



EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
10.06.2020 Bulletin 2020/24

(51) Int Cl.:
B65H 29/51 (2006.01)

(21) Application number: **17920282.5**

(86) International application number:
PCT/JP2017/027640

(22) Date of filing: **31.07.2017**

(87) International publication number:
WO 2019/026108 (07.02.2019 Gazette 2019/06)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA MD

- **TAMAHASHI, Tomoyuki**
Inagi-shi
Tokyo 206-8555 (JP)
- **YANAGIDA, Hiroshi**
Inagi-shi
Tokyo 206-8555 (JP)
- **HARAI, Daiki**
Inagi-shi
Tokyo 206-8555 (JP)
- **TAKAYAMA, Makoto**
Inagi-shi
Tokyo 206-8555 (JP)

(71) Applicant: **Fujitsu Frontech Limited**
Inagi-shi, Tokyo 206-8555 (JP)

(74) Representative: **Haseltine Lake Kempner LLP**
Lincoln House, 5th Floor
300 High Holborn
London WC1V 7JH (GB)

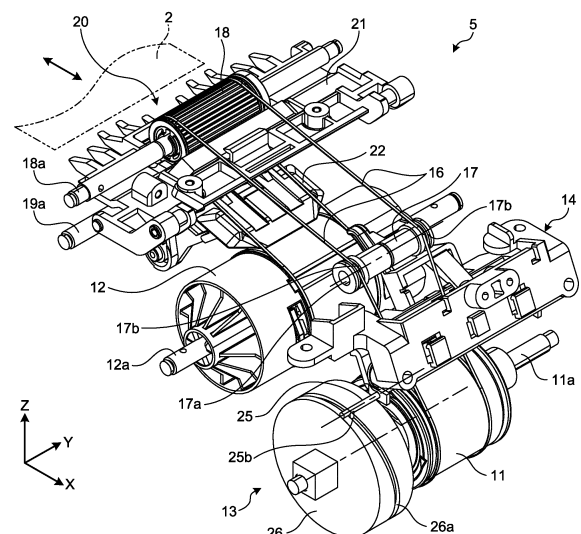
(72) Inventors:

- **FUJIWARA, Ryo**
Inagi-shi
Tokyo 206-8555 (JP)
- **HOSOYAMA, Koichi**
Inagi-shi
Tokyo 206-8555 (JP)

(54) **PAPER SHEET STORAGE DEVICE**

(57) A paper sheet storing apparatus (5) includes: a supply reel (11) that supplies a wound threadlike material (16); a winding drum (12) around which a paper sheet (2) is wound around together with the threadlike material (16) supplied from the supply reel (11); and a guide mechanism (13) that guides the threadlike material (16) through a conveyance path between the supply reel (11) and the winding drum (12).

FIG.3



Description

Technical Field

[0001] The present invention relates to a paper sheet storing apparatus.

Background Art

[0002] A banknote handling apparatus included in an ATM (Automated Teller Machine) includes a banknote storing apparatus that temporarily stores received banknote. This type of banknote storing apparatus has a known configuration in which banknote together with a tape supplied from a supply reel are wound around a winding drum in its circumferential direction to store the banknote. In the banknote storing apparatus, the axial direction of the winding drum is arranged parallel to the axial direction of the supply reel, and a predetermined tensional force is applied in the length direction of the tape conveyed between the supply reel and the winding drum.

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Laid-open Patent Publication No. 2016-3095

Summary of Invention

Technical Problem

[0004] And now, in the above-described banknote storing apparatus, the axial direction of the winding drum is arranged parallel to the axial direction of the supply reel, to apply a predetermined tensional force to the tape without twisting the tape, and therefore there is a restriction on the relative position between the winding drum and the supply reel. For this reason, in the banknote storing apparatus, the conveyance path of the tape wound around the winding drum has low flexibility, and difficulty arises in the efficient use of the space inside the banknote storing apparatus.

[0005] The disclosed technology has been made in consideration of the foregoing and has an object to provide a paper sheet storing apparatus that may improve the flexibility in the arrangement of a supply reel relative to a winding drum and reduce the size of the entire paper sheet storing apparatus.

Solution to Problem

[0006] To solve the above problem and attain the object, a paper sheet storing apparatus disclosed in this application, according to an aspect, includes: a supply reel that supplies a wound threadlike material; a winding

drum around which a paper sheet is wound together with the threadlike material supplied from the supply reel; and a guide mechanism that guides the threadlike material along a conveyance path between the supply reel and the winding drum.

Advantageous Effects of Invention

[0007] According to an aspect of the paper sheet storing apparatus disclosed in the subject application, it is possible to improve the flexibility in the arrangement of a supply reel relative to a winding drum and reduce the size of the entire paper sheet storing apparatus.

Brief Description of Drawings

[0008]

FIG. 1 is a schematic diagram that schematically illustrates an overall banknote handling apparatus including a banknote storing apparatus according to an embodiment.

FIG. 2 is an enlarged view that illustrates the banknote storing apparatus in the banknote handling apparatus according to the embodiment.

FIG. 3 is a perspective view that illustrates the banknote storing apparatus according to the embodiment.

FIG. 4 is a plan view that illustrates the banknote storing apparatus according to the embodiment.

FIG. 5 is a front view that illustrates the banknote storing apparatus according to the embodiment when viewed from the side of a supply reel.

FIG. 6 is a side view that illustrates a conveyance path of a threadlike material in the banknote storing apparatus according to the embodiment.

FIG. 7A is a front view that illustrates a guide mechanism of the banknote storing apparatus according to the embodiment.

FIG. 7B is a front view that illustrates the guide mechanism of the banknote storing apparatus according to the embodiment.

FIG. 8A is a perspective view that schematically illustrates a detector in the banknote storing apparatus according to the embodiment.

FIG. 8B is a perspective view that schematically illustrates a modification of the detector in the banknote storing apparatus according to the embodiment.

FIG. 9 is a plan view that schematically illustrates a modification of a conveyance path of threadlike materials in the banknote storing apparatus according to the embodiment.

FIG. 10 is a schematic diagram that illustrates an example of the structure in which the conveyance path of the threadlike material is changed by using a circular guide member in the banknote storing apparatus according to the embodiment.

Embodiments for Carrying Out the Invention

[0009] With reference to the drawings, an embodiment of a paper sheet storing apparatus disclosed in the subject application is described below in detail. Furthermore, the paper sheet storing apparatus disclosed in the subject application is not limited to the embodiment below. Embodiment

[Configuration of Banknote Handling Apparatus]

[0010] FIG. 1 is a schematic diagram that illustrates an overall banknote handling apparatus including a banknote storing apparatus according to the embodiment. FIG. 2 is an enlarged view of the banknote storing apparatus in the banknote handling apparatus according to the embodiment. As illustrated in FIG. 1, a banknote handling apparatus 1 according to the embodiment includes: a banknote insertion/drawing unit 3 which banknote 2, which is a paper sheet, is inserted into or drawn from; a differentiation unit 4 that differentiates the banknote 2 inserted into the banknote insertion/drawing unit 3; and a temporary storing unit 5 that temporarily stores the banknote 2 conveyed from the differentiation unit 4. Furthermore, the banknote handling apparatus 1 includes: a banknote drawing unit 6 that stores the banknote 2 to be drawn; and a storage unit 7 that stores the banknote 2 delivered from the temporary storing unit 5 in a storage 7a. Moreover, the banknote handling apparatus 1 includes: a conveying mechanism 8 that conveys the banknote 2 along a conveyance path 8a among the units 3, 4, 5, 6, and 7; and a controller (not illustrated) that controls the units 3, 4, 5, 6, 7, and 8.

[0011] As illustrated in FIG. 1 and FIG. 2, the temporary storing unit 5 installed in the banknote handling apparatus 1 corresponds to the banknote storing apparatus according to the embodiment. Hereinafter, the temporary storing unit 5 is referred to as the banknote storing apparatus 5 in the description. For the convenience of description, in FIG. 1, the direction in which the banknote 2 is inserted into or drawn from the banknote insertion/drawing unit 3 (the front-back direction of the banknote handling apparatus 1) is an X-direction, the axial direction of a winding drum 12, described later, included in the banknote storing apparatus 5 (the width direction of the banknote handling apparatus 1) is a Y-direction, and the vertical direction of the banknote storing apparatus 5 is a Z-direction. In the figures subsequent to FIG. 1, the X-, Y-, and Z-directions are illustrated in the same manner as in FIG. 1.

