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(71) Applicant: **GOSS GRAPHIC SYSTEMS LIMITED**
Preston, Lancashire PR1 7LA (GB)

(72) Inventors:
• **Lamb, Arthur**
Lancaster, Lancashire LA1 4LG (GB)

• **Hollings, Tony**
Whalley, Lancashire BB7 9RJ (GB)
• **McCrone, John**
Preston, Lancashire PR2 1ER (GB)

(74) Representative: **Grey, Ian Michael**
Venner Shipley LLP
20 Little Britain
London EC1A 7DH (GB)

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(54) **Printing press**

(57) A folder for a web-offset printing press is disclosed. It comprises an upper folder module including at least one former to impart a first longitudinal fold to a continuous web of printed matter passing over the or each former, a lower folder module to receive the folded web from the upper folder module and comprising means to cut the web into longitudinal sections and impart a

second fold to each section substantially at right angles to the first longitudinal fold and, a delivery module comprising means to receive the folded sections from the lower folder module and deliver them for transportation out of the folder. The delivery module is discrete and separable from the lower folder module.

EP 1 767 363 A2

Description

[0001] The present invention relates to a folder for a web-offset press.

[0002] A web-offset rotary printing press comprises a number of printing units designed to print matter onto separate continuous webs of a print medium, such as paper, travelling through each print unit. Each unit contains at least one pair of cylinder groups or print couples comprising a rotatably mounted plate cylinder, to which one or more printing plates are attached, and a rotatably mounted blanket cylinder. Many presses of this type incorporate a shaftless drive system in which each cylinder group is driven by its own drive motor which directly drives one of the cylinders of the group via a belt or gear drive. The cylinders within each cylinder group are typically coupled mechanically so that drive is transferred from the directly driven cylinder to the other cylinder of that group. An inking system associated with each print couple and comprising a train of ink rollers is operable to feed ink onto the printing plates as the plate cylinder rotates. As the cylindrical surfaces of the plate and blanket cylinder are in rolling contact, an inked image is transferred onto the blanket cylinder from the plate cylinder and, from the blanket cylinder, to the print medium generally comprising a web of paper passing between the blanket cylinder and an impression cylinder. To enable the paper web to be printed on both sides, the impression cylinder is actually the blanket cylinder of another print couple including a plate cylinder having printing plates to which ink is transferred from another inking system roller train. Therefore, it will be appreciated that a print couple is arranged on opposite sides of the paper web which runs between them.

[0003] Each printing unit comprises a frame to which each print couple and its respective inking system are mounted. The printing unit may also comprise a dampening system associated with each inking unit also mounted to the frame. The printing units are spaced from each other and aligned with a folder unit so that the paper web is fed through each print unit from a separate reelstand mounted below or to one side of each printing unit at floor level and then travels in a lateral direction away from the unit and into the folder. A slitting mechanism for cutting the web into separate ribbons and turner bars for turning one or more of the ribbons to orientate them before they enter the folder are located between the print unit and the folder.

[0004] In large scale high volume presses used, for example, in the printing of newspapers, multi-colour printing is achieved by providing each printing unit with a number of printing couple pairs mounted vertically one above the other in a stack so that the paper web travels in a vertically upward direction between each pair of print couples from the reelstand. A unit having four printing couple pairs, i.e. eight print couples, is able to print up to four colours on each side of the paper web and is often known as a "four-high" unit. A unit having a different

number of print couple pairs is also possible depending on the application to which the press is to be put and the quality and number of colours to be printed. For example, a "five-high" unit having five print couple pairs is also known. When a printed web emerges from the upper end of each print unit it is passed over a roller having an axis of rotation at right angles to the direction of travel of the web. As the web passes over the roller its upward direction of travel is changed so that it now travels in a lateral direction along the press and towards the folder. Depending on the configuration of the press, the webs are slit and turned by passing them over turner bars angled at 45 degrees to the direction of travel of the web before they enter the folder.

