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(54) **Method and system for colour correction in printing jobs performed in a printing machine**

(57) The present invention relates to color correction system and method for correcting color in print jobs run in a printing machine, whereby a first ink unit provides to a printing group of a printing machine an initially mixed ink similar to a target color provided by a prepress digital file. Printing is performed on a support, and an optical sensor obtains colorimetric information about the printed color, which is compared with the target color by means of a control device detecting color deviations in the printed color and calculates the composition of a corrective ink which, when mixed with the initially mixed ink, allows printing colors without color deviations. A second ink unit controlled by the control device provides said corrective ink with temperature and/or viscosity similar to the temperature and/or viscosity of the initially mixed ink used during initial printing.

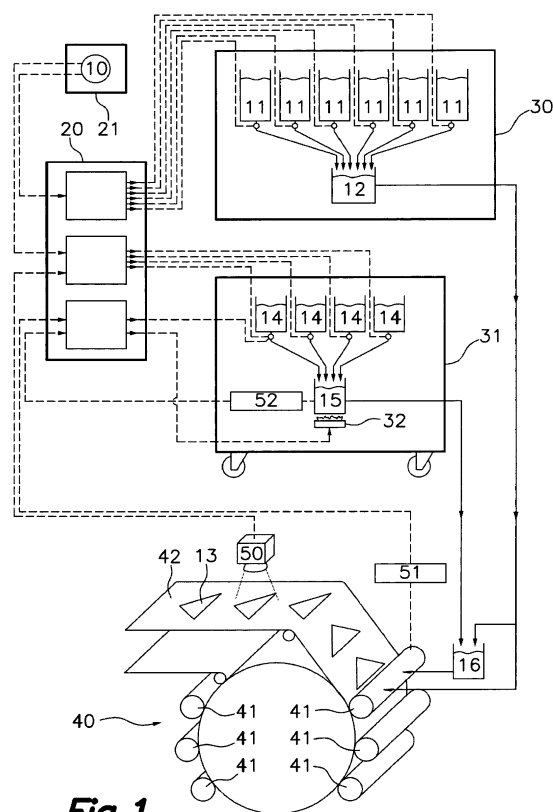


Fig. 1

Description

Field of the Art

[0001] The present invention relates to the field of printing machines provided with a plurality of printing groups, each fed by an ink with a certain specific composition obtained from mixing pigments or dyes and liquids, and precisely regulating the composition of said ink for obtaining color for printing on a substrate by means of an initial printing step with an initially mixed ink, and a final printing step with a corrected ink obtained from the initially mixed ink corrected by means of amounts of corrective ink.

State of the Art

[0002] Assigning a target color to printing performed on a substrate, calculating the amounts of first basic inks that must be mixed to obtain an initially mixed ink that allows printing said target color with few color deviations with respect to said target color, and then dispensing said calculated amounts of first basic inks by means of a first ink preparation and dispensing unit are known in the state of the art in the field of printing machines, said first unit being a static unit suitable for serving, simultaneously or successively, one or several printing machines each provided with one or several printing groups. Supplying each initially mixed ink to at least one printing group, for example by means of a system of pipes and pumps, and performing initial printing with these initially mixed inks, which printing is then analyzed by means of optical sensors detecting values relating to the color qualities of all or part of the printed substrate is also known.

[0003] Finally, the use of a second ink production and dispensing unit different from the first ink production and dispensing unit for obtaining a corrective ink which, when added to the initially mixed ink, allows obtaining print colors with minimized color deviations is known.

[0004] Document DE 20105481U1 discloses a device and method of the type described above, in which an initial ink mixture created by an initial first ink mixer is provided to a printing machine printing a sample. Sensors obtain color values that are compared with reference values, detecting deviations, and a second ink mixer different from the initial ink mixer generating a corrective ink which is added to the initial ink mixture.

[0005] Document US2791323 discloses the inclusion of an ink mixer integrated in the printing machine itself.

[0006] Document WO2007110764A2 describes an automatic ink mixture dispenser arranged in a moving carriage with wheels which can be moved to any desired location by a user.