[0012] As illustrated in FIG. 2, the two banknote storing apparatuses 5 are arranged side by side in the X-direction inside the banknote handling apparatuses 1. Here, according to the present embodiment, the banknote 2 is used as an example of the paper sheet; however, banknote is not a limitation. Examples of the paper sheet include a bill, a check, a coupon, various types of securities, and valuable securities such as a stock certificate.

[Configuration of Banknote Storing Apparatus]

[0013] FIG. 3 is a perspective view that illustrates the banknote storing apparatus 5 according to the embodiment. FIG. 4 is a plan view that illustrates the banknote storing apparatus 5 according to the embodiment. FIG. 5 is a front view that illustrates the banknote storing apparatus 5 according to the embodiment when viewed from the side of a supply reel. FIG. 6 is a side view that illustrates a conveyance path of a threadlike material in the banknote storing apparatus 5 according to the embodiment.

[0014] As illustrated in FIG. 3, FIG. 4, and FIG. 5, the banknote storing apparatus 5 according to the embodiment includes a supply reel 11, the winding drum 12, a guide mechanism 13, and a detector 14. The supply reel 11 has two threadlike materials 16 wound therearound and supplies the wound threadlike material 16. The supply reel 11 supplies the two threadlike materials 16 in parallel with a predetermined space between each other. The banknote 2 together with the threadlike materials 16 supplied from the supply reel 11 are wound around the winding drum 12. The guide mechanism 13 guides the threadlike material 16 along the conveyance path between the supply reel 11 and the winding drum 12.

[0015] As the threadlike material 16, for example, a cotton thread, what is called a kite string, is used. Furthermore, as the threadlike material 16, other thread materials, such as a resin fishing line or a rubber thread, may be used. In a case where a kite string is used, it may be coated with a cover film to adjust the friction force of the kite string to the desired level. Moreover, the diameter of the threadlike material 16 may be partially enlarged to form enlarged diameter sections at a predetermined interval in the longitudinal direction of the threadlike material 16 as appropriate to, for example, strengthen the winding state of the banknote 2 around the winding drum 12.

[0016] The number of the threadlike materials 16 supplied from the supply reel 11 is not limited to two, and a configuration may be such that the two or more threadlike materials 16 are supplied. Furthermore, although the two threadlike materials 16 are supplied from the single supply reel 11 according to the present embodiment, the two supply reels 11 supplying the single threadlike material 16 may be provided. In this case, there is no limitation on the configuration that the two supply reels 11 are provided around the same rotary shaft, and each of the two supply reels 11 may be provided at a different position around an independent rotary shaft. The use of the threadlike material 16 may improve the degree of freedom of the supplying structure described above.

[0017] As illustrated in FIG. 3 and FIG. 6, the supply reel 11 is supported by a rotary shaft 11a and is rotationally driven by a driving mechanism (not illustrated). The winding drum 12 is supported by a rotary shaft 12a and is rotationally driven by a driving mechanism (not illustrated). Although the rotary shaft 11a of the supply reel

11 is arranged parallel to the rotary shaft 12a of the winding drum 12 according to the embodiment, the rotary shaft 11a of the supply reel 11 may be arranged in any direction with respect to the rotary shaft 12a of the winding drum 12 in accordance with a space within the banknote storing apparatus 5.

[Configuration of Guide Mechanism]

[0018] As illustrated in FIG. 6, the guide mechanism 13 includes a guide roller 17, a pair of an upper conveyance roller 18, and a lower conveyance roller 19, along the conveyance path of the threadlike material 16. The guide roller 17 is supported by a support shaft 17a and has the threadlike materials 16, which are supplied from the supply reel 11 placed thereon. As illustrated in FIG. 3 and FIG. 4, the outer circumference of the guide roller 17 is provided with a guide groove 17b extending in a circumferential direction to guide the threadlike material 16. The guide grooves 17b are formed at both ends of the outer circumference of the guide roller 17 in the axial direction. The two threadlike materials 16 are supported at the inside of the guide grooves 17b of the guide roller 17 and are guided by the guide grooves 17b in a desired conveying direction.

[0019] Thus, the conveying direction of the threadlike material 16 may be optionally adjusted in accordance with the extending direction of the guide groove 17b, which is formed on the outer circumference of the guide roller 17, the attitude of the guide roller 17, e.g., the direction of the guide roller 17 in the axial direction. In other words, depending on the state of the threadlike material 16 placed on the guide roller 17, the extending direction of the threadlike material 16 supplied from the supply reel 11 (the extending direction of the threadlike material 16 wound around the supply reel 11) may be different from the extending direction of the threadlike material 16 wound around the winding drum 12 (the extending direction of the threadlike material 16 returning from the winding drum 12). That is, the conveying direction of the threadlike material 16 may be optionally set through the guide roller 17 so that the degree of freedom of the conveyance path of the threadlike material 16 may be improved.

[0020] The upper conveyance roller 18 is supported by a support shaft 18a. The lower conveyance roller 19 is supported by a support shaft 19a, which is arranged parallel to the support shaft 18a. The upper conveyance roller 18 and the lower conveyance roller 19 are rotationally driven by the driving mechanism (not illustrated) to convey the banknote 2. The threadlike materials 16, which are supplied from the supply reel 11 through the guide rollers 17, are placed on the upper conveyance roller 18. The threadlike materials 16, which are placed on the upper conveyance roller 18, are extended toward the winding drum 12 and wound around the winding drum 12 in the circumferential direction thereof.

[0021] The upper conveyance roller 18 and the lower

conveyance roller 19 are provided such that the outer circumferences are in contact with each other, so as to form a carry-in/out section 20 that carries the banknote 2 to/out of the winding drum 12, as illustrated in FIG. 2 and FIG. 6. Near the upper conveyance roller 18 and the lower conveyance roller 19, an upper guide member 21 and a lower guide member 22 are provided to guide the banknote 2 carried from the carry-in/out section 20. The space, in which the banknote 2 is delivered toward the winding drum 12, is ensured between the lower guide member 22 and the threadlike materials 16, which are placed on the upper conveyance roller 18 and extending toward the winding drum 12. Furthermore, on the outer circumference side of the winding drum 12, a detection member 23 is provided to detect the outer diameter of the winding drum 12 that changes due to the winding of the banknote 2 together with the threadlike materials 16.

[0022] In the banknote storing apparatus 5, a predetermined tensional force is applied to the threadlike materials 16 coming from the supply reel 11 and wound around the winding drum 12 via the guide roller 17 and the upper conveyance roller 18 provided on the conveyance path of the threadlike materials 16.

[0023] FIG. 7A and FIG. 7B are front views that illustrate the guide mechanism 13 of the banknote storing apparatus 5 according to the embodiment. As illustrated in FIG. 7A and FIG. 7B, the guide mechanism 13 includes a slide member 25 and a cam member 26. The slide member 25 changes the position of the threadlike materials 16 wound around the outer circumference of the supply reel 11 in the axial direction of the supply reel 11. The cam member 26 moves the slide member 25 back and forth in the axial direction (the Y-direction) of the supply reel 11.

[0024] The slide member 25 is formed in a rod-like shape extending along the axial direction of the supply reel 11, and is supported by an undepicted support member so as to be movable in the axial direction (the Y-direction) of the supply reel 11. The slide member 25 includes a pair of the holding parts 25a that hold the threadlike materials 16, and a follower part 25b that follows the cam member 26. The holding part 25a is formed in a circular shape to have guide holes, through which the threadlike materials 16 are passed. Furthermore, the holding parts 25a may be configured to have a form like, for example, flanges instead of the guide hole so that the threadlike materials 16 are supported between the flanges in a pair.

[0025] The cam member 26 is a cylindrical cam provided around the rotary shaft 11a of the supply reel 11. As the cam member 26 is provided around the rotary shaft 11a of the supply reel 11, the cam member 26 moves the slide member 25 in conjunction with the rotation of the supply reel 11. The outer circumference of the cam member 26 is provided with a cam groove 26a that is engaged with the follower part 25b. The cam groove 26a is formed along the circumferential direction of the cam member 26 such that the position thereof in the axial

direction (the Y-direction) of the cam member 26 gradually changes. As the follower part 25b engaged with the cam groove 26a moves along the cam groove 26a in accordance with the rotation of the cam member 26, the slide member 25 moves back and forth in the Y-direction. Furthermore, the cam member 26 is not limited to a cylindrical cam, and other cam structures, such as a plate cam, may be used.

