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(54) Stencil printer

(57) A stencil printer has a printing drum (200) which has a flexible and ink-permeable cylindrical side wall (104) around which a stencil master (107) is wound and is rotated about its longitudinal axis, a back press roller (101) which is disposed outside the printing drum at a predetermined distance from the printing drum in parallel to the printing drum, and an internal press roller (112) which is disposed inside the printing drum in parallel to the printing drum and is moved between an operative position where it presses and deforms radially outward the side wall of the printing drum and an inoperative position where it is held away from the side wall. Printing is effected by conveying a printing paper with the printing paper pinched between the back press roller and the side wall of the printing drum deformed by the internal press roller in the operative position. A side wall pressing member presses (201) outward the side wall of the printing drum on longitudinally opposite sides of the internal press roller when the internal press roller is in the operative position.

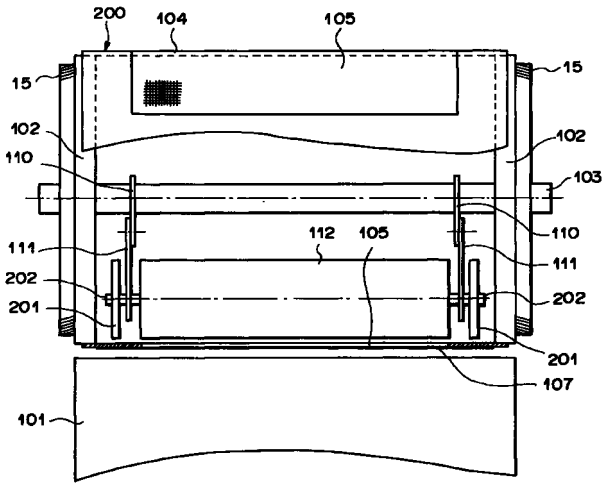

FIG.5

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] This invention relates to a stencil printer which comprises a printing drum having a deformable side wall, an internal press roller provided inside the printing drum to be movable up and down and a back press roller provided outside the printing drum and in which the side wall of the printing drum is pressed and deformed by the internal press roller and ink is transferred to a printing paper from inside the printing drum while the printing paper is conveyed pinched between the deformed side wall and the back press roller, and more particularly to such a stencil printer which is improved to prevent leakage of ink from side edges of the printing paper pinched between the side wall of the printing drum and the back press roller.

Description of the Related Art

[0002] The structure of the conventional stencil printer and the drawbacks of the stencil printer will be described with reference to Figures 11 and 12, hereinbelow. As shown in Figure 11, the conventional stencil printer comprises a printing drum 100 which is cylindrical and hollow and a back press roller 101 which is disposed at a predetermined distance from the printing drum 100. The printing drum 100 and the back press roller 101 are rotated about axes parallel to each other.

[0003] The printing drum 100 has a pair of annular members 102 which are opposed to each other at a predetermined distance from each other and connected to each other by a connecting plate (not shown). A flexible side wall 104 is wrapped around the annular member 102 with its one end fixed to the connecting plate and its the other end connected to the connecting plate by way of a spring. The side wall 104 is provided with a plurality of substantially square ink-permeable openings. Reference numeral 105 denotes a printing area. Though not shown, an ink supply means is provided inside the printing drum and supplied ink to the inner surface of the side wall 104.

[0004] A shaft 103 supported on a frame extends through the annular members 102 so that the printing drum 100 is rotatable about the shaft 103 relatively to the shaft 103. The print drum 100 is rotated about the shaft 103 by a drive means not shown.

[0005] A pair of frames 110 is mounted on the shaft 103 inside the printing drum 100. The frames 110 are kept stationary when the printing drum 100 is rotated. A pair of main arms 111 are connected for rotation to the respective frames 110 at their one ends. An internal press roller 112 is supported for rotation on the other ends of the main arms 111. The internal press roller 112 is rotated about an axis which is parallel to the shaft 103. When the main arms 111 are swung, the internal press roller 112 is moved up and down in the printing drum 100. The internal press roller 112 is moved between an operative (printing) position shown in Figure 12 where it presses and deforms outward the side wall 104 of the printing drum 100 and an inoperative position shown in Figure 11 where it is away from the side wall 104 and the deformation of the side wall 104 is relieved.

[0006] An interlocking mechanism (not shown) swings the main arms 111 in synchronization with rotation of the printing drum 100. In response to swing of the main arms 111, the internal press roller 112 is moved up and down between the operative position and the inoperative position. When the internal press roller 112 is in the operative position, the side wall 104 is pressed by the internal press roller 112 and is deformed outward.

[0007] A stencil master 107 is wound around the side wall 104 of the printing drum 100. When the printing drum 100 is rotated, the internal press roller 112 is moved up and down in synchronization with the rotation of the printing drum 100. A printing paper 108 is supplied between the side wall 104 of the printing drum 100 and the back press roller 101 at a predetermined timing. The printing paper 108 is pinched between the deformed side wall 104 and the back press roller 101 and conveyed thereby. While the printing paper 108 is thus conveyed, ink 120 is transferred to the printing paper 108 through the openings in the printing are 105 in the side wall 104 and through imagewise perforations in the stencil master 107, thereby printing is effected.

[0008] As shown in Figure 12, in the conventional stencil printer, there has been a problem that the ink 120 leaks from side edges of the printing paper 108 pinched between the side wall 104 of the printing drum 100 deformed by the internal press roller 112 and the back press roller 101.

[0009] In the conventional stencil printer, the pressure applied to the side wall 104 from the internal press roller 112 is higher on opposite end portions of the roller 112. Due to the higher pressure, opposite end portions of the side wall 104 are folded as shown in Figure 12. That is, though the intermediate portion of the side wall 104 directly pressed by the internal press roller 112 is pressed against the back press roller 101, the opposite end portions of the side wall 104 extending beyond the opposite ends of the internal press roller 112 are spaced from the surface of the back press roller 101.

[0010] Accordingly, the ink 120 can leak outward through the space between the stencil master 107 and the end portions of the side wall 104 and contaminate the printing drum 100 and/or the back press roller 101.

SUMMARY OF THE INVENTION

[0011] In view of the foregoing observations and description, the primary object of the present invention is to provide a stencil printer in which leakage of ink

from side edges of the printing paper pinched between the side wall of the printing drum and the back press roller is prevented.

[0012] In accordance with the present invention, there is provided a stencil printer comprising

a printing drum which has a flexible and ink-permeable cylindrical side wall around which a stencil master is wound and is rotated about its longitudinal axis,
a back press roller which is disposed outside the printing drum at a predetermined distance from the printing drum in parallel to the printing drum, and
an internal press roller which is disposed inside the printing drum in parallel to the printing drum and is moved between an operative position where it presses and deforms radially outward the side wall of the printing drum and an inoperative position where it is held away from the side wall,
wherein printing is effected by conveying a printing paper with the printing paper pinched between the back press roller and the side wall of the printing drum deformed by the internal press roller in the operative position, and wherein the improvement comprises
a side wall pressing member which presses outward the side wall of the printing drum on longitudinally opposite sides of the internal press roller when the internal press roller is in the operative position.

[0013] In one embodiment of the present invention, the internal press roller is mounted for rotation on one ends of a pair of main arms the other ends of which are mounted for rotation on a frame provided in a predetermined position in the printing drum and is rotated by a drive mechanism between the operative position and the inoperative position in synchronization with rotation of the printing drum, and the back press roller is a paper drum which is substantially the same as the printing drum in diameter and is provided with a clamp mechanism which clamps the leading end of the printing paper.

[0014] For example, the side wall pressing member presses outward the end portions of the side wall of the printing drum against the back press roller when the internal press roller is in the operative position.

[0015] The side wall pressing member may comprise a pair of auxiliary rollers which are disposed on longitudinally opposite sides of the internal press roller, are mounted on the same shaft as the internal press roller, are substantially of the same diameter as the internal press roller and are formed of an elastically deformable material.

[0016] Otherwise, the side wall pressing member may comprise a pair of auxiliary rollers which are disposed on longitudinally opposite sides of the internal press roller, are mounted for rotation on a shaft which is at a predetermined distance from the internal press roller in parallel thereto, are smaller than the internal press roller in diameter and are formed of a rigid material.

[0017] In this case, for example, a pair of auxiliary arms are mounted for rotation on the main arms, the auxiliary rollers are mounted for rotation on the ends of the respective auxiliary arms, the auxiliary arms are urged by an urging means in a direction in which the auxiliary rollers approach the side wall of the printing drum, and the auxiliary arms are held in a predetermined position by a stopper means so that the lower surfaces of the auxiliary rollers are at substantially the same level as the lower surface of the internal press roller.

[0018] Said drive mechanism for rotating the internal press roller between the operative position and the inoperative position may be a cam mechanism comprising a drive means, a cam which is selectively driven to one of a pair of preset positions by the drive means, and a cam follower which is interlocked with the cam and is connected to the main arms so that the internal press roller is moved to one of the operative position and the inoperative position by moving the cam to a desired position by the drive means, and said clamp mechanism which clamps the leading end of the printing paper may comprise a clamp member which fixes the printing paper to the side surface of the paper drum and a cam mechanism which drives the clamp member.

