Sheet carrier or transfer cylinder for use in a polychrome rotary printing press adapted for both one-side and two-side printing.

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ABSTRACT
Sheet guide or transfer cylinder for use in a polychrome rotary printing machine adapted for one-side or two-side printing, in which the sheet printed in the first printing device is pressed against the solid jacketed surface of the printing cylinder at the point of tangent, i.e., at the point of contact between the sheet guide or transfer cylinder and the printing cylinder arranged before it, in the direction of movement, by directing and carrier elements arranged on the sheet guide or transfer cylinder, and is securely carried thereby until the suction means disposed on the sheet guide or transfer cylinder grasp the end of the sheet and lift it off from the cylinder. The directing and carrier elements are arranged on the periphery of the sheet guide or transfer cylinder so as to be radially movable, whereby they permit crease-free transfer of the sheet to a further printing device.

4 Claims, 10 Drawing Figures
SHEET CARRIER CYLINDER FOR USE IN A POLYCHROME ROTARY PRINTING PRESS ADAPTED FOR BOTH ONE-SIDE AND TWO-SIDE PRINTING

In order to assure the transfer of a sheet upon a change in the size of the sheets it has been proposed to fix the gripper opening point for the release of the sheet printed in the first printing device at the leading edge of the sheet in a uniform manner suitable for all of the formats to be printed on the machine. Until the time when the trailing edge is grasped by the suction means disposed on the sheet guide or transfer cylinder, it is pressed against the solid peripheral surface of the printing cylinder by pressure strips which are also arranged on the sheet guide or transfer too and in this manner the sheet is securely guided. In both area of the gripper opening point, suction devices are provided which are directed against the printing cylinder, and which, in the case of intermittent operation, hold the sheets already released by the grippers. The flexible pressure strips which are arranged on the sheet guide or transfer cylinder, are in this arrangement mounted on segments which are displaceable, i.e., movable, circumferentially and axially.

This particular sheet guide or transfer cylinder has the disadvantage that pressure is applied to the sheet also at the transfer point and namely to the point of contact between the sheet guide or transfer cylinder and the second printing cylinder, by the flexible pressure strips provided on the sheet guide or transfer cylinder. This is particularly disadvantageous in connection with the printing of this paper using high machine speeds, as the time interval between the transfer of the sheet at the transfer point and its arrival at the second printing zone, i.e., the time interval between the printing cylinder and the rubber cylinder or roller, is short for setting the fluttering or movement of the sheet too in the direction of its movements and crosswise thereto, which fluttering movement is produced by the reversal, i.e., turning of the sheet to be eliminated. The pressure applied while the sheet is undergoing fluttering movements results in the formation of creases in the sheet.

It is an object of the invention to provide a sheet guide transfer cylinder which will result in a superior handling of the sheet even at high printing speeds and for all of the different materials that are to be printed.

A further object of the invention is to provide a sheet guide or transfer cylinder for one-side and two-side printing which assures a crease free-transfer of the sheets from the sheet guide or transfer cylinder to the next succeeding cylinder in the direction of movement.

These and other objects and advantages of the invention are obtained by providing on the periphery of a transfer cylinder carrier elements which will press the sheet at the point of contact therewith against the outer surface of the preceding cylinder. The carrier elements are movable in a radial direction. The radial movement of the carrier elements is controlled by a parallel rocker arrangement which induces the movement of the carrier elements at the point of contact in the direction from the periphery in toward the interior of the transfer cylinder.

The invention will be understood from the following description with reference to the drawings accompanying this application of an embodiment of the invention, in which:

FIG. 1 is a general, schematic representation of said embodiment;

FIGS. 2 to 7 are details thereof, shown in various positions;

FIG. 8 is a detail view drawn on a larger scale, partly in section and showing the transfer cylinder mechanism in accordance with the invention;

FIG. 9 is a sectional side elevation of the transfer cylinder taken along line A—A of FIG. 8; and

FIG. 10 is a sectional front elevation of the transfer cylinder taken along line B—B of FIG. 9.

