

(19)



(11)

EP 3 538 369 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
04.10.2023 Bulletin 2023/40

(51) International Patent Classification (IPC):
B41J 2/01^(2006.01) B41J 2/155^(2006.01)
B41J 2/21^(2006.01)

(21) Application number: **17868586.3**

(52) Cooperative Patent Classification (CPC):
B41J 2/155; B41J 2/2146

(22) Date of filing: **13.07.2017**

(86) International application number:
PCT/TR2017/000082

(87) International publication number:
WO 2018/088979 (17.05.2018 Gazette 2018/20)

(54) **CONTINUOUS MULTI-PASS INKJET DIGITAL PRINTING MACHINE**

KONTINUIERLICHER TINTENSTRAHLDRUCKER MIT MEHREREN DURCHGÄNGEN

MACHINE D'IMPRESSION NUMÉRIQUE À JET D'ENCRE À PASSES MULTIPLES EN CONTINU

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

(74) Representative: **Kaya, Erdem**
Erdem Kaya Patent Inc.
Konak Mahallesi Kudret Sk.
Elitpark Park Sit. Ofisler Apt.
No: 12/27
16110 Nilüfer/Bursa (TR)

(30) Priority: **13.11.2016 TR 201616296**

(43) Date of publication of application:
18.09.2019 Bulletin 2019/38

(56) References cited:
EP-A2- 2 094 496 GB-A- 2 484 418
JP-B1- 2 979 398 US-A1- 2006 033 764
US-A1- 2006 139 394 US-B1- 8 864 283
US-B2- 6 938 970

(73) Proprietor: **Turan, Ali**
Nilüfer/Bursa (TR)

(72) Inventor: **Turan, Ali**
Nilüfer/Bursa (TR)

EP 3 538 369 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] Inkjet printing machines prints by spraying particular amount of paint material over the material which will be printed on. The paint material sprayed in particular amounts, mixes on the material which will be printed on, and desired colors are obtained.

Inkjet printing machines has two different constructions:

[0002]

1. Scanner type inkjet digital printing machines: The system in which printing is done by making the inkjet printheads scan the material which will be printed on in width. The simplest example of such is the inkjet printers available in offices.

2. Continuous inkjet digital printing machines: These machines are also named as machines with standing multiple printheads. In such machines, the inkjet printheads are placed to form a line along the width of the machine. Printing operation is realized with paint material sprayed from the inkjet printheads over the which will be printed while the material passes down the inkjet printheads in a fixed speed. Such printing machines are produced as single pass (in which the paint material of each colors that is required to form the image pattern can only be spread once). An example to such a system is enclosed within the utility model application with number TR2009/07956. Another example of a continuous multi-pass inkjet digital printing machine is disclosed in US 2006/0033764. It does not disclose a multi-canal printhead in which the canals have the same color.

INKJET PRINTHEADS:

[0003] Inkjet printheads have different constructions varying by company and models. In digital inkjet printing machines, separate inkjet printheads were used for each color. Inkjet printhead producers has started to manufacture double (canal) inkjet printheads for reducing the number of printheads in the printing machines. Double (canal) inkjet printheads accept filling the canals different paint materials with different colors, and control them independently. In other words, a single printhead can be used for two paint materials of different color, instead of requiring two inkjet printheads. It can be considered that, inkjet printheads with more canals will be produced in the future. In the application, such inkjet printheads are referred as "multi-canal inkjet printheads (8)".

FIGURES AND THEIR EXPLANATION**[0004]**

FIGURE-1: Continuous inkjet digital printing machine

FIGURE-2: Continuous inkjet digital printing machine with multi-canal inkjet printheads (8)

5 FIGURE-3: The bird's eye view of inkjet digital printing machine

10 FIGURE-4: The bird's eye view of inkjet digital printing machine with multi-canal inkjet printheads (8)

EXPLANATION OF NUMBERS USED IN THE FIGURES:**[0005]**

- 15 1. Belt (carrier of the print material (fabric, paper, nylon, etc.) which will be printed on)
- 20 2. Inlet of the will-be-printed material to the machine
3. Will-be-printed material glued onto the belt
4. Printing-completed material glued onto the belt
5. Outlet of printing-completed material from the machine
6. The cylinder to glue the will-be-printed material
7. Inkjet printheads
- 25 8. Multi-canal inkjet printheads
9. Inkjet printhead groups which are lined up along the width of the machine in a way to leave no printing gap and will be steady throughout the time of printing.
10. Cylinders carrying and moving the belt.
- 30 11. Redactor driving the cylinder
12. Belt moving motor
13. Belt washing system
14. Belt drying system

