US010926532B2

(12) **United States Patent**
Chechik et al.

(10) **Patent No.: US 10,926,532 B2**
(45) **Date of Patent: Feb. 23, 2021**

(54) **ENDLESS FLEXIBLE BELT FOR A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Helena Chechik**, Rehovot (IL); **Shoham Livaderu**, Moshav Sitriyya (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/649,177**

(22) PCT Filed: **Oct. 16, 2018**

(86) PCT No.: **PCT/IB2018/058009**
§ 371 (c)(1),
(2) Date: **Mar. 20, 2020**

(87) PCT Pub. No.: **WO2019/077489**
PCT Pub. Date: **Apr. 25, 2019**

(65) **Prior Publication Data**

US 2020/0290340 A1 Sep. 17, 2020

Related U.S. Application Data

(60) Provisional application No. 62/574,275, filed on Oct. 19, 2017.

(51) **Int. Cl.**
B41J 2/01 (2006.01)
B41J 11/00 (2006.01)
B41J 29/38 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/01*** (2013.01); ***B41J 11/007*** (2013.01); ***B41J 11/0055*** (2013.01); ***B41J 29/38*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
CPC B41J 2002/012; B41J 11/007; B41J 2/01; B41J 11/0055
(Continued)

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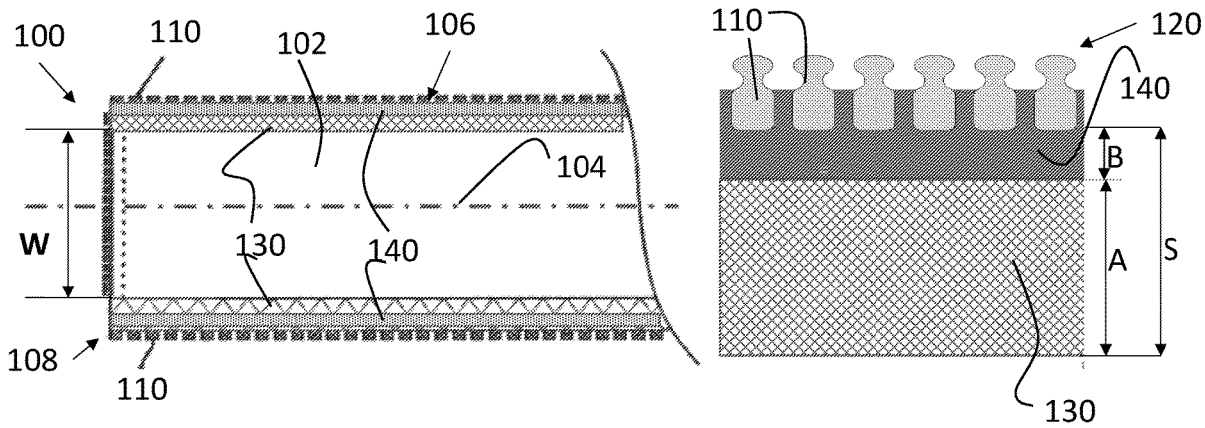
(Continued)

Primary Examiner — An H Do
(74) *Attorney, Agent, or Firm* — Momentum IP; Marc Van Dyke

(57) **ABSTRACT**

An intermediate transfer member (ITM) for use in a printing system. The ITM includes an endless flexible belt formed of an elongate belt having a longitudinal axis. Attached to lateral edges of the endless flexible belt along the longitudinal axis are a first elongate strip and a second elongate strip, each of the elongate strips including lateral formations on outward facing lateral ends thereof which are distal to the lateral edges of the belt. At least one of the first and second elongate strips includes a first longitudinal portion having a first elasticity, and a second longitudinal portion having a second elasticity, such that the second elasticity is greater than the first elasticity. The first portion is attached to the lateral edges of the flexible belt and the second portion extends between the first portion and the lateral formations.

20 Claims, 4 Drawing Sheets



US010889128B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,889,128 B2**
(45) **Date of Patent: Jan. 12, 2021**

(54) **INTERMEDIATE TRANSFER MEMBER**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Moshe Levanon**, Rehovot (IL); **Helena Chechik**, Rehovot (IL); **Tatiana Kurtser**, Petach Tikva (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/303,615**

(22) PCT Filed: **May 30, 2017**

(86) PCT No.: **PCT/IB2017/053167**
§ 371 (c)(1),
(2) Date: **Nov. 20, 2018**

(87) PCT Pub. No.: **WO2017/208144**
PCT Pub. Date: **Dec. 7, 2017**

(65) **Prior Publication Data**

US 2020/0062002 A1 Feb. 27, 2020

Related U.S. Application Data

(60) Provisional application No. 62/343,108, filed on May 30, 2016.

(30) **Foreign Application Priority Data**

May 30, 2016 (GB) 1609463.3

(51) **Int. Cl.**
B41J 2/22 (2006.01)
B32B 5/26 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 2/22*** (2013.01); ***B32B 5/26*** (2013.01); ***B32B 7/06*** (2013.01); ***B32B 7/12*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC B41J 2/0057; B41J 2/22; B41J 2002/012; B41M 5/36; B41M 5/52
See application file for complete search history.

(56) **References Cited**

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3,011,545 A 12/1961 Welsh et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CN 1121033 A 4/1996
CN 1200085 A 11/1998
(Continued)

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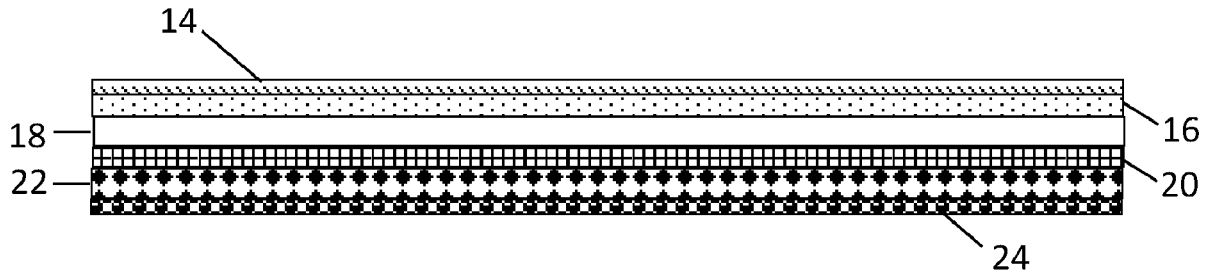
"Amino Functional Silicone Polymers", in Xiameter.Copyrgt. 2009 Dow Corning Corporation.
(Continued)

Primary Examiner — John Zimmermann
(74) *Attorney, Agent, or Firm* — Marc Van Dyke; Momentum IP Group

(57) **ABSTRACT**

An intermediate transfer member (ITM) for use with a printing system, the ITM having (a) a support layer; and (b) a release layer having an ink reception surface and a second surface opposing the ink reception surface, the second surface attached to the support layer, the release layer formed of an addition-cured, hydrophobic silicone material, wherein the release surface of the release layer has relatively hydrophilic properties with respect to the addition-cured, hydrophobic silicone material.

24 Claims, 4 Drawing Sheets



US010828888B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,828,888 B2**
(45) **Date of Patent: Nov. 10, 2020**

(54) **ENDLESS FLEXIBLE BELT FOR A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Rami Keller**, Tel Aviv (IL); **Itshak Ashkanazi**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/714,756**

(22) Filed: **Dec. 15, 2019**

(65) **Prior Publication Data**

US 2020/0189264 A1 Jun. 18, 2020

Related U.S. Application Data

(63) Continuation of application No. 16/219,582, filed on Dec. 13, 2018, now Pat. No. 10,569,533, which is a continuation of application No. 15/790,026, filed on Oct. 22, 2017, now Pat. No. 10,201,968, which is a continuation of application No. 15/345,238, filed on Nov. 7, 2016, now Pat. No. 9,849,667, which is a

(Continued)

(51) **Int. Cl.**
B41J 2/005 (2006.01)

(52) **U.S. Cl.**
CPC .. ***B41J 2/0057*** (2013.01); *G03G 2215/00147* (2013.01); *G03G 2215/00151* (2013.01)

(58) **Field of Classification Search**
CPC . B41J 11/007; B41J 2/0057; B41J 1/30; B41J 2/22; B41J 2/315; B41J 2/435; B41J 347/103; B41J 17/28; B41J 17/30; B41J 17/32; G03G 2215/00147; G03G 2215/00151; B65H 5/02
See application file for complete search history.

(56) **References Cited**

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Co-pending U.S. Appl. No. 16/512,915, filed Jul. 16, 2019.

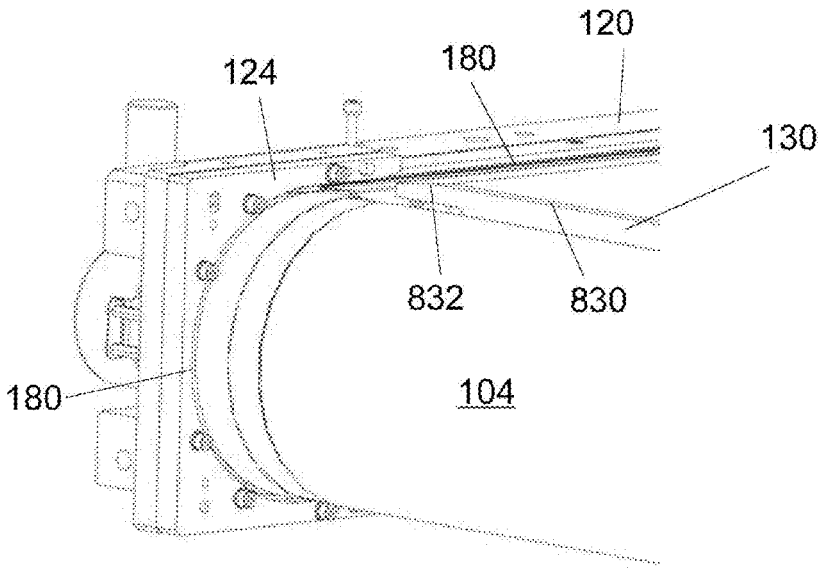
(Continued)

Primary Examiner — Scott A Richmond
(74) *Attorney, Agent, or Firm* — Marc Van Dyke; Momentum IP Group

(57) **ABSTRACT**

A flexible belt is disclosed for use in a printing system. The belt comprises an endless strip which, in use, travels along a continuous path. Formations are provided along the sides of the strip which are capable of engaging with lateral tracks to place the belt under lateral tension, the lateral tracks further serving to constrain the belt to follow the continuous path.

26 Claims, 8 Drawing Sheets



US010800936B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,800,936 B2**
(45) **Date of Patent: Oct. 13, 2020**

(54) **INK FILM CONSTRUCTIONS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Galia Golodetz**, Rehovot (IL); **Gregory Nakhmanovich**, Rishon Lezion (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rohovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 14 days.

(21) Appl. No.: **16/282,317**

(22) Filed: **Feb. 22, 2019**

(65) **Prior Publication Data**

US 2019/0256724 A1 Aug. 22, 2019

Related U.S. Application Data

(63) Continuation of application No. 15/082,065, filed on Mar. 28, 2016, now Pat. No. 10,266,711, which is a (Continued)

(51) **Int. Cl.**
C09D 11/30 (2014.01)
B41J 2/005 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***C09D 11/30*** (2013.01); ***B32B 3/10*** (2013.01); ***B32B 5/02*** (2013.01); ***B41F 16/0006*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC ... B41J 2/01; B41J 2/211; B41J 2/1433; B41J 2/17; B41J 2/17593; B41J 2/2107;
(Continued)

(56) **References Cited**

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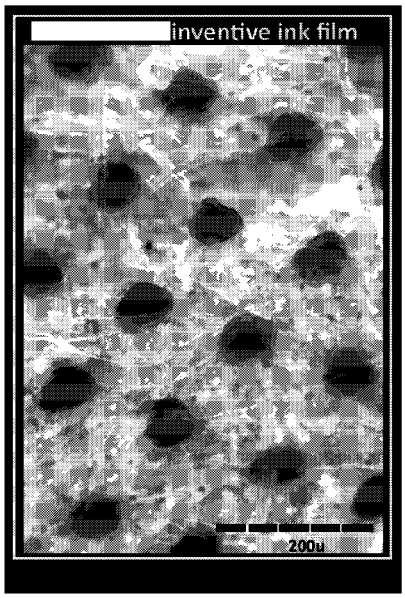
(Continued)

Primary Examiner — Manish S Shah
(74) *Attorney, Agent, or Firm* — Marc Van Dyke; Momentum IP Group

(57) **ABSTRACT**

An ink film construction including: (a) a printing substrate; and (b) at least one ink film, fixedly adhered to a top surface of the printing substrate, the ink film having an upper film surface distal to the top surface of the substrate, wherein a surface concentration of nitrogen at the upper film surface exceeds a bulk concentration of nitrogen within the film, the bulk concentration measured at a depth of at least 30 nanometers below the upper film surface, and wherein a ratio of the surface concentration to the bulk concentration is at least 1.1 to 1.

19 Claims, 27 Drawing Sheets



US010759953B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,759,953 B2**
(45) **Date of Patent: Sep. 1, 2020**

(54) **INK FORMULATIONS AND FILM CONSTRUCTIONS THEREOF**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Gregory Nakhmanovich**, Rishon LeZion (IL); **Galia Golodetz**, Rehovot (IL); **Sagi Abramovich**, Ra'anana (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/048,299**

(22) Filed: **Jul. 29, 2018**

(65) **Prior Publication Data**

US 2019/0023919 A1 Jan. 24, 2019

Related U.S. Application Data

(63) Continuation of application No. 14/917,461, filed as application No. PCT/IB2014/002395 on Sep. 11, 2014, now abandoned.

(60) Provisional application No. 61/876,727, filed on Sep. 11, 2013.

(30) **Foreign Application Priority Data**

Jan. 23, 2014 (GB) 1401173.8

(51) **Int. Cl.**

C09D 11/107	(2014.01)
C09D 11/104	(2014.01)
C09D 11/38	(2014.01)
C09D 11/06	(2006.01)
C09D 11/30	(2014.01)
C09D 11/106	(2014.01)

(52) **U.S. Cl.**

CPC ***C09D 11/107*** (2013.01); ***C09D 11/104*** (2013.01); ***C09D 11/106*** (2013.01); ***C09D 11/30*** (2013.01); ***C09D 11/38*** (2013.01)

(58) **Field of Classification Search**

CPC C09D 11/07; C09D 11/104; C09D 11/38; C09D 11/06; C09D 11/30

USPC 524/562

See application file for complete search history.

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Primary Examiner — Deve V Hall

(74) *Attorney, Agent, or Firm* — Marc Van Dyke; Momentum IP Group

(57) **ABSTRACT**

Ink formulations suitable for deposition upon the intermediate transfer member of an indirect printing system and for transfer therefrom to a substrate. The inks are aqueous inkjet inks comprising an organic polymeric resin and a colorant. Ink film constructions including a plurality of continuous ink films fixedly adhered to the printing substrate that can be obtained with these inks are also disclosed. The inks and the printed constructions are such that the ink films and the dried inks composing them have a first dynamic viscosity within a range of 10^6 cP to $5 \cdot 10^7$ cP at at least a first temperature within a first range of 60° C. to 87.5° C., and a second dynamic viscosity of at least $6 \cdot 10^7$ cP, for at least a second temperature within a second range of 50° C. to 55° C.

19 Claims, 23 Drawing Sheets

US010730333B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,730,333 B2**
(45) **Date of Patent: Aug. 4, 2020**

(54) **PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Itshak Ashkanazi**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/433,970**

(22) Filed: **Jun. 6, 2019**

(65) **Prior Publication Data**

US 2019/0358982 A1 Nov. 28, 2019

Related U.S. Application Data

(63) Continuation of application No. 15/871,797, filed on Jan. 15, 2018, now Pat. No. 10,357,985, which is a (Continued)

(30) **Foreign Application Priority Data**

Mar. 20, 2015 (GB) 1504719.4

(51) **Int. Cl.**
B41M 5/025 (2006.01)
B41J 2/01 (2006.01)

(52) **U.S. Cl.**
CPC ***B41M 5/0256*** (2013.01); ***B41J 2/01*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
CPC B41M 5/0256; B41J 2/01; B41J 2002/012
(Continued)

(56) **References Cited**

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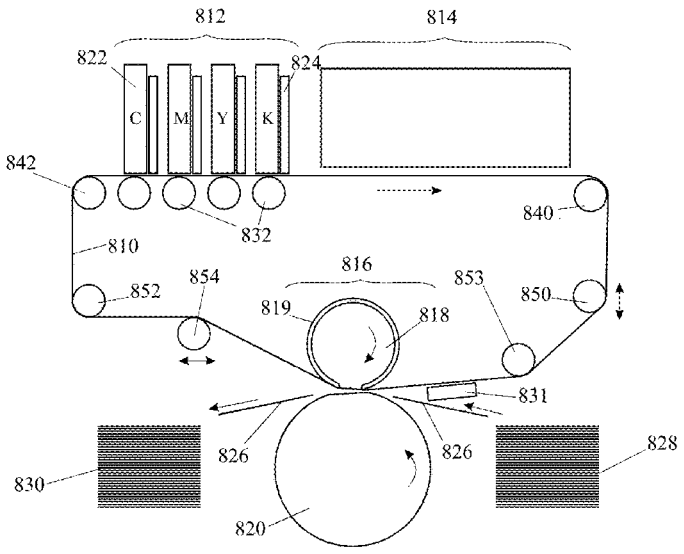
Co-pending U.S. Appl. No. 16/282,317, filed Feb. 22, 2019.
(Continued)

Primary Examiner — Huan H Tran
Assistant Examiner — Alexander D Shenderov
(74) *Attorney, Agent, or Firm* — Marc Van Dyke; Momentum IP Group

(57) **ABSTRACT**

An intermediate transfer member (ITM) for use in a printing system to transport an ink image from an image forming station to an impression station for transfer of the ink image from the ITM onto a printing substrate, wherein the ITM is an endless flexible belt of substantially uniform width which, during use, passes over drive and guide rollers and is guided through at least the image forming station by means of guide channels that receive formations provided on both lateral edges of the belt, wherein the formations on a first edge differ from the formations on the second edge by being configured for providing the elasticity desired to maintain the belt taut when the belt is guided through their respective lateral channels.

17 Claims, 10 Drawing Sheets



US010703093B2

(12) **United States Patent**
Karlinski et al.

(10) **Patent No.: US 10,703,093 B2**
(45) **Date of Patent: Jul. 7, 2020**

(54) **INDIRECT INKJET PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Haggai Karlinski**, Ramat Gan (IL); **Alon Siman-Tov**, Or Yehuda (IL); **Yehoshua Sheinman**, Ra'anana (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Daniel Alkhanati**, Nes Ziona (IL); **Elad Pur Buchray**, Nes Ziona (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/244,145**

(22) Filed: **Jan. 10, 2019**

(65) **Prior Publication Data**

US 2019/0168503 A1 Jun. 6, 2019

Related U.S. Application Data

(63) Continuation-in-part of application No. 15/741,897, filed as application No. PCT/IB2016/053049 on May 25, 2016, now Pat. No. 10,259,245.
(Continued)

(30) **Foreign Application Priority Data**

Jul. 10, 2015 (GB) 1512145.2

(51) **Int. Cl.**
B41J 2/005 (2006.01)
B41J 2/17 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41J 2/01*** (2013.01); ***B41J 2/165*** (2013.01); ***B41J 2/1714*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/1714
See application file for complete search history.

(56) **References Cited**

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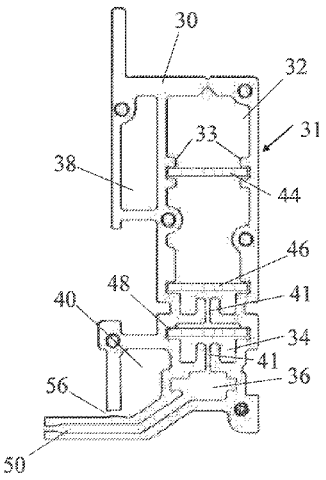
(Continued)

Primary Examiner — Shelby L Fidler
(74) *Attorney, Agent, or Firm* — Marc Van Dyke; Momentum IP Group

(57) **ABSTRACT**

An indirect printing system comprising an intermediate transfer member (ITM) and an image forming station at which droplets of ink are applied to the ITM to form ink images thereon, the image forming station including a first print bar including a first plurality of print heads and having mounted thereon a first blowing mechanism for introducing a first gas flow, having a first flow rate, into a gap between the first plurality of print heads and the ITM, and a second print bar including a second plurality of print heads and having mounted thereon a second blowing mechanism for introducing a second gas flow, having a second flow rate, into a gap between the second plurality of print heads and the ITM, the second print bar being disposed downstream of the first print bar, the second flow rate being greater than the first flow rate.