[0019] In the stencil printer of the present invention, the side wall pressing means presses the end portions of the side wall of the printing drum on longitudinally opposite sides of the internal press roller. Accordingly, the end portions of the side wall outside the internal press roller are brought into close contact with the back press roller, whereby ink is prevented from leaking from the edges of the printing paper.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

Figure 1 is a schematic side view of a stencil printer to which the present invention is applied showing a state where the squeegee roller is in the operative position,
Figure 2 is a schematic side view of the stencil printer showing a state where the squeegee roller is in the inoperative position,
Figure 3 is a schematic view partly cut away showing a state where the squeegee roller is in the operative position,
Figure 4 is a schematic view partly cut away showing a state where the squeegee roller is in the inoperative position,
Figure 5 is a front view partly cut away showing the printing drum and the back press roller of a stencil printer in accordance with a first embodiment of the present invention in a state where the internal press

roller is in the inoperative position,

Figure 6 is a front view partly cut away showing the printing drum and the back press roller of the stencil printer in a state where the internal press roller is in the operative position,

Figure 7 is a front view partly cut away showing the printing drum and the back press roller of a stencil printer in accordance with a second embodiment of the present invention in a state where the internal press roller is in the inoperative position,

Figure 8 is a cross-sectional view showing the printing drum and the back press roller of the stencil printer in a state where the internal press roller is in the inoperative position,

Figure 9 is a front view partly cut away showing the printing drum and the back press roller of the stencil printer in a state where the internal press roller is in the operative position,

Figure 10 is a cross-sectional view showing the printing drum and the back press roller of the stencil printer in a state where the internal press roller is in the operative position,

Figure 11 is a front view partly cut away showing the printing drum and the back press roller of a conventional stencil printer, and

Figure 12 is a view similar to Figure 11 showing leakage of ink in the conventional stencil printer.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] A structure of an example of a stencil printer with an internal press mechanism to which the present invention is applied will be described in detail with reference to Figures 1 to 4, hereinbelow.

[0022] In Figures 1 to 4, the stencil printer of this example has a printing drum 1 comprising a pair of disc-like end plates 3 opposed to each other in the longitudinal direction of the printing drum 1, a clamp base plate 5 which extends in parallel to the longitudinal axis of the printing drum 1 and connects the end plates 3, and a side wall 7 wound around the side plates 3.

[0023] The side wall 7 is formed by weaving wire such as of stainless steel into a mesh-like structure and accordingly is flexible and ink-permeable.

[0024] A clamp plate 11 is mounted for rotation on the clamp base plate 5. The clamp plate 11 clamps the leading end portion of a stencil master. The stencil master is wound around the side wall 7 of the printing drum 1 with its leading end clamped by the clamp plate 11.

[0025] The printing drum 1 is supported for rotation about its longitudinal axis on a tubular drum shaft 13. Each of the end plates 3 is formed with a gear 15 on its circumferential surface and the gear 15 is in mesh with a drive gear of a printing drum drive motor (not shown).

[0026] An in-drum frame 17 is fixedly supported in the printing drum 1 by the drum shaft 13. A pair of roller support arms 21 are connected to the in-drum frame 17 by way of pivot shafts 19 at their one ends so that the roller support arms 21 are rotatable up and down. A squeegee roller 23 is supported for rotation on intermediate portions of the roller support arms 21. The squeegee roller 23 extends in parallel to the longitudinal axis of the printing drum 1 and the side surface of the squeegee roller 23 is in contact with the inner surface of the side wall 7 of the printing drum 1.

[0027] A doctor rod 25 extends in parallel to the squeegee roller 23 at a slight distance therefrom and is fixed to the roller support arms 21 at its opposite ends. A wedge-shaped ink fountain 27 is formed between the squeegee roller 23 and the doctor rod 25. An ink delivery pipe 29 which supplies ink to the ink fountain 27 extends in the printing drum 1 in parallel to the longitudinal axes of the squeegee roller 23 and the doctor rod 25. The ink delivery pipe 29 is connected to an ink hose 31 which extends through the tubular drum shaft 13 to the outside of the printing drum 1 and is connected to an ink source (not shown).

[0028] A cam shaft 33 is supported for rotation on the in-drum frame 17. The in-drum frame 17 is provided with a cam mechanism A formed by a double-heart-shaped cam plate 35 fixed to the cam shaft 33 and a cam follower 39 mounted on a yoke member 39. The yoke member 39 is connected to the end of the roller support arm 21 by way of a pivot 37. Each time the cam plate 35 is rotated by 90° , the cam plate 35 alternately takes a printing position shown in Figure 1 where it moves the squeegee roller 23 to an operative position where the squeegee roller 23 presses outward the side wall 7 of the printing drum 1 and a non-printing position shown in Figure 2 where it moves the squeegee roller 23 to an inoperative position where the squeegee roller 23 is kept away from the side wall 7.

[0029] The cam shaft 33 is connected to a driven side of an electromagnetic clutch 43 and a drive side of the electromagnetic clutch 43 is connected to a cam shaft drive gear 45. The cam shaft drive gear 45 is in mesh with an in-drum main gear 47 and is driven by the main gear 47 in response to rotation of the printing drum 1.

[0030] A cam switch (a limit switch) 49 is mounted on the in-drum frame 17 and the cam switch 49 is actuated by an actuator 51 mounted on the yoke member 37.

[0031] A roller drive arm 53 is supported for rotation on the drum shaft 13 at an intermediate portion thereof. An intermediate gear 55 is supported for rotation on one end portion of the roller drive arm 53 and the other end portion of the roller drive arm 53 is connected to a tension spring 57 so that the roller drive arm 53 is urged in the counterclockwise direction. The intermediate gear 55 is in mesh with the in-drum main gear 47 and a gear 58 formed on one end portion of the squeegee roller 23 coaxially with the squeegee roller 23 under the force of the tension spring 57 and is rotated in response to rotation of the printing drum 1 to rotate the squeegee roller 23 in the same direction as the printing drum 1, i.e., in the counterclockwise direction.

[0032] The end plate 3 is provided with a cam mechanism B formed by a cam 60 having a crescent cam section 61 formed on the inner side surface of the printing drum 1 and a cam follower 59 which is in contact with the cam section 61. The cam follower 59 is formed on the end portion of the squeegee roller 23 coaxially with the squeegee roller 23 on the outer side of the gear 58.

[0033] The back press roller 63 is substantially the same as the printing drum 1 in contour and is supported for rotation on a shaft 62 at a predetermined distance from the printing drum 1 in parallel thereto. The back press roller 63 is provided with a recess 65 for avoiding interference with the stencil master clamp mechanism of the printing drum 1.

[0034] The back press roller 63 is provided with a paper clamp member 67. The paper clamp member 67 is rotatably mounted on the back press roller 63 by a pivot 69. A clamping piece 71 which is associated with the outer side surface of the back press roller 63 to clamp a printing paper P is provided on one end of the clamp member 67.

[0035] The back press roller 63 is provided with a cam mechanism C for clamping and releasing the printing paper P. The cam mechanism C comprises a halfmoon-like cam 75 which is disposed coaxially with the back press roller 63 and a cam follower 73 formed on the end of the paper clamp member 67 opposite to the clamping piece 71. The outer peripheral surface of the cam 75 comprises a cam section 74 including left and right flat portions 70 and 72 and a smaller diameter portion 76, and a larger diameter portion 78. The left flat portion 70 and the smaller diameter portion 76 form a step therebetween and the right flat portion 72 extends in a tangential direction of the smaller diameter portion 76. The cam follower 73 slides on the outer peripheral surface of the cam 75 and rests on the cam portion 74.

[0036] The stencil printer further comprises a paper supply section 77 and a paper discharge section 79. The paper supply section 77 comprises a paper supply table 81 on which a stack of printing papers P is placed, a pair of paper supply rollers 83 and a paper separator roller 85 for taking out the printing papers P from the paper supply table 81 one by one, a pair of timing rollers 89 which feeds at a predetermined timing the printing paper P to a paper clamping position where the clamping piece 71 of the back press roller 63 clamps the printing paper P, and an optical paper supply sensor 91 which detects that the printing paper P is fed to the paper clamping position. The paper clamping position is an angular position of the back press roller 63 where the clamping piece 71 clamps the leading end portion of the printing paper P in synchronization with rotation of the back press roller 63 and is indicated at a in Figure 2.

[0037] The paper discharge section 79 comprises a discharge pinch roller 93 which is disposed in a paper release position and is associated with the back press roller 63 to convey and discharge the printing paper P from the back press roller 63, a paper scraper 95 which removes the printing paper P from the back press roller 63, a pair of paper discharge pinch rollers 99 which discharge the printed paper to a paper chute 97, a paper discharge table 98 on which the printed papers are stacked, and an optical paper discharge sensor 96 which optically detects that the printed paper P is chuted from the paper chute 97 toward the paper discharge table 98. The paper release position is a position where the clamping piece 71 is rotated rightward by rotation of the back press roller 63 and is indicated at b in Figure 2.

[0038] The discharge pinch roller 93 and the upper one of the discharge pinch rollers 99 are brought into contact with the upper surface of the printing paper P, bearing thereon a printed image, only at opposite margins of the printing paper P. The positions of these rollers are automatically adjusted according to the size of the printing papers P on the paper supply table 81 detected by a paper size sensor (not shown) so that the rollers are brought into contact with the upper surface of the printing paper P only at opposite margins irrespective of the width of the printing paper P.

[0039] Operation of the stencil printer will be described, hereinbelow. First a stencil master is wound around the side wall 7 of the printing drum 1. Then when the number of copies to be printed is input through a tenkey pad on a control panel (not shown) and a print start key is depressed, the printing drum 1 is rotated about the drum shaft 13 in the counterclockwise direction by the printing drum drive motor.

[0040] In an angular position where the recess 65 on the back press roller 63 is faced toward the printing drum 1, the cam follower 59 of the cam mechanism C abuts against the cam section 61, whereby the cam follower 59 lifts, i.e., moves inward, the squeegee roller 23 away from the side wall 7 of the printing drum 1 when the clamp base plate 5 comes to be below the squeegee roller 23 and the clamp base plate 5 is prevented from colliding against the edge of the recess 65. Thus the side wall 7 is protected.

