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PRINTER WITH LIFTING DEVICE FOR PAPER FEEDER

(57) A printer with a lifting device for a paper feeder comprises a frame (1), a paper feeding unit group (2) and a motor (4) both are arranged in the frame. A paper inlet (8) is arranged on one side of the frame. The paper feeding unit group and a cutter (6) are arranged on the two sides of the paper inlet. A printing module (7) is arranged downstream of the cutter. The paper feeding unit group includes a plurality of paper feeding units (21) arranged in layers. One of the paper feeding units is aligned with the paper inlet via driving the paper feeding unit group by the motor. By the movement of the paper feeding units, paper feeding paths of all the paper feeding units of the printer can be exactly the same. Thereby, each paper feeding unit does not impact each other, and it is convenient for maintenance.

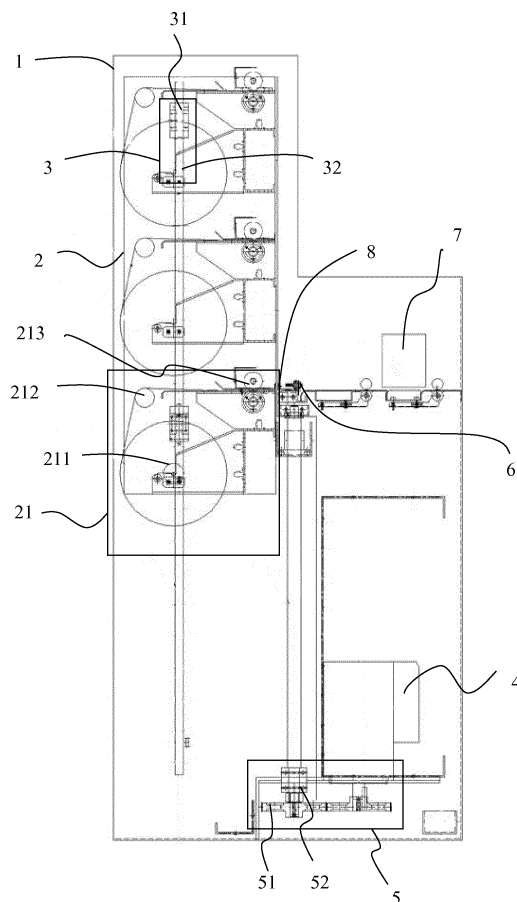


Figure 1

Description

TECHNICAL FIELD

[0001] The present invention relates to the field of printing and drawing and particularly to a printer that is capable of printing and outputting drawings with different sizes.

BACKGROUND

[0002] Among the existent printers used for engineering drawings, there already have designs for multiple paper feeding units that place a plurality of paper rolls with different widths in a printing machine so as to enable one printer to print and output drawings with several different sizes. In this type of printer, paper rolls with different widths are fixed respectively on a plurality of paper feeding units and each of the paper rolls has a fixed position. A plurality of paper rolls such arranged share one paper inlet, which results in different lengths of paper feeding paths for each of the paper rolls and thus causes a rather complicated structure of junction of the paper feeding paths. In designing of the paper feeding paths, a designer not only needs to consider reasonable use of the entire internal space of the printer but also needs to try the best to shorten the distance between each of the paper rolls and the paper inlet. However, regardless of how the paper feeding paths are arranged, there always has such a problem that the more distant from the paper roll to the paper inlet, the more complicated the paper feeding path will be. This complicated paper feeding path will cause deviation of paper and paper jam and it will also impact normal paper feeding of other paper rolls.

SUMMARY OF THE INVENTION

[0003] In view of the above technical problems in the prior art, one aspect of the present invention provides a printer with a lifting device for a paper feeder comprising a frame, a paper feeding unit group and a motor both arranged in the frame. At one side of the frame is arranged with a paper inlet. The paper feeding unit group and a cutter are arranged at opposite sides of the paper inlet, respectively. A printing module is arranged downstream of the cutter. The paper feeding unit group includes a plurality of paper feeding units arranged in different levels. One of the paper feeding units is aligned with the paper inlet via driving of the paper feeding unit group by the motor.

