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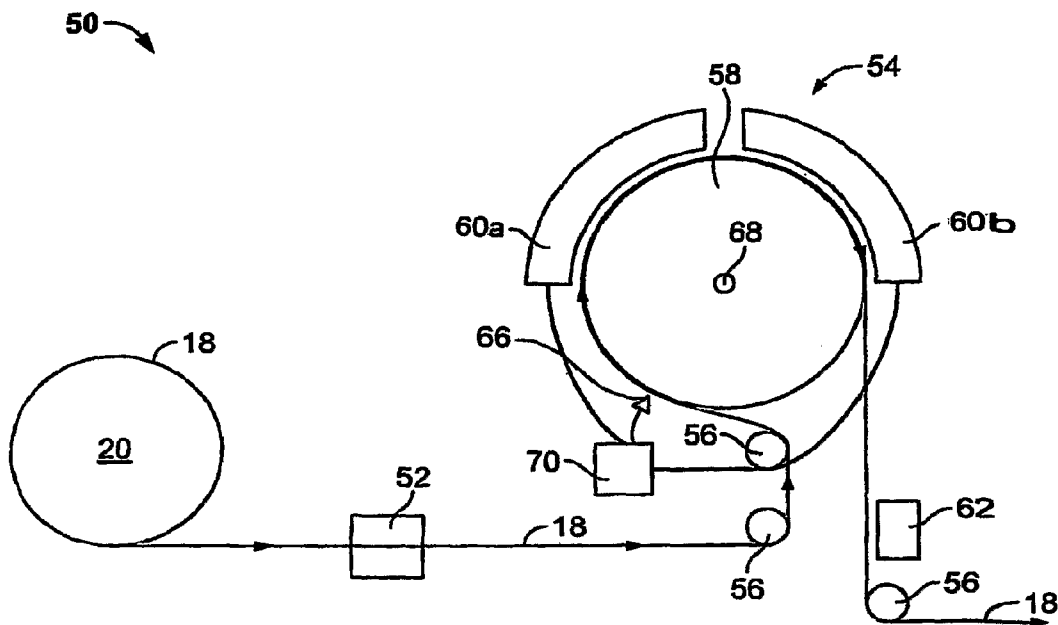
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(54) Title: USE OF A SENSE MARK TO CONTROL A PRINTING SYSTEM



(57) Abstract: A printing system includes a printer that prints only a sense mark on a substrate and an imaging unit. The imaging unit prints data onto the substrate and includes a plurality of printheads. The printing system also includes a sensor that detects the sense mark and a controller that instructs the imaging unit to print data onto the substrate, wherein the controller distributes print data among the plurality of printheads.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

AMENDED CLAIMS

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WE CLAIM:

1. A printing system, comprising:
 - a printer that prints only a sense mark on a substrate;
 - an imaging unit that prints data onto the substrate, wherein the imaging unit includes a plurality of printheads;
 - a drum associated with the imaging unit, wherein the substrate is fed onto the drum;
 - a sensor that detects the sense mark; and
 - a controller that instructs the imaging unit to print data onto the substrate, wherein the controller distributes print data among the plurality of printheads.
2. The printing system of claim 1, wherein the printer prints a plurality of sense marks on the substrate, and wherein consecutive sense marks are separated by a predetermined distance.
3. The printing system of claim 2, wherein the sense marks indicate a top of page or a bottom of page.
4. The printing system of claim 2, wherein the controller distributes the print data among the plurality of printheads in accordance with the detection of the sense marks and the angular position of the drum.
5. The printing system of claim 4, wherein the controller tracks the positions of multiple sense marks and distributes portions of a raster line among the plurality of print heads in accordance with the positions of the sense marks.
6. The printing system of claim 2, wherein the substrate is a paper web that is fed onto the drum.
7. The printing system of claim 6, wherein the imaging unit is capable of printing data on substantially the entire width of the paper web including the portion wherein the sense marks are printed.

8. The printing system of claim 6, wherein the sensor detects the sense marks after the paper web contacts the drum.

9. The printing system of claim 8, wherein the imaging unit prints data onto the paper web while the paper web is in contact with the drum.

10. The printing system of claim 9, wherein the paper web is driven by the rotation of the drum.

11. The printing system of claim 9, further comprising a second imaging unit that prints data onto the substrate subsequent to the first imaging unit, wherein the second imaging unit includes a plurality of printheads,

a second drum associated with the second imaging unit, wherein the paper web is fed onto the second drum,

and a second sensor that detects the sense marks at the second imaging unit,

and wherein the controller distributes print data among the plurality of printheads of the second imaging unit in accordance with the detection of the sense marks so that the data printed by the second imaging unit is aligned with the data printed by the first imaging unit.

12. The printing system of claim 11, wherein the first imaging unit prints data on a front side of the paper web and the second imaging unit prints data on a back side of the paper web, and wherein the sense marks are detected by the second sensor before the paper web contacts the second drum.

