



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
09.03.2016 Bulletin 2016/10

(51) Int Cl.:
B65H 1/22 (2006.01) **B65H 1/02 (2006.01)**
B65H 3/12 (2006.01) **B65H 1/30 (2006.01)**

(21) Application number: **15181685.7**

(22) Date of filing: **20.08.2015**

(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

(71) Applicant: **Kabushiki Kaisha Toshiba**
Minato-ku
Tokyo 105-8001 (JP)

(72) Inventor: **USAMI, Yusuke**
Tokyo, Tokyo 105-8001 (JP)

(74) Representative: **Horn Kleimann Waitzhofer**
Patentanwälte PartG mbB
Ganghoferstrasse 29a
80339 München (DE)

(30) Priority: **02.09.2014 JP 2014178205**

(54) **SHEET FEEDING DEVICE AND SHEET PROCESSING APPARATUS**

(57) A sheet feeding device (10) has a conveying belt (21), a first roller (22), a second roller (23), a support portion (24), a takeout section (3). The conveying belt is wound along the first roller and the second roller, and the first roller forms a conveying terminal portion (31) of the conveying belt in the first conveying direction. The second roller forms a slope portion (32) of the conveying belt that slopes downward toward the conveying terminal portion.

The support portion supports each of a plurality of sheets dropped from the conveying terminal portion in an upright position, at a position more downward in the vertical direction than the conveying terminal portion. The upper sheet, out of the sheets which are overlapping on the conveying belt in the vertical direction, is arranged to relatively deviate toward a downstream side in the first conveying direction than the lower sheet.

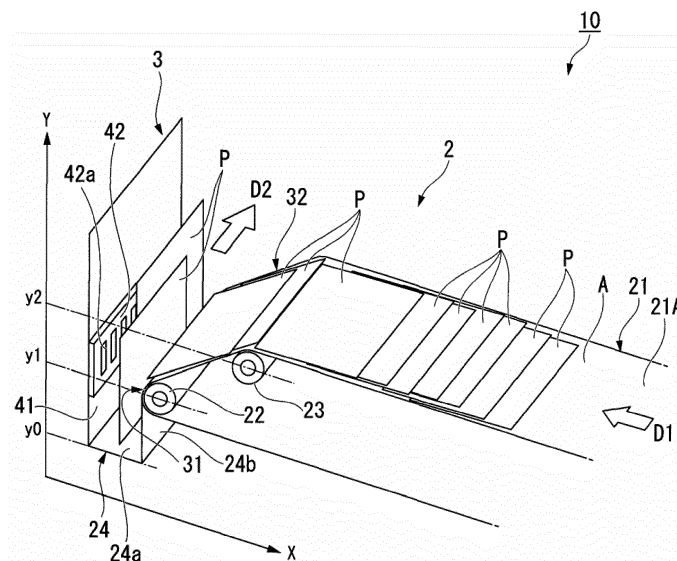


FIG. 2

Description

FIELD

[0001] Embodiments relate to a sheet feeding device and a sheet processing apparatus.

BACKGROUND

[0002] Conventionally, there has been a sheet feeding device which feeds a plurality of sheets overlapped in an upright position, to a takeout section which takes out tipmost sheets one by one from a plurality of overlapped sheets. In this sheet feeding device, when a sheet is thin or when a sheet is soft, it becomes difficult to feed sheets to the takeout section in an upright position, and thereby there has been a possibility that the takeout section cannot properly take out sheets.

BRIEF DESCRIPTION OF THE DRAWINGS

[0003]

Fig. 1 is perspective view showing a configuration of a sheet processing apparatus provided with a sheet feeding device of an embodiment.

Fig. 2 is a perspective view schematically showing a configuration of the sheet feeding device of the embodiment.

Fig. 3 is a side view schematically showing a vertical movement of the first roller of the sheet feeding device of the embodiment.

Fig. 4 is a side view schematically showing a configuration of a sheet feeding device according to a first modification of the embodiment.

Fig. 5 is a perspective view schematically showing a configuration of a sheet feeding device according to a second modification of the embodiment.

Fig. 6 is a side view schematically showing a configuration of a sheet feeding device according to a third modification of the embodiment.

Fig. 7 is a side view schematically showing a configuration of a sheet feeding device according to a fourth modification of the embodiment.

DETAILED DESCRIPTION

[0004] A sheet feeding device of an embodiment has a conveying belt, a first roller, a second roller, a support portion, a takeout section. The conveying belt conveys a plurality of sheets in a first conveying direction. The conveying belt is wound along a first roller, and the first roller forms a conveying terminal portion of the conveying belt in the first conveying direction. The conveying belt is wound along the second roller at a more upstream side in the first conveying direction than the first roller. The second roller forms a slope portion of the conveying belt that slopes downward toward the conveying terminal por-

tion. The support portion supports each of the plurality of sheets dropped from the conveying terminal portion in an upright position, at a position more downward in the vertical direction than the conveying terminal portion. The takeout section takes out a topmost sheet from the plurality of sheets arranged in the support portion, and conveys the taken-out sheet in a second conveying direction. The plurality of sheets is loaded on the conveying belt in an overlapping manner. The upper sheet, out of the sheets which are overlapping on the conveying belt in the vertical direction, is arranged to relatively deviate toward a downstream side in the first conveying direction than the lower sheet.

[0005] Hereinafter, a sheet feeding device and a sheet processing apparatus of an embodiment will be described with reference to the drawings.

[0006] A sheet processing apparatus 1 of an embodiment is provided with a controller 1a, a feeding section 2, a takeout section 3, a rejection accumulating section 4, a reading recognition section 5, a sorting and stacking section (sorting processing section) 6, as shown in Fig. 1.

[0007] The controller 1a totally controls an operation of the sheet processing apparatus 1.

[0008] The feeding section 2 holds a plurality of stacked sheets in a prescribed posture state. The feeding section 2 moves a plurality of sheets in a first conveying direction, and thereby feeds the plurality of sheets to the takeout section 3 which exists at a forefront side in the first conveying direction. The sheets are a letter such as a postcard, and a flat document such as an envelope, for example. The sheet has a first surface on which sorting information is written or printed.

[0009] The takeout section 3 takes out, out of a plurality of sheets fed by the feeding section 2, top sheets in the first conveying direction one by one, and sends out the taken-out sheet toward a conveying section (not shown) in a second conveying direction.

