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(54) **SHEET-FED FLEXO PRINTING MACHINE**

(57) The present invention relates to the field of printing equipment and, particularly to a single-sheet flexographic printing press, which includes a first printing unit and a second printing unit for printing both surfaces of the printing stock, respectively. A first printing paper delivering drums I, the first printing paper delivering drum II, the second printing paper delivering drum I and the second printing paper delivering drum II are provided as drums having a temperature control or a quality checking

device. An even number of printing paper feed drums are added between and behind the printing units corresponding to the two sides of the printed product. On one hand, the paper alternatives even times to ensure that the two sides printing of the printed product. On the other hand, the problem of thermal accumulation and timely quality control is solved by adding additional temperature control function and print quality inspection function to the printing paper drum.

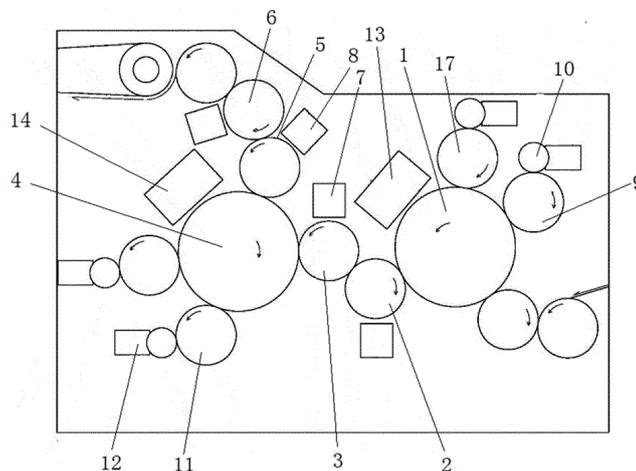


Figure 1

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Description

Technical field

[0001] The present invention relates to the technical field of printing equipment, and more particularly to a single-sheet flexographic printing press.

Background

[0002] For existing flexographic printing press, especially the double-sided flexographic printing press, in order to satisfy the requirements of high production efficiency, ink drying and curing process are conducted on the printing surface immediately after printing such that the printing operations on the next step or the next side can be carried out. The existing fast drying technology for printed product usually uses hot air, infrared or UV light curing and other principles, to achieve the fast drying of printed product. The above drying method will have a thermal effect on the printed surface, causing a slightly warping due to slight increase of temperature on one side surface of the printed product, or even seriously significant deformation of printed product. In special circumstances, this even leads to coking or burning of the printed product. In addition, since the demand for quality of the printing production is getting more and more strict, the user proposes more requirements to the online quality inspection system of the printing equipment. The existing flexographic printing presses are still poor in terms of the online inspection system and the printing quality.

[0003] Figure 4 is a flow chart of an existing double-sided flexographic printing press, and the two printing color groups corresponding to both sides of the printed product in the flow chart are sequentially connected. The printing, drying and curing of the other surface (B side) is carried out immediately after the ink is dried and cured by the drying device when the printing of the first side (A side) is completed. And then, the quality check of the two printing surfaces is carried out respectively in the checking drum. The printing structure has thermal accumulation problems when continuous drying of the printed product is conducted. The deformation caused by overheating and other issues affects the printing quality, which is not conducive to the neat collection of the printing matter. Additionally, in the printing machine structure used in the process, the on-line checking of both sides of the printing process is carried out after the two printings are completed, so that the feedback of the printing quality problems on the first side can be received only after the printing of the second side is completed. Therefore, there is a delay in quality control.

[0004] Figure 5 is a schematic diagram showing the arrangement of the printing unit drums of the existing double-sided flexographic printing press. The arrangement of the printing unit drums conforms to the printing process shown in Figure 4. The flexographic printing press adopts the printing method of continuously printing

on both sides, which causes the above-mentioned problem of thermal accumulation of printed product and timeliness control of the printed product quality during the production process.

Summary of the invention

[0005] In order to overcome the above-mentioned deficiencies of the prior art, the present invention provides a single-sheet flexographic printing press which reduces the thermal accumulation of the printed product and timely detects quality problems of the printed product.

