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(54) **METHOD OF PRINTING WITH A HEIGHT-ADJUSTABLE PRINT HEAD**

(57) A method of printing with a printing system comprising:

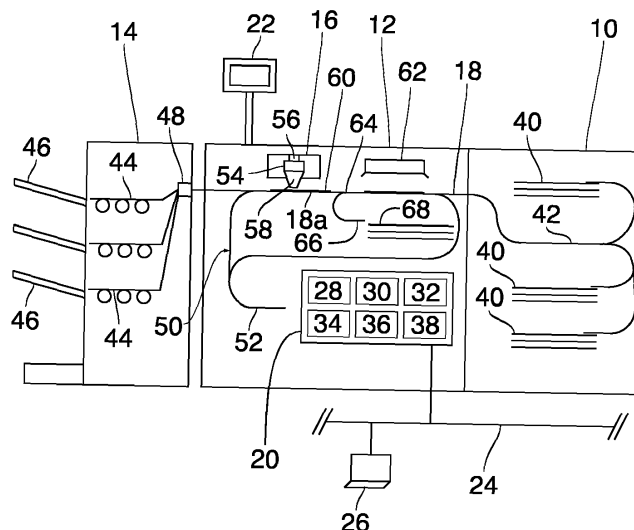
- a print surface (18a);
- a feed mechanism (42) arranged for feeding a print substrate (60) onto the print surface;
- a sensor (62) capable of detecting a height of an image receiving surface of the print substrate (60) relative to the print surface (18a); and
- a print head (54) disposed above the print surface (18a) for forming an image on the image receiving surface, the

print head being adjustable in height relative to the print surface,

characterized in that the following steps are performed at least at a start of a print run:

- a) if the height detected by the sensor (62) is within a predetermined range, discarding the print substrate and feeding a new print substrate; and
- b) changing the height of the print head (54) only on condition that an event in which a print substrate has been discarded in step (a) has occurred at least twice.

Fig. 1



Description

[0001] The invention relates to a method of printing with a printing system comprising:

- a print surface;
- a feed mechanism arranged for feeding a print substrate onto the print surface;
- a sensor capable of detecting a height of an image receiving surface of the print substrate relative to the print surface; and
- a print head disposed above the print surface for forming an image on the image receiving surface, the print head being adjustable in height relative to the print surface.

[0002] US 2016 136971 A1 discloses a printing method and an ink jet printing system of this type, wherein the height of the ink jet print head above the image receiving surface can be chosen to be relatively low in order to improve the print quality. Depending upon the environment conditions, e.g. ambient air humidity, the print substrate, e.g. a sheet of paper, may get wavy or swell, so that the maximum height of the image receiving surface above the print surface is increased and may even exceed the height of the print head, so that the print head would collide with the print substrate. In order to overcome this problem, the height of the image receiving surface is measured by means of the sensor, and if the height turns out to be too large, the height of the print head is increased, so that the print operation can be performed safely.

[0003] It is an object of the invention to provide a printing method and a system which permit to further improve the print quality.

[0004] In order to achieve this object, the method according to the invention is characterized in that the following steps are performed at least at a start of a print run:

- a) if the height detected by the sensor is within a predetermined range, discarding the print substrate and feeding a new print substrate; and
- b) changing the height of the print head only on condition that an event in which a print substrate has been discarded in step (a) has occurred at least twice.

[0005] The invention is based on the consideration that, in many cases, the condition that the height of the image receiving surface of the substrate above the print surface is unacceptably large, is an abnormal condition that occurs only temporarily. Then, when the height of the print head has been adjusted and, thereafter, the height condition of the substrate returns to normal, the gap between the print head and the image receiving surface will be unnecessarily large, and this may result in a non-optimal print quality.

[0006] According to the invention, when an abnormal

height condition of the substrate is detected for the first time, the reaction is not to adjust the height of the print head but to discard the print substrate. Then, when the print run is resumed with a new substrate which probably does not suffer from the abnormal condition, the print head will be at a height which had been considered to be optimal for processing the type of print substrate in consideration, so that a high print quality can be achieved. Only if the abnormal condition persists and is detected again for a subsequent substrate, it is concluded that the height setting for the print head is in fact too low and should be corrected.

[0007] In this way, the invention can improve the print quality in cases where an abnormal height of the image receiving surface of the substrate occurs only sporadically, while, on the other hand, an excessive waste of print substrates is avoided.

