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(54) Title: METHOD AND APPARATUS FOR CLEANING OF PLATE-SHAPED CLICHÉS

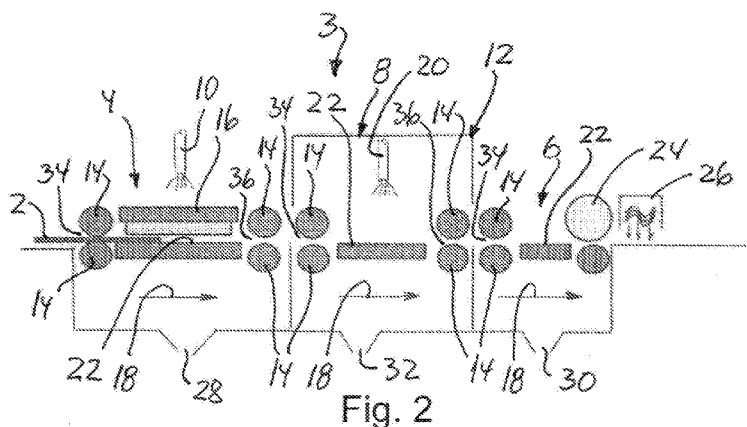


Fig. 2

(57) Abstract: A method for cleaning of plate-shaped clichés (2) comprising the following method actions: - feeding plate-shaped clichés (2) into and through a first cleaning chamber (4); - flushing cleaning fluid to at least the print side of the plate-shaped cliché (2), when the latter is worked over by cleaning brushes (16); - feeding the plate-shaped clichés into and through another cleaning chamber (6) for subsequent flushing over and drying the plate-shaped clichés (2); - applying hot air from a hot air blower (26) to at least said print side of the plate-shaped clichés (2); comprising the further action - feeding the plate-shaped clichés (2) into and through a high-pressure cleaning chamber (8) situated between said first cleaning chamber (2) and said other cleaning chamber (6); - flushing in said high-pressure cleaning chamber (8) a high-pressure cleaning fluid at a range of 30 –120 bar to at least said print side of the plate-shaped clichés (2). By rather simple method and means it hereby become possible to obtain sufficient cleaning of plate-shaped clichés by which the printing side in advance has been laser cut with the desired printing pattern whereby sufficient removing of the resulting metal dust can be effectively flushed of and removed from the front side of the plate-shaped clichés by an effective and safe continuously cleaning process.

Method and apparatus for cleaning of plate-shaped clichés

Field of the Invention

The present invention relates to a method for cleaning of newly produced plate-shaped clichés made from a rubber web or substrate and of the type as defined in the preamble to claim 1.

The invention also relates to a cleaning apparatus for carrying out the method for cleaning of plate-shaped clichés.

Background of the Invention

Known cleaning methods and processes comprise a cleaning chamber where cleaning fluid is applied to a plate-shaped cliché while simultaneously the plate-shaped cliché is brushed with a soft brush. The cleaning chamber is part of a closed circuit where the cleaning fluid is recirculated from and to a receptacle.

After the cleaning chamber the plate-shaped cliché passes another cleaning chamber where the plate-shaped cliché is flushed with fresh cleaning fluid and dried. The latter is carried out by means of a special sponge roller acting at the same time as a wet cloth and a sponge.

US 2009/0013888 A1 discloses a method for feeding a photopolymerised elastomeric printing plate, subsequent to exposure and washing out thereof, along a path through a rinsing station, comprising: optionally providing a plate assembly comprising the plate and, supporting the plate, a carrier having a pair of opposed peripheral regions each extending laterally beyond respective opposed lateral edge regions of the plate, providing, transversely of the path, at least one pair of driven rollers defining a nip there between through which the plate can pass so as to be forwarded along the path by frictional engagement of the plate or palter assembly with each of the driven rollers within the nip, at least one of which rollers is profiled so as to allow contact of the profiled roller with the opposed lateral edge regions of the plate or, when provided, corresponding opposed peripheral regions of the plate assembly, thereby to allow the said frictional engagement, but to allow freedom from contact of the plate with the or each profiled roller at an interior region of the plate between the said regions in con-

tact with the or each profiled roller, and feeding the plate, or optionally when provided, the plate assembly, by the driven rollers along the path through the rinsing station.

