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(54) APPARATUS AND METHODS OF DETECTING RELATIVE POSITION OF RF SIGNATURE ON PRINT MEDIA

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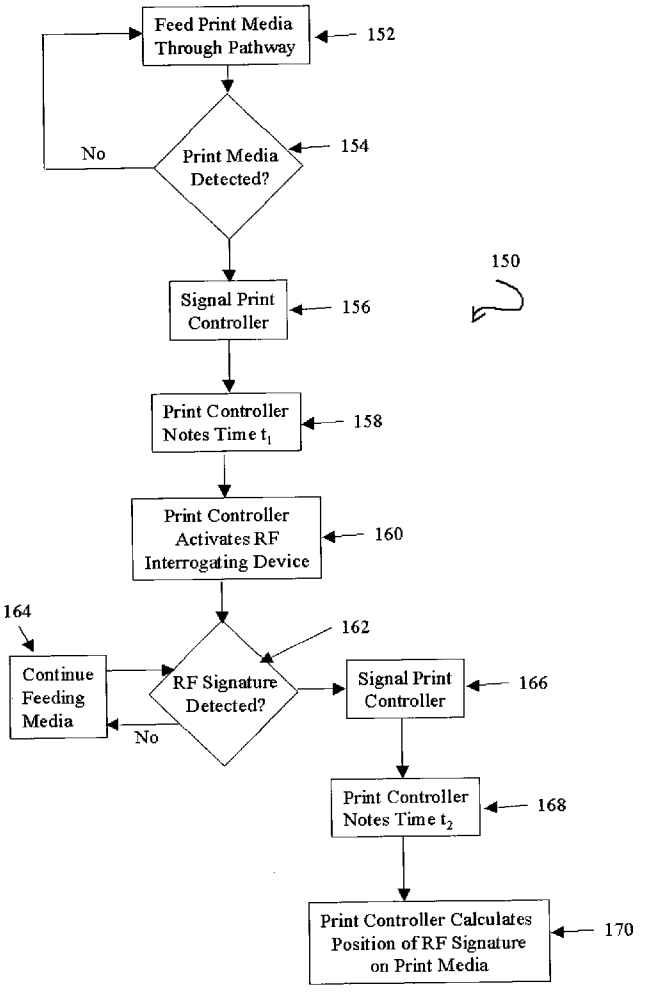
(57) **ABSTRACT**

The presence of a radio frequency signature **(88)** on a cut sheet of print media **(28)** is detected by a radio frequency interrogating device **(94)** to determine it's relative left/right position on the print media **(28)**. Either the leading edge **(124)** or trailing edge **(126)** of the print media **(28)** is detected by one or more print media sensors **(86, 90)**. A print controller **(24)** can note the time (t_1) when print media is detected and cause the radio frequency interrogating device **(94)** to detect the radio frequency signature **(88)** at a time (t_2) when the print media has reached a predetermined point along the print media pathway **(110)**. The position of the radio frequency signature **(88)** on the print media **(28)** can be calculated using the time differential (t_2-t_1) and the known angular displacement of the radio frequency interrogating device **(94)**.