[0004] This type of lifting device for a paper feeder is of simple structure and easy to manufacture. It enables a plurality of paper feeding units to move correspondingly to a target position in the frame of the printer according to the demand to paper, which unifies the paper feeding path for each paper feeding unit and thus dramatically reduces the complexity of the paper transmission path for multiple paper feeding units. It effectively solves the

above problems of existent printers with multiple paper feeding units and its stability and accuracy of paper transmission are both superior to the existent printers with multiple paper feeding units.

[0005] In some embodiments of the present invention, the printer with a lifting device for a paper feeder further comprises a mobile device arranged in the frame. The paper feeding unit group can be driven by the motor to move along the mobile device.

[0006] In some embodiments of the present invention, the mobile device further comprises a guide rail and a slider. The guide rail is vertically arranged at two opposite sides of the frame. The two sides of the paper feeding unit group are fixed with the slider. When driven by the motor, the paper feeding unit group moves along the guide rail via the slider.

[0007] In some embodiments of the present invention, the printer with a lifting device for a paper feeder further comprises a transmission device. The transmission device comprises a belt and a screw stem. The belt can be driven by the motor to rotate. The screw stem is connected to the paper feeding unit. The screw stem converts the rotational motion of the belt into linear motion which drives the paper feeding unit group to move along the guide rail.

[0008] In some embodiments of the present invention, the paper feeding unit comprises a paper roll mounting device, a support roller and a paper feeding roller. The support roller is disposed above the paper roll mounting device. The paper feeding roller and the support roller are arranged horizontally on one side near the paper inlet. There are two of the paper feeding rollers which are arranged opposite to each other in order to enable the paper to pass between the two paper feeding rollers.

[0009] In some embodiments of the present invention, the paper roll mounting devices of the paper feeding units are of different widths.

[0010] In some embodiments of the present invention, each of the different levels has a plurality of the paper feeding units.

[0011] In some embodiments of the present invention, the paper inlet, cutter, and printing module have a width larger than a sum of the length of paper roll mounting device of a plurality of the paper feeding units at each level.

[0012] The above embodiments of the present invention may also have several possible combination forms. The printer with a lifting device for a paper feeder provided thereby is of simple mechanical structure. Through the movement of paper feeding units, it makes transmission paths of all the paper feeding units totally the same. This kind of arrangement makes each paper feeding unit not be affected by others and thus it is easy to maintain and repair. It can avoid the problems of the existent printer with multiple paper feeding units, such as easy deviation and jam of paper, and not easy to take out paper after jam, etc.. This improves greatly the working efficiency of printing and outputting drawings.

DESCRIPTION OF FIGURES

[0013]

Figure 1 is a sectional side view of a printer with a lifting device for a paper feeder according to one embodiment of the present invention.

Figure 2 is a front view showing a paper feeding unit and a mobile device according to one embodiment of the present invention.

Figure 3 is a top view of a guide rail and a slider according to one embodiment of the present invention, in which collaboration between the guide rail and the slider after they are installed together is shown.

DETAILED DESCRIPTION OF EMBODIMENTS

[0014] As shown in Figure 1, in an embodiment of the present invention, a printer with a lifting device for a paper feeder comprises: a frame 1, a paper feeding unit group 2, a mobile guide device 3, a motor 4, a transmission device 5, a cutter 6 and a printing module 7. The paper feeding unit group 2, the mobile guide device 3, the motor 4 and the transmission device 5 are arranged in the frame 1. The transmission device 5 transmits power from the motor 4 to the paper feeding unit group 2 so as to make the paper feeding unit group 2 movable along the mobile guide device 3. On one side of the frame, a paper inlet 8 is provided with the paper feeding unit group 2 and the cutter 6 being arranged on opposite side of the paper inlet 8, respectively. The printing module 7 is arranged downstream of the cutter 6. The paper feeding unit group 2 comprises a plurality of paper feeding units 21 arranged in different levels. One of the paper feeding units 21 can be aligned with the paper inlet 8 through driving of the motor 4 to the paper feeding unit group 2. The printing module 7 is the same as conventional printing module in the existent printers and hence details thereof will be omitted in the context.

[0015] The transmission device 5 comprises a belt 51 and a screw stem 52. The belt 51 transmits motive force of the motor 4 to the screw stem 52. The screw stem 52 is designed for converting rotary motion into linear motion. The screw stem 52 is in a threaded-fit with the paper feeding unit group 2 for pushing the paper feeding unit group 2 upwards or downwards. Alternatively, other ways may also be used to convert rotary motion into linear motion.