Object of the Invention

In the printing industry a quite new development is that as the prices for acquiring rather complicated laser cutting devices has been lowered more printing business acquires rather complicated laser cutting system for the production of plate-shaped clichés by themselves and therefore it is the purpose of the present invention to provide an improved method for the cleaning of plate-shaped clichés where special adaptations of the known method is achieved by adding a high-pressure.

Description of the Invention

According to the invention the method for cleaning of plate-shaped clichés is characterised in comprising the further actions

- feeding the plate-shaped clichés into and through a high-pressure cleaning chamber situated between said first cleaning chamber and said other cleaning chamber;
- flushing in said high-pressure cleaning chamber a high-pressure cleaning fluid at a range of 30-120 bar to at least said print side of the plate-shaped clichés.

By a rather simple method and means it hereby becomes possible to obtain sufficient cleaning of newly produced plate-shaped clichés made from a rubber web or substrate (EPDM) by which the printing side in advance has been laser cut with the desired printing pattern whereby sufficient removing of the resulting EPDM dust can be effectively flushed of and removed from the front side of the plate-shaped clichés by an effective and safe continuously cleaning process.

In order to obtain an improved method for cleaning plate-shaped clichés according to the invention it can be advantageous to make use of combined transport and separation rollers preferably made from semi-hard rubber at an entrance to and at an outlet from said first cleaning chamber and said high-pressure cleaning chamber.

Such semi-hard rollers has a double function namely to act both as transportation roller for the continuously moving of the plate-shaped clichés through the respective

cleaning chambers and at the same time to prevent the cleaning fluid to escape from the cleaning chambers along the plate-shaped clichés.

5 Because of the semi-hard rubber material the semi-hard surface of the rubber rollers is able to act as a continuous barrier following the surface pattern of the printing surface of the plate-shaped clichés.

10 It may furthermore be advantageous that said cleaning brushes of said primary cleaning chamber are reciprocating perpendicular to the direction of movement of the plate-shaped clichés.

In order to optimize and simplify the method for cleaning plate-shaped clichés according to the invention may be modified by using fresh water as cleaning fluid in said high-pressure cleaning chamber.

15 The present invention also relates to a cleaning apparatus for cleaning plate-shaped clichés comprising a first cleaning chamber where said plate-shaped clichés are fed through an entrance opening onto a carrier surface supporting the rear side of the plate-shaped clichés, when the print side of the plate-shaped clichés is brushed by means of cleaning brushes and at the same time the plate-shaped clichés are flushed
20 by cleaning fluid applied from nozzles before leaving the first cleaning chamber through an outlet opening, and are then fed through an entrance opening to another cleaning chamber comprising a subsequent flushing and drying zone with a drying sponge roller and a hot air blower, which cleaning apparatus is characterised in comprising a high-pressure cleaning chamber for applying high-pressure cleaning fluid to
25 said plate-shaped clichés, said high-pressure cleaning chamber is placed between said first cleaning chamber and said other cleaning chamber.

30 By a rather simple apparatus - as seen from a technical point of view - it hereby becomes possible to obtain both an effective and a sufficient cleaning of plate-shaped clichés by which the printing side in advance has been laser cut with the desired printing pattern, whereby sufficient removing of the resulting EPDM dust can be effectively flushed of and removed from the front side of the plate-shaped clichés by an effective and safe continuously cleaning process.

The cleaning apparatus according to the invention may be such provided that said entrance opening and said outlet opening being provided with combined transport and separation rollers made from semi-hard rubber or a similar elastic material.

5

As mentioned above such semi-hard rollers has a double function namely to act both as transportation roller for the continuously moving of the plate-shaped clichés through the respective cleaning chambers and at the same time to prevent the cleaning fluid to escape from the cleaning chambers along the plate-shaped clichés.