13. The printing system of claim 11, wherein the first imaging unit prints data on a first side of the paper web and the second imaging unit prints data on a back side of the paper web, and wherein the printer prints sense marks on both sides of the paper web and the sense marks are detected by the second sensor after the paper web contacts the second drum.

14. The printing system of claim 11, wherein the first imaging unit prints data on a first side of the paper web and the second imaging unit prints data on a back side of the paper web, and wherein the printer prints the sense marks on only one side of the paper web in infrared or invisible ink, and the sense marks are detected by the second sensor after the paper web contacts the second drum.

15. The printing system of claim 9, wherein the paper web is in contact with the surface of the drum along greater than 180 degrees.

16. The printing system of claim 15, wherein the paper web is in contact with the surface of the drum along about 270 degrees.

17. The printing system of claim 16, wherein the paper web first contacts the drum along a substantially horizontal tangent line and separates from the drum along a substantially vertical tangent line.

18. The printing system of claim 17, wherein the paper web separates from the drum and moves into a drying station before coming into contact with a turn-bar.

19. A method of printing, comprising the steps of:
printing a plurality of sense marks on a substrate using a printer that prints only the sense marks, wherein consecutive sense marks are separated by a predetermined distance;
feeding the substrate onto a drum associated with an imaging unit;
detecting the sense marks; and
instructing the imaging unit to print images onto the substrate, wherein the instructing step distributes print data among a plurality of printheads in the imaging unit.

20. The method of claim 19, wherein the sense marks indicate a top of page or a bottom of page.

21. The method of claim 19, wherein the instructing step distributes the print data among the plurality of printheads in accordance with the detection of the sense marks and the angular velocity of the drum, and further comprising the step of tracking the positions of multiple sense marks.

22. The method of claim 19, wherein the substrate is a paper web driven past the plurality of print heads by the rotation of the drum.

23. The method of claim 22, further comprising the step of printing images onto the paper web in accordance with the instructing step, wherein the second printing step is capable of printing data on substantially the entire width of the paper web, including the portion wherein the sense marks are printed.

24. The method of claim 23, wherein the detecting step detects the sense marks after the paper web is fed onto the drum.

25. The method of claim 24, wherein the second printing step prints images onto portions of the paper web that are in contact with the drum.

26. The method of claim 25, further comprising the steps of feeding the paper web onto a second drum associated with a second imaging unit, and instructing the second imaging unit to print images onto the substrate, wherein the first imaging unit prints images onto a first side of the paper web and the second imaging unit prints images onto a second side of the paper web, and wherein the instructing step distributes print data among a plurality of printheads in the second imaging unit so that the images printed by the first and second imaging units are aligned.

27. The method of claim 26, further comprising the step of detecting the sense marks at the second imaging unit at a position before the paper web is in contact with the second drum.

28. The method of claim 26, further comprising the step of detecting the sense marks at the second imaging unit after the paper web is in contact with the second drum, wherein the printing step prints sense marks on both sides of the paper web.

29. The method of claim 26, further comprising the step of detecting the sense marks at the second imaging unit after the paper web is in contact with the second drum, wherein the printing step prints the sense marks on only one side of the paper web in infrared or invisible ink.

30. The method of claim 22, wherein the paper web is in contact with the surface of the drum along greater than 180 degrees.

31. The method of claim 30, wherein the paper web is in contact with the surface of the drum along about 270 degrees.

32. A printing system, comprising:

a sense mark printer that prints only a plurality of sense marks on a paper web, wherein consecutive sense marks are separated by predetermined distances;

an imaging unit that prints images on the paper web, wherein the imaging unit includes a plurality of printhead assemblies;

a drum that drives the paper web past the printhead assemblies;

a sensor that detects the sense marks after the paper web has contacted the drum;

a controller that instructs the printhead assemblies to print images onto the paper web, wherein the controller tracks the position of multiple sense marks concurrently and accounts for the speed of the paper web so that the printhead assemblies print images onto the paper web in accordance with the sense marks.

33. The printing system of claim 32, further comprising a second imaging unit that prints images on the paper web downstream from the first imaging unit, wherein the second imaging unit includes a plurality of printhead assemblies, and wherein a second sensor at the second imaging unit detects the sense marks before the paper web has contacted a second drum that drives the paper web past the printhead assemblies associated with the second imaging unit.

34. The printing system of claim 32, further comprising a second imaging unit that prints images on the paper web downstream from the first imaging unit, wherein the second imaging unit includes a plurality of printhead assemblies, and wherein a second sensor at the second imaging unit detects the sense marks after the paper web has contacted a second drum that drives the paper web past the printhead assemblies associated with the second imaging unit.

35. The printing system of claim 34, wherein the sense marks are printed on one side of the paper web in infrared or invisible ink.