[0007] Finally, document EP2219870 (Windmüller) describes an ink color correction system in which a first ink mixing device generates an initial mixture which is supplied to at least one printing machine, and a second ink supplying device generates a corrective ink mixture

which can be mixed with the first ink mixture to correct color deviations in the print color detected by means of optical sensors.

[0008] None of these documents discloses controlling the corrective ink so that it has temperature and/or viscosity properties that are comparable with the temperature and/or viscosity of the initially mixed ink provided in the printing machine, such that upon mixing with the latter, the corrective ink makes said mixing easier.

Brief Description of the Invention

[0009] The present invention relates to a method and system for obtaining a corrected ink which allows printing by means of a printing machine, minimizing color deviations with respect to color values of target colors established as the colors to be obtained. Said target colors can be included in a prepress digital file accessible throughout the proposed method or be in the form of a physical sample, or in the form of a reference to a colorimetric value of a defined and known scale, such as Pantone colors, for example.

[0010] One and the same ink can produce different print colors or different tones of said color, depending on parameters such as the thickness of the layer of ink deposited, the degree of absorption of the printing substrate, the size of the printing dot, etc. These and other parameters may be affected depending on the temperature and viscosity of the ink used during printing, so regulating these parameters is relevant for obtaining a specific color.

[0011] To better understand the following description, the nomenclature that will be used in the rest of the document is defined below:

Inks refer to solutions containing pigments, pigment bases or dyes in liquid medium, such as a varnish or solvent. Inks can also refer to colorless transparent inks, colorless solvents or pigment-free varnishes. Inks allow obtaining inks of different colors by means of mixing them at different concentrations. The most common pigment bases or pigments are, in a non-limiting manner: magenta, cyan, yellow, blue, green, red, white and black. Furthermore, inks are quite often obtained from only one of these pigment bases or pigments, these pigment bases or pigments therefore also being the most common basic ink colors.

[0012] In this document, colors refer to any visible color tone in any degree of saturation obtained from mixing or combining the pigment bases or inks described above.

[0013] The target color is a pre-established reference color to be obtained as the result of the final printing.

[0014] The first basic inks are those separately stored inks intended for being used directly in a printing machine or for being mixed to obtain initially mixed inks, which have colors different from the colors of the first basic inks.

[0015] The initial print color is the color obtained from printing with at least one printing group of a printing machine provided with an initially mixed ink.

[0016] The second basic inks are those separately stored inks intended for being used directly or for being mixed to the initially mixed inks, obtaining corrected inks. The second basic inks can be mixed with one another before being mixed with the initially mixed inks, resulting in corrective inks.

[0017] The color correction system according to the already known state of the art consists of:

- at least one printing machine provided with at least one printing group. Each printing group is capable of printing with a single ink, and therefore in a single color, so multicolor printing requires a plurality of printing groups.
- each of the printing machines has at least one optical sensor suitable for detecting color deviations in the initial print color printed on a substrate by said printing machine with said initially mixed ink.
- separate containers containing second basic inks suitable for being supplied to one or more printing groups of one or more printing machines provided with initially mixed ink for obtaining a corrected ink.

[0018] Optionally, according to the already known state of the art, the system can also have:

- a first ink preparation and dispensing unit, hereinafter first ink unit, provided with different first basic inks in separate containers, and said first ink unit being suitable for supplying initially mixed inks to one or more printing groups of one or more printing machines;
- at least one second ink preparation and dispensing unit, hereinafter second ink unit, which is independent from the first ink unit and is provided with second basic inks in separate containers, and said second ink unit being suitable for supplying corrective inks to one or more printing groups of one or more printing machines provided with initially mixed ink;
- at least one control device suitable for regulating at least the first ink unit and second ink unit and for receiving information from the mentioned at least one optical sensor. According to the proposal of this invention, the system also has:
- at least one temperature and/or viscosity sensor integrated in each printing group, capable of providing data relating to the initially mixed ink contained in said printing group;
- at least one heating and/or cooling device suitable for obtaining a corrected ink with temperature and/or viscosity equal to the temperature and/or viscosity of the initially mixed ink, according to the data provided by said at least one temperature and/or viscosity sensor; and/or
- a container containing a colorless solvent suitable

for altering the viscosity conditions of a corrected ink by means of the addition thereof.