[0008] More specific optional features of the invention are indicated in the dependent claims.

[0009] The "predetermined range" that is checked in step (a) will have a lower boundary defined by the maximum height of the print surface that is still admissible. The range may also have an upper boundary which may be selected such that, if the measured height exceeds that upper boundary, it is unlikely that the measured height is due only to a sporadic defect, but it must be concluded that the print substrate is of a type having a nominal thickness larger than expected, so that the height of the print head should be adapted right away.

[0010] In case of a roll-to-sheet or roll-to-roll printer, the print substrate will be an endless web that is withdrawn from a roll. Then, if the sensor detects that the substrate is not acceptable, a certain length of the web is withdrawn from the roll and is cut-off and discarded, and when the media roll has been "flushed" in this way, the print run is resumed with the remainder of the web on the roll.

[0011] In cases where an increased air humidity has caused the print substrate to become wavy or to swell, it will in most cases only be the outmost layer of the substrate on the roll that is affected by the high humidity. Consequently, the length of the web to be discarded will correspond to the circumferential length of the roll, so that the outmost layer on the roll is flushed completely and the print run is resumed with the layer that had been covered by the outmost layer and can therefore be expected to have been hardly affected by the high air humidity.

[0012] There may however be cases where the abnormal condition applies not only for the outermost layer on the roll but also to the second, the third and possibly the next few layers on the roll. For example, if the roll has been supported on a flat surface for an extended period of time, the outer layers on the roll may have become deformed and flattened and, when withdrawn from the roll, this deformed part of the web will be wavy and may be rejected by the sensor. In such cases, it may be expedient to discard several layers of the web and to adjust

the height of the print head only when the defect persists even after several layers of the web have been discarded.

[0013] In case of a cut sheet printer, the print substrates will take the form of separate sheets which are typically withdrawn from a stack. In that case, mechanical deformations or environment conditions such as increased air humidity will in many cases also affect only the first, top-most sheet on a stack or the first few sheets on a stack. Then, in accordance with the principles of the invention, defective sheets will be discarded, and the height of the print head will be adjusted only when a certain number of sheets have been withdrawn from a stack and the ratio between the numbers of defective sheets and non-defective sheets is above a certain limit.

[0014] The adjustment of the height of the print head may be performed manually by an operator, possibly upon instructions that have been generated by a controller of the printing system and output via a user interface. In other embodiments, the printing system may be configured for automatic height adjustment of the print head.

[0015] More specific optional features of the invention are indicated in the dependent claims.

[0016] In another aspect, the present invention provides a printing system comprising:

- a print surface;
- a feed mechanism arranged for feeding a print substrate onto the print surface;
- a sensor capable of detecting a height of an image receiving surface of the print substrate relative to the print surface; and
- a print head disposed above the print surface for forming an image on the image receiving surface, the print head being adjustable in height relative to the print surface,
- a controller configured for:
 - a) if the height detected by the sensor is within a predetermined range, discarding the print substrate and feeding a new print substrate; and
 - b) changing the height of the print head only on condition that an event in which a print substrate has been discarded in step (a) has occurred at least twice.

The controller counts and/or tracks the number of discarded sheets, preferably consecutively discarded sheets. The controller may for example determine the number of discarded sheets within a predetermined time period and compare it to a preset threshold number representing a maximum number of discarded sheets. Said time period may start when starting the print job and is adjusted or shifted when the end of the period (or the predefined maximum number of discarded sheets) is reached. When the controller determines that the number of discarded sheets equal or exceeds the threshold number, the controller instructs an actuator to raise the print head. Thereby, the height between the print surface

and the print head is increased. Thus, the number of rejected sheets is reduced and productivity is maintained. It will further be appreciated that the sensor capable of detecting a height of an image receiving surface of the print substrate relative to the print surface implies any manner of height detection with respect to a, preferably flat, reference surface. The sensor may comprise its own support surface for supporting the sheet during sensing. Said determined sheet height yields height information of the sheet height relative to the print surface. Preferably, the operating conditions on the sheet on said support surface are similar to those on the sheet on the print surface. Thereto, the printing system may apply similar suction forces, transport mechanisms, temperatures, humidities, etc to the sheet on both surfaces.

