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(71) Applicant: **LANDA LABS (2012) LTD** [IL/IL]; P.O. Box 2418, 7612301 Rehovot (IL).

(72) Inventors: **LANDA, Benzion**; 35 Itamar Ben-Avi Street, 7405135 Nes Ziona (IL). **ABRAMOVICH, Sagi**; 20 HaLotus Street, 4339320 Ra'anana (IL). **HAVIV, Amit**; 1 HaRav Pinto Street, 4923701 Petach Tivka (IL). **AKNIN, Ofer**; 8 Zavlodovich Street, 4938937 Petach Tivka (IL). **VALDMAN, Yaakov**; 8 Omer Street, 7655960 Rehovot (IL). **NAGLER, Michael**; 4 Avshalom Haviv Street, 6949503 Tel Aviv (IL).

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Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

(54) Title: THERMAL TRANSFER PRINTING

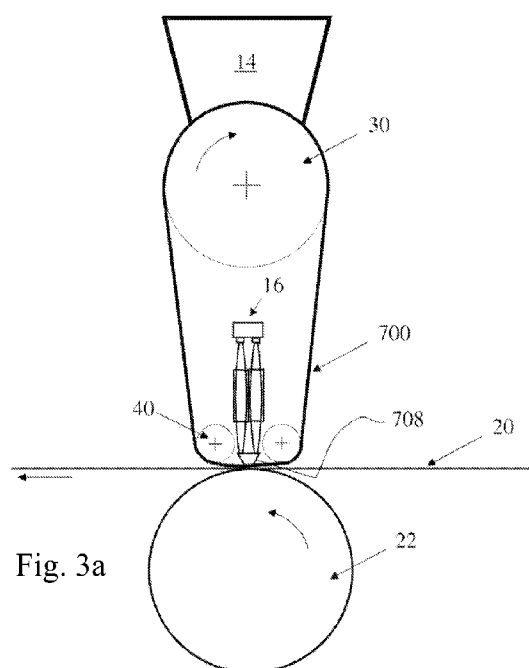


Fig. 3a

(57) Abstract: A method and system are disclosed for thermal transfer printing onto selected regions of a surface of a substrate. The system comprises a transfer member having opposite front and rear sides with an imaging surface on the front side, a coating station at which a monolayer of particles made of, or coated with, a thermoplastic polymer is applied to the imaging surface, an imaging station at which energy in the form of electromagnetic (EM) radiation is applied via the rear side of the transfer member to selected regions of the particles coated imaging surface to render the particles thereon tacky within the selected regions, and a transfer station at which the imaging surface and the surface of the substrate are pressed against one another to cause transfer to the surface of the substrate of only the regions of the particle coating that have been rendered tacky. In the invention, the rear side of the transfer member is formed of a body transparent to the EM radiation, and an EM radiation absorbing layer made of an elastomeric silicone is provided on the front side of the transfer member adjoining the transparent body, the imaging surface being formed on, or as part of, the radiation absorbing layer.

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- *with international search report (Art. 21(3))*
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(88) Date of publication of the international search report:

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2017/057535

A. CLASSIFICATION OF SUBJECT MATTER
INV. B41M5/025 B41M5/03 B41J2/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B41M B41J B41N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010/075843 A1 (IKUNO MASAYA [JP] ET AL) 25 March 2010 (2010-03-25) the whole document -----	1-15
A	US 2013/250021 A1 (SHIMOMURA NAOFUMI [JP] ET AL) 26 September 2013 (2013-09-26) the whole document -----	1-15
A	US 2016/176185 A1 (KANUNGO MANDAKINI [US] ET AL) 23 June 2016 (2016-06-23) paragraphs [0008], [0009], [0018], [0020], [0029], [0030], [0031], [0048], [0050], [0055], [0061], [0068]; claims 14,17 -----	1-15



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

15 May 2018

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23/07/2018

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Pulver, Michael

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2017/057535

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-15

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-15

A printing system for thermal transfer printing as defined in claim 1, which system comprises an imaging station at which energy in the form of electromagnetic radiation is applied via the rear side of the transfer member to selected regions of the particles coated imaging surface to render the particles thereon tacky within the selected regions, and a transfer station at which the imaging surface and the surface of a substrate are pressed against one another to cause transfer to the surface of the substrate of only the regions of the particle coating that have been rendered tacky. Present claim 15 defines a method of thermal transfer printing comprising the corresponding steps to be carried out by such printing system. It is thus considered that claim 15 can be grouped together with claim 1.

These special technical features solve the objective technical problem of providing a printing system for thermal transfer printing, and a method of thermal transfer printing carried out by this system, which system enables irradiation and transfer of the particles to occur substantially simultaneously, wherein the system operates on the same principle of thermal transfer of an ink film formed of thermoplastic polymer particles to a printing substrate and is capable of printing images of high quality.

2. claims: 16-18

A transfer member as defined in claim 16 comprising a hydrophobic release layer formed on the front side of the transfer member, the release layer being in thermal contact with, or formed as part of, the radiation absorbing layer. These special technical features solve the objective technical problem of providing a transfer member capable of providing sufficient adhesion to the native (i.e. non-tacky) particles and at the same time capable of releasing particles softened by irradiation to selectively transfer, thus being capable of transiently retaining the particles until they are selectively softened for release. Further, the transfer member with such release layer can reduce or prevent "parasitic transfer".

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2017/057535

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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