[0019] This system allows supplying initially mixed inks to one or to a plurality of printing machines and knowing the value of these physical variables relating to the initially mixed ink used in each printing group during initial printing by means of temperature and/or viscosity sensors, and it also allows altering the temperature and/or viscosity of the corrected ink, or of the second basic inks, or of the corrective ink, so that said corrected ink maintains the same temperature and/or viscosity as the initially mixed ink.

[0020] The described system is used to implement the following color correction method for correcting color in print jobs run in a printing machine by means of the following steps already known in the field of the art:

- a) providing, to each one of one or more printing groups of one or more printing machines, an initially mixed ink with color qualities equal or very close to the color qualities of one of the established target colors which are at least one in number, the color values of which are known;
- b) performing initial printing on a substrate with one of said printing machines by means of one or more of its printing groups each provided with an initially mixed ink;
- c) obtaining color values relating to at least one initial print color resulting from step b) by means of at least one optical sensor;
- d) detecting color value deviations between each initial print color detected by the optical sensor and its respective target color;
- e) based on said detection of step d), calculating amounts of second basic inks to be dispensed for correction for each initially mixed ink printing colors with deviations;
- f) precisely adding to each initially mixed ink printing with deviations the respective calculated amounts of the second basic inks, and homogenizing same for obtaining a corrected ink which allows performing final printing with minimized color deviations; and
- g) performing final printing.

[0021] According to the proposal of this invention, this color correction method further comprises the following additional steps:

- h) acquiring data relating to the temperature and/or viscosity values of the initially mixed ink during step b) by means of temperature and/or viscosity sensors integrated in the printing machine;
- i) using the data acquired in step h) to obtain a corrected ink with temperature and/or viscosity values equal to the temperature and/or viscosity values of the initially mixed ink during step b) by means of regulating at least one heating and/or cooling device

and/or by means of adding solvents.

[0022] Step i) allows modifying the physical properties of the corrective ink relating to temperature and/or viscosity to make mixing it with the initially mixed ink easier in a quicker and more uniform manner, and to assure that the resulting color is the desired color.

[0023] To achieve said temperature and/or viscosity regulation, the heating and/or cooling device controlled by the control device allows individually heating or cooling the second basic inks, or the dispensed amounts of the second basic inks, or the corrective ink, or the corrected ink, so that their temperature is increased or reduced and their viscosity altered. Alternatively or additionally, a colorless solvent which can be metered into the corrected ink or corrective ink to reduce viscosity thereof is provided.

[0024] Therefore, first target colors which, can be included, for example, along with other information relating to the document to be printed, such as the shape, size, motifs to be printed, etc..., are provided to the control device in a prepress digital file. An initially mixed ink with color values close or equal to the color values of the target color is then provided to at least one printing group of at least one printing machine.

[0025] Initial printing is then performed with said initially mixed inks on a printing support, one or several initial print colors thus being obtained.

[0026] Values relating to the color qualities of each analyzed initial print color are obtained by means of an optical sensor arranged in the printing machine.

[0027] Said obtained color values are then compared with the color values of the target colors. As a result of said comparison, possible color deviations between both values are detected, and the precise amounts of second basic inks necessary for obtaining a corrected ink capable of print colors with minimized color deviations are calculated.

[0028] The calculated amount of second basic inks is precisely added, respectively, to each initially mixed ink of each printing group. Preferably, a sensor will be provided for sensing the dispensed amount of ink that will consist, for example, of a scale which can measure both the weight gain of the dispensed ink collection container, and the weight loss of the stored amounts of second basic inks upon extracting an amount of ink therefrom.

[0029] This step can be performed manually by an operator or automatically.

[0030] The control device also has data relating to the temperature and/or viscosity of the initially mixed ink used for initial printing as a result of sensors installed in the printing machine, and data relating to the temperature and/or viscosity of the corrective ink as a result of sensors arranged in the second ink unit. With that information the control device regulates the amount of solvent and/or the temperature of the corrective ink, such that they have a viscosity and/or temperature that are substantially equal or with a predetermined difference, with respect to the

initially mixed ink used in initial printing.