Referring to the drawings and in particular to the printing assembly as shown in FIG. 1, the sheet fed by the feeding drum 6 to the printing cylinder 1 is being printed at the zone of contact between the printing cylinder 1 and the rubber cylinder 2. In the case where the sheet is to be printed on one side only, the sheet is, upon further rotation of the cylinder, sized by the grippers arranged in the transfer cylinder 3 and held by its leading edge in front, to the printing cylinder 4. In the contact zone established between the printing cylinder 4 and the rubber cylinder 5, the sheet is printed on the same side with a second color. Thereafter the sheet is fed to a further printing unit or to a receiving station. If, however, the machine is set for printing on both sides of the sheet, the sheet which has been printed in the contact zone between printing cylinder 1 and deleter rubber cylinder 2 is retained on the printing cylinder 1 until the trailing edge of the sheet has reached the contact point between the printing cylinder and the transfer cylinder (t₀). At this point (FIG. 2), the trailing edge of the sheet is sized by the suction devices 7 arranged on the sheet transfer cylinder 3. On the further rotation of the cylinder (FIGS. 4, 5), the suction devices 7 and the associated grippers 8 are retracted into the space inside the cylinder and the trailing edge of the sheet transferred from the suction device 7 to the gripper 8. Upon completion of the transfer of the trailing edge (FIGS. 6, 7), the gripper 8 and the suction device 7 are moved to their outside position and the sheet now with its trailing edge in front is turned over without creasing and fed to the printing cylinder 4 of the next printing unit.

In the zone of contact between the printing cylinder 4 and the rubber cylinder 5, the sheet is printed on its reverse side.

In the printing assembly shown in FIG. 8, a sheet 9 which is on the printing cylinder 1 and which has been printed by the first printing unit is guided on the cylinder 1 past the tangent point thereof. While this is done, all the way to the trailing edge of the sheet 9, the sheet 9 is pressed against the solid outer surface of the printing cylinder 1 and is securely held by carrier elements 10 which are arranged on the transfer cylinder 3 and are provided with resilient strips 11. At its leading edge, the sheet 9 is held by a gripper system arranged on the printing cylinder 1; this is done up to the gripper opening point. The gripper opening point is identical for all of the formats that are to be printed in the machine and is determined by the smallest possible (FIG. 3). A longer sheet 9 (FIG. 2) which has already been released by the gripper system arranged on cylinder 1 is securely carried only by the carrier elements 10 (FIG. 8). When the trailing edge of the sheet is at the tangent point, it is sized by a suction device 7 provided on the sheet guide or transfer cylinder 3 and removed from the printing cylinder 1.

Upon further rotation of the cylinder, the transfer of the sheet, which has been printed on by printing cylinder 1, to the printing cylinder 4 is achieved in the manner as has been described above and as illustrated in FIGS. 2–7. According to the invention, a crease free transfer between the sheet guide or transfer cylinder 3 and the printing cylinder 4 is achieved by the fact that the carrier elements 10 with resilient strips 11 are carried past the printing cylinder 4 without contacting it. The sheet 9 sized by the gripper system of the printing cylinder 4 (FIG. 7) thus can settle down from the flutter or movement thereof caused by its inversion or reversal (FIGS. 4, 5, 6) before it undergoes printing in the second printing unit. The advancement of the carrier segment 10, opposite printing cylinder 1, and its retraction opposite printing cylinder 4 is carried out by a parallel rocker system, which will now be described with reference to FIGS. 8–10.