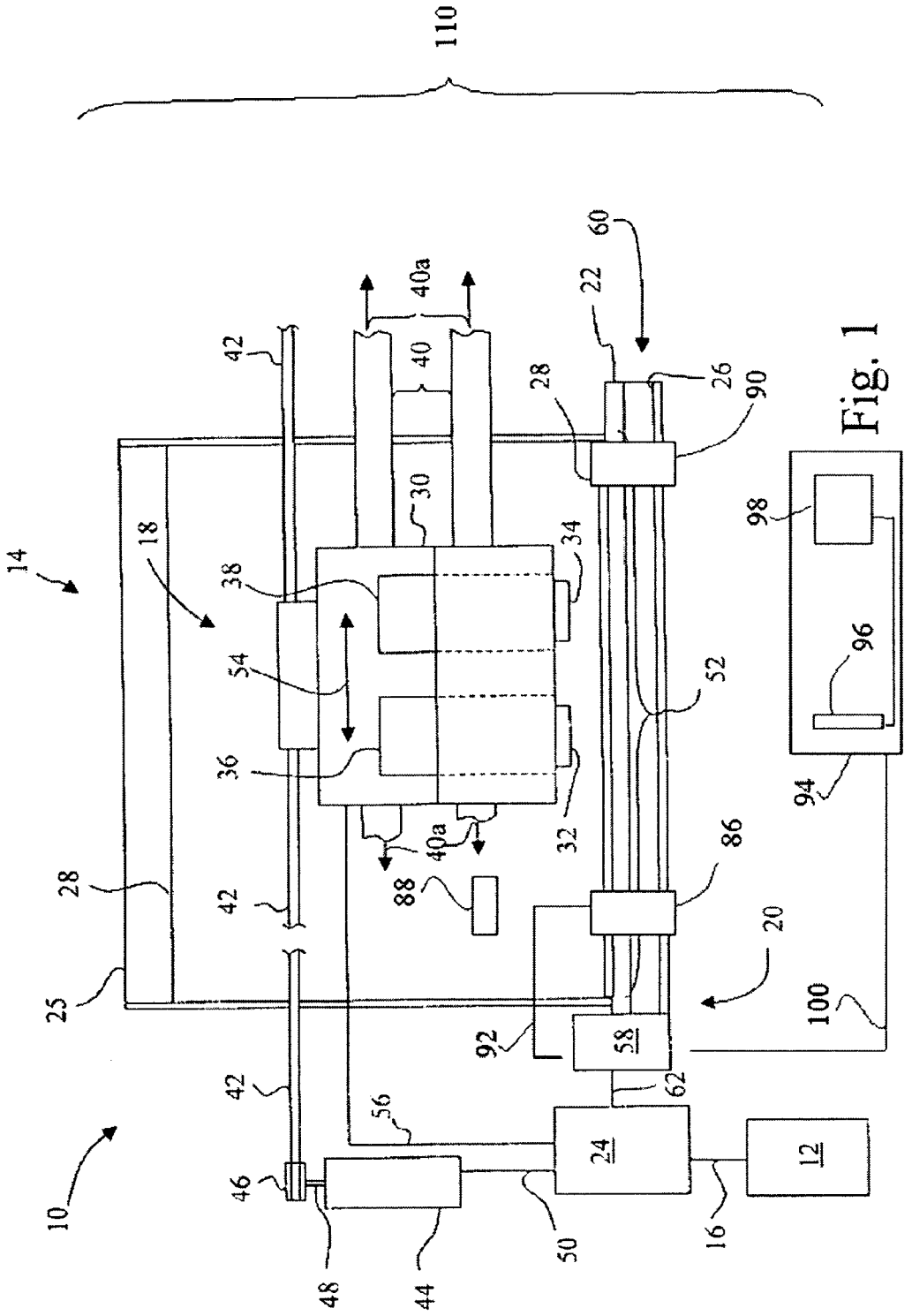
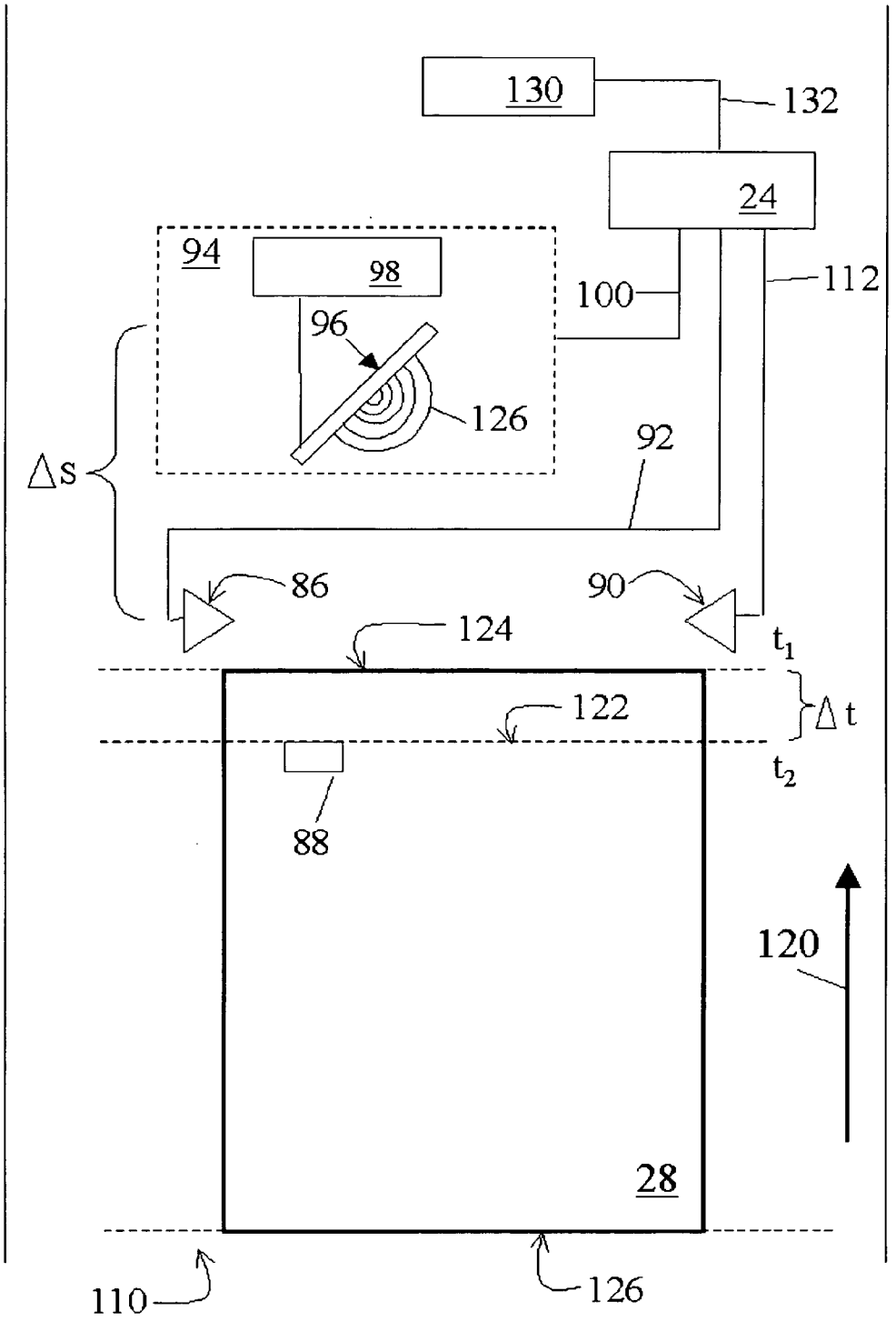

110
14
18
38
54
36
34
32
30
40
40a
42
28
22
60
26
90
98
96
94
52
86
88
20
25
92
58
62
56
24
12
16
46
48
44
50
10
100