10 Claims, 10 Drawing Sheets



US010642198B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,642,198 B2**
(45) **Date of Patent: May 5, 2020**

(54) **INTERMEDIATE TRANSFER MEMBERS FOR USE WITH INDIRECT PRINTING SYSTEMS AND PROTONATABLE INTERMEDIATE TRANSFER MEMBERS FOR USE WITH INDIRECT PRINTING SYSTEMS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Meir Soria**, Jerusalem (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 465 days.

(21) Appl. No.: **15/379,625**

(22) Filed: **Dec. 15, 2016**

(65) **Prior Publication Data**

US 2017/0192374 A1 Jul. 6, 2017

Related U.S. Application Data

(63) Continuation-in-part of application No. 14/382,917, filed as application No. PCT/IB2013/051751 on Mar. 5, 2013, now abandoned, which is a continuation-in-part of application No. 14/382,885, filed as application No. PCT/IB2013/051743 on Mar. 5, 2013, now abandoned, which is a continuation-in-part of application No. 15/345,238, filed on Nov. 7, 2016, now Pat. No. 9,849,667.

(60) Provisional application No. 61/640,893, filed on May 1, 2012, provisional application No. 61/640,881, filed on May 1, 2012, provisional application No. 61/606,913, filed on Mar. 5, 2012, provisional application No. 61/607,537, filed on Mar. 6, 2012, provisional application No. 61/611,557, filed on Mar. 15, 2012, provisional application No. 61/611,564, filed on Mar. 15, 2012, provisional application No. 61/611,566, filed on Mar. 15, 2012, provisional application No. 61/611,552, filed on Mar. 15, 2012, provisional application No. 61/611,497, filed on Mar. 15, 2012, provisional application No. 61/635,180, filed on Apr. 18, 2012, provisional application No. 61/641,258, filed on May 1, 2012, provisional application No. 61/640,493, filed on Apr. 30, 2012.

(51) **Int. Cl.**
B41D 7/00 (2006.01)
G03G 15/16 (2006.01)

(52) **U.S. Cl.**
CPC ***G03G 15/162*** (2013.01)

(58) **Field of Classification Search**
CPC G03G 15/162
See application file for complete search history.

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Primary Examiner — Kara B Boyle
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

Disclosed are curable polymer compositions, elastomers thereof and release layers useful in the art of printing made of the disclosed elastomers. Disclosed are also intermediate transfer members having a release layer useful in the art of printing. Disclosed are anisotropic intermediate transfer members. Disclosed are curable adhesive compositions, that in some embodiments are useful in preparing intermediate transfer members useful in printing. Also disclosed are intermediate transfer members useful in the art of printing having a release layer with an image transfer surface having protonatable functional groups apparent thereupon. Also disclosed are methods of making such intermediate transfer members.

23 Claims, 11 Drawing Sheets

US010632740B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,632,740 B2**
(45) **Date of Patent: Apr. 28, 2020**

(54) **DIGITAL PRINTING PROCESS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Moshe Levanon**, Rehovot (IL); **Galia Golodetz**, Rehovot (IL); **Helena Chechik**, Rehovot (IL); **On Mero**, Ganei Tikva (IL); **Tatiana Kurtser**, Petach Tikva (IL); **Ayal Galili**, Beit Elazari (IL); **Uriel Pomerantz**, Kfar Saba (IL); **Dan Avital**, Mazkeret Batya (IL); **Jose Kuperwasser**, Ashdod (IL); **Omer Ashkenazi**, Kfar Gibton (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/303,613**

(22) PCT Filed: **May 30, 2017**

(86) PCT No.: **PCT/IB2017/053177**
§ 371 (c)(1),
(2) Date: **Nov. 20, 2018**

(87) PCT Pub. No.: **WO2017/208152**
PCT Pub. Date: **Dec. 7, 2017**

(65) **Prior Publication Data**

US 2019/0389196 A1 Dec. 26, 2019

Related U.S. Application Data

(60) Provisional application No. 62/343,108, filed on May 30, 2016, provisional application No. 61/343,123, filed on Apr. 23, 2010.

(51) **Int. Cl.**
B41J 2/005 (2006.01)
B41M 5/025 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41M 5/0256*** (2013.01); ***B41M 5/03*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC B41J 2/0057; C09D 11/322; C09D 11/38; C09D 11/54; B41M 5/03; B41M 5/0256; B41M 5/0017
See application file for complete search history.

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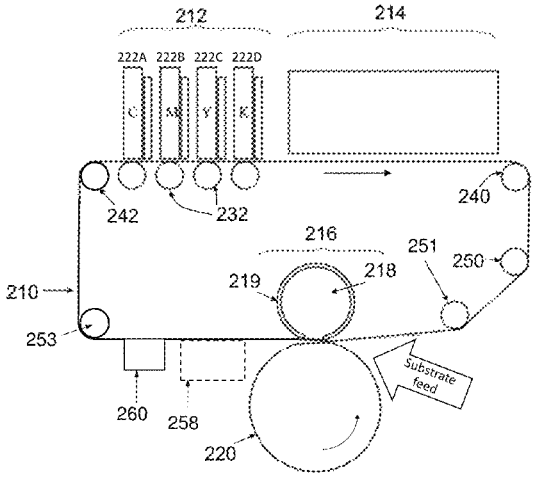
(Continued)

Primary Examiner — Yaovi M Ameh
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

An aqueous treatment composition for ITM (Intermediate transfer member) of a printing system and a method of printing comprising the step of applying said treatment composition to the surface of an ITM, wherein said treatment composition comprising: at least 3% wt quaternary ammonium salt, at least 1% wt water soluble polymer, and
(Continued)



US010596804B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,596,804 B2**
(45) **Date of Patent: Mar. 24, 2020**

(54) **INDIRECT PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Alon Siman-Tov**, Or Yehuda (IL); **Alon Levy**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/556,324**

(22) PCT Filed: **Mar. 20, 2016**

(86) PCT No.: **PCT/IB2016/051560**
§ 371 (c)(1),
(2) Date: **Sep. 7, 2017**

(87) PCT Pub. No.: **WO2016/151462**
PCT Pub. Date: **Sep. 29, 2016**

(65) **Prior Publication Data**

US 2018/0093470 A1 Apr. 5, 2018

(30) **Foreign Application Priority Data**

Mar. 20, 2015 (GB) 1504716.0

(51) **Int. Cl.**
B41J 29/38 (2006.01)
B41J 2/01 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/01*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
USPC 347/102
See application file for complete search history.

(56) **References Cited**

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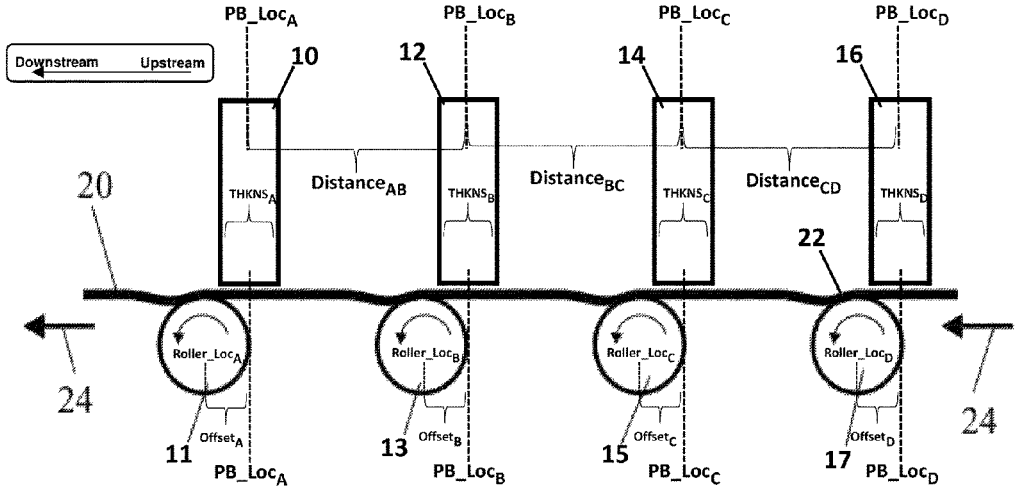
Primary Examiner — Lam S Nguyen
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

An indirect printing system is disclosed having an intermediate transfer member (ITM) in the form of an endless belt that circulates during operation to transport ink images from an image forming station. Ink images are deposited on an outer surface of the ITM by one or a plurality of print bars. At an impression station, the ink images are transferred from the outer surface of the ITM onto a printing substrate. In some embodiments, the outer surface of the ITM **20** is maintained within the image forming station at a predetermined distance from the one or each of the print bars **10**, **12**, **14** and **16** by means of a plurality of support rollers **11**, **13**, **15**, **17** that have a common flat tangential plane and contact the inner surface of the ITM. In some embodiments, the inner surface of the ITM is attracted to the support rollers, the attraction being such that the area of contact between the ITM and each support roller is greater on the downstream side than the upstream side of the support roller, referenced to the direction of movement of the ITM.

20 Claims, 8 Drawing Sheets



US010569534B2

(12) **United States Patent**
Shmaiser et al.

(10) **Patent No.: US 10,569,534 B2**
(45) **Date of Patent: Feb. 25, 2020**

(54) **DIGITAL PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Aharon Shmaiser**, Rishon LeZion (IL); **Benzion Landa**, Nes Ziona (IL); **Sagi Moskovich**, Petach Tikva (IL); **Nir Zarmi**, Be'erotayim (IL); **Yehuda Solomon**, Rishon LeZion (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/226,726**

(22) Filed: **Dec. 20, 2018**

(65) **Prior Publication Data**

US 2019/0202198 A1 Jul. 4, 2019

Related U.S. Application Data

(63) Continuation-in-part of application No. 15/871,652, filed on Jan. 15, 2018, now Pat. No. 10,179,447, (Continued)

(30) **Foreign Application Priority Data**

Sep. 11, 2013 (GB) 1316203.7
Jan. 15, 2015 (GB) 1500683.6

(51) **Int. Cl.**
B41J 2/005 (2006.01)
B41J 3/60 (2006.01)
B41J 2/01 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41J 2/005*** (2013.01); ***B41J 2/01*** (2013.01); ***B41J 3/60*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
CPC ... B41J 2/0057; B41J 3/60; B41J 2/005; B41J 2002/012; B41J 2/01
See application file for complete search history.

(56) **References Cited**

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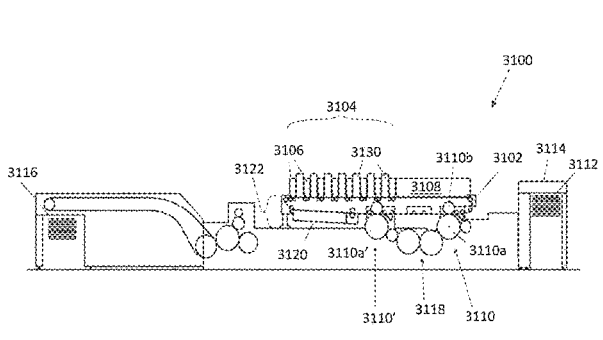
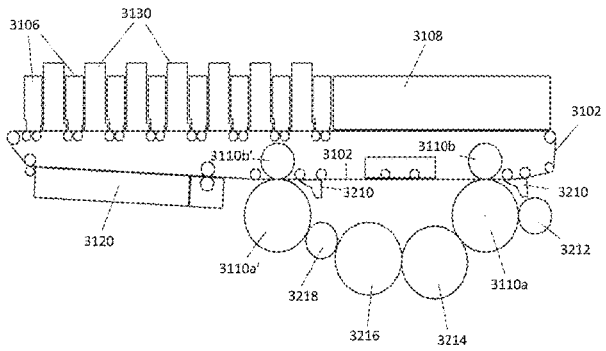
IP.com search (Year: 2019).*
(Continued)

Primary Examiner — Lisa Solomon
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A system printing comprises: a movable intermediate transfer member in the form of a flexible, substantially inextensible, belt guided to follow a closed path, an image forming station for forming an ink image, a drying station for drying the ink image to leave an ink residue film, first and second impression stations spaced from one another in the direction of movement of the belt, each impression station comprising an impression cylinder for supporting and transporting a substrate and a pressure cylinder for urging the belt against the substrate supported on the impression cylinder, and a transport system including a perfecting system for selectively inverting the substrate during transportation between the two impression stations; and a treatment station situated between the second impression station and the image form-
(Continued)





US010569533B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,569,533 B2**
(45) **Date of Patent: Feb. 25, 2020**

(54) **ENDLESS FLEXIBLE BELT FOR A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Rami Keller**, Tel Aviv (IL); **Itshak Ashkanazi**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/219,582**

(22) Filed: **Dec. 13, 2018**

(65) **Prior Publication Data**

US 2019/0193391 A1 Jun. 27, 2019

Related U.S. Application Data

(63) Continuation of application No. 15/790,026, filed on Oct. 22, 2017, now Pat. No. 10,201,968, which is a continuation of application No. 15/345,238, filed on Nov. 7, 2016, now Pat. No. 9,849,667, which is a continuation of application No. 14/382,759, filed as application No. PCT/IB2013/051719 on Mar. 5, 2013, now Pat. No. 9,517,618.

(60) Provisional application No. 61/611,505, filed on Mar. 15, 2012, provisional application No. 61/611,497, filed on Mar. 15, 2012, provisional application No. 61/635,180, filed on Apr. 18, 2012.

(51) **Int. Cl.**
B41J 2/005 (2006.01)

(52) **U.S. Cl.**
CPC .. ***B41J 2/0057*** (2013.01); *G03G 2215/00147* (2013.01); *G03G 2215/00151* (2013.01)

(58) **Field of Classification Search**
CPC . B41J 11/007; B41J 2/0057; B41J 2/22; B41J 2/315; B41J 2002/012; B41J 17/28; B41J 17/30
See application file for complete search history.

(56) **References Cited**

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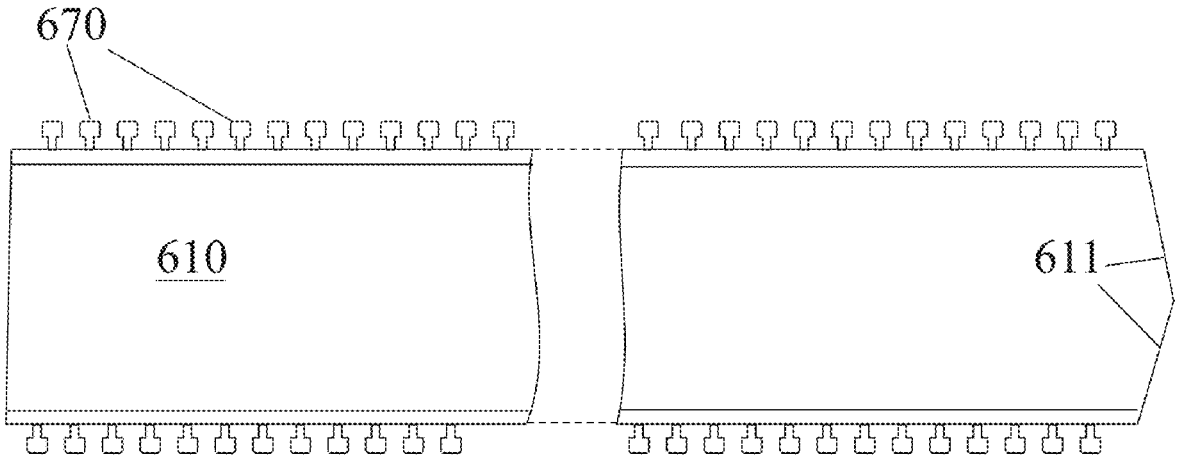
Primary Examiner — Scott A Richmond
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A flexible belt is disclosed for use in a printing system. The belt comprises an endless strip which, in use, travels along a continuous path. Formations are provided along the sides of the strip which are capable of engaging with lateral tracks to place the belt under lateral tension, the lateral tracks further serving to constrain the belt to follow the continuous path.

15 Claims, 8 Drawing Sheets



US010569532B2

(12) **United States Patent**
Shmaiser et al.

(10) **Patent No.: US 10,569,532 B2**
(45) **Date of Patent: Feb. 25, 2020**

(54) **DIGITAL PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Aharon Shmaiser**, Rishon LeZion (IL); **Benzion Landa**, Nes Ziona (IL); **Sagi Moskovich**, Petach Tikva (IL); **Nir Zarmi**, Be'erotayim (IL); **Yehuda Solomon**, Rishon LeZion (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/203,472**

(22) Filed: **Nov. 28, 2018**

(65) **Prior Publication Data**

US 2019/0168502 A1 Jun. 6, 2019

Related U.S. Application Data

(63) Continuation of application No. 15/871,652, filed on Jan. 15, 2018, now Pat. No. 10,179,447, which is a (Continued)

(30) **Foreign Application Priority Data**

Sep. 11, 2013 (GB) 1316203.7

(51) **Int. Cl.**
B41J 2/005 (2006.01)
B41J 3/60 (2006.01)
B41J 2/01 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41J 2/005*** (2013.01); ***B41J 3/60*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
CPC ... B41J 2/0057; B41J 2/005; B41J 3/60; B41J 2002/012
See application file for complete search history.

(56) **References Cited**

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3,889,802 A 6/1975 Jonkers et al.
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FOREIGN PATENT DOCUMENTS

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CN 1493514 A 5/2004
(Continued)

OTHER PUBLICATIONS

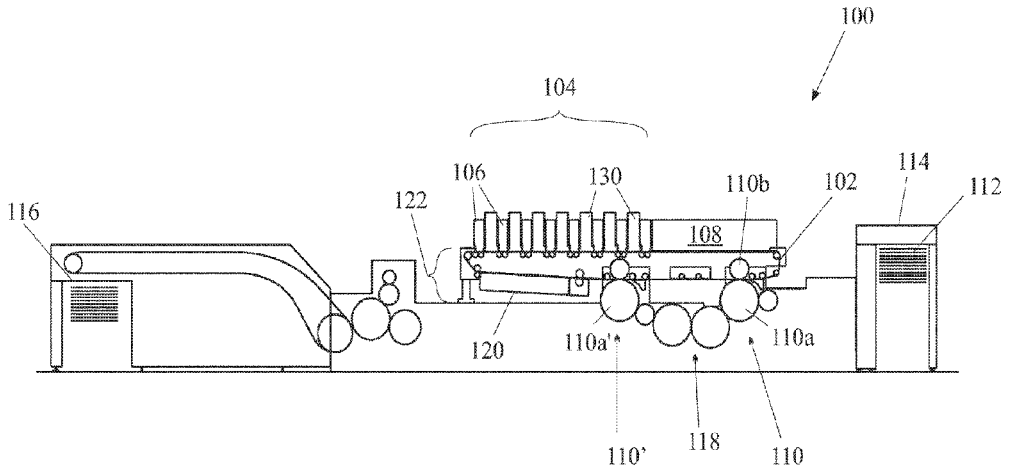
IP.com search (Year: 2019).*
(Continued)

Primary Examiner — Lisa Solomon
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A printing system for printing on a substrate. In embodiments, the system comprises: a movable intermediate transfer member in the form of a flexible, substantially inextensible, thin belt whose compressible layer has a thickness of at most 400 micrometers, the belt being guided to follow a closed path, an image forming station for depositing ink droplets onto an outer surface of the belt to form an ink image, a drying station for drying the ink image to leave an ink residue film, first and second impression stations spaced from one another in the direction of movement of the belt, each impression station comprising an impression cylinder for supporting and transporting the substrate and a pressure cylinder carrying a thick compressible blanket for urging the belt against the substrate supported on the impression cylinder, a thickness of the compressible blanket being at least 1 mm.

12 Claims, 9 Drawing Sheets



US010562318B2

(12) **United States Patent**
Siman-Tov et al.

(10) **Patent No.: US 10,562,318 B2**
(45) **Date of Patent: Feb. 18, 2020**

(54) **METHOD AND SYSTEM FOR COMPENSATING FOR A MALFUNCTIONING NOZZLE**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Alon Siman-Tov**, Or Yehuda (IL); **Shahar Klinger**, Rehovot (IL); **Mattetyahu Litvak**, Tel Aviv (IL); **David Tal**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/181,265**

(22) Filed: **Nov. 5, 2018**

(65) **Prior Publication Data**

US 2019/0134990 A1 May 9, 2019

Related U.S. Application Data

(60) Provisional application No. 62/581,051, filed on Nov. 3, 2017.