[0041] In response to depression of the print start key, also the back press roller 63 is rotated about the shaft 62 by a synchronized drive mechanism (not shown) in the clockwise direction at the same speed as the printing drum 1.

[0042] As the printing drum 1 and back press roller 63 start to rotate, a printing paper P is taken out from the paper supply table 81 by the paper supply rollers 83 and the paper separator roller 85 and fed toward the timing rollers 89 under the guidance of a paper guide member 87.

[0043] When the printing drum 1 and the back press roller 63 are rotated to a predetermined angular position, the timing rollers 89 feed the printing paper P to the paper clamping position a at a predetermined timing. When the cam switch 49 is not on, the electromagnetic clutch 43 is energized for a predetermined time interval,

whereby the cam plate 35 is rotated to the printing position. At this time, the actuator 51 actuates the cam switch 49, whereby that the cam plate 35 is in the printing position is detected.

[0044] When the cam plate 35 is rotated to the printing position, the squeegee roller 23 is moved downward into abutment against the inner surface of the side wall 7 of the printing drum 1. Then as the printing drum 1 is further rotated, the squeegee roller 23 presses the side wall 7 radially outward and deforms the same toward the back press roller 63.

[0045] At this time, ink in the ink fountain 27 is caused to pass the narrow space between the squeegee roller 23 and the doctor rod 25 by counterclockwise rotation of the squeegee roller 23 and is metered. Thus ink adheres to the outer surface of the squeegee roller 23 in a layer of a predetermined thickness and is squeezed into the inner surface of the side wall 7 as the squeegee roller 23 rotates.

[0046] When the printing paper P is supplied from the paper supply section 77 in synchronization with rotation of the back press roller 63, the leading end of the printing paper P is clamped in the paper clamping position by the action of the cam mechanism C. As the back press roller 63 rotates, the printing paper P is wound around the back press roller 63 and is carried to the contact area of the printing drum 1 and the back press roller 63, i.e., to the deformed part of the side wall 7. Thus the printing paper P is pinched, together with the stencil master on the printing drum 1, between the deformed part of the printing drum 1 and the back press roller 63 under a predetermined pressure. Printing is made on the printing paper P while the printing paper P is conveyed by rotation of the printing drum 1 and the back press roller 63.

[0047] When the leading end of the printing paper P reaches the paper release position b, the printing paper P is released from the clamping piece 71 and delivered to the paper discharge pinch roller 93. Thereafter, the printing paper P is removed from the back press roller 63 by the paper scraper 95 and is discharged to the paper chute 97 by the paper discharge pinch rollers 99. Thereafter the printing paper P is chuted onto the paper discharge table 98 with its printed surface facing upward.

[0048] In this example, the back press roller 63 functions as a paper drum which forcibly conveys the printing paper P with the printing paper P wound around the roller 63.

[0049] An embodiment of the present invention applied to such a stencil printer with an internal press mechanism will be described with reference to Figures 5 and 6, hereinbelow.

[0050] The printing drum and the back press roller of the stencil printer of this embodiment are basically the same in structure as those of the conventional stencil printer shown in Figures 11 and 12 and accordingly the elements analogous to those shown in Figures 11 and 12 are given the same reference numerals and will not be described here. Further the difference of the stencil printer of this embodiment from the conventional stencil printer will be mainly described, hereinbelow.

[0051] In this embodiment, the printing drum 200 is provided with a pair of auxiliary rollers 201 mounted on opposite end portions of a shaft 202 of the internal press roller (corresponding to the squeegee roller 23 in the stencil printer shown in Figures 1 to 4) 112 on longitudinally opposite sides of the roller 112. The auxiliary rollers 201 function as a side wall pressing member for preventing the edge portions of the side wall 104 from being bent upward away from the back press roller 101. The auxiliary rollers 201 may be either fixedly mounted on the shaft 202 or mounted for rotation on the shaft 202. Both the internal press roller 112 and the auxiliary roller 201 may be fixedly mounted on the shaft 202 so that they are rotated in synchronization with each other or may be mounted for rotation of the shaft 202 so that they rotated independently of each other.

[0052] The auxiliary rollers 201 may be formed of, for instance, an elastically deformable material such as rubber. In this particular embodiment, the auxiliary rollers 201 are substantially the same as the internal press roller 112 in outer diameter.

[0053] Operation of this embodiment will be described, hereinbelow.

[0054] A stencil master 107 is wound around the side wall 104 of the printing drum 200. When the printing drum 200 is rotated, the internal press roller 112 is moved up and down in synchronization with the rotation of the printing drum 200. A printing paper 108 is supplied between the printing drum 200 and the back press roller 101 at a predetermined timing. The printing paper 108 is conveyed pinched between the part of the side wall 104 deformed by the internal press roller 112 and the back press roller 101. While the printing paper 108 is thus conveyed, ink 120 is supplied to the printing area 105 and transferred to the printing paper 108 through the perforations of the stencil master 107, whereby printing is effected.

[0055] In the stencil printer of this embodiment, the auxiliary rollers 201 press the end portions of the side wall 104 of the printing drum 200 on longitudinally opposite sides of the internal press roller 112. Accordingly, the end portions of the side wall 104 outside the internal press roller 112 are brought into close contact with the back press roller 101. During printing, the side wall 104 of the printing drum 200 is brought into close contact with the back press roller 101 with the stencil master 107 and the printing paper 108 intervening therebetween.

[0056] Since the part of the side wall 104 surrounding the printing area 105 is kept in close contact with the back press roller 101 during printing, the ink 120 supplied to the printing area 105 is enclosed in the openings in the printing area 105 and cannot leak outside. That is, the ink 120 cannot flow outside the openings

and leak through the space between the stencil master 107 and the side wall 104. Accordingly, the printing drum 200 and/or the back press roller 101 cannot be stained with ink 120 unlike in the conventional stencil printer.

[0057] In this particular embodiment, since the auxiliary rollers 201 and the internal press roller 112 are of the same diameter and are mounted on one shaft, design and manufacture of these rollers are facilitated. Further, after the rollers are once mounted on the shaft, the axes of the rollers less apt to be displaced from each other and accordingly the maintenance is facilitated.

[0058] Further since the auxiliary rollers 201 are of an elastically deformable material, the auxiliary rollers 201 does not obstruct the internal press roller 112 pressing the side wall 104 though the auxiliary rollers 201 are of the same diameter as the internal press roller 112, are mounted on the same shaft and are brought into contact with the side wall 104 substantially simultaneously with the internal press roller 112.

[0059] A stencil printer in accordance with another embodiment of the present invention will be described with reference to Figures 7 to 10, hereinbelow. The printing drum and the back press roller of the stencil printer of this embodiment are basically the same in structure as those of the stencil printer shown in Figures 5 and 6 and accordingly the elements analogous to those shown in Figures 5 and 6 are given the same reference numerals and will not be described here. The operation of the stencil printer of this embodiment are substantially the same as that of the preceding embodiment.

[0060] In this embodiment, the printing drum 300 is provided therein with a pair of auxiliary rollers 301 which function as a side wall pressing member for preventing the edge portions of the side wall 104 from being bent upward away from the back press roller 101. Each of the auxiliary rollers 301 is rotated about an axis disposed at a predetermined distance from the axis of the internal press roller 112 in parallel thereto. Further the auxiliary roller 301 is rigid and smaller than the internal press roller 112 in outer diameter. Unlike the auxiliary rollers 201 in the preceding embodiment, the auxiliary rollers 301 in this embodiment are mounted on shafts separate from that of the internal press roller 112.

[0061] That is, an auxiliary arm 302 is mounted for rotation on each of the main arms 111 by a pivot 303 at its intermediate portion. The auxiliary roller 301 is mounted for rotation on one end of the auxiliary arm 302 nearer to the internal press roller 112. The other end of the auxiliary arm 302 is connected to the main arm 111 by way of a coiled tension spring 304. A stopper 305 for limiting the range of rotation of the auxiliary arm 302 is mounted on the main arm 111 opposed to the upper end portion of the auxiliary arm 302 on the same side as the coiled tension spring 304.

[0062] Figures 7 and 8 show a state where the internal press roller 112 does not press the side wall 104. In this state, the side wall 104 is not deformed and is at a distance from the back press roller 101. The auxiliary rollers 301 apply no load on the side wall 104 though they are in contact with the side wall 104. In this state, the coiled tension springs 304 causes the auxiliary arms 302 to abut against the stoppers 305 and the lower surfaces of the auxiliary rollers 301 are on substantially the same level as the lower surface of the internal press roller 112.

[0063] Figures 9 and 10 show a state where the internal press roller 112 presses downward the side wall 104. In this state, also the auxiliary rollers 301 press downward the side wall 104. The auxiliary arms 301 have been rotated about the pivots 303 in the clockwise direction as seen in Figure 10 with the coiled tension springs 304 stretched. Accordingly, the auxiliary rollers 301 apply downward load on the side wall 104 under the force of the coiled tension springs 304.

[0064] In the stencil printer of this embodiment, the auxiliary rollers 301 press the end portions of the side wall 104 of the printing drum 300 on longitudinally opposite sides of the internal press roller 112. The auxiliary rollers 301 are movable independently of the internal press roller 112 and can press the end portions of the side wall 104 with a proper pressure under the force of the springs 304. Accordingly, the end portions of the side wall 104 outside the internal press roller 112 are brought into close contact with the back press roller 101. During printing, the side wall 104 of the printing drum 300 is brought into close contact with the back press roller 101 with the stencil master 107 and the printing paper 108 intervening therebetween.

[0065] Thus, also in this embodiment, leakage of the ink from the edges of the printing paper 108 can be prevented. In this embodiment, the auxiliary rollers 301 are smaller than the internal press roller 112 in outer diameter. This is advantageous in that they can be compactly arranged in the limited space in the printing drum 300 though additional components such as the auxiliary arms 302 are required. Further the force with which the auxiliary rollers 302 press the side wall under the force of the coiled tension springs 304 can be kept constant.