Fig. 1


130
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100
112
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92
Δs
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90
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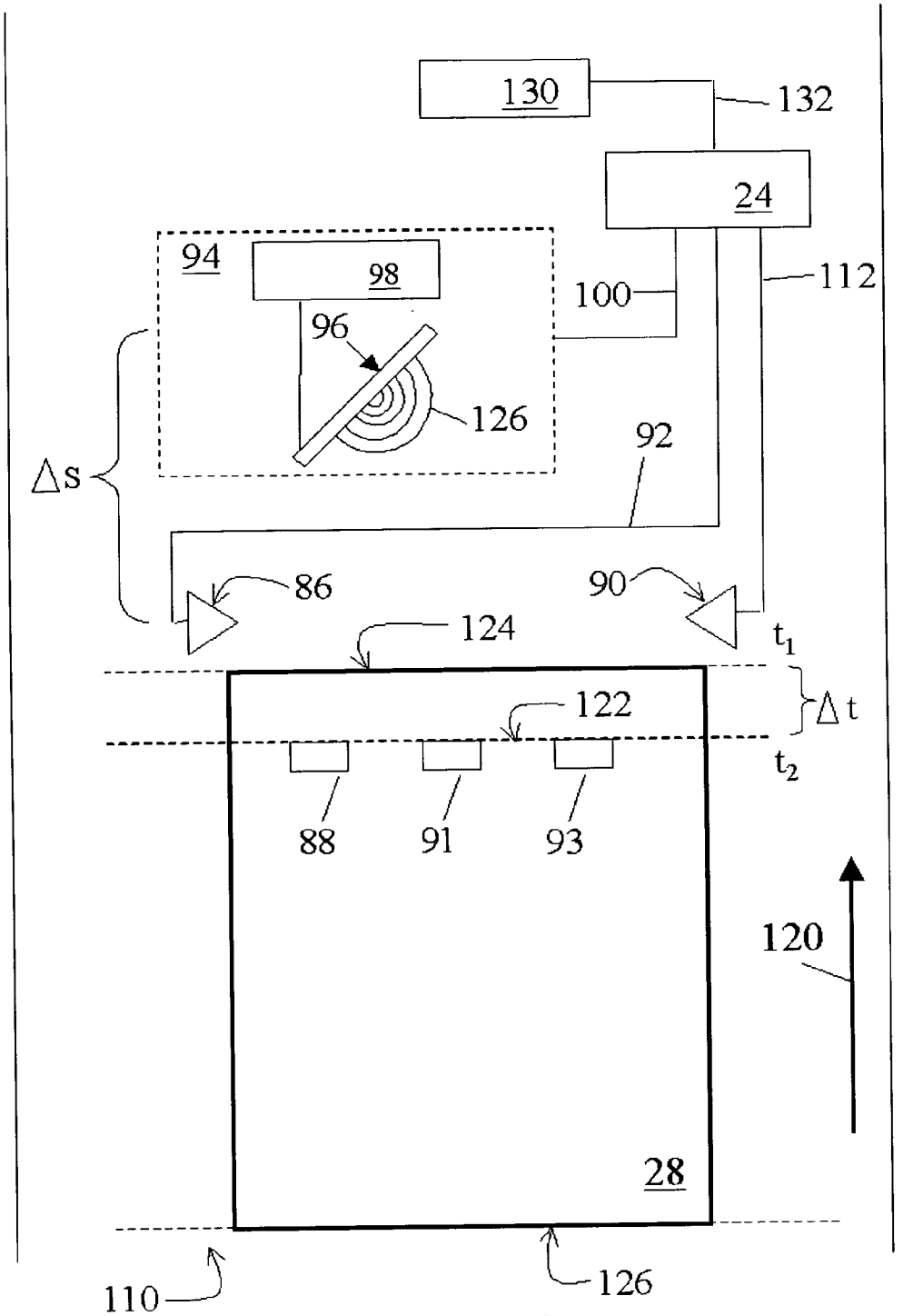
t1
122
Δt
t2
88
120
28
110
126

Fig. 2a


130
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Δs
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t1
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t2
88
91
93
120
28
110
126

Fig. 2b

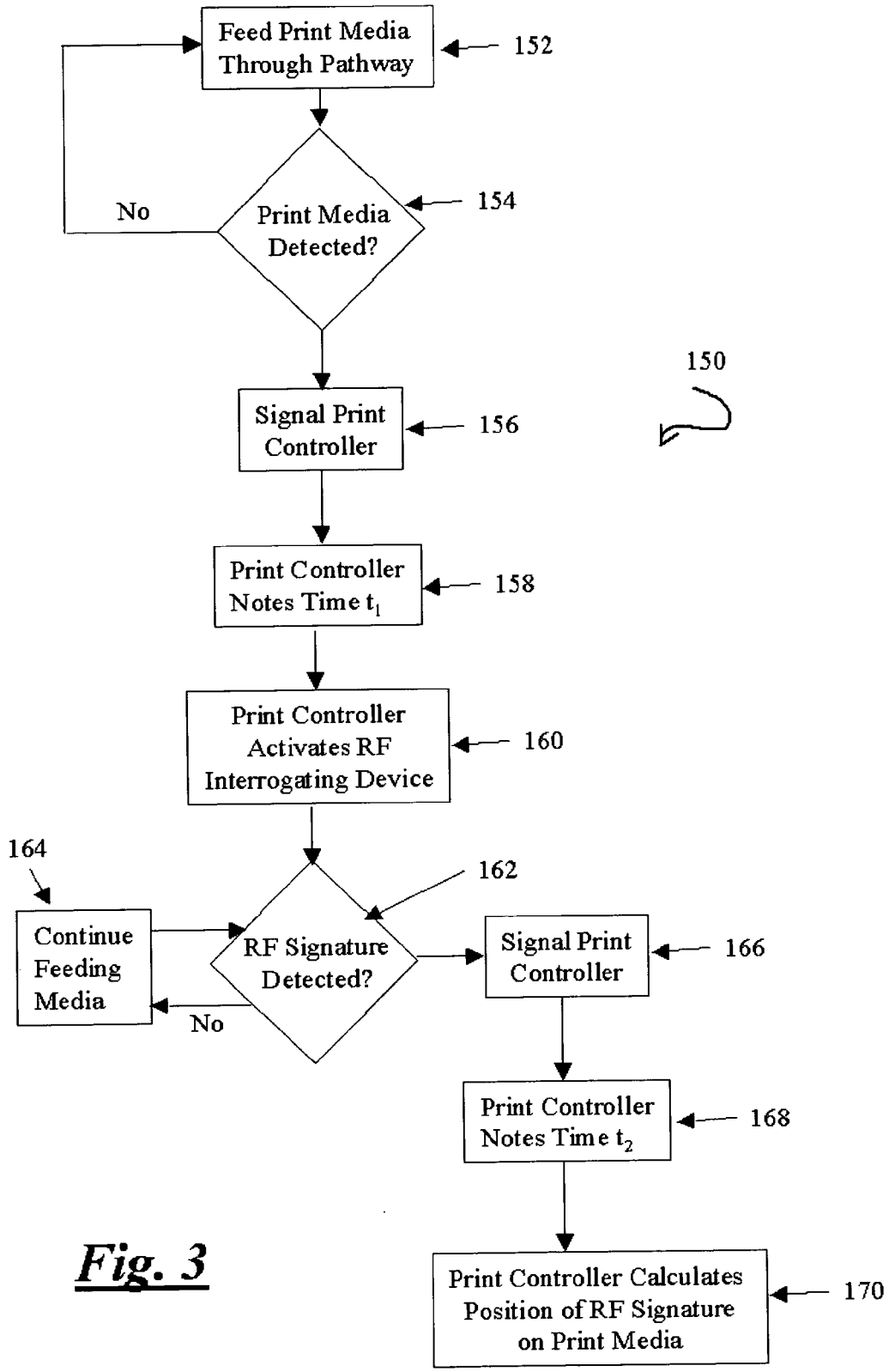
Feed Print Media Through Pathway
152
Print Media Detected?
154
No
150
Signal Print Controller
156
Print Controller Notes Time t_1
158
Print Controller Activates RF Interrogating Device
160
164
162
Continue Feeding Media
RF Signature Detected?
No
Signal Print Controller
166
Print Controller Notes Time t_2
168
Print Controller Calculates Position of RF Signature on Print Media
170

