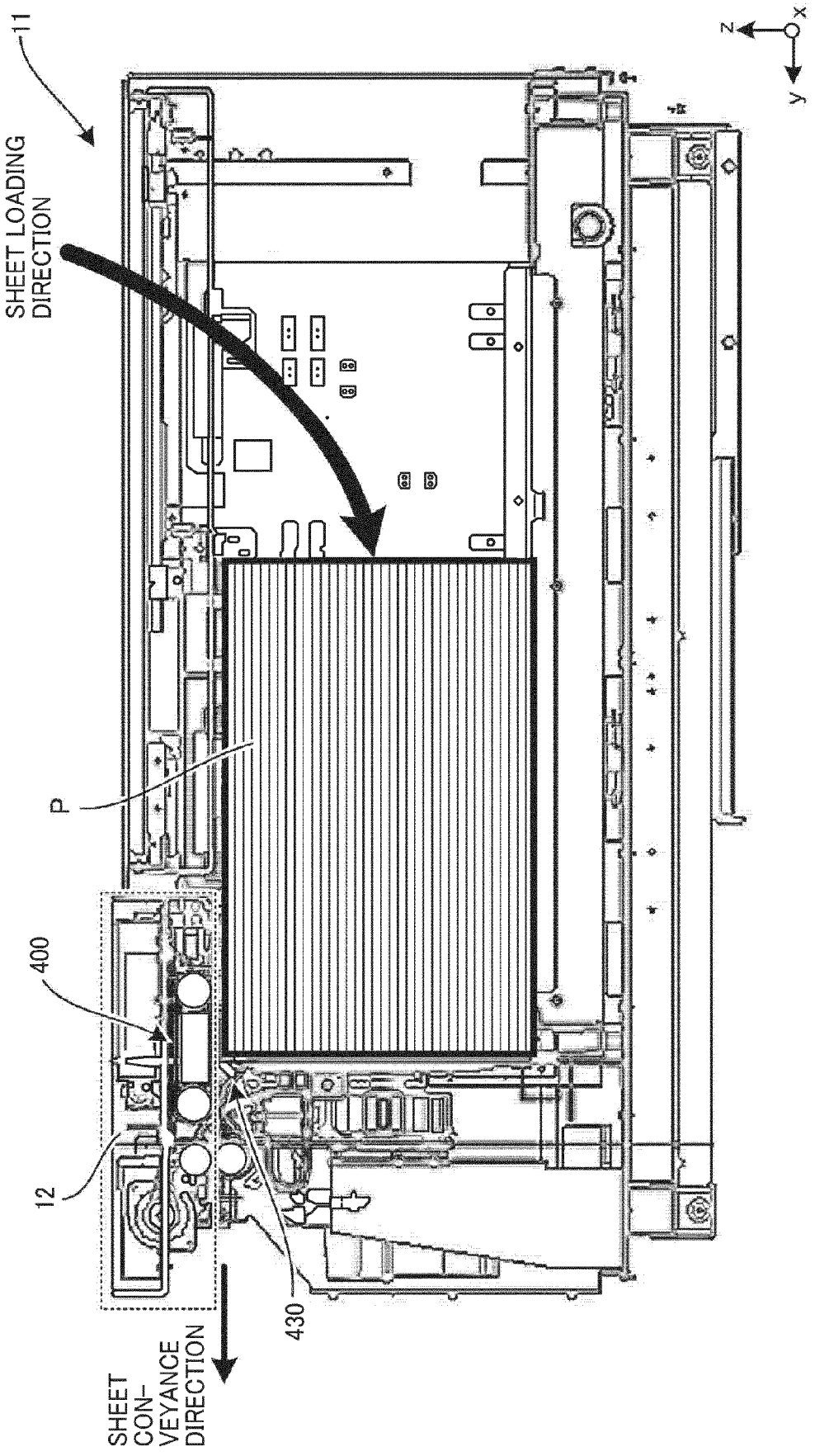

11
610
SHEET LOADING DIRECTION
L1
400
12
430
SHEET CON-VEYANCE DIRECTION
P
z
x
y

FIG. 6B


11
SHEET LOADING DIRECTION
P
400
12
430
SHEET CON-VEYANCE DIRECTION
Z
X
Y

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EUROPEAN SEARCH REPORT

Application Number
EP 20 16 0240

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B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	28 July 2020	Athanasiadis, A

CATEGORY OF CITED DOCUMENTS

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28-07-2020

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