(51) **Int. Cl.**

B41J 2/21	(2006.01)
H04N 1/405	(2006.01)
H04N 1/401	(2006.01)
H04N 1/409	(2006.01)

(52) **U.S. Cl.**

CPC ***B41J 2/2139*** (2013.01); ***B41J 2/2146*** (2013.01); ***H04N 1/405*** (2013.01); ***H04N 1/409*** (2013.01); ***H04N 1/4015*** (2013.01)

(58) **Field of Classification Search**

CPC B41J 2/2139; B41J 2/2146

See application file for complete search history.

(56) **References Cited**

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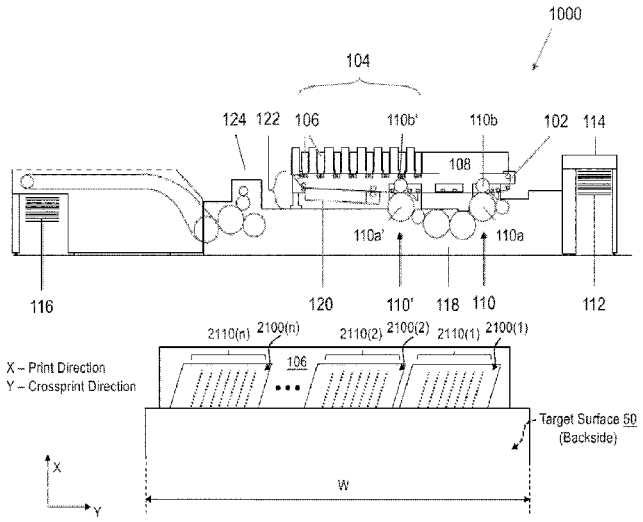
Primary Examiner — Julian D Huffman

(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

Embodiments of the invention relate to techniques whereby sufficient compensation is provided to counteract the deleterious effects of a malfunctioning nozzle (i.e. which might create a white streak within the printed ink image) in a manner that is faithful to/harmonious with the underlying AM or FM screening. In this manner, it is possible to minimize the negative impact a failed or malfunctioning nozzle has upon the printed ink image.

6 Claims, 28 Drawing Sheets



US010518526B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,518,526 B2**
(45) **Date of Patent: Dec. 31, 2019**

(54) **APPARATUS AND METHOD FOR CONTROL OR MONITORING A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Nir Zarmi**, Be'erotayim (IL); **Abraham Keren**, Modi'in Maccabim Reut (IL); **Alon Siman-Tov**, Or Yehuda (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/047,033**

(22) Filed: **Jul. 27, 2018**

(65) **Prior Publication Data**

US 2019/0023000 A1 Jan. 24, 2019

Related U.S. Application Data

(63) Continuation of application No. 15/818,010, filed on Nov. 20, 2017, now Pat. No. 10,065,411, which is a (Continued)

(51) **Int. Cl.**
B41J 2/005 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/0057; B41J 2002/012
(Continued)

(56) **References Cited**

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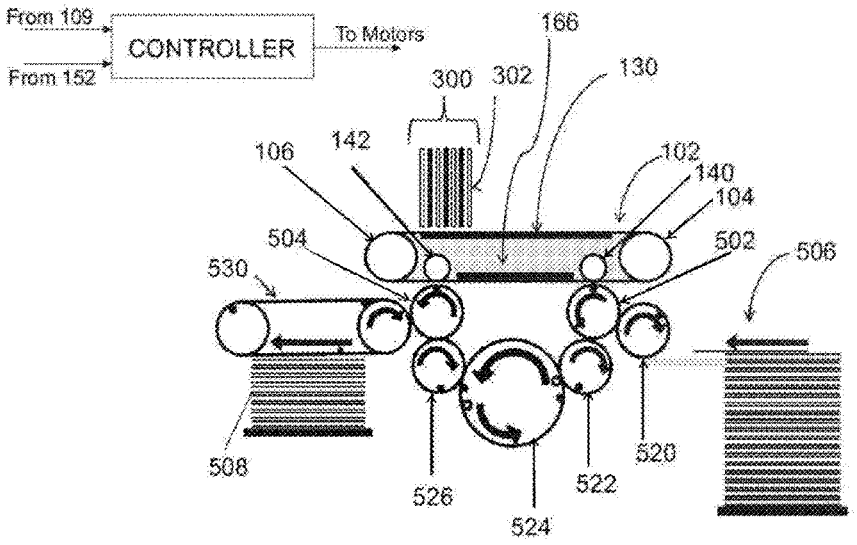
(Continued)

Primary Examiner — Huan H Tran
Assistant Examiner — Alexander D Shenderov
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

Embodiments of the present invention relate to control apparatus and methods of a printing system, for example, comprising an intermediate transfer member (ITM) and to user-related features of a printing system. Some embodiments relate to regulation of a velocity and/or tension and/or length of the ITM. Some embodiments relate to regulation of deposition of ink on the moving ITM. Some embodiments regulate to apparatus configured to alert a user of one or more events related to operation of the ITM. Some embodiments relate to a time-line GUI for visualizing and/or manipulating queued print jobs which may be employed. Some embodiments relate to a reversed augmented reality GUI for visualization and/or control of the printing system. In some embodiments, a display screen is mounted to a printer housing and/or able to control access to moving parts of a printing system.

25 Claims, 70 Drawing Sheets



US010507647B1

(12) **United States Patent**
Tal

(10) **Patent No.: US 10,507,647 B1**
(45) **Date of Patent: Dec. 17, 2019**

(54) **METHODS AND SYSTEMS FOR COMPENSATING FOR A MALFUNCTIONING NOZZLE IN A DIGITAL PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventor: **David Tal**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/237,608**

(22) Filed: **Dec. 31, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/612,881, filed on Jan. 2, 2018.

(51) **Int. Cl.**
B41J 2/045 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0451*** (2013.01); ***B41J 2/04586*** (2013.01)

(58) **Field of Classification Search**
CPC .. B41J 2/0451; B41J 2/04561; B41J 2/04558; B41J 2/04586
See application file for complete search history.

(56) **References Cited**

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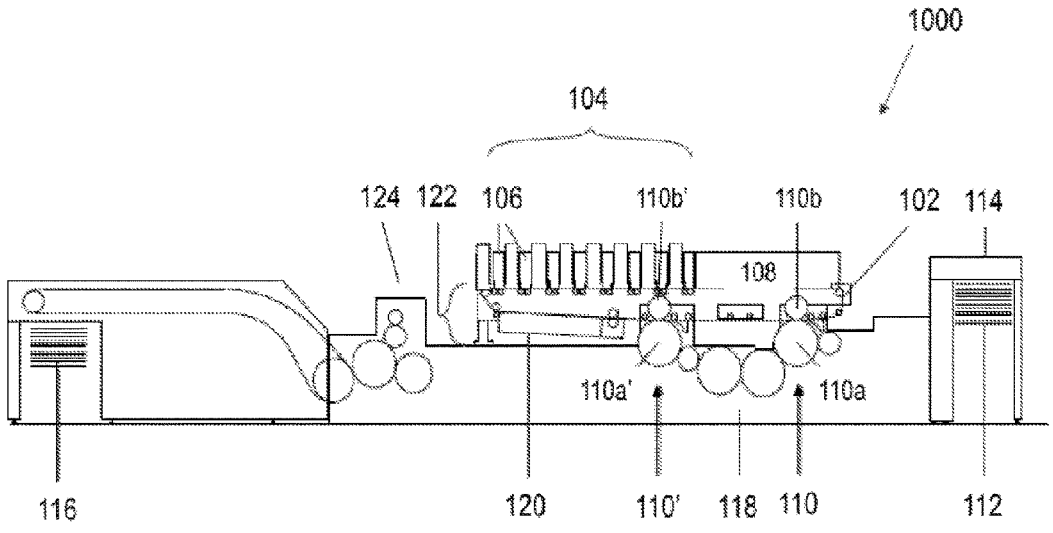
Primary Examiner — Thinh H Nguyen
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

Printing an image, using a printing system having a malfunctioning or inoperative nozzle corresponding to a column of affected positions in a half-toned digital image, includes modifying the half-toned digital image, using a pre-print digital processor of the printing system to compute a modified version of the half-toned digital image, such that droplet sizes are increased only in the two neighboring columns and according to a value of a compensation function, and printing the modified half-toned digital image on the target surface. Values of the threshold-based compensation function are based on a luminance-debt function defined by an iterative row-by-consecutive-row computation procedure, where for each iteration step the luminance-debt function is re-calculated according to data representing the ink values of affected positions and data representing the instant value of the compensation function.

9 Claims, 14 Drawing Sheets



US010477188B2

(12) **United States Patent**
Stiglic et al.

(10) **Patent No.: US 10,477,188 B2**
(45) **Date of Patent: Nov. 12, 2019**

(54) **SYSTEM AND METHOD FOR GENERATING VIDEOS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Dragan Stiglic**, Rehovot (IL); **Noam Harel**, San Francisco, CA (US)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 267 days.

(21) Appl. No.: **15/434,126**

(22) Filed: **Feb. 16, 2017**

(65) **Prior Publication Data**

US 2017/0244956 A1 Aug. 24, 2017

(30) **Foreign Application Priority Data**

Feb. 18, 2016 (GB) 1602877.1

(51) **Int. Cl.**

H04N 13/275	(2018.01)
H04N 13/156	(2018.01)
G09B 5/06	(2006.01)
G09B 9/00	(2006.01)
G11B 27/036	(2006.01)
H04N 7/18	(2006.01)

(Continued)

(52) **U.S. Cl.**

CPC ***H04N 13/275*** (2018.05); ***G09B 5/065*** (2013.01); ***G09B 9/00*** (2013.01); ***G11B 27/036*** (2013.01); ***H04N 5/232*** (2013.01); ***H04N 5/23206*** (2013.01); ***H04N 7/181*** (2013.01); ***H04N 13/156*** (2018.05); *H04N 21/85* (2013.01)

(58) **Field of Classification Search**

CPC H04N 13/275
USPC 386/278
See application file for complete search history.

(56) **References Cited**

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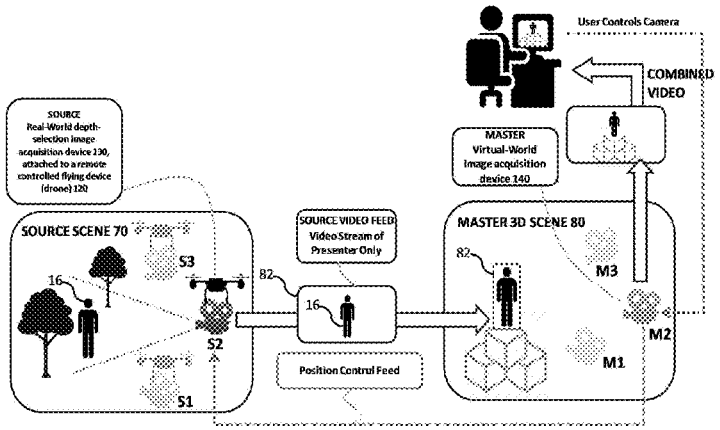
Primary Examiner — William C Vaughn, Jr.
Assistant Examiner — Daniel T Tekle
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A system comprising a processor configured to: provide a master Three-Dimensional (3D) scene; insert at least one source video feed into at least one position within the master 3D scene, allowing a configuration in which at least a first part of the master 3D scene is in front of the source video feed and at least a second part of the master 3D scene is behind the source video feed; and generate a combined video of the master 3D scene with the at least one source video feed inserted therein.

8 Claims, 16 Drawing Sheets



US010434764B1

(12) **United States Patent**
Tal

(10) **Patent No.: US 10,434,764 B1**
(45) **Date of Patent: Oct. 8, 2019**

(54) **YAW MEASUREMENT BY SPECTRAL ANALYSIS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventor: **David Tal**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/122,943**

(22) Filed: **Sep. 6, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/554,596, filed on Sep. 6, 2017.

(51) **Int. Cl.**
B41J 2/045 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/04505*** (2013.01); ***B41J 2/04586*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/04505; B41J 2/04586
See application file for complete search history.

(56) **References Cited**

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Co-pending U.S. Appl. No. 16/244,145, filed Jan. 10, 2019.

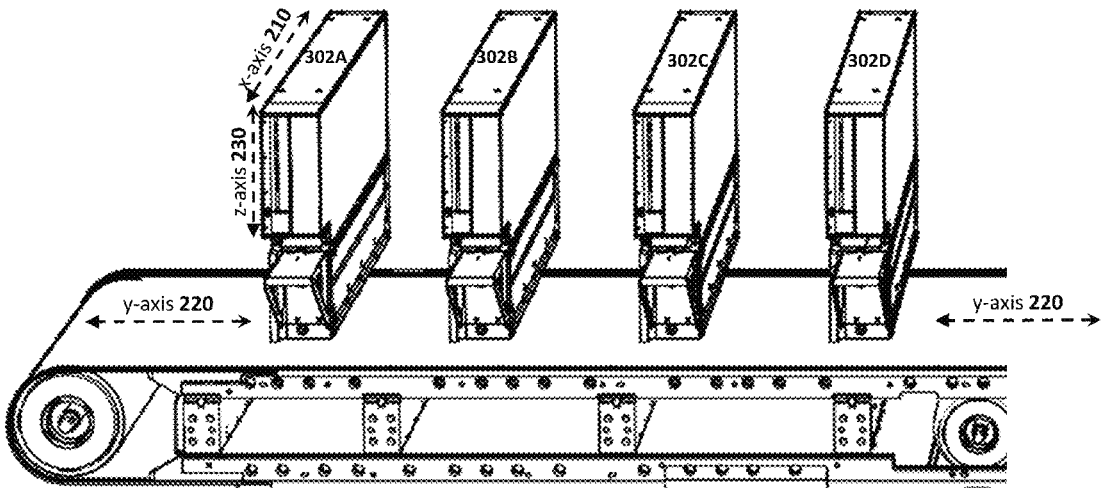
(Continued)

Primary Examiner — Sharon A. Polk
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

Some embodiments relate to a method of measuring a magnitude of a yaw angle of print head(s) or of a supporting print-bar thereof relative to cross-print direction. In some embodiments, a 1D-representation (1D-rep) of an ink-calibration image is transformed into the frequency domain (e.g. by FFT) characterized by peak profile. The yaw angle magnitude may be computed from relative energies of a primary and secondary peak of the peak profile of the frequency domain.

20 Claims, 21 Drawing Sheets



US010427399B2

(12) **United States Patent**
Shmaiser et al.

(10) **Patent No.: US 10,427,399 B2**
(45) **Date of Patent: *Oct. 1, 2019**

(54) **APPARATUS FOR THREADING AN INTERMEDIATE TRANSFER MEMBER OF A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Aharon Shmaiser**, Rishon LeZion (IL); **Sagi Moskovich**, Petach Tikva (IL); **Zohar Goldenstein**, Nes Ziona (IL); **Matan Bar-On**, Hod Hasharon (IL); **Yiftach Katzir**, Kibbutz Bet Guvrin (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **16/118,494**

(22) Filed: **Aug. 31, 2018**

(65) **Prior Publication Data**

US 2019/0084295 A1 Mar. 21, 2019

Related U.S. Application Data

(63) Continuation of application No. 15/564,198, filed as application No. PCT/IB2016/052120 on Apr. 14, 2016, now Pat. No. 10,226,920.

(30) **Foreign Application Priority Data**

Apr. 14, 2015 (GB) 1506314.2

(51) **Int. Cl.**
B41J 2/005 (2006.01)
B41J 11/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41J 11/007*** (2013.01); ***B41J 13/08*** (2013.01); ***B41J 15/048*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC B41J 2/0057; B41J 15/16; B41J 11/007; B41J 13/08; B41J 15/048; B41J 2002/012; B65G 17/323; G03G 15/1615
See application file for complete search history.

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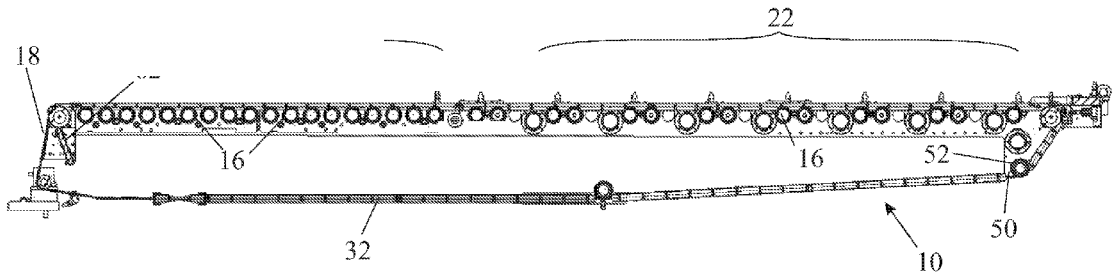
Primary Examiner — Ryan D Walsh
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A printing system is described that has an intermediate transfer member in the form of a seamed endless belt for transporting an ink image from an image forming station, at which an ink image is deposited on the intermediate transfer member, to an impression station, where the ink image is transferred onto a printing substrate. The belt has along its edges formations of a greater thickness than the belt. The formations are received in channels to guide the belt and
(Continued)



US010410100B1

(12) **United States Patent**
Tal et al.

(10) **Patent No.: US 10,410,100 B1**
(45) **Date of Patent: Sep. 10, 2019**

(54) **AM SCREENING**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **David Tal**, Rehovot (IL); **Shahar Klinger**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/191,249**

(22) Filed: **Nov. 14, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/585,556, filed on Nov. 14, 2017.

(51) **Int. Cl.**

G06K 15/02	(2006.01)
G06K 15/10	(2006.01)
B41J 2/045	(2006.01)
B41J 2/21	(2006.01)
H04N 1/52	(2006.01)
H04N 1/50	(2006.01)

(Continued)

(52) **U.S. Cl.**
CPC ***G06K 15/1881*** (2013.01); ***B41J 2/04586*** (2013.01); ***B41J 2/21*** (2013.01); ***G06K 15/102*** (2013.01); ***G06K 15/1873*** (2013.01); ***H04N 1/52*** (2013.01); *H04N 1/405* (2013.01); *H04N 1/4056* (2013.01); *H04N 1/4058* (2013.01); *H04N 1/50* (2013.01); *H04N 1/58* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

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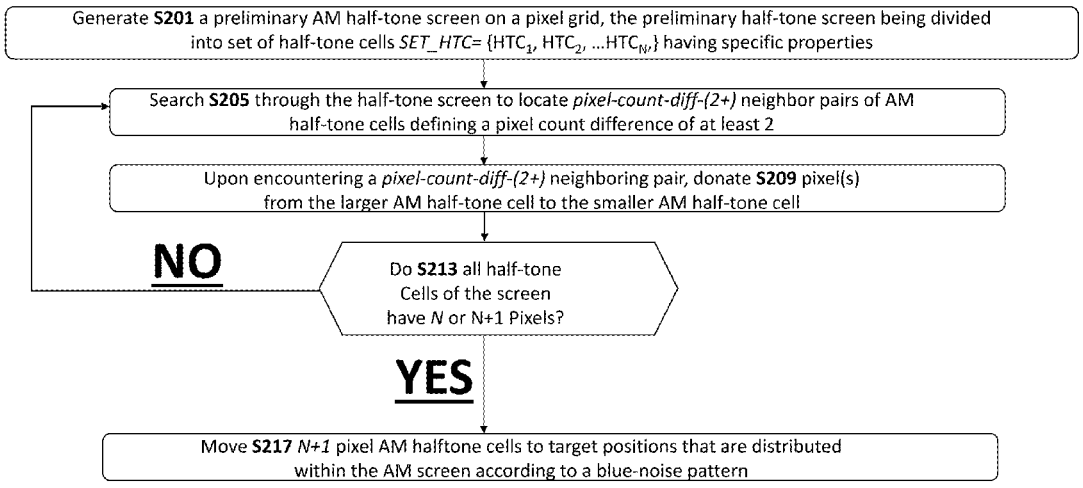
Primary Examiner — Miya J Williams
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

Apparatus and methods for printing multi-level and multi-color digital image are disclosed herein. In some embodiments, first and second level AM half-tone screens are respectively applied to first and second multi-level color-components of the multi-level and multi-color input digital image to respectively generate first and second target binary images. The first and second target binary images are printed respectively using first and second inks (e.g. of different colors) onto a common surface. Specific properties of the AM half-tone screens as well as techniques for producing the AM half-tone screens are disclosed herein. In some embodiments, the techniques overcome objectionable textures derived from rounding errors in divisional of conventional AM supercells.

