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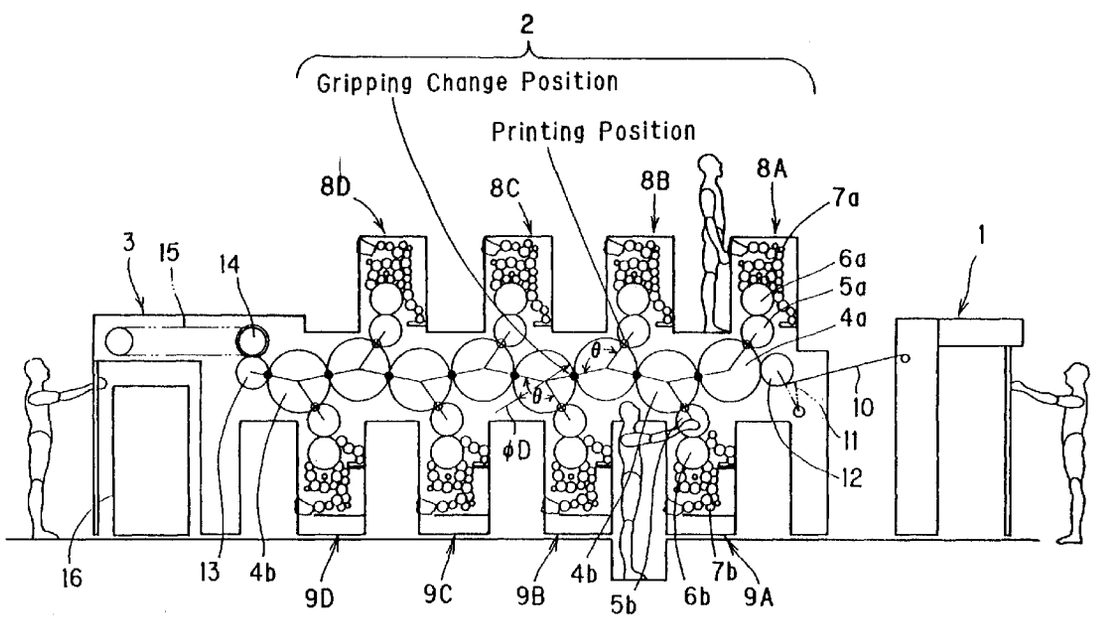
(54) Perfecting sheet-fed rotary press

(57) In a perfecting sheet-fed rotary press, cylinders are arranged such that the distance from a printing position, i.e., a point of contact between an impression cylinder (4a,b) and a blanket cylinder (5a,b), to a gripping change position on the next impression cylinder or a transport cylinder (13) is longer than the length of a sheet, and after the sheet is released from between the blanket cylinder (5a,b) and the impression cylinder (4a, b) in a preceding printing unit, the sheet is transferred between the impression cylinders (4a,b) and between the impression cylinder (4b) and the transport cylinder (13), whereby printing malfunctions due to defective transfer of sheets are avoided to decrease the number of waste sheets.

Fig.1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] This invention relates to a perfecting sheet-fed rotary press. More specifically, the invention relates to a printing press capable of offset printing both sides of a sheet of paper in a single color or a plurality of colors by single threading (without converting or turning the sheet upside down).

2. Description of the Related Art

[0002] An example of the above type of printing press is shown in Fig. 2 (see Japanese Unexamined Patent Publication No. 336003/94) . According to this printing press, sheets piled on a feeder 100 are fed to a printing unit 104 via a register board 101, a swing gripper device 102, and a transfer cylinder 103. In the printing unit 104, both sides of each sheet are printed in four colors per side.

[0003] In detail, the printing unit 104 is constructed in the following manner: Above an impression cylinder 105a having a sheet gripper, a blanket cylinder 106a, a plate cylinder 107a, and an inking unit 108a are provided to form a face side printing unit 109a. Below an impression cylinder 105b having a sheet gripper, a blanket cylinder 106b, a plate cylinder 107b, and an inking unit 108b are provided to form a reverse side printing unit 109b. The impression cylinder 105a of the face side printing unit 109a and the impression cylinder 105b of the reverse side printing unit 109b are horizontally connected together to constitute a 1st color double-sided printing unit A as one unit. In the same manner as for the 1st color double-sided printing unit A, 2nd color to 4th color double-sided printing units B to D are also constituted. These 1st color to 4th color double-sided printing units A to D are horizontally connected together by intermediate cylinders 110 to construct the printing unit 104. The intermediate cylinders 110 have sheet grippers, and are provided such that two of the intermediate cylinders 110 are arranged between the adjacent double-sided printing units.

