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(54) **PRINTING UNIT FOR A PRINTING APPARATUS AND PRINTING APPARATUS COMPRISING SAID PRINTING UNIT**

(57) Printing unit (2) for a printing apparatus (1) for printing on substrates (18) of the type comprising at least a tank (8), a print head (5) and feed members (19) of the ink or other print material from said tank (8) to the print head (5), a slider (3) also being provided to support and

move said printing unit (2) above a respective support plane (4). According to the invention said printing unit (2) is a modular printing unit (2), provided with a support element (12) equipped with said tank (8), print head (5) and feed members (19).

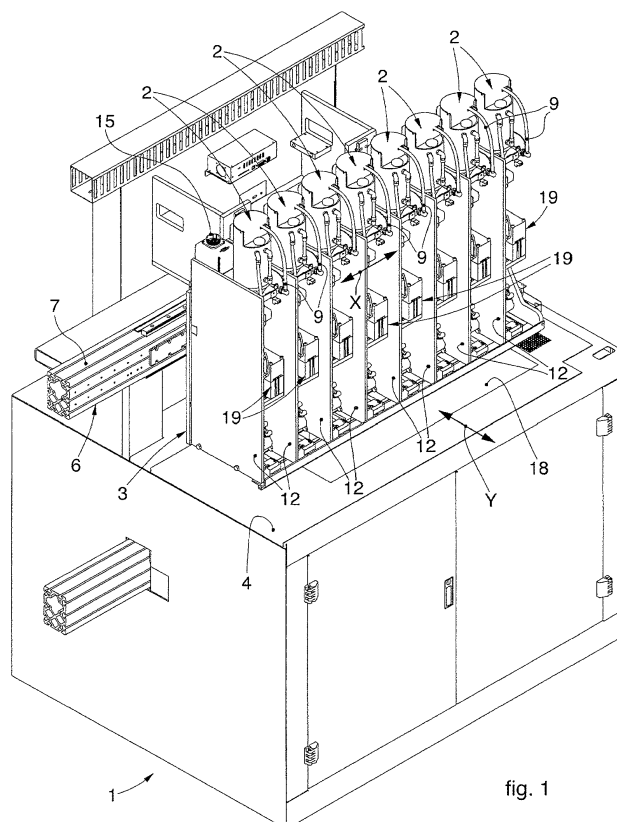


fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention concerns a modular printing unit for a printing apparatus.

[0002] The present invention also extends to the printing apparatus provided with at least a modular unit.

BACKGROUND OF THE INVENTION

[0003] Printing apparatuses are known, of the laser or inkjet type for example, for printing on substrates such as paper, sheets or polymer panels, tiles, posters or suchlike and on different types of materials of the substrate, generally comprising one or more printing units installed sliding on a slider and a support plane, for example a belt, a plane or a mat, to correctly position the article to be printed in cooperation with the printing unit.

[0004] A plurality of print heads are installed on the printing units, each of which is provided with delivery nozzles disposed reciprocally in a coordinated manner, in order to carry out the correct printing sequence with the pre-set materials and colors.

[0005] The print head can also be provided, or cooperate, with a drying device, normally a UV lamp or other similar or comparable device, to dry the print material at the end of the corresponding cycle substantially instantaneously.

[0006] Each of the print heads allows to deliver a color, for example the primary colors (cyan, magenta and yellow), the neutral colors (black and white), as well as possible specific materials in order to confer, for example, shiny/opaque effects or to deposit additives such as glitter.

[0007] The printing unit can be moved vertically nearer/downward to the mat or belt to position the print heads at the correct distance from the support or from the article to carry out the printing.

[0008] The slider, which supports the printing unit, also moves transversely to the direction of feed of the article, to perform one or two successive printing cycles. As the printing passages increase, so does the definition of the printed image.

[0009] The slider can be installed on a bridge structure that comprises a guide parallel to the support plane.

[0010] In the known solutions, the tanks containing the ink or the print material are separated from the print heads and are always located in a fixed position, for example below the support plane. Flexible tubes are provided to feed the ink from the tanks to the print heads. However, during the movement of the slider the flexible tubes can get damaged.

[0011] Pumping devices (to feed the ink) and devices to recirculate the ink (to prevent the ink drying in the print heads) are also associated to each print head, which in some known solutions are installed directly on the slider, or in other known solutions are installed in a fixed posi-

tion, for example below the support plane.

[0012] According to the state of the art, the slider with the print heads, the pumping devices and the recirculating devices form a group, predisposed as a function of the specific printing needs of the client.

[0013] For this reason, in the case where it is necessary to replace one type of color with another, a drastic intervention on the printing apparatus is required, in order to replace the print heads, the flexible connection tubes, the pumping and recirculating devices.

[0014] Therefore the user is unable to make personalizations in the combination of colors and/or finishings, unless radical changes are made on the overall structure of the combined slider-print heads-pumping devices-recirculating devices.

[0015] This requires complex interventions carried out by qualified personnel, for example the assistant personnel of the printing apparatus, and long downtimes of the machine.