10

In order to support the recirculation and reuse of the cleaning fluid it may be advantageous that the apparatus according to the invention is such provided that each cleaning chambers are provided with lower funnel-shaped drainage openings through which cleaning fluid from the respective chamber is collected and led to receptacles or tanks, since the cleaning fluid preferably is recirculated and reused in the respective chambers.

15

Advantageously the cleaning apparatus according to the invention may be such provided that said other cleaning chamber also comprises an entrance opening provided with combined separation and transport rollers made from semi-hard rubber or a similar elastic material.

20

In order to optimize and simplify the cleaning process the cleaning apparatus according to the invention may be such provided that said high-pressure cleaning chamber is adapted to use cleaning fluid preferable in the form of fresh water applied to the front or print side of the plate-shaped clichés through one or more nozzles for high-pressure cleaning fluid.

25

Description of the Drawing

30

The invention is explained in more details with reference to the accompanying drawing in which:

Fig. 1 shows a plane view illustrating schematically a prior art cleaning method for cleaning of plate-shaped clichés,

- Fig. 2 shows a plane view illustrating schematically an embodiment of an improved cleaning method for cleaning plate-shaped clichés according to the invention,
- 5 Fig. 3 shows a perspective view of an embodiment for a cleaning apparatus for cleaning plate-shaped clichés according to the invention - shown with a high-pressure cleaning chamber exposed (without top cover),
- 10 Fig. 4 shows a perspective view of the cleaning apparatus for cleaning plate-shaped clichés cf. Fig. 3 with the high-pressure cleaning chamber closed by a hood-shaped top cover,
- Fig. 5 shows a perspective view of another embodiment for a cleaning apparatus according to the invention, and
- 15 Fig. 6 shows a perspective view showing the respective chamber parts of the cleaning apparatus cf. Fig. 5 according to the invention.

Detailed Description of the Invention

20 In Fig. 1 is shown a prior art cleaning method where a plate-shaped cliché 2 is cleaned by means of a cleaning apparatus as the plate-shaped cliché 2 is feed into a first cleaning chamber 4 through an entrance opening 34 provided with combined transport and separation rollers 14 made from semi-hard rubber or a similar elastic material such that the combined transport and separation rollers 14 at the same time take care of the continuously transport of the plate-shaped cliché 2 and the holding back the cleaning

25 fluid from streaming out along the upper surface of the plate-shaped cliché 2, since the latter also leaves the first cleaning chamber 4 through an outlet opening 36 provided with combined transport and separation rollers 14 made from semi-hard rubber or a similar elastic material.

30 In said first cleaning chamber the upper printing side of cliché 2 is brushed by mean of reciprocating cleaning brushes 16 and at the same time cleaning fluid is applied to the upper surface of the cliché 2 from nozzles 10. The cleaning brushes 16 are reciprocating perpendicular to the direction of movement of the cleaning brushes 16 indicated with arrows 18.

From said first cleaning chamber 4 the cliché 2 leaves the chamber through an outlet opening 36 and into another cleaning chamber 6 through an entrance opening 34 similar to that of said first cleaning chamber 4. In the other cleaning chamber 6 the cliché 2 is again flushed with cleaning fluid before leaving the other cleaning chamber 6 when passing a drying zone with a drying sponge roller 24 and a hot air blower 26.

Both the first and the other cleaning chambers 4, 6 are in the bottom provided with lower funnel-shaped drainage openings 28, 30 through which the cleaning fluid is collected and lead to receptacles or tanks as preferably the cleaning fluid is recirculated and reused in the respective cleaning chambers 4, 6.

Fig. 2 shows a schematically plane view of an embodiment for a cleaning apparatus 3 for carrying out the method according to the invention and consequently the cleaning apparatus 3 comprising a first cleaning chamber 4 and another cleaning chamber 6 - however between the first and other cleaning chambers 4, 6 is built-in a high-pressure cleaning chamber 8 so that a plate-shaped cliché 2 can be continuously feed through three successively arranged cleaning chambers 4, 6, 8.

