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- **HORI, Yutaka**
Daito-shi
Osaka 574-0013 (JP)
- **FUKUYAMA, Shouichi**
Daito-shi
Osaka 574-0013 (JP)

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(74) Representative: **Grünecker Patent- und Rechtsanwälte**
PartG mbB
Leopoldstraße 4
80802 München (DE)

(71) Applicant: **Funai Electric Co., Ltd.**
Daito-shi
Osaka 574-0013 (JP)

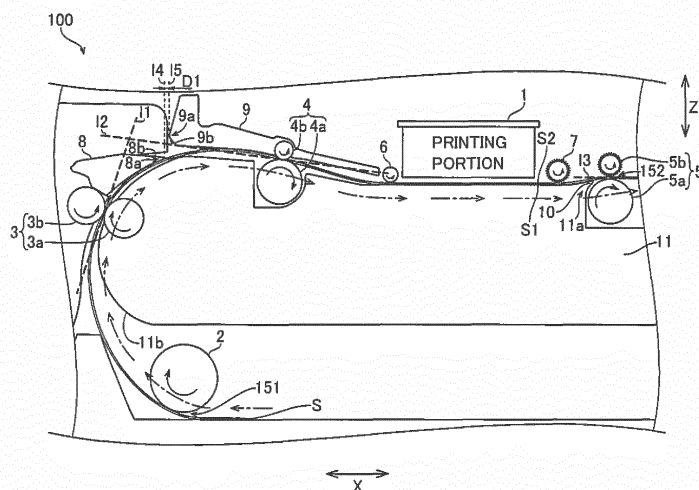
(72) Inventors:
• **TAKAGI, Masaaki**
Daito-shi
Osaka 574-0013 (JP)

(54) **PAPER SHEET CONVEYANCE DEVICE**

(57) This paper sheet conveyance device (100) includes an upstream-side roller pair (3) and a downstream-side roller pair (4) as well as an upstream-side guide member (8) and a downstream-side guide member (9). The upstream-side guide member is arranged to

traverse a tangent (11) to the upstream-side roller pair extending along a conveyance direction, while the downstream-side guide member is arranged to traverse a tangent (12) to the downstream-side roller pair extending along the conveyance direction.

FIG.2



Description

Technical Field

[0001] The present invention relates to a paper sheet conveyance device, and more particularly, it relates to a paper sheet conveyance device including an upstream-side roller pair and a downstream-side roller pair for conveying a paper sheet.

Background Art

[0002] A paper sheet conveyance device including an upstream-side roller pair and a downstream-side roller pair for conveying a paper sheet is known in general. Such a paper sheet conveyance device is disclosed in Japanese Patent No. 3453508, for example.

[0003] In Japanese Patent No. 3453508, there is disclosed a sheet material conveyance device (a paper sheet conveyance device) including sheet material conveyance portions consisting of roller pairs for holding and conveying a sheet material (a paper sheet). In this sheet material conveyance device, the sheet material conveyance portions are provided one by one on an upstream side and a downstream side of a conveyance direction for the sheet material. These sheet material conveyance portions on the upstream side and the downstream side are so arranged that a tangent to the roller pair constituting the sheet material conveyance portion on the upstream side and a tangent to the roller pair constituting the sheet material conveyance portion on the downstream side intersect with each other. Thus, a conveyance path for the sheet material is configured to bend between the sheet material conveyance portion on the upstream side and the sheet material conveyance portion on the downstream side. An upper guide and a downstream guide portion for guiding the sheet material along the conveyance direction are provided between the sheet material conveyance portion on the upstream side and the sheet material conveyance portion on the downstream side. These upper guide and downstream guide portion are formed to linearly extend parallelly with respect to the tangents to the roller pairs constituting the sheet material conveyance portions on the upstream side and the downstream side respectively, while a vicinity of a downstream-side end portion of the upper guide and a vicinity of an upstream-side end portion of the downstream guide portion are fixed to each other in a state in contact with each other.

Prior Art

Patent Document

[0004] Patent Document 1: Japanese Patent No. 3453508

Summary of the Invention

Problem to be Solved by the Invention

[0005] In the conventional paper sheet conveyance device such as that disclosed in Japanese Patent No. 3453508, the conveyance path for the paper sheet may be bent in the form of a curved surface, in order to attain downsizing of the device by folding back the conveyance path for the paper sheet while smoothly conveying the paper sheet along the curved surface. In the structure disclosed in Japanese Patent No. 3453508, however, the upper guide and the downstream guide portion are formed to linearly extend parallelly with respect to the tangents to the roller pairs on the upstream side and the downstream side respectively while the vicinity of the downstream-side end portion of the linear upper guide and the vicinity of the upstream-side end portion of the linear downstream guide portion are fixed to each other in the state in contact with each other, and hence it is difficult to bend the conveyance path for the paper sheet in the form of a curved surface, and there is conceivably such a problem as a result that it is difficult to attain downsizing of the device while smoothly conveying the paper sheet.

[0006] The present invention has been proposed in order to solve the aforementioned problem, and one object of the present invention is to provide a paper sheet conveyance device capable of attaining downsizing of the device while smoothly conveying a paper sheet.

Means for Solving the Problem

[0007] In order to attain the aforementioned object, a paper sheet conveyance device according to one aspect of the present invention includes an upstream-side roller pair and a downstream-side roller pair arranged to hold a paper sheet therebetween for conveying the held paper sheet in a prescribed conveyance direction and an upstream-side guide member and a downstream-side guide member arranged to separate from each other in the vicinity of the upstream-side roller pair and the downstream-side roller pair for guiding the paper sheet along the conveyance direction, while arrangement positions of the upstream-side guide member and the downstream-side guide member with respect to the upstream-side roller pair and the downstream-side roller pair are set to include at least one of such a structure that the upstream-side guide member is arranged to traverse a tangent to the upstream-side roller pair extending along the conveyance direction and such a structure that the downstream-side guide member is arranged to traverse a tangent to the downstream-side roller pair extending along the conveyance direction.

[0008] In the paper sheet conveyance device according to the aspect of the present invention, the conveyance path for the paper sheet can be easily bent in the form of a curved surface (in the form of a curve) through at

least one of the upstream-side guide member arranged to traverse the tangent to the upstream-side roller pair and the downstream-side guide member arranged to traverse the tangent to the downstream-side roller pair by structuring the paper sheet conveyance device in the aforementioned manner. Thus, downsizing of the device can be attained by folding back the conveyance path for the paper sheet while smoothly conveying the paper sheet along the conveyance path in the form of a curved surface, dissimilarly to a case where the conveyance path for the paper paths is constituted of a plurality of linearly extending conveyance paths. Further, the upstream-side guide member and the downstream-side guide member are so arranged to separate from each other that a downstream-side end portion of the upstream-side guide member and an upstream-side end portion of the downstream-side guide member may not be elongated up to positions coming into contact with the downstream-side guide member and the upstream-side guide member respectively dissimilarly to a case where a vicinity of the downstream-side end portion of the upstream-side guide member and a vicinity of the upstream-side end portion of the downstream-side guide member come into contact with each other, whereby the respective lengths of the upstream-side guide member and the downstream-side guide member can be shortened, and downsizing of the device can be attained also according to this.

[0009] Preferably in the paper sheet conveyance device according to the aforementioned aspect, the upstream-side guide member is arranged to traverse the tangent to the upstream-side roller pair extending along the conveyance direction, and the downstream-side guide member is arranged to traverse the tangent to the downstream-side roller pair extending along the conveyance direction. When structuring the paper sheet conveyance device in this manner, the conveyance path for the paper sheet can be more easily bent in the form of a curved surface (in the form of a curve) through both of the upstream-side guide member arranged to traverse the tangent to the upstream-side roller pair and the downstream-side guide member arranged to traverse the tangent to the downstream-side roller pair.

[0010] Preferably, the paper sheet conveyance device according to the aforementioned aspect has at least such a structure that the upstream-side guide member is arranged to traverse the tangent to the upstream-side roller pair extending along the conveyance direction, and at least the upstream-side guide member is arranged to extend in a direction intersecting with the conveyance direction in the vicinity of the upstream-side roller pair. When structuring the paper sheet conveyance device in this manner, at least the upstream-side guide member is arranged to traverse the tangent to the upstream-side roller pair, whereby the conveyance path for the paper sheet can be easily and reliably bent in the form of a curved surface through this upstream-side guide member. Thus, downsizing of the device can be easily and

reliably attained while smoothly conveying the paper sheet.

[0011] Preferably in the paper sheet conveyance device according to the aforementioned aspect, the upstream-side guide member is arranged on a downstream side with respect to the upstream-side roller pair and on an outer side with respect to the conveyance direction, while the downstream-side guide member is arranged on an upstream side with respect to the downstream-side roller pair and on an outer side with respect to the conveyance direction, and a vicinity of an upstream-side end portion of the downstream-side guide member is arranged on an outer side beyond a vicinity of a downstream-side end portion of the upstream-side guide member with respect to the conveyance direction. When structuring the paper sheet conveyance device in this manner, the paper sheet can be inhibited from advancing in a direction deviating from the original conveyance direction due to such a situation that the forward end portion of the paper sheet conveyed from the upstream-side guide member toward the downstream side come into contact with the vicinity of the upstream-side end portion of the downstream-side guide member, dissimilarly to a case where the vicinity of the upstream-side end portion of the downstream-side guide member is arranged on an inner side beyond the vicinity of the downstream-side end portion of the upstream-side guide member with respect to the conveyance direction. Thus, paper jamming can be inhibited from occurring also in the case of bending the conveyance path for the paper sheet in the form of a curved surface.

[0012] Preferably in this case, the vicinity of the downstream-side end portion of the upstream-side guide member and the vicinity of the upstream-side end portion of the downstream-side guide member are arranged separately from each other not to overlap with each other. When structuring the paper sheet conveyance device in this manner, the vicinity of the upstream-side end portion of the downstream-side guide member can be reliably arranged on the outer side beyond the vicinity of the downstream-side end portion of the upstream-side guide member with respect to the conveyance direction, whereby paper jamming can be reliably inhibited from occurring due to such a situation that the forward end portion of the paper sheet conveyed from the upstream-side guide member toward the downstream side comes into contact with the vicinity of the upstream-side end portion of the downstream-side guide member also in the case of bending the conveyance path for the paper sheet in the form of a curved surface.