Claims

1. A stencil printer comprising

a printing drum which has a flexible and ink-permeable cylidrical side wall around which a stencil master is wound and is rotated about its longitudinal axis,

a back press roller which is disposed outside the printing drum at a predetermined distance from the printing drum in parallel to the printing drum, and

an internal press roller which is disposed inside the printing drum in parallel to the printing drum and is moved between an operative position

where it presses and deforms radially outward the side wall of the printing drum and an inoperative position where it is held away from the side wall,

wherein printing is effected by conveying a printing paper with the printing paper pinched between the back press roller and the side wall of the printing drum deformed by the internal press roller in the operative position, and wherein the improvement comprises

a side wall pressing member which presses outward the side wall of the printing drum on longitudinally opposite sides of the internal press roller when the internal press roller is in the operative position.

2. A stencil printer as defined in Claim 1 in which the side wall pressing member presses outward the end portions of the side wall of the printing drum against the back press roller when the internal press roller is in the operative position.

3. A stencil printer as defined in Claim 1 in which

the interal press roller is mounted for rotation on one ends of a pair of main arms the other ends of which are mounted for rotation on a frame provided in a predetermined position in the printing drum and is rotated by a drive mechanism between the operative position and the inoperative position in synchronization with rotation of the printing drum, and

the back press roller is a paper drum which is substantially the same as the printing drum in diameter and is provided with a clamp mechanism which clamps the leading end of the printing paper.

4. A stencil printer as defined in Claim 1 in which the side wall pressing member comprises a pair of auxiliary rollers which are disposed on longitudinally opposite sides of the internal press roller, are mounted on the same shaft as the interpress roller, are substantially of the same diameter as the internal press roller and are formed of an elastically deformable material.

5. A stencil printer as defined in Claim 1 in which the side wall pressing member comprises a pair of auxiliary rollers which are disposed on longitudinally opposite sides of the internal press roller, are mounted for rotation on a shaft which is at a predetermined distance from the internal press roller in parallel tthereto, are smaller than the internal press roller in diameter and are formed of a rigid material.

6. A stencil printer as defined in Claim 5 in which a pair of auxiliary arms are mounted for rotation on the main arms, the auxiliary rollers are mounted for rotation on the ends of the respective auxiliary arms, the auxiliary arms are urged by an urging means in a direction in which the auxiliary rollers approach the side wall of the printing drum, and the auxiliary arms are held in a predetermined position by a stopper means so that the lower surfaces of the auxiliary rollers are at substantially the same level as the lower surface of the internal press roller.

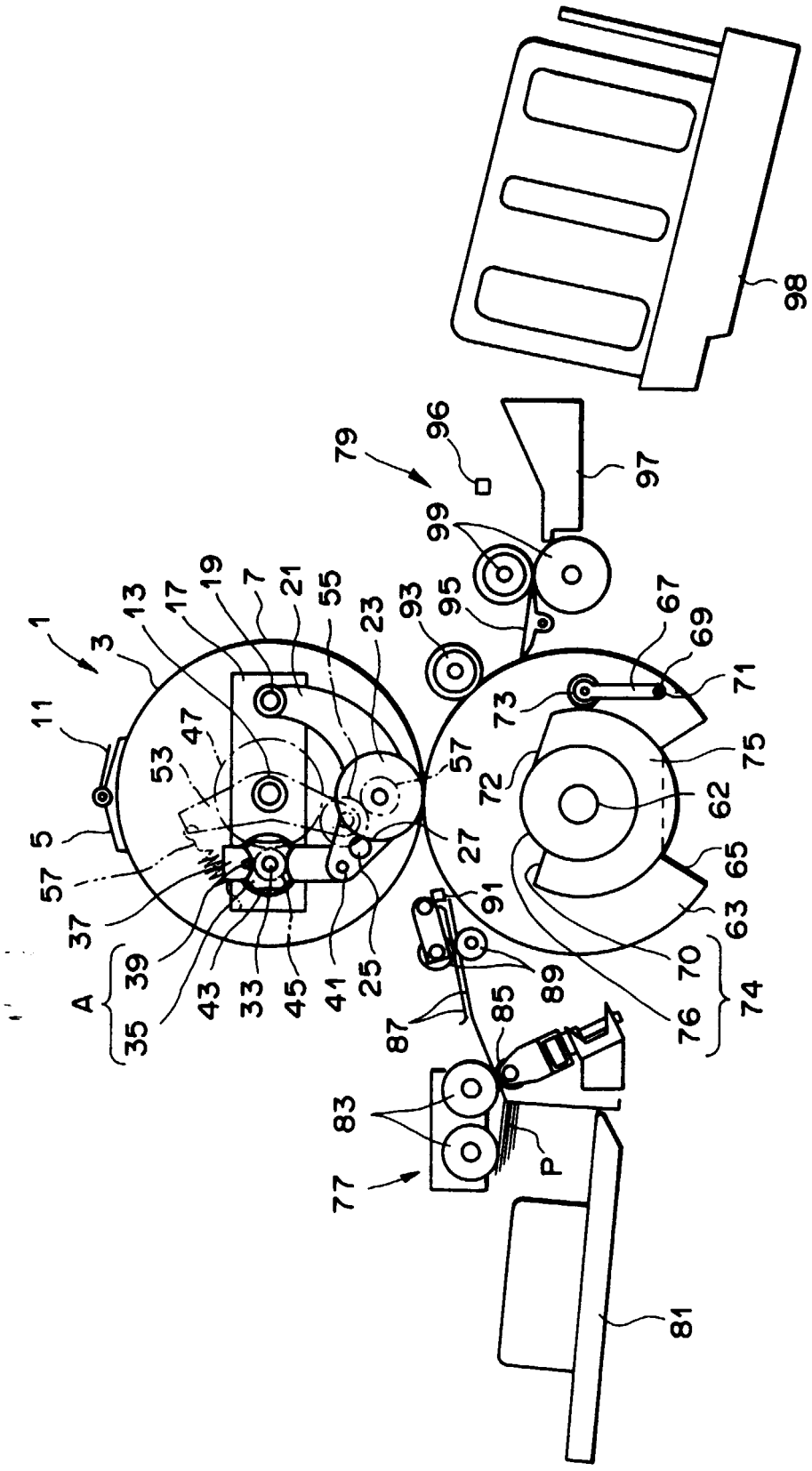
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FIG.1

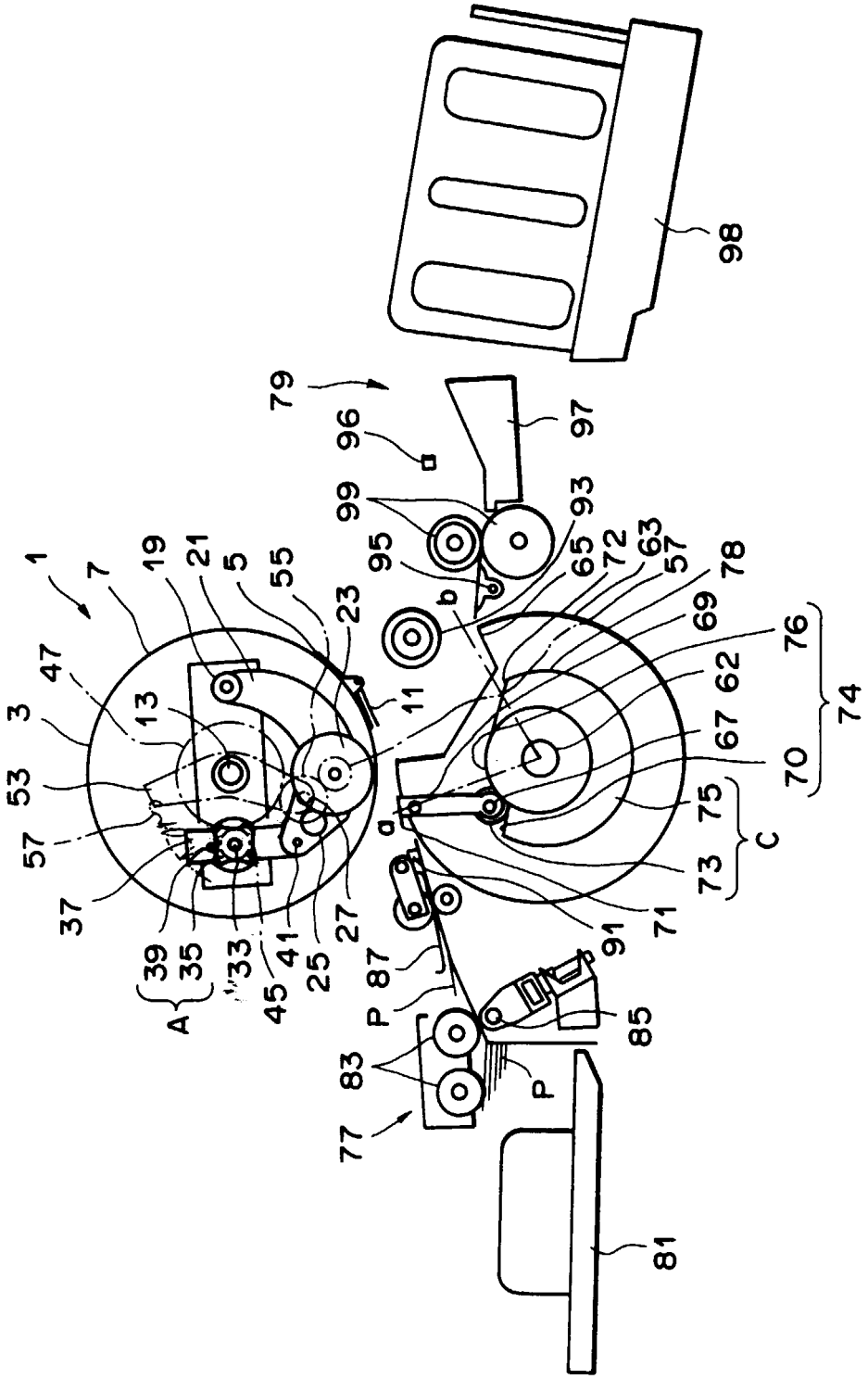
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FIG. 2