[0010] The rejection accumulating section 4 is provided in the conveying section. The rejection accumulating section 4 accumulates a sheet to be rejected, out of a plurality of sheets taken out by the takeout section 3. The rejection accumulating section 4 detects a sheet with a thickness exceeding a specified thickness, and a sheet in which a foreign body is contained, and accumulates and recovers the detected sheet. In addition, the rejection accumulating section 4 detects a sheet whose conveying posture is deviated from a prescribed posture, and accumulates and recovers the detected sheet.

[0011] The reading recognition section 5 acquires sorting information given to a sheet.

[0012] The sorting and stacking section 6 sorts and stacks a sheet in accordance with the sorting information of the sheet.

[0013] A sheet feeding device 10 is provided with the feeding section 2 and the takeout section 3.

[0014] The feeding section 2 is provided with a conveying belt 21, a first roller 22, a second roller 23, a support portion 24, as shown in Fig. 2.

[0015] The conveying belt 21 is formed of flexible material. The conveying belt 21 is a tubular endless belt formed of a flat belt, for example. The conveying belt 21 is wound along a plurality of rollers including at least the first roller 22 and the second roller 23. At least any one roller out of the plurality of rollers is a drive roller which generates a rotation driving force. The conveying belt 21 rotates by a driving force which the drive roller generates, and makes the other roller to be driven to rotate. As for the conveying belt 21, an upper surface of an outer surface 21A in which a normal line direction thereof is a vertical upward direction (a Y direction shown in Fig. 2), or an upper surface of an outer surface 21A in a slope direction which slopes to form a prescribed sharp angle with respect to the vertical upward direction is used as a loading surface A on which a plurality of sheets P are to be loaded in an overlapping manner. The loading surface A generates a friction force between the loading surface A and each sheet P which is larger than a friction force between the two overlapping sheets. The conveying belt 21 conveys a plurality of sheets P on the loading surface A in a first conveying direction D1 that is the longitudinal direction of the conveying belt 21. Out of the sheets P which are overlapping in the vertical direction on the loading surface A, an upper sheet P is arranged to relatively deviate toward the forward side (downstream side) in the first conveying direction D1 than a lower sheet P.

[0016] The conveying belt 21 is wound along the first roller 22, and the first roller 22 forms a conveying terminal portion 31 of the conveying belt 21 in the first conveying direction D1. The conveying terminal portion 31 is an end portion of the loading surface A of the conveying belt 21 in the first conveying direction D1. The conveying terminal portion 31 sequentially drops each of the plurality of sheets on the loading surface A toward the support portion 24 in the downward vertical direction described later. In the following, a position y1 of the central axis of the first roller 22 in the vertical direction is determined as a position of the conveying terminal portion 31 in the vertical direction, for example. The first roller 22 is provided with a displacement mechanism (not shown) which displaces the central axis in the vertical direction.

[0017] The second roller 23 is arranged upward in the vertical direction than the first roller 22, at a more upstream side in the first conveying direction D1 than the first roller 22. That is, a position y2 of the central axis of the second roller 23 in the vertical direction is set more upward than the position y1 of the central axis of the first roller 22 in the vertical direction. The conveying belt 21 is wound along the second roller 23, and the second roller 23 forms a slope portion 32 of the conveying belt 21 which slopes downward toward the conveying terminal portion 31.

[0018] The support portion 24 is arranged downward in the vertical direction than the conveying terminal portion 31. The support portion 24 supports each of the plurality of sheets P dropped downward in the vertical direc-

tion from the conveying terminal portion 31, in an upright position. The support portion 24 is provided with a bottom wall 24a forming a horizontal plane and a guide wall 24b forming a vertical plane. A position y0 of the bottom wall 24a in the vertical direction is set lower than the position y1 of the conveying terminal portion 31 in the vertical direction. The bottom wall 24a supports the lower end of each of the sheets P in an upright position. A length of the bottom wall 24a in the first conveying direction D1, that is an interval between the guide wall 24b and the takeout section 3, is formed to a length enough to maintain upright position of a prescribed number (one - several sheets, for example) of the sheets P. Or the interval between the guide wall 24b and the takeout section 3 is formed such that the guide wall 24b or the takeout section 3 can help upright position of a prescribed number (one - several sheets, for example) of the sheets P. The guide wall 24b is formed so as to approximately vertically rise from an end portion of the back side of the bottom wall 24a in the first conveying direction D1. The guide wall 24b comes in contact with a sheet P at the rearmost end in the first conveying direction D1, out of a plurality of sheets P supported by the bottom wall 24a, to help the upright position of each of the sheets P. The guide wall 24b prevents that each sheet P which has dropped from the conveying terminal portion 31 is caught into the backward side in the first conveying direction D1, by the conveying belt 21.

[0019] The takeout section 3 is provided with a guide plate 41 and a suction belt 42.

[0020] The guide plate 41 is arranged so as to approximately vertically rise from the end portion of the forward side (downstream side) of the bottom wall 24a in the first conveying direction D1. The suction belt 42 is an endless belt formed with a plurality of suction holes 42a. A negative pressure or a positive pressure (a pressure higher than the atmospheric pressure) is given to a plurality of the suction holes 42a, by a valve device (not shown) provided with a vacuum pump (not shown) and an air chamber (not shown), and so on. When a negative pressure is given to the plurality of suction holes 42a by the valve device, the plurality of suction holes 42a suck and take out a front sheet P in the first conveying direction D1 from a plurality of the sheets P arranged in the support portion 24.

[0021] As for the suction belt 42, a part of a region thereof is exposed on the surface of the guide plate 41. The suction belt 42 rotates by a driving force which a drive mechanism (not shown) generates. The drive mechanism is provided with a plurality of pulleys (not shown) along which the suction belt 42 is wound, and a drive motor (not shown) coupled to at least any one of the plurality of pulleys, for example. In the suction belt 42, the region exposed on the surface of the guide plate 41 moves in a second conveying direction D2 orthogonal to the first conveying direction D1, by the driving force which the drive mechanism generates. The suction belt 42 is rotationally driven by the drive mechanism in a state

that a negative pressure is given to the plurality of suction holes 42a. By this means, the suction belt 42 conveys the sheets P taken out sequentially one by one from the support portion 24 toward the conveying section of the second conveying direction D2.

[0022] Hereinafter, an operation of the sheet feeding device 10 of the embodiment will be described.