[Configuration of Detector]

[0026] FIG. 8A is a perspective view that schematically illustrates the detector 14 in the banknote storing apparatus 5 according to the embodiment. As illustrated in FIG. 3, FIG. 6, and FIG. 8, the detector 14 is provided near the conveyance path of the threadlike material 16 drawn from the supply reel 11, and an optical sensor is used. As illustrated in FIG. 8A, the optical sensor as the detector 14 includes: a light emitting unit 14a that emits a detection light; and a light receiving unit 14b that receives the detection light emitted by the light emitting unit 14a. The light emitting unit 14a and the light receiving unit 14b are provided such that they are opposed to each other with the conveyance path of the threadlike material 16 interposed therebetween and with the space allowing the passage of the threadlike material 16.

[0027] The detector 14 detects the end part of the threadlike material 16 to detect the supply amount of the threadlike material 16 supplied from the supply reel 11. The end part of the threadlike material 16 is provided with a nodular light shielding member that bulges in the radial direction of the threadlike material 16. A light shielding member 28 is formed so as to pass through the guide hole of the holding part 25a of the slide member 25. The detector 14 emits the detection light to the outer circumference side of the light shielding member 28 shifted in the radial direction of the threadlike material 16, and detects the end part of the threadlike material 16 when the light shielding member 28 blocks the detection light.

[0028] FIG. 8B is a perspective view that schematically illustrates a modification of the detector 14 in the banknote storing apparatus 5 according to the embodiment. Furthermore, as illustrated in FIG. 8B, the end part of the threadlike material 16 may be provided with, for example, a light shielding film 29 that crosses the end parts of the two threadlike materials 16. In this case, the pair of the holding parts 25a of the slide member 25 is configured such that they are formed to have, for example, a hook-like shape, and they hold the threadlike materials 16 at two sides in the array direction of the two threadlike materials 16, so as not to prevent the light shielding film 29 from passing by the slide member 25. Moreover, in this case, the interval between the two threadlike materials 16 does not change over the conveyance path of the threadlike materials 16.

[0029] Although the light emitting unit 14a and the light receiving unit 14b are provided such that they are opposed to each other via the threadlike material 16 inter-

posed therebetween, this configuration is not a limitation. For example, the light emitting unit 14a and the light receiving unit 14b may be provided on one side with respect to the conveyance path of the threadlike material 16. In the case of this configuration, an optical member (not illustrated) may be provided on the other side with respect to the threadlike material 16 such that it is opposed to the light emitting unit 14a and the light receiving unit 14b provided on one side with respect to the threadlike material 16, and the optical member may be configured to reflect and guide the detection light emitted by the light emitting unit 14a, so that the detection light is reflected to the light receiving unit 14b.

[0030] Furthermore, in a case where a light-transmissive fishing line, e.g., a transparent nylon line, is used as the threadlike material 16, the end part of the nylon line may be covered with a light shielding film, so that the detector 14 is configured to detect the end part. In this case, the detector 14 detects the end part as the light shielding film at the end part of the threadlike material 16 blocks the detection light. Moreover, the end part of the threadlike material 16 may be provided with a reflection section that reflects the detection light, so that the detector 14 may detect the detection light reflected by the reflection section to detect the end part of the threadlike material 16.

[Storing Operation of Banknote]

[0031] A storing operation to wind the banknote 2 around the winding drum 12 in the banknote storing apparatus 5 having the above-described configuration is described. In the banknote storing apparatus 5, the threadlike materials 16, which are supplied from the supply reel 11, are conveyed to the upper conveyance roller 18 through the guide rollers 17 and, together with the threadlike materials 16 returned at the upper conveyance roller 18, the banknote 2, which is carried into the carry-in/out section 20, is wound around the winding drum 12. In the banknote storing apparatus 5, the threadlike materials 16, which are supplied from the supply reel 11, causes the banknote 2, which is carried into the carry-in/out section 20, to be wound and stored along the circumferential direction of the winding drum 12. In the banknote storing apparatus 5, the predetermined amount of the threadlike material 16 is supplied from the supply reel 11 and, when the detector 14 detects the end part of the threadlike material 16, the rotational driving of the supply reel 11 and the winding drum 12 is stopped.

[0032] Conversely, in the banknote storing apparatus 5, the rotation direction of the winding drum 12 and the supply reel 11 is reversed with respect to the rotation direction during the above-described storing operation so that the banknote 2 wound around the winding drum 12 is carried through the carry-in/out section 20, and the threadlike materials 16 wound around the winding drum 12 are wound around the supply reel 11 again through the guide mechanism 13. At this point, as the guide mech-

anism 13 causes the cam member 26 to slide the slide member 25, the winding positions of the threadlike materials 16 in the axial direction of the supply reel 11 are smoothly changed. This allows the threadlike materials 16 to be wound equally with respect to the axial direction of the supply reel 11, which results in a stable winding state of the threadlike materials 16 around the supply reel 11 and a reduction in the space occupied by the entire supply reel 11 around which the threadlike materials 16 are wound.

[0033] Furthermore, according to the present embodiment, a configuration is such that the banknote 2 is wound around the winding drum 12 with the two threadlike materials 16; however, a configuration may be such that a supply reel (not illustrated) that supplies the two threadlike materials 16 is further provided to hold the banknote 2, so that the banknote 2 carried into the carry-in/out section 20 is wound around the winding drum 12 while it is sandwiched between the upper and lower threadlike materials 16. In this case, the two threadlike materials 16 holding the banknote 2 from above and the two threadlike materials 16 holding the banknote 2 from beneath may be provided at different positions from each other in the axial direction of the winding drum 12 as appropriate. That is, a configuration may be such that the banknote 2 is wound around the winding drum 12 while it is sandwiched between the four threadlike materials 16 from above and from beneath alternately in the axial direction of the winding drum 12.

[0034] FIG. 9 is a plan view that schematically illustrates a modification of the conveyance path of the threadlike materials 16 in the banknote storing apparatus 5 according to the embodiment. As illustrated in FIG. 9, the conveying direction of the threadlike materials 16 are bent to extend in any direction through the guide roller 17, whereby the axial direction of the supply reel 11 may be set as appropriate with respect to the axial direction of the winding drum 12. For example, the axial direction (the X-direction) of the supply reel 11 is set to be perpendicular to the axial direction (the Y-direction) of the winding drum 12, whereby the space inside the banknote storing apparatus 5 may be efficiently used.

[0035] FIG. 10 is a schematic diagram that illustrates an example in which the conveyance path of the threadlike material 16 is changed by using a circular guide member in the banknote storing apparatus 5 according to the embodiment. As illustrated in FIG. 10, the guide mechanism 13 may include a circular guide member 31 that changes the conveying direction of the threadlike material 16. The circular guide member 31 is formed in a cylindrical shape and is provided on the conveyance path of the threadlike material 16. The circular guide member 31 has the threadlike material 16 inserted through an inner circumference 31a thereof, so as to smoothly and easily change the direction of the threadlike material 16 extending toward the winding drum 12 and the direction of the threadlike material 16 extending toward the supply reel 11.

[0036] The banknote storing apparatus 5 according to the embodiment includes: the winding drum 12 around which the banknote 2 together with the threadlike materials 16, which are supplied from the supply reel 11, are wound; and the guide mechanism 13 that guides the threadlike materials 16 through the conveyance path. Thus, as the threadlike materials 16 have no restrictions in the bending direction thereof in the conveyance path as compared with a tape used for winding the banknote 2 around the winding drum 12, the conveyance path of the threadlike materials 16 between the supply reel 11 and the winding drum 12 may have more degree of freedom. Thus, according to the embodiment, higher degree of freedom in the arrangement of the supply reel 11 relative to the winding drum 12 allows the efficient use of the space inside the banknote storing apparatus 5 and a reduction in the size of the entire banknote storing apparatus 5.

[0037] Furthermore, with the use of the threadlike material 16, the force for applying a certain tensional force to the threadlike material 16 may be small as compared with a tape; thus, the size of a motor included in the driving mechanism for the winding drum 12 and the supply reel 11 may be reduced, and the size of the entire banknote storing apparatus 5 may be reduced.

[0038] Furthermore, the guide mechanism 13 in the banknote storing apparatus 5 according to the embodiment includes the guide roller 17 whose outer circumference is provided with the guide grooves 17b that guide the threadlike materials 16. This enables the appropriate guiding of the threadlike materials 16, the setting of the conveying direction of the threadlike materials 16 as appropriate, and higher degree of freedom in the conveyance path of the threadlike materials 16.