[0005] In conventional presses, each printing unit has a plate and a blanket cylinder with a fixed diameter. It will be appreciated that the diameter of these cylinders dictates the printed image cut-off which is the maximum length of the image that can be printed by the printing unit. In a one-around press or a press in which the image to be applied to one page is transferred to the blanket cylinder in one revolution of the plate cylinder, the maximum length of the printed page cannot exceed the circumference or slightly less than the circumference of the plate and blanket cylinders or, in a two-around press, where the image to be applied to two pages is transferred to the blanket cylinder in one revolution of the plate cylinder, the maximum height of the printed page cannot exceed half the circumference of the cylinders.

[0006] It is a very difficult and time consuming task to alter the cut-off because it is fundamental to the size and geometry of the printing and folding machines and essentially involves changing the plate and blanket cylinders for cylinders of a different diameter as well as replacing or altering the position of many of the other components of the printing unit or press, including the cylinders of the folder which cut the webs into each copy and must change size to vary the cut-off, i.e. the length of the copy that the webs are cut into. This generally necessitates a complete strip-down and reassembly of the or each printing unit and the folder. Not only is this a very expensive operation to perform but it is particularly undesirable because it involves a considerable amount of time during which the press remains inoperable. Consequently, this has a significant negative affect on the overall productivity of the press. In fact, many press operators simply cannot afford to shut down the press for such lengthy periods of time due to increased demand for printed matter and the very tight deadlines which must be met. Therefore, the printed image cut-off achievable with a particular printing press is generally regarded as being fixed so the size of the newspaper that can be printed using that press is limited. The inability to change the cut-off of a conventional press, or the inability to do so rapidly and easily, has severely limited the desired flexibility that this type of press would otherwise be able to offer. Press manufacturers therefore have to offer different presses, including printing units and folders, in a range of specific

cut-off sizes to meet customer demand.

[0007] In addition to the problems described above, a conventional printing press also suffers from a number of other disadvantages that reduces its operational time and hinders its flexibility. Very short deadlines and high demand often means that the press must be run continually over long periods of time. However, delays occur due to the time it takes for the press to be made ready for a new print job when the previous print job has been completed. For example, to plate-up the press, individual printing plates on each printing cylinder of each printing couple must be replaced. This is a time consuming task especially as access to the plate cylinders may be limited by other components such as the inking and/or dampening mechanism which get in the way. It will also be appreciated that in a four high printing unit, the printing plates may need to be replaced on eight plate cylinders before initiating a new print run with that printing unit. In addition, the press may comprise several printing units all of which require plating-up before initiating a new print run using all the printing units. Experience has shown that it can take at least 45 minutes for one person to replace the printing plates on a single four-high printing unit.

[0008] It will also be appreciated that individual printing units or specific couples within each unit require regular attention for the purposes of maintenance and/or repair. However, the inaccessibility of certain components means that the printing unit often has to be stripped down to gain access to the failed component or for cleaning and this significantly increases the down time of the press.

[0009] The aforementioned problems are exacerbated by the structural height of each printing unit making access to the higher print couples and their associated components for plating-up and maintenance even more complicated in addition to requiring larger and more expensive buildings to contain them. Furthermore, as the print couple pairs are stacked one above the other, the paper web to be printed must travel over a comparatively long distance between points at which different coloured ink are printed onto the web. This can lead to problems in maintaining registration of the printed image and increases waste when the press is stopped, during plate changes and when the press is restarted. It will also be noted that a printing unit of greater height has a corresponding increase in weight and structural instability requiring the foundations of the press to be more heavily reinforced. Although problems caused by the height of the press and the distance between points at which the different coloured inks are printed onto the web can be alleviated by the use of a satellite press in which a number of cylinder groups are arranged around a central impression cylinder, this type of press is mechanically very complicated and requires regular maintenance.

[0010] It is an object of the present invention to overcome or substantially alleviate the problems with a conventional folder for a web-offset printing press.

[0011] It is known from EP 1149694A to provide a folder for a web-offset printing press comprising an upper folder module including at least one former to impart a first longitudinal fold to a continuous web of printed matter passing over the or each former, a lower folder module to receive the folded web from the upper folder module and comprising means to cut the web into longitudinal sections and impart a second fold to each section substantially at right angles to the first longitudinal fold and, a delivery module comprising means to receive the folded sections from the lower folder module and deliver them for transportation out of the folder.

[0012] A folder for a web-offset printing press is characterised in that the delivery module is discrete and separable from the lower folder module.