[0004] Thus, each sheet is transferred from the transfer cylinder 103 to the impression cylinder 105a of the face side printing unit 109a constituting the 1st color double-sided printing unit A, and its face side is printed in the first color. Then, the printed sheet is transferred to the impression cylinder 105b of the reverse side printing unit 109b to have its reverse side printed in the first color. Then, the sheet is fed to the 2nd color double-sided printing unit B via the two intermediate cylinders 110, and further fed to the 3rd color to 4th color double-sided printing units C to D in this order to have its face and reverse sides printed in the second to fourth colors.

[0005] In the drawing, the reference numeral 111 denotes a delivery unit. The sheet after completion of printing is transferred from the impression cylinder 105b at the tail of the printing unit 104 to a delivery cylinder 113 via the intermediate cylinders 110 and a transport cylinder 112. From the delivery cylinder 113, the sheet is delivered onto a pile plate of a pile raising and lowering device 115 by means of a chain gripper 114.

[0006] With the above-described conventional perfecting press, the impression cylinder and the plate cylinder are set at nearly the same diameter. Partly because of this, transfer (gripping change) of a sheet is performed between the impression cylinder and the adjacent impression cylinder and between the impression cylinder and the adjacent intermediate cylinder, before the sheet is released from between the blanket cylinder and the impression cylinder in the preceding printing unit. Assume, here, that a difference in peripheral speed (due to the manufacturing error of the cylinder diameter or the like) exists between the impression cylinders, thereby causing a difference in the transport speed of the sheet. In this case, the tension of the sheet changes, so that the sheet maybe stretched or loosened. If the sheet is stretched, the sheet remains locked, with its trailing edge being pinched between the impression cylinder and the blanket cylinder, namely, the sheet remains firmly pressed against the surface of the impression cylinder. In this state, shear relative to the surface of the impression cylinder occurs in a printed surface of the sheet facing the surface of the impression cylinder. Hence, the printed surface of the sheet rubs against the surface of the impression cylinder, whereby ink adheres to the surface of the impression cylinder. During next printing, a printed surface of a subsequent sheet is displaced relative to the ink adhering to the surface of the impression cylinder. Thus, the ink adhering to the surface of the impression cylinder adheres to the displaced site of the printed surface of the sheet facing the impression cylinder surface, and appears as a smudge or doubling. Scratches also occur. When the sheet is loosened, on the other hand, the trailing edge of the sheet is pulled toward the blanket cylinder by the attracting force of the ink that has adhered to the blanket cylinder. Likewise, shear develops between the surface of the impression cylinder and the printed surface of the sheet facing the impression cylinder surface. Consequently, the same disadvantages occur. Such disadvantages also emerge when there is a difference in peripheral speed between the impression cylinder and the intermediate cylinder.

SUMMARY OF THE INVENTION

[0007] It is an object of the present invention, therefore, to provide a perfecting sheet-fed rotary press capable of avoiding printing malfunctions due to defective transfer of sheets, thereby decreasing the number of waste papers.

[0008] To attain the foregoing object, the present in-

vention provides a perfecting sheet-fed rotary press which transfers a sheet between impression cylinders of face side printing unit and impression cylinders of adjacent reverse side printing unit to print both sides of the sheet, wherein cylinders are arranged such that the sheet can be transferred between the adjacent cylinders after the sheet is released from between a blanket cylinder and the impression cylinder the preceding printing unit. According to this constitution, even if the peripheral speeds of the adjacent cylinders are different, the tension of a sheet does not change during its transfer, and no printing malfunctions due to shear between the sheet and the cylinder take place.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009]

Fig. 1 is a schematic constitutional view of a four-color perfecting sheet-fed rotary press showing an embodiment of the present invention; and
Fig. 2 is a schematic constitutional view of a four-color perfecting sheet-fed rotary press according to a conventional example.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0010] A preferred embodiment of a perfecting sheet-fed rotary press according to the present invention will now be described in detail by way of the following Example using the attached drawing.