[0006] A technical solution for achieving the object of the present invention is that a single-sheet flexographic printing press includes a first printing unit and a second printing unit for printing two surfaces of a printing stock, respectively. The first printing unit comprises a first printing drum, a first printing paper delivering drum I and a first printing paper delivering drum II; the second printing unit comprises a second imprinting drum, a second printing paper delivering drum I and a second printing paper delivering drum II; the first printing paper delivering drums I and the first printing paper delivering drum II are provided between the first imprinting drum and the second imprinting drum; the second printing paper delivering drum I and the second printing paper delivering drum II are provided behind the second imprinting drum; each of the first printing paper delivering drums I, the first printing paper delivering drum II, the second printing paper delivering drum I and the second printing paper delivering drum II is a drum having a temperature control or a quality checking device. A temperature adjustment control mechanism is provided inside the drum having the temperature control to enable liquid medium to flow, and the drum having the quality checking device is a drum in which an optoelectronic device or a camera is mounted.

[0007] As a preferred embodiment of the present invention, a first checking device is provided outside the first printing paper delivering drums I and the first printing paper delivering drum II, and a second checking device is provided outside the second printing paper delivering drums I and the second printing paper delivering drum II; both the first checking device and the second checking device are configured to check material or print quality of the printing stock transferred from an adjacent direction of a front end.

[0008] As a preferred embodiment of the present invention, a gripper mechanism for gripping the printing stock is installed inside each of the first imprinting drum, the first printing paper delivering drum I, the first printing paper delivering drum II, the second imprinting drum, the second printing paper delivering drum I, and the second printing paper delivering drum II.

[0009] As a preferred embodiment of the present invention, a temperature adjustment control mechanism for flowing of the liquid medium is provided inside the first imprinting drum and the second imprinting drum.

[0010] As a preferred embodiment of the present in-

vention, the first imprinting drum is provided with at least one first flexographic printing drum for installing a flexographic plate; the flexographic printing drum is provided with a corresponding first ink supply system; the second imprinting drum is provided with at least one second flexographic printing drum for installing a flexographic plate; the second flexographic printing drum is provided with a corresponding second ink supply system.

[0011] As a preferred embodiment of the present invention, a first printing ink drying and curing device is provided outside the first imprinting drum, and a second printing ink drying and curing device is provided outside the second imprinting drum.

[0012] As a preferred embodiment of the present invention, a paper feeding device is provided at a front end of the first printing unit.

[0013] As a preferred embodiment of the present invention, a multi-bin paper collecting device is provided at a rear end of the second printing unit.

[0014] The present invention has following advantages. In the present invention, two units (four printing paper feeding drums in total) are installed between and behind components where the two imprinting drums are located, respectively. These printing paper feeding drums can be set as the drums having a temperature control or a quality checking device. The printing paper feed drums are provided with the temperature control function, which can reduce the thermal accumulation of the printed product, to create conditions for print quality control and neat collection. The printing paper feeding drums are provided with the quality checking device to conduct different quality checking or optical characteristics checking on two sides of the printed product based on the requirements of quality checking, such that the scope of checking is enlarged. At the same time, the checking device is provided between the components, which provides a condition for the timely feedback of the printing quality of the printed product. For example, after the first side of the printing is completed, when it is found during checking that there are quality problems, the present invention can set a timely alarm, shutdown the machine, stop the printing drums or separate collection of printed product and other measures to reduce the unnecessary printing materials and printing stocks waste.

Brief description of the drawings

[0015] In order to make the contents of the present invention more easily understood, the present invention will be described in further detail with reference to embodiments in conjunction with the accompanying drawings.

Figure 1 is a structural diagram of the present invention;

Figure 2 is a diagram of an embodiment of the present invention;

Figure 3 is a working flow chart of the present inven-

tion;

Figure 4 is a flow chart of an existing double-sided flexographic printing press;

Figure 5 is a schematic diagram showing the arrangement of the printing unit drums of the existing double-sided flexographic printing press.