[0023] To begin with, the controller 1a sets the position of the first roller 22 in the vertical direction (that is, the position y1 of the central axis of the first roller 22 in the vertical direction), in accordance with an instruction which an operator inputs from an input device (not shown) to the controller 1a. The controller 1a sets a distance between the position y1 of the conveying terminal portion 31 and the position y0 of the bottom wall 24a of the support portion 24 to a prescribed vertical direction distance in accordance with a size of a sheet P to be conveyed, based on the instruction of the operator. The size of the sheet P is a length of the sheet P in the first conveying direction D1, for example, that is a height in the vertical direction of the sheet P which is in an upright position in the support portion 24. The prescribed vertical direction distance changes in an upward trend as a size of the sheet P increases, and changes in a downward trend as a size of the sheet P decreases. The first roller 22 moves the central axis up and down in the vertical direction by an instruction from the controller 1a, in accordance with a size of each sheet P on the loading surface A, as shown in Fig. 3. By this means, the first roller 22 changes a dropping height of each sheet P dropping from the conveying terminal portion 31 to the support portion 24, in accordance with a size of each sheet P.

[0024] And, the controller 1a rotationally drives the conveying belt 21, to convey a plurality of the sheets P loaded on the loading surface A in an overlapping manner toward the conveying terminal portion 31 in the first conveying direction D1. The plurality of sheets P are stacked and arranged on the loading surface in a prescribed posture state, by a collection operation of an operator which has been previously performed. Out of the sheets P which are overlapping in the vertical direction on the loading surface A, an upper sheet P is arranged to relatively deviate toward the forward side (downstream side) in the first conveying direction D1 than a lower sheet P. The loading surface A of the conveying belt 21 is arranged horizontal to a position in front of the second roller 23 in the first conveying direction D1, and at the slope portion 32 ranging from the second roller 23 to the first roller 22, the loading surface A is arranged to form a downward slope. The conveying belt 21 conveys each sheet P from the front of the second roller 23 to the slope portion 32, to thereby change a posture of each sheet P from a horizontal state to a tilted state.

[0025] The conveying belt 21 conveys each sheet P to the conveying terminal portion 31, and thereby sequentially drops uppermost sheets P, out of a plurality of the sheets P overlapping on the loading surface A, one by one from the conveying terminal portion 31 to the support

portion 24 of the vertical downward direction. More specifically, since, an upper sheet P, out of the sheets P which are overlapping, is arranged to relatively deviate toward the forward side in the first conveying direction D1 than a lower sheet P, the upper sheet P is held on the loading surface A by a friction force between the upper sheet P and the loading surface A, in a state that a part of the upper sheet P is directly in contact with the loading surface A. Since the upper sheet P gradually projects outward from the conveying terminal portion 31 earlier than the lower sheet P, in accordance with the driving of the conveying belt 21, when at least a region of the upper sheet P which is directly in contact with the loading surface A is not present, a friction force between the upper sheet P and the loading surface A is lost, and thereby the upper sheet P drops out from on the loading surface A. When the upper sheet P drops out from on the loading surface A, a part of the lower sheet is directly in contact with the loading surface A yet, the lower sheet P is held on the loading surface A, by a friction force between the lower sheet P and the loading surface A.

[0026] The conveying belt 21 drops each sheet P in a state that its posture is tilted, from the conveying terminal portion 31. By this means, it is possible to make each sheet P self-stand more easily in the support portion 24, compared with a case in which each sheet P in a state that its posture is horizontal is dropped from the conveying terminal portion 31, for example.

[0027] And, the controller 1a makes the valve device and the drive mechanism of the takeout section 3 operate, to drive the suction belt 42 which is exposed on the surface of the guide plate 41 in the second conveying direction D2, while giving a negative pressure to a plurality of the suction holes 42a of the suction belt 42. The suction belt 42 draws and sucks a front sheet P in the first conveying direction D1 from a plurality of the sheet P arranged in the support portion 24 in an upright position, and conveys it toward the conveying section of the second conveying direction D2.

[0028] According to the above-described embodiment, the sheet feeding device 10 has the conveying belt 21 on which a plurality of sheets P are loaded in an overlapping manner, and thereby, even when the plurality of sheets P are thin, or the plurality of sheets P are soft, the sheet feeding device 10 can properly convey the plurality of sheets P. The sheet feeding device 10 has the conveying belt 21 on which an upper sheet P, out of the sheets P which are overlapping, is arranged to relatively deviate toward the forward side (downstream side) in the first conveying direction D1 than a lower sheet P, and thereby can sequentially feed the plurality of sheets P one by one from the conveying terminal portion 31 to the support portion 24. The sheet feeding device 10 has the support portion 24 downward the conveying terminal portion 31 in the vertical direction, and thereby can support each sheet P dropped from the conveying terminal portion 31 in an upright position by the support portion 24. The sheet feeding device 10 has the second roller 23 to

form the slope portion 32 of the conveying belt 21 which slopes downward toward the conveying terminal portion 31, and thereby can drop each sheet P in a tilted posture from the conveying terminal portion 31, and can make each sheet P easily self-stand in the support portion 24.

[0029] The sheet feeding device 10 has the first roller 22 which moves up and down in the vertical direction, to change the position of the conveying terminal portion 31 in the vertical direction, and thereby can change a dropping height of each sheet P which drops from the conveying terminal portion 31 to the support portion 24, in accordance with a size (a height in an upright position) of each sheet P.

[0030] Hereinafter, a first modification will be described.

[0031] In the above-described embodiment, a plurality of sheets P are stacked and arranged on the loading surface A in a prescribed posture state by an operator. But the embodiment is not limited to this.

[0032] The sheet feeding device 10 according to a first modification may be provided with a first position adjusting portion 51 which automatically causes a plurality of sheets P loaded on the loading surface A in an overlapping manner to be in a prescribed posture state, as shown in Fig. 4.

[0033] The first position adjusting portion 51 slopes downward the conveying belt 21 toward the forward side of the first conveying direction D1, at the front of the second roller 23 in the first conveying direction D1, and vibrates the conveying belt 21 at an appropriate timing. By this means, the first position adjusting portion 51 relatively deviates an upper sheet P, out of the sheets P which are overlapping in the vertical direction on the loading surface A, toward the forward side (downstream side) in the first conveying direction D1 than a lower sheet P.

[0034] Hereinafter, a second modification will be described.

[0035] In the above-described embodiment, a plurality of sheets P are stacked and arranged on the loading surface A in a prescribed posture state by a collection operation of an operator which is previously performed. But a modification of the embodiment is not limited to this.

[0036] The sheet feeding device 10 according to a second modification may be provided with a second position adjusting portion 52 which automatically causes a plurality of sheets P loaded on the loading surfaces A in an overlapping manner to be in a prescribed posture state, as shown in Fig. 5.