[0013] Preferably in the aforementioned paper sheet conveyance device in which the vicinity of the downstream-side end portion of the upstream-side guide member and the vicinity of the upstream-side end portion of the downstream-side guide member are arranged not to overlap with each other, the vicinity of the downstream-side end portion of the upstream-side guide member and the vicinity of the upstream-side end portion of the down-

stream-side guide member are arranged separately from each other on positions close to each other not to overlap with each other. When structuring the paper sheet conveyance device in this manner, formation of a large clearance between the vicinity of the downstream-side end portion of the upstream-side guide member and the vicinity of the upstream-side end portion of the downstream-side guide member can be suppressed, dissimilarly to a case where the vicinity of the downstream-side end portion of the upstream-side guide member and the vicinity of the upstream-side end portion of the downstream-side guide member are arranged to extremely separate from each other. Thus, paper jamming can be easily inhibited from occurring due to such a situation that the forward end portion of the paper sheet conveyed from the upstream-side guide member toward the downstream side enters a clearance between the vicinity of the downstream-side end portion of the upstream-side guide member and the vicinity of the upstream-side end portion of the downstream-side guide member.

[0014] Preferably in the aforementioned paper sheet conveyance device in which the vicinity of the upstream-side end portion of the downstream-side guide member is arranged on the outer side beyond the vicinity of the downstream-side end portion of the upstream-side guide member with respect to the conveyance direction, a first inclined surface inclined to separate from the vicinity of the upstream-side end portion of the downstream-side guide member is formed on a surface of the vicinity of the downstream-side end portion of the upstream-side guide member on the side of the downstream-side guide member, and a second inclined surface inclined to separate from the vicinity of the downstream-side end portion of the upstream-side guide member is formed on a surface of the vicinity of the upstream-side end portion of the downstream-side guide member on the side of the upstream-side guide member. When structuring the paper sheet conveyance device in this manner, the vicinity of the upstream-side end portion of the downstream-side guide member can be more reliably arranged on the outer side beyond the vicinity of the downstream-side end portion of the upstream-side guide member with respect to the conveyance direction by forming the first inclined surface and the second inclined surface on the upstream-side guide member and the downstream-side guide member respectively. Thus, paper jamming can be inhibited from occurring due to such a situation that the forward end portion of the paper sheet conveyed from the upstream-side guide member toward the downstream side comes into contact with the vicinity of the upstream-side end portion of the downstream-side guide member, also in the case of bending the conveyance path for the paper sheet in the form of a curved surface.

[0015] Preferably in the aforementioned paper sheet conveyance device in which the vicinity of the upstream-side end portion of the downstream-side guide member is arranged on the outer side beyond the vicinity of the downstream-side end portion of the upstream-side guide

member with respect to the conveyance direction, the upstream-side guide member is arranged to extend over both of an upstream side and a downstream side with respect to the upstream-side roller pair. When structuring the paper sheet conveyance device in this manner, the paper sheet can be guided on both of the upstream side and the downstream side with respect to the upstream-side roller pair, whereby the paper sheet can be reliably conveyed.

[0016] Preferably in the aforementioned paper sheet conveyance device in which the upstream-side guide member extends over both of the upstream side and the downstream side, the upstream-side guide member is arranged in such a manner that at least the downstream side with respect to the upstream-side roller pair traverses the tangent to the upstream-side roller pair extending along the conveyance direction. When structuring the paper sheet conveyance device in this manner, the conveyance path for the paper sheet can be bent in the form of a curved surface (in the form of a curve) on the downstream side with respect to the upstream-side roller pair, whereby the paper sheet can be inhibited from advancing in a direction deviating from the original conveyance direction between the upstream-side roller pair and the downstream-side roller pair. Thus, paper jamming can be inhibited from occurring also in the case of bending the conveyance path for the paper sheet in the form of a curved surface.

[0017] Preferably in the aforementioned paper sheet conveyance device in which the vicinity of the upstream-side end portion of the downstream-side guide member is arranged on the outer side beyond the vicinity of the downstream-side end portion of the upstream-side guide member with respect to the conveyance direction, the downstream-side guide member is arranged to extend over both of an upstream side and a downstream side with respect to the downstream-side roller pair. When structuring the paper sheet conveyance device in this manner, the paper sheet can be guided on both of the upstream side and the downstream side with respect to the downstream-side roller pair, whereby the paper sheet can be reliably conveyed.

[0018] Preferably in the aforementioned paper sheet conveyance device in which the downstream-side guide member extends over both of the upstream side and the downstream side, the downstream-side guide member is arranged in such a manner that at least the upstream side with respect to the downstream-side roller pair traverses the tangent to the downstream-side roller pair extending along the conveyance direction. When structuring the paper sheet conveyance device in this manner, the conveyance path for the paper sheet can be bent in the form of a curved surface (in the form of a curve) on the upstream side with respect to the downstream-side roller pair, whereby the paper sheet can be inhibited from advancing in a direction deviating from the original conveyance direction between the upstream-side roller pair and the downstream-side roller pair. Thus, paper jam-

ming can be inhibited from occurring also in the case of bending the conveyance path for the paper sheet in the form of a curved surface.

[0019] Preferably in the paper sheet conveyance device according to the aforementioned aspect, a vicinity of a downstream-side end portion of the upstream-side guide member is formed to taper toward a downstream side in the conveyance direction. When structuring the paper sheet conveyance device in this manner, the thickness of the upstream-side guide member can be inhibited from enlarging in the vicinity of the downstream-side end portion of the upstream-side guide member, whereby downsizing of the device can be further attained.

[0020] Preferably, the paper sheet conveyance device according to the aforementioned aspect further includes a printing portion for printing images on the paper sheet, the downstream-side roller pair includes a discharge roller arranged to come into contact with a surface of the paper sheet on a side opposite to a side printed with the images and rotatable in a direction for discharging the paper sheet, and a driven roller arranged to come into contact with a surface of the paper sheet on the side printed with the images and rotating following the discharge roller, and the driven roller includes a thin disc member arranged to be orthogonal to the paper sheet and having an outer peripheral portion of an irregular shape. When structuring the paper sheet conveyance device in this manner, contact areas between the driven roller and the surface of the paper sheet on the side printed with the images can be reduced dissimilarly to a case of constituting the driven roller of a disc member with a large thickness having no irregularities on the outer peripheral portion, whereby such a situation can be suppressed that the driven roller rubs against the surface of the paper sheet on the side printed with the images to lower the qualities of the images.

[0021] Preferably, the paper sheet conveyance device according to the aforementioned aspect further includes a printing portion for printing images on the paper sheet, the downstream-side roller pair includes a discharge roller arranged to come into contact with a surface of the paper sheet on a side opposite to a side printed with the images and rotatable in a direction for discharging the paper sheet and a driven roller arranged to come into contact with a surface of the paper sheet on the side printed with the images and rotating following the discharge roller, and the downstream-side guide member arranged in the vicinity of the discharge roller and the driven roller is arranged on an upstream side of the discharge roller and the driven roller and on a side opposite to a side where the printing portion is arranged. When structuring the paper sheet conveyance device in this manner, the paper sheet can be guided toward the discharge roller while inhibiting the surface of the paper sheet on the side printed with the images from coming into contact with the downstream-side guide member.

[0022] Preferably in this case, the paper sheet conveyance device further includes an intermediate member ar-

ranged on an inner side with respect to the conveyance direction and including a curved surface portion bent in the form of a curved surface along the conveyance direction, the paper sheet is conveyed to be along the curved surface portion of the intermediate member, and the downstream-side guide member arranged in the vicinity of the discharge roller and the driven roller is integrally formed on the intermediate member. When structuring the paper sheet conveyance device in this manner, the conveyance path for the paper sheet can be more reliably bent in the form of a curved surface (in the form of a curve) through the curved surface portion of the intermediate member. Further, the downstream-side guide member arranged in the vicinity of the discharge roller and the driven roller may not be provided independently of the intermediate member, whereby downsizing of the device can be effectively attained.

[0023] Preferably, the paper sheet conveyance device according to the aforementioned aspect further includes a reading portion for performing image reading processing with respect to the paper sheet, and the downstream-side guide member arranged on a downstream side of the reading portion is arranged on an upstream side of the downstream-side roller pair arranged on the downstream side of the reading portion and on a side opposite to a side where the reading portion is arranged, and arranged to traverse the tangent to the downstream-side roller pair extending along the conveyance direction. When structuring the paper sheet conveyance device in this manner, the conveyance path for the paper sheet can be easily bent in the form of a curved surface (in the form of a curve) while inhibiting the surface of the paper sheet on the side to be read from coming into contact with the downstream-side guide member.

[0024] Preferably, the paper sheet conveyance device according to the aforementioned aspect further includes an intermediate member arranged on an inner side with respect to the conveyance direction and including a curved surface portion bent in the form of a curved surface along the conveyance direction, the paper sheet is conveyed to be along the curved surface portion of the intermediate member, and the upstream-side guide member and the downstream-side guide member are arranged on an outer side with respect to the conveyance direction. When structuring the paper sheet conveyance device in this manner, the conveyance path for the paper sheet can be more reliably bent in the form of a curved surface (in the form of a curve) through the curved surface portion of the intermediate member, whereby downsizing of the device can be attained by folding back the conveyance path for the paper sheet while more smoothly conveying the paper sheet along the conveyance path in the form of a curved surface. Further, the paper sheet can be guided from the inner side with respect to the conveyance direction through the curved surface portion of the intermediate member while the paper sheet can be guided from the outer side with respect to the conveyance direction through the upstream-side guide member and

the downstream-side guide member, whereby the paper sheet can be reliably conveyed by guiding the paper sheet from both sides.

[0025] Preferably in this case, the curved surface portion is at least provided between the upstream-side roller pair and the downstream-side roller pair in the conveyance direction. When structuring the paper sheet conveyance device in this manner, the conveyance path for the paper sheet can be more reliably bent in the form of a curved surface (in the form of a curve) between the upstream-side roller pair and the downstream-side roller pair.