[0016] In drawings: 1, the first imprinting drum; 2, the first printing paper delivering drum I; 3, the first printing paper delivering drum II; 4, the second imprinting drum; 5, the second printing paper delivering drum I; 6, the second printing paper delivering drum II; 7, the first checking device; 8, the second checking device; 9, a first flexographic printing drum; 10, a first ink supply system; 11, a second flexographic printing drum; 12, a second ink supply system; 13, a first printing ink drying and curing device; 14, a second printing ink drying and curing device; 15, a paper feeding device; 16, a multi-bin paper collecting device; 17, a flexographic printing drum.

Detailed description of the embodiments

[0017] As shown in Figure 1, the present invention discloses a single-sheet flexographic printing press, which includes a first printing unit and a second printing unit for printing both surfaces of the printing stock respectively. The first printing unit includes first imprinting drum 1, first printing paper delivering drum I 2, first printing paper delivering drum II 3, second imprinting drum 4, second printing paper delivering drum I 5 and second printing paper delivering drum II 6. First printing paper delivering drum I 2 and first printing paper delivering drum II 3 are provided between first imprinting drum 1 and second imprinting drum 4, second printing paper delivering drum I 5 and second printing paper delivering drum II 6 are provided behind second imprinting drum 4. First printing paper delivering drum I 2, first printing paper delivering drum II 3, second printing paper delivering drum I 5 and second printing paper delivering drum II 6 are provided as drums having a temperature control or a quality checking device. The interior of the drum having the temperature control is provided with a temperature adjustment control mechanism for the liquid medium to flow, and the drum having the quality checking device is a drum in which an optoelectronic device or a camera is mounted. The optoelectronic device or camera is connected to a computer or other analytical equipment, so that the printing quality of the paper can be checked in real time.

[0018] In the arrangement structure of the drums, two (even number) of printing paper feed drums are added between and behind the printing units corresponding to two surfaces of the printed product. On one hand, the paper alternates even times to ensure the two surface printings of the printed product. On the other hand, the problem of thermal accumulation and timely quality control is solved by adding additional temperature control function and print quality checking function on the added printing paper drum.

[0019] First checking device 7 is provided at the exterior of first printing paper delivering drum I 2 and first printing paper delivering drum II 3, and second checking device 8 is provided at the exterior of second printing paper delivering drum I 5 and second printing paper delivering drum II 6. Both, first checking device 7 and second checking device 8, are configured to check the material or print quality of the printing stock transferred from the adjacent direction of the front end. Both, first checking device 7 and second checking device 8, are configured to check the print quality of the printing stock transferred from the adjacent direction of the front end. First checking device 7 and the second checking device 8 can be a high-speed camera, and the high-speed camera can be connected to a computer to carry out the checking of the printing quality of the printed product.

[0020] A gripper mechanism is installed in the interior of each of first imprinting drum 1, first printing paper delivering drum I 2, first printing paper delivering drum II 3, second imprinting drum 4, second printing paper delivering drum I 5 and second printing paper delivering drum II 6 for gripping printing stock. The present invention is mainly suitable for single-sheet double-sided flexographic printing press. Thus, the gripper mechanism used to grip printing stock is provided at the gap between imprinting drums, printing paper feed drums and other drums related to paper gripping and transferring.

[0021] A temperature adjustment control mechanism for flow of the liquid medium is provided inside first imprinting drum 1 and second imprinting drum 4. At least one first flexographic printing drum 9 used for installing the flexographic plate is configured on first imprinting drum 1. Flexographic printing drum 9 is provided with a corresponding first ink supply system 10. At least one second flexographic printing drum 11 used for installing the flexographic plate is configured on second imprinting drum 4. Second flexographic printing drum 11 is provided with a corresponding second ink supply system 12. First ink supply system 10 and second ink supply system 12 are an anilox roller ink supply system.

[0022] In the present invention, it is possible to carry out flexographic printing on both sides of the printed product. A fast drying and curing type ink is necessary for printing and a corresponding drying and curing device needs to be configured. First printing ink drying and curing device 13 is configured outside of first imprinting drum 1, and second printing ink drying and curing device 14 is configured outside of second imprinting drum 4. The fast drying and curing method will cause a certain amount of heat radiation, leading to increase in the temperature of the drums, other components and the printed product. In order to avoid the influence on the components and quality problem of the printed product caused by increase in the temperature, pipelines for flow of the liquid medium are designed inside the first imprinting drum 1, first printing paper delivering drum I 2, first printing paper delivering drum II 3, second imprinting drum 4, second printing paper delivering drum I 5 and second printing paper de-

livering drum II 6, the temperature control of the drum and printed product can be achieved by controlling the temperature and flow of liquid medium from outside.