In this connection is important to be aware of that the size the plate-shaped clichés 2 in question may differ rather dramatically from a small size of 100 x 100 mm to a medium size of 2000 x 3000 mm - or maybe even a special size of 2000 mm x endless. In other words such plate-shaped clichés 2 may have any configuration including rectangular or squared. And in the cleaning apparatus 3 the front or print side of the clichés 2 are always facing upwards towards the reciprocating brushes 16 of the first cleaning chamber 4 and the high-pressure nozzles 20 of the high-pressure cleaning chamber 8.

The high-pressure cleaning chamber 8 has an entrance opening 34 with combined transport and separation rollers 14 and an outlet opening 36 also with combined transport and separation rollers 14 - the special double function of these combined transport and separation rollers 14 is previously explained.

Figs 3-6 show further embodiments for a cleaning apparatus 3 according to the invention, where the specific apparatus parts are designated with the same reference numbers as appear from the glossary.

Glossary - reference numbers used in the drawings

	2	plate-shaped cliché
	3	cleaning apparatus for carrying out the method according to the invention
	4	first cleaning chamber
5	6	other cleaning chamber
	8	high-pressure cleaning chamber
	10	nozzles for cleaning fluid
	12	hood-shaped top cover for high-pressure cleaning chamber
	14	combined transport and separation rollers made from semi-hard rubber
10	16	cleaning brushes is reciprocating perpendicular to the direction of movement of the plate-shaped clichés
	18	arrows showing the direction of movement of the plate-shaped clichés
	20	nozzles for high-pressure cleaning fluid (water)
	22	carrier surfaces for plate-shaped clichés
15	24	drying sponge roller
	26	hot air blower
	28	lower funnel-shaped drainage opening from first cleaning chamber
	30	lower funnel-shaped drainage opening from other cleaning chamber
	32	lower funnel-shaped drainage opening from high-pressure cleaning chamber
20	34	entrance opening of first cleaning chamber and high-pressure cleaning chamber
	36	outlet opening of first cleaning chamber and high-pressure cleaning chamber

CLAIMS:

1. A method for cleaning of newly produced plate-shaped clichés (2) made from a rubber web or substance comprising the following actions:
 - feeding plate-shaped clichés (2) into and through a first cleaning chamber (4);
 - 5 - flushing a cleaning fluid to at least a print side of the plate-shaped cliché (2), when the latter is worked over by cleaning brushes (16);
 - feeding the plate-shaped clichés further into and through another cleaning chamber (6) for subsequent flushing over and drying the plate-shaped clichés (2);
 - applying hot air from a hot air blower (26) to at least said print side of the plate-
 - 10 shaped clichés (2);

characterised in comprising the further method actions

 - feeding the plate-shaped clichés (2) into and through a high-pressure cleaning chamber (8) situated between said first cleaning chamber (2) and said other cleaning chamber (6);
 - 15 - flushing in said high-pressure cleaning chamber (8) a high-pressure cleaning fluid at a range of 30 – 120 bar to at least said print side of the plate-shaped clichés (2).
2. A method for cleaning plate-shaped clichés (2) according to claim 1, **characterised in** comprising the further action
 - 20 - using combined transport and separation rollers (14) preferably made from semi-hard rubber at an entrance (34) to and at an outlet (36) from said first cleaning chamber (4) and said high-pressure cleaning chamber (8).
3. A method for cleaning plate-shaped clichés (2) according to claim 1, **characterised in** comprising the further action
 - 25 - said cleaning brushes (16) of said first cleaning chamber (4) are reciprocating perpendicular to the direction of movement (18) of the plate-shaped clichés (2).
4. A method for cleaning plate-shaped clichés (2) according to claim 1, **characterised in** comprising the further action
 - 30 - using water as cleaning fluid in said high-pressure cleaning chamber (8).
5. A cleaning apparatus (3) for cleaning newly produced plate-shaped clichés (2) made from a rubber web or substance comprising a first cleaning chamber (4) to

