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(54) Transfer device for folder unit

(57) In a transfer device R, which feeds a first web group W20 obtained by overlapping a plurality of webs and vertically folding them in a half width by a former F11 and a second web group W10 of a plurality of overlapped webs in the same width dimension as that of the first web group W20 vertically folded by the former F11 in mutual overlap between a cutting cylinder C1 and a folding cylinder C2, so as to form a newspaper signature, wherein at least one transfer roller R1, R2, R3, or R3' is provided for guiding the second web group W10 to a position at which it is overlapped on the first web group W20 and at least one out of the transfer rollers is rotationally driven, at least one of the transfer rollers to be driven is a roller having a step formed at a peripheral surface in a range in contact with the web while circumferential surfaces having different diameters in an axial direction are adjacent to each other, thus providing the transfer device for a folder unit capable of applying an appropriate tension to each of the webs constituting the web group, so as to prevent the web from being deviated or meandering.

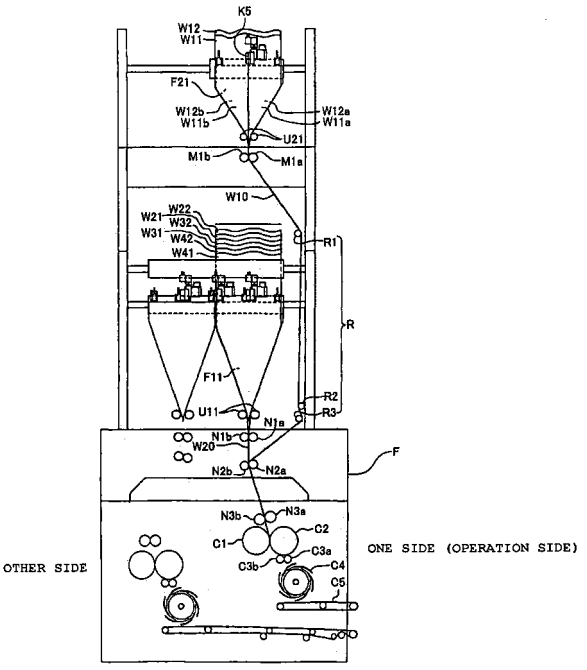

Fig. 1

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Description

Background of the Invention

1. Field of the Invention

[0001] The preset invention relates to a transfer device for a folder unit, which, in a web-fed press, feeds a first web group obtained by overlapping a plurality of webs and vertically folding them in a half width by a former and a second web group consisting of a plurality of webs in the same width dimension as that of the first web group vertically folded by the former in mutual overlap between a cutting cylinder and a folding cylinder, so as to form a newspaper signature, wherein at least one transfer roller is provided for guiding the second web group to a position at which it is overlapped on the first web group, at least one transfer roller being rotationally driven.

2. Description of the Prior Art

[0002] A newspaper signature is normally formed by a web-fed press, as follows: a longitudinal dimension of a web is determined in accordance with a predetermined cut dimension in a folder unit; a plurality of printed webs in a two-page width are overlapped one on another, to be fed through a former in the folder unit; and the webs are vertically folded in a half width in parallel to a traveling direction by the former, thus to obtain a web group having a one-page width, that is, a width of a folding signature (hereinafter referred to a folding signature width), with which the webs are discharged onto a conveyor in the folder unit, described later. And then, the web group is guided to a cut position located between a cutting cylinder and a folding cylinder, to be cut in the predetermined cut dimension by a cutting blade fixed to the cutting cylinder perpendicularly to the traveling direction of the webs; is laterally folded by the folding cylinder and a folding roller; thus obtaining a quarto newspaper signature (hereinafter referred to a signature A) of the web group to be discharged onto the conveyor via a delivery fan.

[0003] Alternatively, a plurality of printed webs having the folding signature width in the state in which a longitudinal dimension of a web is determined in accordance with a predetermined cut dimension in a folder unit are overlapped one on another, thereby obtaining a web group which is then guided to a cut position located between a cutting cylinder and a folding cylinder, to be cut in the predetermined cut dimension by a cutting blade fixed to the cutting cylinder perpendicularly to the traveling direction of the webs; is laterally folded by the folding cylinder and a folding roller; thus obtaining a another folio newspaper signature (hereinafter referred to a signature B) of the web group to be discharged onto the conveyor via a delivery fan.

[0004] These newspaper signatures have been independently formed in the prior art. However, it has been recently desirable that a combined web group (hereinafter referred to as a web group E) should be first obtained by overlapping a web group having a folding signature width which consists of the folding signature A (hereinafter referred to as a web group A) obtained by vertically folding, in the half width, the plurality of overlapped webs having the two-page width by the former and another web group consisting of the plurality of overlapped webs having folding signature widths which consist of the folding signature B (hereinafter referred to as a web group B) in the state in which the web groups are aligned at both side edges thereof with each other; and then, the web group E is guided to a cut position located between a cutting cylinder and a folding cylinder, to be cut in the predetermined cut dimension by a cutting blade fixed to the cutting cylinder perpendicularly to the traveling direction and is laterally folded by the folding cylinder; thus forming a newspaper signature (hereinafter referred to as a folding signature E) obtained by folding the folding signature A and the folding signature B in overlap on a common laterally folding line.

[0005] In order to form the above-described folding signature E, it is necessary to transfer the web group A and the web group B to a overlap position by a transfer device provided in the folder unit, so as to be, as the web group E, either or both of the web group A and the web group B which are overlapped on web paths independent of each other and are guided onto the web paths independent of each other.

[0006] Here, the traveling direction of the transfer device provided in the folder unit is changed in contact of the web group at a roll angle with one or more transfer rollers rotatably supported. Therefore, the tension of the web group to be transferred is decreased due to extension generated in the traveling direction or the rotational resistance of the transfer roller during the traveling on the web paths in the transfer device, so that the web meanders caused by its movement in the width direction during its traveling, thereby raising a problem of degradation of the quality of the folding signature.

[0007] On the other hand, Japanese Utility Model Application Laid-open No. Sho 62-53279 (hereinafter referred to as Patent Document 1) discloses a technique in a transfer device for a folder unit.

[0008] A transfer device disclosed in Patent Document 1 is provided with a rotary drive device in a transfer roller, so as to apply an appropriate tension to a web.