[0023] Figure 3 is a flow chart of printing process using the present invention. The flow chart shows the sequential process of double-sided printing, drying and curing, cooling and quality checking of the printing press, respectively. By the printing, drying, cooling and quality checking processes, the problem of thermal accumulation and delayed quality control existing in the double-sided flexographic printing will be well solved.

[0024] As shown in Figure 2, the printing stock is firstly transferred to first imprinting drum 1 by the paper entering and feeding drum, and the printing stock is successively passed through first flexographic printing drum 9 and flexographic printing drum 17 to complete the two-color overprinting of the first surface of the printed product. Next, the drying and curing of ink is conducted on the first surface by first printing ink drying and curing device 13. And then, the cooling treatment is conducted by first printing paper delivering drum I 2. And then, the printed product is transferred to second imprinting drum 4 through first printing paper delivering drum II to complete the two-color overprinting of the other surface. Next, the drying and curing of ink is conducted on the other surface by second printing ink drying and curing device 14. After that, the cooling treatment is conducted by second printing paper delivering drum I 5 and second printing paper delivering drum II 6. Finally, the printing is completed and the paper is provided as output. In the process, the two-sided printing can be checked and controlled by first checking device 7 and second checking device 8, respectively, to ensure the quality of the printed product. In addition, paper feeding device 15 is provided at the front end of the first printing unit, and multi-bin paper collecting device 16 is provided at the rear end of the second printing unit. It is convenient to print a large amount of paper by setting paper feeding device 15 and multi-bin paper collecting device 16.

[0025] The above embodiments illustrate the objectives, technical solutions and advantages of the present invention in detail. It should be understood that the above descriptions are only specific embodiments of the present invention, which are not intended to limit the present invention. Any modifications, equivalent substitutions, improvements within the spirit and principles of the present invention fall within the scope of the present invention.

Claims

1. A single-sheet flexographic printing press, comprising:
 - a first printing unit and a second printing unit for printing two surfaces of a printing stock, respectively,

wherein

the first printing unit comprises a first imprinting drum (1), a first printing paper delivering drum I (2) and a first printing paper delivering drum II (3);

the second printing unit comprises a second imprinting drum (4), a second printing paper delivering drum I (5) and a second printing paper delivering drum II (6);

the first printing paper delivering drum I (2) and the first printing paper delivering drum II (3) are provided between the first imprinting drum (1) and the second imprinting drum (4);

the second printing paper delivering drum I (5) and the second printing paper delivering drum II (6) are provided behind the second imprinting drum (4);

each of the first printing paper delivering drums I (2), the first printing paper delivering drum II (3), the second printing paper delivering drum I (5) and the second printing paper delivering drum II (6) is a drum having a temperature control or a quality checking device;

a temperature adjustment control mechanism is provided inside the drum having the temperature control to enable liquid medium to flow, and the drum having the quality checking device is a drum in which an optoelectronic device or a camera is mounted.