35 EXPLANATIONS OF THE FIGURES:

[0006] FIGURE-1: Continuous inkjet digital printing machine: Inkjet printheads (7) are placed inside the inkjet printhead groups which are lined up along the width of the machine in a way to leave no printing gap and will be steady throughout the time of printing (9). Within this system, equipment such as necessary electronics, communication system, paint material system is included.

[0007] FIGURE-2: Same structure as described for the continuous inkjet digital printing machine FIGURE-1, except the difference: Multi-canal inkjet printheads (8) are placed inside the inkjet printhead groups which are lined up along the width of the machine in a way to leave no printing gap and will be steady throughout the time of printing (9). Within this system, equipment for multi-canal inkjet printheads (8) such as necessary electronics, communication system, paint material system is included.

[0008] FIGURE-3: The bird's eye view of continuous inkjet digital printing machine in FIGURE-1.

55 **[0009]** FIGURE-4: The bird's eye view of continuous inkjet digital printing machine in FIGURE-2.

EXPLANATION OF NUMBERS ON THE FIGURES AND THE WORK METHOD:

[0010] Belt (1) provides movement to the will-be-printed material by making it glued on the belt (1) in a way that lets it be removed later.

[0011] Will-be-printed material inputs to the machine from the inlet of the will-be-printed material to the machine (2) is glued on the belt (1) by the cylinder to glue the will-be-printed material (6) in a way that lets it be removed later. The aim here is to avoid involuntary movements of will-be-printed material during printing. While the will-be-printed material glued onto the belt (3) moves along together with the belt with a fixed speed, printing is performed by spraying paint material from the inkjet printheads (7) and/or the multi-canal inkjet printheads (8) placed inside the inkjet printhead groups which are lined up along the width of the machine in a way to leave no printing gap and will be steady throughout the time of printing (9) in a way that will form the desired pattern. Printing-completed material glued onto the belt (4) is left the machine being removed from the belt (1) in the direction of outlet of printing-completed material from the machine (5). Controlled rotation movement is transferred to belt (1), by cylinders carrying and moving the belt (10), redactor driving the cylinder (11) and belt moving motor (12). After printing the belt (1) is washed with the belt washing system (13), and dried with the belt drying system (14).

[0012] Continuous inkjet digital printing machines are produced as complying to the single pass printing method. In single pass system; printing is performed by spraying the paint materials, which forms the pattern with different colors, from the inkjet printheads (7) and/or the multi-canal inkjet printheads (8) to the will-be-printed material only once. As the will-be-printed material moves continuously, there is no room to repeat spraying the identical color paint material to a point more than once. In such system, in order to increase the density of paint material, speed of printing is reduced, and more paint material is sprayed to each point. In case of scanner type printers; however, multi-pass printing is performed by scanning the medium multiple times.

OUR PROPOSED CONTINUOUS MULTI-PASS INKJET DIGITAL PRINTING MACHINE:

[0013] To perform multi-pass printing in continuous inkjet digital printing machines; the machine needs to be equipped with more than one inkjet printhead groups which are lined up along the width of the machine in a way to leave no printing gap and will be steady throughout the time of printing (9), each have the identical color printing materials.

[0014] That is accomplished by filling the multi-canal inkjet printheads (8) with identical color paint materials. In other words, the identical color paint materials should be available on the printing machine in consecutive or

within equal distances along the direction from inlet of the will-be-printed material to the machine (2) to outlet of printing-completed material from the machine (5). These paint materials are transferred to the multi-canal inkjet printheads (8) inside the one inkjet printhead groups which are lined up along the width of the machine in a way to leave no printing gap and will be steady throughout the time of printing (9), and are injected here.

[0015] In continuous inkjet digital printing machines, in order to increase the density of paint material, speed of printing is reduced, and more paint material is sprayed to each point. With this method, printing speed is decreased. As more paint is sprayed to a fixed place, the paint material diffuses on the surface before absorbed well.