Fig. 3

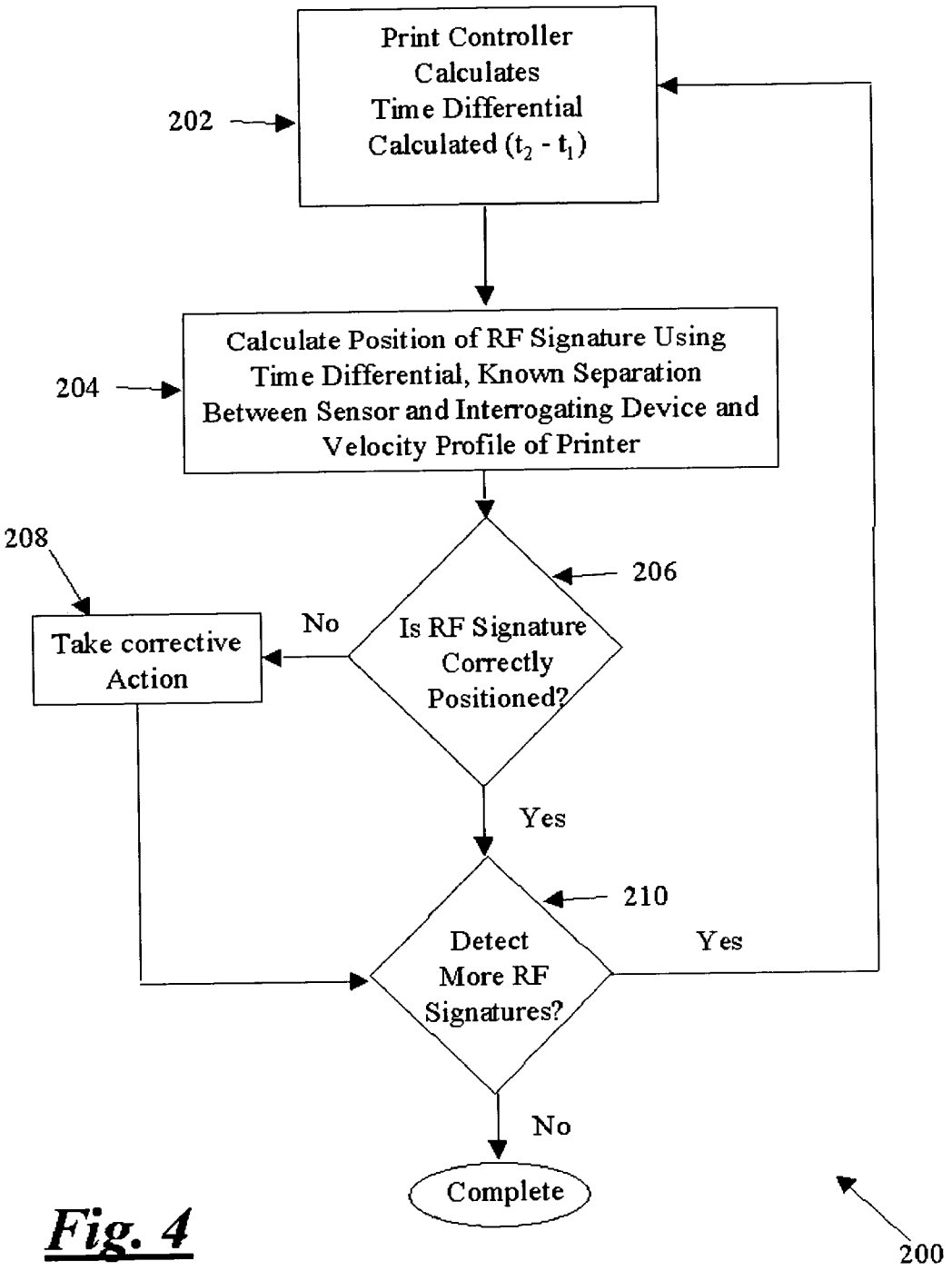
Print Controller Calculates Time Differential Calculated (t_2 - t_1)
202
Calculate Position of RF Signature Using Time Differential, Known Separation Between Sensor and Interrogating Device and Velocity Profile of Printer
204
Is RF Signature Correctly Positioned?
206
No
208
Take corrective Action
Yes
Detect More RF Signatures?
210
Yes
No
Complete
200

Fig. 4

APPARATUS AND METHODS OF DETECTING RELATIVE POSITION OF RF SIGNATURE ON PRINT MEDIA

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is related to application Ser. No. 10/897,131 filed Jul. 22,2004, entitled APPARATUS AND METHOD OF DETECTING PRINT MEDIA ORIENTATION by the same inventors.

TECHNICAL FIELD

[0002] Specific embodiments of the present invention relate to apparatus and methods of detecting the position of a radio frequency signature on print media and more specifically to detecting relative position or one or more RFID tags on a sheet or print media sheet across the width of the print media as it is fed through a printing device.

BACKGROUND OF THE INVENTION

[0003] Inkjet and laser printers have become commonplace equipment in most workplace and home computing environments. Today, many printers are multi-functional assemblies capable of printing on a large array of print media such as, for example, letterhead, envelopes and labels. A recent innovation in the printing industry involves the manufacturing of print media with embedded radio frequency signatures such as is possible with a Radio Frequency Identification (RFID) tag. These tags, sometimes called "Smart Labels", may be used with a variety of existing printing methods and the embedded tags may be programmed with information that is of use to the user.