[0017] In a preferred embodiment, the feed mechanism comprises a roll feed mechanism and the printing system further comprises a cutter for separating a sheet of a certain size from a web fed from a roll in the roll feed mechanism. Large numbers of consecutively discarded sheets are prone to occur when using a roll feeder. The outer layer of the feed roll may e.g. be more humid than the inner part of the roll. The outer layer may also be damaged or deformed due to contact. Generally, the outer layers are discarded, but exact determination of the amount to be discarded is in practice difficult. Discarding also leads to waste. The present invention allows for printing on a feed roll without initially discarding a large amount of web. Further, the operator need not be concerned with removing the outer layer or determining its thickness.

[0018] Embodiment examples of the invention will now be described in conjunction with the drawings, wherein:

- Fig. 1 is a schematic view of a cut sheet printing system to which the invention is applicable;
- Fig. 2 is a flow diagram illustrating a method according to the invention to be performed with the system shown in Fig. 1;
- Fig. 3 is a schematic view of a roll-to-sheet printing system to which the invention is applicable; and
- Fig. 4 is a flow diagram illustrating a method according to the invention to be performed with the system shown in Fig. 3.

[0019] As is shown in Fig. 1, a printing system that is described here as a representative example comprises a sheet feeder 10, a main body 12, and a sheet receiver 14. The main body 12 comprises a print station 16 disposed at a sheet transport path 18 and above a print surface 18a, an electronic controller 20 and a user interface 22.

[0020] The controller 20 may be formed by a computer, a server or a workstation and is connected to all the functional components of the printing system for controlling

the printing system, and is further connected to the user interface 22 and to a network 24 via which the controller may communicate with a remote workstation 26 of a user or operator. In an alternative embodiment, the controller 22 may also be installed outside of the main body 12 for controlling the various system components via the network 24.

[0021] The hardware and/or the software of the controller 20 includes among others a print job receiving section 28, a scheduler 30, a feed control section 32, a print control section 34, an output control section 36, and a sheet manager 38. The print job receiving section 28 is arranged to receive, e.g., via the network 24, print jobs each of which includes image data for one or more pages to be printed as well as various job settings. Optionally, the image data may also be received from a local scanner whereas the job settings are input at the user interface 22. The job settings include among others instructions that specify for each image to be printed the properties or type of a recording medium on which the image shall be printed.

[0022] The sheet feeder 10 includes a plurality of holders 40 each of which accommodates a supply, e.g. a stack of media (print substrate) sheets of a certain media type. The media types in the different holders 40 may differ in sheet thickness, sheet material, surface properties of the sheets and the like. The sheet feeder 10 further includes a feed mechanism 42 arranged to separate individual sheets from a selected one of the holders 40 and to supply them one by one into the sheet transport path 18 under the control of the feed control section 32.

[0023] When the job receiving section 28 has received a print job, the scheduler 30 determines a sequence in which the images of this print job shall be printed. For the purposes of this description, the term "image" shall designate a page size image that is to be printed onto one side of a recording sheet. The scheduler 30 further has access to a data base that stores the media types and properties of the sheets accommodated in the various holders 40. Based on the job settings that concern the media properties, the scheduler 30 selects the holders 40 from which the sheets with the desired properties are to be taken and determines a sequence in which the sheets of the different media types are to be fed into the sheet transport path 18 such that the sequence of sheets matches the sequence of images to be printed.

[0024] When the print process has been started, the feed control section 32 controls the feed mechanism 42 to supply the sheets in the sequence as scheduled into the sheet transport path 18, and the print control section 34 controls the print station 16 so as to print a corresponding image on the top side of each sheet.

[0025] In the example shown, the output section 14 has a plurality of output paths 44 including bins in which the sheets may be stacked after they have left the print station 16. When a stack, which may for example comprise a set of sheets forming one or more complete copies of a multi-page document, has been completed, the stack

will be forwarded to an associated output tray 46. In an alternative embodiment the completed stacks may also be forwarded to a finisher (not shown) for performing finishing operations such as stapling, punching and the like.

[0026] The output section 14 further includes a switch 48 which is controlled by the output control section 36 for directing each sheet to a designated one of the output paths 44.

[0027] In the example shown, the main body 12 of the printing section also includes a duplex loop 50 which branches off from the sheet transport path 18 downstream of the print station 16, reverses the orientation of the sheets in a sheet reversing mechanism 52 and then returns the sheets upside down to the entry side of the sheet transport path 18.