2. The single-sheet flexographic printing press according to claim 1, **characterized in that**, a first checking device (7) is provided outside the first printing paper delivering drum I (2) and the first printing paper delivering drum II (3), and a second checking device (8) is provided outside the second printing paper delivering drum I (5) and the second printing paper delivering drum II (6); both the first checking device (7) and the second checking device (8) are configured to check material or print quality of the printing stock transferred from an adjacent direction of a front end.
3. The single-sheet flexographic printing press according to claim 1 or 2, **characterized in that**, a gripper mechanism for gripping the printing stock is installed inside each of the first imprinting drum (1), the first printing paper delivering drum I (2), the first printing paper delivering drum II (3), the second imprinting drum (4), the second printing paper delivering drum I (5), and the second printing paper delivering drum II (6).
4. The single-sheet flexographic printing press according to claim 1 or 2, **characterized in that**, a temperature adjustment control mechanism enabling liquid medium to flow is provided inside the first imprinting drum (1) and the second imprinting drum (4).
5. The single-sheet flexographic press according to claim 1 or 2, **characterized in that**, the first imprinting drum (1) is provided with at least one first flexographic printing drum (9) for installing a flexographic plate; the flexographic printing drum (9) is provided with a corresponding first ink supply system (10); the second imprinting drum (4) is provided with at least one second flexographic printing drum (11) for installing a flexographic plate; the second flexographic printing drum (11) is provided with a corresponding second ink supply system (12).
6. The single-sheet flexographic printing press according to claim 1 or 2, **characterized in that**, a first printing ink drying and curing device (13) is provided outside the first imprinting drum (1), and a second printing ink drying and curing device (14) is provided outside the second imprinting drum (4).
7. The single-sheet flexographic printing press according to claim 1 or 2, **characterized in that**, a paper feeding device (15) is provided at a front end of the first printing unit.
8. The single-sheet flexographic printing press according to claim 1 or 2, **characterized in that**, a multi-bin paper collecting device (16) is provided at a rear end of the second printing unit.