[0004] Such print media generally comprises a backing material (sometimes referred to as the "web") upon which a label is applied, with a RFID tag sandwiched between the label and the backing. There may be one or more labels on the web and the sheet as presented may be part label and part plain paper. Typically, there is a desired orientation of the media to be fed through the printer that will ensure the printed image aligns as intended with the labels and/or tags on the media sheet.

[0005] In some cases, there may be more than one tag arrayed across the width of the media. In other cases, the position of a tag across the width of the media may be used to indicate when the media is mis-fed, and therefore allow the user to take some form of corrective action. For these reasons and others, it is desirable for the printing device to be able to determine the relative location of each tag on the media sheet in the horizontal direction.

BRIEF DESCRIPTIONS OF THE DRAWINGS

[0006] The present invention is illustrated by way of example and not limitation in the figures of the accompanying drawings in which like references indicate similar elements, and in which:

[0007] **FIG. 1** is a diagrammatic representation of a print media orientation detecting apparatus according to one embodiment of the invention;

[0008] **FIGS. 2*a*** and **2*b*** show print media embedded with one or more radio frequency signature(s);

[0009] **FIG. 3** is a process flow diagram for a method of detecting the position of radio frequency signatures according to the invention; and

[0010] **FIG. 4** is a process flow diagram for a method of calculating the position of a radio frequency signature on printed media according to the invention.

DETAILED DESCRIPTION

[0011] Referring now to the drawings and more particularly to **FIG. 1**, therein are shown the various electromechanical systems for a radio frequency signature position detecting apparatus **10** according to one embodiment of the present invention. Apparatus **10** may include a host **12** and a printer assembly **14** such as, for example, an ink jet or laser printer or other image forming platform. For convenience, apparatus **10** will be described in connection with an ink jet printer although it should be understood the radio frequency signature position detecting apparatus **10** of the invention may be implemented in other image forming platforms such as laser or dye diffusion, for example.

[0012] Host **12** is communicatively coupled to printer assembly **14** by way of communications link **16**. Communications link **16** may be established by, for example, a direct connection, such as a cable connection, between printer assembly **14** and host **12**; by a wireless connection; or by a network connection, such as for example, an Ethernet local area network (LAN) or a wireless networking standard, such as IEEE 802.11. Host **12** may include a display, an input device such as a keyboard, a processor and associated memory. Resident in the memory of host **12** may be printer driver software which places print data and print commands in a format that can be recognized by printer assembly **14**. The format can be, for example, a data packet including print data and printing commands for a given print request and may include a print header that identifies the scan data. The printer driver software may also include print media information such as, for example, media type and size. In addition, such print media information may include the expected and predetermined placement of radio frequency signature, such as a RFID tag which has been placed on or embedded in the print media as a "Smart" Label or other similar cut-sheet print media, as well as the expected separation between an edge of the print media and the radio frequency signature. By providing the placement information for the radio frequency signature, it is possible to compare the actual placement of the signature on a particular sheet of print media to the expected location.

[0013] **FIG. 1** shows that printer assembly **14** includes a printhead carrier system **18**, a print media feed system **20**, a mid-frame **22**, a print controller **24**, a print media source **25** and an exit tray **26**. Print media source **25** is configured and arranged to supply individual sheets of print media **28** to print media feed system **20** which, in turn, further transports sheets of print media **28** during a printing operation.

[0014] Printhead carrier system **18** includes a printhead carrier **30** which may carry, for example, a color printhead **32** and black printhead **34**. A color ink reservoir **36** is provided in fluid communication with color printhead **32** and a black ink reservoir **38** is provided in fluid communication with black printhead **34**. Reservoirs **36**, **38** may be located near respective printheads **32** and **34**, which in turn may be assembled as respective unitary cartridges. Alterna-

tively, reservoirs **36**, **38** may be located remote from printheads **32**, **34**, e.g., off-carrier, and reservoirs **36**, **38** may be fluidly interconnected to printheads **32**, **34**, respectively, by fluid conduits. Printhead carrier system **18** and printheads **32** and **34** may be configured for unidirectional printing or bi-directional printing.

[**0015**] Printhead carrier **30** is guided by a pair of guide rods **40**. Alternatively, one of guide rods **40** could be a guide rail made of a flat material, such as metal. The axes **40***a* of guide rods **40** define a bi-directional-scanning path, also referred to as **40***a*, of printhead carrier **30**. Printhead carrier **30** is connected to a carrier transport belt **42** that is driven by a carrier motor **44** by way of a driven carrier pulley **46**. Carrier motor **44** has a rotating carrier motor shaft **48** that is attached to carrier pulley **46**. Carrier motor **44** is electrically connected to print controller **24** via communications link **50**. At a directive of print controller **24**, printhead carrier **30** is transported, in a reciprocating manner, along guide rods **40**. Carrier motor **44** can be, for example, a direct current motor or a stepper motor.

[**0016**] The reciprocation of printhead carrier **30** transports ink jet printheads **32** and **34** across the sheet of print media **28** along bi-directional scanning path **40***a* to define a print area **52** of printer assembly **14** as a rectangular region. This reciprocation occurs in a scan direction **54** that is parallel with bi-directional scanning path **40***a* and is also commonly referred to as the horizontal scanning direction. Printheads **32** and **34** are electrically connected to print controller **24** via communications link **56**.

[**0017**] During each printing pass, i.e., scan, of printhead carrier **30**, while ejecting ink from printheads **32** and/or **34**, the sheet of print media **28** is held stationary by print media feed system **20**. Before ink ejection begins for a subsequent pass, print media feed system **20** conveys the sheet of print media **28** in an incremental, i.e., indexed, fashion to advance the sheet of print media **28** into print area **52**. Following printing, the printed sheet of print media **28** is delivered to print media exit tray **26**. Print media feed system **20** includes a drive unit **58** coupled to a sheet handling unit **60**. Drive unit **58** is electrically connected to print controller **24** via communications link **62**, and provides a rotational force which is supplied to sheet handling unit **60**.