[0028] It shall further be assumed in this example that the print station 16 includes as print engine an ink jet print head 54 that is disposed above the print surface 18a and is adjustable in height by means of a height adjustment mechanism 56. Dependent upon the thickness and other properties of the sheets, the height of the print head 54 is adjusted such that a nozzle face 58 at the bottom side of the print head forms only a very narrow gap with a top surface of a sheet 60 that is being conveyed past the print head. In this way, it will be assured that, for each individual sheet, the ink jet print process will be performed with an optimal nozzle-to-sheet distance.

[0029] As the gap between the nozzle face 58 and the sheet 60 may be very small, any wrinkles or a surface waviness or other surface irregularities of the sheet 60 may result in a poor image quality or even in a collision of the sheet with the print head. For this reason, a sensor 62 for monitoring the quality of the sheets is disposed at the sheet transport path 18 upstream of the print station 16. The sensor 62 may for example be a 3D laser scanner that scans the entire surface of the sheet in order to capture a surface relief. The relief data are transmitted to the sheet manager 38 in the controller 20, where they are processed further to decide whether the quality of the sheet is acceptable or not. The sensor 62 may also detect other quality criteria relating to, for example, alignment errors or skew errors of the sheets.

[0030] When a sheet is found to be unacceptable, the sheet manager 38 discards the sheet by controlling a sheet ejector 64 in the sheet transport path 18 in order to excise this sheet from the scheduled sequence and to divert it into a discharge path 66 via which the sheet is discharged into a discharge bin 68. In this way, the defective sheet will be skipped in the print process.

[0031] The image that would have been printed on the discarded sheet will have to be printed on another sheet. In duplex printing, however, this image cannot be printed on the next sheet arriving on the sheet transport path, at least not if this sheet has returned from the duplex loop and carries already an image on one side. Consequently, discarding a defective sheet may sometimes imply that all the sheets that are present in the duplex loop 50 have to be discarded as well.

[0032] Therefore, in order to avoid an excessive waste of media sheets, it may be advisable to re-adjust the height of the print head 54 so that a larger range of surface irregularities of the sheets can be tolerated.

[0033] Fig. 2 is a flow diagram of a method that is based on these considerations.

[0034] When a print run has started with step S1, two counters, N and D, are initialized to zero in step S2. Then, the first substrate sheet is fed into the sheet transport path 18 in step S3, and the sensor 62 measures the height profile or at least the maximum height of the image receiving top surface of that sheet in step S4.

[0035] Then, if it is found in step S5 that the quality or surface height of the substrate is acceptable (Y), an image is printed onto the sheet in step S6 and the counter N is incremented by one in step S7, whereupon the process loops back to step S3 to feed the next substrate.

[0036] On the other hand, if it has been found in step S5 that the substrate is not acceptable (N), this substrate sheet is discarded in step S8, i.e. the switch 64 is controlled to deflect the sheet into the discharge path 66. Then, both counters N and D are incremented by one in step S8.

[0037] It will be understood that the counter N counts the total number of sheets that have been fed to the sensor 62, whereas the counter D counts only the defective sheets that have been discarded. Subsequent to the step S9 it is checked in step S10 whether two conditions are fulfilled. The first condition is that the total count N of sheets is larger than 20 (or any other number suitably selected so as to avoid a too large waste of media sheets, but large enough to smoothen-out statistical fluctuations). The second condition is that the ratio between the counts D and N is larger than 0.2 (or any other suitably selected threshold value).

[0038] As long as none of these conditions is fulfilled (N), the process loops back to step S3, and a new substrate is fed.

[0039] If it is found in step S10 that both conditions are fulfilled (Y), it is decided that the frequency of defective sheets is too large and would lead to an unreasonable waste of substrate sheets if the adjustment of the print head is not changed. Then, in step S11, the height adjustment mechanism 56 is controlled to increase the height of the print head 54, so that larger defects of the media sheets can be tolerated. Simultaneously, the sheet manager 38 adapts the tolerable height of the image receiving surface of the sheet as detected by the sensor 62.

[0040] Then, the print process loops back to step S2 where the counters N and D are reset and the print run is resumed with the new setting of the print head.