[0009] In the transfer device disclosed in Patent Document 1, in the case of the web group A vertically folded in the half width by the former, a radially inside web guided in contact with the periphery of the transfer roller provided with the rotary drive device and a radially outside web guided from the periphery of the transfer roller via a plurality of webs are integrated with each other in continuation on a folded portion formed by the former, thereby applying some tension to each of the webs constituting the web group A.

[0010] A transfer path in a transfer device recently tends to become longer for various reasons in, for exam-

ple, a folder unit provided with a balloon former disposed above a general former or a folder unit provided with a former elongated in a traveling direction of a web while taking a greater inclination angle between the surface of the former and a horizontal plane. As a consequence, while a web group is transferred by the transfer device, tension is conspicuously decreased due to extension generated in the traveling direction, and further, an air layer is frequently taken in between the webs.

[0011] In, particularly, the web group B, in which the plurality of webs having the folding signature width are overlapped one on another, the radially inside web guided in contact with the periphery of the transfer roller and the radially outside web guided from the periphery of the transfer roller via the plurality of webs are independent of each other, and therefore, neither of the side edges in the width direction are closed. Consequently, the air layer is liable to be markedly taken in between the webs during the transferring, that is, while the web group B travels between a nipping roller and the transfer roller or between the transfer rollers. Even if the web group B is brought into contact with the transfer roller at a roll angle, the air layer taken in between the webs cannot be completely discharged only from both of the side edges of the web group B.

[0012] As a consequence, the air layer remaining between the webs markedly reduces transmission of force due to mutual frictional force between the webs overlapped one on another. The appropriate tension produced by the drive of the transfer roller and applied to the radially inside web to be guided in contact with the periphery of the transfer roller, as disclosed in, for example, above-mentioned Patent Document 1, cannot effectively act on the webs overlapped in sequence outside of the web.

[0013] In this way, since the appropriate tension cannot be applied to each of the webs constituting the web group B, the web meanders while being moved in the width direction during its traveling, thus degrading the quality of the folding signature.

Summary of the Invention

[0014] In order to solve the above-described problems experienced by the prior art, an object of the present invention is to provide a transfer device for a folder unit capable of applying an appropriate tension to each of webs constituting a web group, so as to prevent the web from being deviated or meandering.

[0015] In order to solve the above-described problems, in a transfer device for a folder unit according to the present invention, which feeds a first web group obtained by overlapping a plurality of webs and vertically folding them in a half width by a former and a second web group of a plurality of overlapped webs in the same width dimension as that of the first web group vertically folded by the former in mutual overlap between a cutting cylinder and a folding cylinder, so as to form a newspaper signature, and at least one transfer roller is provided for guiding the second web group to a position at which it is overlapped on the first web group and at least one out of the transfer rollers is rotationally driven,

wherein at least one of the transfer rollers to be driven is a roller having a step formed at a peripheral surface in a range in contact with the web while circumferential surfaces having different diameters in an axial direction are adjacent to each other.

[0016] In the transfer device for the folder unit according to the present invention, the transfer roller is the roller having the step formed in the range with which the web is brought into contact adjacently to the circumferential surface having the different diameters in the axial direction, so that the web path detours within the range in contact with the small-diameter portions with respect to the range in contact with the large-diameter portions of the transfer roller in the web group in contact with the transfer roller at the roll angle, and accordingly, each of the webs is firmly pressed against the surface of the transfer roller. In contrast, each of the webs is weakly pressed against the surface of the transfer roller in the range in contact with the small-diameter portions, and therefore, an air layer taken in between the webs is pushed out from between the webs in contact with the large-diameter portions firmly pressed against the transfer roller toward the range in contact with the small-diameter portions at which the pressing force is weak, thereby dissipating the air layer taken in between the webs in contact with the large-diameter portions. In this manner, the webs are brought into contact with each other at the large-diameter portions on the transfer roller, thus transmitting the power generated by the frictional force. As a consequence, it is possible to apply an appropriate tension to each of the webs constituting the web group, so as to prevent the web from being deviated or meandering.

[0017] Preferably, in the transfer device for the folder unit with the above-described configuration according to the transfer device for the folder unit of this present invention, the two transfer rollers to be driven should approach each other, at least either one of the transfer rollers should be a roller having a step formed at a peripheral surface in a range in contact with the web while circumferential surfaces having different diameters in an axial direction are adjacent to each other, and further, at least one arrangement should be provided in such a manner that the transfer roller is brought into contact with one side and the other side of the second web group with certain central angle.

[0018] In this manner, in addition to the above-described effect, there are further produced the following effects.

[0019] Since the overlapped webs function as a cushion in the case of the greater number of webs, an effect of pushing out the air layer at the large-diameter portions becomes weaker in the web remoter from the surface of the transfer roller in contact with one of the transfer rollers

having the step formed at the peripheral surface via the plurality of webs. As a consequence, in the case where much air is taken in between the webs, the web remoter from the surface of the transfer roller cannot sufficiently push out the air layer even at the large-diameter portions, thereby making it difficult to transmit the power generated by the frictional force from the surface of the transfer roller. In view of this, one of the transfer rollers is disposed in the vicinity of the other transfer roller, both of the transfer rollers being brought into contact with the different sides of the second web group at the roll angle, so that the power can be sufficiently transmitted, from the other transfer roller, even to the web remoter from the surface of one of the transfer rollers, thus applying the appropriate tension to the entire web constituting the web group. Consequently, it is possible to further enhance the effect of preventing the web from being deviated or meandering.

[0020] In a preferred mode, large-diameter portions should be arranged at the circumferential surface having the different diameters substantially symmetrically with respect to a center in a width direction of the web.

[0021] In another preferred mode, a ratio of a large-diameter portion to a small-diameter portion in an axial direction range at the circumferential surface having the different diameters should be equal to or smaller than the small-diameter portion.

[0022] In a further preferred mode, a circumferential surface of a large-diameter portion at the circumferential surface having the different diameters should be subjected to surface treatment for increasing a friction coefficient.

[0023] In these preferred modes, a traveling tension to be applied to the web group in the width direction can be balanced, thus eliminating any occurrence of deviation.

Brief Description of the Drawings

[0024] The foregoing and other features of the present invention will become apparent to those skilled in the art to which the present invention relates from reading the following description with reference to the accompanying drawings, in which:

Fig. 1 is a view indicated by an arrow A-A of Fig. 5, schematically showing a folder unit F provided with a transfer device R according to the present invention;

Fig. 2 is a perspective view illustrating, in enlargement, the relationship between a transfer roller R1 in the transfer device R shown in Fig. 1 and a second web group W10;

Fig. 3 is a perspective view illustrating, in enlargement, the relationship between transfer rollers R2 and R3 in the transfer device R shown in Fig. 1 and a second web group W10';

Fig. 4 is a perspective view illustrating, in enlargement, the relationship between, another transfer roller R3' and the second web group W10'shown in Fig. 3, replaced with the transfer roller R3; and

Fig. 5 is a general view showing the outline of a newspaper web-fed press provided with the transfer device R according to the present invention.