[0016] In continuous multi-pass inkjet digital printing machines; however, the paint material is sprayed once; when the paint material is absorbed in to the will-be-printed material, then the paint material is sprayed to the particular point for a second time. With this method, without decreasing the printing speed, painting depth and density is obtained on the will-be-printed material in continuous multi-pass inkjet digital printing machines.

THE GOAL OF CONTINUOUS MULTI-PASS INKJET DIGITAL PRINTING MACHINE:

[0017] To obtain painting depth and density in continuous inkjet digital printing machines, without decreasing the printing speed. This patent application involves what needs to be done to reach this goal.

Claims

1. It is continuous multi-pass inkjet digital printing machine with the feature that; inkjet printhead groups (9), which are lined up along with width of the machine in a way to leave no printing gap and stand steady through the time of printing, consist of multi-canal inkjet printheads (8) that include a particular color print material enabling the spraying of the same color print materials to a particular point at different time instances from different sections.
2. It is the method to increase paint depth and density on the material to be printed on continuous inkjet digital printing machine with the feature that consists of;
 - Spraying the identical color print material to the same points on the material to be printed, at different time instances from the multi-canal inkjet printheads (8),
 - Having the spraying ability, such that the identical color print materials, which are sprayed at different time instances from the multi-canal inkjet printheads (8), hit the same point on the

material to be printed, by synchronizing the spraying to the movement speed of the material to be printed on.

Patentansprüche

1. Durchgehende multi-pass Inkjet-Digitaldruckmaschine; wobei die Inkjet-Druckkopfgruppen (9), die entlang der Breite von Maschine derart fluchten, dass sie keinen Druckspalt lassen und über die Druckzeit ständig bleiben, aus den multikanalen Inkjet-Druckköpfen (8) bestehen, die das Druckmaterial mit einer bestimmten Farbe umfassen und die vorsehen, dass die gleichfarbigen Druckmaterialien zu einem bestimmten Punkt in verschiedenen Zeiträumen aus verschiedenen Abschnitten zu spritzen. 5
10
15
2. Verfahren zur Erhöhung der Farbtiefe und Farbdichte auf dem in der durchgehenden Inkjet-Digitaldruckmaschine zu druckenden Material; wobei es aus Folgendem besteht; 20
 - Spritzen von dem gleichfarbigen Druckmaterial zu den gleichen Punkten auf dem zu druckenden Material in verschiedenen Zeiträumen aus den multikanalen Inkjet-Druckköpfen (8), 25
 - Aufweisen von Spritzenfähigkeit derart, dass die aus der multikanalen Inkjet-Druckköpfen (8) in verschiedenen Zeiträumen gespritzten gleichfarbigen Druckmaterialien zum gleichen Punkt auf dem zu druckenden Material treffen, indem das Spritzen auf die Bewegungsgeschwindigkeit des zu druckenden Materials abgestimmt wird. 30
35

- Pulvériser le matériau d'impression de couleur identique aux mêmes points sur le matériau à imprimer, à des instances temporelles différentes à partir des têtes d'impression à jet d'encre multi-canal (8),

- Avoir la capacité de pulvérisation, de manière à ce que les matériaux d'impression de couleur identique, qui sont pulvérisés à différents instances temporelles à partir des têtes d'impression à jet d'encre multi-canal (8), frappent le même point sur le matériau à imprimer, en synchronisant la pulvérisation avec la vitesse de déplacement du matériau à imprimer.

Revendications

1. Il s'agit d'une machine d'impression numérique à jet d'encre multi-passes en continu ayant la caractéristique que ; les groupes de têtes d'impression à jet d'encre (9), qui sont alignés le long de la largeur de la machine de manière à ne laisser aucun espace d'impression et à rester stables pendant toute la durée de l'impression, se composent de têtes d'impression à jet d'encre multi-canal (8) qui comprennent un matériau d'impression de couleur particulière permettant la pulvérisation des matériaux d'impression de même couleur à un point particulier à des instances temporelles différentes à partir de sections différentes. 40
45
50
2. Il s'agit d'une méthode pour augmenter la profondeur et la densité de la peinture sur le matériau à imprimer sur une machine d'impression numérique à jet d'encre continu ayant la caractéristique que; 55