which said plate-shaped clichés (2) continuously are fed through an entrance opening (34) onto a carrier surface (22) supporting the rear side of the plate-shaped clichés (2), when a print side of the plate-shaped clichés (2) is brushed by means of cleaning brushes (16) and at the same time the plate-shaped clichés are flushed by cleaning fluid applied from nozzles (10) before leaving said first cleaning chamber (4) through an outlet opening (36), and are then fed through an entrance opening (34) to another cleaning chamber (6) comprising a subsequent flushing and drying zone with a drying sponge roller (24) and a hot air blower (26), **characterised in** comprising a high-pressure cleaning chamber (8) for applying high-pressure cleaning fluid at a range of 30-120 bar to said plate-shaped clichés (2), said high-pressure cleaning chamber (8) is placed between said first cleaning chamber (4) and said other cleaning chamber (6).

6. A cleaning apparatus (3) according to claim 5, **characterised in** that said entrance opening (34) and said outlet opening (36) being provided with combined transport and separation rollers (14) made from semi-hard rubber or a similar elastic material.

7. A cleaning apparatus (3) according to any of the preceding claims, **characterised in** that each cleaning chambers (4, 6, 8) are provided with lower funnel-shaped drainage openings (28, 30, 32) through which cleaning fluid from the respective cleaning chamber (4, 6, 8) is collected and led to receptacles or tanks, since the cleaning fluid preferably is recirculated and reused in the respective cleaning chambers (4, 6, 8).

8. A cleaning apparatus (3) according to any of the preceding claims, **characterised in** that said other cleaning chamber (6) also comprises an entrance opening (34) provided with combined separation and transport rollers (14) made from semi-hard rubber or a similar elastic material.

9. A cleaning apparatus (3) according to any of the preceding claims, **characterised in** that said high-pressure cleaning chamber (8) is adapted to use cleaning fluid preferably in the form of water applied to the front or print side of the plate-shaped clichés (2) through one or more nozzles (20) for high-pressure cleaning fluid.