[0031] Said temperature and/or viscosity adjustment is achieved either by means of an adjustable heating and/or cooling device or by means of adding colorless solvents. Temperature alteration can affect the viscosity of the ink, and both the viscosity and the temperature can affect the final print color of an ink, since they can modify ink absorption by the substrate or can affect the thickness of the layer of ink deposited on said substrate, or even the size of the printing dot. All these parameters will affect color and must therefore be considered when performing color corrections.

[0032] This method allows obtaining a corrected ink that provides printing with minimized color deviations with respect to target colors and without altering the viscosity and/or temperature characteristics of the initially mixed ink arranged in the printing machine upon adding thereto the corrective ink or the amounts of second basic inks, achieving better homogenization and increasing reliability and precision in color correction, and therefore in obtaining the target color.

[0033] Adding the amounts of second basic inks necessary for obtaining the corrected ink directly to the initially mixed ink, without being previously mixed together forming the corrective ink, prevents dirtying a mixing container which must be cleaned using specific products with the economical and environmental costs this involves, so preventing the mixing of said corrective ink leads to savings.

[0034] The printing machines in which this system and method are implemented can be a central drum type printing machine, for example an offset-, flexographic-, rotogravure-type printing machine.

[0035] Optionally, the initially mixed ink can be obtained from mixing different first basic inks, for example in a first ink preparation and/or dispensing unit capable of serving initially mixed inks to a plurality of printing machines, for example.

[0036] A control device can have the color information of the target color or colors, whereby the amounts of first basic inks necessary for preparing the initially mixed inks can be calculated. The mentioned control device can also automatically control said first ink preparation and/or dispensing unit to provide the calculated amounts of first basic inks.

[0037] Similarly and also optionally, a second ink preparation and/or dispensing unit provided with a plurality of second basic inks separated in independent containers can provide the amounts of second basic inks necessary for obtaining the corrected ink. The mentioned second unit can be located on a moving platform which can be located adjacent to a printing machine for correcting the print colors of said printing machine, and can subsequently be moved to a position adjacent to another printing machine where the operation is repeated. Optionally, it is also envisaged that said second unit is integrated in each printing machine. This second unit can also be controlled by the control device.

[0038] According to one embodiment, the control device receives the color information relating to the first print colors detected by the optical sensors and calculates the amounts of second basic inks necessary for obtaining the corrected ink based on the information relating to the target colors available.

[0039] The first and second ink preparation and/or dispensing units can be independent from one another, not being physically connected or intercommunicated whatsoever, so one or both units lack control devices, or both have independent control devices.

[0040] According to an alternative embodiment, both ink preparation and/or dispensing units are connected to one another and share data, both can even be controlled by one and the same centralized control device controlling both units, said control device being able to be physically located in the first ink preparation and/or dispensing unit, in the second unit, or in none of them, and being able to control them remotely or be distributed in different nodes connected to one another wirelessly for example.

[0041] By way of non-limiting example, the mentioned control devices can be a computer, a programmable logic controller or the like, provided with data inputs and outputs and memories, and implementing calculating operations, said device being able to be fed with data from sensors and/or databanks, and these calculating operations allowing providing control orders. Said control device can be a single centralized device or consist of multiple distributed nodes that are connected to or independent from one another. Many other equivalent solutions are possible, as will be obvious for a person skilled in the art.

[0042] Said control device will include a supply source and can comprise data display means such as a screen to provide information to an operator. It can also comprise means allowing said operator to alter the configuration of the control device, such as, for example, a keyboard, pushbuttons, a options menu, etc. These devices can be local or remote devices.

[0043] Preferably, the second ink unit will be smaller than the first ink unit, such that it can be more easily handled or even transported by a single operator using a carriage with wheels, for example. To obtain this small size, the second ink unit can have a smaller number of second basic inks with respect to the number of first basic inks contained in the first ink unit, and/or the containers containing said second basic inks are smaller than the containers containing the first basic inks.

[0044] Other features of the invention will be described in the following detailed description of an embodiment.

Brief Description of the Drawings

[0045] The foregoing and other advantages and features will be better understood from the following detailed description of an embodiment in reference to the attached drawing, which must be interpreted in an illustrative and non-limiting manner, in which:

Figure 1 shows a simplified diagram of the proposed color correction system, showing only the system applied to a single printing group of a single printing machine, and in which the arrows drawn with a solid line symbolize the ink trajectory, and the arrows drawn with dotted lines symbolize data connections.