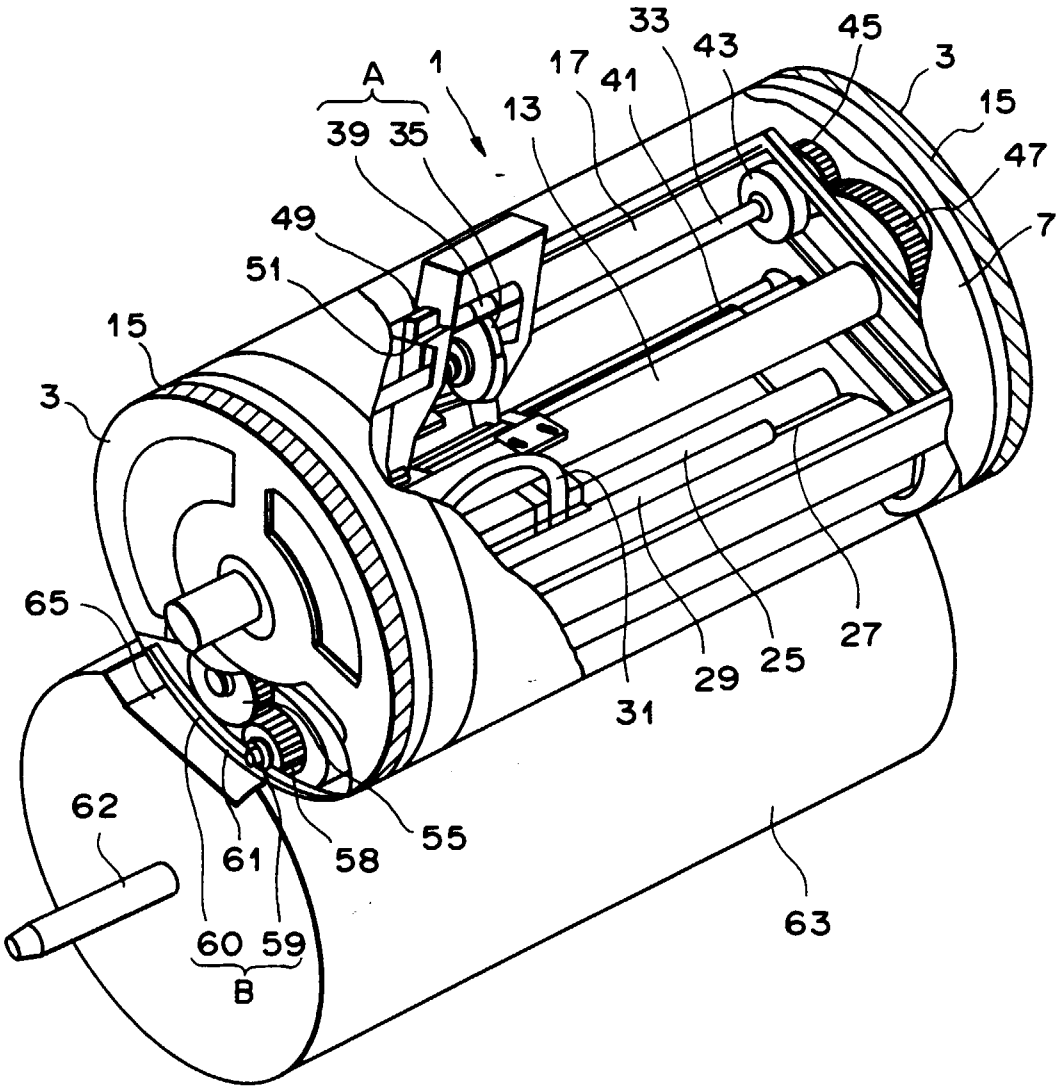
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FIG.3

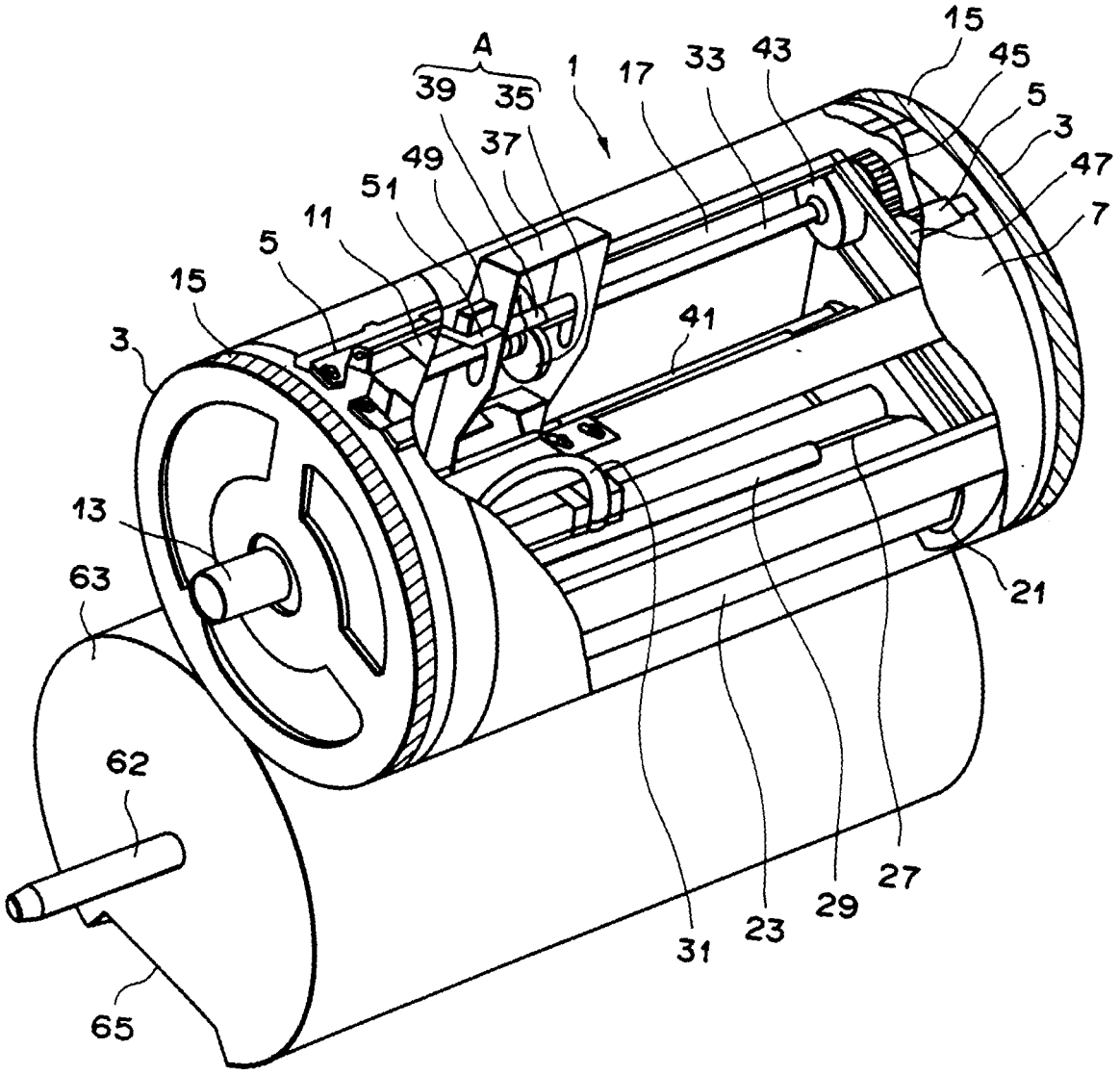
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FIG. 4