[0016] As shown in Figure 3, the mobile guide device 3 comprises a guide rail 31 and a slider 32. The paper feeding unit group 2 is fixedly connected with the slider 32. Through the slider 32, the paper feeding unit group 2 can move along the guide rail 31.

[0017] One exemplary collaboration way between the guide rail 31 and the slider 32 is illustrated with reference

to Figure 3. As shown, the slider 32 has a recess part 321. At the opening of the recess part 321, protrusions 322 are formed by inward extension of the inner wall of the slider 32 which makes the opening of the recess part 321 has a width less than the width of the remaining portion of the recess part 321. A part of the guide rail 31 is inserted into the recess part 321 of the slider 32. The part of the guide rail 31 inserted into the recess part 321 has a shape matched with the inner cavity of the recess part 321. The guide rail 31 is also provided with a positioning groove 311 to collaborate with the protrusions 322 of the slider 32. This arrangement enables the slider 32 to only move along the guide rail 31 up and down without swing or shake.

[0018] There are two guide rails 31 in the present embodiment. The two guide rails 31 are respectively mounted vertically on the frame 1 at each side of the paper inlet 8. Such arrangement further limits the paper feeding unit group 2 to only make vertical movement up and down without movement to left and right or back and forth so that the paper feeding unit group 1 can be positioned more accurately.

[0019] As shown by Figures 1 and 2, the paper feeding unit group 2 comprises a plurality of paper feeding units 21. These paper feeding units 21 are arranged from up to down in several levels. In each of the levels, two or more paper feeding units 21 arranged horizontally can be provided. For example, the paper feeding units 21 may be arranged in three levels in which: the first level has one paper feeding unit 21 with a width that is two-thirds of the width of the paper inlet 8; the second level has two paper feeding units 21 with their sum of width being smaller than the width of the paper inlet 8; and the third level has one paper feeding unit 21 with a width that is slightly smaller than the width of the paper inlet 8. Thus, the total number of the paper feeding units 21 is four in this example. Further in this case, because the sum of width of the two paper feeding units 21 at the second level is still smaller than the width of the paper inlet 8 and thus of the cutter 6 and printing module 7, these two paper feeding units 21 can transport paper from their respective position towards the paper inlet 8.

[0020] Each paper feeding unit 21 includes a paper roll mounting device 211, a support roller 212 and two paper feeding rollers 213. The support roller 212 is arranged above the paper roll mounting device 211, functioning as a support point as well as a transition member for changing the paper's movement direction to horizontal direction. The two paper feeding rollers 213 and the support roller 212 are arranged horizontally on one side near the paper inlet 8. The two paper feeding rollers 213 are arranged opposite to each other which enables the paper to pass between the two rollers 213. Because such arrangement of the paper roll mounting device 211, support roller 212 and two paper feeding rollers 213 as well as the collaboration relationship therebetween are the same as a conventional paper feeding unit, detailed description are omitted.

[0021] The paper roll mounting device 211 can be of different sizes for supporting paper rolls with different widths. When in use, paper rolls are firstly mounted on the paper roll mounting device 211. Then, head of the paper roll is pulled out to lap over the support roller 212 and pass between the two feeding rollers 213. With rotation of the support roller 212 and two feeding rollers 213, the paper roll will be continuously pulled out smoothly and be delivered to the paper inlet 8.

[0022] It should be noted that, for each of the paper feeding unit 21, angles and distances among the paper roll mounting device 211, support roller 212 and two feeding rollers 213 are the same. In other words, the positional relationships of these three parts are the same. The printing module 8 is arranged axially along the paper feeding unit 21. Width of the printing module 8 is larger than sum of width of the paper roll mounting devices 211 of the paper feeding unit 21 at any of the levels.