Detailed Description of the Preferred Embodiment

[0025] A preferred embodiment will be described in reference to Figs. 1 to 5.

[0026] Fig. 1 is a view indicated by an arrow A-A of Fig. 5, schematically showing a folder unit F provided with a transfer device R according to the present invention; Fig. 2 is a perspective view illustrating, in enlargement, the relationship between a transfer roller R1 in the transfer device R shown in Fig. 1 and a second web group W10; Fig. 3 is a perspective view illustrating, in enlargement, the relationship between transfer rollers R2 and R3 in the transfer device R shown in Fig. 1 and a second web group W10'; Fig. 4 is a perspective view illustrating, in enlargement, the relationship between the transfer roller R3, shown in Fig. 3, replaced with another transfer roller R3' and the second web group W10'; and Fig. 5 is a general view showing the outline of a newspaper web-fed press including the folder unit F provided with the transfer device R according to the present invention.

[0027] As shown in Fig. 5, webs W1 to W4 having a newspaper 4-page width supplied from reel stands B1 to B4, respectively, are subjected to a double-sided printing operation by printing units T1 to T4, and then, are bisected at the center of the web width in parallel to a traveling direction of the web by slitter knives K1 to K4 disposed in a rail frame L, into webs W11 to W41 on one side having a half width (i.e., a 2-page width) and webs W12 to W42 on the other side having a half width (i.e., a 2-page width). The bisected webs W12 to W42 on the other side having the half width are guided to the folder unit F in a state in which traveling positions in a direction perpendicular to the traveling direction thereof are located at the same positions of the webs W11 to W41 on one side having the half width by a deviating angle bar Z1 to Z4.

[0028] The webs W2 to W4 printed by the printing units T2 to T4 are cut into the webs W21 to W41 on one side having the half width and the webs W22 to W42 on the other side having the half width by the slitter knives K2 to K4, respectively, as described above, and then, they are overlapped one on another in a drag roller D11, to pass on a web path through a lower former F11. Here, a great inclination angle formed between the surface of the former and a horizontal plane is taken in the lower former F11 for various reasons, and therefore, the former elongated in the traveling direction of the web is adopted.

[0029] In the meantime, the web W1 printed in the printing unit T1 is cut into the web W11 on one side having the half width and the web W12 on the other side having the half width by the slitter knife K1, as described above. These two webs W11 and W12, each having the half

width, are overlapped one on another in a drag roller D21, to pass on a web path through a balloon former F21.

[0030] The webs W21 to W41 on one side having the half width and the webs W22 to W42 on the other side having the half width are vertically folded (former-folded) in parallel to the traveling direction at the widthwise center by the lower former F11 and a pair of forming rollers U11. The six webs W21 to W41 and W22 to W42, each having the half width, overlapped in the above-described manner are vertically folded, thereby constituting a first web group W20, having a former-folded portion. The first web group W20 is fed downstream while being held at both ends thereof by appropriate force between first nipping rollers N1a and N1b, between second nipping rollers N2a and N2b, and between third nipping rollers N3a and N3b, which all are driven, and then, intrudes into between a cutting cylinder C1 and a folding cylinder C2.

[0031] The web W11 on one side having the half width and the web W12 on the other side having the half width are overlapped in the drag roller D21 right above the balloon former F21, and further, the two overlapped webs W11 and W12, each having the half width, are bisected at the widthwise center in parallel to the traveling direction by a slitter knife K5, thereby constituting four webs W11a, W11b, W12a, and W12b, each having a 1/4 width of the width of the web W1. The four webs are overlapped one on another by the balloon former F21 and a pair of forming rollers U21 in a state in which both widthwise ends are aligned with each other, thereby constituting the second web group W10 without any former-folded portion. The second web group W10 is fed downstream while both their side being held between driven nipping rollers M1a and M1b by appropriate force. The second web group W10 is brought, at a roll angle, into contact with the nipping roller M1a and a transfer roller R1, which is disposed under the nipping rollers M1a and M1b and on a frame side nearer the nipping roller M1a (hereinafter referred to as an operation side), and thus, the traveling position of the second web group W10 is moved onto the operation side down to a position at which the second web group W10 cannot interfere with the lower former F11.

[0032] The second web group W10 travels downward in substantially a vertical direction in the vicinity of the lower former F11 on the operation side, and then, is brought at different sides thereof into contact with another transfer roller R2 and a further transfer roller R3 disposed under in the vicinity of the transfer roller R2, respectively, at a roll angle.

[0033] The second web group W10 detouring the lower former F11 and the forming roller U11 disposed under the lower former F11 is brought, at the roll angle, into contact with the transfer roller R3, as described above, and then, it travels toward the center of the folder unit in separation from the frame, to be brought, at the roll angle, into contact with the second nipping roller N2a, through which the first web group W20 travels on the web path to between the cutting cylinder C1 and the folding cylinder C2. In this manner, the second web group W10 merges with the first web group W20 in a state in which the position of a widthwise side aligns with the first web group W20. The second web group W10 and the first web group W20 are overlapped one on another while being held between the second nipping roller N2a and the other second nipping roller N2b by appropriate force, thereby constituting a combined web group which is then fed out. The combined web group is further fed out by the third nipping rollers N3a and N3b, to travel between the cutting cylinder C1 and the folding cylinder C2. The first web group W20 is wound around the peripheral surface of the folding cylinder C2 while the overlapped second web group W10 is oriented inward. Furthermore, the first web group W20 is cut in a predetermined length perpendicularly to the traveling direction by a cutting blade disposed in the cutting cylinder C1, to be then pushed into between folding rollers C3a and C3b and laterally folded by a folding blade, not shown, projecting from the folding cylinder C2. As a consequence, a section having the former-folded portion, separated from the first web group W20, is oriented outward whereas a section without any former-folded portion, separated from the second web group W10, is oriented inward, thus achieving a newspaper folding signature having the two sections, to be then discharged onto a conveyor C5 via a delivery fan C4.