[0013] Embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 illustrates a simplified side elevational view of a folder according to an aspect of the invention; and

Figure 2 illustrates a simplified plan view of the lower folder module, the delivery module and a replacement lower folder module.

[0014] As already mentioned above, the folder must also be modified each time a primary module is changed for another primary module having cylinders operable to print with a different image cut-off. As can be seen from Figure 1, a folder according to an embodiment of the invention generally comprises three sections namely, an upper folder module 50, a lower folder module 51 and a delivery module 52. The upper folder module 50 comprises at least one former 53 (two are shown in Figure 1) which imparts a first longitudinal fold to the ribbons 54 as they travel over it and a plurality of nipping rollers 55. There are generally two different types of lower folder and these are usually referred to as a jaw folder and a rotary folder, respectively. A jaw folder, as shown in Figure 1, comprises a collect cylinder 56 to collect the ribbons 54 as they leave the or each former 53, a cutting cylinder 58 which cuts the ribbons 54 into longitudinal sections defined by the height of the page and a jaw cylinder 57 which imparts a second fold to the cut sections substantially at right-angles to the fold imparted to the ribbons 54 by the or each former 53. A rotary folder (not shown) comprises a folding cylinder and second fold rollers together with a cutting cylinder to perform the same function.

[0015] The cut sections or newspapers pass from the folder module 51 into the delivery module 52 comprising a rotatably mounted paddle wheel 59 which delivers the newspapers to a conveyor 59a with an appropriate copy spacing for stacking and bundling by post-press machinery. The delivery module 52 also includes a stripper (not shown) situated between the paddle wheel 59 and the conveyor 59a which runs slower than the paddle wheel

but at the same speed as the conveyor 59a. The stripper pushes copies out of the paddle wheel 59 and onto the conveyor 59a.

[0016] The cylinders 56,57,58 of the lower folder module 51 are all cut-off dependent which means that when the cut-off is changed, each of the cylinders 56,57,58 must be replaced with cylinders having a different diameter corresponding to the new cut-off. Therefore, if the primary modules 7 of the printing units are replaced to alter cut-off, the cylinders 56,57,58 of the lower folder module 51 must also be replaced.

[0017] To facilitate replacement of the cylinders 56,57,58 and to facilitate a change in copy spacing of copies delivered by the delivery module, the delivery module 52 is discrete and separable from the lower folder module 51. The delivery module includes the paddle wheel 59 and, preferably, includes the stripper and the conveyor. However, it may just comprise the paddle wheel 59. Furthermore, the lower folder module is preferably separable from the upper folder module so that the whole lower folder module can be separated from the upper folder module and the delivery module and replaced as a whole with another lower folder module having cylinders with a diameter corresponding to the required cut-off.

[0018] Therefore, the lower folder module 51 together with its cylinders 56,57,58 forms an entirely separate part which may be removed from the folder as a whole and replaced with another folder module 60 (see Figure 2) stored in an off-line location and which may be assembled together with cylinders 56,57 having a diameter corresponding to the required new cut-off size. The lower folder module 51 and the delivery module 52 may be mounted on slideways to enable them to be moved between operative positions in the folder and non-operative off-line positions. In the plan view of Figure 2, the lower folder module 51 is shown in its operative position in which it is connected to the upper folder module 50 (not shown in Figure 2) and to the delivery module 52. The lower folder module 51 can be separated from the folder and moved in the direction indicated by arrow Y to an off-line storage position shown in dashed lines and can be replaced with another lower folder module 51a by moving it in the direction indicated by arrow Z.

[0019] The same delivery module 52 can be used with any lower folder module 51 irrespective of its cut-off size and even with folding modules that use different folding actions. It is also much easier to alter the relative position of the lower folder module 51 and the delivery module 52 to optimise the transfer of copies from the lower folder module 51 to the delivery module 52. The lower folder module 51 and the delivery module 52 each have their own side frames 65,66 to which the components of the respective module 51,52 are mounted. Preferably, the side frames 66 of the delivery module 52 are spaced closer together than the side frames 65 of the lower folder module 51 so that the delivery module 52 can be slid partially inside the lower folder module 51 in its operative

position. The delivery module 52 can also be easily slid out of engagement with, or retracted away from, the lower folder module 51 to facilitate access to the lower folder module 51 and the delivery module 52 for maintenance and repair or replacement of one or both of them.