[0023] In operation, descending or ascending of the paper feeding unit group 2 will trigger a "0" point of a positioning grating sensor. Parameters of the distance between each of the paper roll mounting devices 211 and the "0" point are pre-stored in a controller (not shown). This controller may adopt conventional control devices such as a PLC controller, etc. When a paper roll with a width corresponding to the size of an image to be printed is selected, the motor 4, according to a paper style signal given by the controller, drives the paper feeding unit group 2 to move on the guide rail 31 through the screw stem 52. When the paper feeding unit group 2, according to the paper style signal, automatically makes selection to cause the paper feeding unit 21 that fixes a paper roll with corresponding width align with the paper inlet 8, the motor stops rotation. At this time, the screw stem 52 continuously maintains the paper feeding unit group to keep it stopped at the position. Then, under a starting signal from the controller, the supporting rollers 212 and the feeding roller 213 begin to rotate for pulling out continuously the paper roll mounted on the paper feeding unit 21 that is aligned with the paper inlet 8 and to make the paper enter into the paper inlet 8 smoothly. The paper entering into the paper inlet 8 continues to move toward the printing module 7. The printing module 7 starts printing the image on the paper. When printing of the image is completed, the cutter 7 receives a paper length signal issued by the system of the printer and cuts the paper to a desired length.

[0024] Figure 1 shows a situation in which the paper feeding unit 21 at the lowermost level is aligned with the paper inlet 8. If it needs to use the paper of other paper feeding unit above it, then the screw stem 52 is driven according to the afore-mentioned way to drive the whole paper feeding unit group 2 to move downwards until the paper feeding unit with desired paper is aligned with the paper inlet 8.

[0025] In the printer provided in the present invention, widths of paper rolls of different paper feeding units are different (the paper roll mounting devices are of different

widths). When the paper roll of one of the paper feeding units 21 is selected for printing, it will be moved to a position aligned with the paper inlet 8. Each paper roll will then arrive at the paper inlet 8 smoothly through the support roller 212 and the feeding roller 213. Therefore, the paper feeding path for all the paper rolls is totally the same, which avoids the defect of complicated paper feeding path caused by the necessity to install a plurality of support rollers 212 for the paper feeding unit 21 far away from the paper inlet 8 due to the different positions of the paper feeding units. In addition, by such structural feature, there is no junction between the paper feeding paths of the different paper rolls so that they will not affect each other when the paper is fed. Even there occurs the problem of paper jam in one paper feeding unit 21, the maintenance personnel may quickly find out the problem and remove the fault.

[0026] The person skilled in the art would understand, if the direction of the transmitting motive force of the transmission device 5 is changed and the guide rail 31 is arranged horizontally, this will make the paper feeding unit group 2 move horizontally along the guide rail 31. This alternative embodiment can also achieving selection among a plurality of paper rolls with different widths through the control system and then moving the selected one to the paper inlet 8 followed by printing and cutting. Further, a horizontal movement and a vertical movement of the paper feeding unit group 2 can be combined so as to select, among more paper rolls, a paper roll with desired width corresponding to the printing requirement.

[0027] The above makes detailed description of various embodiments of the present invention. The person skilled in the art may understand that various modifications, changes and variations may be made to the embodiment under the circumstance that it does not deviates from the scope of the present invention (as defined by the attached Claims). The interpretation of the claims should be interpreted as a whole and be the widest scope consistent with the Description, not limited to the exemplary embodiments or embodiments described in detail in the Description.

Claims

1. A printer with a lifting device for a paper feeder comprising a frame, a paper feeding unit group and a motor both arranged in the frame, wherein a paper inlet is arranged at one side of the frame with the paper feeding unit group and a cutter being arranged at opposite sides of the paper inlet respectively, wherein a printing module is arranged downstream of the cutter, wherein the paper feeding unit group comprises a plurality of paper feeding units arranged in different levels; and wherein the paper feeding unit group can make one of the paper feeding units aligned with the paper inlet by driven of the motor.