[**0018**] As such, printer assembly **14** provides a print media pathway **110** for the transport of print media **28** from a paper source **25** to a designated print area **52**. Printer assembly **14** includes a print media sensor **86** capable of detecting when print media **28** has reached a predetermined point along the print media pathway **110**. Print media sensor **86** may be configured to detect the leading edge of the print media **28** as it is conveyed by the print media feed system **20** through the printer assembly **14**. In addition to or alternatively, the print media sensor **86** may detect the trailing edge of the print media **28**. In this regard, the leading edge of the print media **28** is defined as the media edge which enters the printing device's print area **52** first and the trailing edge is equivalently to that edge which enters the print area **52** last.

[**0019**] The invention has particular application and provides particular advantages in the context of modern day printers, such as print assembly **14** and other types of printer platforms, that employ one or more sensors arranged about a printer's print media pathway to determine and track the location of print media as it passes through the printer's print area, such as print area **52**. Such sensors may be arranged to "make" at the leading edge of a sheet of print media and "break" at the trailing edge, providing a print controller, such as print controller **24**, with an indication of the location of the print media at any given point along the printer's print media pathway **110**. For this purpose, printer assembly **14** may include a second print media sensor **90** which functions like first print media sensor **86**. In either configuration, i.e. one or two print media sensors, a communications link **92** is provided between the print media sensor **86** and the print controller **24**. Communications link **92** provides a means for print media sensor **86** to signal print controller **24** and thereby notify print controller **24** that a sheet of print media, such as print media **28**, has been detected. A similar communications link (not shown) may be provided coupling the second print media sensor **90** to the print controller **24**. In this way, the print controller **24** will know when the leading edge and/or trailing edge of the print media **28** traverses the print area **52** and/or a predetermined point along the print media pathway **110**.

[**0020**] As shown, a radio frequency signature **88** has been placed on or embedded in print media **28** at a specific location. Radio frequency signature **88** may be detected by a suitable radio frequency detection device. In one embodiment, radio frequency signature **88** takes the form of a Radio Frequency Identification (RFID) tag that is placed on print media **28** prior to being loaded into print media source **25** such as during manufacture, i.e. at a paper plant or specialty paper mill. A radio frequency interrogating device **94** is placed about the printer assembly **14** in an area where it can detect the presence of radio frequency signature **88** once print media **28** has reached a predetermined point along the print media pathway **110**.

[**0021**] By placing radio frequency signature **88** at a predetermined and known location on the print media **28**, radio frequency interrogating device **94** can be used to detect radio frequency signature **88**. Once radio frequency signature **88** is detected, a signal is communicated to print controller **24** to indicate the presence of radio frequency signature **88** on print media **28**. Print controller **24** can then calculate the position of radio frequency signature **88** and determine if it is properly placed on print media **28** as expected and, if not, cause print assembly **14** to take corrective action such as suspending print operations, sending a warning message to a user and/or canceling pending print requests, among other options.

[**0022**] As such, print controller **24** of print assembly **14** may confirm if a radio frequency signature **88** embedded in print media **28** is positioned as expected on print media **28**. It is contemplated that any one of a plurality of commercially available RFID readers can be used as radio frequency interrogating device **94**. Therefore, radio frequency interrogating device **94** may be equipped with a RFID antenna **96** and a RFID read/write module **98**. RFID antenna **96** is used to communicate with and/or detect radio frequency signals from, for example, a standard RF emitting device, such as a RFID tag comprising radio frequency signature **88** on print media **28**. RFID read/write module **98** includes the interface and process logic for communication with an RFID tag as well as with an external host system, such as host **12**. Communications link **100** coupling radio frequency interrogating device **94** to print controller **24** provides a signal

pathway for this purpose. Radio frequency signature **88** may also include information about the print media **28** such as the size, weight, brightness, location of radio frequency signature and/or other characteristics of the print media. Alternatively, radio frequency signature **88** may include no readable information at all but its position on print media **28** is known allowing print controller **24** to determine if print media **28** is properly oriented.

[**0023**] Apparatus **10** provides a means of coupling the information provided by the paper path sensors **86**, **90** to information provided by a radio frequency based system, such as a RFID system, consisting of radio frequency signature **88** (or RFID tag) and radio frequency interrogating device **94** (or RFID reader). In this way, print controller **24** may calculate the orientation of a cut sheet of print media **28** as it passes through the print area **52**. While it is contemplated that a RFID system including a RFID reader, RFID antenna and RFID tag could be used for such a purpose, other suitable RF-based components may also be employed.

[**0024**] With reference to **FIGS. 2***a* and **2***b*, the print media pathway **110** is shown extending in the direction of arrow **120** so that the leading edge **124** of print media **28** traverses print media sensors **86**, **90** as print media **28** is fed along print media pathway **110**. Once leading edge **124** is detected by sensor **86**, sensor **90** and/or both, a signal may be communicated to print controller **24** along communication link **92** and/or communication link **112**, respectively, thereby informing print controller **24** that print media **28** has reached a designated point along the print media pathway **110**. Also, once leading edge **124** is detected by print media sensor **86** and/or **90**, radio frequency interrogating device **94** may begin interrogating radio frequency signature **88** in order to detect its presence.

[**0025**] Print controller **24** may access print driver **130** to obtain information about the print media **28** such as, for example, the expected horizontal position of the radio frequency signature **88** on print media. Print controller **24** may note the time (t_1) when the leading edge **124** of print media **24** first is detected by either sensor **86** and/or sensor **90**. Next, print controller **24** may note the time (t_2) when radio frequency signature **88** is detected by radio frequency interrogating device **94**. By subtracting one time from the other (t_1-t_2), the difference (Δt) may be calculated to determine a time difference between the time the leading edge **124** of the print media **28** is detected and the time when a radio frequency signature **88** is detected. A similar computation can be made using the trailing edge **126** of print media **28**.