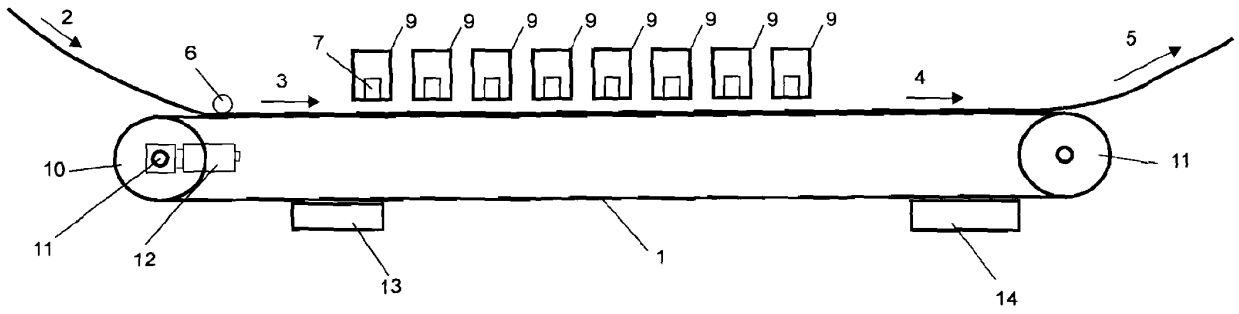


FIGURE-1

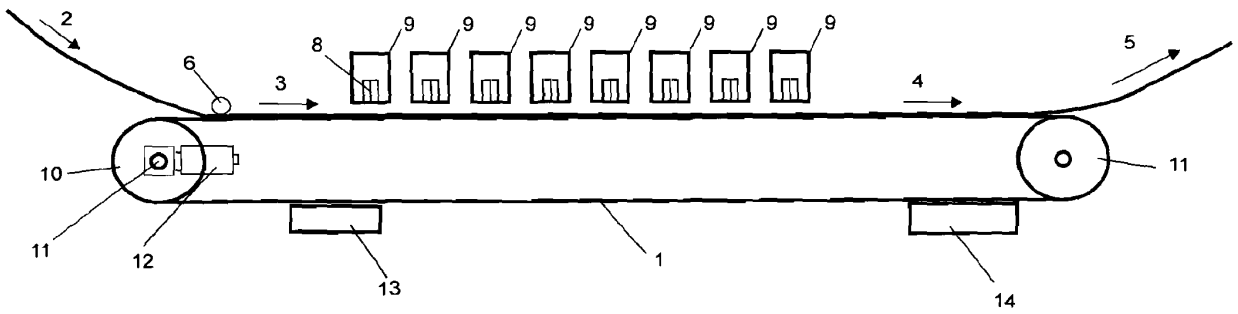


FIGURE-2

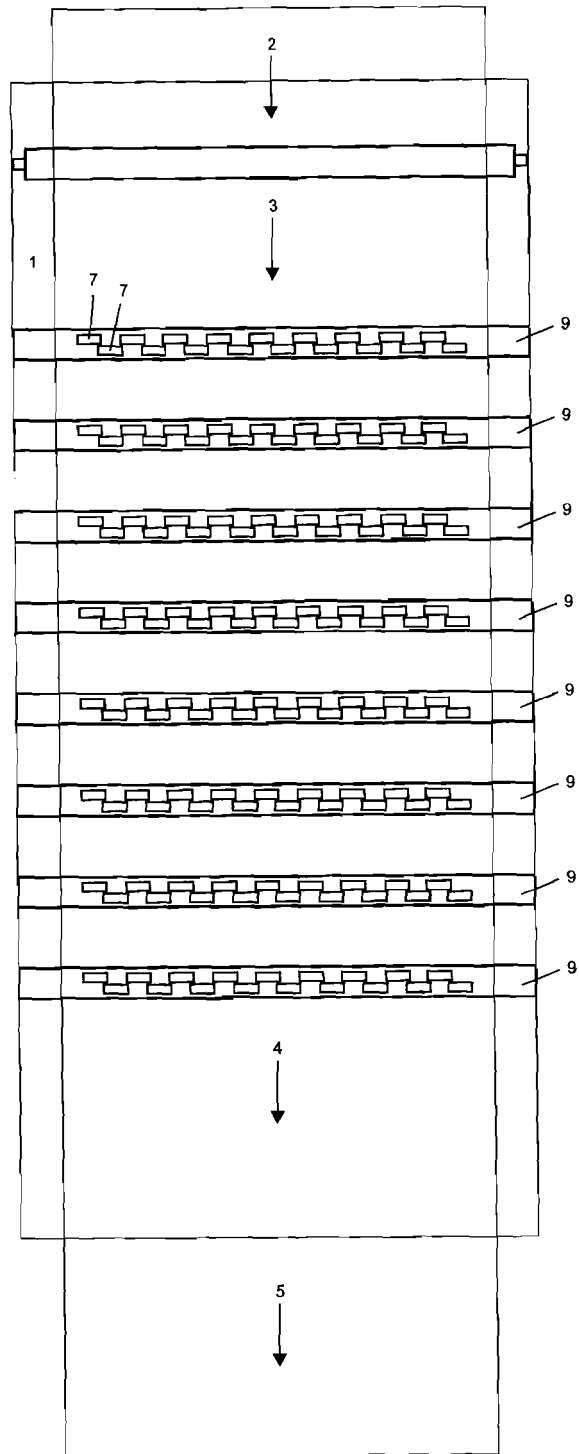


FIGURE-3