Detailed Description of an Embodiment

[0046] According to a first non-limiting embodiment, there are provided three flexographic printing machines 40 having a central drum, each provided with six printing groups 41.

[0047] Information relating to the printing to be performed is provided by means of a prepress digital file 21 containing the motifs to be printed, coinciding with the printing plates arranged in each of the printing groups, preferably with the monochromatic motifs separated from one another, as well as target colors 10 with which each of said motifs must be printed. This information is stored in a digital memory of a control device 20 formed by a PLC (programmable logic controller).

[0048] A first ink preparation and dispensing unit 30, hereinafter first ink unit 30, is provided with first basic inks 11, corresponding to frequently used specific colors and/or to primary color inks with which other colors are obtained by means of mixing same, and/or to solvents or colorless inks. Said first ink unit 30 also has means for precisely dispensing inks and is controlled by means of the control device 20.

[0049] Based on the target colors 10 provided, the control unit 20 calculates the amounts of each of the first basic inks 11 necessary for obtaining each of the initially mixed inks 12 required for printing each of the target colors 10.

[0050] The control unit 20 actuates the first ink unit 30 to dispense the calculated amounts of the first basic inks 11, thus obtaining the initially mixed inks 12 which are supplied to at least one of the printing groups 41 of at least one printing machine 40 by means of a system of pipes and pumps, for example. This operation is repeated until having supplied at least all the initially mixed inks 12 necessary for printing the target colors 10 included in the prepress digital file 21 to at least one printing machine 40.

[0051] Then printing is performed on a substrate 42 with a printing machine 40 the printing groups 41 of which have the printing plates and the corresponding initially mixed inks 12 coinciding with the information in the prepress digital file 21. All or part of the printed substrate is analyzed by means of at least one colorimetric or optical sensor 50, such as a camera or a spectrophotometer, for example.

[0052] The control device 20 analyzes the data obtained by the optical sensors 50, spectrophotometric sensors, or density sensors and compares this data with the target colors 10 included in the prepress digital file 21. Said comparison allows automatically detecting color de-

viations in the initial print color 13. Said control device 20 then designs, by means of calculation, corrective inks 15 which, when mixed with the initially mixed inks 12 and once printed, give rise to printed colors 13 with minimized color deviations and/or which allow eliminating said color deviations in future printings.

[0053] A second ink preparation and dispensing unit 31, hereinafter second ink unit 31, has second basic inks 14 stored in second containers and corresponding to primary color inks, white ink, and black ink, with which other colors are obtained by means of mixing same, and/or solvents or colorless inks. Said second ink unit 31 also has means for precisely dispensing the second basic inks 14. Said second ink unit 31 is independent from the first ink unit 30 and is controlled by the control device 20 regulating same for obtaining the corrective ink 15, which is supplied by an operator or by means of pipes to each printing group 41, where the corrective ink 15 is mixed with the initially mixed ink 12 to obtain the corrected ink 16.

[0054] Optionally and in a non-limiting manner, the second ink unit 31 is integrated on a platform with wheels that can be pushed by a user and arranged next to any of the three printing machines 40. Said second ink unit 31 has a smaller number of second basic inks 14 to be dispensed contained in smaller second containers compared with the first ink unit 30. Furthermore, the control device 20 of the first ink unit 30 and the second ink unit 31 can be centralized in the first ink unit 30 by remotely controlling the second ink unit 31, or it can be divided into nodes located in each of the ink units 30 and 31, but sharing information wirelessly.

[0055] For correct and quick homogenous mixing of the initially mixed ink 12 and corrective ink 15, and to enable prompter production start-up, the second ink unit 31 provides the corrective ink 15 at a temperature and/or viscosity equal to the temperature and/or viscosity of the initially mixed ink 12 arranged in at least one printing group 41 which has been heated to obtain better printing, as per usual practice. This information is transmitted to the control device 20 from printer temperature and/or viscosity sensors 51 arranged in each printing group 41.