[0026] Preferably in the aforementioned paper sheet conveyance device including the intermediate member including the curved surface portion, at least either one of the upstream-side roller pair and the downstream-side roller pair is arranged on a position corresponding to the curved surface portion. When structuring the paper sheet conveyance device in this manner, the paper sheet can be reliably conveyed through at least either one of the upstream-side roller pair and the downstream-side roller pair arranged on the position corresponding to the curved surface portion also in the state where the conveyance path for the paper sheet is bent in the form of a curved surface (in the form of a curve) through the curved surface portion.

[0027] Preferably in the aforementioned paper sheet conveyance device including the intermediate member including the curved surface portion, the upstream-side roller pair and the downstream-side roller pair both include driving rollers rotatable in a direction for conveying the paper sheet and driven rollers rotating following the driving rollers, the driving roller of the upstream-side roller pair and the driving roller of the downstream-side roller pair are both arranged on an inner side with respect to the conveyance direction, and the driven roller of the upstream-side roller pair and the driven roller of the downstream-side roller pair are both arranged on an outer side with respect to the conveyance direction. When structuring the paper sheet conveyance device in this manner, the driving rollers are so arranged on the inner side provided with the intermediate member that the driving rollers and a driving mechanism or the like for driving the driving rollers may not be provided on the outer side with respect to the conveyance direction, whereby the device can be inhibited from size increase.

Effect of the Invention

[0028] According to the present invention, as hereinabove described, downsizing of the device can be attained while smoothly conveying the paper sheet.

Brief Description of the Drawings

[0029]

[Fig. 1] A block diagram showing the structure of an

ink jet composite machine including a printer portion and a scanner portion according to an embodiment of the present invention.

[Fig. 2] A schematic diagram showing the internal structure of the printer portion according to the embodiment of the present invention.

[Fig. 3] An enlarged perspective view showing a discharge roller pair of the printer portion according to the embodiment of the present invention.

[Fig. 4] A schematic diagram showing the internal structure of the scanner portion according to the embodiment of the present invention.

Modes for Carrying Out the Invention

[0030] An embodiment of the present invention is now described on the basis of the drawings.

[0031] The structure of an ink jet composite machine 1000 including a printer portion 100 and a scanner portion 200 according to the embodiment of the present invention is described with reference to Figs. 1 to 4. The printer portion 100 and the scanner portion 200 are both examples of the "paper sheet conveyance device" in the present invention.

[0032] As shown in Fig. 1, the ink jet composite machine 100 includes the printer portion 100 having an image reading function and the scanner portion 200 having an image printing function. In the following, the specific internal structure of the printer portion 100 according to the embodiment of the present invention is first described with reference to Figs. 1 to 3.

[0033] As shown in Fig. 2, the printer portion 100 includes a printing portion 1 of an ink jet system for performing image printing processing with respect to a paper sheet S. Further, the printer portion 100 includes a paper feed roller 2 arranged in the vicinity of a paper feed portion 151 for feeding the paper sheet S, conveyance roller pairs 3 and 4 for conveying the paper sheet S fed by the paper feed roller 2 to the side of the printing portion 1, and a discharge roller pairs arranged in the vicinity of a discharge portion 152 for discharging the paper sheet S after printing. In addition, the printer portion 100 includes two auxiliary rollers 6 and 7 arranged in front of and at the back of the printing portion 1 (between the printing portion 1 and the conveyance roller pair 4 and between the printing portion 1 and the conveyance roller pair 5). The paper feed roller 2, the conveyance roller pairs 3 and 4, the discharge roller pair 5 and the auxiliary rollers 6 and 7 are so arranged that a conveyance path for the paper sheet S is bent in the form of a curved surface (in the form of a curve) and has a folded shape (see arrowed one-dot chain lines in Fig. 2) in the interior of the printer portion 100 (the portion on the left side of Fig. 2). The printing portion 1 is arranged on an outer side with respect to the conveyance direction for the paper sheet S.

[0034] The conveyance roller pairs 3 and 4 and the discharge roller pair 5 include driving rollers 3a, 4a and 5a rotating/driving with motors (not shown) serving as

power sources and driven rollers 3b, 4b and 5b respectively rotating following rotation of the driving rollers 3a, 4a and 5a respectively. The driving roller 5a is an example of the "discharge roller" in the present invention. The conveyance roller pair 3 is configured to hold the paper sheet S conveyed from an upstream side (the side of the paper feed roller 2) and to convey the same to a downstream side (the side of the discharge roller pair 4). The discharge roller pair 4 is configured to hold the paper sheet S conveyed from an upstream side (the side of the conveyance roller pair 3) and to convey the same to a downstream side (the side of the discharge roller pair 5). The discharge roller pair 5 is configured to hold the paper sheet S conveyed from an upstream side (the side of the conveyance roller pair 4) and to discharge the same. In other words, the conveyance roller pair 3 is an example of the "upstream-side roller pair" in the present invention through the relation to the conveyance roller pair 4, while the conveyance roller pair 4 is an example of the "downstream-side roller pair" in the present invention through the relation to the conveyance roller pair 3. Further, the conveyance roller pair 4 is an example of the "upstream-side roller pair" in the present invention through the relation to the discharge roller pair 5, while the discharge roller pair 5 is an example of the "downstream-side roller pair" in the present invention through the relation to the conveyance roller pair 4.

[0035] In the vicinity of the conveyance roller pairs 3 and 4, guide members 8 and 9 for guiding the paper sheet S along the conveyance direction (see the arrowed one-dot chain lines in Fig. 2) are arranged respectively. Also in the vicinity of the upstream side of the discharge roller pair 5, a guide portion 10 for guiding the paper sheet S along the conveyance direction (a discharge direction) is arranged. The printing portion 1 is arranged on the downstream side of the conveyance roller pair 4 and the guide member 9 and on the upstream side of the discharge roller pair 5 and the guide portion 10. These guide members 8 and 9 and the guide portion 10 are arranged to separate from each other along the conveyance direction for the paper sheet S. The guide member 8 is an example of the "upstream-side guide member" in the present invention through the relation to the guide member 9, while the guide member 9 is an example of the "downstream-side guide member" in the present invention through the relation to the guide member 8. Further, the guide member 9 is an example of the "upstream-side guide member" in the present invention through the relation to the guide portion 10, while the guide portion 10 is an example of the "downstream-side guide member" in the present invention through the relation to the guide member 9.

[0036] The guide member 8 is formed to extend in a direction (a direction from the lower left toward the upper right in Fig. 2) along the conveyance direction (see the arrowed one-dot chain lines in Fig. 2) for the paper sheet S from a vicinity of the driven roller 3a of the conveyance roller pair 3. The guide member 8 is arranged to extend

in a direction (a direction from the lower right toward the upper left in Fig. 2) substantially orthogonal to (a direction intersecting with) the conveyance direction (see the arrowed one-dot chain lines in Fig. 2) for the paper sheet S in the vicinity of the conveyance roller pair 3 on the upstream side. The guide member 9 is formed to extend in a direction (a direction from the upper left toward the lower right in Fig. 2) along the conveyance direction for the paper sheet S about the driven roller 4a, to include the driven roller 4a of the conveyance roller pair 4. The guide portion 10 is integrally formed on an intermediate member 11 to protrusively extend in the direction (the direction from the lower left toward the upper right in Fig. 2) along the conveyance direction for the paper sheet S from a corner portion 11a in the vicinity of the driving roller 5a of the discharge roller pair 5 in the intermediate member 11 (a member provided with the driving rollers 3a, 4a and 5a) arranged in the vicinity of a central portion of the printer portion 100 in the vertical direction (a Z direction) and on an inner side of the conveyance direction for the paper sheet S.

[0037] The intermediate member 11 is provided with a curved surface portion 11b extending from a vicinity of the paper feed roller 2 up to a vicinity of the conveyance roller pair 4 through a space between the conveyance roller pair 3 and bent in the form of a curved surface (in the form of a curve). In other words, the curved surface portion 11b is formed at least between the conveyance roller pair 3 and the conveyance roller pair 4, while the conveyance roller pair 3 is arranged on positions corresponding to the curved surface portion 11b. The paper sheet S is so conveyed along this curved surface portion 11b that the conveyance path for the paper sheet S is configured to be bent in the form of a curved surface (in the form of a curve) in the interior (the portion on the left side in Fig. 2) of the printer portion 100 and to have the folded shape (see the arrowed one-dot chain lines in Fig. 2).

[0038] According to this embodiment, the guide member 8 is arranged to traverse a tangent 11 (see a thick dotted line in Fig. 2) to the conveyance roller pair 3 extending along the conveyance direction (see the arrowed one-dot chain lines in Fig. 2) for the paper sheet S. The guide member 9 is arranged to traverse a tangent 12 (see a thick dotted line in Fig. 2) to the conveyance roller pair 4 extending along the conveyance direction for the paper sheet S. On the other hand, the guide portion 10 is arranged not to intersect with a tangent 13 (see a thick dotted line in Fig. 2) to the discharge roller pair 5 extending along the conveyance direction for the paper sheet S. The tangent 11 to the conveyance roller pair 3 and the tangent 12 to the conveyance roller pair 4 intersect with each other.

[0039] According to this embodiment, the guide member 8 is arranged on a downstream side with respect to the conveyance roller pair 3 and on an outer side with respect to the conveyance direction (see the arrowed one-dot chain lines in Fig. 2) for the paper sheet S. The

guide member 9 is arranged to extend over both of an upstream side and a downstream side with respect to the conveyance roller pair 4 and on an outer side with respect to the conveyance direction for the paper sheet S. A vicinity of an upstream-side end portion 9a of the guide member 9 is arranged on an outer side beyond a vicinity of a downstream-side end portion 8a of the guide member 8 with respect to the conveyance direction for the paper sheet S. The guide portion 10 is arranged on an inner side with respect to the conveyance direction for the paper sheet S. In other words, the guide portion 10 is arranged on a side opposite to the printing portion 1 arranged on the outer side with respect to the conveyance direction for the paper sheet S.