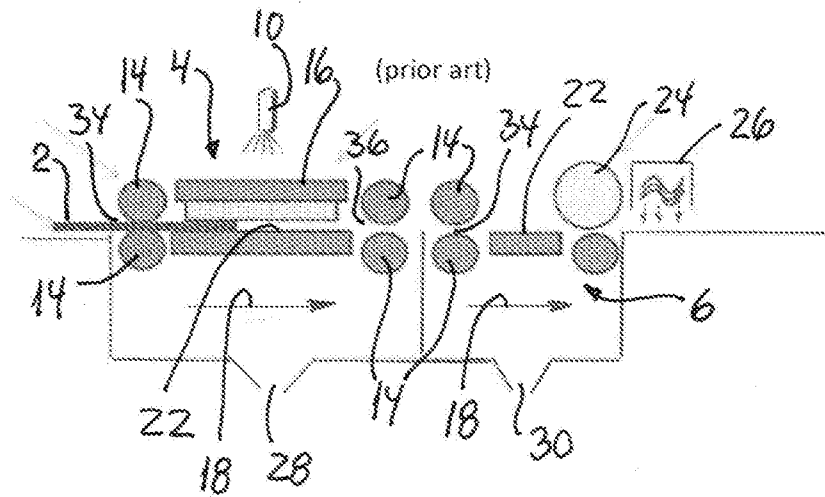


Fig. 1

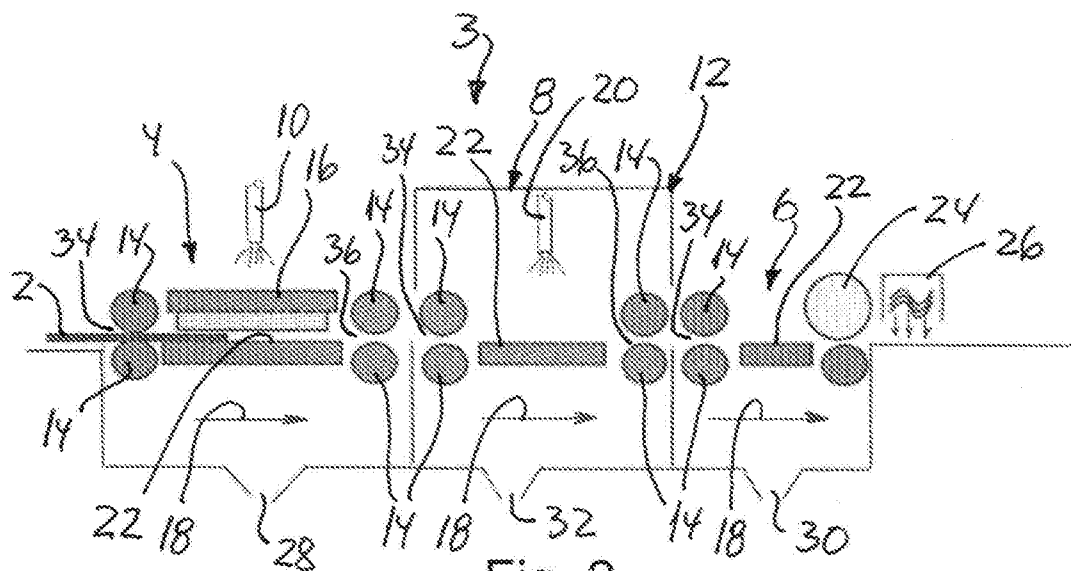


Fig. 2

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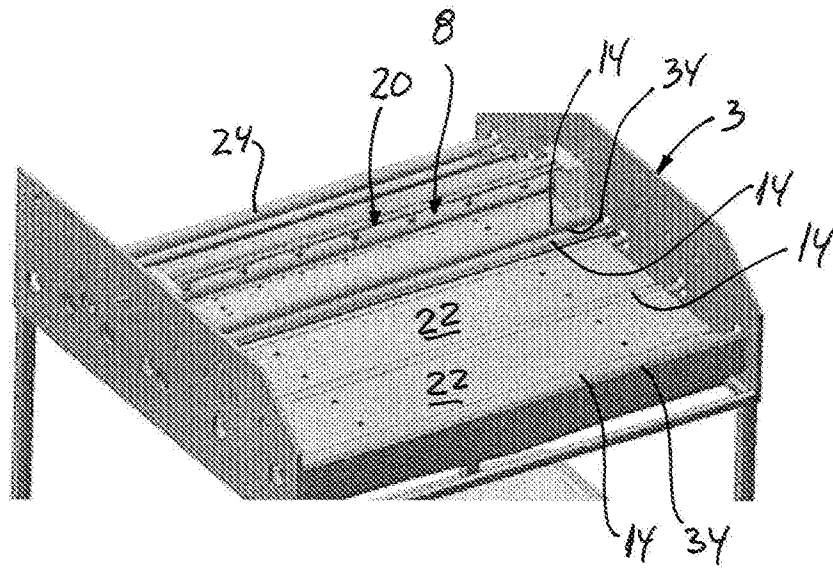