[0056] The second ink unit 31 regulates the temperature of the dispensed corrective ink 15 using at least one heating device 32 controlled by the control device 20. The heating device 32 can consist of an ink unit temperature and/or viscosity sensor 52 and an electric resistance, arranged for heating and controlling the temperature of the dispensed corrective ink 15. An alternative embodiment in which the temperature of each of the amounts of second basic ink 14 dispensed for preparing the corrective ink 15 or the temperature of the second basic inks 14 contained in the second containers being individually regulated is also contemplated.

[0057] Additionally or alternatively, the second ink unit 31 can add a solvent or colorless ink to the corrective ink 15, thus thinning said corrective ink 15.

[0058] This temperature and/or viscosity regulation

prevents the temperature and/or viscosity of the corrective ink 15 from being substantially altered upon adding said corrective ink 15 to the initially mixed ink 12, and therefore makes mixing easier, the final print color 13 being more predictable. A quicker and more homogenous mixing of both inks is also achieved.

[0059] Additionally, other sensors can be added to the second ink unit 31 for obtaining a corrective ink 15 closer to the necessary corrective ink calculated by the control device 20, such as an ink unit optical sensor, for example, which allows obtaining color values of the actually dispensed corrective ink 15, and being able to perform additional adjustments before being supplied to the printing group 41.

[0060] Optionally, the amounts of second basic inks 14 used for minimizing color deviations in the print color 13 of a specific initially mixed ink 12 obtained based on a specific target color 10 are stored in a database accessible by the control device 20 together with said target color 10. The control device 20 consults said database in the initial steps of future successive jobs, searching for stored print jobs having color characteristics equal or similar to those color characteristics of the job to be implemented by the control device. If the control device 20 finds a previous job with comparable color characteristics, it can implement said amounts of inks necessary for minimizing color deviations, calculated and checked in previous jobs, in the preparation of the initially mixed ink 12 of the job to be done, thus reducing possible color deviations in the initial print color printed only with the initially mixed ink 12.

Claims

1. A color correction method for correcting color in print jobs run in a printing machine including:

- a) providing, to each one of one or more printing groups (41) of a printing machine (40), an initially mixed ink (12) with color qualities equal or very close to the color qualities of one of the established target colors (10) which are at least one in number, the color values of which are known;
- b) performing initial printing on a substrate (42) with said printing machine (40) by means of one or more of its printing groups (41) each provided with an initially mixed ink (12);
- c) obtaining color values relating to at least one initial print color (13) resulting from step b) by means of at least one optical sensor (50);
- d) detecting color value deviations between each initial print color (13) detected by the optical sensor (50) and its respective target color (10);
- e) based on said detection of step d), and for each initially mixed ink (12) printing with deviations, calculating amounts of second basic inks (14) to be dispensed for correction of each said

initially mixed inks (12) printing with deviations;
 f) precisely adding to each initially mixed ink (12) printing with deviations the respective calculated amounts of the second basic inks (14), and homogenizing same for obtaining a corrected ink (16) which allows performing final printing with minimized color deviations, and
 g) performing final printing;

characterized in that the method further comprises:

h) acquiring data relating to the temperature and/or viscosity values of the initially mixed ink during step b) by means of temperature and/or viscosity sensors (51) integrated in the printing machine;
 i) using the data acquired in step h) to obtain a corrected ink (16) with temperature and/or viscosity values equal or close to the temperature and/or viscosity values of the initially mixed ink during step b) by means of regulating at least one heating and/or cooling device (32) and/or by means of adding solvents.

2. The method according to claim 1, **characterized in that** step f) is carried out by an operator or by means of a second ink preparation and/or dispensing unit (31) having said second basic inks (14).
3. The method according to claim 1, **characterized in that** the initially mixed ink (12) is obtained from mixing amounts of first basic inks (11) dispensed in a first ink preparation and/or dispensing unit (30).
4. The method according to claim 3, **characterized in that** the second ink preparation and/or dispensing unit (31) is different and independent from the first ink preparation and/or dispensing unit (30), and **in that** said second ink preparation and/or dispensing unit (31) is remotely connected with the first ink preparation and/or dispensing unit (30).
5. The method according to claim 2 or 4, **characterized in that** the amounts of second basic inks (14) added to each initially mixed ink (12) printing with deviations in step f) were previously mixed creating a corrective ink (15).
6. The method according to any one of the preceding claims, **characterized in that** sensors measure the temperature and/or viscosity of the amounts of the second basic inks (14) added to each initially mixed ink (12) in step f) before the addition thereof.
7. The method according to claim 6, **characterized in that** the heating and/or cooling device (32) and/or the addition of solvents of step i) act on the corrected ink (16).