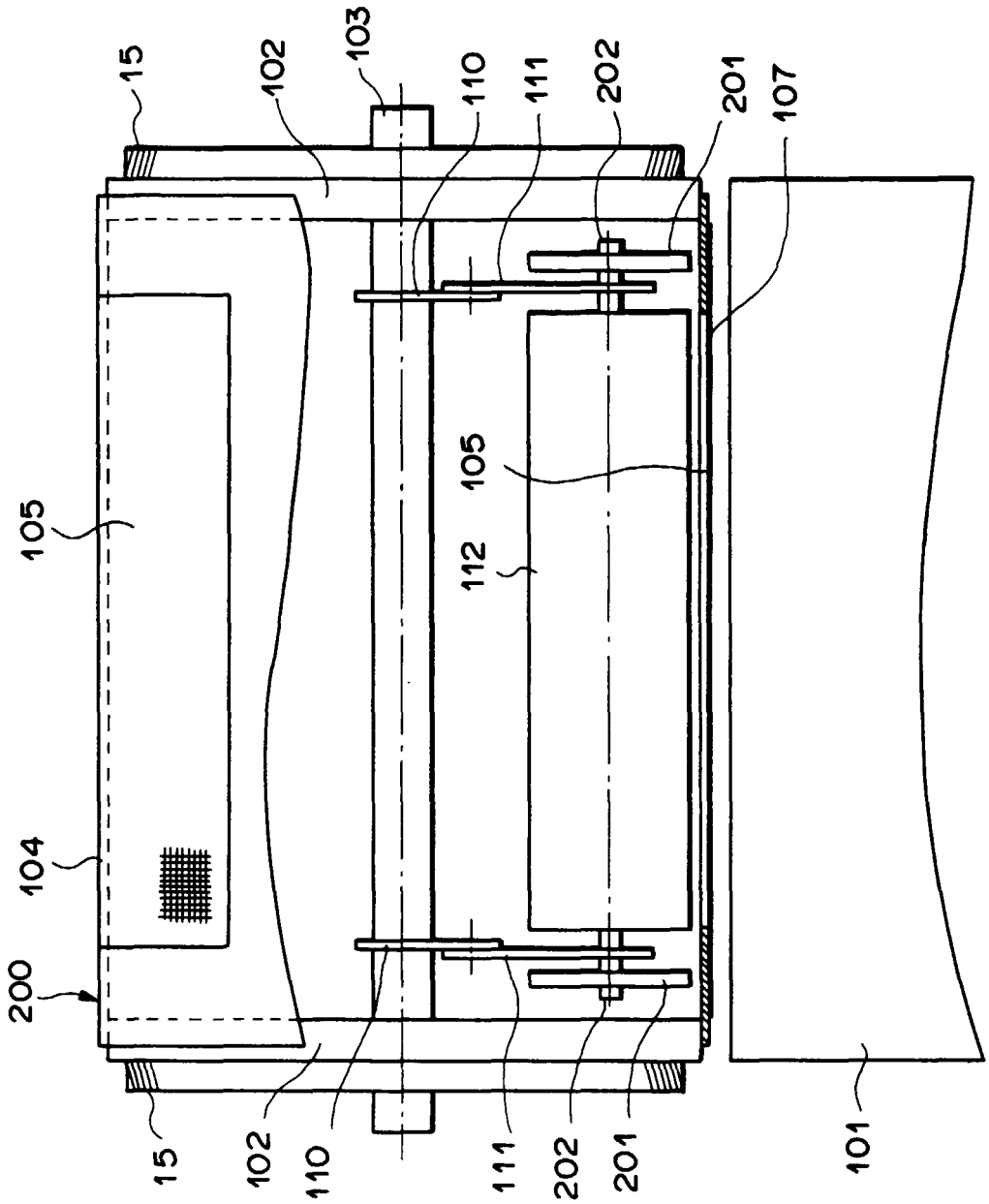
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FIG.5

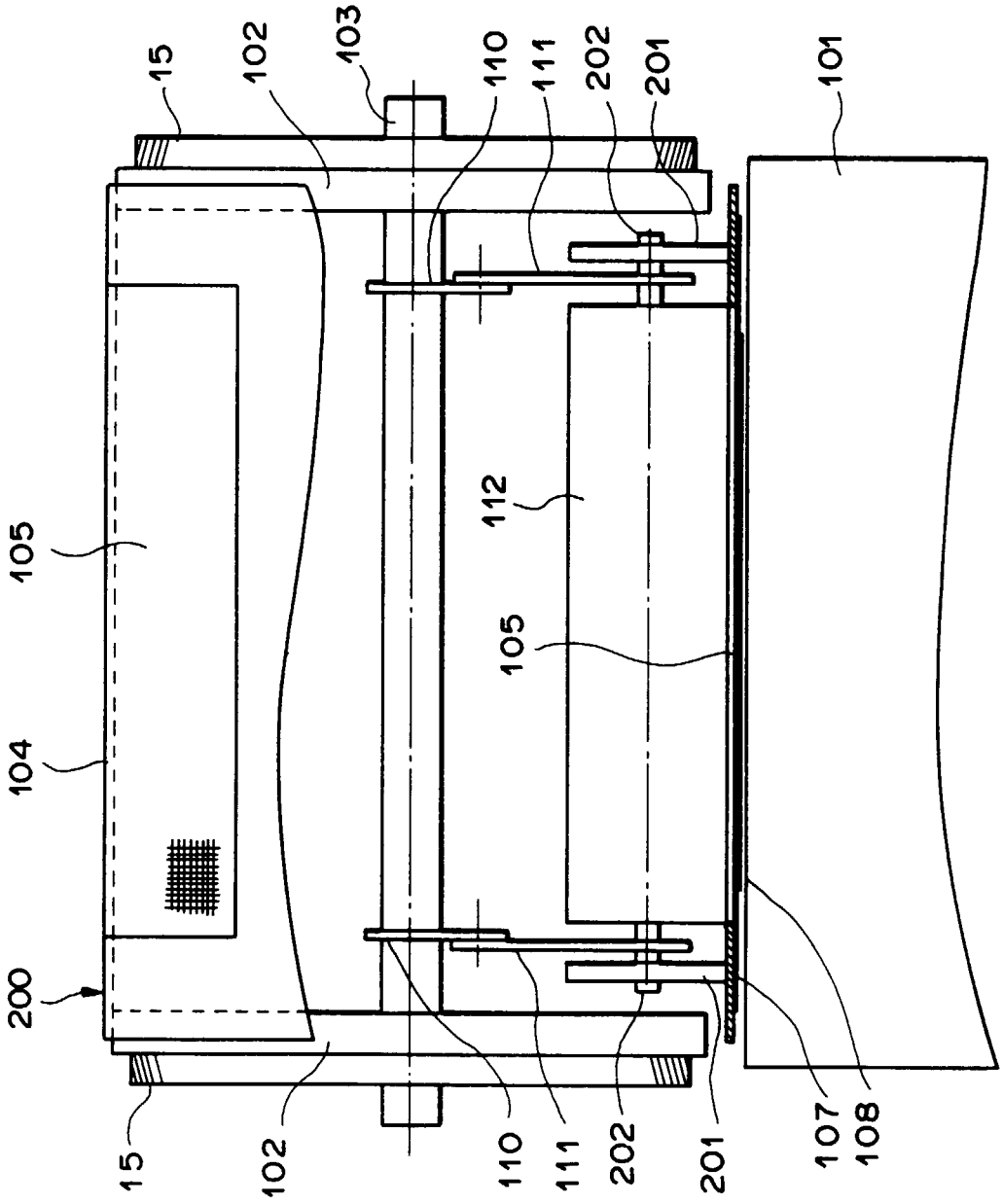
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FIG.6