[0034] With the above-described configuration, the transfer device R according to the present invention is configured in such a manner as to include the transfer rollers R1 to R3 and relevant mechanisms such as their drive means, not shown.

[0035] Next, explanation will be made on the positions and shapes of the transfer rollers R1 to R3.

[0036] The transfer roller R1 for guiding the second web group W10 to the position, at which the second web group W10 cannot interfere with the lower former F11, is disposed near the frame on the operation side and under the nipping rollers M1a and M1b, as described above.

[0037] The transfer roller R3 for guiding the second web group W10, which is introduced from the transfer roller R1 downward in substantially the vertical direction, in a direction confluent with the web path for the first web group W20 is disposed substantially right under the transfer roller R1 and above the nipping rollers N2a and N2b.

[0038] The transfer roller R2 is disposed above and near the transfer roller R3. Moreover, a horizontal interval between the axis of the transfer roller R2 and the axis of the transfer roller R3 is smaller than the sum of the radius of the transfer roller R2 and the radius of the transfer roller R3. The transfer roller R2 is located at a position remoter from the nipping rollers N2a and N2b than the transfer roller R3. Consequently, the transfer roller R2 is guided the second web group W10, which travels from above in substantially the vertical direction in contact with the transfer roller R3 at the circumferential surface on a side facing to the frame, in such a manner as to be brought into contact, at the roll angle, with the transfer roller R2 at the circumferential surface on a side opposite

to the circumferential surface on the side facing to the frame.

[0039] Each of the transfer rollers R1 and R2 is formed at the circumferential surface thereof into a shape in which large-diameter portions X and small-diameter portions Y are alternately arranged in an axial direction range in contact with the second web group W10, as shown in Figs. 2 and 3. The radii of the large-diameter portion X and the small-diameter portion Y are different from each other by almost 1 mm, wherein adjacent portions constitute a step. The large-diameter portions X are arranged substantially symmetrically with respect to the widthwise center of the second web group W10. In the present preferred embodiment, the large-diameter portions X are arranged at four positions inclusive of the vicinity of both ends of the second web group W10 with respect to the width of the second web group W10. A ratio of the large-diameter portion X to the small-diameter portion Y in the axial direction range is equal to or smaller than the small-diameter portion Y. The circumferential surface of the large-diameter portion X is subjected to surface treatment for increasing a friction coefficient, for example, knurling.

[0040] The transfer roller R3 is a roller having the uniform diameter in the axial direction without any step at its circumferential surface, as shown in Fig. 3.

[0041] The transfer rollers R1, R2, and R3 are driven by drive means, not shown, in such a manner that their circumferential speeds become higher than the traveling speed of the second web group W10, which is determined by the drive circumferential speeds of the nipping rollers M1a, M1b, N2a, and N2b. And then, it is desirable that their circumferential speeds should be set at an appropriate rate within a range of 103% to 120% of the traveling speed of the second web group W10 during the operation of the web-fed press. Here, the transfer rollers R1, R2, and R3 are driven via an appropriate power transmission mechanism from a motor for driving the folder unit or a motor for driving the nipping roller which is rotated in synchronism with the motor for driving the folder unit, or are driven by a special motor which is rotated in synchronism with the motor for driving the folder unit.

[0042] Subsequently, a description will be given of the function of the present preferred embodiment.

[0043] The four webs W11a, W11b, W12a, and W12b in the second web group W10 fed downstream by the nipping rollers M1a and M1b travel toward the transfer roller R1.

[0044] While the second web group W10 travels on the web path from the nipping rollers M1a and M1b toward the transfer roller R1, air layers are taken in among the four webs W11a, W11b, W12a, and W12b, to be thus brought into contact with the transfer roller R1 with slight clearances.

[0045] The large-diameter portion X and the small-diameter portion Y are adjacent to each other on the transfer roller R1. The webs W11a, w11b, W12a, and W12b are firmly pressed against the surface of the transfer roller in a range, in which the overlapped second web group W10 in contact with the transfer roller R1 at the roll angle is brought into contact with the large-diameter portion X on the transfer roller R1, more than in a range, in which the second web group W10 is brought into contact with the small-diameter portion Y. In contrast, in the range, in which the second web group W10 is brought into contact with the small-diameter portion Y, the webs W11a, W11b, W12a, and W12b are pressed against the surface of the transfer roller by a weaker force. The respective air layers taken in between the webs W11a, W11b, W12a, and W12b are pushed out from between the webs in contact with the large-diameter portion X firmly pressed against the surface of the transfer roller to the range, in which the second web group W10 is pressed against the surface of the transfer roller in contact with the small-diameter portion Y by the weaker force, and therefore, the air layers between the webs in contact with the large-diameter portion X are dissipated. As a consequence, the webs W11a, W11b, W12a, and W12b are mutually brought into contact with each other at the large-diameter portion X, so that the force is transmitted in the traveling direction by the frictional force, thereby applying the appropriate tension to each of the webs.

[0046] The second web group W10, which detours onto the operation side of the lower former F11 by the transfer roller R1, travels toward the transfer roller R3 for changing the traveling direction, so as to merge with the first web group W20 at the outside section having the former folded portion. During the traveling, the traveling tension becomes weak in the second web group W10, and further, the air layers are taken in among the four webs W11a, W11b, W12a, and W12b. Additionally, the distance from the transfer roller R1 to the transfer roller R3 is longer than that from the nipping rollers M1a and M1b to the transfer roller R1, and therefore, much air is liable to be taken in among the four webs W11a, W11b, W12a, and W12b. The taken-in air layers reduce respective contact portions between the webs, thereby reducing mutual connection by the frictional force.

[0047] In view of this, the second web group W10 is brought into contact with the transfer roller R2 disposed upstream in the vicinity thereof at the roll angle before its traveling direction is changed by the transfer roller R3. The surface, at which the second web group W10 is brought into contact with the transfer roller R2, is reverse side of the surface, at which the second web group W10 is brought into contact with the transfer roller R3.