[**0026**] As shown, radio frequency interrogating device **94** includes a radio frequency antenna **96** that is angularly positioned with respect to the direction of travel of print media **28** as indicated by arrow **120**. By placing radio frequency antenna **96** at an angle with respect to the direction of travel of the print media **28**, the time delta ($\Re t$) between the sensor trigger event (t_1) and the tag presence event (t_2) will depend upon the position of the radio frequency signature **88** from left to right on the print media **28**. If there are multiple radio frequency signatures (as indicated by elements designated as **88**, **91** and **93** on **FIG. 2***b*) on the print media **28**, the apparatus **10** and methods of the present invention may be used to determine the relative left/right position as well as the relative left/right order of each signature detected.

[**0027**] It is desired that radio frequency emitting devices that come within the range, as indicated by circular lines **126**, of radio frequency antenna **96** would be detected as the print media **28** is fed through print media pathway **110**. Various techniques may be used to ensure the desired sensitivity of the radio frequency antenna **96** such as, for example, shielding the transponder portion (not shown) of the antenna **96** so that it only responds when a radio frequency emitting device, such any one of signatures **88**, **91**, or **93**, are traveling directly below the transponder portion of the radio frequency antenna **96**. Other methods of obtaining a desired sensitivity may likewise be used. In this way, the radio frequency antenna **96** will not react to radio frequencies, such as any that may be emitting from stray or unintended signatures, which are left or right from a position signatures such as **88**, **91** or **93**. This allows the invention to be used with print media that may be embedded with a plurality of radio frequency information in the form, for example, of RFID tags which are not placed on the media for positioning purposes useful to the objects of the present invention.

[**0028**] A variety of factors may be used to calculate the position of a radio frequency signature. One such factor may include the separation ($\Re S$) between the radio frequency antenna **96** and one of the paper position sensors **86** and/or **90** in the apparatus **10**. In addition, the relative geometries of these devices (the antenna and sensors) may be made known to the printer controller **24** to assist in the position calculations.

[**0029**] **FIGS. 2***a* and **2***b* show that print driver **130** may be communicably linked to print controller **24** via communications link **132**. In this way, print controller **24** may obtain information indicating the expected separation of the leading edge **124** from the detection line **122** of radio frequency signature **88**. Once radio frequency signature **88** comes within detectable range of radio frequency interrogating device **94**, a signal may be communicated to print controller **24** over communications link **100**. Print controller **24** may compute the position of radio frequency signature **88** by using the computed time differential (Δt) with the velocity of print media **28** along print media pathway **110**. By comparing the computed position of the radio frequency signature **88** with the information obtained from print driver **130**, the relative horizontal position of radio frequency signature **88** (and **91** and **93** in **FIG. 2***b*) on print media **28** may be determined. Thus, outside a specified tolerance, a discrepancy between the computed position of the radio frequency signature **88** and the expected position may be taken as an indication the print media **28** is incorrectly oriented or mis-fed. Should print media **28** be incorrectly oriented, corrective action may be taken such as, for example, suspending print operations and/or sending a warning message to a user and/or canceling pending print requests. In this way, the waste and cost associated with ruined print media due to mis-orientations can be avoided.

[**0030**] Of course, it should be understood that variations to the functionality of radio frequency signature position detecting apparatus **10** may be implemented. For example, instead of detecting the leading edge, the print assembly **14** may be arranged to detect the trailing edge **126** of the print media. Also, print media sensors **86**, **90** may be configured

to detect both the leading edge **124** and trailing edge **126**. Still other variations will be apparent to those of ordinary skill.

[**0031**] In **FIG. 3**, a process flow diagram for a method of detecting the position of a radio frequency signature is shown and denoted generally as **150**. Process **150** begins at step **152** wherein a cut sheet of print media is fed through a print media pathway, such as pathway **110**. Step **154** determines if the leading edge (or trailing edge) of the print media is detected with the media being fed through the print media pathway until it is. Once detected, the print controller is notified, step **156**, and the print controller notes the time (t_1) when the print media is detected, step **158**. Depending on the imaging system, the print controller may activate the radio frequency interrogating device, step **160**, putting the device in a ready state for detecting a radio frequency signature, such as radio frequency signature **88**. In one specific embodiment, this entails a RFID reader interrogating a RFID tag within a detectable range of a radio frequency antenna **96** to determine when the RFID tag has passed through a designated point of the print media pathway **110**.

[**0032**] Next, at step **162**, it is determined if the radio frequency signature has been detected and, if so, process flow is directed to step **166** wherein the print controller is signaled to indicate the radio frequency signature has passed through a designated point along the print media pathway. If not, the print media continues to be fed along the media pathway, step **164**. Once the radio frequency signature is detected, the print controller notes the time (t_2) of detection, step **168**. Using the time difference (t_2-t_1), the known separation between the print controller and one or more print media sensor and the velocity profile of the print media, the position of a radio frequency signature on the print media may be calculated, step **170**.

[**0033**] **FIG. 4** is a process flow diagram, denoted generally as **200**, for a method of calculating the position of a radio frequency signature on print media as it is fed through print media pathway. Process **200** begins at step **202** wherein a print controller, such as print controller **24**, calculates the time differential (t_2-t_1) between the time the leading edge of print media fed through the printing device is detected and the time when a radio frequency signature on the print media is detected. Of course, a similar computation can be made using the trailing edge of print media. Next, at step **204** the position of the radio frequency signature on the moving print media is determined by considering the time differential along with the known separation between an edge of the print media and the radio frequency signature and the velocity profile of the printer which indicates how fast the print media is traveling through the printer's print media pathway. At step **206**, the calculated position of the radio frequency signature is compared with the expected position and a decision is made if the difference, if any, is within a specified tolerance. If so, that may be taken as an indication the print media is correctly oriented. On the other hand, should the difference in positions be outside a specified tolerance then a determination is made that print media is probably improperly oriented or mis-fed, with respect to an image orientation of a print job. As such, the print controller can cause the print assembly, such as print assembly **14**, to take corrective action, step **208**. Correction action may include, among other options, suspending ongoing print operations, sending a warning message to a user and/or canceling pending print requests.

[**0034**] Thus, the present invention provides apparatus and methods of determining the position of one or more radio frequency signatures on a cut sheet of print media in order to help eliminate or reduce the occurrence of ruined print media. It is contemplated the invention would allow the detection of print media that is improperly oriented or mis-fed. Such conditions have the potential of placing a radio frequency signature closer than or farther away from an edge of the print media as it is fed into the printer.