[0040] According to this embodiment, the vicinity of the downstream-side end portion 8a of the guide member 8 and the vicinity of the upstream-side end portion 9a of the guide member 9 are arranged not to overlap with each other. In other words, a straight line 14 of a thin dotted line extending in the vertical direction (the Z direction) through the vicinity of the downstream-side end portion 8a of the guide member 8 and a straight line 15 of a thin dotted line extending in the vertical direction through the vicinity of the upstream-side end portion 9a of the guide member 9 are configured to separate from each other at a prescribed interval D1 in the horizontal direction (an X direction), as shown in Fig. 2. The vicinity of the downstream-side end portion 8a of the guide member 8 and the vicinity of the upstream-side end portion 9a of the guide member 9 are arranged to separate from each other on positions close to each other.

[0041] According to this embodiment, an inclined surface 8b inclined to separate from the vicinity of the upstream-side end portion 9a of the guide member 9 is formed on a surface of the vicinity of the downstream-side end portion 8a of the guide member 8 on the side of the guide member 9. An inclined surface 9b inclined to separate from the vicinity of the downstream-side end portion 8a of the guide member 8 is formed on a surface of the vicinity of the upstream-side end portion 9a of the guide member 9 on the side of the guide member 8. The vicinity of the downstream-side end portion 8a of the guide member 8 is formed to taper so that the thickness lessens toward the conveyance direction for the paper sheet S. The inclined surfaces 8b and 9b are examples of the "first inclined surface" and the "second inclined surface" in the present invention respectively.

[0042] According to this embodiment, the driving roller 5a of the discharge roller pair 5 arranged to come into contact with a rear surface S1 (see Fig. 2) of the paper sheet S opposite to the side printed with images is configured to include a column member 50a (see Fig. 3) having a side surface coming into surface contact with the rear surface S1 of the paper sheet S, as shown in Figs. 2 and 3. The driven roller 5b of the discharge roller pair 5 arranged to come into contact with a surface S2 (see Fig. 2) of the paper sheet S on the side printed with the images is configured to include two thin disc members

50b (see Fig. 3) arranged to be orthogonal to the paper sheet S and having outer peripheral portions of irregular shapes (concavo-convex shapes) whose forward ends are pointed.

[0043] As shown in Fig. 3, the column member 50a included in the driving roller 5a is formed to extend in a direction (a Y direction) orthogonal to the discharge direction for the paper sheet S. The two disc members 50b included in the driven roller 5b are arranged to separate from each other at an interval D2 in the Y direction. The Y-directional interval D2 between the two disc members 50b included in the driven roller 5b is smaller than the Y-directional length L of the column member 50a included in the driving roller 5a. As shown in Fig. 2, the auxiliary roller 7 arranged between the printing portion 1 and the discharge roller pair 5 also has an outer peripheral portion of an irregular shape whose forward end is pointed, similarly to the driven roller 5b of the discharge roller pair 5. The driving rollers 3a, 4a and 5a are provided on an inner side with respect to the conveyance direction for the paper sheet S together, while the driven rollers 3b, 4b and 5b are provided on an outer side with respect to the conveyance direction for the paper sheet S together.

[0044] The specific internal structure of the scanner portion 200 according to the embodiment of the present invention is now described with reference to Fig. 4.

[0045] As shown in Fig. 4, the scanner portion 200 includes a reading portion 21 for performing image reading processing with respect to the paper sheet S. Further, the scanner portion 200 includes a paper feed roller 22 arranged in the vicinity of a paper feed portion 251 for feeding the paper sheet S, conveyance roller pairs 23 and 24 for conveying the paper sheet S fed by the paper feed roller 22 to the side of the reading portion 1, and a discharge roller pair 25 arranged in the vicinity of a discharge portion 252 for discharging the paper sheet S after reading. The paper feed roller 22, the conveyance roller pairs 23 and 24 and the discharge roller pair 25 are so arranged that the conveyance path for the paper sheet S is bent in the form of a curved surface (in the form of a curve) and has a folded shape (see arrowed two-dot chain lines in Fig. 4) in the interior (the portion on the left side in Fig. 4) of the scanner portion 200. The reading portion 21 is arranged on an outer side with respect to the conveyance direction for the paper sheet S.

[0046] The conveyance roller pairs 23 and 24 and the discharge roller pair 25 include driving rollers 23a, 24a and 25a rotating/driving with motors (not shown) serving as power sources and driven rollers 23b, 24b and 25b respectively rotating following rotation of the driving rollers 23a, 24a and 25a respectively. The conveyance roller pair 23 is configured to hold the paper sheet S conveyed from an upstream side (the side of the paper feed roller 22) and to convey the same to a downstream side (the side of the conveyance roller pair 24). The conveyance roller pair 24 is configured to hold the paper sheet S conveyed from an upstream side (the side of the conveyance roller pair 23) and to convey the same to a downstream

side (the side of the discharge roller pair 25). The discharge roller pair 25 is configured to hold the paper sheet S conveyed from an upstream side (the side of the conveyance roller pair 24) and to discharge the same. In other words, the conveyance roller pair 23 is an example of the "upstream-side roller pair" in the present invention through the relation to the conveyance roller pair 24, while the conveyance roller pair 24 is an example of the "downstream-side roller pair" in the present invention through the relation to the conveyance roller pair 23. The conveyance roller pair 24 is an example of the "upstream-side roller pair" in the present invention through the relation to the discharge roller pair 25, while the discharge roller pair 25 is an example of the "downstream-side roller pair" in the present invention through the relation to the conveyance roller pair 24.

[0047] In the vicinity of the conveyance roller pairs 23 and 24, guide members 26 and 27 for guiding the paper sheet S along the conveyance direction (see the arrowed two-dot chain lines in Fig. 4) are arranged respectively. Also in the vicinity of the upstream side of the discharge roller pair 25, a guide member 28 for guiding the paper sheet S along the conveyance direction (the discharge direction) is arranged. These guide members 26, 27 and 28 are arranged to separate from each other along the conveyance direction for the paper sheet S. The reading portion 21 is arranged on a downstream side of the conveyance roller pair 24 and the guide member 27 and on an upstream side of the discharge roller pair 25 and the guide member 28. The guide member 26 is an example of the "upstream-side guide member" in the present invention through the relation to the guide member 27, while the guide member 27 is an example of the "downstream-side guide member" in the present invention through the relation to the guide member 26. Further, the guide member 27 is an example of the "upstream-side guide member" in the present invention through the relation to the guide member 28, while the guide member 28 is an example of the "downstream-side guide member" in the present invention through the relation to the guide member 27.

[0048] The guide members 26 and 27 are both arranged to be opposed to an intermediate member 29 (a member provided with the driving rollers 23a, 24a and 25a) arranged in the vicinity of a central portion of the scanner portion 200 in the vertical direction (the Z direction) and on an inner side of the conveyance direction for the paper sheet S. The intermediate member 29 is provided with a curved surface portion 29a extending from a vicinity of the paper feed roller 22 up to a vicinity of the discharge roller pair 25 through a space between the conveyance roller pair 23 and through a space between the conveyance roller pair 24 and bent in the form of a curved surface (in the form of a curve). In other words, the curved surface portion 29a is formed at least between the conveyance roller pair 23 and the conveyance roller pair 24, while the conveyance roller pairs 23 and 24 are arranged on positions corresponding to the curved sur-

face portion 29a. The paper sheet S is so conveyed along this curved surface portion 29a that the conveyance path for the paper sheet S is configured to be bent in the form of a curved surface (in the form of a curve) in the interior (the portion on the left side in Fig. 4) of the scanner portion 200 and has a folded shape (see the arrowed two-dot chain lines in Fig. 4).

[0049] The guide member 26 is formed to have a portion 26a extending in a direction (a direction from the upper right toward the lower left in Fig. 4) along the conveyance direction (see the arrowed two-dot chain lines in Fig. 4) for the paper sheet S, to be opposed to an outer surface of the intermediate member 29 in the vicinity of the driving roller 23a. Further, the guide member 27 is formed to have a portion 27a extending in a direction (a direction from the lower right toward the upper left in Fig. 4) along the conveyance direction for the paper sheet S, to be opposed to an outer surface of the intermediate member 29 in the vicinity of the driving roller 24a. The guide member 28 is arranged to be opposed to a base member 30 (a member arranged under the discharge portion 252) provided with the driven roller 25b. Further, the guide member 28 is formed to extend in a direction (a direction from the lower left toward the upper right in Fig. 4) along the conveyance direction for the paper sheet S on an outer surface of the intermediate member 29 in the vicinity of the driving roller 25a.

[0050] According to this embodiment, the guide member 26 is formed to extend over both of the upstream side and the downstream side with respect to the conveyance roller pair 23, and so arranged that the downstream side with respect to the conveyance roller pair 23 traverses a tangent 16 (see a thick dotted line in Fig. 4) to the conveyance roller pair 23 extending along the conveyance direction (see the arrowed two-dot chain lines in Fig. 4) for the paper sheet S. The guide member 27 is formed to extend over both of the upstream side and the downstream side with respect to the conveyance roller pair 24, and so arranged that the upstream side with respect to the conveyance roller pair 24 traverses a tangent 17 (see a thick dotted line in Fig. 4) to the conveyance roller pair 24 extending along the conveyance direction for the paper sheet S. The guide member 28 is arranged to traverse a tangent 18 (see a thick dotted line in Fig. 4) to the discharge roller pair 25 extending along the conveyance direction for the paper sheet S.

[0051] According to this embodiment, the guide members 26 and 27 are both arranged on an outer side with respect to the conveyance direction (see the arrowed two-dot chain lines in Fig. 4) for the paper sheet S. A vicinity of the upstream-side end portion 27a of the guide member 27 is arranged on an outer side beyond a vicinity of the downstream-side end portion 26a of the guide member 26 with respect to the conveyance direction for the paper sheet S. The guide member 28 is arranged on an inner side with respect to the conveyance direction for the paper sheet S. In other words, the guide member 28 is arranged on a side opposite to the reading portion

21 arranged on an outer side with respect to the conveyance direction for the paper sheet S.