[0048] The transfer roller R2 is provided with large-diameter portions X and small-diameter portions Y adjacently arranged on it's circumference surface, like the transfer roller R1. First of all, similarly to the effect produced by the transfer roller R1, the webs W11a, W11b, W12a, and W12b are firmly pressed against the surface of the transfer roller in a range, in which the second web group W10 in contact with the transfer roller R2 at the roll angle is brought into contact with the large-diameter portions X in the transfer roller R2, more than in a range,

in which the second web group W10 is brought into contact with the small-diameter portions Y. In contrast, in the range, in which the second web group W10 is brought into contact with the small-diameter portion Y, the webs W11a, W11b, W12a, and W12b are pressed against the surface of the transfer roller by a weaker force. The respective air layers taken in between the webs W11a, W11b, W12a, and W12b are pushed out from between the webs in contact with the large-diameter portions X firmly pressed against the surface of the transfer roller to the range, in which the second web group W10 is pressed by the weaker force against the surface of the transfer roller in contact with the small-diameter portions Y, and therefore, the air layers between the webs in contact with the large-diameter portions X are dissipated. However, the number of webs constituting a second web group is not limited to four constituting the second web group W10, and, twelve webs to the maximum are applicable in the web-fed press shown in the drawings. In this manner, when the webs constituting the second web group is another second web group W10' constituted of the number of webs more than that of the second web group W10, overlapped webs function as a cushion to thus reduce the effect for pushing out an air layer in a web remote from the surface of the transfer roller. Therefore, the air layer remains between some webs remote from the surface of the transfer roller R2 out of the webs in contact with the large-diameter portions X in the case where much air is taken in, thereby inducing an insufficient contact between the webs on the side remote from the surface of the transfer roller R2 at the large-diameter portions X of the transfer roller R2, whereby the power can be insufficiently transmitted in the traveling direction by the frictional force generated between the webs.

[0049] However, in the second web group W10' having the air layer remaining between the webs remote from the surface of the transfer roller R2,the web remoter from the surface of the transfer roller R2 is brought into contact with the peripheral surface of the transfer roller R3 disposed downstream near the transfer roller R2 and therefore, the force in the traveling direction can be applied also to the web on the side from the transfer roller R3, thus applying the appropriate tension to all of the webs constituting the second web group W10'.

[0050] Moreover, explanation will be made on an effect produced in the case where a transfer roller R3', in which large-diameter portions X and small-diameter portions Y are arranged adjacently to each other on the transfer roller, like in the transfer rollers R1 and R2, is disposed in place of the transfer roller R3 in the transfer device R, which has been described above in the preferred embodiment (see Fig. 4).

[0051] As described above, in the second web group W10' having the air layers remaining between some webs remoter from the surface of the transfer roller R2, the web remoter from the surface of the transfer roller R2 is brought into contact with the periphery of the transfer roller R3' disposed downstream near the transfer roller R2. Since the large-diameter portions X and the small-diameter portions Y are arranged adjacently to each other on the transfer roller R3', like in the transfer rollers R1 and R2, a range, in which the transfer roller R3' in the second web group W10' is brought into contact with the large-diameter portions X, is firmly pressed against the surface of the transfer roller, more than in a range, in which the transfer roller R3' is brought into contact with the small-diameter portions Y. In contrast, a range, in which the transfer roller R3' is brought into contact with the small-diameter portions Y, is pressed against the surface of the transfer roller by a weaker force. The air layer remaining between some webs remote from the surface of the transfer roller R2 in the second web group W10' is pushed out in the range, in which the transfer roller R3' is brought into contact with the small-diameter portions Y, pressed against the surface of the transfer roller R3' by the weaker force, from between the webs in contact with the large-diameter portions X, firmly pressed against the surface of the transfer roller R3', and thus, the air layer remaining between the webs in contact with the large-diameter portions X is dissipated. As a consequence, the respective webs constituting the second web group W10' are brought into contact with each other at the large-diameter portions X in the transfer roller R3', and further, the force can be securely transmitted also to some webs disposed remote from the surface of the transfer roller R2 in the traveling direction by the frictional force. Thus, the appropriate tension can be applied to all of the webs constituting the second web group W10'.

[0052] By the way, for the above-described reasons, the positional relationship between the transfer rollers R2 and R3 (R3'), that is, the arrangement in which the two driven transfer rollers approach each other in contact with one side and the other side of the second web group at the roll angle, respectively, is desired such that the rollers should be arranged at a relatively great interval, and further, should be arranged in a transfer roller downstream of a portion at which much air is liable to be taken in between the webs, like in the present preferred embodiment, in the case where the number of arrangement portions is limited.

[0053] In the meantime, if the traveling tension is not balanced in the width direction of the second web group W10 (W10') when the tension is applied to the second web group W10 (W10'), the second web group W10 (W10') is accidentally moved to be deviated in the width direction. Since the large-diameter portions formed on the peripheral surface of the transfer roller R1, R2 and R3' are disposed at the four portions including the vicinity of both ends of the second web group W10 (W10'), the power in the traveling direction can be transmitted equally in the vicinity of both widthwise ends of the second web group W10 (W10'). Consequently, the traveling tension in the width direction can be balanced, thereby preventing any occurrence of deviation.

[0054] With the above-described effects, it is possible to prevent the second web group W10 (W10') from oc-

curring a deviation or meander on the web path inside of the transfer device during the traveling.

[0055] Incidentally, the step formed between the large-diameter portion X and the small-diameter portion Y formed on the transfer roller R1, R2, or R3' is about 1 mm, and therefore, no folding trace due to the step remains on the second web group W10 (W10').

[0056] Although the second web group is formed by using the balloon former in the present preferred embodiment, means for forming the second web group is not limited to such an above-mentioned means.

[0057] In addition, the number of large-diameter portions on the transfer roller and the arrangement position of the transfer roller are not limited to those in the present preferred embodiment, they may be varied without departing from the scope of claims.

Claims

1. A transfer device for a folder unit, which feeds a first web group (W20) obtained by overlapping a plurality of webs and vertically folding them in a half width by a former (F11) and a second web group (W10) of a plurality of overlapped webs in the same width dimension as that of the first web group (W20) vertically folded by the former (F11) in mutual overlap between a cutting cylinder (C1) and a folding cylinder (C2), so as to form a newspaper signature, wherein at least one transfer roller (R1, R2, R3, or R3') is provided for guiding the second web group (W10) to a position at which it is overlapped on the first web group (W20), at least one out of the transfer rollers being rotationally driven, the transfer device for a folder unit
characterized in that:

   at least one of the transfer rollers to be driven is a roller having a step formed at a peripheral surface in a range in contact with the web while circumferential surfaces having different diameters in an axial direction are adjacent to each other.

2. The transfer device for a folder unit according to claim 1, **characterized in that** the two transfer rollers to be driven approach each other, at least either one of the transfer rollers is a roller having a step formed at a peripheral surface in a range in contact with the web while circumferential surfaces having different diameters in an axial direction are adjacent to each other, and further, at least one arrangement is provided in such a manner that one transfer roller is brought into contact with one side of the second web group (10) with certain central angle and the other transfer roller is brought into contact with the other side of the second web group (W10) respectively with certain central angle.