6 Claims, 24 Drawing Sheets



US010357985B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,357,985 B2**
(45) **Date of Patent: Jul. 23, 2019**

(54) **PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Itshak Ashkanazi**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/871,797**

(22) Filed: **Jan. 15, 2018**

(65) **Prior Publication Data**

US 2018/0222235 A1 Aug. 9, 2018

Related U.S. Application Data

(63) Continuation of application No. 15/439,966, filed on Feb. 23, 2017, now Pat. No. 9,914,316, which is a (Continued)

(30) **Foreign Application Priority Data**

Mar. 20, 2015 (GB) 1504719.4

(51) **Int. Cl.**
B41M 5/025 (2006.01)
B41J 2/01 (2006.01)

(52) **U.S. Cl.**
CPC ***B41M 5/0256*** (2013.01); ***B41J 2/01*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
CPC B41M 5/0256; B41J 2/01; B41J 2002/012
(Continued)

(56) **References Cited**

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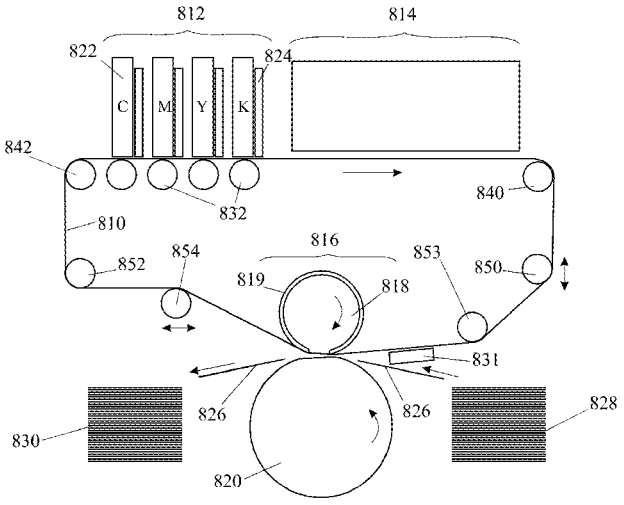
Primary Examiner — Huan H Tran
Assistant Examiner — Alexander D Shenderov
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

ABSTRACT

An intermediate transfer member (ITM) for use in a printing system to transport an ink image from an image forming station to an impression station for transfer of the ink image from the ITM onto a printing substrate, wherein the ITM is an endless flexible belt of substantially uniform width which, during use, passes over drive and guide rollers and is guided through at least the image forming station by means of guide channels that receive formations provided on both lateral edges of the belt, wherein the formations on a first edge differ from the formations on the second edge by being configured for providing the elasticity desired to maintain the belt taut when the belt is guided through their respective lateral channels.

24 Claims, 10 Drawing Sheets



US010357963B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,357,963 B2**
(45) **Date of Patent: Jul. 23, 2019**

(54) **DIGITAL PRINTING PROCESS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Yehoshua Sheinman**, Ra'anana (IL); **Sagi Abramovich**, Ra'anana (IL); **Galia Golodetz**, Rehovot (IL); **Gregory Nakhmanovich**, Rishon Lezion (IL); **Meir Soria**, Jerusalem (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/708,151**

(22) Filed: **Sep. 19, 2017**

(65) **Prior Publication Data**

US 2018/0065358 A1 Mar. 8, 2018

Related U.S. Application Data

(63) Continuation of application No. 15/175,275, filed on Jun. 7, 2016, now Pat. No. 9,776,391, which is a (Continued)

(51) **Int. Cl.**
B41J 2/00 (2006.01)
B41M 5/025 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41M 5/0256*** (2013.01); *B41M 5/03* (2013.01); *B41N 10/00* (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/0057; B41M 5/0256; B41M 5/03
See application file for complete search history.

(56) **References Cited**

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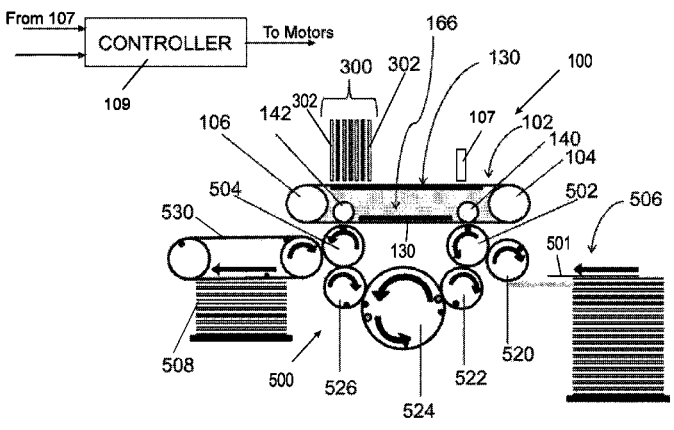
Primary Examiner — Jason S Uhlenhake
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A printing process is disclosed which comprises directing droplets of an ink onto an intermediate transfer member to form an ink image, the ink including an organic polymeric resin and a coloring agent in an aqueous carrier, and the transfer member having a hydrophobic outer surface so that each ink droplet in the ink image spreads on impinging upon the intermediate transfer member to form an ink film. The ink is dried while the ink image is being transported by the intermediate transfer member by evaporating the aqueous carrier from the ink image to leave a residue film of resin and coloring agent. The residue film is then transferred to a substrate. The chemical compositions of the ink and of the surface of the intermediate transfer member are selected such that attractive intermolecular forces between molecules in the outer skin of each droplet and on the surface of the intermediate transfer member counteract the tendency of the ink film produced by each droplet to bead under the action of the surface tension of the aqueous carrier, without causing
(Continued)



US010300690B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,300,690 B2**
(45) **Date of Patent: *May 28, 2019**

(54) **INK FILM CONSTRUCTIONS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Galia Golodetz**, Rehovot (IL); **Gregory Nakhmanovich**, Rishon Lezion (IL); **Alon Asher**, Tel Aviv (IL); **Mattetyahu Litvak**, Tel Aviv (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 161 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **15/083,204**

(22) Filed: **Mar. 28, 2016**

(65) **Prior Publication Data**

US 2016/0297190 A1 Oct. 13, 2016

Related U.S. Application Data

(63) Continuation of application No. 14/382,875, filed as application No. PCT/IB2013/000822 on Mar. 5, 2013, now Pat. No. 9,327,496.
(Continued)

(51) **Int. Cl.**
B41J 2/01 (2006.01)
B41M 5/03 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 2/01*** (2013.01); ***B32B 3/10*** (2013.01); ***B32B 5/02*** (2013.01); ***B41M 5/0256*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC ... B41J 2/01; B41J 2/211; B41J 2/1433; B41J 2/17; B41J 2/17593; B41J 2/2107;
(Continued)

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(Continued)

Primary Examiner — Manish S Shah
(74) *Attorney, Agent, or Firm* — Marc Van Dyke;

(57) **ABSTRACT**

An ink film construction including: (a) a first printing substrate selected from the group consisting of an uncoated fibrous printing substrate, a commodity coated fibrous printing substrate, and a plastic printing substrate; and (b) an ink dot set contained within a square geometric projection projecting on the first printing substrate, the ink dot set containing at least 10 distinct ink dots, fixedly adhered to a surface of the first printing substrate, all the ink dots within the square geometric projection being counted as individual members of the set, each of the ink dots containing at least one colorant dispersed in an organic polymeric resin, each of the dots having an average thickness of less than 2,000 nm, and a diameter of 5 to 300 micrometers; each ink dot of the ink dots having a generally convex shape in which a
(Continued)

US010266711B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,266,711 B2**
(45) **Date of Patent: *Apr. 23, 2019**

(54) **INK FILM CONSTRUCTIONS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Galia Golodetz**, Rehovot (IL); **Gregory Nakhmanovich**, Rishon Lezion (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 178 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **15/082,065**

(22) Filed: **Mar. 28, 2016**

(65) **Prior Publication Data**

US 2016/0297978 A1 Oct. 13, 2016

Related U.S. Application Data

(63) Continuation of application No. 14/382,869, filed as application No. PCT/IB2013/000840 on Mar. 5, 2013, now Pat. No. 9,353,273.
(Continued)

(51) **Int. Cl.**
B41J 2/005 (2006.01)
C09D 11/30 (2014.01)
(Continued)

(52) **U.S. Cl.**
CPC ***C09D 11/30*** (2013.01); ***B32B 3/10*** (2013.01); ***B32B 5/02*** (2013.01); ***B41F 16/0006*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC C09D 11/36; C09D 11/40; C09D 11/30; C09D 11/38; C09D 11/32; C09D 11/322;
(Continued)

(56) **References Cited**

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Primary Examiner — Manish S Shah
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

An ink film construction including: (a) a printing substrate; and (b) at least one ink film, fixedly adhered to a top surface of the printing substrate, the ink film having an upper film surface distal to the top surface of the substrate, wherein a surface concentration of nitrogen at the upper film surface exceeds a bulk concentration of nitrogen within the film, the bulk concentration measured at a depth of at least 30 nanometers below the upper film surface, and wherein a ratio of the surface concentration to the bulk concentration is at least 1.1 to 1.

15 Claims, 27 Drawing Sheets

US010259245B2

(12) **United States Patent**
Karlinski et al.

(10) **Patent No.: US 10,259,245 B2**
(45) **Date of Patent: Apr. 16, 2019**

(54) **INDIRECT INKJET PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Haggai Karlinski**, Ramat Gan (IL); **Alon Siman-Tov**, Or Yehuda (IL); **Yehoshua Sheinman**, Ra'anana (IL); **Daniel Alkhanati**, Nes Ziona (IL); **Elad Pur Buchray**, Nes Ziona (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/741,897**

(22) PCT Filed: **May 25, 2016**

(86) PCT No.: **PCT/IB2016/053049**
§ 371 (c)(1),
(2) Date: **Jan. 4, 2018**

(87) PCT Pub. No.: **WO2017/009722**
PCT Pub. Date: **Jan. 19, 2017**

(65) **Prior Publication Data**

US 2018/0201038 A1 Jul. 19, 2018

(30) **Foreign Application Priority Data**

Jul. 10, 2015 (GB) 1512145.2

(51) **Int. Cl.**
B41J 29/377 (2006.01)
B41J 2/005 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 29/377*** (2013.01); ***B41J 2/0057*** (2013.01); ***B41J 2/01*** (2013.01); ***B41J 2/16517*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC B41J 2202/02; B41J 2/1714
See application file for complete search history.

(56) **References Cited**

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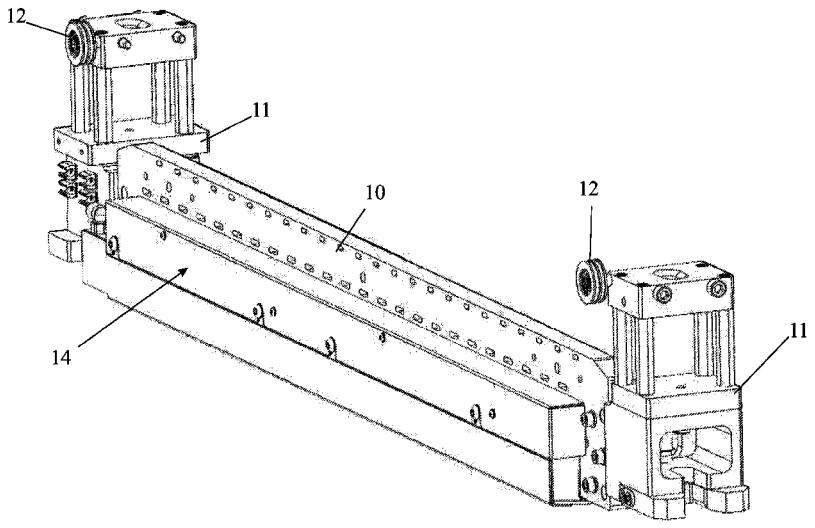
Co-pending U.S. Appl. No. 16/122,943, filed Sep. 6, 2018.

Primary Examiner — Shelby L Fidler
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

ABSTRACT

A manifold is disclosed for introducing gas into a gap between a print head and an intermediate transfer member (ITM) of an indirect inkjet printing system. The manifold has a first gas flow path terminating in a first discharge mouth for delivering a continuous low speed gas stream and a second separate gas flow path terminating in a second discharge mouth, vertically spaced from the first discharge mouth, for intermittently delivering into the gap a high speed gas stream.

20 Claims, 5 Drawing Sheets



US010226920B2

(12) **United States Patent**
Shmaiser et al.

(10) **Patent No.: US 10,226,920 B2**
(45) **Date of Patent: Mar. 12, 2019**

(54) **APPARATUS FOR THREADING AN INTERMEDIATE TRANSFER MEMBER OF A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Aharon Shmaiser**, Rishon LeZion (IL); **Sagi Moskovich**, Petach Tikva (IL); **Zohar Goldenstein**, Nes Ziona (IL); **Matan Bar-On**, Hod Hasharon (IL); **Yiftach Katzir**, Kibbutz Bet Guvrin (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/564,198**

(22) PCT Filed: **Apr. 14, 2016**

(86) PCT No.: **PCT/IB2016/052120**
§ 371 (c)(1),
(2) Date: **Oct. 4, 2017**

(87) PCT Pub. No.: **WO2014/166690**
PCT Pub. Date: **Oct. 20, 2016**

(65) **Prior Publication Data**

US 2018/0126726 A1 May 10, 2018

(30) **Foreign Application Priority Data**

Apr. 14, 2015 (GB) 1506314.2

(51) **Int. Cl.**
G03G 15/16 (2006.01)
B41J 2/005 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41J 11/007*** (2013.01); ***B41J 13/08*** (2013.01); ***B41J 15/048*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC B41J 2/0057; B41J 15/16; B41J 11/007; B41J 13/08; B41J 15/048; B41J 2002/012; B65G 17/323; G03G 15/1615
See application file for complete search history.

(56) **References Cited**

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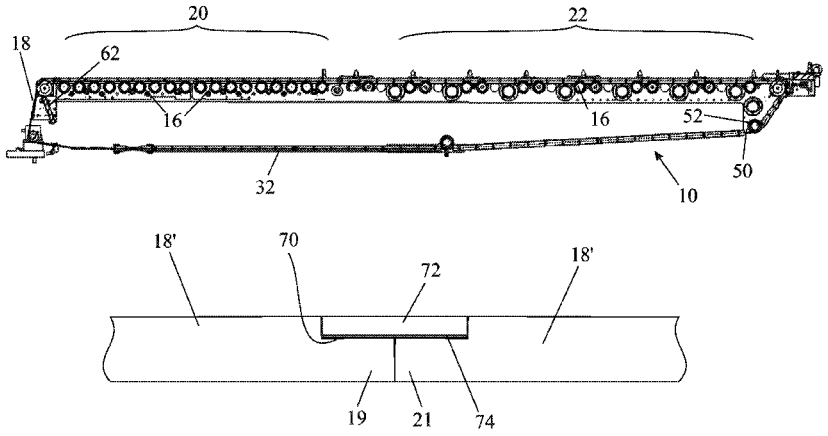
(Continued)

Primary Examiner — Ryan D Walsh
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A printing system is described that has an intermediate transfer member in the form of a seamed endless belt for transporting an ink image from an image forming station, at which an ink image is deposited on the intermediate transfer member, to an impression station, where the ink image is transferred onto a printing substrate. The belt has along its edges formations of a greater thickness than the belt. The formations are received in channels to guide the belt and
(Continued)



US010214038B2

(12) **United States Patent**
Klinger et al.

(10) **Patent No.: US 10,214,038 B2**
(45) **Date of Patent: Feb. 26, 2019**

(54) **PRINTING SYSTEM AND METHOD**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Shahar Klinger**, Rehovot (IL); **David Tal**, Rehovot (IL); **Alon Siman-Tov**, Or Yehuda (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/541,478**

(22) PCT Filed: **Jan. 14, 2016**

(86) PCT No.: **PCT/IB2016/050170**
§ 371 (c)(1),
(2) Date: **Jul. 4, 2017**

(87) PCT Pub. No.: **WO2016/113698**
PCT Pub. Date: **Jul. 21, 2016**

(65) **Prior Publication Data**

US 2018/0022131 A1 Jan. 25, 2018

(30) **Foreign Application Priority Data**

Jan. 15, 2015 (GB) 1500683.6

(51) **Int. Cl.**
B41J 29/393 (2006.01)
H04N 1/401 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 29/393*** (2013.01); ***G06T 7/0004*** (2013.01); ***H04N 1/4015*** (2013.01); ***H04N 1/6041*** (2013.01); *G06T 2207/30144* (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/2135; B41J 2/2146; B41J 29/393; H04N 1/6033; H04N 1/1903
See application file for complete search history.

(56) **References Cited**

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(Continued)

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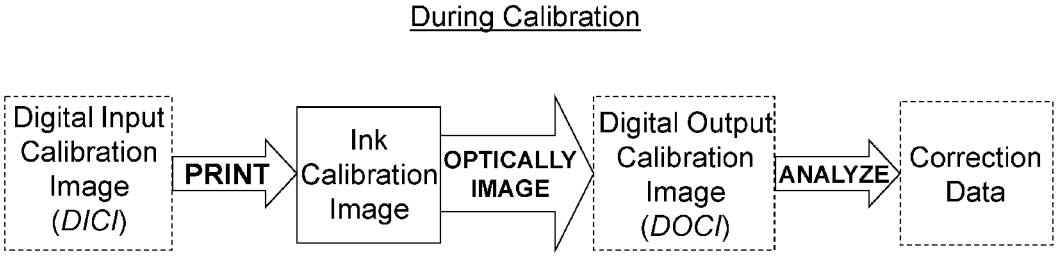
(Continued)

Primary Examiner — Sharon A Polk
(74) *Attorney, Agent, or Firm* — Marc Van Dyke;

(57) **ABSTRACT**

Some embodiments relate to a digital printing system and method for depositing ink droplets onto a target surface in dependence upon a received electrical printing signal containing data indicating the desired image to be printed while improving the uniformity of intended tone reproduction of the printed image.

6 Claims, 24 Drawing Sheets



US010201968B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,201,968 B2**
(45) **Date of Patent: Feb. 12, 2019**

(54) **ENDLESS FLEXIBLE BELT FOR A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Rami Keller**, Tel Aviv (IL); **Itshak Ashkanazi**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/790,026**

(22) Filed: **Oct. 22, 2017**

(65) **Prior Publication Data**

US 2018/0117906 A1 May 3, 2018

Related U.S. Application Data

(63) Continuation of application No. 15/345,238, filed on Nov. 7, 2016, now Pat. No. 9,849,667, which is a continuation of application No. 14/382,759, filed as application No. PCT/IB2013/051719 on Mar. 5, 2013, now Pat. No. 9,517,618.
(Continued)

(51) **Int. Cl.**
B41J 2/005 (2006.01)

(52) **U.S. Cl.**
CPC .. ***B41J 2/0057*** (2013.01); *G03G 2215/00147* (2013.01); *G03G 2215/00151* (2013.01)

(58) **Field of Classification Search**
CPC . B41J 11/007; B41J 1/30; B41J 2/0057; B41J 2/22; B41J 2/315; B41J 347/103; B41J 2002/012; B41J 17/28; B41J 17/30; B65H 5/02
See application file for complete search history.

(56) **References Cited**

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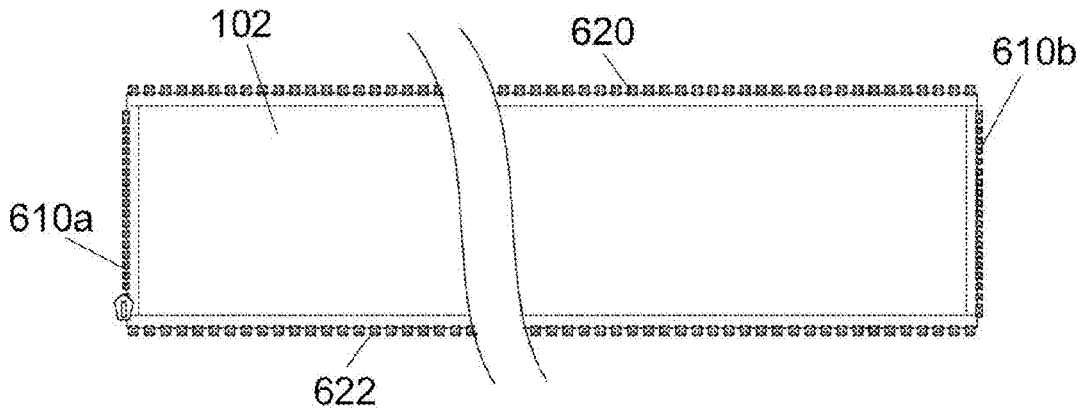
Primary Examiner — Geoffrey S Mruk
Assistant Examiner — Scott A Richmond
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A flexible belt is disclosed for use in a printing system. The belt comprises an endless strip which, in use, travels along a continuous path. Formations are provided along the sides of the strip which are capable of engaging with lateral tracks to place the belt under lateral tension, the lateral tracks further serving to constrain the belt to follow the continuous path.