[0020] It will be appreciated that the paddle wheel 59 and stripper of the delivery module 52 delivers copies to the conveyor 59a with a predetermined fixed copy spacing for stacking and bundling by post press machinery. However, various customers often require copies to be delivered with different copy spacing. To change the copy spacing of a conventional folder, the paddle wheel 59 and stripper must be substituted for another of a different configuration. However, in the present invention, instead of having to disassemble the delivery module 52 to replace the paddle wheel 59 and stripper, the whole delivery module 52 can be quickly and easily replaced with another module 52 having a paddle wheel capable of delivering copies with the required copy spacing.

[0021] It is common practice to install a back-up lower folder next to a primary lower folder so that in the event of a failure of one unit, production can be switched to the other. If the folder is provided with a separable delivery module 52, only one delivery module 52 is required and can be used with either of two lower folder modules 51. Alternatively, if there are two delivery modules 52, each delivery module 52 can be used with either lower folder module 51.

[0022] It will be appreciated that some of the aforementioned advantages such as access to the lower folder unit and substitution of the delivery module 52 can be achieved without the need for a separable lower folder module 51. Therefore, the upper and lower folder modules 50,51 may be integral in which case only the delivery module is separable from the rest of the folder. In either arrangement, it is proposed that the delivery module 52 incorporates its own motor for driving the paddle wheel 59 and, preferably, the stripper and the conveyor.

[0023] Many modifications and variations of the invention falling within the terms of the following claims will be apparent to those skilled in the art and the foregoing description should be regarded as a description of the preferred embodiments only.

Claims

1. A folder for a web-offset printing press comprising an upper folder module including at least one former to impart a first longitudinal fold to a continuous web of printed matter passing over the or each former, a lower folder module to receive the folded web from the upper folder module and comprising means to cut the web into longitudinal sections and impart a second fold to each section substantially at right angles to the first longitudinal fold and, a delivery module comprising means to receive the folded sections from the lower folder module and deliver them for

transportation out of the folder, **characterised in that** the delivery module is discrete and separable from the lower folder module.

2. A folder according to claim 1 wherein the lower folder module is discrete and separable from the upper folder module. 5
3. A folder according to claim 2 wherein the lower folder module comprises a frame to which said means are mounted, the frame including cooperating means to releasably attach it to the upper folder module in an operative position. 10
4. A folder according to claims 2 or 3 wherein the lower folder module is a jaw folder and comprises a collect cylinder, a jaw cylinder and a cutting cylinder. 15
5. A folder according to claims 2 or 3 wherein the lower folder module is a rotary folder module and comprises a folding cylinder, second fold rollers and a cutting cylinder. 20
6. A folder according to claim 5 wherein the diameter of the respective cylinders of each lower folder module are different. 25
7. A folder according to any of claims 2 to 6 wherein the frame includes means to enable the lower folder module to be moved from its operative position to an off-line storage position. 30
8. A folder according to claim 7 wherein said means for moving the lower folder module includes means to enable a different lower folder module to be located in said operative position in place of the lower folder module. 35
9. A folder according to claim 7 or 8 wherein the folder includes at least two lower folder modules, each module movable between the operative position in the folder and an off-line storage position. 40
10. A folder according to any of claims 2 to 9 wherein the delivery module comprises a frame and cooperating means to releasably attach the frame to the lower folder module in an operative position. 45
11. A folder according to any of claims 2 to 10 wherein the means in the delivery module to receive the folded sections from the lower folder and deliver them for transportation out of the folder comprises a rotatably mounted paddle wheel. 50
12. A folder according to claim 11 wherein the delivery unit further comprises a stripper and a delivery conveyor to receive folded sections from the paddle wheel and transport them from the folder. 55
13. A folder according to claim 11 or 12 wherein the paddle wheel is rotatably driven by its own motor.
14. A folder according to claim 13 wherein the motor is mounted to the delivery module.
15. A method of reconfiguring a folder for a web-offset printing press comprising an upper folder module including at least one former to impart a first longitudinal fold to a continuous web of printed matter passing over the or each former, a discrete lower folder module separable from the upper folder module to receive the folded web from the upper folder module and comprising means to cut the web into longitudinal sections and impart a second fold to each section substantially at right angles to the first longitudinal fold and, a delivery module comprising means to receive the folded sections from the lower folder module and deliver them for transportation out of the folder, wherein method includes the step of separating the lower folder module from the upper folder module and replacing the lower folder module with another lower folder module, the method being **characterised by** the step of separating the delivery module from the lower folder module and re-attaching the delivery module to said other lower folder module.
16. A printing press including a folder according to any of claims 1 to 14.