3. The transfer device for a folder unit according to claim 1 or claim 2, **characterized in that** large-diameter portions are arranged at the circumferential surface having the different diameters substantially symmetrically with respect to a center in a width direction of the web.

4. The transfer device for a folder unit according to claim 1 or claim 2, **characterized in that** a ratio of a large-diameter portion to a small-diameter portion in an axial direction range at the circumferential surface having the different diameters is equal to or smaller than the small-diameter portion.

5. The transfer device for a folder unit according to claim 1 or claim 2, **characterized in that** a circumferential surface of a large-diameter portion at the circumferential surface having the different diameters is subjected to surface treatment for increasing a friction coefficient.

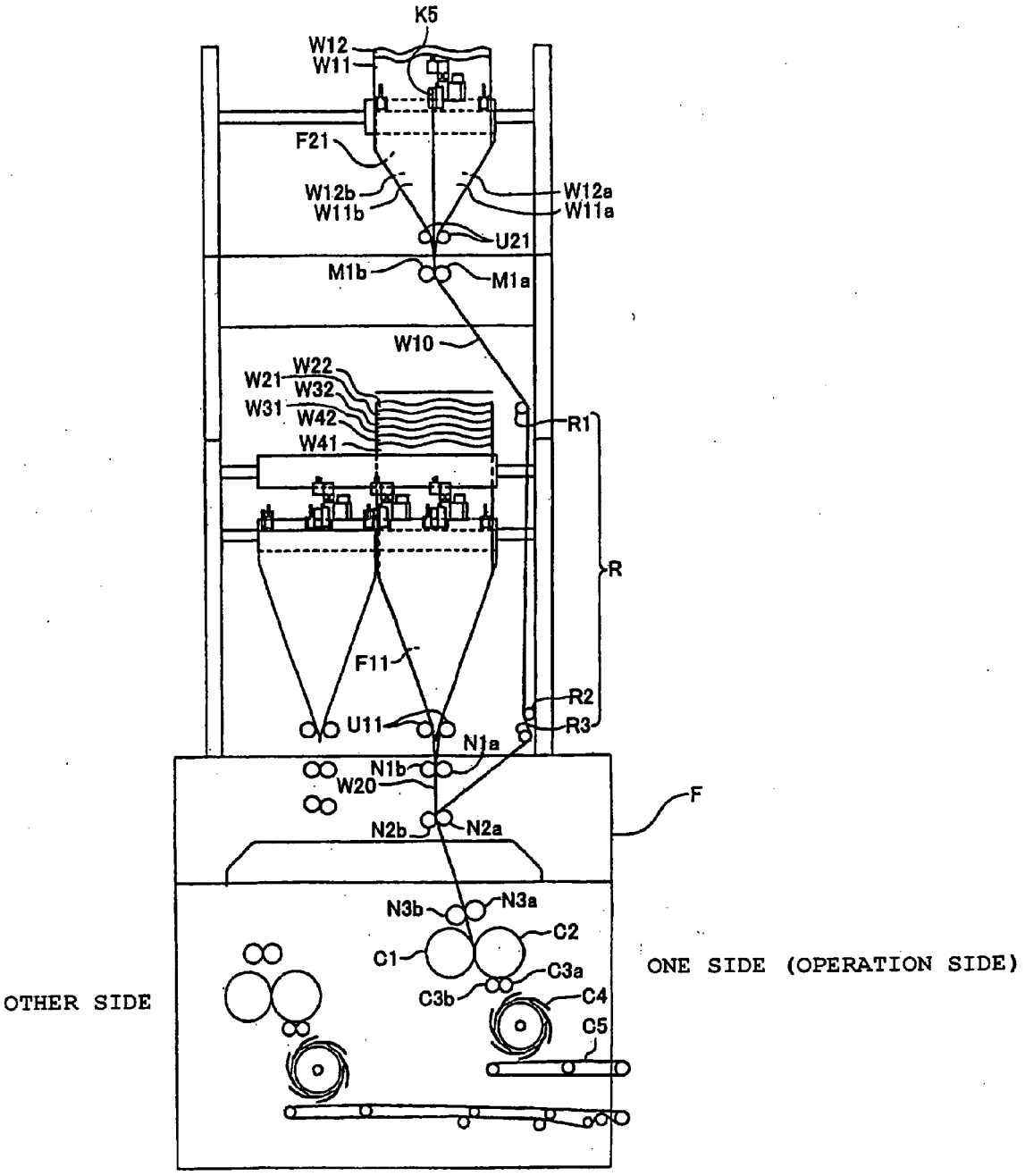
K5
W12
W11
F21
W12b
W11b
W12a
W11a
U21
M1b
M1a
W10
W22
W21
W32
W31
W42
W41
R1
R
F11
R2
R3
U11
N1a
N1b
W20
F
N2b
N2a
N3b
N3a
C2
C1
C3a
C3b
C4
C5
OTHER SIDE
ONE SIDE (OPERATION SIDE)