[0052] According to this embodiment, the vicinity of the downstream-side end portion 26a of the guide member 26 and the vicinity of the upstream-side end portion 27a of the guide member 27 are arranged not to overlap with each other. In other words, a straight line 19 of a thin dotted line extending in the horizontal direction (the X direction) through the vicinity of the downstream-side end portion 26a of the guide member 26 and a straight line 110 of a thin dotted line extending in the X direction through the vicinity of the upstream-side end portion 27a of the guide member 27 are configured to separate from each other at a prescribed interval D3 in the vertical direction (the Z direction), as shown in Fig. 4. The vicinity of the downstream-side end portion 26a of the guide member 26 and the vicinity of the upstream-side end portion 27a of the guide member 27 are arranged to separate from each other on positions close to each other. The vicinity of the downstream-side end portion 26a of the guide member 26 is so formed that the thickness lessens toward the conveyance direction for the paper sheet S.

[0053] The driving rollers 23a, 24a and 25a are provided on an inner side with respect to the conveyance direction for the paper sheet S together, while the driven rollers 23b, 24b and 25b are provided on an outer side with respect to the conveyance direction for the paper sheet S together.

[0054] According to this embodiment, as hereinabove described, the guide members 8 and 9 of the printer portion 100 are arranged to traverse the tangent 11 to the conveyance roller pair 3 of the printer portion 100 and the tangent 12 (see the thick dotted line in Fig. 2) to the conveyance roller pair 4 respectively. Further, the guide members 26, 27 and 28 of the scanner portion 200 are arranged to traverse the tangent 16 to the conveyance roller pair 23 of the scanner portion 200, the tangent 17 to the conveyance roller pair 24 and the tangent 18 (see the thick dotted line in Fig. 4) to the discharge roller pair 25 respectively. Thus, the conveyance path (see the arrowed one-dot chain lines in Fig. 2) for the paper sheet S in the printer portion 100 and the conveyance path (see the arrowed two-dotted chain lines in Fig. 4) for the paper sheet S in the scanner portion 200 can be more easily bent in the form of curved surfaces (in the form of curves) through the guide members 8, 9, 27, 28 and 29 arranged to traverse the aforementioned tangents 11, 12, 16, 17 and 18 respectively. Consequently, downsizing of the ink jet composite machine 1000 including the printer portion 100 and the scanner portion 200 can be attained by folding back the conveyance path for the paper sheet S while smoothly conveying the paper sheet S along the conveyance path in the form of curved surfaces, dissimilarly to a case where conveyance paths for the paper sheet S are constituted of a plurality of linearly extending conveyance paths.

[0055] Further, the guide members 8 and 9 of the printer portion 100 (the guide members 26 and 27 of the scan-

ner portion 200) are so arranged to separate from each other that the downstream-side end portion 8a (26a) of the guide member 8 (26) and the upstream-side end portion 9a (27a) of the guide member 9 (27) may not be elongated up to positions coming into contact with the guide member 9 (27) and the guide member 8 (26) respectively dissimilarly to a case where the vicinity of the downstream-side end portion 8a (26a) of the guide member 8 (26) and the vicinity of the upstream-side end portion 9a (27a) of the guide member 9 (27) are in contact with each other, whereby the respective lengths of the guide member 8 (26) and the guide member 9 (27) can be shortened, and downsizing of the ink jet composite machine 1000 including the printer portion 100 and the scanner portion 200 can be attained also according to this.

[0056] According to this embodiment, as hereinabove described, the guide member 8 is arranged to traverse the tangent 11 to the conveyance roller pair 3 extending along the conveyance direction for the paper sheet S while the guide member 8 is arranged to extend in the direction intersecting with the conveyance direction for the paper sheet S in the vicinity of the conveyance roller pair 3. Thus, the conveyance path for the paper sheet S can be easily and reliably bent in the form of a curved surface through the guide member 8, whereby downsizing of the ink jet composite machine 1000 can be easily and reliably attained while smoothly conveying the paper sheet S.

[0057] According to this embodiment, as hereinabove described, the vicinity of the upstream-side end portion 9a of the guide member 9 of the printer portion 100 (the vicinity of the upstream-side end portion 27a of the guide member 27 of the scanner portion 200) is arranged on an outer side beyond the vicinity of the downstream-side end portion 8a of the guide member 8 (the vicinity of the downstream-side end portion 26a of the guide member 26). Thus, the paper sheet S can be inhibited from advancing in a direction deviating from the original conveyance direction due to such a situation that the forward end portion of the paper sheet S conveyed from the guide member 8 (26) toward the downstream side comes into contact with the vicinity of the upstream-side end portion 9a (27a) of the guide member 9 (27), dissimilarly to a case where the vicinity of the upstream-side end portion 9a (27a) of the guide member 9 (27) is arranged on an inner side beyond the vicinity of the downstream-side end portion 8a (26a) of the guide member 8 (26). Consequently, paper jamming can be inhibited from occurring also in the case of bending the conveyance path for the paper sheet S in the form of a curved surface.

[0058] According to this embodiment, as hereinabove described, the vicinity of the downstream-side end portion 8a of the guide member 8 of the printer portion 100 (the vicinity of the downstream-side end portion 26a of the guide member 26 of the scanner portion 200) and the vicinity of the upstream-side end portion 9a of the guide member 9 (the vicinity of the upstream-side end

portion 27a of the guide member 27) are arranged not to overlap with each other. Thus, the vicinity of the upstream-side end portion 9a (27a) of the guide member 9 (27) can be reliably arranged on the outer side beyond the vicinity of the downstream-side end portion 8a (26a) of the guide member 8 (26), whereby paper jamming can be reliably inhibited from occurring due to such a situation that the forward end portion of the paper sheet S conveyed from the guide member 8 (26) toward the downstream side comes into contact with the vicinity of the upstream-side end portion 9a (27a) of the guide member 9 (27), also in the case of bending the conveyance path for the paper sheet S in the form of a curved surface.

[0059] According to this embodiment, as hereinabove described, the vicinity of the downstream-side end portion 8a of the guide member 8 of the printer portion 100 (the vicinity of the downstream-side end portion 26a of the guide member 26 of the scanner portion 200) and the vicinity of the upstream-side end portion 9a of the guide member 9 (the vicinity of the upstream-side end portion 27a of the guide member 27) are arranged to separate from each other on the positions close to each other, not to overlap with each other. Thus, formation of a large clearance between the vicinity of the downstream-side end portion 8a (26a) of the guide member 8 (26) and the vicinity of the upstream-side end portion 9a (27a) of the guide member 9 (27) can be suppressed, dissimilarly to a case where the vicinity of the downstream-side end portion 8a (26a) of the guide member 8 (26) and the vicinity of the upstream-side end portion 9a (27a) of the guide member 9 (27) are arranged to extremely separate from each other. Consequently, paper jamming can be easily inhibited from occurring due to such a situation that the forward end portion of the paper sheet S conveyed from the guide member 8 (26) toward the downstream side enters a clearance between the vicinity of the downstream-side end portion 8a (26a) of the guide member 8 (26) and the vicinity of the upstream-side end portion 9a (27a) of the guide member 9 (27).

[0060] According to this embodiment, as hereinabove described, the inclined surface 8b inclined to separate from the vicinity of the upstream-side end portion 9a of the guide member 9 is formed on the surface of the vicinity of the downstream-side end portion 8a of the guide member 8 on the side of the guide member 9, while the inclined surface 9b inclined to separate from the vicinity of the downstream-side end portion 8a of the guide member 8 is formed on the surface of the vicinity of the upstream-side end portion 9a of the guide member 9 on the side of the guide member 8. Thus, the vicinity of the upstream-side end portion 9a of the guide member 9 can be more reliably arranged on the outer side beyond the vicinity of the downstream-side end portion 8a of the guide member 8 by forming the inclined surfaces 8b and 9b on the guide members 8 and 9 respectively. Consequently, paper jamming can be more reliably inhibited from occurring due to such a situation that the forward end portion of the paper sheet S conveyed from the guide member 8 toward

the downstream side comes into contact with the vicinity of the upstream-side end portion 9a of the guide member 9, also in the case of bending the conveyance path for the paper sheet in the form of a curved surface.

[0061] According to this embodiment, as hereinabove described, the guide member 26 is so formed to extend over both of the upstream side and the downstream side with respect to the conveyance roller pair 23 that the same can guide the paper sheet S on both of the upstream side and the downstream side with respect to the conveyance roller pair 23, whereby the paper sheet S can be reliably conveyed.

[0062] According to this embodiment, as hereinabove described, the guide member 26 is so arranged that the downstream side with respect to the conveyance roller pair 23 traverses the tangent 16 to the conveyance roller pair 23 extending along the conveyance direction for the paper sheet S so that the conveyance path for the paper sheet S can be bent in the form of a curved surface (in the form of a curve) on the downstream side with respect to the conveyance roller pair 23, whereby the paper sheet S can be inhibited from advancing in a direction deviating from the original conveyance direction between the conveyance roller pair 23 and the conveyance roller pair 24. Thus, paper jamming can be inhibited from occurring also in the case of bending the conveyance path for the paper sheet S in the form of a curved surface.

[0063] According to this embodiment, as hereinabove described, the guide member 27 is formed to extend over both of the upstream side and the downstream side with respect to the conveyance roller pair 24 so that the same can guide the paper sheet S on both of the upstream side and the downstream side with respect to the conveyance roller pair 24, whereby the paper sheet S can be reliably conveyed.

[0064] According to this embodiment, as hereinabove described, the guide member 27 is so arranged that the upstream side with respect to the conveyance roller pair 24 traverses the tangent 17 to the conveyance roller pair 24 extending along the conveyance direction for the paper sheet S so that the conveyance path for the paper sheet S can be bent in the form of a curved surface (in the form of a curve) on the upstream side with respect to the conveyance roller pair 24, whereby the paper sheet S can be inhibited from advancing in a direction deviating from the original conveyance direction between the conveyance roller pair 23 and the conveyance roller pair 24. Thus, paper jamming can be inhibited from occurring also in the case of bending the conveyance path for the paper sheet S in the form of a curved surface.