[0039] Furthermore, the guide mechanism 13 in the banknote storing apparatus 5 according to the embodiment includes the slide member 25 that changes the positions of the threadlike materials 16 wound around the outer circumference of the supply reel 11 in the axial direction of the supply reel 11. This makes it possible to equally wind the threadlike materials 16 in the axial direction of the supply reel 11 and obtain the stable winding state of the threadlike materials 16 around the supply reel 11. Furthermore, as the space occupied by the entire supply reel 11 having the threadlike materials 16 wound therearound is reduced so that the size of the entire banknote storing apparatus 5 may be further reduced.

[0040] Furthermore, the guide mechanism 13 in the banknote storing apparatus 5 according to the embodiment includes the cam member 26 that moves the slide member 25 back and forth in the axial direction of the supply reel 11. The outer circumference of the cam member 26 is provided with the cam groove 26a that is engaged with the follower part 25b of the slide member 25. Thus, it is possible to appropriately change the winding positions of the threadlike materials 16 wound around the supply reel 11.

[0041] Furthermore, the cam member 26 of the guide

mechanism 13 in the banknote storing apparatus 5 according to the embodiment is a cylindrical cam provided around the rotary shaft 11a of the supply reel 11. Thus, the structure that moves the slide member 25 in conjunction with the rotation of the supply reel 11 may be a simple structure, and the size of the guide mechanism 13 may be reduced.

[0042] Moreover, the guide mechanism 13 in the banknote storing apparatus 5 according to the embodiment includes the circular guide member 31 that has the threadlike material 16 inserted through the inner circumference 31a to change the conveying direction of the threadlike material 16. This makes it possible to smoothly and easily change the direction of the threadlike material 16 extending toward the winding drum 12 and the direction of the threadlike material 16 extending toward the supply reel 11, and therefore the conveyance path of the threadlike material 16 may be easily formed.

Explanation of Reference

[0043]

1 BANKNOTE HANDLING APPARATUS

2 BANKNOTE

5 BANKNOTE STORING APPARATUS (TEMPORARY STORING SECTION)

11 SUPPLY REEL

12 WINDING DRUM

13 GUIDE MECHANISM

14 DETECTOR

16 THREADLIKE MATERIAL

17 GUIDE ROLLER

17b GUIDE GROOVE

25 SLIDE MEMBER

25a HOLDING PART

25b FOLLOWER PART

26 CAM MEMBER (CYLINDRICAL CAM)

26a CAM GROOVE

31 CIRCULAR GUIDE MEMBER

31a INNER CIRCUMFERENCE

guide roller having an outer circumference provided with a guide groove to guide the threadlike material.

3. The paper sheet storing apparatus according to claim 1, wherein the guide mechanism includes a slide member that changes a position of the threadlike material wound around the outer circumference of the supply reel in an axial direction of the supply reel.

4. The paper sheet storing apparatus according to claim 3, wherein the guide mechanism includes a cam member that moves the slide member back and forth in the axial direction of the supply reel, the slide member comprising:

a holding part that holds the threadlike material; and

a follower part that follows the cam member, and

an outer circumference of the cam member is provided with a cam groove engaged with the follower part.

5. The paper sheet storing apparatus according to claim 4, wherein the cam member is a cylindrical cam provided around a rotary shaft of the supply reel.

6. The paper sheet storing apparatus according to claim 1, wherein the guide mechanism includes a circular guide member that has the threadlike material passed through an inner circumference to change a conveying direction of the threadlike material.

Claims

1. A paper sheet storing apparatus comprising:

a supply reel that supplies a wound threadlike material;

a winding drum around which a paper sheet is wound together with the threadlike material supplied from the supply reel; and

a guide mechanism that guides the threadlike material along a conveyance path between the supply reel and the winding drum.