[0037] In the sheet feeding device 10 according to the second modification, the conveying belt 21 is provided with a pair of separation conveying belts 21a, 21a which are separated with a prescribed interval in the width direction. Each of the pair of separation conveying belts 21a, 21a is wound along a plurality of rollers including at least the first roller 22 and the second roller 23, and conveys the plurality of sheets P in the first conveying direction D1. At least one or more (for example, 3 shown in Fig. 5, or the like) second position adjusting portions 52

are arranged in a region 21b between the pair of separation conveying belts 21a, 21a. The second position adjusting portion 52 is a roller, a belt or the like which rotates in a direction reverse to the rotation direction of the pair of separation conveying belts 21a, 21a. The second position adjusting portion 52 projects slightly upward in the vertical direction from the loading surfaces A that are the outer surfaces 21A of the pair of separation conveying belts 21a, 21a. The second position adjusting portion 52 gives a driving force in the reverse direction (that is backward side of the first conveying direction D1) to a sheet P which is directly in contact with the second position adjusting portion 52, out of the plurality of sheets P to be conveyed in the first conveying direction D1 by the pair of separation conveying belts 21a, 21a. The driving force which the second position adjusting portion 52 gives to each sheet P is weaker than a driving force which the pair of separation conveying belts 21a, 21a gives to the each sheet P. By this means, the second position adjusting portion 52 relatively deviates a lower sheet P which is in contact with the second position adjusting portion 52, out of the sheets P which are overlapping in the vertical direction on the loading surfaces A, toward the backward side (upstream side) in the first conveying direction D1 than an upper sheet P.

[0038] Hereinafter, a third modification will be described.

[0039] The above-described second modification of the embodiment is provided with the second position adjusting portion 52 in the region 21b between the pair of separation conveying belts 21a, 21a. But, without being limited to this, a modification of the embodiment may be provided with a third position adjusting portion 53 in place of the second position adjusting portion 52.

[0040] In the sheet feeding device 10 according to a third modification, the third position adjusting portion 53 is provided with a blowing portion 53a to blow out air to a sheet P on the loading surfaces A, and a suction portion 53b which sucks a sheet P on the loading surfaces A by sucking air, as shown in Fig. 6. A negative pressure and a positive pressure (a pressure higher than the atmospheric pressure) are respectively given to the suction portion 53b and the blowing portion 53a, by a valve device (not shown) of the takeout section 3, for example. The blowing portion 53a is arranged at the downstream of the suction portion 53b in the first conveying direction D1. A suction force which the suction portion 53b gives to each sheet P is weaker than a driving force which the pair of separation conveying belts 21a, 21a gives to the each sheet P. By this means, the third position adjusting portion 53 relatively deviates a lower sheet P which is sucked by the suction portion 53b, out of the sheets P which are overlapping in the vertical direction on the loading surfaces A, toward the backward side (upstream side) in the first conveying direction D1 than an upper sheet P.

[0041] Hereinafter, a fourth modification will be described.

[0042] In the above-described embodiment, the first

roller 22 is provided with the displacement mechanism (not shown) which displaces the central axis in the vertical direction. But a modification of the embodiment is not limited to this.

[0043] The sheet feeding device 10 according to a fourth embodiment may be provided with a support portion displacement mechanism (not shown) to displace the bottom wall 24a of the support portion 24 in the vertical direction, in place of the displacement mechanism of the first roller 22, or in addition to the displacement mechanism of the first roller 22 as shown in Fig. 7. The support portion 24 moves the bottom wall 24a up and down in the vertical direction in accordance with a size of each sheet P on the loading surface A, as shown in Fig. 7. By this means, the support portion 24 changes a dropping height of each sheet P dropping from the conveying terminal portion 31 to the support portion 24, in accordance with a size of the each sheet P.

[0044] Hereinafter, another modification will be described.

[0045] The above-described embodiment may be provided with a conveying portion (not shown) to convey a plurality of sheets P supported by the bottom wall 24a toward the takeout section 3, the conveying portion may be arranged at the bottom wall 24a of the support portion 24. The conveying portion is a belt or the like which slightly projects upward from the surface of the bottom wall 24a in the vertical direction, for example, and is driven toward the forward side of the first conveying direction D1.

[0046] According to at least one of the embodiments and modifications as described above, the sheet feeding device and the sheet processing apparatus have the conveying belt 21 on which a plurality of sheets P are loaded in an overlapping manner, and thereby, even when the plurality of sheets P are thin, or the plurality of sheets P are soft, they can properly convey the plurality of sheets P. The sheet feeding device and the sheet processing apparatus have the conveying belt 21 on which an upper sheet P, out of the sheets P which are overlapping, is arranged to relatively deviate toward the forward side (downstream side) in the first conveying direction D1 than a lower sheet P, and thereby can feed the plurality of sheets P sequentially one by one from the conveying terminal portion 31 to the support portion 24. The sheet feeding device and the sheet processing apparatus have the support portion 24 downward the conveying terminal portion 31 in the vertical direction, and thereby can support each sheet P dropped from the conveying terminal portion 31 in an upright position by the support portion 24. The sheet feeding device and the sheet processing apparatus have the second roller 23 to form the slope portion 32 of the conveying belt 21 which slopes downward toward the conveying terminal portion 31, and thereby can drop each sheet P in a tilted posture from the conveying terminal portion 31, and can make each sheet P easily self-stand in the support portion 24.

[0047] While certain embodiments have been de-

scribed, these embodiments have been presented by way of example only, and are not intended to limit the scope of the inventions.

Claims

1. A sheet feeding device, comprising:

a conveying belt to convey a plurality of sheets in a first conveying direction;
a conveying terminal portion at an end of the conveying belt;
a first and a second roller along which the conveying belt is wound, wherein the first roller is positioned lower and downstream in the first conveying direction from the second roller thereby forming a sloped portion of the conveying belt;
a support portion below the conveying terminal portion which supports each of the plurality of sheets dropped from the sloped portion in an upright position; and
a takeout section which takes out a front sheet from the plurality of sheets arranged on the support portion, and conveys the taken-out sheet in a second conveying direction;
wherein the plurality of sheets being loaded on the conveying belt are positioned in an overlapping manner.

2. The sheet feeding device according to Claim 1, wherein a distance between the conveying terminal portion of the conveying belt and the support portion in the vertical direction can be changed.

3. The sheet feeding device according to Claim 1 or 2, wherein the first roller can change a position thereof in the vertical direction.

4. The sheet feeding device according to any one of Claims 1 to 3, wherein the support portion can change a position thereof in the vertical direction.