[0065] According to this embodiment, as hereinabove described, the vicinity of the downstream-side end portion 8a of the guide member 8 and the vicinity of the downstream-side end portion 26a of the guide member 26 are formed to taper so that the thicknesses lessen toward the conveyance direction for the paper sheet S. Thus, the thicknesses of the guide members 8 and 26 can be inhibited from enlarging in the vicinity of the end

portion 8a of the guide member 8 and the end portion 26a of the guide member 26, whereby downsizing of the ink jet composite machine 1000 can be further attained.

[0066] According to this embodiment, as hereinabove described, the driven roller 5b of the discharge roller pair 5 arranged to come into contact with the surface S2 (see Fig. 2) of the paper sheet S on the side printed with the images is configured to include the thin disc members 50b (see Fig. 3) having the outer peripheral portions of the irregular shapes whose forward ends are pointed. Thus, contact areas between the driven roller 5b and the surface S2 of the paper sheet S on the side printed with the images can be reduced dissimilarly to a case of constituting the driven roller 5b of disc members with large thicknesses having no irregularities on the outer peripheral portions, whereby such a situation can be suppressed that the driven roller 5b rubs against the surface S2 of the paper sheet S on the side printed with the images to lower the qualities of the images.

[0067] According to this embodiment, as hereinabove described, the guide portion 10 formed in the vicinity of the upstream side of the discharge roller pair 5 (the driving roller 5a and the driven roller 5b) is arranged on the side (the inner side) opposite to the printing portion 1 arranged on the outer side with respect to the conveyance direction for the paper sheet S. Thus, the paper sheet S can be guided toward the driving roller 5a while inhibiting the surface of the paper sheet S on the side printed with the images from coming into contact with the guide portion 10.

[0068] According to this embodiment, as hereinabove described, the guide portion 10 formed in the vicinity of the discharge roller pair 5 (the driving roller 5a and the driven roller 5b) is integrally formed on the intermediate member 11 to protrusively extend in the direction along the conveyance direction for the paper sheet S from the corner portion 11a in the vicinity of the driving roller 5a of the discharge roller pair 5 in the intermediate member 11 having the curved surface portion 11b. Thus, the conveyance path for the paper sheet S can be more reliably bent in the form of a curved surface (in the form of a curve) through the curved surface portion 11b of the intermediate member 11. Further, the guide portion 10 arranged in the vicinity of the driving roller 5a and the driven roller 5b may not be provided independently of the intermediate member 11, whereby downsizing of the ink jet composite machine 1000 can be effectively attained.

[0069] According to this embodiment, as hereinabove described, the guide member 28 formed in the vicinity of the upstream side of the discharge roller pair 25 (the driving roller 25a and the driven roller 25b) is arranged on the side (the inner side) opposite to the reading portion 21 arranged on the outer side with respect to the conveyance direction for the paper sheet S, and arranged to traverse the tangent 18 to the discharge roller pair 25 extending along the conveyance direction for the paper sheet S. Thus, the conveyance direction for the paper sheet S can be easily bent in the form of a curved surface

(in the form of a curve) while inhibiting the surface of the paper sheet S on the side to be read from coming into contact with the guide member 28.

[0070] According to this embodiment, as hereinabove described, the intermediate member 11 having the curved surface portion 11b is arranged on the inner side of the conveyance direction for the paper sheet S, while the guide members 8 and 9 are both arranged on the outer side with respect to the conveyance direction for the paper sheet S. Thus, the conveyance path for the paper sheet S can be more reliably bent in the form of a curved surface (in the form of a curve) through the curved surface portion 11b of the intermediate member 11, whereby downsizing of the ink jet composite machine 1000 can be attained by folding back the conveyance path for the paper sheet S while more smoothly conveying the paper sheet S along the conveyance path in the form of a curved surface. Further, the paper sheet S can be guided from the inner side with respect to the conveyance direction through the curved surface portion 11b of the intermediate member 11 and the paper sheet S can be guided from the outer side with respect to the conveyance direction through the guide members 8 and 9, whereby the paper sheet S can be reliably conveyed by guiding the paper sheet S from both sides.

[0071] According to this embodiment, as hereinabove described, the intermediate member 29 having the curved surface portion 29a is arranged on the inner side of the conveyance direction for the paper sheet S, while the guide members 26 and 27 are both arranged on the outer side with respect to the conveyance direction for the paper sheet S. Thus, the conveyance path for the paper sheet S can be more reliably bent in the form of a curved surface (in the form of a curve) through the curved surface portion 29a of the intermediate member 29, whereby downsizing of the ink jet composite machine 1000 can be attained by folding back the conveyance path for the paper sheet S while more smoothly conveying the paper sheet S along the conveyance path in the form of a curved surface. Further, the paper sheet S can be guided from the inner side with respect to the conveyance direction through the curved surface portion 29a of the intermediate member 29 and the paper sheet S can be guided from the outer side with respect to the conveyance direction through the guide members 26 and 27, whereby the paper sheet S can be reliably conveyed by guiding the paper sheet S from both sides.

[0072] According to this embodiment, as hereinabove described, the curved surface portion 11b is formed at least between the conveyance roller pair 3 and the conveyance roller pair 4, while the curved surface portion 29a is formed at least between the conveyance roller pair 23 and the conveyance roller pair 24. Thus, the conveyance path for the paper sheet S can be more reliably bent in the form of a curved surface (in the form of a curve) between the conveyance roller pair 3 and the conveyance roller pair 4 and between the conveyance roller pair 23 and the conveyance roller pair 24.

[0073] According to this embodiment, as hereinabove described, the conveyance roller pair 3 is arranged on the position corresponding to the curved surface portion 11b, while the conveyance roller pairs 23 and 24 are arranged on the positions corresponding to the curved surface portion 29a. Thus, the paper sheet S can be reliably conveyed through the conveyance roller pairs 3, 23 and 24 arranged on the positions corresponding to the curved surface portions 11b and 29a, also in the state where the conveyance path for the paper sheet S is bent in the form of curved surfaces (in the form of curves) through the curved surface portions 11b and 29a.

[0074] According to this embodiment, as hereinabove described, the driving rollers 3a, 4a and 5a are provided on the inner side with respect to the conveyance direction for the paper sheet S together, while the driven rollers 3b, 4b and 5a are provided on the outer side with respect to the conveyance direction for the paper sheet S together. When structuring the ink jet composite machine 1000 in this manner, the driving rollers 3a, 4a and 5a and driving mechanisms or the like for driving the driving rollers 3a, 4a and 5a may not be provided on the outer side with respect to the conveyance direction for the paper sheet S by arranging the driving rollers 3a, 4a and 5a on the inner side provided with the intermediate member 11, whereby the ink jet composite machine 1000 can be inhibited from size increase.

[0075] According to this embodiment, as hereinabove described, the driving rollers 23a, 24a and 25a are provided on the inner side with respect to the conveyance direction for the paper sheet S together, while the driven rollers 23b, 24b and 25b are provided on the outer side with respect to the conveyance direction for the paper sheet S together. When structuring the ink jet composite machine 1000 in this manner, the driving rollers 23a, 24a and 25a and driving mechanisms or the like for driving the driving rollers 23a, 24a and 25a may not be provided on the outer side with respect to the conveyance direction for the paper sheet S by arranging the driving rollers 23a, 24a and 25a on the inner side provided with the intermediate member 29, whereby the ink jet composite machine 1000 can be inhibited from size increase.

[0076] The embodiment disclosed this time must be considered as illustrative in all points and not restrictive. The range of the present invention is shown not by the above description of the embodiment but by the scope of claims for patent, and all modifications within the meaning and range equivalent to the scope of claims for patent are included.

[0077] For example, while the printer portion and the scanner portion included in the ink jet composite machine have been shown as examples of the paper sheet conveyance device according to the present invention in the aforementioned embodiment, the present invention is not restricted to this. The present invention is also applicable to a general paper sheet conveyance device such as a scanner device or a printer device operating as a single substance not included in a composite machine.

[0078] While the printer portion 100 in which the guide members 8 and 9 are arranged to traverse the tangent 11 to the conveyance roller pair 3 and the tangent 12 (see the thick dotted line in Fig. 2) to the conveyance roller pair 4 respectively and the guide portion 10 is arranged not to intersect with the tangent 13 (see the thick dotted line in Fig. 2) to the discharge roller pair 5 has been shown in the aforementioned embodiment, the present invention is not restricted to this. According to the present invention, all of the guide members 8 and 9 and the guide portion 10 may be arranged to traverse the tangents 11, 12 and 13 respectively. According to the present invention, further, only the guide member 8 may be arranged to traverse the tangent 11, while the guide member 9 and the guide portion 10 may be arranged not to intersect with the tangents 12 and 13 respectively.

[0079] Similarly, while the scanner portion 200 in which the guide members 26, 27 and 28 are arranged to traverse the tangent 16 to the conveyance roller pair 23, the tangent 17 to the conveyance roller pair 24 and the tangent 18 (see the thick dotted line in Fig. 4) to the discharge roller pair 25 has been shown in the aforementioned embodiment, the present invention is not restricted to this. According to the present invention, only the guide member 26 may be arranged to traverse the tangent 16, while the guide members 27 and 28 may be arranged not to intersect with the tangents 17 and 18 respectively.

[0080] While the printer portion 100 in which the vicinity of the upstream-side end portion 9a of the guide member 9 is arranged on the outer side beyond the vicinity of the downstream-side end portion 8a of the guide member 8 with respect to the conveyance direction (see the arrowed one-dot chain lines in Fig. 2) for the paper sheet S has been shown in the aforementioned embodiment, the present invention is not restricted to this. According to the present invention, the vicinity of the downstream-side end portion 8a of the guide member 8 and the vicinity of the upstream-side end portion 9a of the guide member 9 may be arranged on the same position with respect to the conveyance direction for the paper sheet S.

[0081] Similarly, while the scanner portion 200 in which the vicinity of the upstream-side end portion 27a of the guide member 27 is arranged on the outer side beyond the vicinity of the downstream-side end portion 26a of the guide member 26 with respect to the conveyance direction (see the arrowed two-dot chain lines in Fig. 4) for the paper sheet S has been shown in the aforementioned embodiment, the present invention is not restricted to this. According to the present invention, the vicinity of the downstream-side end portion 26a of the guide member 26 and the vicinity of the upstream-side end portion 27a of the guide member 27 may be arranged on the same position with respect to the conveyance direction for the paper sheet S.