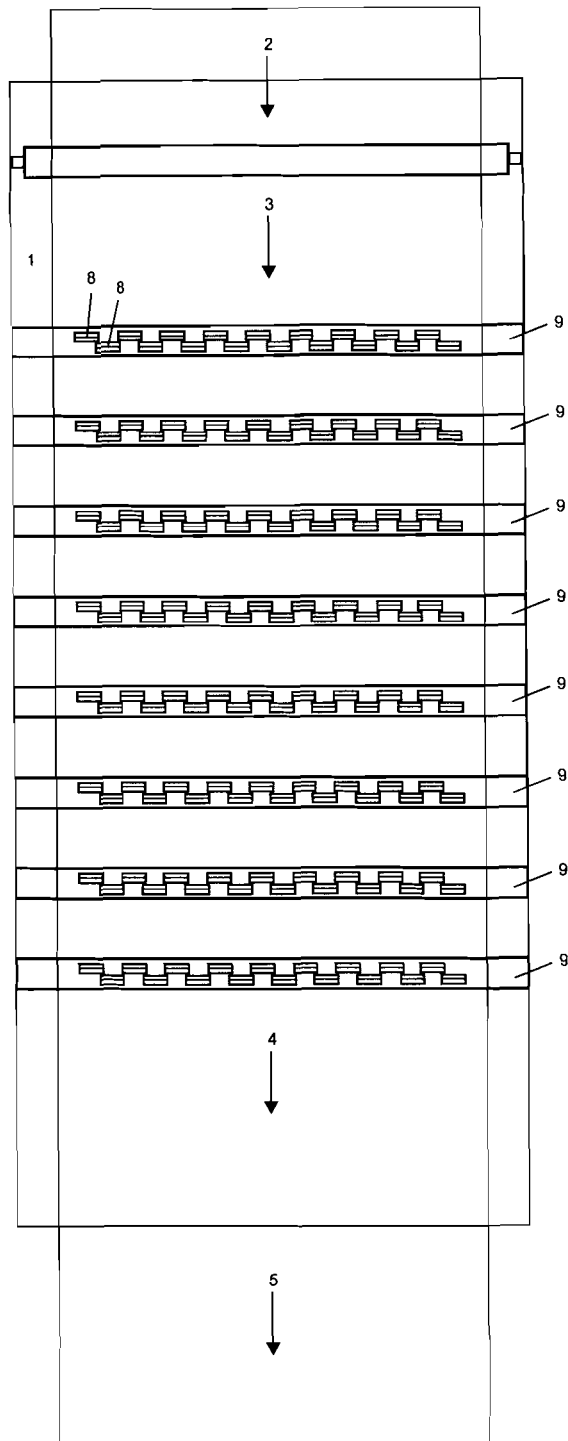


FIGURE-4

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- TR 200907956 [0002]
- US 20060033764 A [0002]