8. The method according to claim 6, **characterized in that** the heating and/or cooling device (32) and/or the addition of solvents of step i) alter the temperature and/or viscosity of the corrective ink (15), or the second basic inks (14), or the dispensed amounts of the second basic inks (14), before the addition thereof to the corrected ink (16).
9. The method according to any one of the preceding claims, **characterized in that** an automatic control device (20) has the color values of the target colors (10) and performs steps d) and e) based on that information.
10. The method according to claim 9 when it does not depend on claim 2, **characterized in that** the automatic control device (20) furthermore performs step f).
11. The method according to any one of claims 1 to 9, **characterized in that** the automatic control device (20) performs steps h) and i) and furthermore controls the first ink preparation and/or dispensing unit (30).
12. The method according to claim 2, **characterized in that** the second ink preparation and/or dispensing unit (31) performs step f) for all the printing groups (41) containing initially mixed ink (12) printing with deviations of one and the same printing machine (40) from a position adjacent to said printing machine (40), and then said second ink preparation and/or dispensing unit (31) is moved to a position adjacent to another printing machine (40), where step f) is repeated for all the printing groups (41) containing initially mixed ink (12) printing with deviations of said another printing machine (40).
13. The method according to any one of the preceding claims, **characterized in that** the amounts of second basic inks (14) used for minimizing color deviations in the print color (13) of a specific initially mixed ink (12) obtained based on a specific target color (10) are stored in a database together with said target color (10), and said database is accessible to implement said amounts of inks necessary for minimizing color deviations in the preparation of the initially mixed ink (12) in successive jobs.
14. A color correction system for at least one printing machine (40) including:
 - l) one or more printing groups (41) of one or more printing machines (40), each provided with an initially mixed ink (12) with color qualities equal or very close to the color qualities of one of the established target colors (10), which are at least one in number, the color values of which

are known;

II) at least one optical sensor (50) arranged in each of the printing machines (40) suitable for detecting color deviations in the print color (13) printed by said printing machine (40) with the at least one initially mixed ink (12);

III) separate containers containing second basic inks (14) to be supplied to one or more printing groups (41) of one or more printing machines (40) provided with initially mixed ink (12) for obtaining a corrected ink (16);

characterized in that:

each printing group (41) has at least one temperature and/or viscosity sensor capable of providing data relating to the initially mixed ink (12) contained in said printing group (41); and **in that** the system furthermore has

at least one heating and/or cooling device (32) suitable for obtaining a corrected ink (16) with temperature and/or viscosity equal to the temperature and/or viscosity of the initially mixed ink (12); and/or

a container containing a colorless solvent suitable for altering the viscosity conditions of a corrected ink (16) by means of the controlled addition thereof.

15. The system according to claim 14, **characterized in that** it integrates a first ink preparation and/or dispensing unit (30) which has first basic inks (11) in separate containers the dispensing of which provides initially mixed inks (12), and **in that** the second basic inks (14) are provided by a second ink preparation and/or dispensing unit (31), said first and/or second ink preparation and/or dispensing unit (30 and/or 31) integrating a control device (20) suitable for regulating said ink dispensing and/or preparation.