[Example]

[0011] Fig. 1 is a schematic constitutional view of a four-color perfecting sheet-fed rotary press showing an embodiment of the present invention. In the drawing, the reference numeral 1 denotes a feeding unit, 2 a printing unit, and 3 a delivery unit. An impression cylinder 4a at the head of the printing unit 2 is fed with sheets, which are piled on the feeding unit 1, via a register board 10, a swing gripper device 11, and a transfer cylinder 12. From an impression cylinder 4b at the tail of the printing unit 2, the sheet after completion of printing is transferred to a delivery cylinder 14 of the delivery unit 3 via a transport cylinder 13. From the delivery cylinder 14, the sheet is delivered onto a pile plate of a pile raising and lowering device 16 by means of a chain gripper 15.

[0012] The printing unit 2 consists of four face side printing units 8A to 8D, and four reverse side printing units 9A to 9D. The 1st color to 4th color face side printing units 8A to 8D are each formed by providing a blanket cylinder 5a, a plate cylinder 6a, and an inking unit 7a above the impression cylinder 4a having a sheet gripper. The 1st color to 4th color reverse side printing units 9A to 9D are each formed by providing a blanket cylinder 5b, a plate cylinder 6b, and an inking unit 7b below the impression cylinder 4b having a sheet gripper. The impression cylinders 4a, 4b of the four face side printing units 8A to 8D and the four reverse side printing units 9A to 9D each have a diameter twice the diameter of each of the plate cylinders 6a, 6b having the same diameter as that of the blanket cylinders 5a, 5b in rolling contact with the impression cylinders 4a, 4b.

[0013] According to the present embodiment, the so formed face side printing units 8A, 8B, 8C, 8D and reverse side printing units 9A, 9B, 9C, 9D are alternately connected, for example, such that the 1st color face side printing unit 8A is followed by the 1st color reverse side printing unit 9A, then followed by the 2nd color face side printing unit 8B, and so on. In this case, the impression cylinders 4a, 4b constituting the face side and reverse side printing units 8A to 8D, 9A to 9D are connected together in the horizontal direction. In the illustrated embodiment, the respective impression cylinders 4a, 4b are connected together so that a line connecting the shaft centers of these impression cylinders will be zigzag.

[0014] The present embodiment is also constituted such that after the sheet exits from between the blanket cylinder 5a and the impression cylinder 4a and between the blanket cylinder 5b and the impression cylinder 4b in the preceding printing units 8A to 8D, 9A to 9D, the sheet is transferred between the impression cylinders 4a and 4b and between the impression cylinder 4b and the transport cylinder 13.

[0015] Concretely, the cylinders are arranged such that the distance from the printing position, i.e., the point of contact between the impression cylinder 4a (4b) and the blanket cylinder 5a (5b), to the gripping change position on the next impression cylinder 4a (4b) or the transport cylinder 13 is longer than the length (L) of the sheet. In other words, the cylinders are arranged to meet the following relation:

$$L < D\pi\ (\theta/360)$$

where

L is the length of the sheet,
D is the diameter of the impression cylinder, and
θ is the angle from the printing position to the gripping change position.

[0016] Because of the above constitution, each sheet is transferred from the transfer cylinder 12 to the impression cylinder 4a of the first face side printing unit 8A to have its face side printed in the first color. Then, the printed sheet is transferred to the impression cylinder 4b of the first reverse side printing unit 9A to have its reverse side printed in the first color. Then, the double-sided printed sheet is fed sequentially to the second to fourth face side printing units 8B to 8D and the second to fourth reverse side printing units 9B to 9D to have its

face and reverse sides printed alternately in the second to fourth colors in the same manner as described above.

[0017] The sheet after completion of printing is transferred from the impression cylinder 4b at the tail of the printing line to the delivery cylinder 14 via the transport cylinder 13. From the delivery cylinder 14, the sheet is delivered onto the pile plate of the pile raising and lowering device 16 by means of the chain gripper 15, as has been described earlier.