Fig. 1

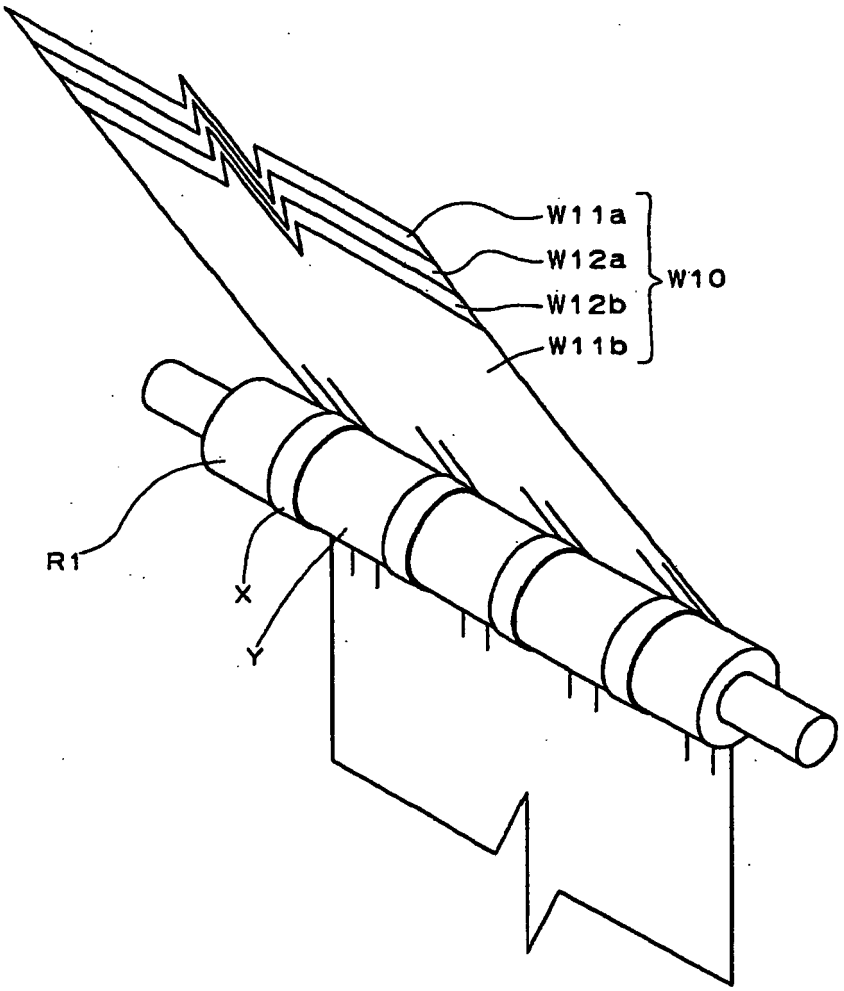

Fig. 2

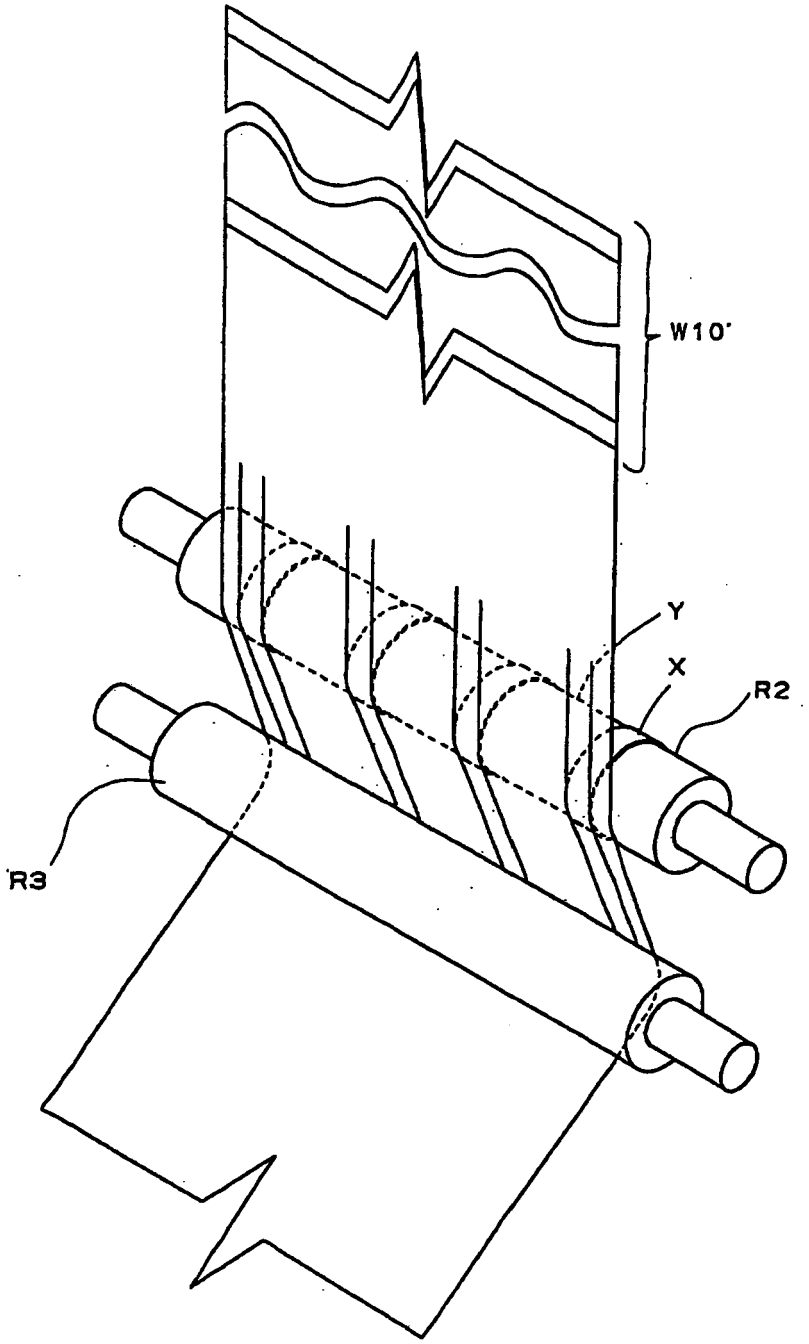

Fig. 3

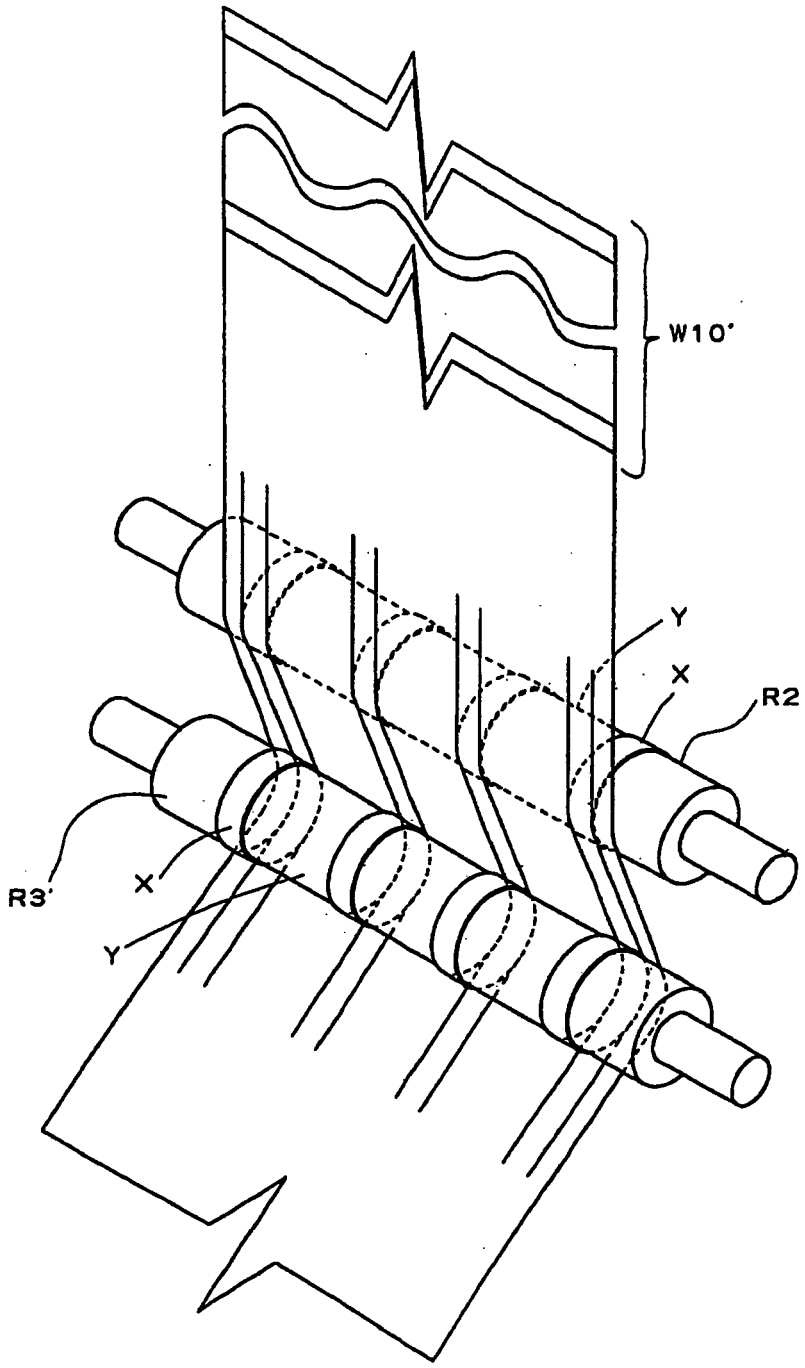

Fig. 4

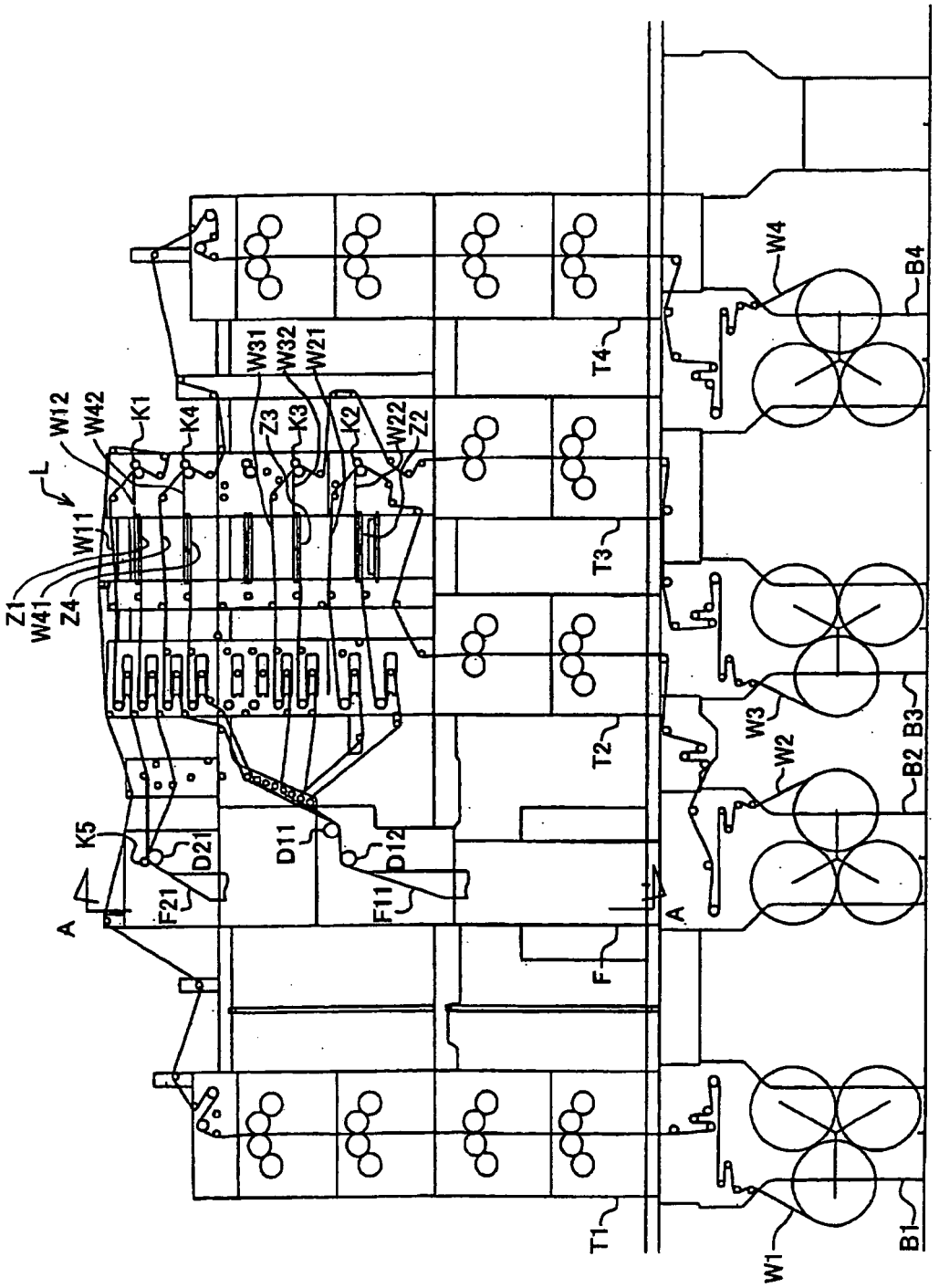
W12
W42
K1
K4
W31
W32
W21
Z3
K3
K2
W22
Z2
L
W11
Z1
W41
Z4
K5
D21
D11
D12
F21
F11
A
A
F
T1
T2
T3
T4
W1
W2
W3
W4
B1
B2
B3
B4

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 08 02 1424

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 June 2009	Jezierski, Krzysztof

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