[**0035**] It should be understood that modifications can be made to the invention in light of the above detailed description. The terms used in the following claims should not be construed to limit the invention to the specific embodiments disclosed in the specification and the claims. Rather, the scope of the invention is to be determined entirely by the following claims, which are to be construed in accordance with established doctrines of claim interpretation.

What is claimed is:

1. A radio frequency signature position detecting apparatus comprising:

a printer assembly with a print media pathway through which print media is fed; and

a radio frequency interrogating device;

wherein the position of one or more radio frequency signatures on a sheet of print media fed through said print media pathway is detected by said radio frequency interrogating device allowing the relative horizontal position of said one or more radio frequency signatures to be determined.

2. The apparatus of claim 1 wherein said radio frequency interrogating device is angled with respect to the direction of travel of the said print media.

3. The apparatus of claim 2 wherein said printer assembly further comprises at least one print media sensor for determining when print media has reached a predetermined point along a print pathway.

4. The apparatus of claim 3 wherein said printer assembly further comprises a print controller in operable communication with said print media sensor.

5. The apparatus of claim 4 wherein said print media sensor is located a predetermined position from said radio frequency interrogating device and said position is known by said print controller.

6. The apparatus of claim 4 wherein said print media sensor signals said print controller upon detecting the leading edge of print media.

7. The apparatus of claim 4 wherein said print media sensor signals said print controller upon detecting the trailing edge of print media.

8. The apparatus of claim 1 wherein said radio frequency interrogating device further comprises:

a radio frequency antenna; and

a read/write module for detecting the presence of a radio frequency signature via said radio frequency antenna.

9. The apparatus of claim 8 further comprising a print controller in communication with said read/write module for receiving a signal from said read/write module indicative that a radio frequency signature has been detected.

10. The apparatus of claim 8 wherein said radio frequency antenna is shielded so that said read/write module detects the

presence of a radio frequency signature when said radio frequency signature is substantially below said radio frequency antenna.

11. The apparatus of claim 8 wherein said radio frequency antenna is positioned about said print media pathway such that a radio frequency signature is detected when print media fed through said print media pathway places said radio frequency signature substantially below said radio frequency antenna.

12. The apparatus of claim 11 wherein said read/write module does not react to radio frequency signatures to the left or right of a radio frequency signature substantially below said radio frequency antenna.

13. The apparatus of claim 1 wherein said radio frequency interrogating device is a RFID reader.

14. The apparatus of claim 13 wherein said radio frequency signature is contained in an RFID tag.

15. A radio frequency signature position detecting apparatus comprising:

a printer assembly having a print media feeder system for conveying print media through a print area of the printer assembly;

at least one print media sensor for detecting the presence of print media as it is fed by said print feeder system to said print area; and

a radio frequency interrogating device;

wherein the position of one or more radio frequency signatures on a sheet of print media fed is detected by said radio frequency interrogating device allowing the relative horizontal position of said one or more radio frequency signatures to be determined.

16. The apparatus of claim 15 further comprising a print controller in operable communication with said print media sensor.

17. The apparatus claim 15 wherein said print media sensor is located a predetermined position from said radio frequency interrogating device and said position is known by said print controller.

18. The apparatus claim 17 wherein said print media sensor detects the leading edge of print media as it traverses said print area of said printer assembly and wherein said print controller causes said radio frequency interrogating device to detect a radio frequency signature embedded in said print media and wherein said print controller determines the relative position of said radio frequency signature on said print media utilizing the predetermined position.

19. The apparatus of claim 15 wherein said radio frequency interrogating device comprises:

a RFID antenna; and

a read/write module for detecting the presence of a radio frequency signature via said radio frequency antenna.

20. The apparatus of claim 19 wherein said radio frequency antenna is shielded so that said read/write module detects the presence of a radio frequency signature when said radio frequency signature is substantially below said radio frequency antenna.

21. The apparatus of claim 19 wherein said radio frequency antenna is positioned such that a radio frequency signature is detected when said radio frequency signature is substantially below said radio frequency antenna.

22. The apparatus of claim 21 wherein said read/write module does not react to radio frequency signatures to the left or right of a radio frequency signature substantially below said radio frequency antenna.

23. A method of detecting the position of a radio frequency signature on print media comprising the step of using a radio frequency interrogating device to determine the relative position of a radio frequency signature traversing on a cut sheet of print media as the print media is fed through a printer's print media pathway.

24. The method of claim 23 further comprising the step of a print media sensor detecting the when said print media reaches a designated point along said print media pathway.

25. The method of claim 24 further comprising the step of the print controller noting the time when the print media sensor detects the print media as having reached a designated point along said print media pathway.

26. The method of claim 25 further comprising the steps of:

the radio frequency interrogating device detecting the presence of a radio frequency signature embedded in print media; and

the print controller noting the time when the radio frequency interrogating device detects the presence of a radio frequency signature embedded in the print media.

27. The method of claim 26 further comprising the step of the print controller calculating the time difference between when the print media sensor detects the print media as having reached a designated point along said print media pathway and when the radio frequency interrogating device detects the presence of a radio frequency signature embedded in the print media.

28. The method of claim 27 further comprising the step of the print controller using the time difference and the known angle between the radio frequency interrogating device and the print media sensor to calculate the relative left/right position of the radio frequency signature.

29. The method of claim 23 further comprising the steps of:

a print controller calculating the time differences between when a print media sensor detects a cut sheet of print media as having reached a designated point along said print media pathway and when a radio frequency interrogating device detects the presence of two or more radio frequency signatures embedded in the print media; and

the print controller using the time differences and the known angle between the radio frequency interrogating device and the print media sensor to calculate the relative left/right positions of each radio frequency signature embedded in the print media.

30. The method of claim 29 further comprising the step of the print controller calculating the relative left/right order of each radio frequency signature embedded in the print media.

31. The method of claim 29 further comprising the step of the print controller determining if print media is mis-oriented or mis-fed.

32. The method of claim 31 further comprising the step of the print controller taking corrective action if the print media is mis-oriented or mis-fed.

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