[0018] According to the present embodiment, as stated above, the cylinders are arranged such that the distance from the printing position, i.e., the point of contact between the impression cylinder 4a (4b) and the blanket cylinder 5a (5b), to the gripping change position on the next impression cylinder 4a (4b) or the transport cylinder 13 is longer than the length (L) of the sheet. Furthermore, after the sheet exits from between the blanket cylinder 5a and the impression cylinder 4a and between the blanket cylinder 5b and the impression cylinder 4b in the preceding printing units 8A to 8D, 9A to 9D, the sheet is transferred between the impression cylinders 4a and 4b and between the impression cylinder 4b and the transport cylinder 13. Thus, even if the peripheral speeds of the adjacent cylinders are different, the tension of the sheet does not change during its transfer, and no printing malfunctions due to shear between the sheet and the cylinder take place. That is, the following events that would otherwise occur are prevented from happening:

[0019] If the sheet is stretched, the sheet remains locked, with its trailing edge being pinched between the impression cylinder 4a (4b) and the blanket cylinder 5a (5b); namely, the sheet remains firmly pressed against the surface of the impression cylinder. In this state, shear relative to the surface of the impression cylinder occurs in the printed surface of the sheet facing the surface of the impression cylinder. Hence, the printed surface of the sheet rubs against the surface of the impression cylinder, whereby ink adheres to the surface of the impression cylinder. During next printing, the printed surface of a subsequent sheet is displaced relative to the ink adhering to the surface of the impression cylinder. Thus, the ink adhering to the surface of the impression cylinder adheres to the displaced site of the printed surface of the sheet facing the impression cylinder surface, and appears as a smudge or doubling. Scratches also occur. When the sheet is loosened, on the other hand, the trailing edge of the sheet is pulled toward the blanket cylinder 5a (5b) by the attracting force of the ink that has adhered to the blanket cylinder 5a (5b). Likewise, shear develops between the surface of the impression cylinder and the printed surface of the sheet facing the impression cylinder surface. Consequently, the same disadvantages occur.

[0020] As noted above, the present invention provides the perfecting sheet-fed rotary press which transfers a sheet between each of the impression cylinders of the face side printing units and each of the impression cylinders of the adjacent reverse side printing units to print both sides of the sheet, wherein the cylinders are arranged such that the sheet can be transferred between the adjacent cylinders after the sheet is released from between the blanket cylinder and the impression cylinder in the preceding printing unit. Even if the peripheral speeds of the adjacent cylinders are different, therefore, the tension of the sheet does not change during its transfer, so that no printing malfunctions due to shear between the sheet and the cylinder take place. Thus, the number of waste papers can be decreased.

[0021] While the invention has been described with reference to the preferred embodiments, it is to be understood that various changes and modifications may be made without departing from the spirit and scope of the invention. All such modifications as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

Claims

1. A perfecting sheet-fed rotary press which transfers a sheet between impression cylinders (4a) of face side printing unit (8A to 8D) and impression cylinders (4b) of adjacent reverse side printing unit (9A to 9D) to print both sides of the sheet, characterized in that cylinders are arranged such that the sheet can be transferred between the adjacent cylinders after the sheet is released from between a blanket cylinder (5a, 5b) and the impression cylinder (4a, 4b) in the preceding printing unit.

2. The perfecting sheet-fed rotary press of claim 1, characterized in that the impression cylinders (4a, 4b) of the face side printing unit (8A to 8D) and the reverse side printing unit (9A to 9D) each have a diameter twice the diameter of each of plate cylinders (6a, 6b) having the same diameter as that of blanket cylinders (5a, 5b) in rolling contact with the impression cylinders (4a, 4b).

3. The perfecting sheet-fed rotary press of claim 1, characterized in that the cylinders are arranged such that the distance from a printing position, which is a point of contact between the impression cylinder (4a, 4b) and the blanket cylinder (5a, 5b), to a gripping change position on the next impression cylinder (4a, 4b) or a transport cylinder (13) is longer than the length of the sheet.