2. The paper sheet storing apparatus according to claim 1, wherein the guide mechanism includes a

FIG.1

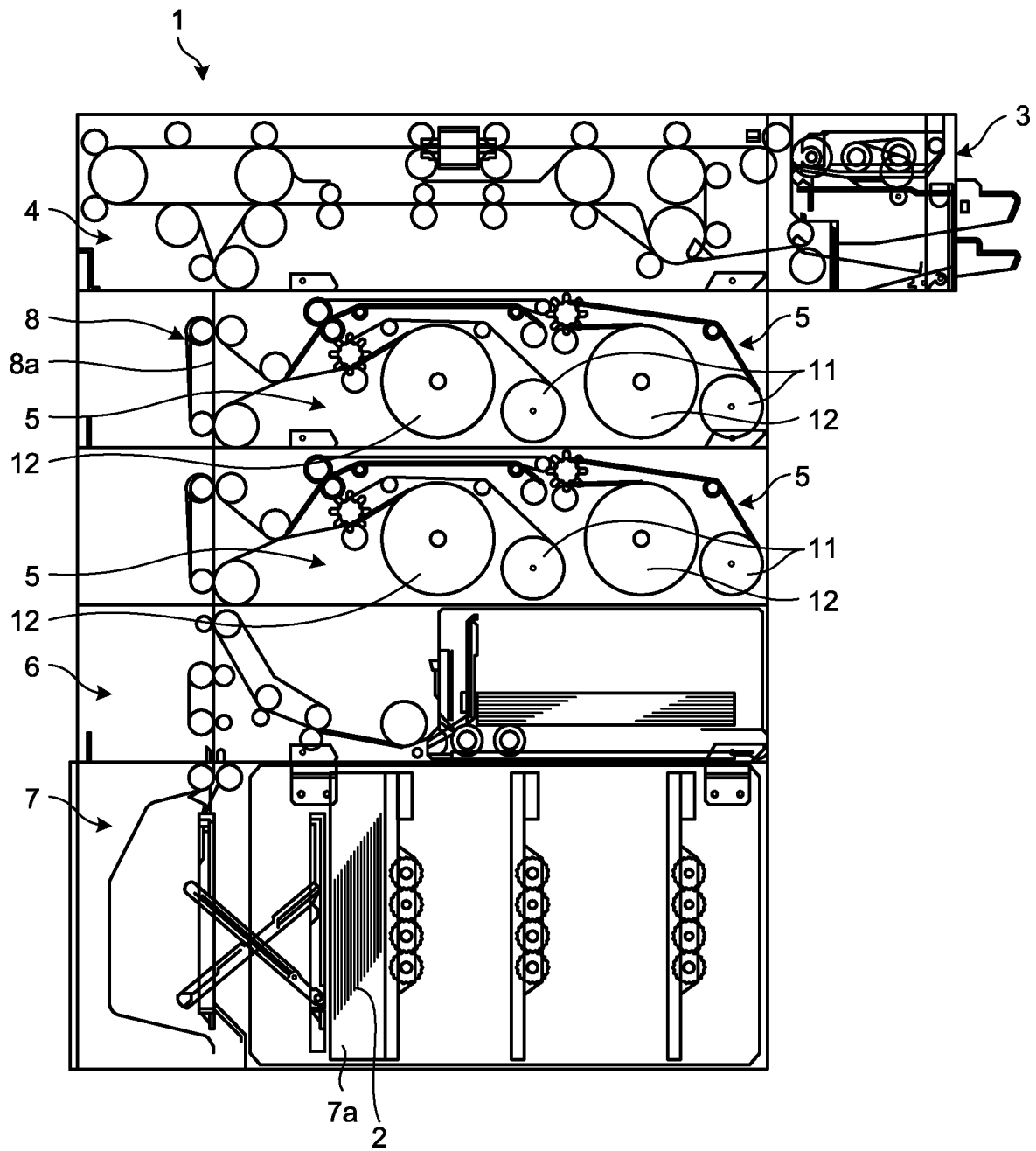


FIG.2

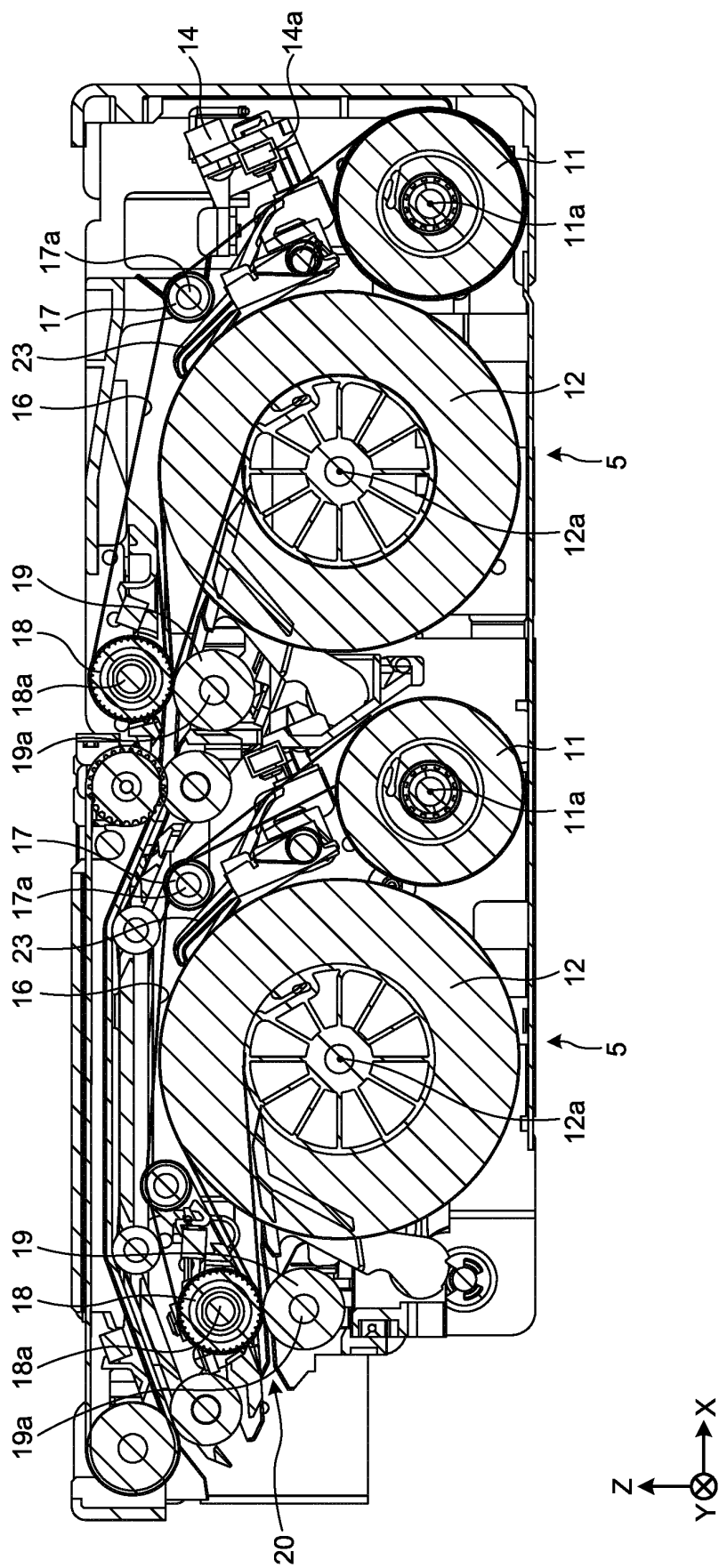


FIG.3

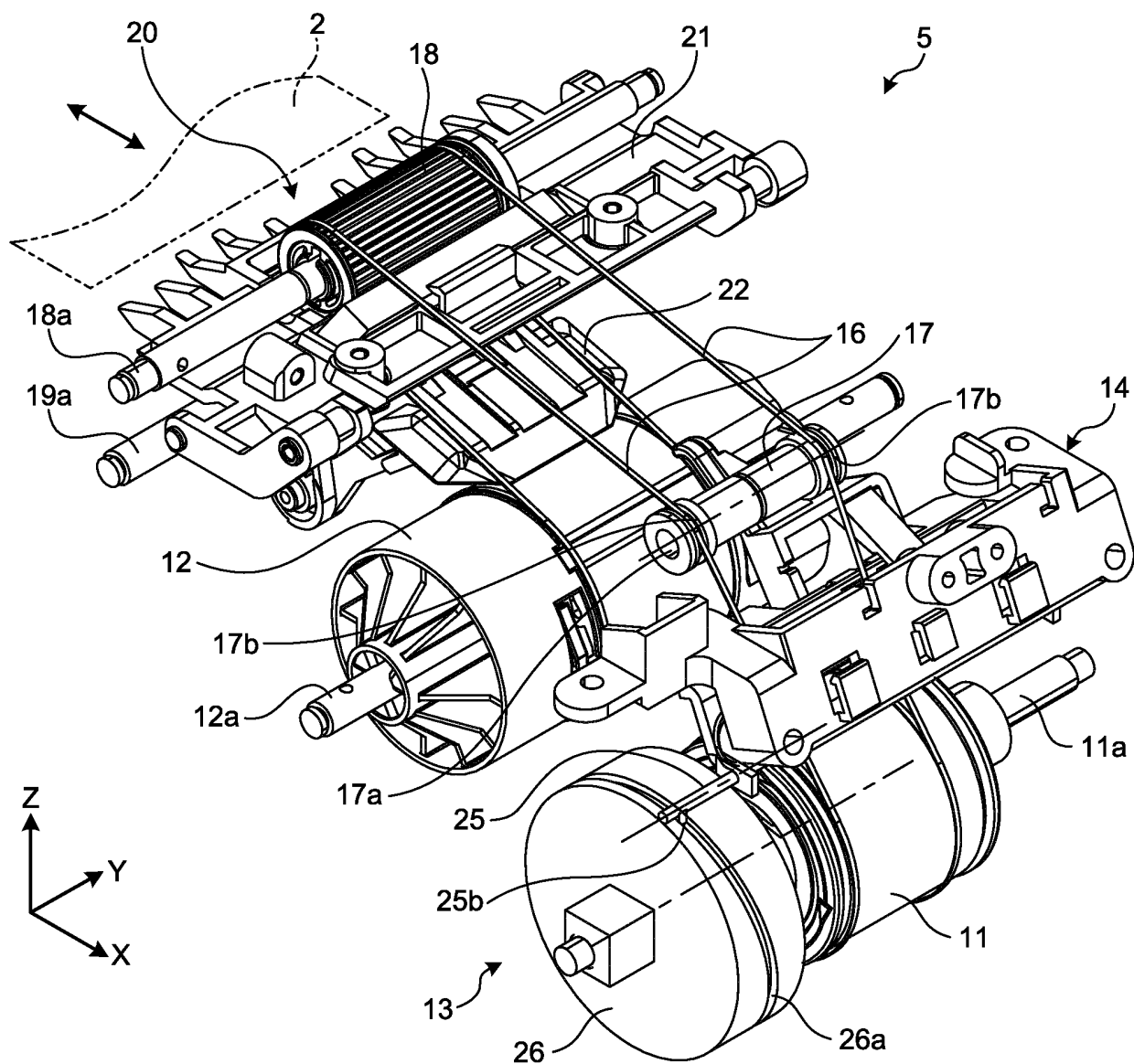


FIG.4

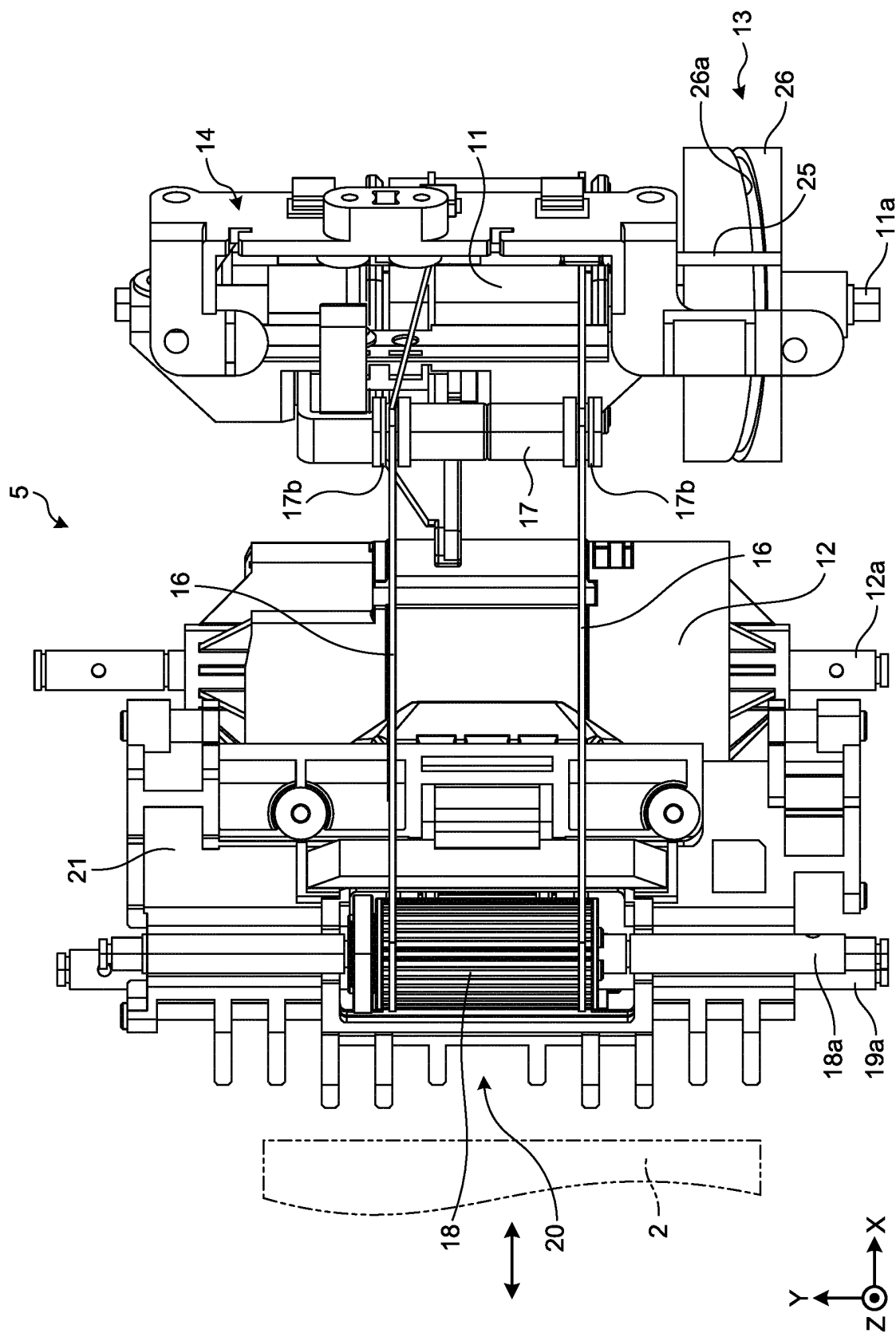


FIG.5

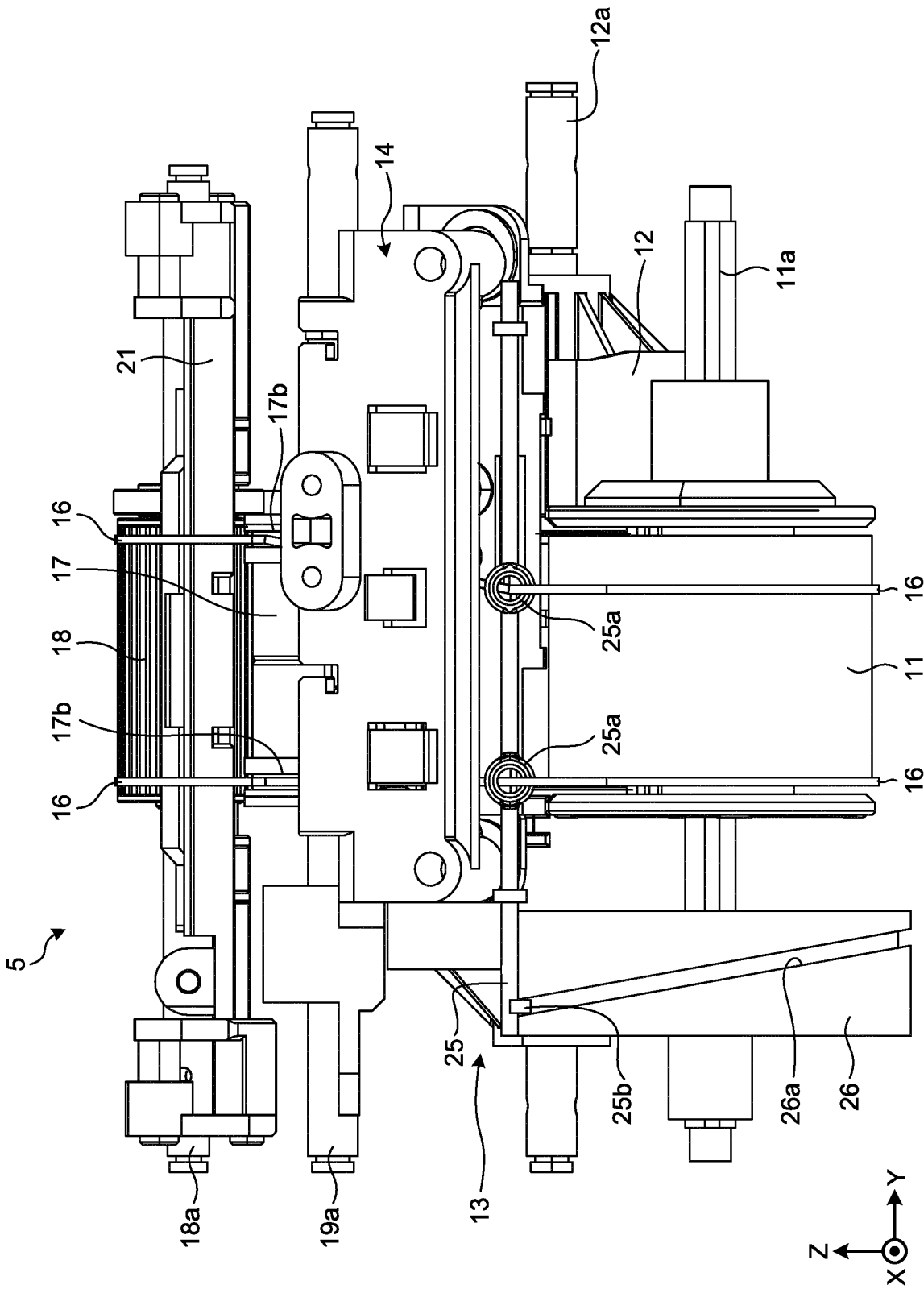


FIG.6

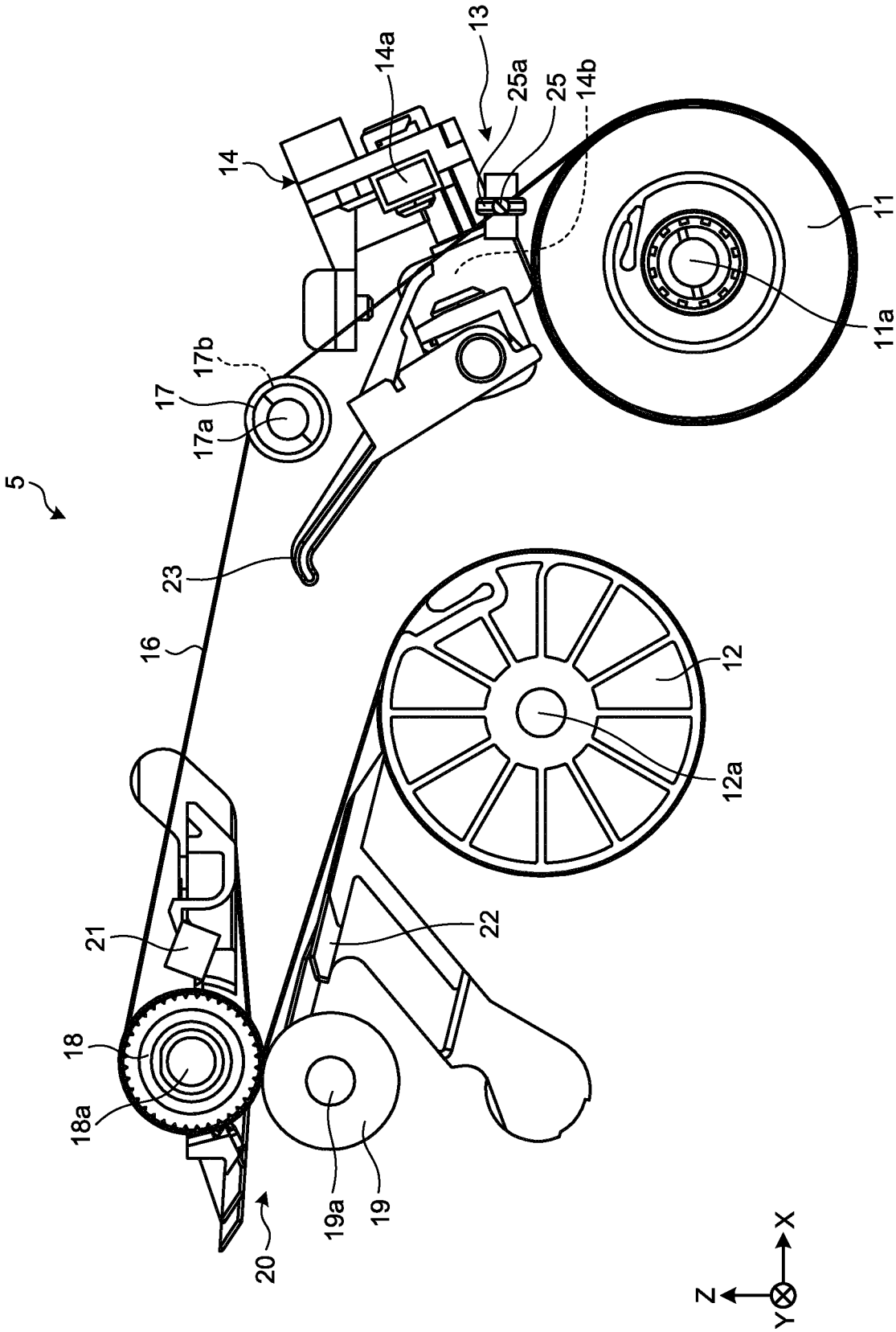


FIG.7A

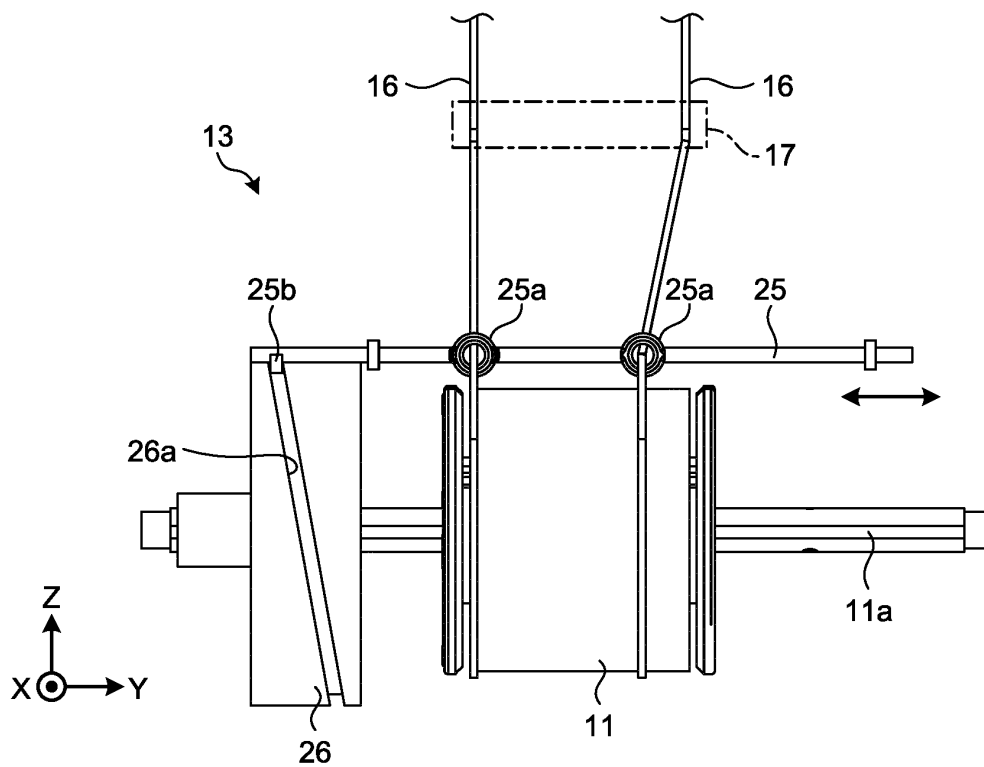


FIG.7B

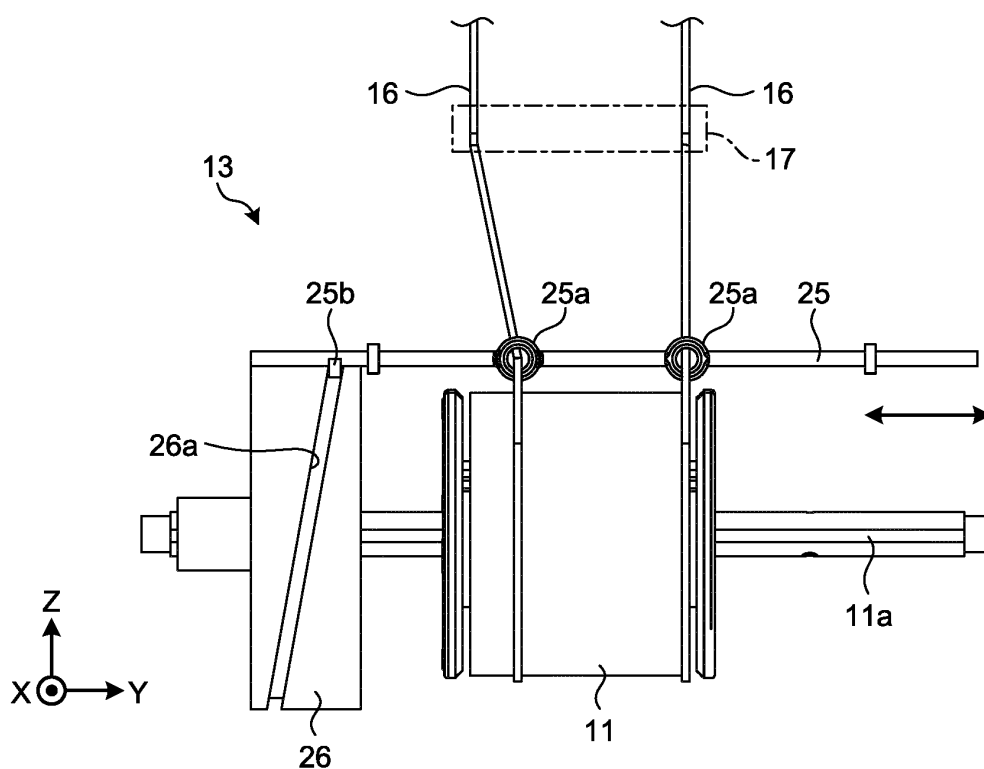


FIG.8A

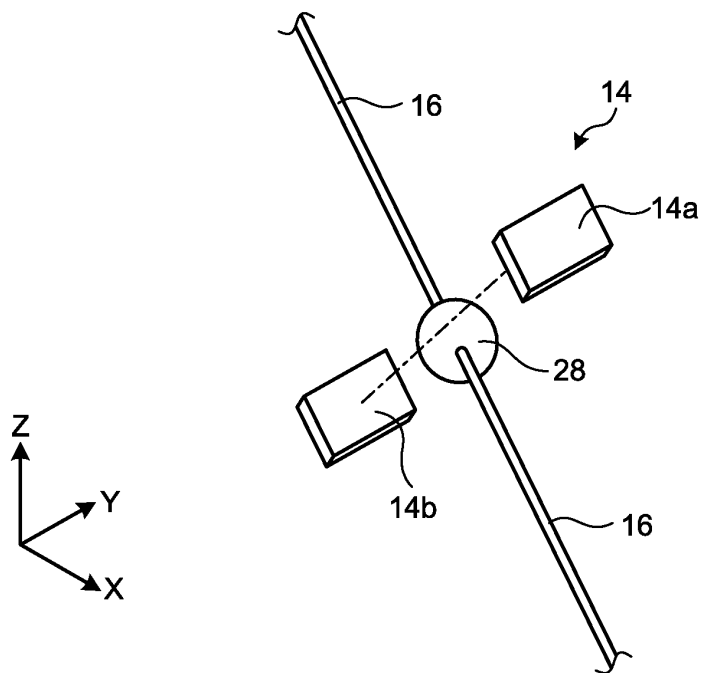


FIG.8B

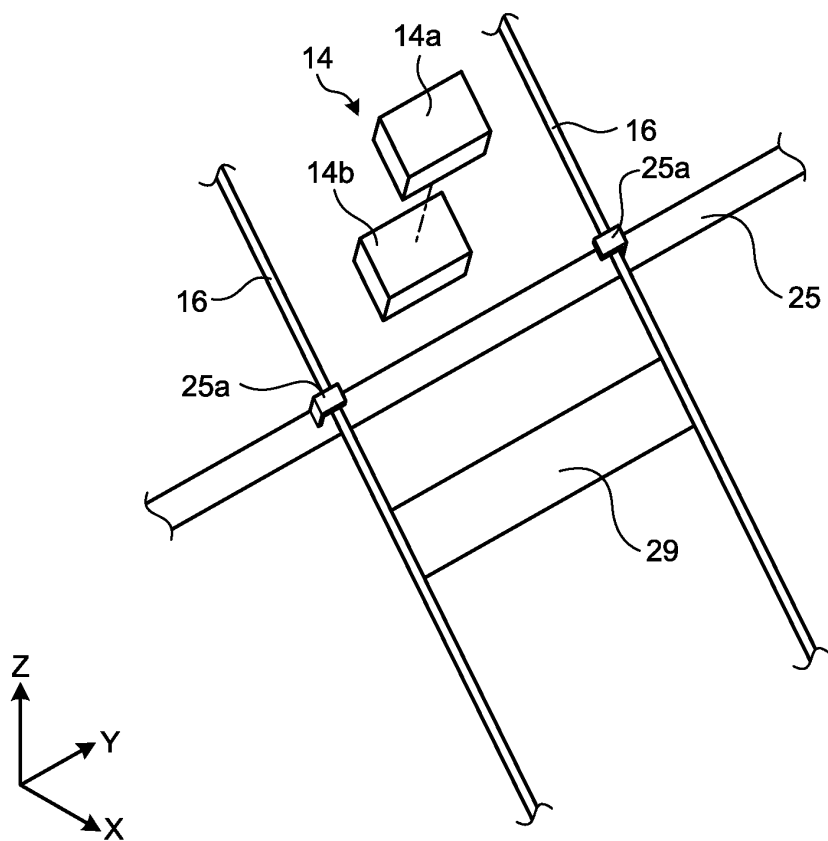


FIG.9

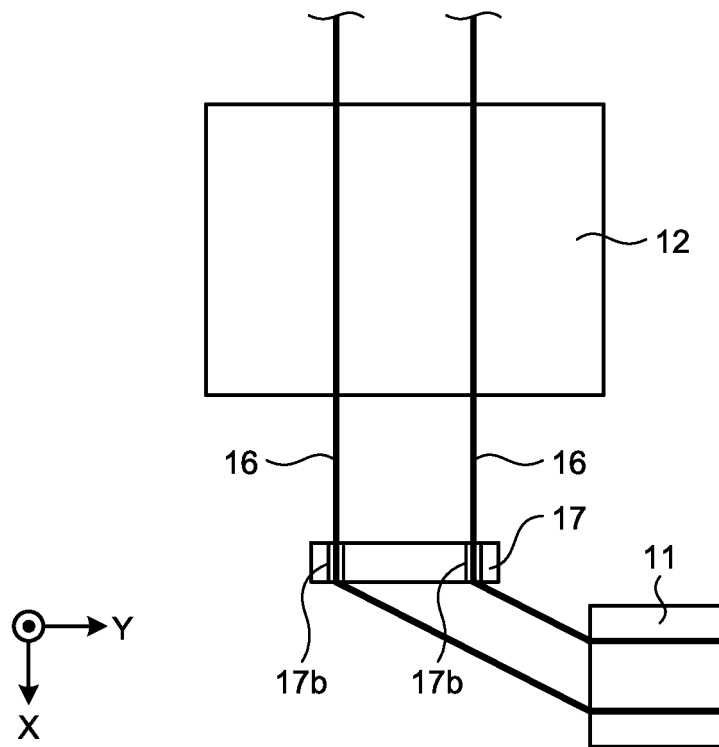
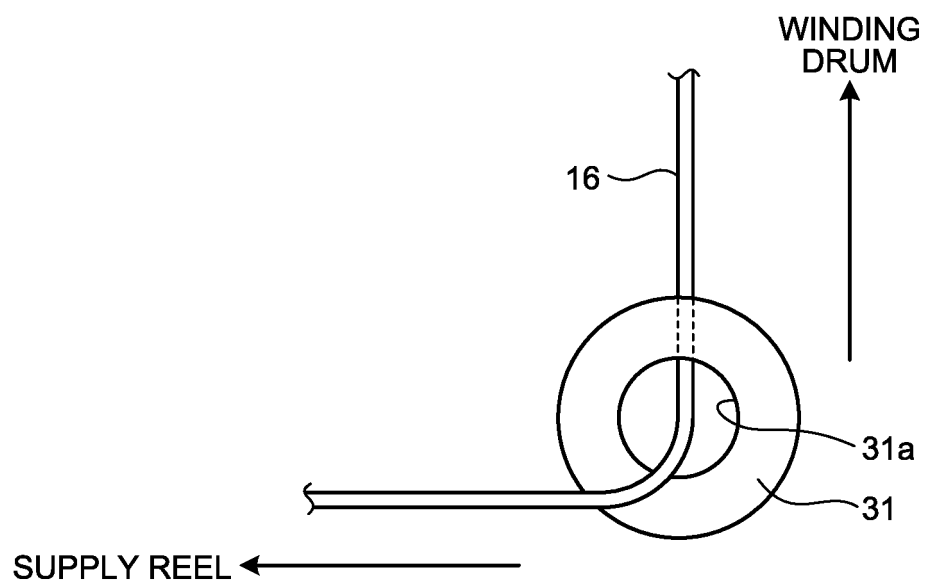


FIG.10



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/027640

A. CLASSIFICATION OF SUBJECT MATTER B65H29/51(2006.01) i According to International Patent Classification (IPC) or to both national classification and IPC																				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) B65H5/28, 29/51, 57/06-57/10, 57/14, G07D9/00, 11/00																				