2. The printer with a lifting device for a paper feeder according to claim 1, wherein it further comprises a mobile guide device arranged in the frame and wherein the paper feeding unit group can be driven by the motor to move along the mobile guide device. 5
3. The printer with a lifting device for a paper feeder according to claim 2, wherein the mobile guide device comprises a guide rail and a slider, wherein the guide rail is vertically arranged at two opposite sides of the frame, wherein the two sides of the paper feeding unit group is fixed with the slider; and wherein the paper feeding unit group, driven by the motor, moves along the guide rail via the slider without swing. 10
4. The printer with a lifting device for a paper feeder according to claim 3, wherein the slider has a recess part and at an opening of the recess part, protrusions are formed by inward extension of the inner wall of the slider which makes the opening of the recess part has a width less than the width of the remaining portion of the recess part, wherein a portion of the guide rail is matched with shape of a cavity of the recess part; and wherein the guide rail also has a positioning groove to be adapted to the protrusions of the slider, which makes the slider only move along the guide rail without swing. 20
5. The printer with a lifting device for a paper feeder according to claim 3, wherein it further comprises a transmission device, wherein the transmission device comprises a belt and a screw stem that can be rotated by driven of the belt; wherein the belt is driven by the motor; and wherein the paper feeding unit is driven through the screw stem to move along the guide rail. 25
6. The printer with a lifting device for a paper feeder according to claim 5, wherein the paper feeding unit comprises a paper roll mounting device, a support roller and a paper feeding roller, wherein the support roller is disposed above the paper roll mounting device; and wherein the paper feeding roller and the support roller are horizontally arranged on one side near the paper inlet and the paper can pass between the two feeding rollers. 30
7. The printer with a lifting device for a paper feeder according to claim 6, wherein the paper roll mounting devices of the paper feeding units are of different widths. 35
8. The printer with a lifting device for a paper feeder according to claim 7, wherein a plurality of the paper feeding units are arranged in a same level. 40
9. The printer with a lifting device for a paper feeder according to claim 8, wherein width of the paper inlet, cutter and printing module are larger than a sum of length of the paper roll mounting devices of a plurality of the paper feeding units in each level. 45
10. The printer with a lifting device for a paper feeder according to claim 8, wherein angles and distances among the paper roll mounting device, the support roller and the paper feeding roller of each of the paper feeding units are the same. 50
11. A paper roll lifting system for digital printing, wherein it comprises a plurality of paper rolls of different widths being installed in different paper feeding units; a motor driving a lifting device for paper roll so that selected paper roll enters into operative position of paper feeding; and a motor for paper feeding which drives a pickup roller to input paper to a paper inlet of printing. 55
12. A paper roll lifting system for digital printing according to claim 11, wherein the plurality of paper feeding units are arranged in parallel; wherein a computer controls to send paper roll with different widths to the paper inlet of printing according to demands of printing; and wherein there are several paper rolls and the specific amount is to be determined based on design of machine; wherein the amount of paper inlet for printing is one.