5. The sheet feeding device according to any one of Claim 1 to Claim 4, further comprising a position adjusting portion which arranges the upper sheet, out of the sheets which are overlapping on the conveying belt in the vertical direction, to relatively deviate toward the downstream side in the first conveying direction than the lower sheet.

6. The sheet feeding device according to Claim 5, wherein the position adjusting portion slopes downward the conveying belt toward a downstream in the first conveying direction, at an upstream side of the first roller in the first conveying direction, and vibrates the relevant conveying belt which slopes downward.

7. The sheet feeding device according to Claim 5 or 6, wherein:

the conveying belt comprises a pair of separation conveying belts which are separated with a prescribed interval in a width direction thereof; and
 the position adjusting portion has a roller which rotates in a direction reverse to a rotation direction of the first roller, and is arranged between the pair of separation conveying belts, at an upstream side of the first roller in the first conveying direction, and an outer surface of the relevant roller projects upward from surfaces of the pair of separation conveying belts.

8. The sheet feeding device according to Claim 5 or 6, wherein:

the conveying belt comprises a pair of separation conveying belts which are separated with a prescribed interval in a width direction thereof; and
 the position adjusting portion has a blowing portion to blow out air and a suction portion to suck air, which are arranged between the pair of separation conveying belts, at an upstream side of the first roller in the first conveying direction, and the blowing portion is arranged at a downstream of the suction portion in the first conveying direction.

9. The sheet feeding device according to any one of Claim 1 to Claim 8, further comprising a conveying portion to convey the plurality of sheets arranged in the support portion toward the takeout section.

10. A sheet processing apparatus, comprising:

a conveying belt to convey a plurality of sheets in a first conveying direction;
 a first roller along which the conveying belt is wound, which forms a conveying terminal portion of the conveying belt;
 a second roller along which the conveying belt is wound that is upstream from the first roller in a first conveying direction, the first and second rollers forming a slope portion of the conveying belt that slopes downward toward the conveying terminal portion ;
 a support portion which supports each of the plurality of sheets dropped from the conveying terminal portion in an upright position, the support portion located lower than the conveying terminal portion;
 a takeout section which takes out a front sheet from the plurality of sheets arranged in the support portion, and conveys the taken-out sheet in

a second conveying direction;
 wherein the plurality of sheets being loaded on the conveying belt are arranged in an overlapping manner; and
 a sorting processing section to perform sorting processing of the plurality of sheets to be conveyed by a sheet processing device.