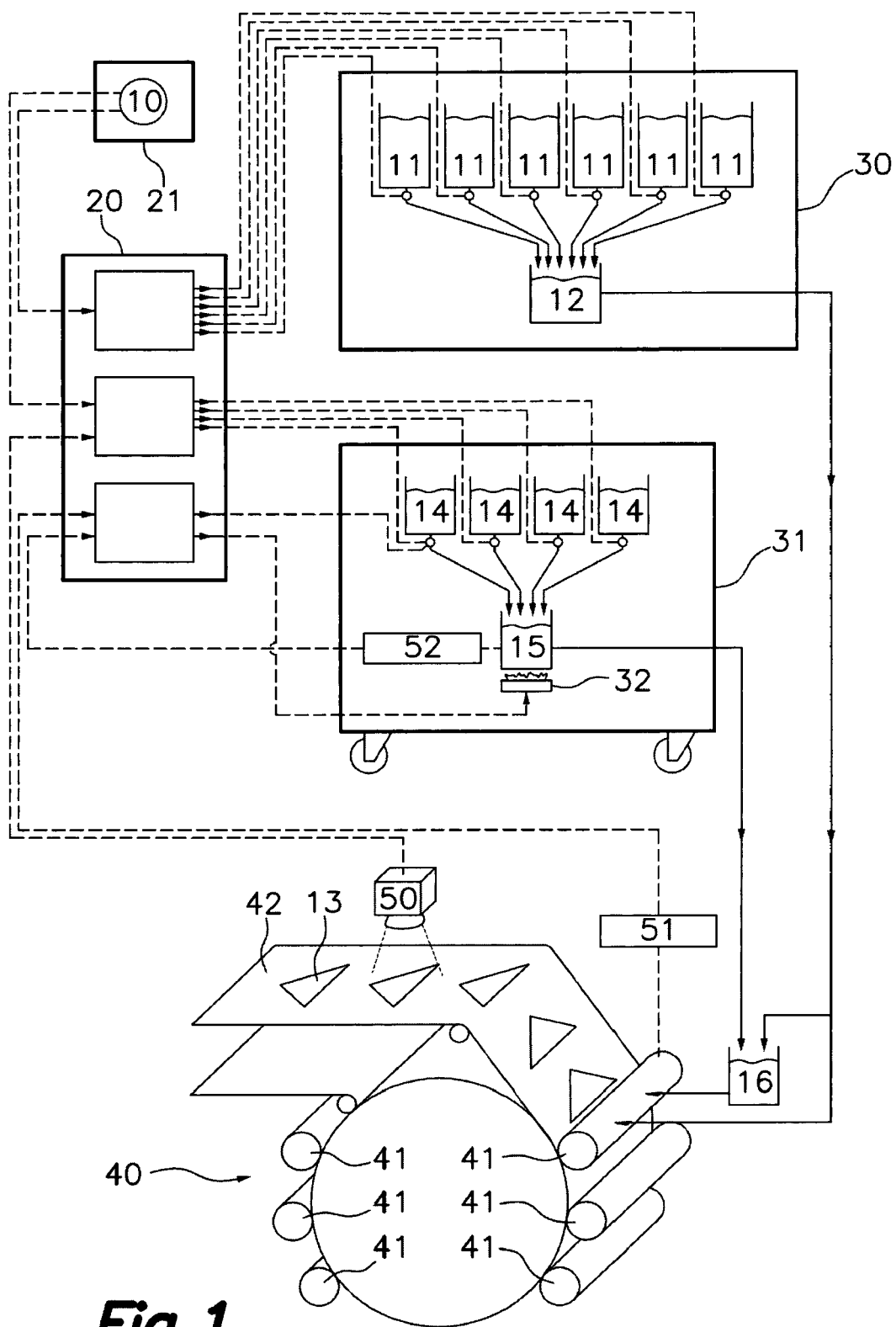


Fig. 1



EUROPEAN SEARCH REPORT

Application Number
EP 14 38 0023

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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)
X	DE 10 2007 059176 A1 (WINDMOELLER & HOELSCHER [DE]) 10 June 2009 (2009-06-10)	1-5,7-15	INV. B41F31/00 B41F31/02
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Place of search Munich		Date of completion of the search 24 June 2015	Examiner Fox, Thomas
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EPO FORM 1503 03.82 (P04C01)



Application Number

EP 14 38 0023

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 14 38 0023

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-15(partially)

A method according to claim 1, 2-13 (dependent on the first embodiment) and a system of claim 14 and 15 (dependent on the first embodiment) wherein the viscosity of the initially mixed ink is measured by a viscosity sensor and the viscosity is controlled by adding a solvent

2. claims: 1-15(partially)

A method according to claim 1, 2-13 (dependent on the second embodiment) and a system of claim 14 and 15 (dependent on the second embodiment) wherein the viscosity of the initially mixed ink is measured by a temperatur sensor and the temperature is controlled by a heating/cooling device

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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