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2017 Kokai Jitsuyo Shinan Koho 1971-2017 Toroku Jitsuyo Shinan Koho 1994-2017																				
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)																				
C. DOCUMENTS CONSIDERED TO BE RELEVANT																				
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td rowspan="3">JP 7-228404 A (Dainippon Printing Co., Ltd.), 29 August 1995 (29.08.1995), paragraphs [0003] to [0005]; fig. 6 to 7 (Family: none)</td> <td>1</td> </tr> <tr> <td>Y</td> <td>2, 6</td> </tr> <tr> <td>A</td> <td>3-5</td> </tr> <tr> <td>Y</td> <td rowspan="2">JP 9-295754 A (Kao Corp.), 18 November 1997 (18.11.1997), paragraph [0011]; fig. 2 (Family: none)</td> <td>2, 6</td> </tr> <tr> <td>A</td> <td>3-5</td> </tr> <tr> <td>A</td> <td>JP 60-106744 A (Kiyoto UCHIDA), 12 June 1985 (12.06.1985), (Family: none)</td> <td>1-6</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	JP 7-228404 A (Dainippon Printing Co., Ltd.), 29 August 1995 (29.08.1995), paragraphs [0003] to [0005]; fig. 6 to 7 (Family: none)	1	Y	2, 6	A	3-5	Y	JP 9-295754 A (Kao Corp.), 18 November 1997 (18.11.1997), paragraph [0011]; fig. 2 (Family: none)	2, 6	A	3-5	A	JP 60-106744 A (Kiyoto UCHIDA), 12 June 1985 (12.06.1985), (Family: none)	1-6		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																		
X	JP 7-228404 A (Dainippon Printing Co., Ltd.), 29 August 1995 (29.08.1995), paragraphs [0003] to [0005]; fig. 6 to 7 (Family: none)	1																		
Y		2, 6																		
A		3-5																		
Y	JP 9-295754 A (Kao Corp.), 18 November 1997 (18.11.1997), paragraph [0011]; fig. 2 (Family: none)	2, 6																		
A		3-5																		
A	JP 60-106744 A (Kiyoto UCHIDA), 12 June 1985 (12.06.1985), (Family: none)	1-6																		
☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.																				
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family																			
Date of the actual completion of the international search 12 September 2017 (12.09.17)	Date of mailing of the international search report 26 September 2017 (26.09.17)																			
Name and mailing address of the ISA/ Japan Patent Office 3-4-3, Kasumigaseki, Chiyoda-ku, Tokyo 100-8915, Japan	Authorized officer Telephone No.																			

Form PCT/ISA/210 (second sheet) (January 2015)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2017/027640

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2013-52950 A (Konica Minolta Business Technologies, Inc.), 21 March 2013 (21.03.2013), & US 2013/0058693 A1	1-6
A	JP 51-51338 A (Ing C. Olivetti & C. S.p.A.), 06 May 1976 (06.05.1976), & US 3971553 A & GB 1480980 A & DE 2535604 A1 & IT 1020700 B	1-6

Form PCT/ISA/210 (continuation of second sheet) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2016003095 A [0003]