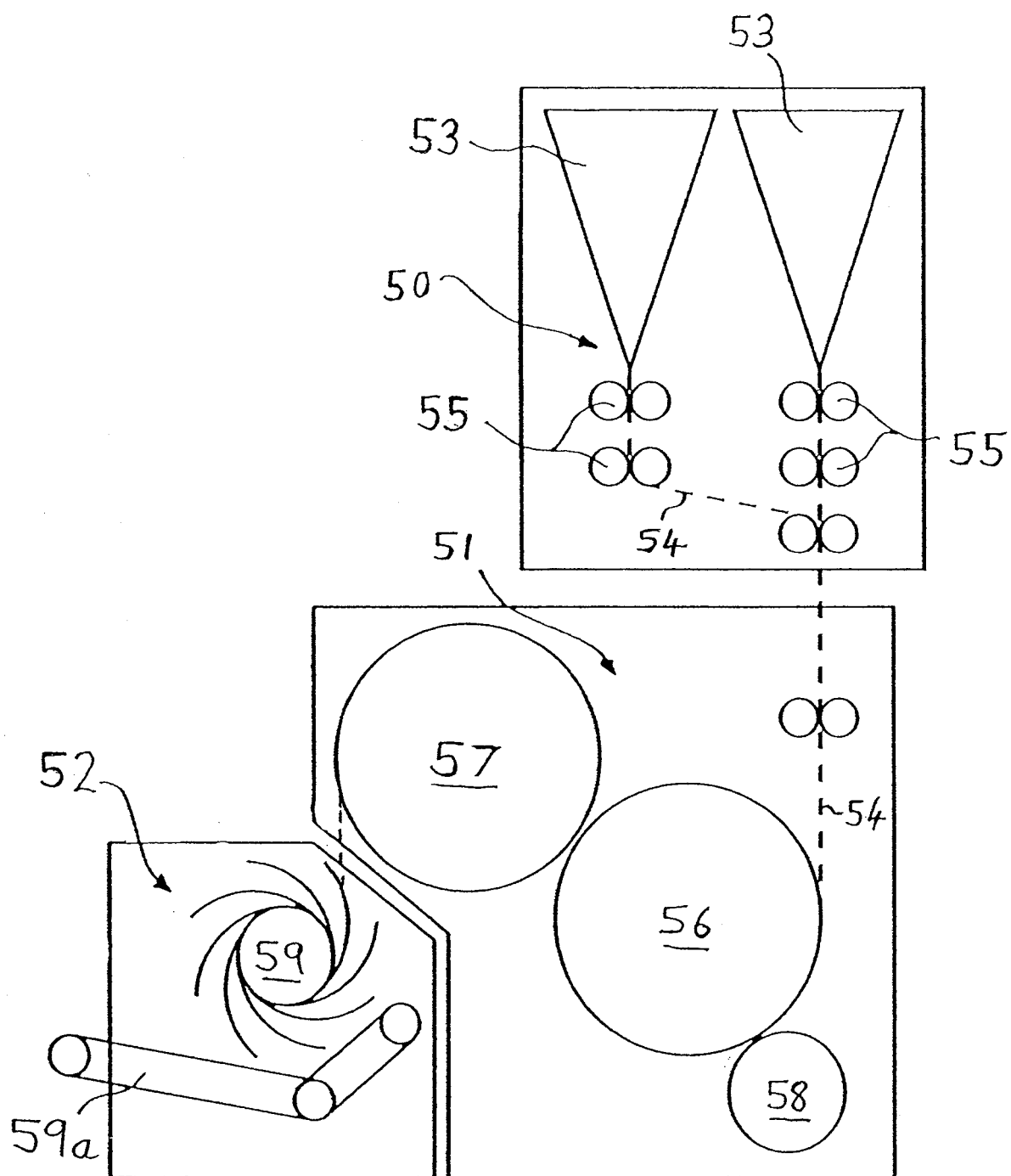


FIGURE 1

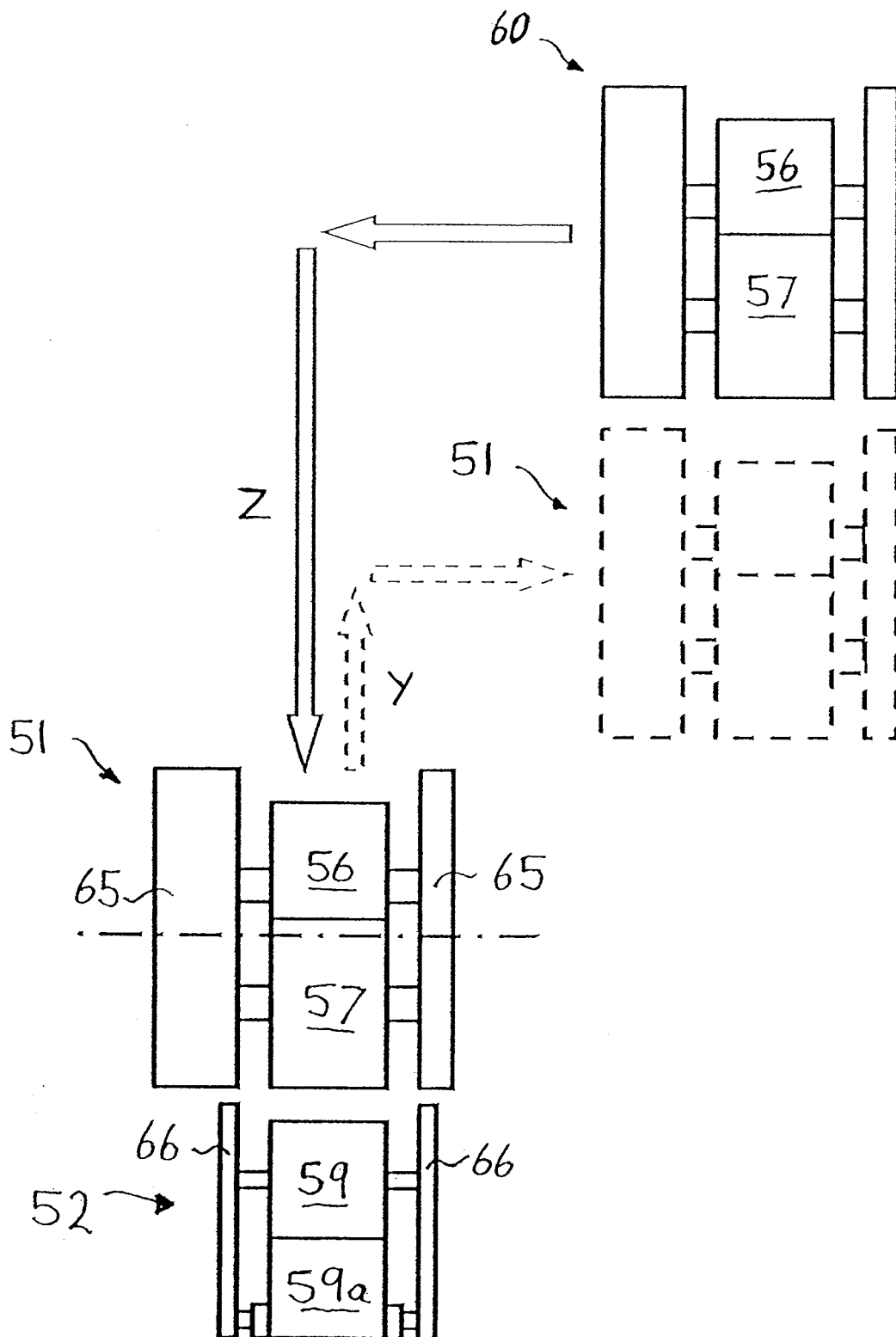


FIGURE 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 1149694 A [0011]