On the lateral wall of the printing machine, there is provided a cam 23 (FIG. 10) on whose surface a roller 24 rolls, which roller is mounted on a lever 26 by means of a rocker spindle 25. Roller 24 is biased on a surface 23 by a spring 22 disposed on lever 26. In the end walls of the sheet guide or transfer cylinder 3, there is mounted a rocker shaft 15 (FIG. 9). As an extension of the rocker shaft 15 the spindle 25 of lever arm 26 is provided for motion with this shaft. The circular eccentrics 14 are provided on their interiors with a groove with which a sliding spring 18 is disposed which in turn is affixed to the circular eccentric by means of a screw.
17. The rocker shaft 15 has been provided with a longitudinal groove 19 in which the sliding spring 18 is guided. The circular eccentrics 14 are displaceably, i.e., adjustably arranged on this rocker shaft in the same manner as described for the circular eccentrics of the rocker shaft 15. On each circular eccentric 14 of the rocker shafts 15 and 16 there is rotatably, i.e., adjustably mounted a block 13 which block is fixed by means of flange plates 21 mounted thereon in its axial position in relation to the circular eccentric 14. Each block 13 on the rocker shaft 15 is joined to a block 13 disposed on rocker shaft 16, by means of carrier element 10. On the rocker shafts 15, 16 there are also provided levers 17 and 31, respectively, these levers being interconnected by means of a link 29 attached to them by pins 28 and 30, respectively.

The drive lever 27, the link 29 and the driven lever 31 form a parallel rocker arrangement which assures positive drive when the circular eccentrics 14 are moved out of their extended position. In the embodiment shown, the circular eccentrics 14 which are associated with the rocker shaft 15 and 16 are in their extended position when the carrier elements 10 are in their inner position. This structural arrangement has the advantage in that it permits a maximum movement of the carrier elements 10 in the radial direction.

For adjustment of the pressure between the resilient strips 11 arranged on the carrier segments 10 and the peripheral surface of the printing cylinder 1, elongated openings 13A are provided which extend radially in blocks 13. The adjustment of the pressure is carried out by loosening screws 12 in these openings and shifting the carrier elements 10 radially, either towards the interior of the sheet guide or transfer cylinder 3 or towards the printing cylinder 1, until the desired pressure is obtained. Then the screws 12 are retightened.

The change over of the sheet transfer carrier cylinder 3 for one-side printing is carried out by locking the carrier elements 10 in the inner position, in which the roller 24 on roller lever 26 is located at the highest point of cam 23 (FIG. 10).

The roller lever 26 is provided with a cross-slotted indexing means 32. When the spring-loaded indexing pin 33 is drawn outwardly and turned, it snaps into an opening 34 in the sheet guide or transfer cylinder 3, thus locking the carrier elements 10 in their inner position against the pressure of spring 22.

The sheet or transfer cylinder 3 is converted from one-side to two-side printing by removing the indexing pin 33 from the opening 34 in the conventional manner. Thereafter, the roller 24 is urged against the cam surface by roller lever 26 under the force of spring 22, so that when the cylinder rotates, the guide elements 10 are moved into the corresponding radial position by the cam 23.

We claim:
1. A printing machine comprising a sheet transfer cylinder, means including at least one first printing cylinder ahead of said transfer cylinder and at least one second printing cylinder following said transfer cylinder for selective one-side or two-side printing of sheets, said last mentioned means including means on said transfer cylinder for selectively grasping either the leading edge of a sheet for one-side printing or the trailing edge of a sheet for reversible feeding and thus two-side printing, arc-shaped plate means constituting a limited peripheral region of said transfer cylinder and adapted to contact a sheet, printed on said first printing cylinder and handled thereafter without two-side printing by normal transfer of the sheet to said second printing cylinder, selectively actuated and reversible means for withdrawing said arc-shaped plate means into said transfer cylinder to carry a sheets, reversed after printing on said first printing cylinder, to said second printing cylinder and into contact therewith without creasing of the sheet.
2. Sheet transfer cylinder according to claim 1, wherein said means for withdrawing said arc-shaped plate means includes a parallel rocker linkage disposed in the sheet transfer cylinder and carrying the plate means.
3. Sheet transfer cylinder according to claim 2 also including cam means in the sheet transfer cylinder for controlling said parallel rocker linkage.
4. Sheet transfer cylinder according to claim 1 also including means for selectively locking and unlocking said means for withdrawing the arc-shaped plate means, in the position wherein the plate means is withdrawn into the transfer cylinder.

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