[0082] While the printer portion 100 in which the vicinity of the downstream-side end portion 8a of the guide member 8 and the vicinity of the upstream-side end portion 9a of the guide member 9 are arranged not to overlap

with each other has been shown in the aforementioned embodiment, the present invention is not restricted to this. According to the present invention, the vicinity of the downstream-side end portion 8a of the guide member 8 and the vicinity of the upstream-side end portion 9a of the guide member 9 may be arranged to overlap with each other.

[0083] Similarly, while the scanner portion 200 in which the vicinity of the downstream-side end portion 26a of the guide member 26 and the vicinity of the upstream-side end portion 27a of the guide member 27 are arranged not to overlap with each other has been shown in the aforementioned embodiment, the present invention is not restricted to this. According to the present invention, the vicinity of the downstream-side end portion 26a of the guide member 26 and the vicinity of the upstream-side end portion 27a of the guide member 27 may be arranged to overlap with each other.

Description of Reference Signs

[0084]

1	printing portion	
3, 23	conveyance roller pair (upstream-side roller pair)	25
3a, 4a, 23a, 24a	driving roller	
3b, 4b, 23b, 24b	driven roller	
4, 24	conveyance roller pair (upstream-side roller pair, downstream-side roller pair)	30
5, 25	discharge roller pair (downstream-side roller pair)	
5a	driving roller (discharge roller)	
5b	driven roller	35
50b	disc member	
8, 26	guide member (upstream-side guide member)	
8b	inclined surface (first inclined surface)	40
9, 27	guide member (upstream-side guide member, downstream-side guide member)	
9b	inclined surface (second inclined surface)	45
10	guide portion (downstream-side guide member)	
11, 29	intermediate member	
11b, 29a	curved surface portion	
21	reading portion	50
28	guide member (downstream-side guide member)	
100	printer portion (paper sheet conveyance device)	
200	scanner portion (paper sheet conveyance device)	55
S	paper sheet	

Claims

1. A paper sheet conveyance device (100, 200) comprising:

an upstream-side roller pair (3, 23) and a downstream-side roller pair (4, 24) arranged to hold a paper sheet (S) therebetween for conveying the held paper sheet in a prescribed conveyance direction; and
an upstream-side guide member (8, 26) and a downstream-side guide member (9, 27) arranged to separate from each other in the vicinity of the upstream-side roller pair and the downstream-side roller pair for guiding the paper sheet along the conveyance direction, wherein arrangement positions of the upstream-side guide member and the downstream-side guide member with respect to the upstream-side roller pair and the downstream-side roller pair are set to include at least one of a structure that the upstream-side guide member is arranged to traverse a tangent (11, 16) to the upstream-side roller pair extending along the conveyance direction and a structure that the downstream-side guide member is arranged to traverse a tangent (12, 18) to the downstream-side roller pair extending along the conveyance direction.

2. The paper sheet conveyance device according to claim 1, wherein the upstream-side guide member is arranged to traverse the tangent to the upstream-side roller pair extending along the conveyance direction, and the downstream-side guide member is arranged to traverse the tangent to the downstream-side roller pair extending along the conveyance direction.
3. The paper sheet conveyance device according to claim 1 or 2, having at least a structure that the upstream-side guide member is arranged to traverse the tangent to the upstream-side roller pair extending along the conveyance direction, wherein at least the upstream-side guide member is arranged to extend in a direction intersecting with the conveyance direction in the vicinity of the upstream-side roller pair.
4. The paper sheet conveyance device according to claim 1 or 2, wherein the upstream-side guide member is arranged on a downstream side with respect to the upstream-side roller pair and on an outer side with respect to the conveyance direction, while the downstream-side guide member is arranged on an upstream side with respect to the downstream-side roller pair and on an outer side with respect to the conveyance direction, and

a vicinity of an upstream-side end portion of the downstream-side guide member is arranged on an outer side beyond a vicinity of a downstream-side end portion of the upstream-side guide member with respect to the conveyance direction.

5. The paper sheet conveyance device according to claim 4, wherein
the vicinity of the downstream-side end portion of the upstream-side guide member and the vicinity of the upstream-side end portion of the downstream-side guide member are arranged separately from each other not to overlap with each other.
6. The paper sheet conveyance device according to claim 5, wherein
the vicinity of the downstream-side end portion of the upstream-side guide member and the vicinity of the upstream-side end portion of the downstream-side guide member are arranged separately from each other on positions close to each other not to overlap with each other.
7. The paper sheet conveyance device according to claim 4, wherein
a first inclined surface (8b) inclined to separate from the vicinity of the upstream-side end portion of the downstream-side guide member is formed on a surface of the vicinity of the downstream-side end portion of the upstream-side guide member on the side of the downstream-side guide member, and
a second inclined surface (9b) inclined to separate from the vicinity of the downstream-side end portion of the upstream-side guide member is formed on a surface of the vicinity of the upstream-side end portion of the downstream-side guide member on the side of the upstream-side guide member.
8. The paper sheet conveyance device according to claim 4, wherein
the upstream-side guide member (26) is arranged to extend over both of an upstream side and a downstream side with respect to the upstream-side roller pair.
9. The paper sheet conveyance device according to claim 8, wherein
the upstream-side guide member is arranged that at least the downstream side with respect to the upstream-side roller pair traverses the tangent to the upstream-side roller pair extending along the conveyance direction.
10. The paper sheet conveyance device according to claim 4, wherein
the downstream-side guide member (27) is arranged to extend over both of an upstream side and a downstream side with respect to the downstream-side roller pair.

er pair.

11. The paper sheet conveyance device according to claim 10, wherein
the downstream-side guide member is arranged that at least the upstream side with respect to the downstream-side roller pair traverses the tangent to the downstream-side roller pair extending along the conveyance direction.
12. The paper sheet conveyance device according to claim 1 or 2, wherein
a vicinity of a downstream-side end portion of the upstream-side guide member is formed to taper toward a downstream side in the conveyance direction.
13. The paper sheet conveyance device according to claim 1 or 2, further comprising a printing portion (1) for printing images on the paper sheet, wherein
the downstream-side roller pair includes a discharge roller (5a) arranged to come into contact with a surface of the paper sheet on a side opposite to a side printed with the images and rotatable in a direction for discharging the paper sheet, and a driven roller (5b) arranged to come into contact with a surface of the paper sheet on the side printed with the images and rotating following the discharge roller, and
the driven roller includes a thin disc member (50b) arranged to be orthogonal to the paper sheet and having an outer peripheral portion of an irregular shape.
14. The paper sheet conveyance device according to claim 1 or 2, further comprising a printing portion for printing images on the paper sheet, wherein
the downstream-side roller pair includes a discharge roller arranged to come into contact with a surface of the paper sheet on a side opposite to a side printed with the images and rotatable in a direction for discharging the paper sheet, and a driven roller arranged to come into contact with a surface of the paper sheet on the side printed with the images and rotating following the discharge roller, and
the downstream-side guide member (10) arranged in the vicinity of the discharge roller and the driven roller is arranged on an upstream side of the discharge roller and the driven roller and on a side opposite to a side where the printing portion is arranged.
15. The paper sheet conveyance device according to claim 14, further comprising an intermediate member (11) arranged on an inner side with respect to the conveyance direction and including a curved surface portion (11b) bent in the form of a curved surface along the conveyance direction, wherein the paper sheet is conveyed to be along the curved surface portion of the intermediate member, and

the downstream-side guide member (10) arranged in the vicinity of the discharge roller and the driven roller is integrally formed on the intermediate member.

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downstream-side roller pair are both arranged on an outer side with respect to the conveyance direction.

16. The paper sheet conveyance device according to claim 1 or 2, further comprising a reading portion (21) for performing image reading processing with respect to the paper sheet, wherein
the downstream-side guide member (28) arranged on a downstream side of the reading portion is arranged on an upstream side of the downstream-side roller pair (25) arranged on the downstream side of the reading portion and on a side opposite to a side where the reading portion is arranged, and arranged to traverse the tangent to the downstream-side roller pair extending along the conveyance direction. 10
17. The paper sheet conveyance device according to claim 1 or 2, further comprising an intermediate member (11, 29) arranged on an inner side with respect to the conveyance direction and including a curved surface portion (11b, 29a) bent in the form of a curved surface along the conveyance direction, wherein
the paper sheet is conveyed to be along the curved surface portion of the intermediate member, and the upstream-side guide member and the downstream-side guide member are arranged on an outer side with respect to the conveyance direction. 20
25
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18. The paper sheet conveyance device according to claim 17, wherein
the curved surface portion is at least provided between the upstream-side roller pair (23) and the downstream-side roller pair (24) in the conveyance direction. 35
19. The paper sheet conveyance device according to claim 17, wherein
at least either one (3) of the upstream-side roller pair and the downstream-side roller pair is arranged on a position corresponding to the curved surface portion. 40
45
20. The paper sheet conveyance device according to claim 17, wherein
the upstream-side roller pair and the downstream-side roller pair both include driving rollers (3a, 4a, 23a, 24a) rotatable in a direction for conveying the paper sheet and driven rollers (3b, 4b, 23b, 24b) rotating following the driving rollers, and
the driving roller of the upstream-side roller pair and the driving roller of the downstream-side roller pair are both arranged on an inner side with respect to the conveyance direction, and the driven roller of the upstream-side roller pair and the driven roller of the 50
55