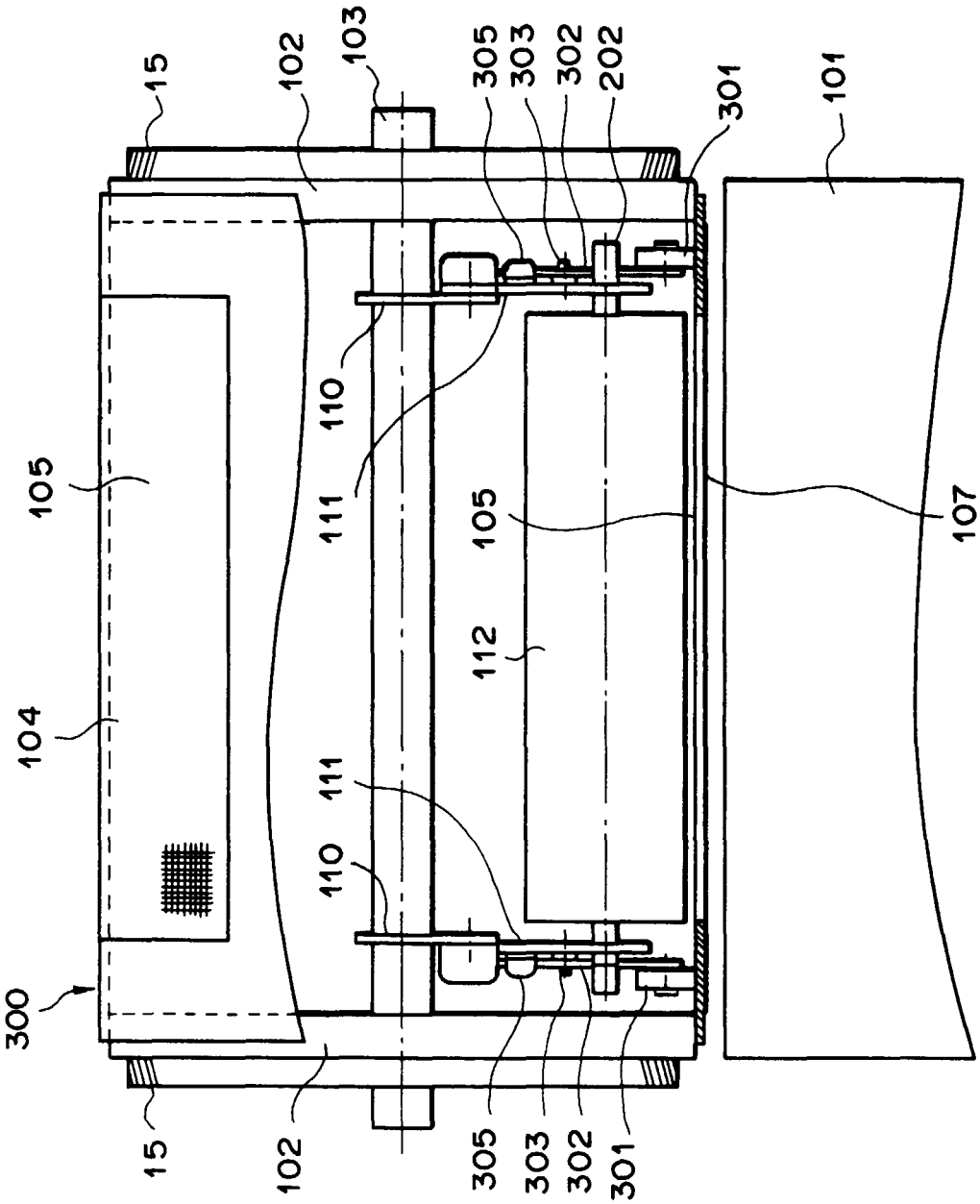

FIG. 7

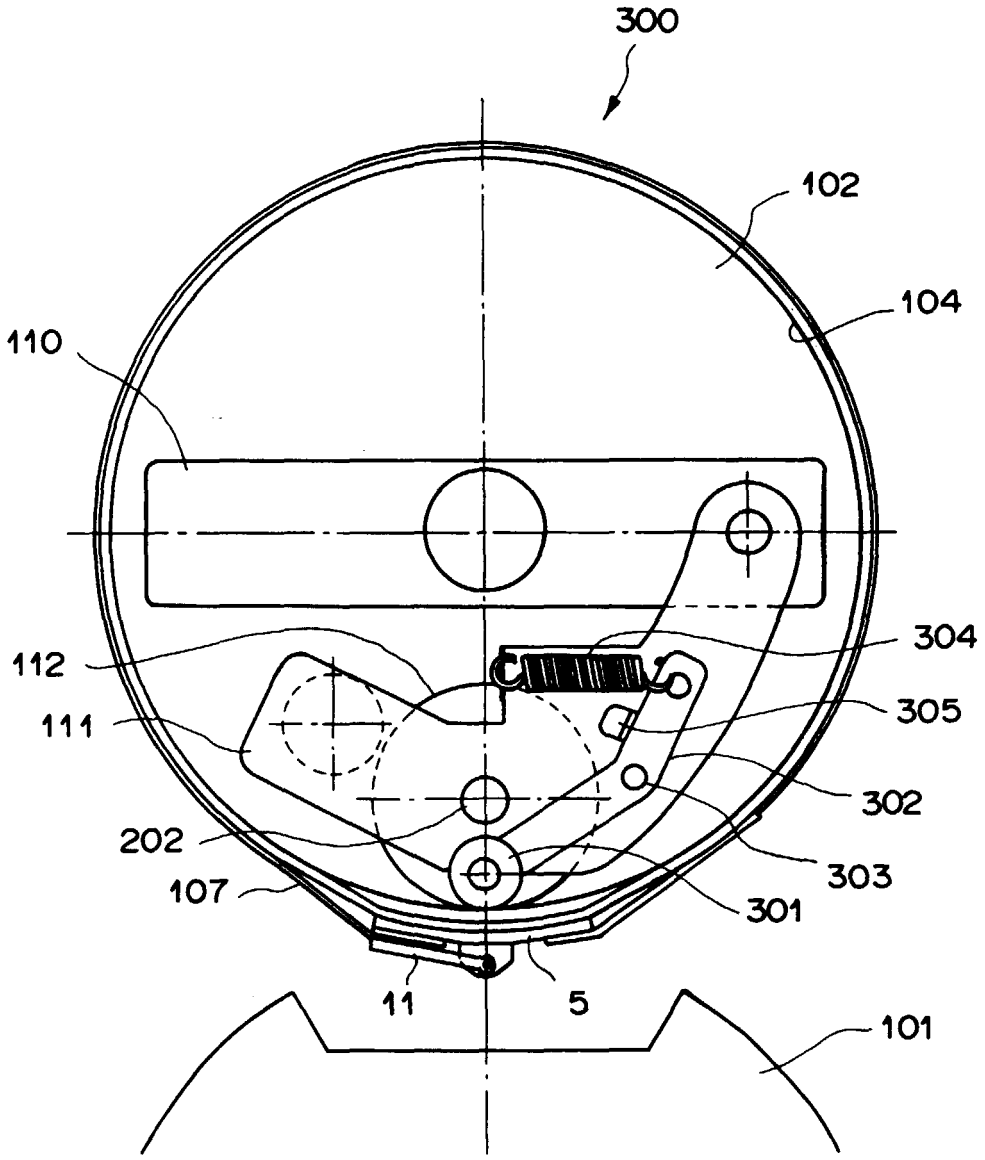

FIG. 8

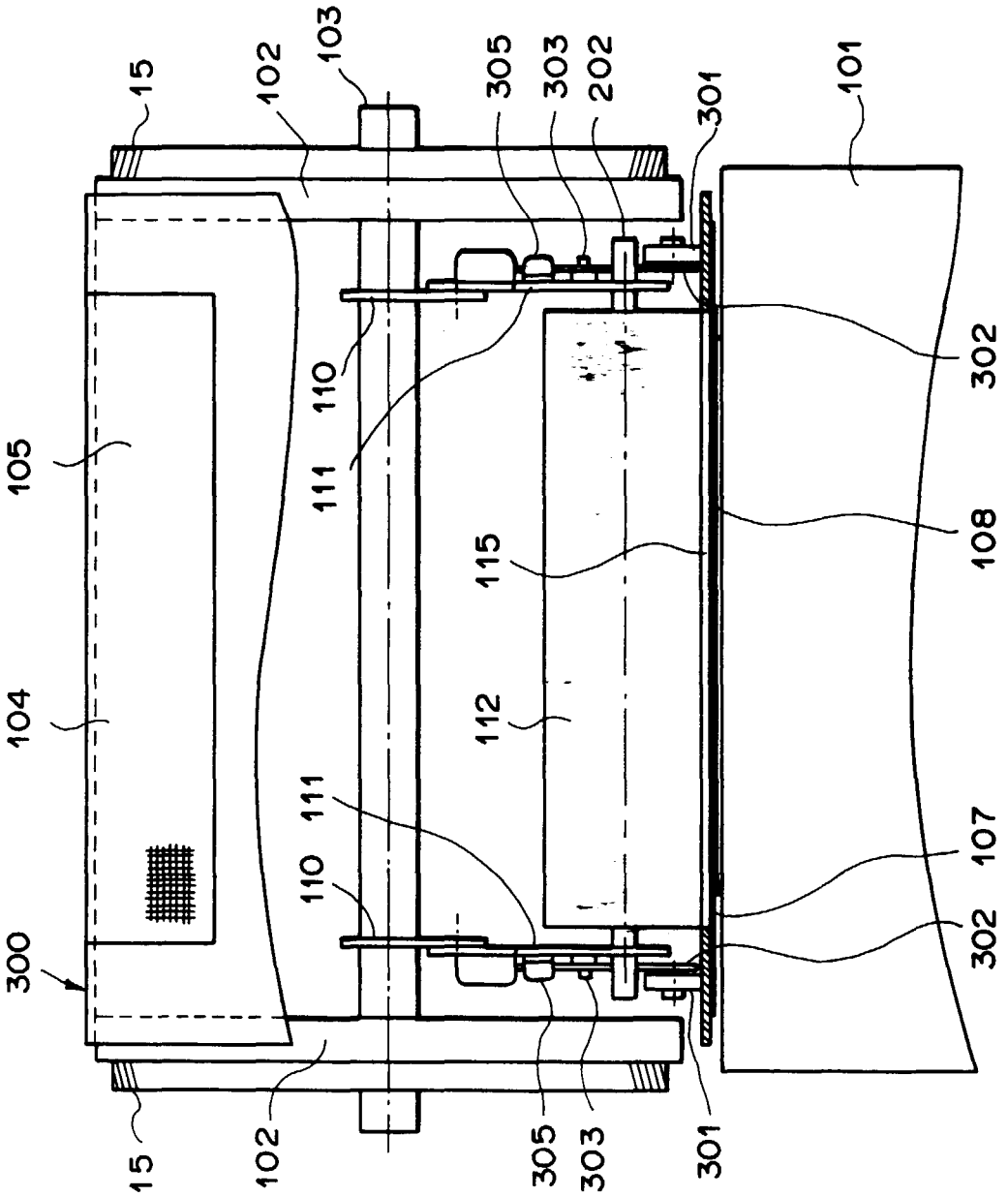
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FIG.9