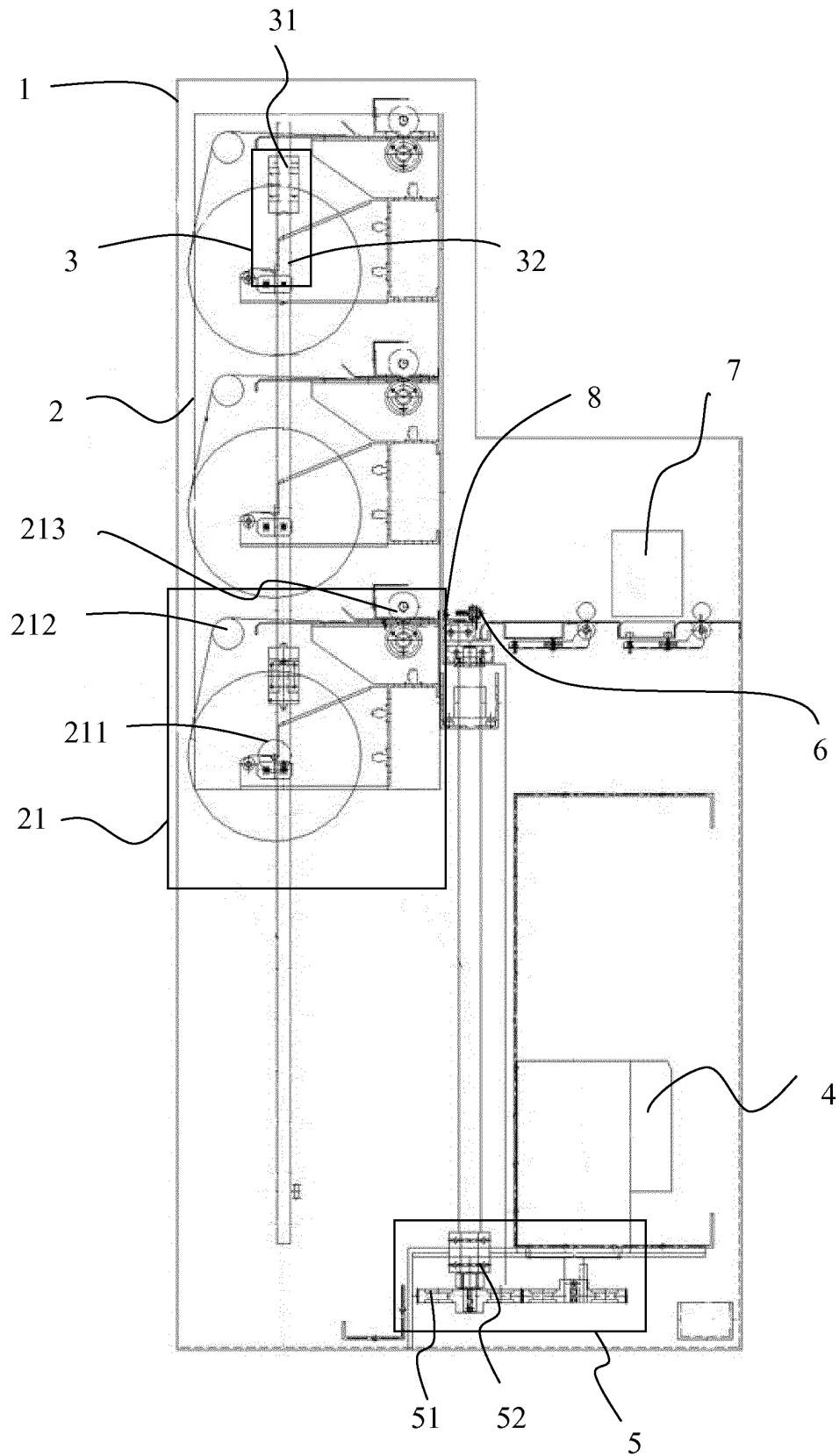


Figure 1

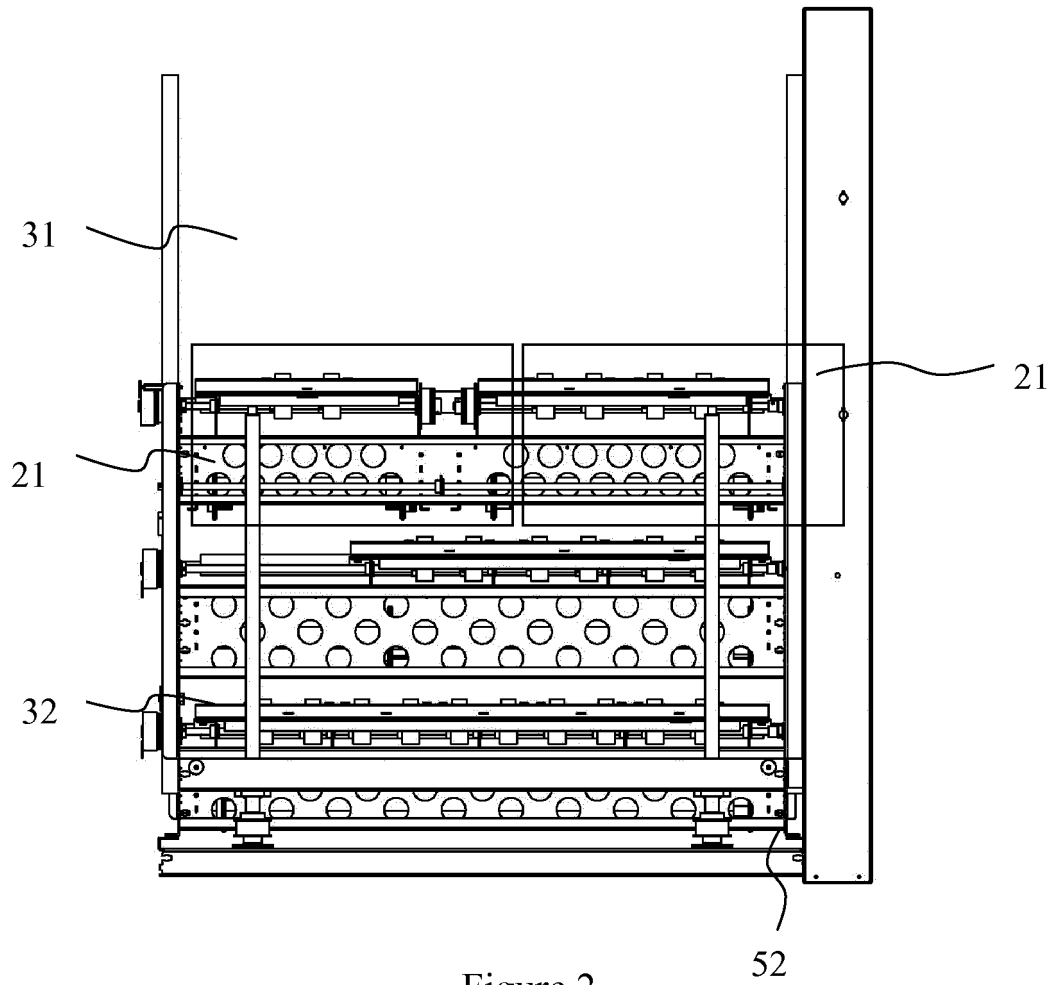


Figure 2

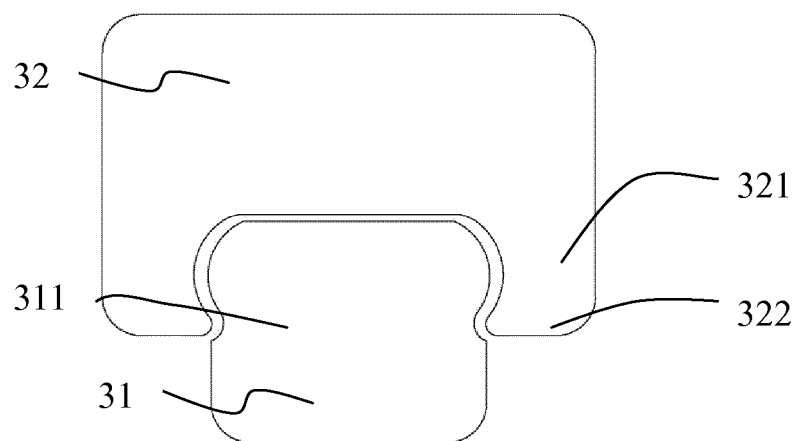


Figure 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2014/082402

A. CLASSIFICATION OF SUBJECT MATTER

B41J 15/18 (2006.01) i; B41J 15/00 (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)

B41J 15/18, B41J 15/00, B41J 11/00

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)
WPI, EPODOC, CNPAT, CNKI: supply+, feed+, paper, sheet, web, roll+, print+, lift+, guid+, motor, driv+, 2c060/ba08/ft, 400/607/uc, 400/609/uc, 400/620/uc; CHINA ARCHITECTURE DESIGN & RESEARCH GROUP; ZHANG, Laijian; paper feeding, elevator, guide rail, rail, roll paper, continuous paper

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5428371 A (EASTMAN KODAK CO.), 27 June 1995 (27.06.1995), description, column 9, line 8 to column 10, line 50, and figures 1-4	1-12
A	US 2005146587 A1 (FUJI PHOTO FILM CO., LTD.), 07 July 2005 (07.07.2005), description, paragraphs [0043]-[0069], and figures 1-7	1-12
A	JP H01247360 A (TODO, M.), 03 October 1989 (03.10.1989), description, page 2, lower left column to page 4, lower left column, and figures 1-2	1-12
A	CN 101683928 A (RICOH CO., LTD.), 31 March 2010 (31.03.2010), the whole document	1-12
A	CN 102189839 A (SEIKO EPSON CORPORATION), 21 September 2011 (21.09.2011), the whole document	1-12
A	US 5149217 A (SEIKO EPSON CORP.), 22 September 1992 (22.09.1992), the whole document	1-12

☐ Further documents are listed in the continuation of Box C. ☒ 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
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"O" document referring to an oral disclosure, use, exhibition or other means	
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2014/082402

5	Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
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			EP 0529562 A2	03 March 1993
10	US 2005146587 A1	07 July 2005	JP 2005194053 A	21 July 2005
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