Fig.1

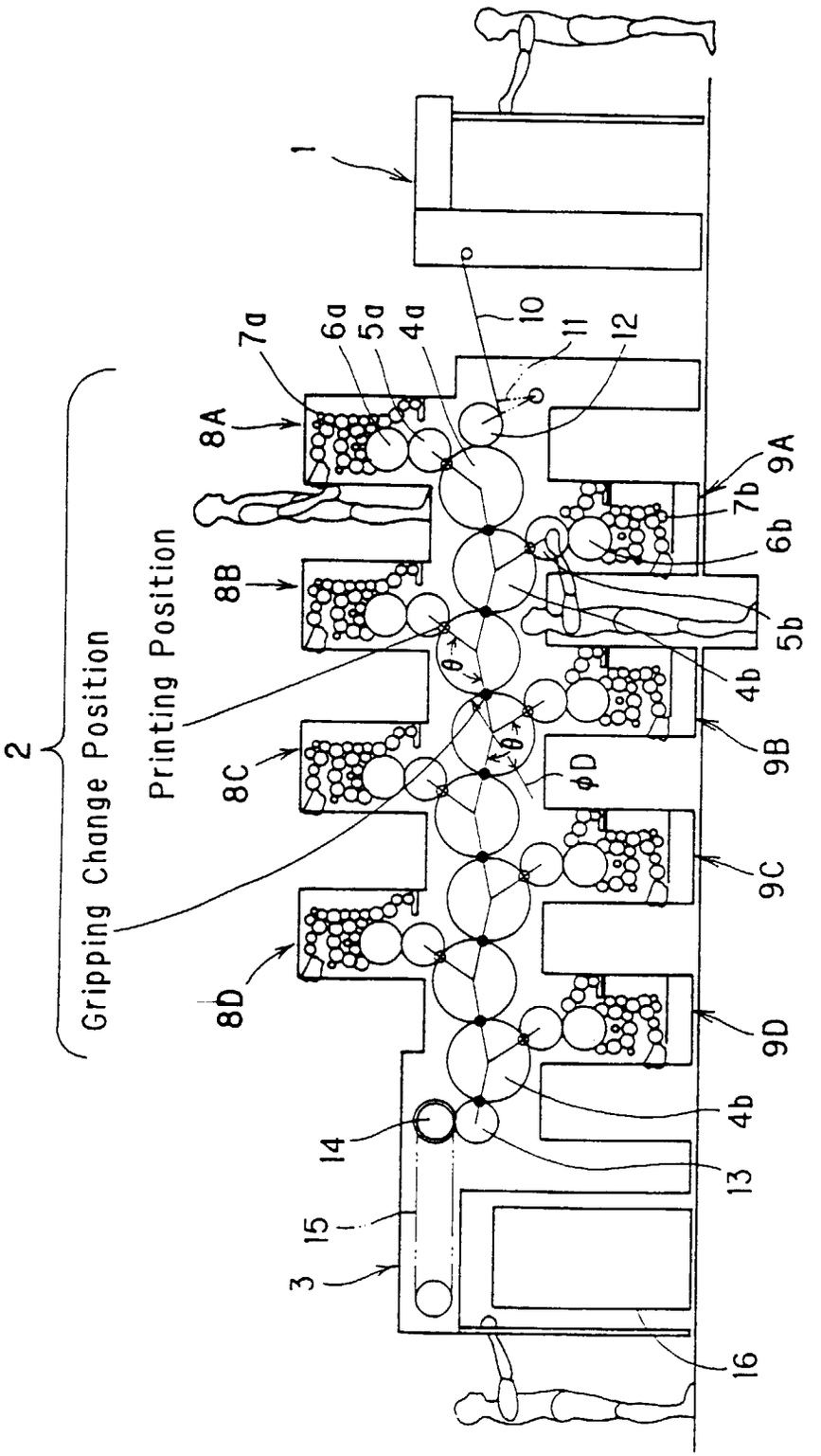
1
2
Gripping Change Position
Printing Position
3
4a
4b
5a
5b
6a
6b
7a
7b
8A
8B
8C
8D
9A
9B
9C
9D
10
11
12
13
14
15
16
θ
θ
φD

Fig.2

Related Art