Fig. 3

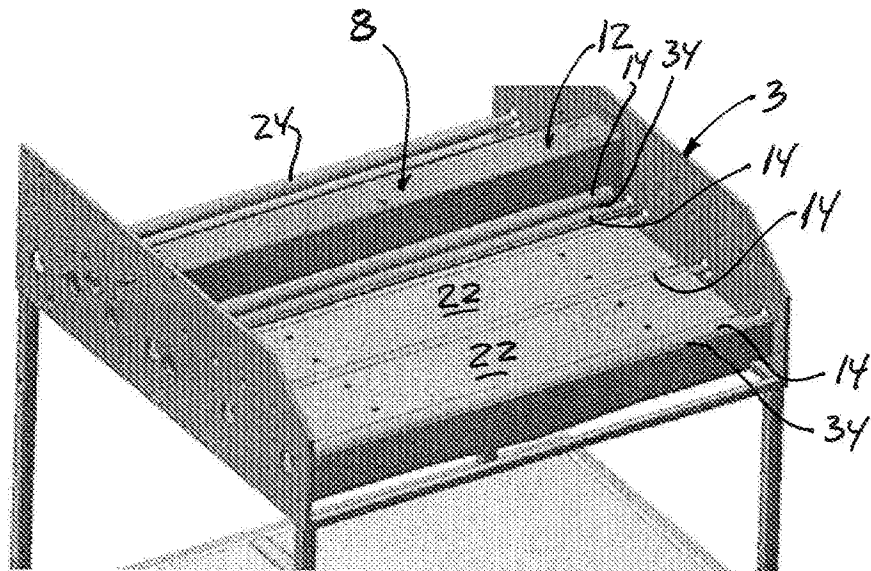
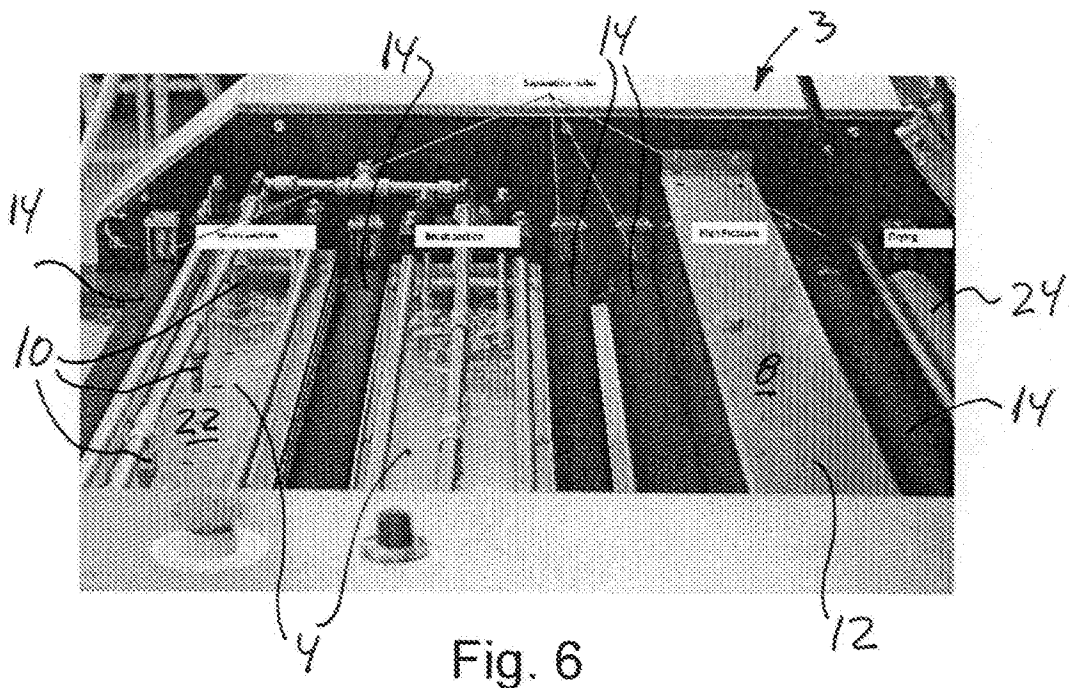
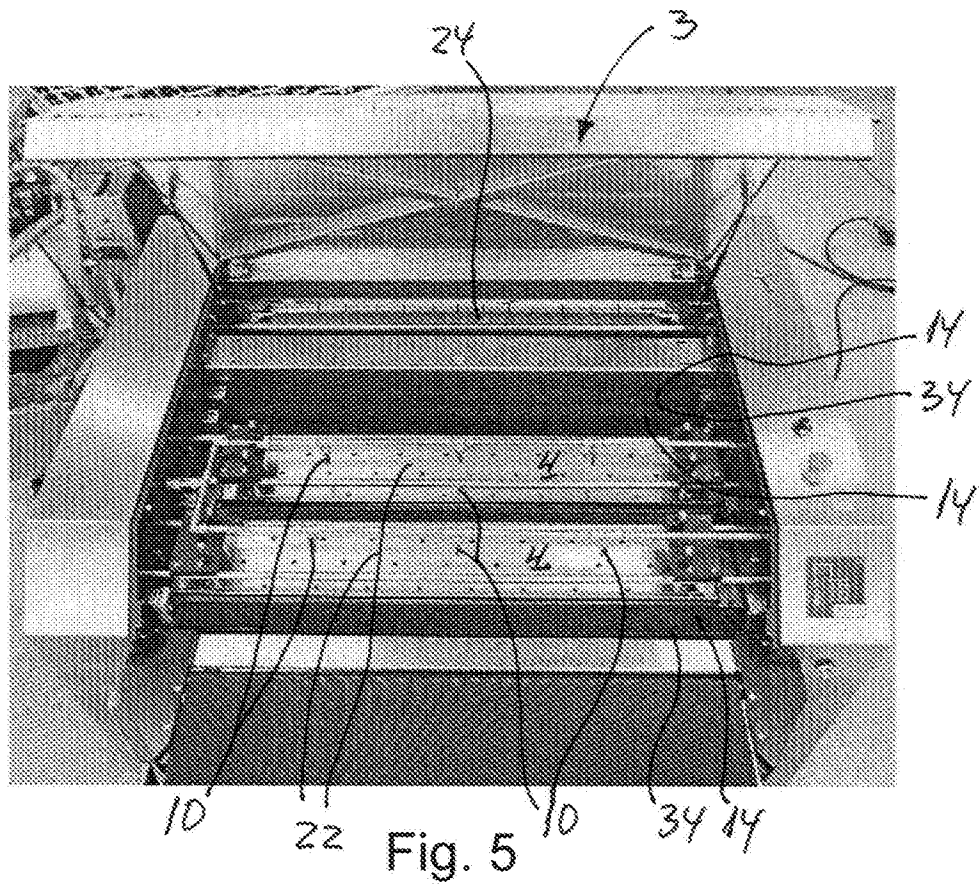