17 Claims, 8 Drawing Sheets



US010190012B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,190,012 B2**
(45) **Date of Patent: Jan. 29, 2019**

(54) **TREATMENT OF RELEASE LAYER AND INKJET INK FORMULATIONS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Gregory Nakhmanovich**, Rishon LeZion (IL); **Galia Golodetz**, Rehovot (IL); **Sagi Abramovich**, Ra'anana (IL); **Yehoshua Sheinman**, Ra'anana (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 40 days.

(21) Appl. No.: **15/182,539**

(22) Filed: **Jun. 14, 2016**

(65) **Prior Publication Data**

US 2016/0369119 A1 Dec. 22, 2016

Related U.S. Application Data

(63) Continuation-in-part of application No. 14/382,881, filed as application No. PCT/IB2013/051755 on Mar. (Continued)

(51) **Int. Cl.**
C09D 11/54 (2014.01)
C09D 11/322 (2014.01)
(Continued)

(52) **U.S. Cl.**
CPC ***C09D 11/54*** (2013.01); ***B41J 2/01*** (2013.01); ***C09D 11/033*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC C09D 11/033; C09D 11/54; Y10T 428/31721; Y10T 428/31725
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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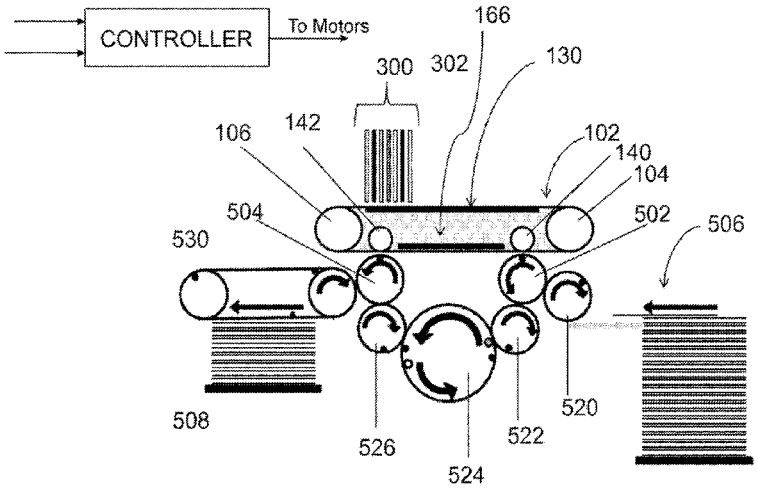
Primary Examiner — Betelhem Shewareged
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

Aqueous inkjet ink formulations comprising a solvent including water and a co-solvent, a water soluble or water dispersible polymeric resin and a colorant, and a method for facilitating the use of such an aqueous inkjet ink in an indirect printing system in which the ink is jetted onto a hydrophobic release layer of an intermediate transfer member before having the solvent removed therefrom and being transferred to a substrate, wherein prior to the jetting of the ink the release layer is brought into contact with an aqueous solution of a positively charged polymeric chemical agent. Other aspects are also described.

20 Claims, 8 Drawing Sheets



US010179447B2

(12) **United States Patent**
Shmaiser et al.

(10) **Patent No.: US 10,179,447 B2**
(45) **Date of Patent: Jan. 15, 2019**

(54) **DIGITAL PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Aharon Shmaiser**, Rishon LeZion (IL); **Benzion Landa**, Nes Ziona (IL); **Sagi Moskovich**, Petach Tikva (IL); **Nir Zarmi**, Be'erotayim (IL); **Yehuda Solomon**, Rishon LeZion (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/871,652**

(22) Filed: **Jan. 15, 2018**

(65) **Prior Publication Data**

US 2018/0134031 A1 May 17, 2018

Related U.S. Application Data

(63) Continuation of application No. 15/287,585, filed on Oct. 6, 2016, now Pat. No. 9,902,147, which is a (Continued)

(30) **Foreign Application Priority Data**

Sep. 11, 2013 (GB) 1316203.7

(51) **Int. Cl.**
B41J 2/005 (2006.01)
B41J 3/60 (2006.01)
B41J 2/01 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41J 2/005*** (2013.01); ***B41J 3/60*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/0057; B41J 3/60; B41J 2002/012
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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FOREIGN PATENT DOCUMENTS

CN 1720187 A 1/2006
CN 1261831 C 6/2006
(Continued)

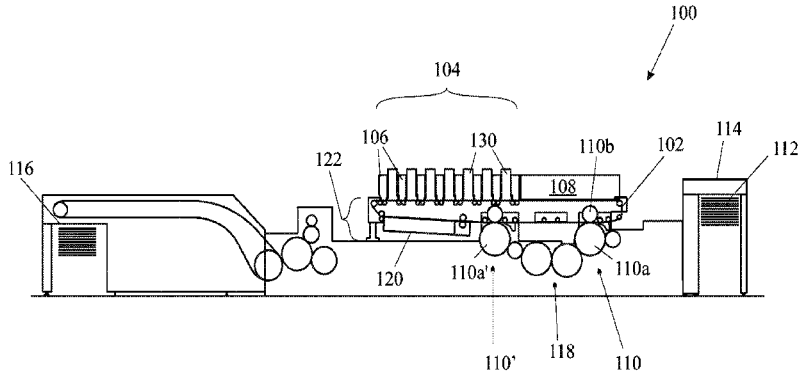
OTHER PUBLICATIONS

IP.com search (Year: 2018).*
(Continued)

Primary Examiner — Lisa Solomon
(74) *Attorney, Agent, or Firm* — Marc Van Dyke;

(57) **ABSTRACT**

A printing system for printing on a substrate, comprises a movable intermediate transfer member in the form of a flexible, substantially inextensible, belt guided to follow a closed path, an image forming station for depositing droplets of a liquid ink onto an outer surface of the belt to form an ink image, a drying station for drying the ink image on the belt to leave an ink residue film on the outer surface of the belt, first and second impression stations spaced from one another in the direction of movement of the belt, each impression station comprising an impression cylinder for supporting and transporting the substrate and a pressure cylinder carrying a compressible blanket for urging the belt against the substrate supported on the impression cylinder, and a transport system for transporting the substrate from the first impression station to the second impression station. The pressure cylinder of at least the first impression station is movable between a first position in which the belt is urged
(Continued)



US010065411B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 10,065,411 B2**
(45) **Date of Patent: Sep. 4, 2018**

(54) **APPARATUS AND METHOD FOR CONTROL OR MONITORING A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Nir Zarmi**, Be'erotayim (IL); **Abraham Keren**, Modi'in Maccabim Reut (IL); **Alon Siman-Tov**, Or Yehuda (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/818,010**

(22) Filed: **Nov. 20, 2017**

(65) **Prior Publication Data**

US 2018/0154628 A1 Jun. 7, 2018

Related U.S. Application Data

(63) Continuation of application No. 15/289,210, filed on Oct. 10, 2016, now Pat. No. 9,884,479, which is a continuation of application No. 14/860,776, filed on Sep. 22, 2015, now Pat. No. 9,498,946, which is a continuation-in-part of application No. 14/382,880, filed as application No. PCT/IB2013/051727 on Mar. 5, 2013, now Pat. No. 9,186,884, which is a continuation-in-part of application No. PCT/IB2013/050245, filed on Jan. 10, 2013, which is a continuation of application No. PCT/IB2012/056100, filed on Nov. 1, 2012, said

(Continued)

(51) **Int. Cl.**
B41J 2/005 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/0057; B41J 2002/012
USPC 347/103
See application file for complete search history.

(56) **References Cited**

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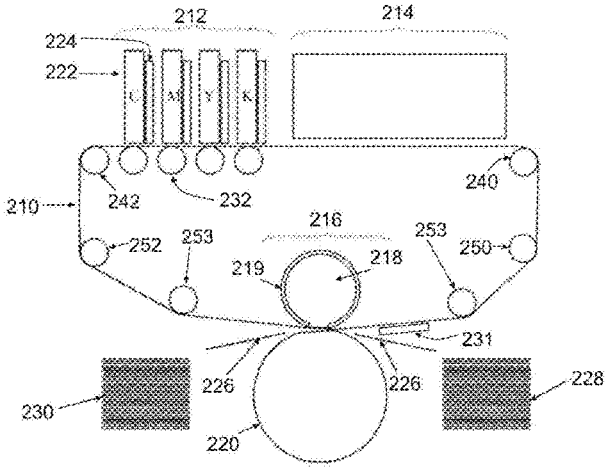
WO WO9307000 A1 5/2013

Primary Examiner — Huan Tran
Assistant Examiner — Alexander D Shenderov
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

Embodiments of the present invention relate to control apparatus and methods of a printing system, for example, comprising an intermediate transfer member (ITM) and to user-related features of a printing system. Some embodiments relate to regulation of a velocity and/or tension and/or length of the ITM. Some embodiments relate to regulation of deposition of ink on the moving ITM. Some embodiments regulate to apparatus configured to alert a user of one or more events related to operation of the ITM. Some embodiments relate to a time-line GUI for visualizing and/or manipulating queued print jobs which may be employed. Some embodiments relate to a reversed augmented reality GUI for visualization and/or control of the printing system. In some embodiments, a display screen is mounted to a printer housing and/or able to control access to moving parts of a printing system.

4 Claims, 70 Drawing Sheets



US00D750165S

(12) United States Design Patent

Landa et al.

(10) Patent No.: US D750,165 S
(45) Date of Patent: ** Feb. 23, 2016

(54) **MONITORING STATION FOR A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Elisha Avram Tal**, Harey Yehuda (IL); **Eitan Sharif**, Kibbutz Gesher-Haziv (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(**) Term: **14 Years**

(21) Appl. No.: **29/466,010**

(22) Filed: **Sep. 4, 2013**

Related U.S. Application Data

(63) Continuation-in-part of application No. 29/461,584, filed on Jul. 25, 2013, now Pat. No. Des. 742,451.

(51) **LOC (10) Cl.** **18-02**

(52) **U.S. Cl.**
USPC **D18/53**

(58) **Field of Classification Search**
USPC D18/53, 56, 59, 36, 38, 39, 40, 41, 45; D14/301, 304, 305, 307; 399/16, 75, 399/81, 131, 151, 361, 365, 367, 381–385, 399/388
CPC ... G06K 15/12; G06K 15/14; H04N 1/00204; H04N 1/00249; H04N 1/00278
See application file for complete search history.

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Primary Examiner — Bridget L Eland
Assistant Examiner — Lauren McVey
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **CLAIM**

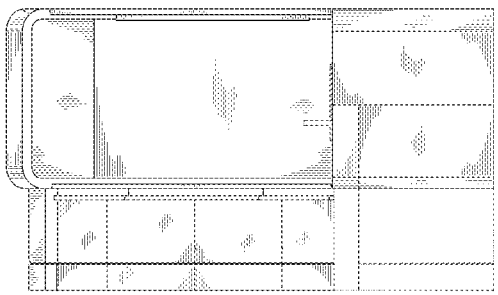
The ornamental design for a monitoring station for a printing system, as shown and described.

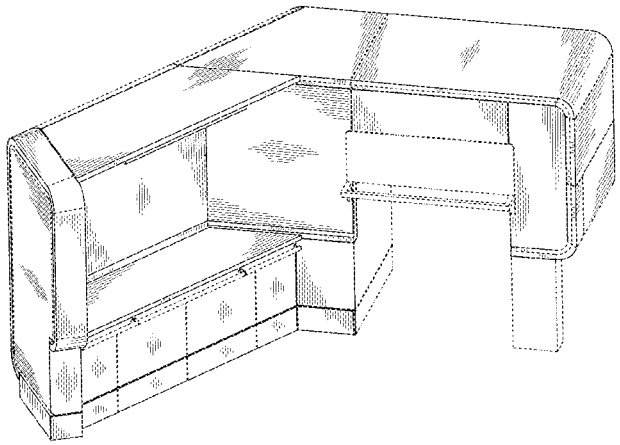
DESCRIPTION

FIG. **1** is a front view of a monitoring station for a printing system showing our new design;
FIG. **2** is a back view of the monitoring station for a printing system shown in FIG. **1**;
FIG. **3** is a right view of the monitoring station for a printing system shown in FIG. **1**;
FIG. **4** is a left view of the monitoring station for a printing system shown in FIG. **1**;
FIG. **5** is a top view of the monitoring station for a printing system shown in FIG. **1**;
FIG. **6** is a bottom view of the monitoring station for a printing system shown in FIG. **1**;
FIG. **7** is a first perspective view of the monitoring station for a printing system shown in FIG. **1**; and,
FIG. **8** is a second perspective view thereof, shown in FIG. **1** in an environment.

The broken lines immediately adjacent to the shaded areas, represent the bounds of the claimed design while all other broken lines are directed to environment and are for illustrative purposes only; the broken lines form no part of the claimed design.

1 Claim, 8 Drawing Sheets





US00D742451S

(12) United States Design Patent

Landa et al.

(10) Patent No.: US D742,451 S
(45) Date of Patent: ** Nov. 3, 2015

(54) **MONITORING STATION FOR A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Elisha Avram Tal**, Harey Yehuda (IL); **Eitan Sharif**, Kibbutz Gesher-Haziv (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot (IL)

(**) Term: **14 Years**

(21) Appl. No.: **29/461,584**

(22) Filed: **Jul. 25, 2013**

(51) **LOC (10) Cl.** **18-02**

(52) **U.S. Cl.**
USPC **D18/53**

(58) **Field of Classification Search**
USPC D18/53, 56, 59, 36, 38, 39, 40, 41, 45; D14/301, 307, 305; 399/16, 75, 81, 399/131, 151, 361, 365, 367, 381–385, 388
CPC ... G06K 15/12; G06K 15/14; H04N 1/00204; H04N 1/00249; H04N 1/00278
See application file for complete search history.

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D693,401	S	*	11/2013	Landa et al.	D18/53
D694,320	S	*	11/2013	Landa et al.	D18/53
D694,818	S	*	12/2013	Landa et al.	D18/53
D694,819	S	*	12/2013	Landa et al.	D18/53
D694,820	S	*	12/2013	Landa et al.	D18/53
D694,821	S	*	12/2013	Landa et al.	D18/53
D695,822	S	*	12/2013	Landa et al.	D18/53

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* cited by examiner

Primary Examiner — Bridget L Eland
(74) *Attorney, Agent, or Firm* — Marc Van Dyke;

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DESCRIPTION

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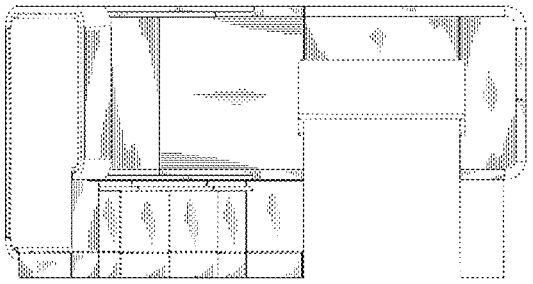
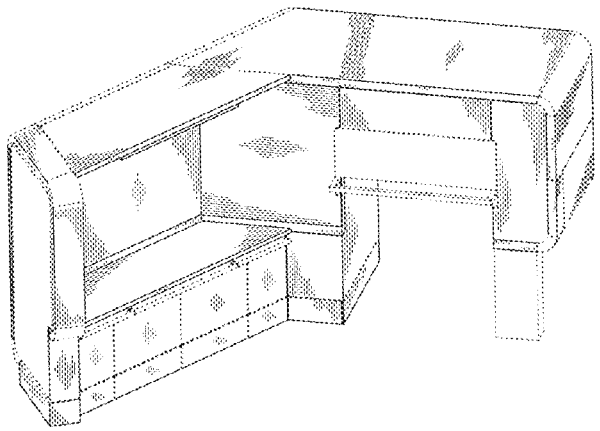
FIG. **4** is a left view of the monitoring station for a printing system shown in FIG. **1**;
FIG. **5** is a top view of the monitoring station for a printing system shown in FIG **1**;
FIG. **6** is a bottom view of the monitoring station for a printing system shown in FIG. **1**;
FIG. **7** is a first perspective view of the monitoring station for a printing system shown in FIG. **1**; and,
FIG. **8** is a second perspective view of the monitoring station for a printing system shown in FIG. **1** in an environment.
The broken lines immediately adjacent to the shaded areas, represent the bounds of the claimed design while all other broken lines are directed to environment and are for illustrative purposes only; the broken lines form no part of the claimed design.

1 Claim, 8 Drawing Sheets





US00D695822S

(12) United States Design Patent

Landa et al.

(10) Patent No.: US D695,822 S
(45) Date of Patent: ** Dec. 17, 2013

(54) **PRINTER**

(75) Inventors: **Benzion Landa**, Nes Ziona (IL); **Elisha Avram Tal**, Harey Yehuda (IL); **Eitan Sharif**, Kibbutz Gesher-Haziv (IL)

(73) Assignee: **Landa Corporation Ltd.**, Rehovot (IL)

(**) Term: **14 Years**

(21) Appl. No.: **29/419,668**

(22) Filed: **Apr. 30, 2012**

(51) **LOC (9) Cl.** **18-02**

(52) **U.S. Cl.**
USPC **D18/53**

(58) **Field of Classification Search**
USPC D18/53, 50, 55, 56, 59, 36–39, 46–49; D14/301, 303; 270/1.01; 271/8.1; 101/2; 358/1.1; 355/78; 399/361
See application file for complete search history.

(56) **References Cited**

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D357,934	S *	5/1995	Karafuji et al.	D18/53
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D416,572	S *	11/1999	Ishida et al.	D18/53
D453,785	S *	2/2002	Grossmann	D18/48
D621,442	S *	8/2010	Kachi et al.	D18/39
D650,417	S *	12/2011	Brown et al.	D18/53
D663,768	S *	7/2012	Yanagisawa et al.	D18/53
D673,212	S *	12/2012	Okamoto	D18/53

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(Continued)

Primary Examiner — Bridget L Eland
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **CLAIM**

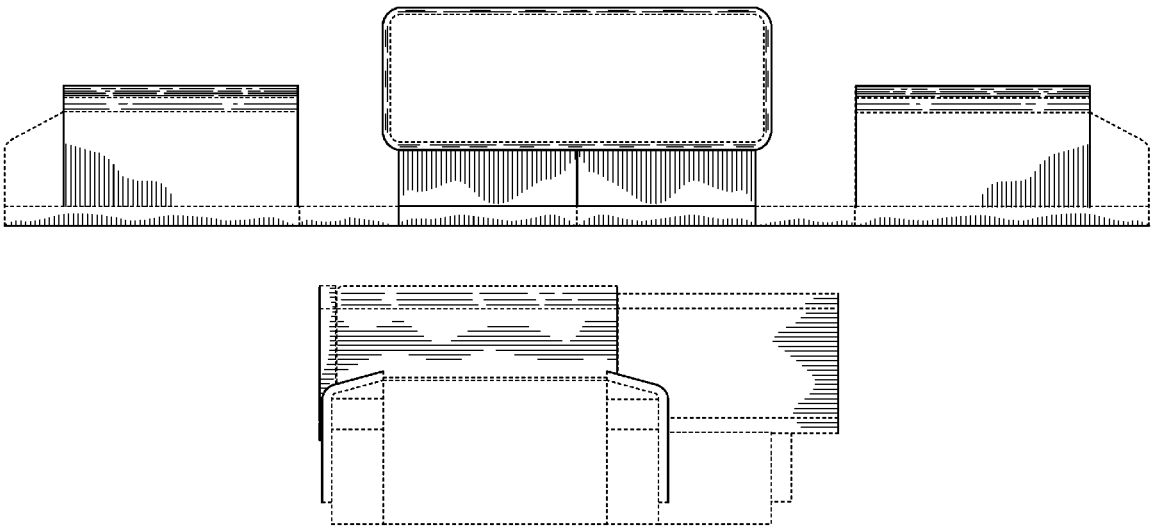
The ornamental design for a printer, as shown and described.

DESCRIPTION

FIG. **1** is a front view of a printer showing our new design;
FIG. **2** is a back view of the printer shown in FIG. **1**;
FIG. **3** is a right view of the printer shown in FIG. **1**;
FIG. **4** is a left view of the printer shown in FIG. **1**;
FIG. **5** is a top view of the printer shown in FIG. **1**;
FIG. **6** is a bottom view of the printer shown in FIG. **1**; and,
FIG. **7** is a perspective view of the printer shown in FIG. **1**.