FIG.1

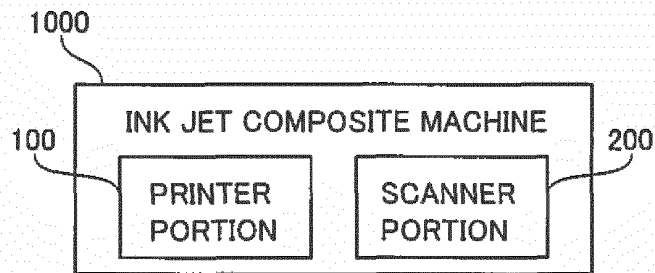


FIG.2

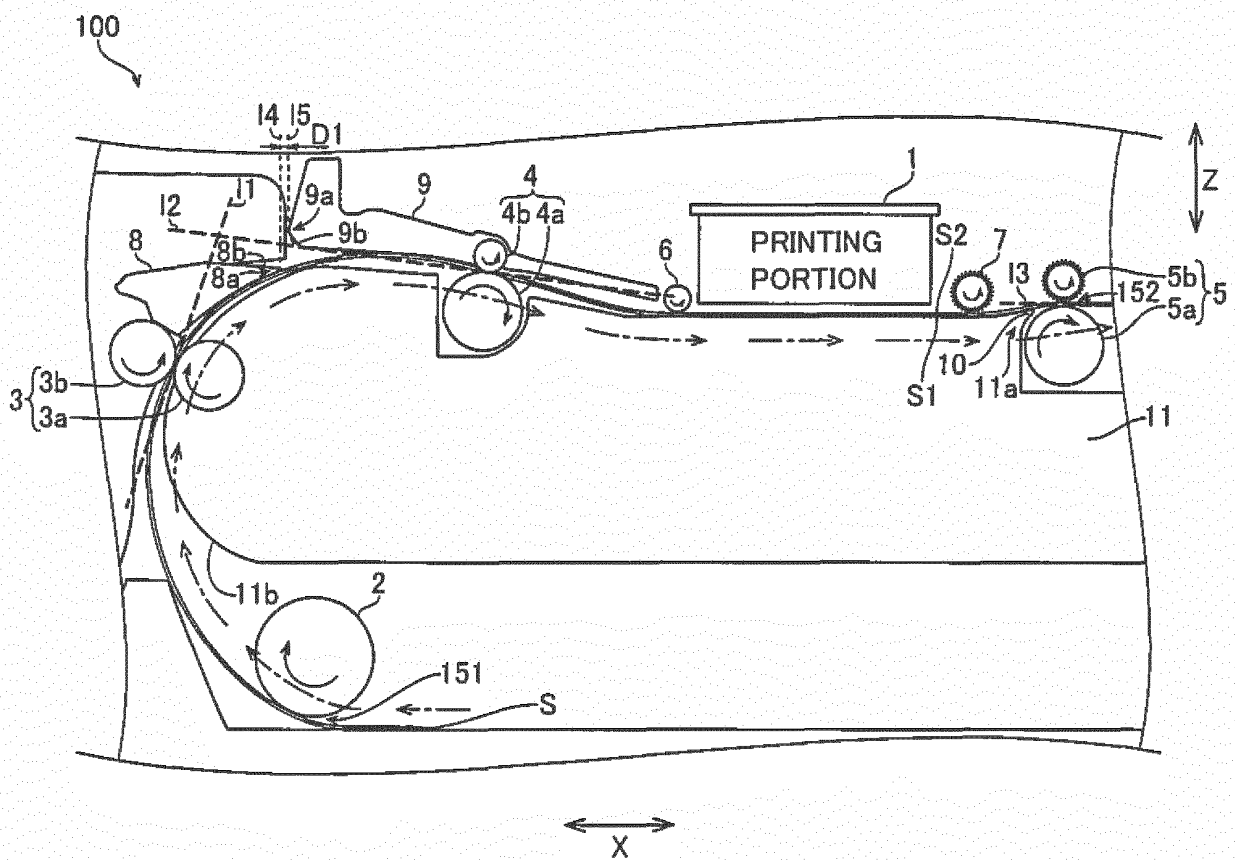


FIG.3

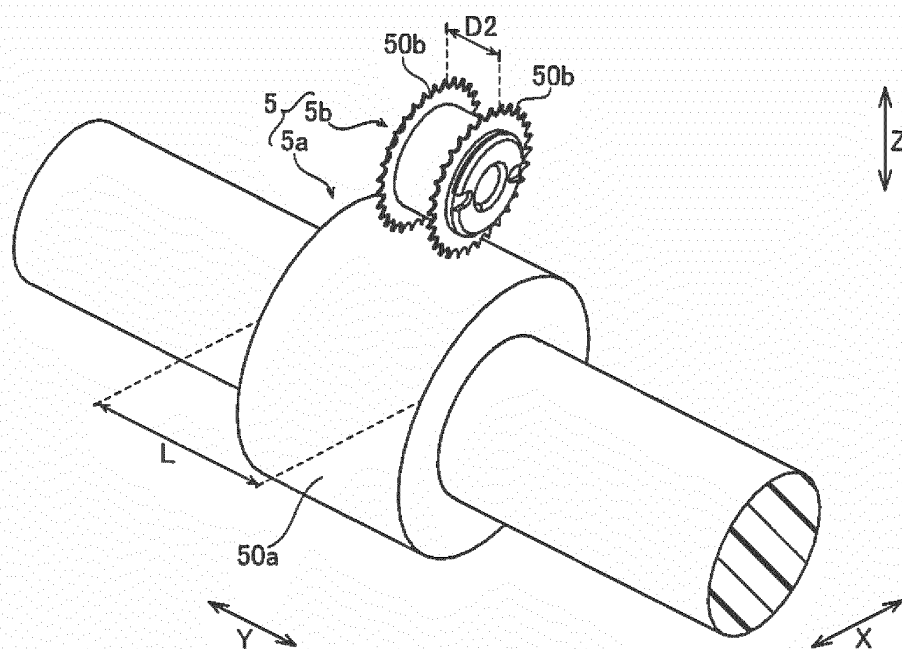
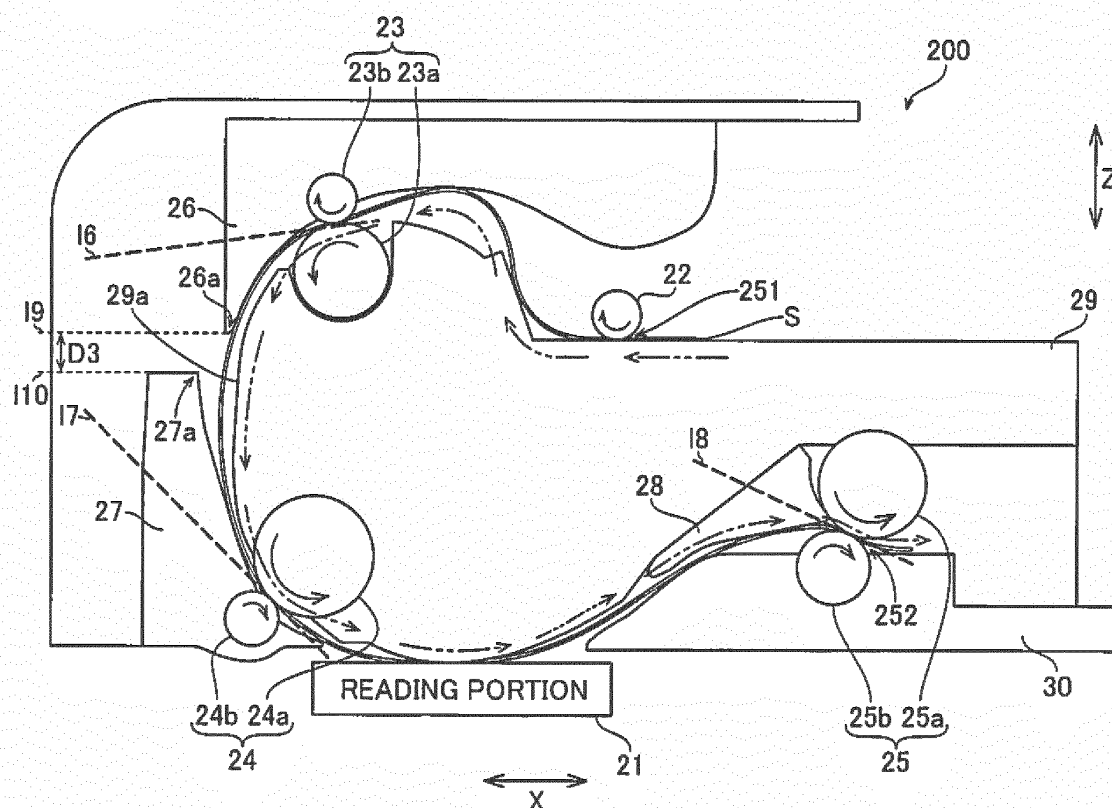


FIG.4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/056957

A. CLASSIFICATION OF SUBJECT MATTER

B65H29/52(2006.01)i, B65H5/06(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)

B65H5/00-5/38, 29/12-29/24, 29/32, 29/52

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 1996-2014

Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	JP 2001-233490 A (Murata Machinery Ltd.), 28 August 2001 (28.08.2001), paragraphs [0021] to [0024], [0028], [0037], [0062]; description of reference characters and numerals; fig. 4 to 5 (Family: none)	1-3, 16-20 4-12 13-15
X Y A	JP 2012-001316 A (Brother Industries, Ltd.), 05 January 2012 (05.01.2012), paragraphs [0033], [0035], [0036], [0042], [0043]; description of reference characters and numerals; fig. 2 & US 2011/0310206 A1 & CN 102285220 A	1, 3, 14, 15 13 2, 4-12, 16-20

☒ Further documents are listed in the continuation of Box C.
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Date of the actual completion of the international search
26 May, 2014 (26.05.14)Date of mailing of the international search report
10 June, 2014 (10.06.14)Name and mailing address of the ISA/
Japanese Patent Office

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/056957

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2010-006508 A (Brother Industries, Ltd.), 14 January 2010 (14.01.2010), paragraphs [0005], [0006], [0032] to [0034]; fig. 3 & US 2009/0322010 A1 & CN 101614991 A	4-11
Y	JP 6-009101 A (Canon Inc.), 18 January 1994 (18.01.1994), paragraph [0006]; fig. 1 (Family: none)	4-11
Y	JP 2003-337452 A (Funai Electric Co., Ltd.), 28 November 2003 (28.11.2003), description of reference characters and numerals; fig. 1 (Family: none)	12
Y	JP 2008-056458 A (Funai Electric Co., Ltd.), 13 March 2008 (13.03.2008), paragraphs [0027], [0028]; fig. 2 to 10 (Family: none)	13

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 3453508 B [0002] [0003] [0004] [0005]