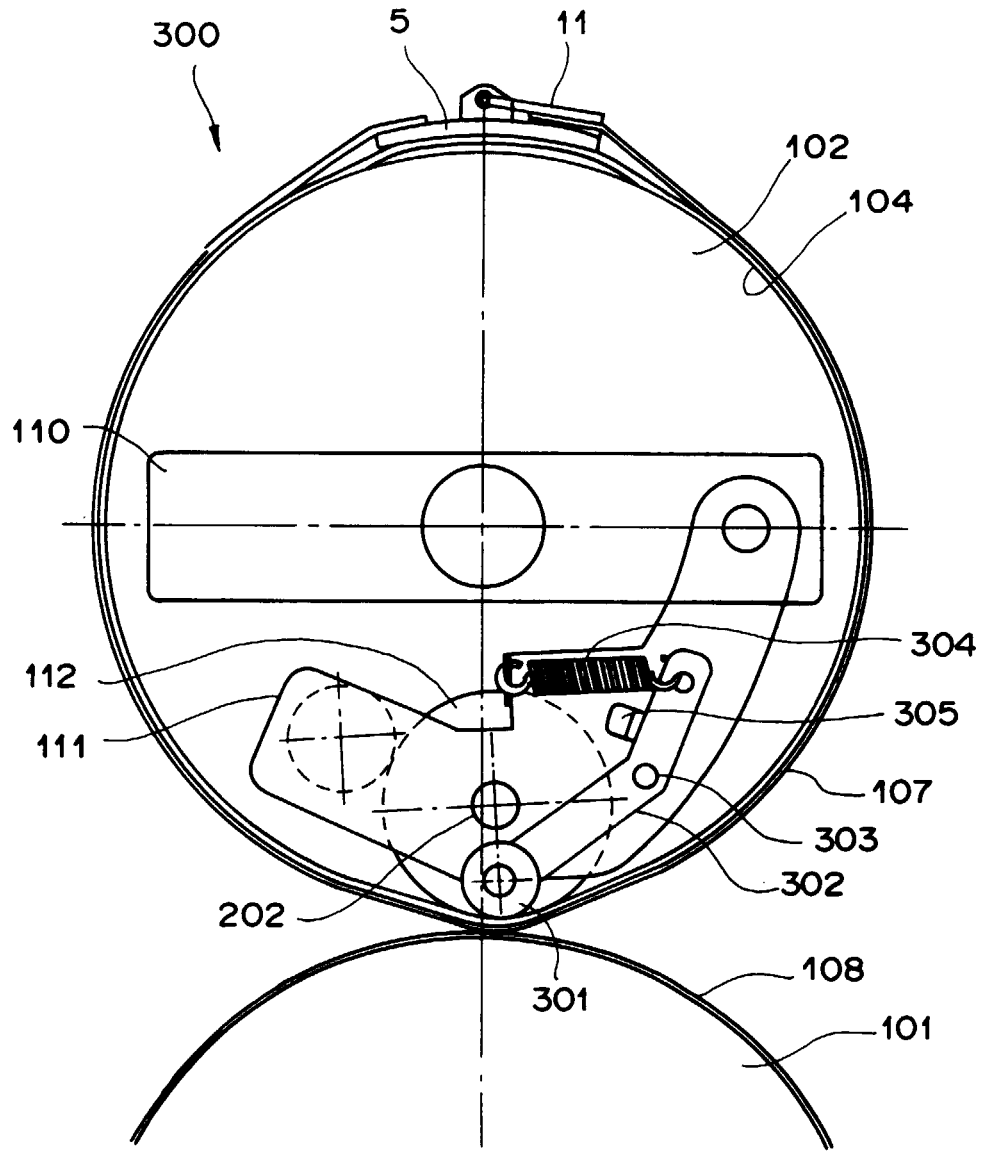

FIG.10

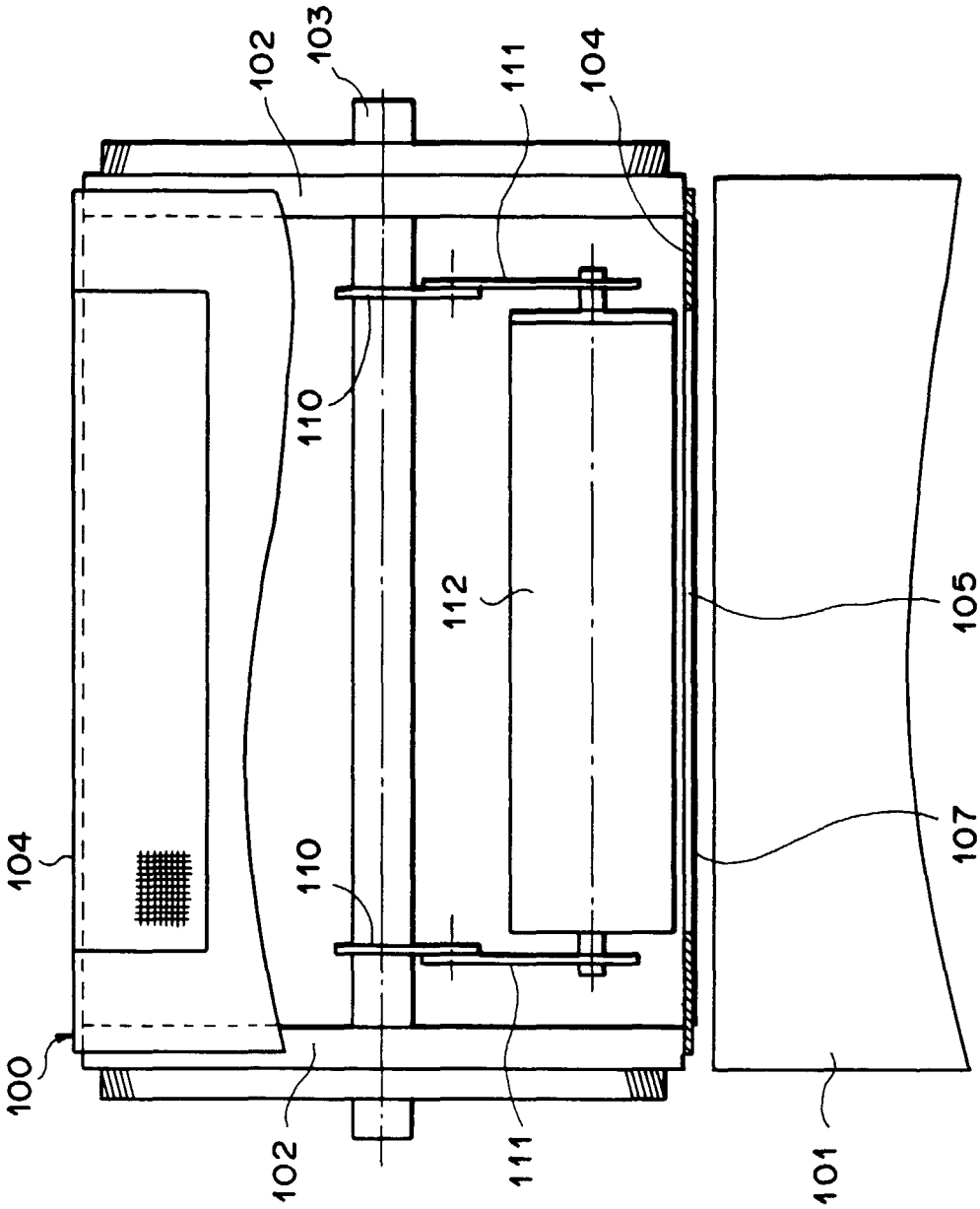

FIG.11 PRIOR ART

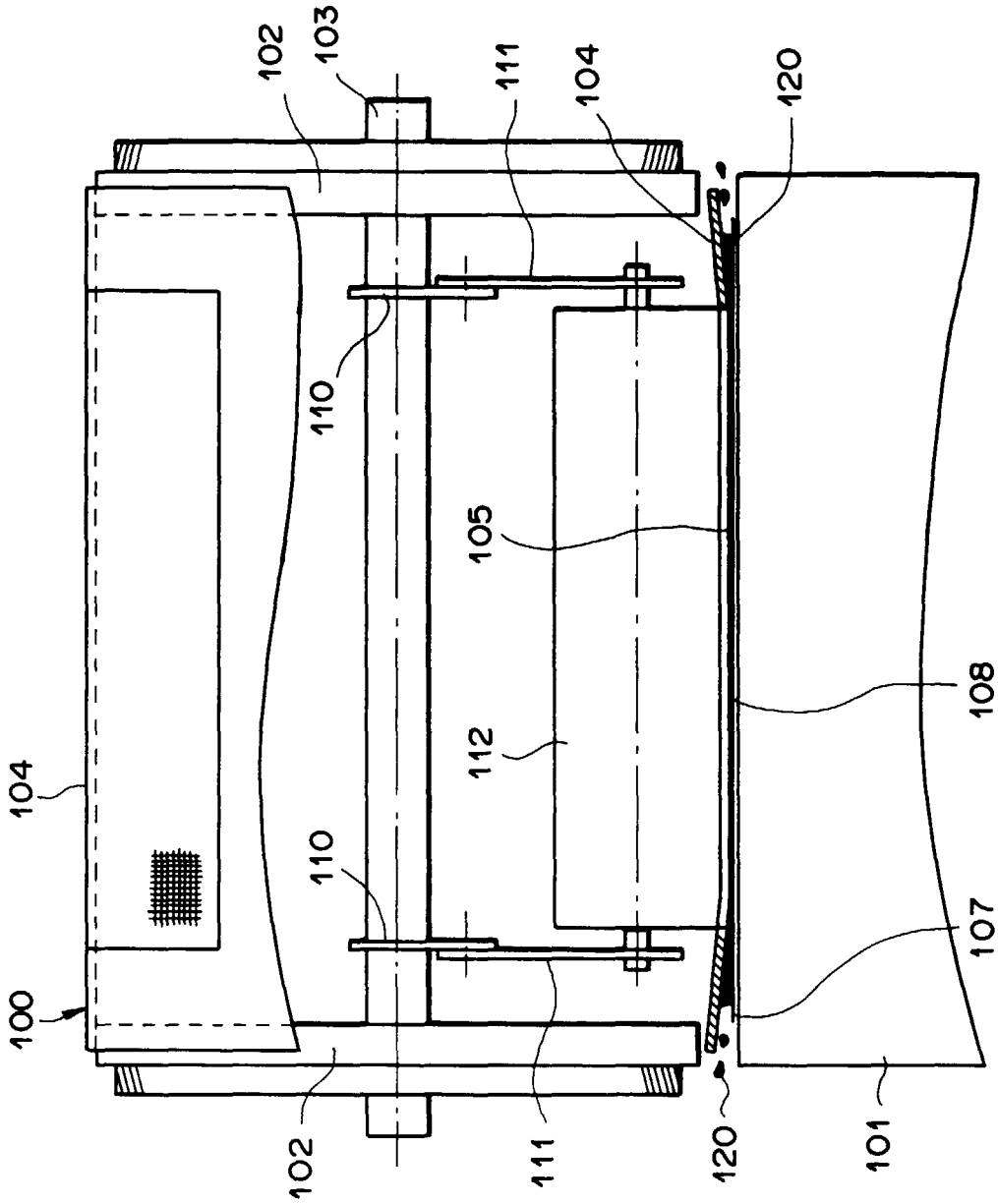

FIG.12 PRIOR ART

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 11 4698

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 406 028 C (BERNHARD HAUSLICH) * the whole document *	1	B41L13/18
A	DE 118 681 C (HARRY WILMER LOWE) * the whole document *	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B41L
B41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 October 1999	Loncke, J

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 99 11 4698

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26-10-1999

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 406028 C		NONE	
DE 118681 C		NONE	

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