[0041] Fig. 3 shows an example of a roll-to-sheet printing system comprising a substrate feeder 70 and an ink jet printer 72. At the start of a print run, a print substrate 74 in the form of an endless web is withdrawn from a roll 76 that is supported in the substrate feeder 70, and the leading edge of the web is threaded through a substrate path 78 in the printer 72. Disposed along the substrate

path 78 are a sensor 80 which detects the thickness of the substrate, a cutter 82, a switch 84 and a print head 86 facing a print surface 88 in the substrate path. If the thickness of the substrate 74 is found to be acceptable, the substrate is fed onto the print surface 88, an image is printed, and the printed substrate is output at an output port 90. Optionally, the cutter 82 may be activated at a suitable timing so as to separate a printed sheet of a certain size from the rest of the web.

[0042] If the sensor 80 detects an inadmissible height of the image receiving surface of the substrate 74, the switch 84 is activated so as to deflect the web into a discharge path 92. Then, the cutter 82 will be activated at a suitable timing which determines the length of the web that is discarded. Optionally, this timing may be determined on the basis of the detection results obtained by the sensor 80 which continues to monitor the thickness of the substrate. In another embodiment, the timing for the cutter 82 may be fixed such that the length of the web that is discarded is at least equal to the circumferential length of the roll 76 (or to an integer multiple thereof). This means that, what is discarded is the part of the web that originally formed the outermost layer (or layers) on the roll 76.

[0043] Fig. 4 is flow diagram of a method according to the invention that may be performed with the printing system shown in Fig. 3.

[0044] When a print run has started in step S21, the substrate 74 is fed to the printer 72 in step S22, and the height of the image receiving surface of the substrate is measured by the sensor 80 in step S23.

[0045] Then, if it is found in step S24 that the substrate is acceptable (Y), the print head 86 is activated so as to print an image onto the substrate in step S25.

[0046] On the other hand, if it is found in step S24 that the substrate is not acceptable (N), a suitable length of the substrate is discarded in step S26. Thereafter, a subsequent length of the substrate is fed in step S27 and the height thereof is measured by the sensor 80 in step S29.

[0047] In a subsequent step S30 it is decided again whether or not the substrate is acceptable. If it is acceptable (Y), an image is printed in step S25. Otherwise (N), the height of the print head relative to the print surface 88 is adjusted in step S31. The adjustment may be made automatically or manually by an operator. In the latter case, a message on a user interface of the printer may instruct the operator to make the adjustment.

[0048] When the print head has been adjusted, the process branches to step S25 to print an image on the substrate web.

[0049] In this example, the height of the print head will be adjusted as soon as a defect of the substrate has been detected twice (in steps S24 and S30). Of course, modified embodiments are possible in which the print head is adjusted only after an unacceptable substrate has been detected three or more times.

[0050] In yet another embodiment, when the substrate

has been found to be unacceptable in step S24, the web may be continuously withdrawn from the roll 76 and discharged via the discharge path 92 while the sensor 80 monitors the thickness of the substrate, until either the thickness has decreased to an acceptable value or the length of the web that is being discarded reaches a predetermined threshold value.

Claims

1. A method of printing with a printing system comprising:

- a print surface (18a; 88);
- a feed mechanism (42; 70) arranged for feeding a print substrate (60; 74) onto the print surface;
- a sensor (62; 80) capable of detecting a height of an image receiving surface of the print substrate (60; 74) relative to the print surface (18a; 88); and
- a print head (54; 86) disposed above the print surface (18a, 88) for forming an image on the image receiving surface, the print head being adjustable in height relative to the print surface,

characterized in that the following steps are performed at least at a start of a print run:

- a) if the height detected by the sensor (62; 80) is within a predetermined range, discarding the print substrate and feeding a new print substrate; and
- b) changing the height of the print head (54; 86) only on condition that an event in which a print substrate has been discarded in step (a) has occurred at least twice.

2. The method according to claim 1, wherein the print substrate (74) is fed to the print surface (88) in the form of an endless web withdrawn from a roll (76).

3. The method according to claim 2, wherein the step (a) comprises deflecting the web into a discharge path (92) and cutting the web in a position upstream of the discharge path when a certain length of the web has been fed into the discharge path.

4. The method according to claim 3, wherein the length of the web in the discharge path (92) is selected to be equal to or larger than the circumferential length of the roll (76) at the time before the web was withdrawn.

5. The method according to claim 1, wherein print substrates (60) are fed to the print surface (18a) in the form of separate sheets.