Fig. 4

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2015/050244

A. CLASSIFICATION OF SUBJECT MATTER B41F 35/00 (2006.01), B41N 3/00 (2006.01), B08B 3/02 (2006.01) According to International Patent Classification (IPC).		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC&CPC: B41C, B41D, B41F, B41N, B08B. Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched DK, NO, SE, FI: Classes as above. Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC, WPIAP, FULLTEXT: ENGLISH		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US2012137908 A1 (TENG G) 2012-06-07. See whole document, in particular figures and [0064].	1-9
A	EP0661109 A1 (ZIBULLA & SOHN GMBH) 1995-07-05. See in particular the figures and col. 5, 42 - col. 6, 01.	1-9
A	DE202007003195U U1 (DAUNQUART A) 2007-06-28. See in particular the figures, [0007], [0020-0021], and [0024].	1-9
A	US4894095 A (SCHRAMM et al.) 1990-01-16. See whole document.	1-9
A	US2013095432 A1 (DIETZ G) 2013-04-18. See whole document.	1-9
☐ 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 04/09/2015		Date of mailing of the international search report 27/10/2015
Name and mailing address of the ISA Nordic Patent Institute Helgeshøj Allé 81 DK - 2630 Taastrup, Denmark. Facsimile No. + 45 43 50 80 08		Authorized officer Carsten Købler Telephone No. +45 43 50 85 32

INTERNATIONAL SEARCH REPORT

International application No.

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Box No. I Nucleotide and/or amino acid sequence(s) (Continuation of item 1.c of the first sheet)

1. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of a sequence listing filed or furnished:

- a. ☐ forming part of the international application as filed:
- ☐ in the form of an Annex C/ST.25 text file.
 - ☐ on paper or in form of an image file.
- b. ☐ furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
- c. ☐ furnished subsequent to the filing date for the purposes of international search only:
- ☐ in the form of an Annex C/ST.25 text file (Rule 13ter.(a))
 - ☐ on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).

2. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

3. Additional comments:

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2015/050244

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:

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 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.:

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.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2015/050244

Box No. IV **Text of the abstract (Continuation of item 5 of the first sheet)**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2015/050244

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/DK2015/050244

Patent document cited in search report / Publication date	Patent family member(s) / Publication date
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INTERNATIONAL SEARCH REPORT

International application No.

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