The broken lines immediately adjacent to the shaded areas, represent the bounds of the claimed design while all other broken lines are directed to environment and are for illustrative purposes only; the broken lines form no part of the claimed design.

1 Claim, 7 Drawing Sheets



US00D694821S

(12) United States Design Patent

Landa et al.

(10) Patent No.: US D694,821 S
(45) Date of Patent: ** Dec. 3, 2013

(54) **PRINTER**

(75) Inventors: **Benzion Landa**, Nes Ziona (IL); **Elisha Avram Tal**, Harey Yehuda (IL); **Eitan Sharif**, Kibbutz Gesher-Haziv (IL)

(73) Assignee: **Landa Corporation Ltd.**, Rehovot (IL)

(**) Term: **14 Years**

(21) Appl. No.: **29/419,875**

(22) Filed: **May 2, 2012**

(51) **LOC (9) Cl.** **18-02**

(52) **U.S. Cl.**
USPC **D18/53**

(58) **Field of Classification Search**
USPC D18/53, 50, 55, 56, 59, 36–39, 46–49; D14/301, 303; 270/1.01; 271/8.1; 101/2; 358/1.1; 355/78; 399/361
See application file for complete search history.

(56) **References Cited**

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D416,572	S *	11/1999	Ishida et al.	D18/53
D453,785	S *	2/2002	Grossmann	D18/48
D621,442	S *	8/2010	Kachi et al.	D18/39
D650,417	S *	12/2011	Brown et al.	D18/53
D663,768	S *	7/2012	Yanagisawa et al.	D18/53
D673,212	S *	12/2012	Okamoto	D18/53

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(Continued)

Primary Examiner — Bridget L Eland
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **CLAIM**

The ornamental design for a printer, as shown and described.

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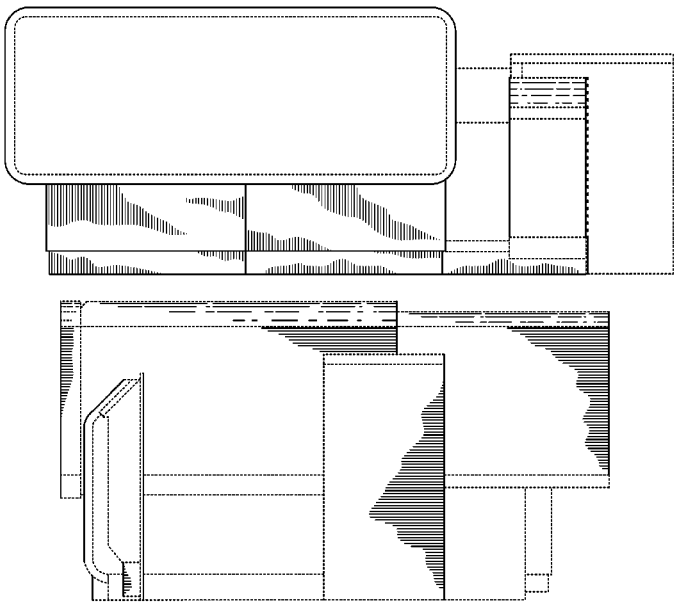

US00D694820S

(12) United States Design Patent

Landa et al.

(10) Patent No.: US D694,820 S
(45) Date of Patent: ** Dec. 3, 2013

(54) **PRINTER**

(75) Inventors: **Benzion Landa**, Nes Ziona (IL); **Elisha Avram Tal**, Harey Yehuda (IL); **Eitan Sharif**, Kibbutz Gesher-Haziv (IL)

(73) Assignee: **Landa Corporation Ltd.**, Rehovot (IL)

(**) Term: **14 Years**

(21) Appl. No.: **29/419,873**

(22) Filed: **May 2, 2012**

(51) **LOC (9) Cl.** **18-02**

(52) **U.S. Cl.**
USPC **D18/53**

(58) **Field of Classification Search**
USPC D18/53, 50, 55, 56, 59, 36–39, 46–49; D14/301, 303; 270/1.01; 271/8.1; 101/2; 358/1.1; 355/78; 399/361
See application file for complete search history.

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D357,499	S	*	4/1995	Karafuji et al.	D18/53
D357,934	S	*	5/1995	Karafuji et al.	D18/53
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D453,785	S	*	2/2002	Grossmann	D18/48
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D650,417	S	*	12/2011	Brown et al.	D18/53
D663,768	S	*	7/2012	Yanagisawa et al.	D18/53
D673,212	S	*	12/2012	Okamoto	D18/53

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(Continued)

Primary Examiner — Bridget L Eland
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **CLAIM**

The ornamental design for an printer, as shown and described.

DESCRIPTION

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FIG. **2** is a back view of the printer shown in FIG. **1**;
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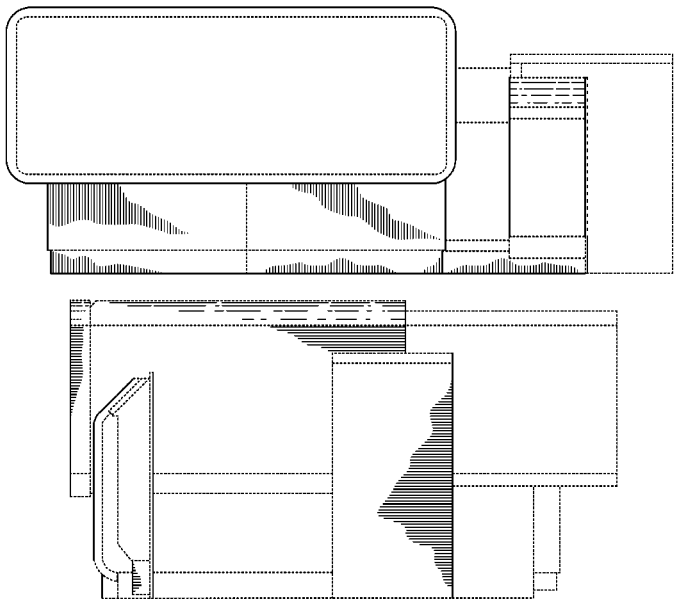

US00D694819S

(12) United States Design Patent

Landa et al.

(10) Patent No.: US D694,819 S
(45) Date of Patent: ** Dec. 3, 2013

(54) **PRINTER**

(75) Inventors: **Benzion Landa**, Nes Ziona (IL); **Elisha Avram Tal**, Harey Yehuda (IL); **Eitan Sharif**, Kibbutz Gesher-Haziv (IL)

(73) Assignee: **Landa Corporation Ltd.**, Rehovot (IL)

(**) Term: **14 Years**

(21) Appl. No.: **29/419,665**

(22) Filed: **Apr. 30, 2012**

(51) **LOC (9) Cl.** **18-02**

(52) **U.S. Cl.**
USPC **D18/53**

(58) **Field of Classification Search**
USPC D18/53, 50, 55, 56, 59, 36–39, 46–49; D14/301, 303; 270/1.01; 271/8.1; 101/2; 358/1.1; 355/78; 399/361
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D357,934	S *	5/1995	Karafuji et al.	D18/53
D412,525	S *	8/1999	Tachibana et al.	D18/53
D416,572	S *	11/1999	Ishida et al.	D18/53
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D663,768	S *	7/2012	Yanagisawa et al.	D18/53
D673,212	S *	12/2012	Okamoto	D18/53

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(Continued)

Primary Examiner — Bridget L Eland
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

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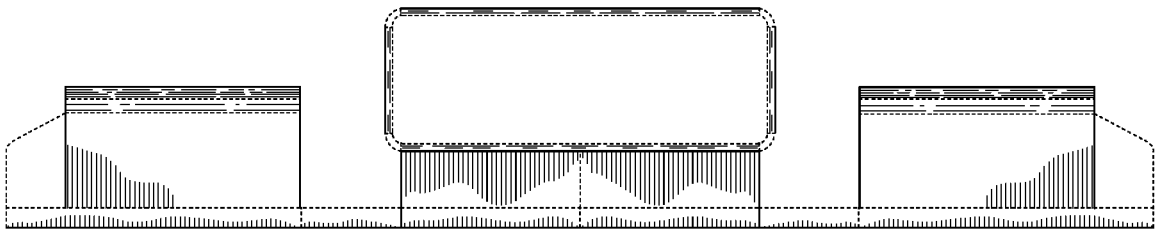

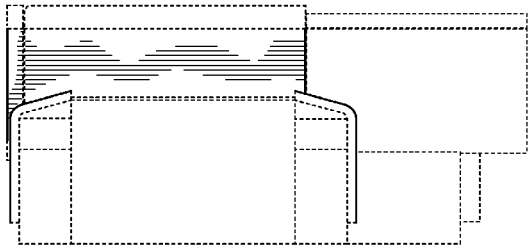

US00D694818S

(12) United States Design Patent

Landa et al.

(10) Patent No.: US D694,818 S
(45) Date of Patent: ** Dec. 3, 2013

(54) **PRINTER**

(75) Inventors: **Benzion Landa**, Nes Ziona (IL); **Elisha Avram Tal**, Harey Yehuda (IL); **Eitan Sharif**, Kibbutz Gesher-Haziv (IL)

(73) Assignee: **Landa Corporation Ltd.**, Rehovot (IL)

(**) Term: **14 Years**

(21) Appl. No.: **29/419,659**

(22) Filed: **Apr. 30, 2012**

(51) **LOC (9) Cl.** **18-02**

(52) **U.S. Cl.**
USPC **D18/53**

(58) **Field of Classification Search**
USPC D18/53, 50, 55, 56, 59, 36–39, 46–49; D14/301, 303; 270/1.01; 271/8.1; 101/2; 358/1.1; 355/78; 399/361
See application file for complete search history.

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D357,934	S	*	5/1995	Karafuji et al.	D18/53
D412,525	S	*	8/1999	Tachibana et al.	D18/53
D416,572	S	*	11/1999	Ishida et al.	D18/53
D453,785	S	*	2/2002	Grossmann	D18/48
D621,442	S	*	8/2010	Kachi et al.	D18/39
D650,417	S	*	12/2011	Brown et al.	D18/53
D663,768	S	*	7/2012	Yanagisawa et al.	D18/53
D673,212	S	*	12/2012	Okamoto	D18/53

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EM	002121681-0010	* 10/2012

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PRV Interpat (Swedish patent office consultancy services) Search Report for drawings of Design U.S. Appl. No. 29/419,659 [US design patent application filed Apr. 30, 2012]—search report mailed Sep. 7, 2012.

(Continued)

Primary Examiner — Bridget L Eland
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **CLAIM**

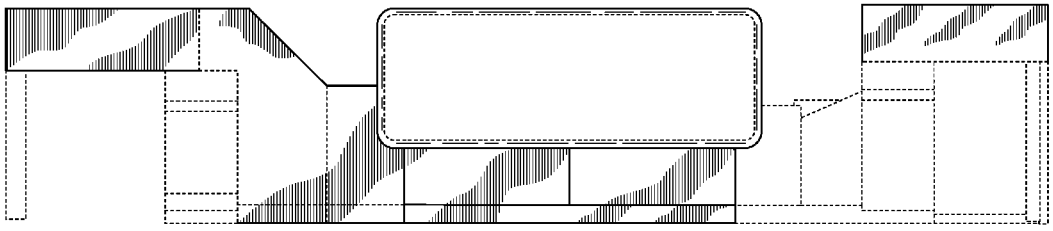
The ornamental design for a printer, as shown and described.

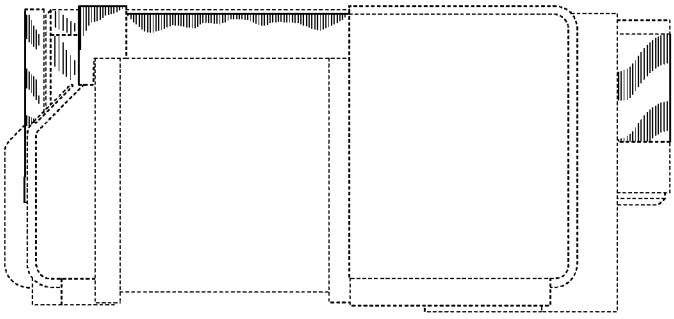
DESCRIPTION

FIG. **1** is a front view of a printer showing our new design;
FIG. **2** is a back view of the printer shown in FIG. **1**;
FIG. **3** is a right view of the printer shown in FIG. **1**;
FIG. **4** is a left view of the printer shown in FIG. **1**;
FIG. **5** is a top view of the printer shown in FIG. **1**;
FIG. **6** is a bottom view of the printer shown in FIG. **1**; and,
FIG. **7** is a perspective view of the printer shown in FIG. **1**.

The broken lines immediately adjacent to the shaded areas, represent the bounds of the claimed design while all other broken lines are directed to environment and are for illustrative purposes only; the broken lines form no part of the claimed design.

1 Claim, 7 Drawing Sheets





US00D694320S

(12) United States Design Patent

Landa et al.

(10) Patent No.: US D694,320 S
(45) Date of Patent: ** Nov. 26, 2013

(54) **PRINTER**

(75) Inventors: **Benzion Landa**, Nes Ziona (IL); **Elisha Avram Tal**, Harey Yehuda (IL); **Eitan Sharif**, Kibbutz Gesher-Haziv (IL)

(73) Assignee: **Landa Corporation Ltd.**, Rehovot (IL)

(**) Term: **14 Years**

(21) Appl. No.: **29/419,654**

(22) Filed: **Apr. 30, 2012**

(51) **LOC (9) Cl.** **18-02**

(52) **U.S. Cl.**
USPC **D18/53**

(58) **Field of Classification Search**
USPC D18/53, 50, 55, 56, 59, 36–39, 46–49; D14/301, 303; 270/1.01; 271/8.1; 101/2; 358/1.1; 355/78; 399/361
See application file for complete search history.

(56) **References Cited**

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5,103,730	A	*	4/1992	Sarda	101/425
D357,499	S	*	4/1995	Karafuji et al.	D18/53
D357,934	S	*	5/1995	Karafuji et al.	D18/53
D412,525	S	*	8/1999	Tachibana et al.	D18/53
D416,572	S	*	11/1999	Ishida et al.	D18/53
D453,785	S	*	2/2002	Grossmann	D18/48
D621,442	S	*	8/2010	Kachi et al.	D18/39
D650,417	S	*	12/2011	Brown et al.	D18/53
D663,768	S	*	7/2012	Yanagisawa et al.	D18/53
D673,212	S	*	12/2012	Okamoto	D18/53

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EM	002121681-0001	* 10/2012
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PRV Interpat (Swedish patent office consultancy services) Search Report for drawings of Design U.S. Appl. No. 29/419,659 [US design patent application filed Apr. 30, 2012]—search report mailed Sep. 7, 2012.

(Continued)

Primary Examiner — Bridget L Eland
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **CLAIM**

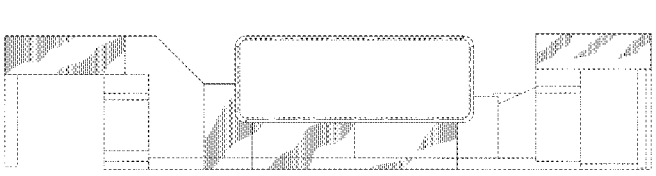
The ornamental design for a printer, as shown and described.

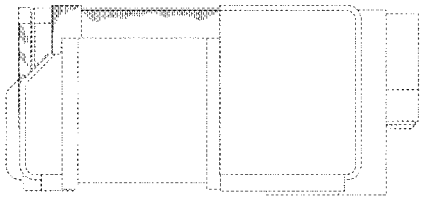
DESCRIPTION

FIG. **1** is a front view of a printer showing our new design;
FIG. **2** is a back view of the printer shown in FIG. **1**;
FIG. **3** is a right view of the printer shown in FIG. **1**;
FIG. **4** is a left view of the printer shown in FIG. **1**;
FIG. **5** is a top view of the printer shown in FIG. **1**;
FIG. **6** is a bottom view of the printer shown in FIG. **1**; and,
FIG. **7** is a perspective view of the printer shown in FIG. **1**.

The broken lines immediately adjacent to the shaded areas, represent the bounds of the claimed design while all other broken lines are directed to environment and are for illustrative purposes only; the broken lines form no part of the claimed design.

1 Claim, 7 Drawing Sheets





US00D693401S

(12) United States Design Patent

Landa et al.

(10) Patent No.: US D693,401 S
(45) Date of Patent: ** Nov. 12, 2013

(54) **PRINTER**

(71) Applicant: **Landa Corporation Limited**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Elisha Avram Tal**, Harey Yehuda (IL); **Eitan Sharif**, Kibbutz Gesher-Haziv (IL)

(73) Assignee: **Landa Corporation Ltd.**, Rehovot (IL)

(**) Term: **14 Years**

(21) Appl. No.: **29/433,159**

(22) Filed: **Sep. 26, 2012**

(51) **LOC (9) Cl.** **18-02**

(52) **U.S. Cl.**
USPC **D18/53**

(58) **Field of Classification Search**
USPC D18/53, 50, 55, 56, 59, 36–39, 46–49; D14/301, 303; 270/1.01; 271/8.1; 101/2; 358/1.1; 355/78; 399/361
See application file for complete search history.

(56) **References Cited**

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D236,378	S *	8/1975	Yanofski	D18/38
D236,379	S *	8/1975	Yanofsky	D18/38
D250,952	S *	1/1979	Spowart et al.	D18/53
5,103,730	A *	4/1992	Sarda	101/425
D357,499	S *	4/1995	Karafuji et al.	D18/53
D357,934	S *	5/1995	Karafuji et al.	D18/53
D412,525	S *	8/1999	Tachibana et al.	D18/53
D416,572	S *	11/1999	Ishida et al.	D18/53
D453,785	S *	2/2002	Grossmann	D18/48
D621,442	S *	8/2010	Kachi et al.	D18/39
D650,417	S *	12/2011	Brown et al.	D18/53
D663,768	S *	7/2012	Yanagisawa et al.	D18/53
D673,212	S *	12/2012	Okamoto	D18/53

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USPTO office action for U.S. Appl. No. 29/419,668—office action mailed on Mar. 8, 2013.

(Continued)

Primary Examiner — Bridget L Eland
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **CLAIM**

The ornamental design for a printer, as shown and described.

DESCRIPTION

FIG. **1** is a front view of a printer showing our new design;
FIG. **2** is a back view of the printer shown in FIG. **1**;
FIG. **3** is a right view of the printer shown in FIG. **1**;
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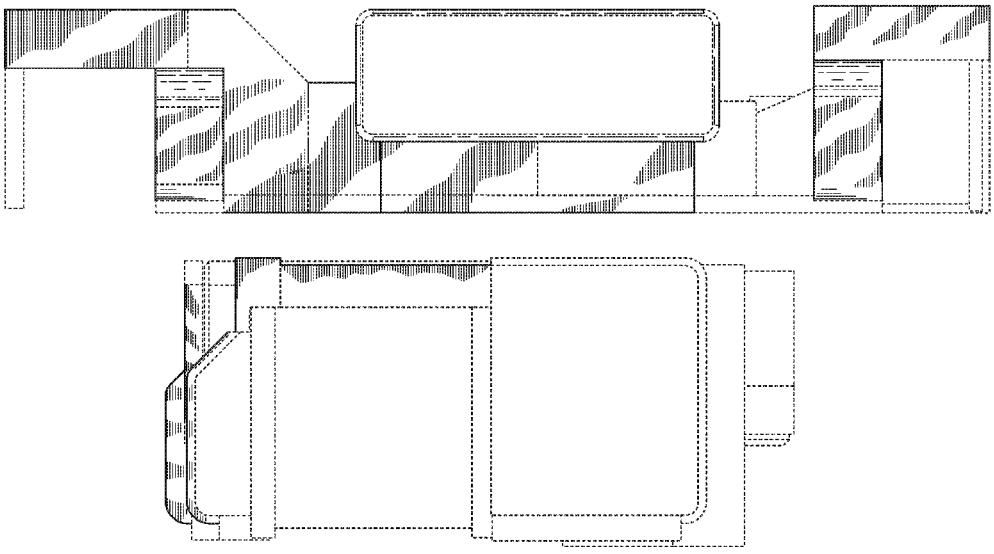
FIG. **6** is a bottom view of the printer shown in FIG. **1**; and,
FIG. **7** is a perspective view of the printer shown in FIG. **1**.

The broken lines immediately adjacent to the shaded areas, represent the bounds of the claimed design while all other broken lines are directed to environment and are for illustrative purposes only; the broken lines form no part of the claimed design.