6. The method according to claim 5, wherein the step (a) is repeated at least once and comprises a sub-step of counting a total number N of sheets for which the height of the image receiving surface has been detected, and a sub-step of counting a number D of sheets for which the detected height was in said predetermined range, and wherein the height of the print head (54) is changed only if the total number N of sheets is larger than a predetermined number and the ratio D/N is larger than a predetermined value.

7. A printing system comprising:

- a print surface (18a; 88);
- a feed mechanism (42; 70) arranged for feeding a print substrate (60; 74) onto the print surface;
- a sensor (62; 80) capable of detecting a height of an image receiving surface of the print substrate (60; 74) relative to the print surface (18a; 88); and
- a print head (54; 86) disposed above the print surface (18a, 88) for forming an image on the image receiving surface, the print head being adjustable in height relative to the print surface,

characterized by a controller configured for:

- a) if the height detected by the sensor (62; 80) is within a predetermined range, discarding the print substrate and feeding a new print substrate; and
- b) changing the height of the print head (54; 86) only on condition that an event in which a print substrate has been discarded in step (a) has occurred at least twice.

8. The printing system according to claim 7, wherein the feed mechanism (70) comprises a roll feed mechanism (70) and the printing system further comprises a cutter (82) for separating a sheet of a certain size from a web fed from a roll (76) in the roll feed mechanism (70).

9. The printing system according to claim 7 or 8, wherein the controller (20) is further configured to perform steps according to any of the claims 1 to 6.