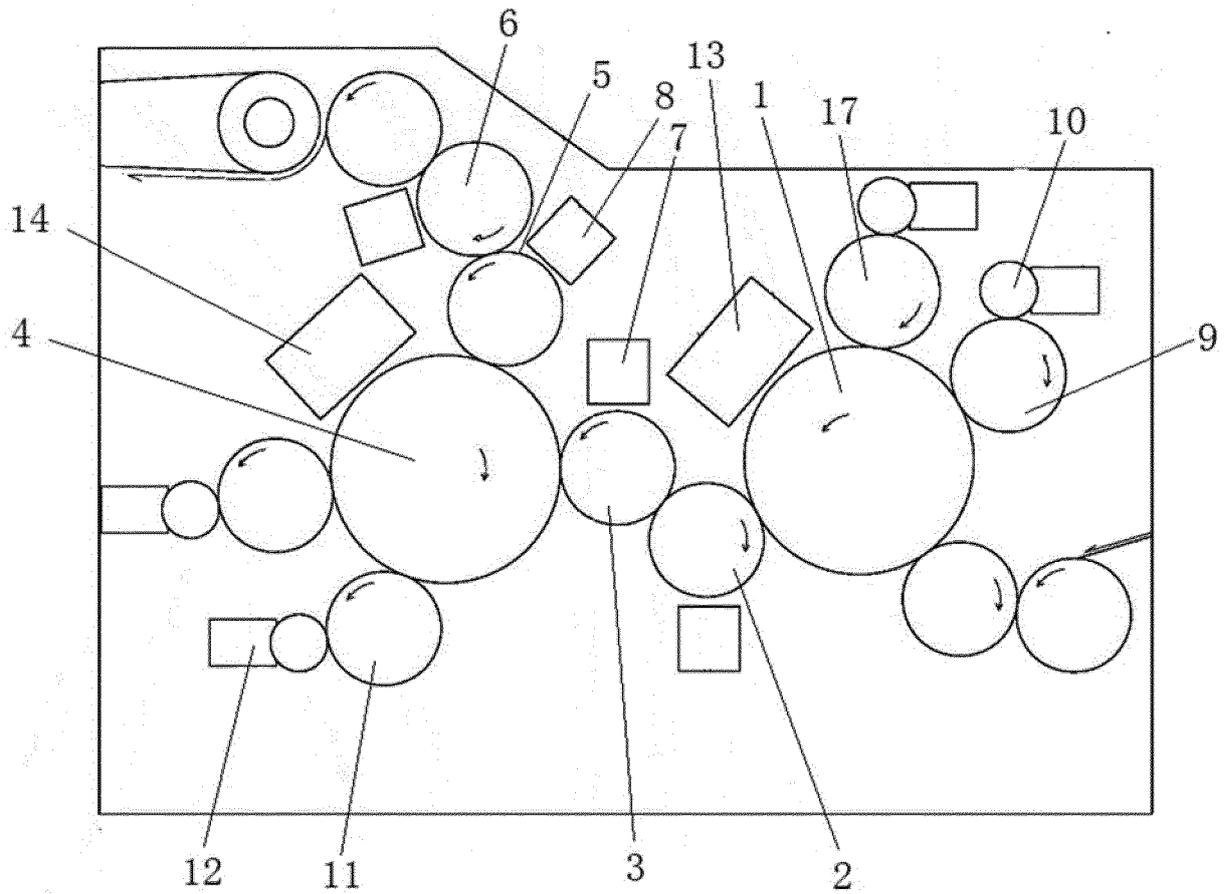


Figure 1

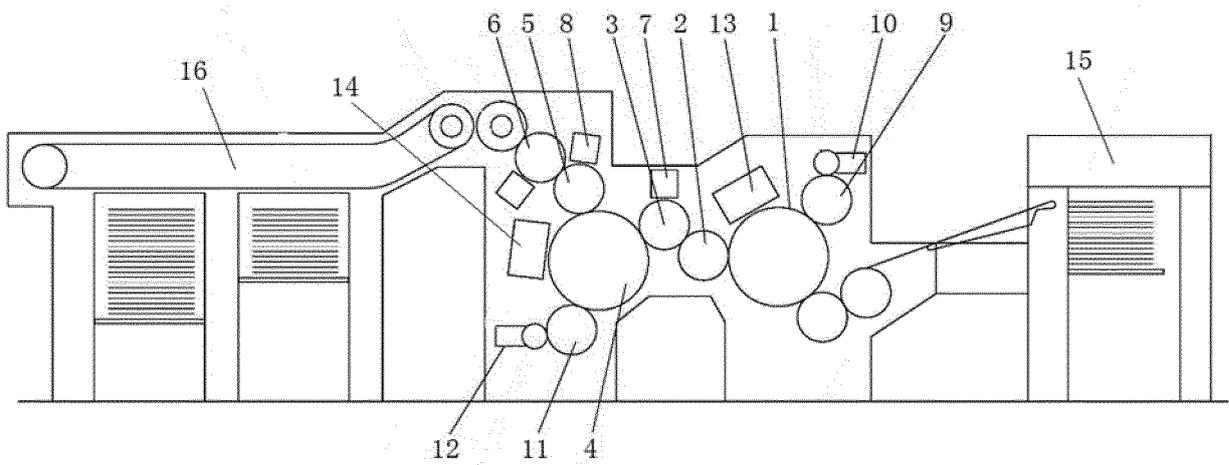


Figure 2

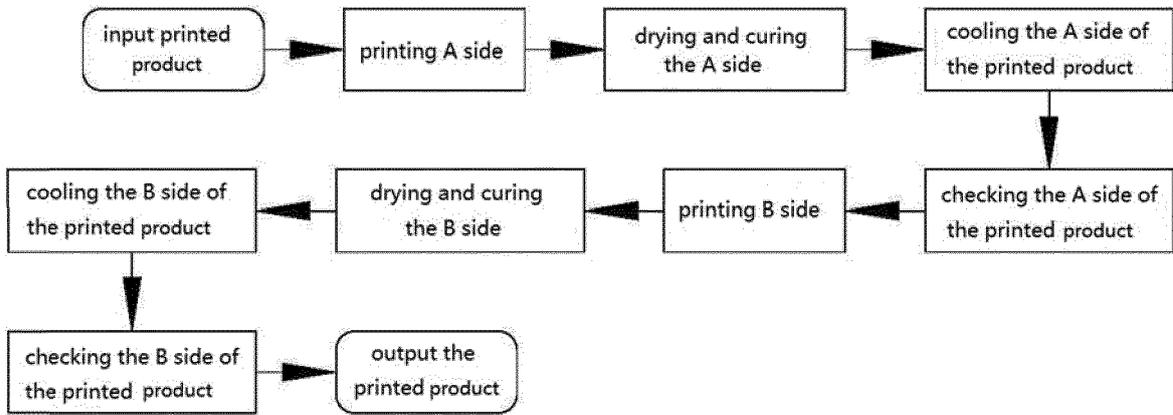


Figure 3

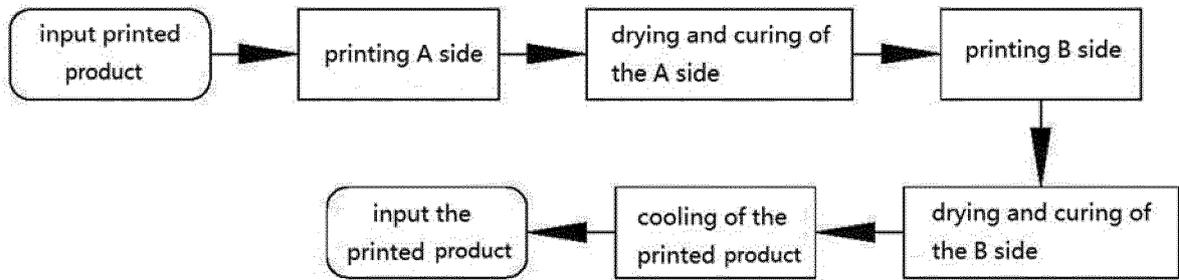


Figure 4

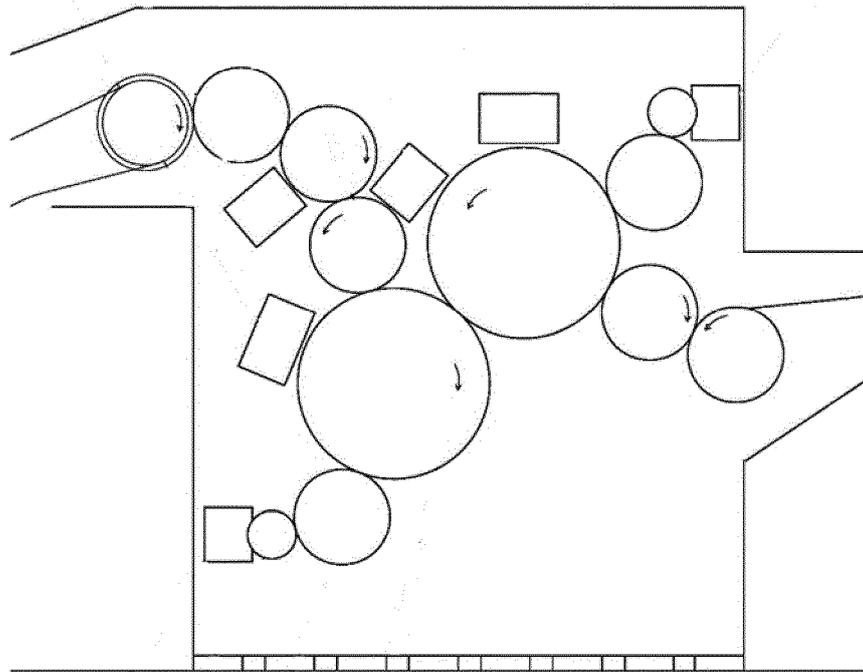


Figure 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2017/073585

A. CLASSIFICATION OF SUBJECT MATTER		
B41F 5/16 (2006.01) i		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
B41F 5/-; B41F 13/22		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
VEN, CNKI, CNABS, DWPI: NANJING MINT, CHINA BANKNOTE PRINTING AND MINTIN, single-cut sheet, flexographic, paper transportation, dual w side, sheet?, transfer+, temperature, heat+, dry, adjust+, quality, detect+, sensor?, control+		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN 1891457 A (KO-PACK INTERNATIONAL CO., LTD.), 10 January 2007 (10.01.2007), description, page 5, line 10 to page 8, line 6, and figures 1-3	1-8
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A	CN 102173184 A (SHANGHAI HUANYE MACHINERY CO., LTD.), 07 September 2011 (07.09.2011), the whole document	1-8
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family	
Date of the actual completion of the international search	Date of mailing of the international search report	
23 March 2017 (23.03.2017)	12 April 2017 (12.04.2017)	
Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer CHENG, Hong Telephone No.: (86-10) 62085065	

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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