1 Claim, 7 Drawing Sheets



US009914316B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 9,914,316 B2**
(45) **Date of Patent: *Mar. 13, 2018**

(54) **PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Itshak Ashkanazi**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **15/439,966**

(22) Filed: **Feb. 23, 2017**

(65) **Prior Publication Data**

US 2017/0239969 A1 Aug. 24, 2017

Related U.S. Application Data

(63) Continuation of application No. 15/053,017, filed on Feb. 25, 2016, now Pat. No. 9,643,403, which is a (Continued)

(51) **Int. Cl.**
B41M 5/025 (2006.01)
B41J 2/01 (2006.01)

(52) **U.S. Cl.**
CPC ***B41M 5/0256*** (2013.01); ***B41J 2/01*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
CPC B41M 5/0256; B41J 2/01; B41J 2002/012
(Continued)

(56) **References Cited**

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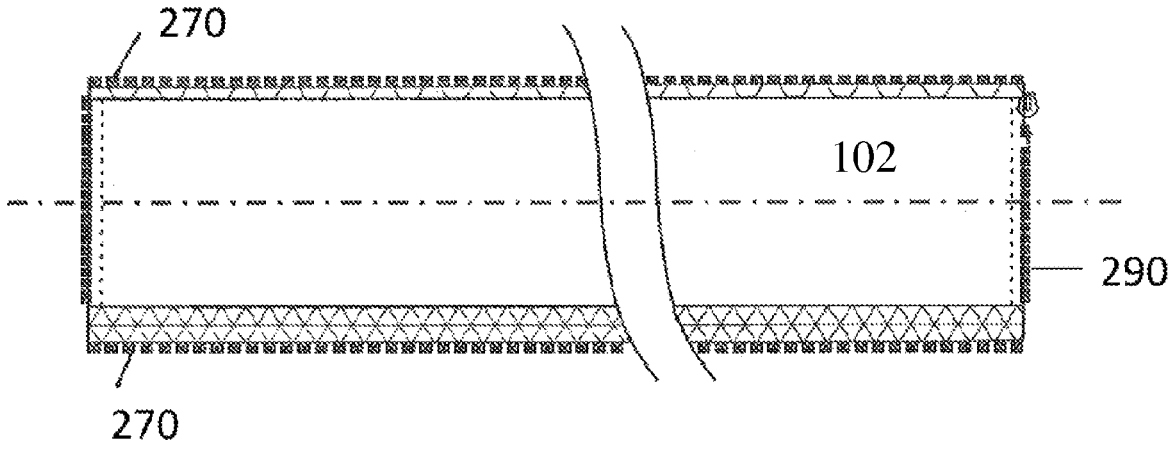
(Continued)

Primary Examiner — Huan Tran
Assistant Examiner — Alexander D Shenderov
(74) *Attorney, Agent, or Firm* — Marc Van Dyke:

(57) **ABSTRACT**

An intermediate transfer member (ITM) for use in a printing system to transport an ink image from an image forming station to an impression station for transfer of the ink image from the ITM onto a printing substrate, wherein the ITM is an endless flexible belt of substantially uniform width which, during use, passes over drive and guide rollers and is guided through at least the image forming station by means of guide channels that receive formations provided on both lateral edges of the belt, wherein the formations on a first edge differ from the formations on the second edge by being configured for providing the elasticity desired to maintain the belt taut when the belt is guided through their respective lateral channels.

15 Claims, 10 Drawing Sheets



US009902147B2

(12) **United States Patent**
Shmaiser et al.

(10) **Patent No.: US 9,902,147 B2**
(45) **Date of Patent: Feb. 27, 2018**

(54) **DIGITAL PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Aharon Shmaiser**, Rishon LeZion (IL); **Benzion Landa**, Nes Ziona (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/287,585**

(22) Filed: **Oct. 6, 2016**

(65) **Prior Publication Data**

US 2017/0080705 A1 Mar. 23, 2017

Related U.S. Application Data

(63) Continuation-in-part of application No. 14/917,020, filed as application No. PCT/IN2014/064277 on Sep. 5, 2014, now Pat. No. 9,505,208, said application No. 15/287,585 is a continuation-in-part of application No. 14/382,756, filed as application No. PCT/IB2013/051717 on Mar. 5, 2013, now Pat. No. 9,568,862.

(60) Provisional application No. 61/606,913, filed on Mar. 5, 2012, provisional application No. 61/611,286, filed on Mar. 15, 2012, provisional application No. 61/619,016, filed on Apr. 2, 2012, provisional application No. 61/619,546, filed on Apr. 3, 2012, provisional application No. 61/635,156, filed on Apr. 18, 2012, provisional application No. 61/640,493, filed on Apr. 30, 2012.

(30) **Foreign Application Priority Data**

Sep. 11, 2013 (GB) 1316203.7

(51) **Int. Cl.**
B41J 2/005 (2006.01)
B41J 3/60 (2006.01)
B41J 2/01 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41J 3/60*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

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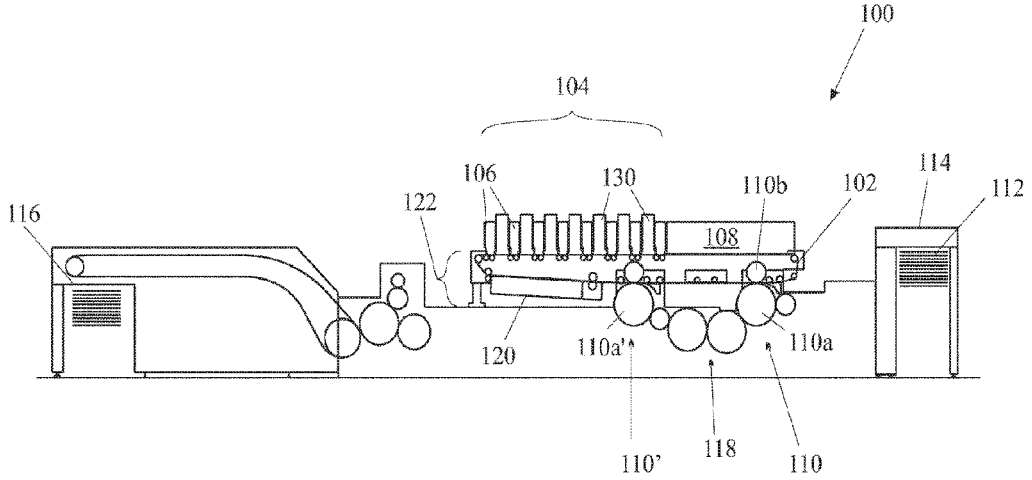
Primary Examiner — Lisa M Solomon
(74) *Attorney, Agent, or Firm* — Marc Van Dyke:

(57) **ABSTRACT**

Embodiments of the invention relate to a digital printing system comprising two independently operable printing towers, each tower having a respective endless intermediate transfer member, a respective image forming system serving under digital control to deposit ink onto the intermediate transfer member to form an ink image on the respective endless intermediate transfer member, a drier for drying the ink image while it is being transported by the intermediate transfer member to form a residue film and a respective impression station at which the residue film is impressed onto a sheet substrate.

17 Claims, 9 Drawing Sheets



US009884479B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 9,884,479 B2**
(45) **Date of Patent: Feb. 6, 2018**

(54) **APPARATUS AND METHOD FOR CONTROL OR MONITORING A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Nir Zarmi**, Be'erotayim (IL); **Abraham Keren**, Modi'in Maccabim Reut (IL); **Alon Siman-Tov**, Or Yehuda (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/289,210**

(22) Filed: **Oct. 10, 2016**

(65) **Prior Publication Data**

US 2017/0080706 A1 Mar. 23, 2017

Related U.S. Application Data

(60) Division of application No. 14/860,776, filed on Sep. 22, 2015, now Pat. No. 9,498,946, which is a (Continued)

(51) **Int. Cl.**
B41J 2/005 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01)

(58) **Field of Classification Search**
CPC G03G 15/00; B41J 2/0057; B41J 2002/012
(Continued)

(56) **References Cited**

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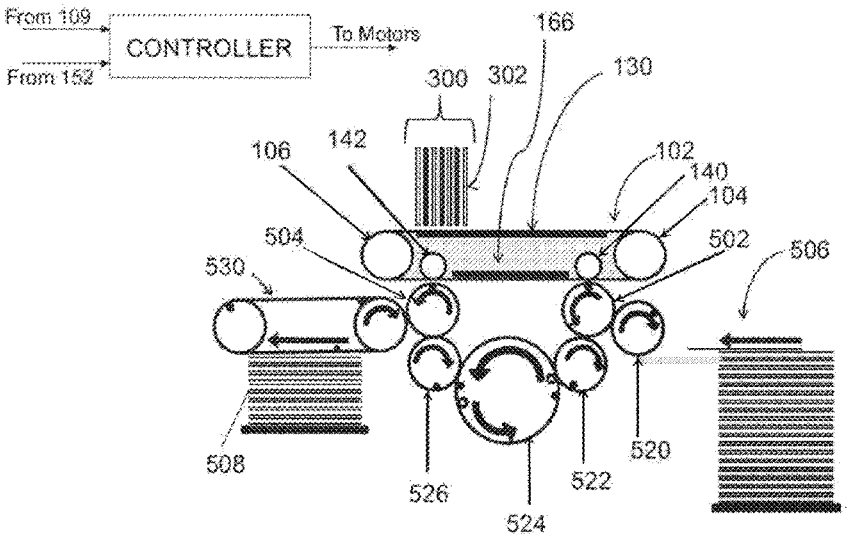
DE 102010060999 Machine Translation (by EPO and Google)—published Jun. 6, 2012; Wolf, Roland, Dr.-Ing.
(Continued)

Primary Examiner — Huan Tran
Assistant Examiner — Alexander D Shenderov
(74) *Attorney, Agent, or Firm* — Marc Van Dyke:

(57) **ABSTRACT**

Embodiments of the present invention relate to control apparatus and methods of a printing system, for example, comprising an intermediate transfer member (ITM) and to user-related features of a printing system. Some embodiments relate to regulation of a velocity and/or tension and/or length of the ITM. Some embodiments relate to regulation of deposition of ink on the moving ITM. Some embodiments regulate to apparatus configured to alert a user of one or more events related to operation of the ITM. Some embodiments relate to a time-line GUI for visualizing and/or manipulating queued print jobs which may be employed. Some embodiments relate to a reversed augmented reality GUI for visualization and/or control of the printing system. In some embodiments, a display screen is mounted to a printer housing and/or able to control access to moving parts of a printing system.

9 Claims, 70 Drawing Sheets



US009749497B2

(12) **United States Patent**
Litvak et al.

(10) **Patent No.: US 9,749,497 B2**
(45) **Date of Patent: Aug. 29, 2017**

(54) **APPARATUS AND METHOD USING A MASK PRODUCING A HALFTONE IMAGE WITH CENTROIDS OF CLUSTERS DISTRIBUTED STOCHASTICALLY AND BRIDGED-CLUSTER COMBINATIONS DEPENDING ON THRESHOLD LIGHTNESS LEVELS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Mattetyahu Litvak**, Tel Aviv (IL); **Shahar Klinger**, Rehovot (IL); **Alon Siman Tov**, Or Yehuda (IL); **Avraham Guttman**, Yavne (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/109,635**

(22) PCT Filed: **Jan. 22, 2015**

(86) PCT No.: **PCT/IB2015/050501**
§ 371 (c)(1),
(2) Date: **Jul. 3, 2016**

(87) PCT Pub. No.: **WO2015/110988**
PCT Pub. Date: **Jul. 30, 2015**

(65) **Prior Publication Data**

US 2016/0344896 A1 Nov. 24, 2016

(30) **Foreign Application Priority Data**

Jan. 22, 2014 (GB) 1401078.9

(51) **Int. Cl.**
H04N 1/405 (2006.01)
H04N 1/409 (2006.01)
G06K 15/02 (2006.01)

(52) **U.S. Cl.**
CPC ***H04N 1/4055*** (2013.01); ***G06K 15/1876*** (2013.01); ***G06K 15/1881*** (2013.01); ***H04N 1/409*** (2013.01); ***H04N 1/4051*** (2013.01)

(58) **Field of Classification Search**
CPC H04N 1/405–1/4058; H04N 1/52; H04N 1/58; G06K 15/1876; G06K 15/1877; G06K 15/1881
See application file for complete search history.

(56) **References Cited**

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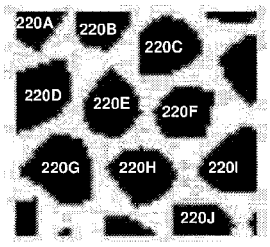
(Continued)

Primary Examiner — Scott A Rogers
(74) *Attorney, Agent, or Firm* — Marc Van Dyke;

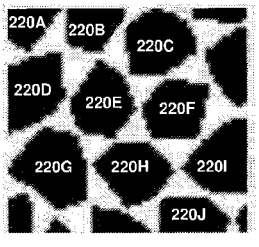
(57) **ABSTRACT**

There is provided an ink-deposition device suitable for depositing ink on a target surface and a printing system comprising the same. In operation in a printing system, the

(Continued)



Sub-threshold



Threshold

US009643403B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 9,643,403 B2**
(45) **Date of Patent: May 9, 2017**

(54) **PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Itshak Ashkanazi**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/053,017**

(22) Filed: **Feb. 25, 2016**

(65) **Prior Publication Data**

US 2016/0167363 A1 Jun. 16, 2016

Related U.S. Application Data

(63) Continuation-in-part of application No. 14/382,758, filed as application No. PCT/IB2013/051718 on Mar. 5, 2013, now Pat. No. 9,290,016.
(Continued)

(30) **Foreign Application Priority Data**

Mar. 20, 2015 (GB) 1504719.4

(51) **Int. Cl.**
B41J 2/005 (2006.01)
B41J 2/01 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/01*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/0057; B41J 2/01; B41J 2002/012
See application file for complete search history.

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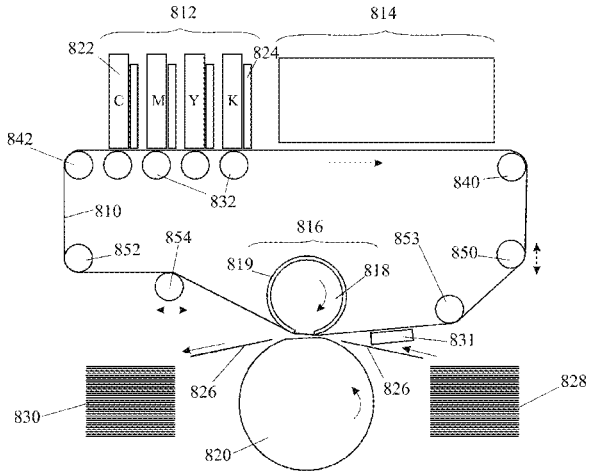
(Continued)

Primary Examiner — Stephen Meier
Assistant Examiner — Alexander D Shenderov
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

An intermediate transfer member (ITM) for use in a printing system to transport an ink image from an image forming station to an impression station for transfer of the ink image from the ITM onto a printing substrate, wherein the ITM is an endless flexible belt of substantially uniform width which, during use, passes over drive and guide rollers and is guided through at least the image forming station by means of guide channels that receive formations provided on both lateral edges of the belt, wherein the formations on a first edge differ from the formations on the second edge by being configured for providing the elasticity desired to maintain the belt taut when the belt is guided through their respective lateral channels.

15 Claims, 10 Drawing Sheets



US009643400B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 9,643,400 B2**
(45) **Date of Patent: May 9, 2017**

(54) **TREATMENT OF RELEASE LAYER**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Gregory Nakhmanovich**, Rishon LeZion (IL); **Dan Avital**, Mazkeret Batya (IL); **Galia Golodetz**, Rehovot (IL); **Yehoshua Sheinman**, Ra'anana (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/382,930**

(22) PCT Filed: **Mar. 5, 2013**

(86) PCT No.: **PCT/IB2013/000757**
§ 371 (c)(1),
(2) Date: **Sep. 4, 2014**

(87) PCT Pub. No.: **WO2013/132339**
PCT Pub. Date: **Sep. 12, 2013**

(65) **Prior Publication Data**

US 2015/0044431 A1 Feb. 12, 2015

Related U.S. Application Data

(60) Provisional application No. 61/611,557, filed on Mar. 15, 2012, provisional application No. 61/607,537, filed on Mar. 6, 2012, provisional application No. 61/606,913, filed on Mar. 5, 2012, provisional application No. 61/641,258, filed on May 1, 2012.

(51) **Int. Cl.**

B41J 2/005	(2006.01)
B41J 2/01	(2006.01)
C09D 11/10	(2014.01)
C09D 11/30	(2014.01)
B41M 5/025	(2006.01)
B41M 5/03	(2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41J 2/01*** (2013.01); ***B41M 5/0256*** (2013.01); ***B41M 5/03*** (2013.01); ***C09D 11/10*** (2013.01); ***C09D 11/30*** (2013.01); *B41J 2002/012* (2013.01); *Y10T 428/24802* (2015.01); *Y10T 428/31663* (2015.04)

(58) **Field of Classification Search**
CPC Y10T 428/24802; B41J 2/057
See application file for complete search history.

(56) **References Cited**

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Primary Examiner — Gerard Higgins
(74) *Attorney, Agent, or Firm* — Marc Van Dyke:

(57) **ABSTRACT**

There is provided a method for treating a hydrophobic release layer of an intermediate transfer member for use in a printing process in which a negatively charged aqueous inkjet ink including a polymeric resin and a colorant is jetted onto said layer, the claimed method comprising contacting the release layer, prior to jetting the ink, with an aqueous solution or dispersion of a positively charged polymeric chemical agent reducing the tendency of a jetted ink droplet to bead up on the intermediate transfer member. Other embodiments, such as hydrophobic release layers having such chemical agents disposed thereupon and printed ink images comprising the same, are also described.

20 Claims, 5 Drawing Sheets

US009568862B2

(12) **United States Patent**
Shmaiser et al.

(10) **Patent No.: US 9,568,862 B2**
(45) **Date of Patent: Feb. 14, 2017**

(54) **DIGITAL PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Aharon Shmaiser**, Rishon LeZion (IL); **Benzion Landa**, Nes Ziona (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/382,756**

(22) PCT Filed: **Mar. 5, 2013**

(86) PCT No.: **PCT/IB2013/051717**
§ 371 (c)(1),
(2) Date: **Sep. 3, 2014**

(87) PCT Pub. No.: **WO2013/132419**
PCT Pub. Date: **Sep. 12, 2013**

(65) **Prior Publication Data**

US 2015/0049134 A1 Feb. 19, 2015

Related U.S. Application Data

(60) Provisional application No. 61/606,913, filed on Mar. 5, 2012, provisional application No. 61/611,286, filed
(Continued)

(51) **Int. Cl.**
G03G 15/16 (2006.01)
B41J 3/60 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G03G 15/1615*** (2013.01); ***B41J 3/60*** (2013.01); ***G03G 15/238*** (2013.01); ***G03G 15/36*** (2013.01); *G03G 2215/00021* (2013.01)

(58) **Field of Classification Search**
CPC G03G 15/1615; B41J 2/0057; B41J 2002/012
See application file for complete search history.

(56) **References Cited**

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JP 2002169383 A 6/2002
(Continued)

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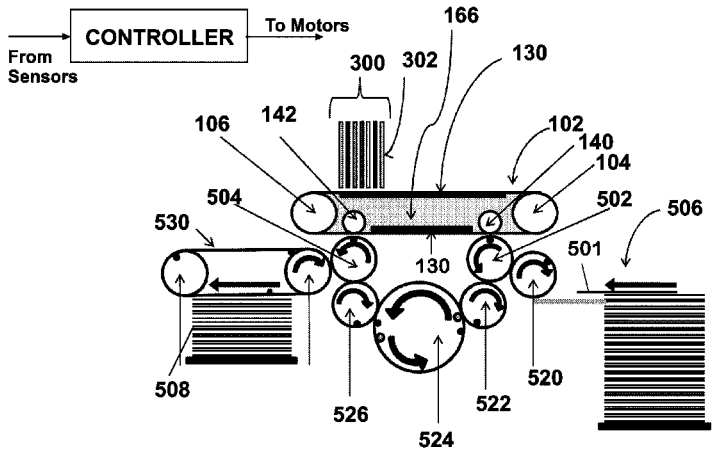
DE 102010060999 Machine Translation (by EPO and Google)—published Jun. 6, 2012; Wolf, Roland, Dr.-Ing.
(Continued)

Primary Examiner — An Do
Assistant Examiner — Renee I Wilson
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A digital printing system is disclosed having two independently operable printing towers arranged in series such that a substrate sheet passes sequentially through both printing towers, and in which a perfecting mechanism is provided between the two towers to reverse each substrate sheet during transfer from the first printing tower to the second printing tower, the perfecting mechanism being selectively operable to enable the second tower to print either on the same side of each substrate sheet as the first tower or on the opposite side of each substrate sheet. As well as allowing a duplex mode, the system provides a higher speed simplex mode during which different separations of the same image are printed by the two towers.