Fig. 1

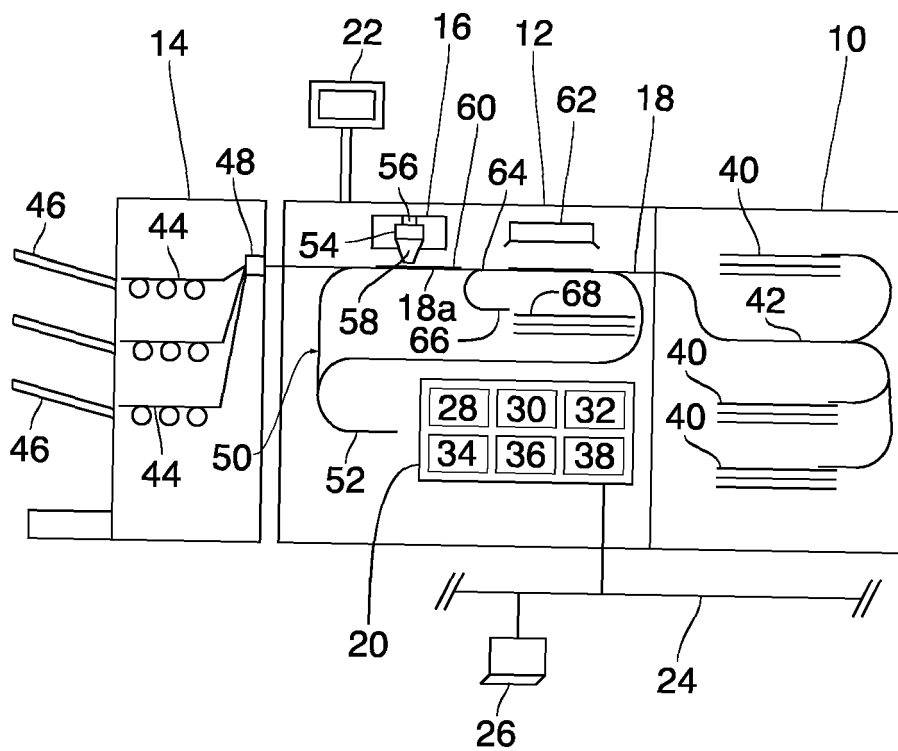


Fig. 2

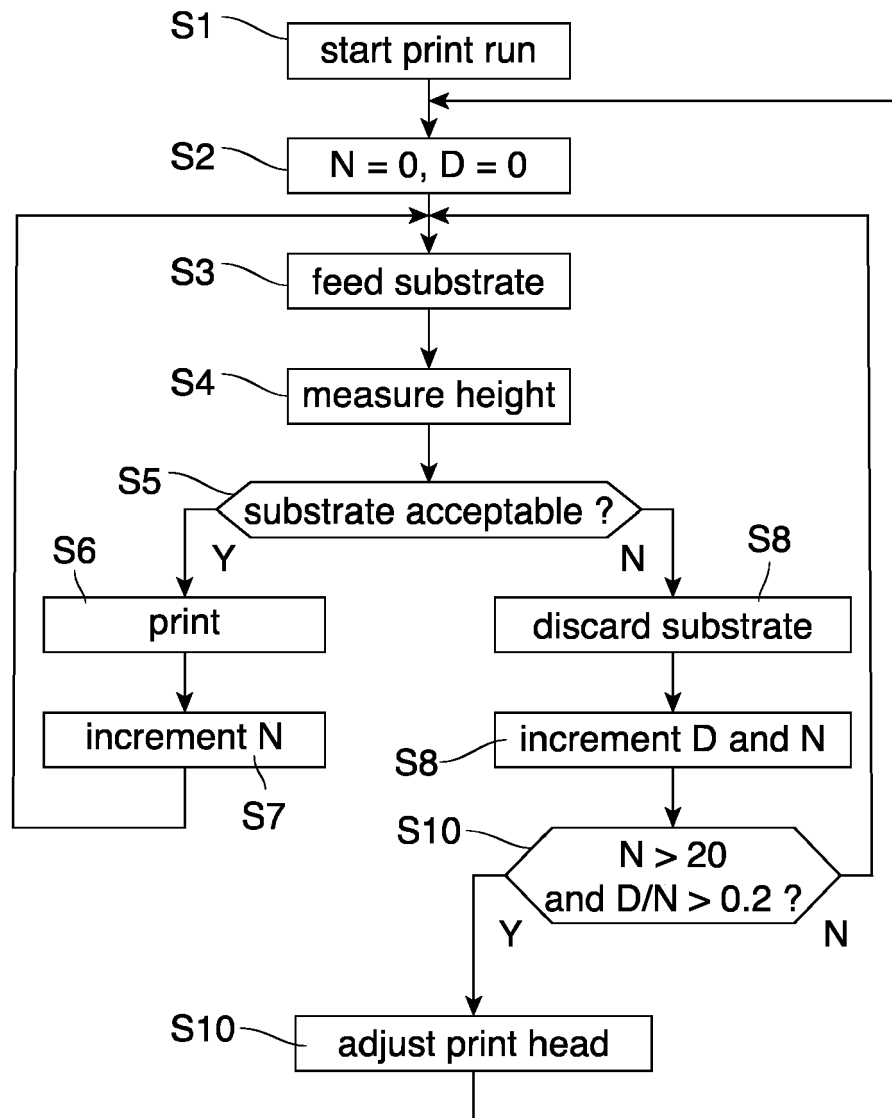


Fig. 3

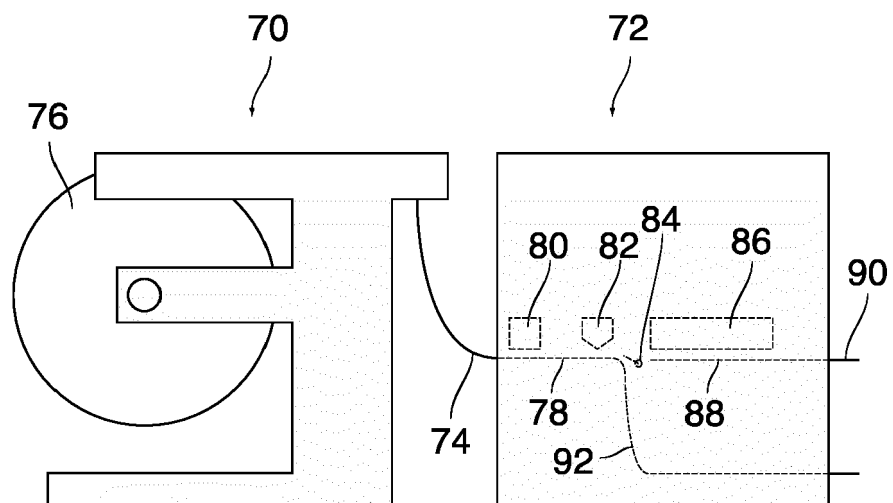
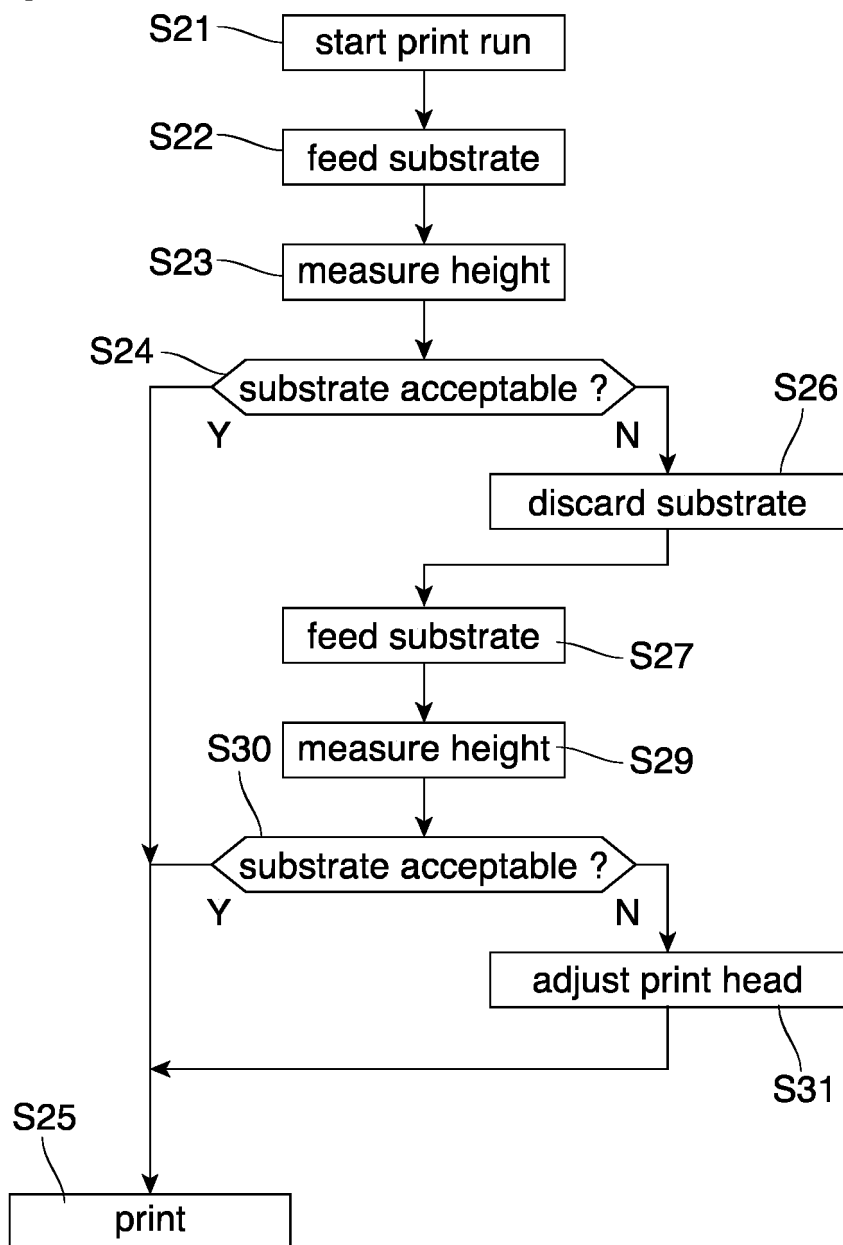


Fig. 4





EUROPEAN SEARCH REPORT

Application Number
EP 18 20 9849

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 2011/279507 A1 (CASTILLO RUDDY [US] ET AL) 17 November 2011 (2011-11-17) * figures 1-4 * * paragraph [0032] - paragraph [0035] * * paragraph [0048] *	1-9	INV. B41J11/00 B41J25/308
A	US 2016/297219 A1 (SATHE KUNAL [NL] ET AL) 13 October 2016 (2016-10-13) * figures 4-5, 9 * * paragraph [0048] - paragraph [0049] * * paragraph [0057] - paragraph [0064] *	1-9	
A	US 2013/257956 A1 (DE JONG JOANNES N M [US] ET AL) 3 October 2013 (2013-10-03) * figures 1-2 * * paragraph [0041] - paragraph [0042] *	1-9	
			TECHNICAL FIELDS SEARCHED (IPC)
			B41J
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 17 April 2019	Examiner João, César
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 20 9849

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011279507 A1	17-11-2011	NONE	
US 2016297219 A1	13-10-2016	EP 3078501 A1 US 2016297219 A1	12-10-2016 13-10-2016
US 2013257956 A1	03-10-2013	NONE	

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Patent documents cited in the description

- US 2016136971 A1 [0002]