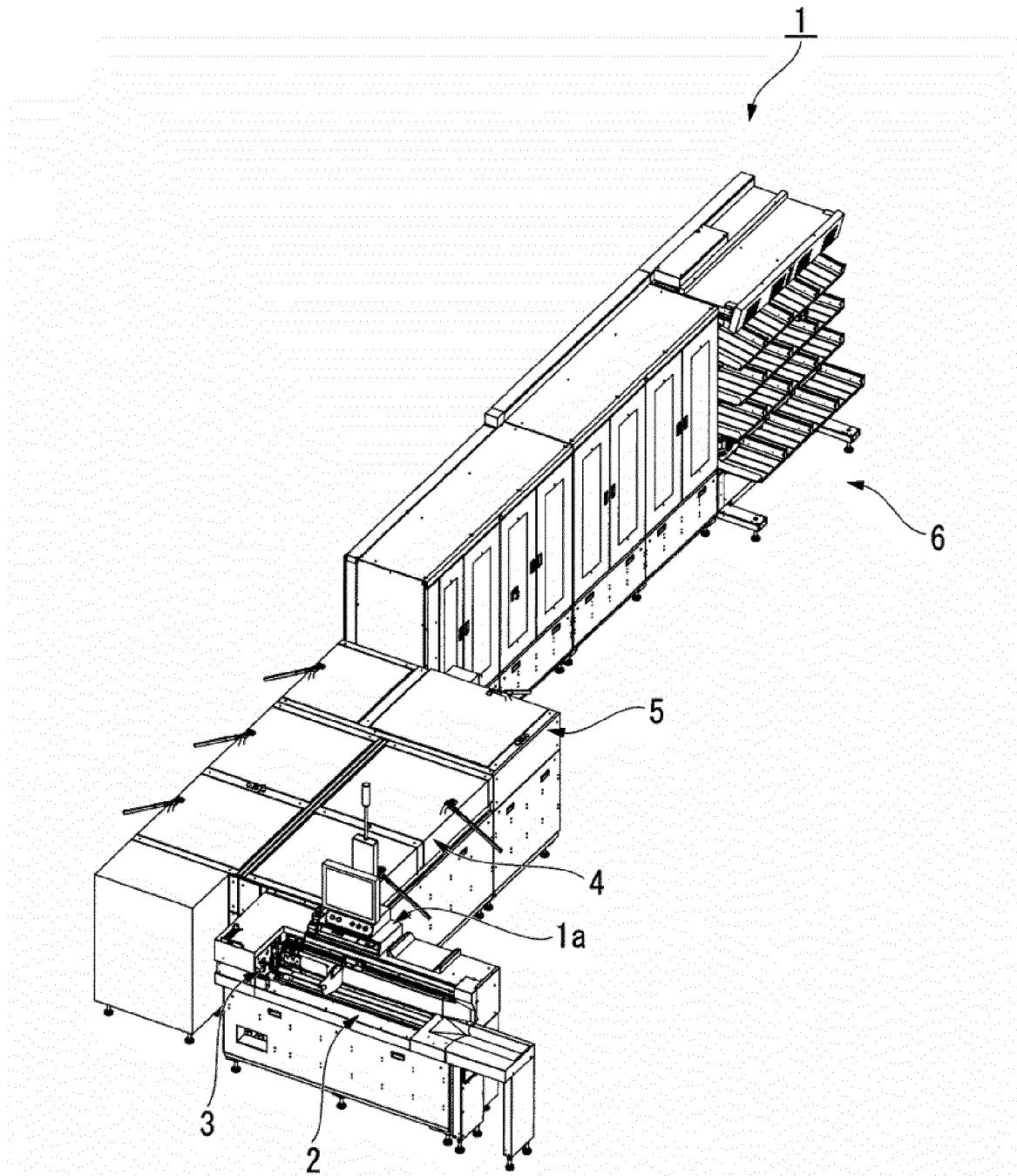


FIG. 1

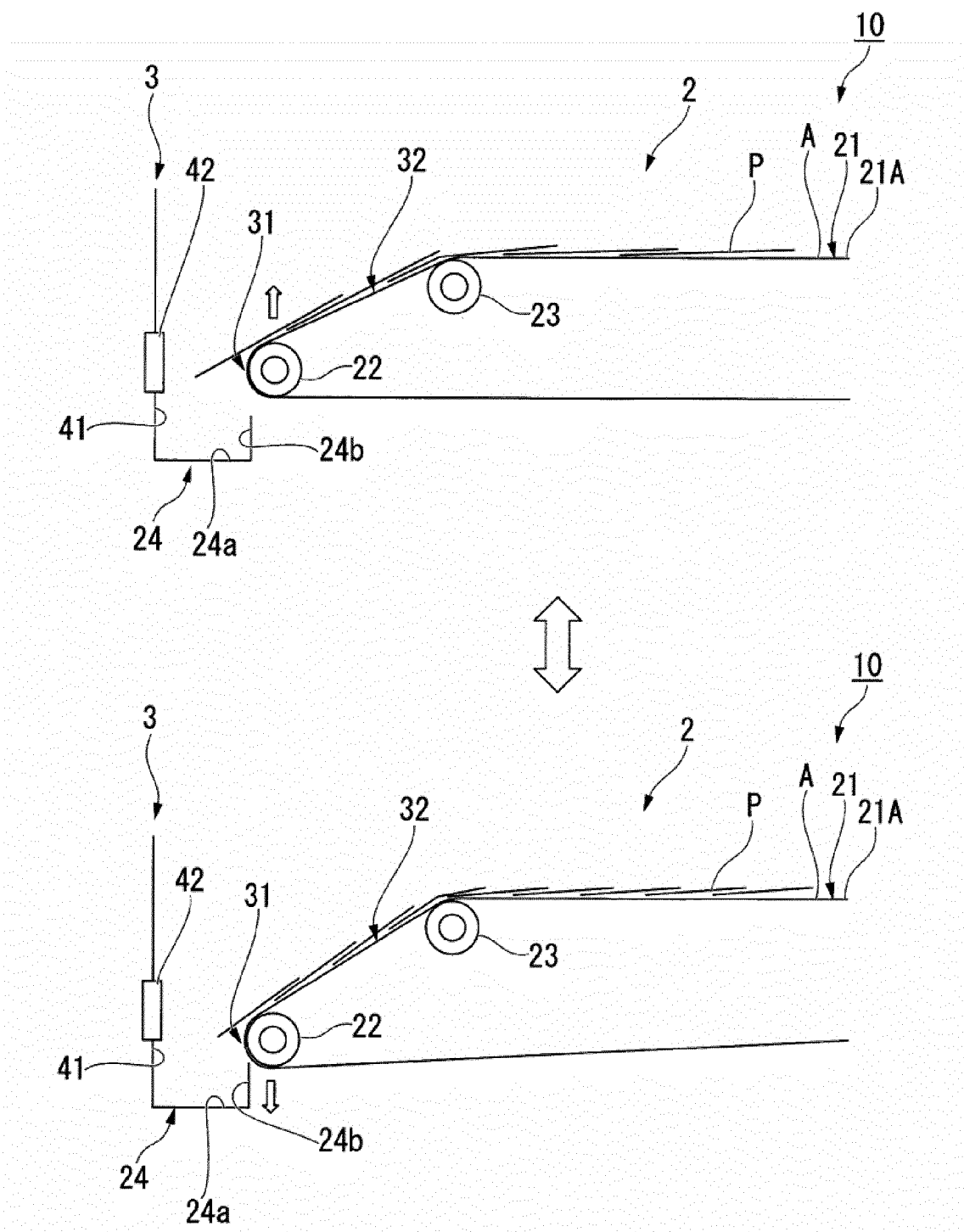


FIG. 3

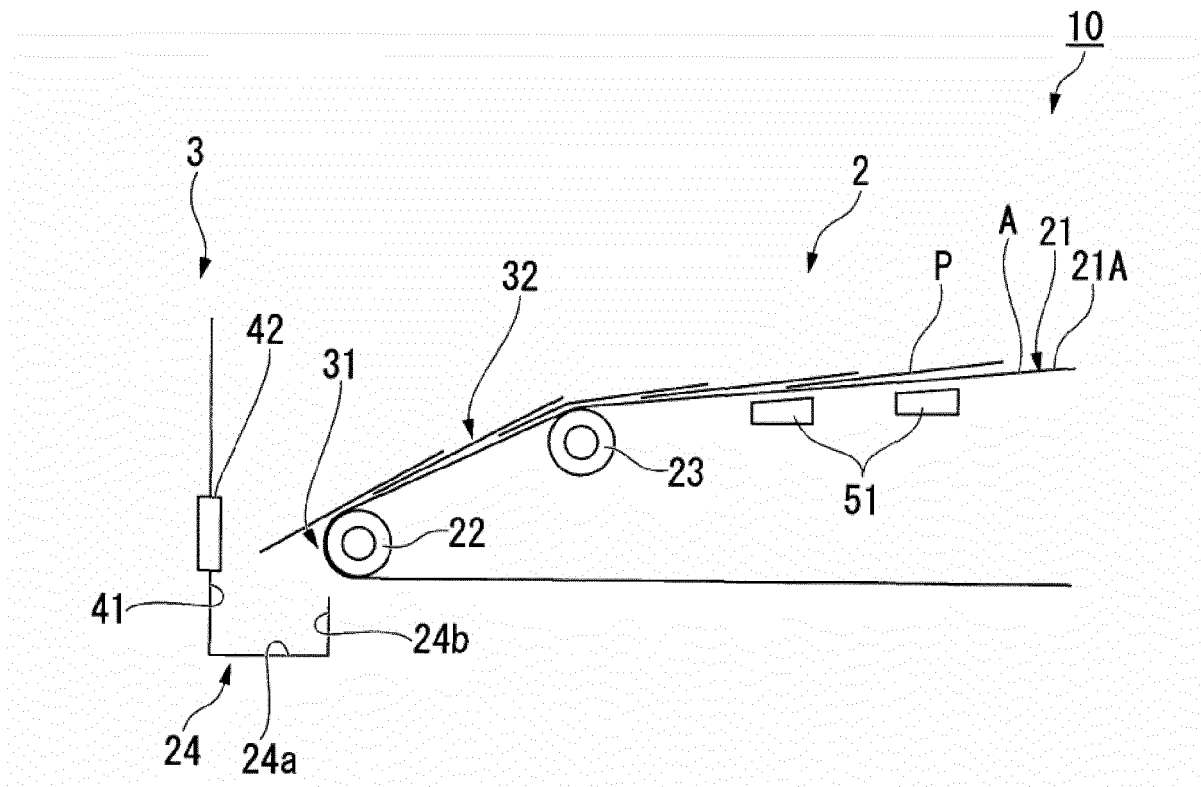


FIG. 4

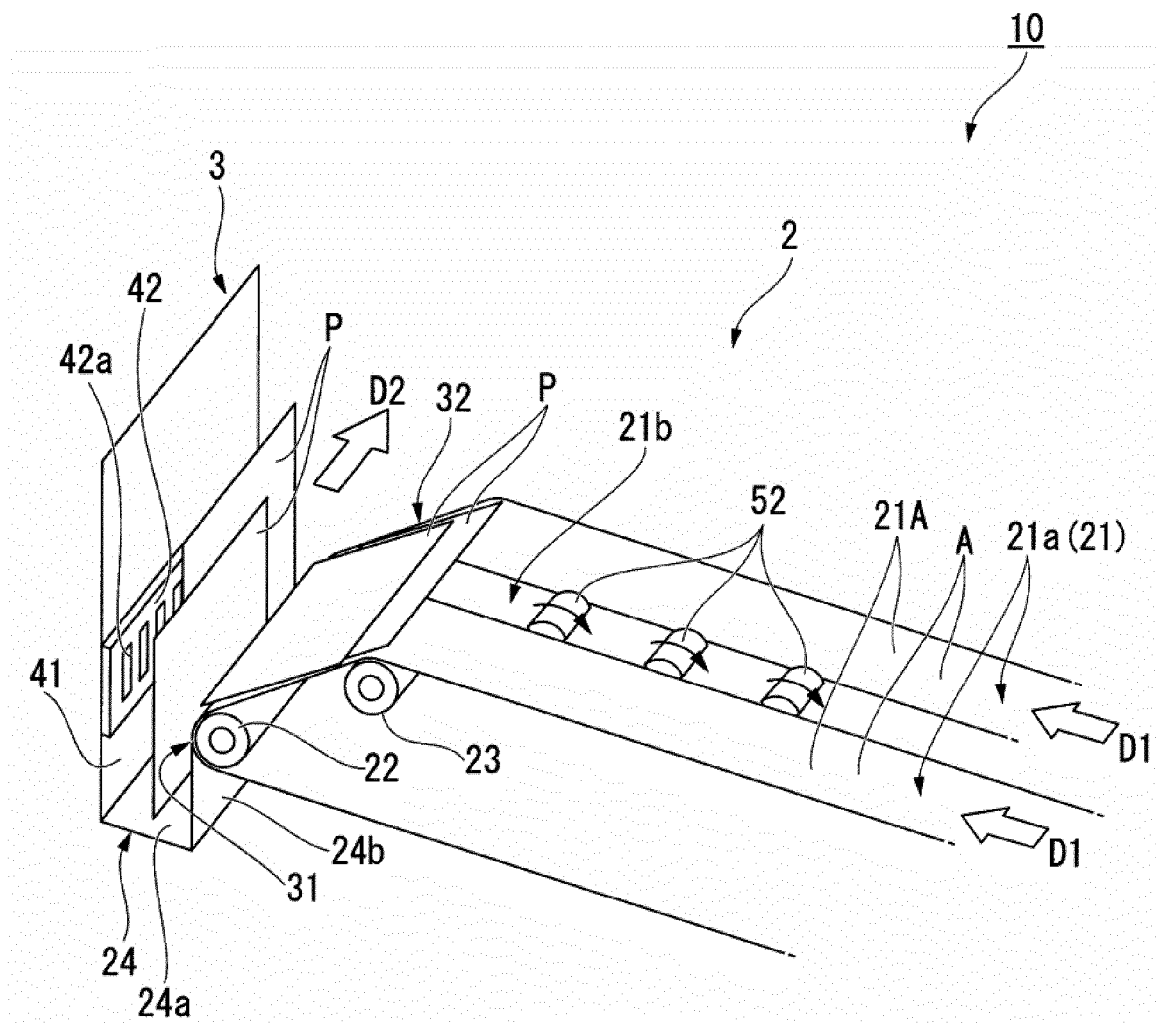


FIG. 5

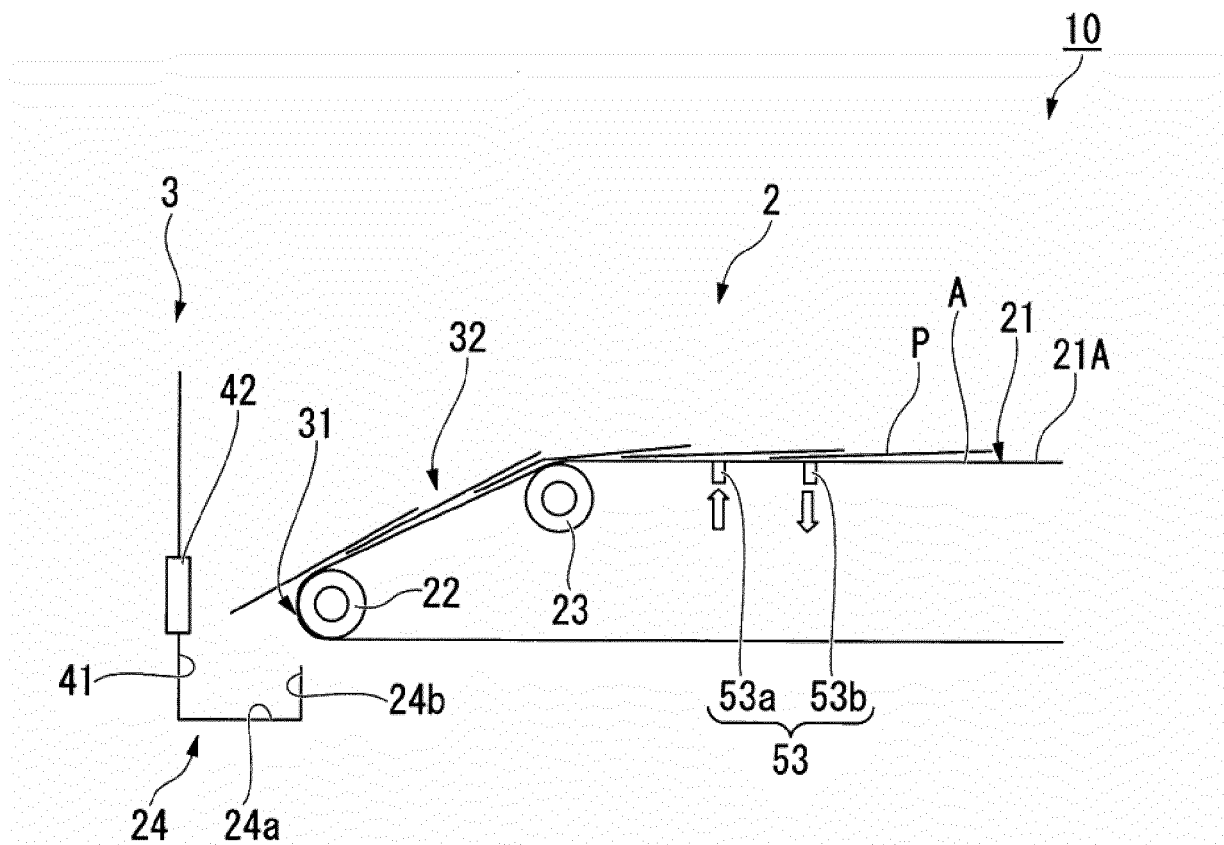


FIG. 6

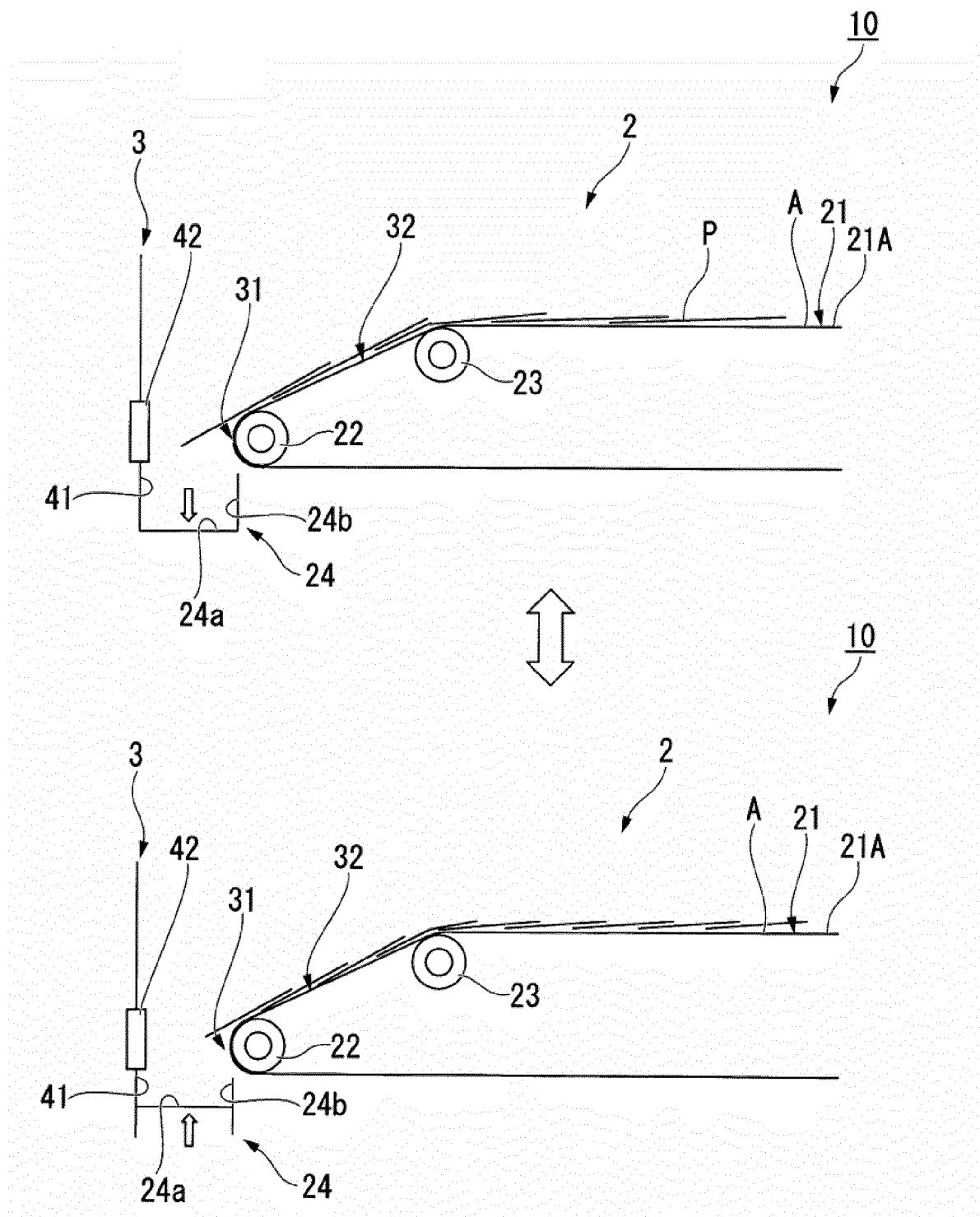


FIG. 7



EUROPEAN SEARCH REPORT

Application Number
EP 15 18 1685

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	CA 2 517 378 A1 (DUVAL MARC [CA]; VARY SYLVIO [CA]; MACKAY JOHN [CA]) 7 March 2007 (2007-03-07)	1-6,9,10	INV. B65H1/22 B65H1/02 B65H3/12 B65H1/30
A	* the whole document * -----	7,8	
X	EP 1 398 286 A1 (FERAG AG [CH]) 17 March 2004 (2004-03-17)	1,5,10	
X	EP 2 213 602 A2 (PITNEY BOWES INC [US]) 4 August 2010 (2010-08-04)	1,9,10	
A	EP 2 524 888 A1 (MUELLER MARTINI HOLDING AG [CH]) 21 November 2012 (2012-11-21) * the whole document * -----	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			B65H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		26 January 2016	Athanasiadis, A
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 18 1685

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

26-01-2016

10

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CA 2517378	A1	07-03-2007	NONE
EP 1398286	A1	17-03-2004	AT 469084 T 15-06-2010 AU 2003244580 A1 01-04-2004 CA 2440517 A1 12-03-2004 DK 1398286 T3 13-09-2010 EP 1398286 A1 17-03-2004 US 2004084830 A1 06-05-2004 US 2009189331 A1 30-07-2009
EP 2213602	A2	04-08-2010	EP 2213602 A2 04-08-2010 US 2010276249 A1 04-11-2010
EP 2524888	A1	21-11-2012	NONE

15

20

25

30

35

40

45

50

55

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82