12 Claims, 6 Drawing Sheets



US009517618B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 9,517,618 B2**
(45) **Date of Patent: Dec. 13, 2016**

(54) **ENDLESS FLEXIBLE BELT FOR A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Sagi Abramovich**, Ra'anana (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Rami Keller**, Tel Aviv (IL); **Itshak Ashkanazi**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/382,759**

(22) PCT Filed: **Mar. 5, 2013**

(86) PCT No.: **PCT/IB2013/051719**
§ 371 (c)(1),
(2) Date: **Sep. 3, 2014**

(87) PCT Pub. No.: **WO2013/136220**
PCT Pub. Date: **Sep. 19, 2013**

(65) **Prior Publication Data**

US 2015/0165759 A1 Jun. 18, 2015

Related U.S. Application Data

(60) Provisional application No. 61/611,505, filed on Mar. 15, 2012, provisional application No. 61/611,497, (Continued)

(51) **Int. Cl.**
B41J 2/005 (2006.01)

(52) **U.S. Cl.**
CPC ... ***B41J 2/0057*** (2013.01); *G03G 2215/00147* (2013.01); *G03G 2215/00151* (2013.01)

(58) **Field of Classification Search**
CPC ... B41J 2/0057; B41J 2002/012; B41J 11/007; B41J 1/30; B41J 2/22; B41J 347/103; B41J 2002/12; B65G 15/00; B65H 5/02
See application file for complete search history.

(56) **References Cited**

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4,009,958 A 3/1977 Kurita et al.
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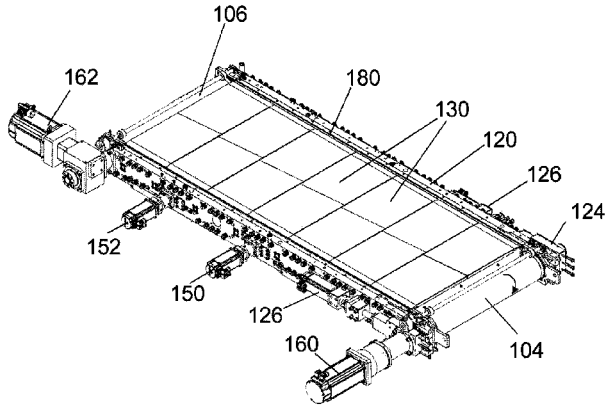
(Continued)

Primary Examiner — Geoffrey Mruk
Assistant Examiner — Scott A Richmond
(74) *Attorney, Agent, or Firm* — Marc Van Dyke;

(57) **ABSTRACT**

A flexible belt is disclosed for use in a printing system. The belt comprises an endless strip which, in use, travels along a continuous path. Formations are provided along the sides of the strip which are capable of engaging with lateral tracks to place the belt under lateral tension, the lateral tracks further serving to constrain the belt to follow the continuous path.

16 Claims, 8 Drawing Sheets



US009505208B2

(12) **United States Patent**
Shmaiser et al.

(10) **Patent No.: US 9,505,208 B2**
(45) **Date of Patent: Nov. 29, 2016**

(54) **DIGITAL PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Aharon Shmaiser**, Rishon LeZion (IL); **Benzion Landa**, Nes Ziona (IL); **Sagi Moskovich**, Petach Tikva (IL); **Nir Zarmi**, Be'erotayim (IL); **Yehuda Solomon**, Rishon LeZion (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/917,020**

(22) PCT Filed: **Sep. 5, 2014**

(86) PCT No.: **PCT/IB2014/064277**

§ 371 (c)(1),
(2) Date: **Mar. 6, 2016**

(87) PCT Pub. No.: **WO2015/036906**

PCT Pub. Date: **Mar. 19, 2015**

(65) **Prior Publication Data**

US 2016/0200097 A1 Jul. 14, 2016

(30) **Foreign Application Priority Data**

Sep. 11, 2013 (GB) 1316203.7

(51) **Int. Cl.**
B41J 2/01 (2006.01)
B41J 2/005 (2006.01)
B41J 11/00 (2006.01)
B41J 3/60 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41J 2/01*** (2013.01); ***B41J 3/60*** (2013.01); ***B41J 11/0015*** (2013.01); *B41J 2002/012* (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

(56) **References Cited**

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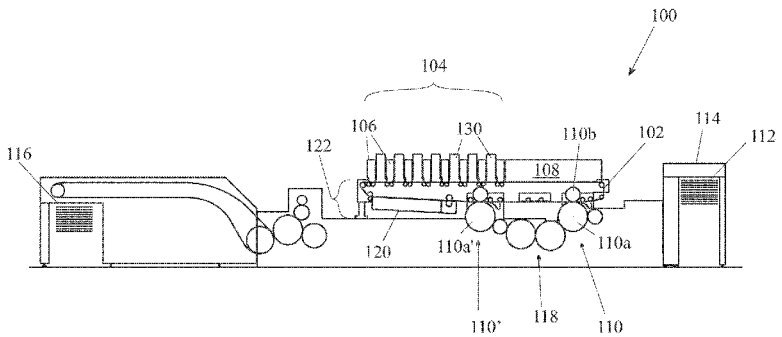
Primary Examiner — Lisa M Solomon
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A printing system for printing on a substrate, comprises a movable intermediate transfer member in the form of a flexible, substantially inextensible, belt guided to follow a closed path, an image forming station for depositing droplets of a liquid ink onto an outer surface of the belt to form an ink image, a drying station for drying the ink image on the belt to leave an ink residue film on the outer surface of the belt, first and second impression stations spaced from one another in the direction of movement of the belt, each impression station comprising an impression cylinder for supporting and transporting the substrate and a pressure cylinder carrying a compressible blanket for urging the belt against the substrate supported on the impression cylinder, and a transport system for transporting the substrate from the first impression station to the second impression station. The pressure cylinder of at least the first impression station is movable between a first position in which the belt is urged towards the impression cylinder to cause the residue film on the outer surface of the belt to be transferred onto the front side of the substrate supported on the impression cylinder, and a second position in which the belt is spaced from the impression cylinder to allow the ink image on the belt to pass through the first impression station and arrive intact at the second impression station for transfer onto the reverse side of the substrate supported on the second impression cylinder.

10 Claims, 3 Drawing Sheets



US009498946B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 9,498,946 B2**
(45) **Date of Patent: Nov. 22, 2016**

(54) **APPARATUS AND METHOD FOR CONTROL OR MONITORING OF A PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Nir Zarmi**, Be'erotayim (IL); **Abraham Keren**, Modi'in Maccabim Reut (IL); **Alon Siman-Tov**, Or Yehuda (IL); **Dragan Stiglic**, Rehovot (IL); **Amit Harburger**, Bat Hefer (IL); **Elisha Avram Tal**, Harey Yehuda (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/860,776**

(22) Filed: **Sep. 22, 2015**

(65) **Prior Publication Data**

US 2016/0075130 A1 Mar. 17, 2016

Related U.S. Application Data

(63) Continuation-in-part of application No. 14/382,880, filed as application No. PCT/IB2013/051727 on Mar. 5, 2013, now Pat. No. 9,186,884, and a continuation-in-part of application No. PCT/IB2013/050245, filed on Jan. 10, 2013, which is a continuation-in-part of application No. PCT/IB2012/056100, filed on Nov. 1, 2012, application No. 14/860,776, which is a (Continued)

(51) **Int. Cl.**
B41J 2/005 (2006.01)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01)

(58) **Field of Classification Search**
CPC B41J 2002/012; B41J 2/0057
See application file for complete search history.

(56) **References Cited**

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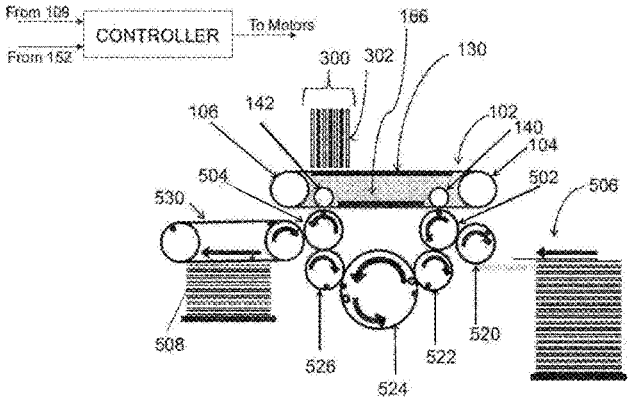
(Continued)

Primary Examiner — Stephen Meier
Assistant Examiner — Alexander D Shenderov
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

Embodiments of the present invention relate to control apparatus and methods of a printing system, for example, comprising an intermediate transfer member (ITM) and to user-related features of a printing system. Some embodiments relate to regulation of a velocity and/or tension and/or length of the ITM. Some embodiments relate to regulation of deposition of ink on the moving ITM. Some embodiments regulate to apparatus configured to alert a user of one or more events related to operation of the ITM. Some embodiments relate to a time-line GUI for visualizing and/or manipulating queued print jobs which may be employed. Some embodiments relate to a reversed augmented reality GUI for visualization and/or control of the printing system. In some embodiments, a display screen is mounted to a printer housing and/or able to control access to moving parts of a printing system.

20 Claims, 70 Drawing Sheets



US009381736B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 9,381,736 B2**
(45) **Date of Patent: Jul. 5, 2016**

(54) **DIGITAL PRINTING PROCESS**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Yehoshua Sheinman**, Ra'anana (IL); **Sagi Abramovich**, Ra'anana (IL); **Galia Golodetz**, Rehovot (IL); **Gregory Nakhmanovich**, Rishon LeZion (IL); **Meir Soria**, Jerusalem (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/382,751**

(22) PCT Filed: **Mar. 5, 2013**

(86) PCT No.: **PCT/IB2013/051716**

§ 371 (c)(1),
(2) Date: **Sep. 3, 2014**

(87) PCT Pub. No.: **WO2013/132418**

PCT Pub. Date: **Sep. 12, 2013**

(65) **Prior Publication Data**

US 2015/0015650 A1 Jan. 15, 2015

Related U.S. Application Data

(60) Provisional application No. 61/606,913, filed on Mar. 5, 2012, provisional application No. 61/611,286, filed on Mar. 15, 2012, provisional application No. 61/611,505, filed on Mar. 15, 2012, provisional

(Continued)

(51) **Int. Cl.**
B41J 11/00 (2006.01)
B41J 2/01 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41M 5/0256*** (2013.01); *B41M 5/03* (2013.01); *B41N 10/00* (2013.01)

(58) **Field of Classification Search**
CPC B41J 2/0057
USPC 347/103, 96
See application file for complete search history.

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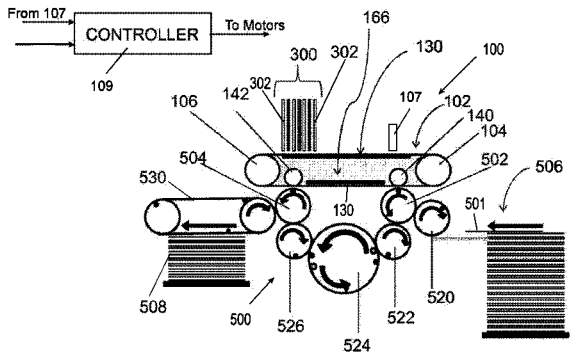
(Continued)

Primary Examiner — Jason Uhlenhake
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A printing process is disclosed which comprises directing droplets of an ink onto an intermediate transfer member to form an ink image, the ink including an organic polymeric resin and a coloring agent in an aqueous carrier, and the transfer member having a hydrophobic outer surface so that each ink droplet in the ink image spreads on impinging upon the intermediate transfer member to form an ink film. The ink is dried while the ink image is being transported by the intermediate transfer member by evaporating the aqueous carrier from the ink image to leave a residue film of resin and coloring agent. The residue film is then transferred to a substrate. The chemical compositions of the ink and of the surface of the intermediate transfer member are selected such that attractive intermolecular forces between molecules in the outer skin of each droplet and on the surface of the intermediate transfer member counteract the tendency of the ink film produced by each droplet to bead under the action of the surface tension of the aqueous carrier, without causing each droplet to spread by wetting the surface of the intermediate transfer member.

20 Claims, 9 Drawing Sheets



US009290016B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 9,290,016 B2**
(45) **Date of Patent: Mar. 22, 2016**

(54) **PRINTING SYSTEM**

(71) Applicant: **LANDA CORPORATION LTD.**, Rehovot (IL)

(72) Inventors: **Benzion Landa**, Nes Ziona (IL); **Aharon Shmaiser**, Rishon LeZion (IL); **Itshak Ashkanazi**, Rehovot (IL)

(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/382,758**

(22) PCT Filed: **Mar. 5, 2013**

(86) PCT No.: **PCT/IB2013/051718**

§ 371 (c)(1),
(2) Date: **Sep. 3, 2014**

(87) PCT Pub. No.: **WO2013/132420**

PCT Pub. Date: **Sep. 12, 2013**

(65) **Prior Publication Data**

US 2015/0022602 A1 Jan. 22, 2015

Related U.S. Application Data

(60) Provisional application No. 61/606,913, filed on Mar. 5, 2012, provisional application No. 61/611,286, filed

(Continued)

(51) **Int. Cl.**
B41J 2/01 (2006.01)
B41J 11/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B41J 11/002*** (2013.01); ***B41J 2/01*** (2013.01); ***G03G 15/0189*** (2013.01); ***G03G 15/1605*** (2013.01); *B41J 2002/012* (2013.01); *G03G 2215/0129* (2013.01)

(58) **Field of Classification Search**
CPC B41J 11/002; B41J 2/01; B41J 2002/012; G03G 15/0189; G03G 15/1605; G03G 2215/0129
USPC 347/102
See application file for complete search history.

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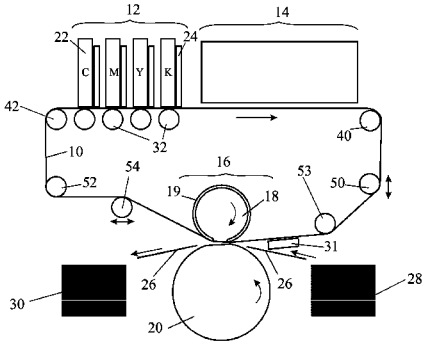
Primary Examiner — Stephen Meier
Assistant Examiner — Alexander D Shenderov
(74) *Attorney, Agent, or Firm* — Marc Van Dyke

(57) **ABSTRACT**

A printing system is disclosed which comprises an image forming station **12** at which an ink that includes an organic polymeric resin and a coloring agent is applied to an outer surface of an intermediate transfer member **10** to form an ink image, a drying station **14** for drying the ink image to leave a residue film of resin and coloring agent; and an impression station **16** at which the residue film is transferred to a substrate. The intermediate transfer member **10** comprises a thin flexible substantially inextensible belt and the impression station **16** comprises an impression cylinder **20** and a pressure cylinder **18** having a compressible outer surface for urging the belt against the impression cylinder to cause the residue film resting on the outer surface of the belt **10** to be transferred onto a substrate passing between the belt **10** and the impression cylinder **20** during engagement with the pressure cylinder. The belt **10** has a length greater than the circumference of the pressure cylinder **18** and is guided to contact the pressure cylinder over only a portion of its length.

20 Claims, 2 Drawing Sheets



US009229664B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 9,229,664 B2**
(45) **Date of Patent: Jan. 5, 2016**

(54) **APPARATUS AND METHODS FOR MONITORING OPERATION OF A PRINTING SYSTEM**

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(73) Assignee: **LANDA CORPORATION LTD.**, Rehovot

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/340,122**

(22) Filed: **Jul. 24, 2014**

(65) **Prior Publication Data**

US 2015/0054865 A1 Feb. 26, 2015

Related U.S. Application Data

(63) Continuation-in-part of application No. PCT/IB2013/050245, filed on Jan. 10, 2013, which is a continuation-in-part of application No. PCT/IB2012/056100, filed on Nov. 1, 2012.

(60) Provisional application No. 61/606,913, filed on Mar. 5, 2012, provisional application No. 61/611,556, filed on Mar. 15, 2012, provisional application No. 61/611,568, filed on Mar. 15, 2012, provisional application No. 61/640,720, filed on Apr. 30, 2012, provisional application No. 61/641,870, filed on May 2, 2012, provisional application No. 61/641,881, filed on May 2, 2012, provisional application No. 61/719,894, filed on Oct. 29, 2012.

(51) **Int. Cl.**

B41J 3/00	(2006.01)
G06F 3/12	(2006.01)
B41J 29/393	(2006.01)
G06K 9/00	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F 3/1211*** (2013.01); ***G06F 3/1258*** (2013.01); ***G06F 3/1286*** (2013.01)

(58) **Field of Classification Search**

CPC B41J 2/01; B41J 3/46; B41J 29/393; B41J 2002/12

USPC 347/2, 19; 382/112

See application file for complete search history.

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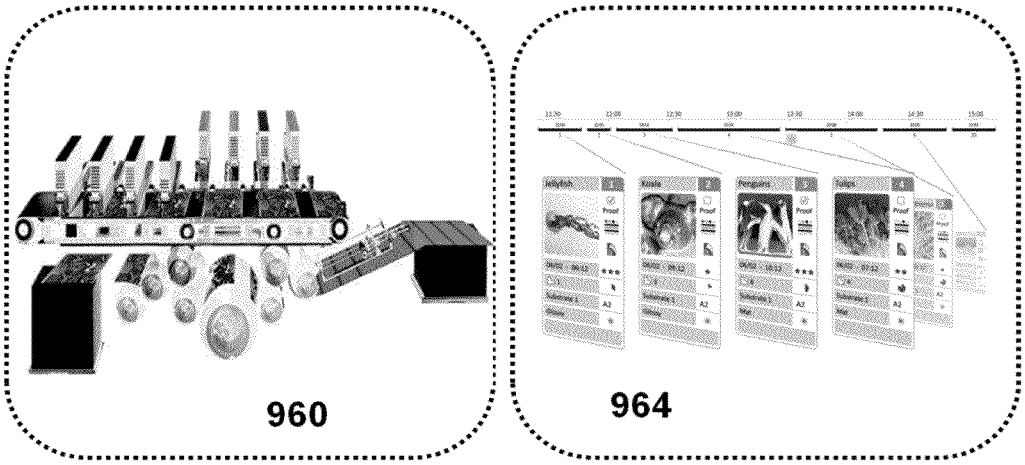
(57) **ABSTRACT**

User-related features of a printing system are disclosed herein. Some embodiments relate to a time-line GUI for visualizing and/or manipulating queued print jobs which may be employed. Some embodiments relate to a reversed augmented reality GUI for visualization and/or control of the printing system. In some embodiments, a display screen is mounted to a printer housing and/or able to control access to moving parts of a printing system.

20 Claims, 40 Drawing Sheets



US009186884B2

(12) **United States Patent**
Landa et al.

(10) **Patent No.: US 9,186,884 B2**
(45) **Date of Patent: Nov. 17, 2015**

(54) **CONTROL APPARATUS AND METHOD FOR A DIGITAL PRINTING SYSTEM**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **14/382,880**

(22) PCT Filed: **Mar. 5, 2013**

(86) PCT No.: **PCT/IB2013/051727**

§ 371 (c)(1),
(2) Date: **Sep. 4, 2014**

(87) PCT Pub. No.: **WO2013/132424**

PCT Pub. Date: **Sep. 12, 2013**

(65) **Prior Publication Data**

US 2015/0042736 A1 Feb. 12, 2015

Related U.S. Application Data

(63) Continuation-in-part of application No. PCT/IB2013/050245, filed on Jan. 10, 2013, which is

(Continued)

(51) **Int. Cl.**
B41J 2/01 (2006.01)
B41J 2/005 (2006.01)

(Continued)

(52) **U.S. Cl.**
CPC ***B41J 2/0057*** (2013.01); ***B41J 3/60*** (2013.01); *G03G 15/1615* (2013.01)

(58) **Field of Classification Search**
USPC 347/103
See application file for complete search history.

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(57) **ABSTRACT**

Embodiments of the present invention relate to control apparatus and methods for a printing system, for example, comprising an intermediate transfer member (ITM). Some embodiments relate to regulation of a velocity and/or tension and/or length of the ITM. Some embodiments relate to regulation of deposition of ink on the moving ITM. Some embodiments regulate to apparatus configured to alert a user of one or more events related to operation of the ITM.

9 Claims, 30 Drawing Sheets