[0016] One purpose of the present invention is to supply a new printing unit and the corresponding printing apparatus, of the laser or inkjet type for example, in order to print on substrates such as paper, sheets or polymer panels, tiles, posters or suchlike and on different types of substrate materials which, unlike traditional printing units and apparatuses, allow to personalize, quickly and simply, the combination of inks and print materials, according to the needs of the user.

[0017] Another purpose of the present invention is to obtain a printing unit, and the corresponding printing apparatus which comprises the printing unit, which is simple and easy to make.

[0018] Another purpose of the present invention is to obtain a printing unit and the corresponding printing apparatus which reduces the maintenance interventions required.

[0019] Another purpose of the present invention is to obtain a printing unit and the corresponding printing apparatus that can be personalized quickly and by non-specialized personnel.

[0020] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0021] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0022] In accordance with the above purposes, a printing unit for a printing apparatus of the laser or inkjet type for example, according to the present invention is used for printing on substrates such as paper, sheets or polymer panels, tiles, posters or suchlike, of the type comprising at least a tank to contain at least a print material, a print head to deliver the print material onto the substrate

and feed members to feed the ink or other print material connected between the tank and the print head.

[0023] In accordance with one aspect of the present invention, the printing unit comprises a support element on which the tank, the print head and the feed members are installed. The support plate is also selectively and releasably installable on a slider of the printing apparatus.

[0024] In this way it is possible to make personalizations in the combination of colors and/or finishings, without the need for radical changes on the overall structure of the combined slider-print head-pumping devices-recirculating devices, but by means of simple and rapid interventions, which can be carried out directly by the user.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] These and other characteristics of the present invention will become apparent from the following description of forms of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 shows an overall perspective view of the printing apparatus according to the present invention,
- figs. 2 and 3 show the totality of the printing units, as assembled on the apparatus of fig. 1; and
- figs. 4 and 5 show the printing unit according to the present invention, with a view to the internal components and respectively the rapid attachment means to the support slider.

[0026] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one form of embodiment can conveniently be incorporated into other forms of embodiment without further clarifications.

DETAILED DESCRIPTION OF SOME FORMS OF EMBODIMENT

[0027] A printing apparatus in accordance with the present invention is indicated in its entirety by the reference number 1 in fig. 1, and can be the laser or inkjet type, for printing on substrates 18 such as paper, sheets or polymer panels, tiles, posters or suchlike and on different types of materials of the substrate.

[0028] The printing apparatus 1 comprises a plurality of printing units 2, installed, in their turn, on a slider 3.

[0029] The slider 3 is installed in a sliding manner, in a direction of movement X, above a support plane 4, for example a movement belt, a plane or a mat, in order to correctly position the substrate 18 to be printed in cooperation with the printing units 2.

[0030] In accordance with possible embodiments of the present invention, the support plane 4 can be provided with feed devices, not shown in the drawings, config-

ured to allow to feed the substrate 18, during the printing process, in a transverse direction of feed Y, for example orthogonal to the direction of movement X.

[0031] On each printing unit 2 a respective print head 5 is installed, provided with respective delivery nozzles in order to carry out the correct printing sequence with the pre-set materials and colors.

[0032] Each print head 5 allows to deliver a color, for example the primary colors (cyan, magenta and yellow), the neutral colors (black and white), as well as possible specific materials to confer shiny/opaque effects or to deposit additives such as glitter.

[0033] In possible solutions, the print heads 5 can cooperate with a drying device, normally a UV lamp or other similar or comparable device, not shown in the drawings, to dry the print material deposited on the substrate 18 substantially instantaneously.

[0034] As described above, the slider 3, moves in the direction of movement X transverse to the direction of feed Y of the substrate 18 in order to carry out successive printing cycles. As the printing passages increase, so does the definition of the printed image.

[0035] In accordance with the embodiment shown in figs. 1-5, the slider 3 of fig. 1 is installed sliding on a bridge structure 6 located above the support plane 4 and extends parallel to the direction of movement X.

[0036] In accordance with the variant shown in figs. 1-3, the bridge structure 6 comprises a guide 7 installed parallel to the support plane 4 and to the direction of movement X.

[0037] The slider 3 is installed in a sliding manner on the guide 7.

[0038] Movement devices, not shown in the drawings, are associated with the slider 3, and are configured to allow the movement of the slider 3 in the direction of movement X.

[0039] In accordance with a possible solution, the printing units 2 can also be moveable nearer and downward, for example vertically, to the support plane 4 in order to position the respective print heads 5 at the correct distance from the substrate 18 to be printed.

[0040] Each printing unit 2, in accordance with the present invention, comprises a support element 12, in the case shown here a support plate, on which at least a tank 8 containing the print material is installed, at least a print head 5 and feed members 19 configured at least to feed the print material contained in the tank 8 toward the print head 5.

[0041] The support plate 12 is selectively installable in a releasable manner on the slider 3. In this way printing units 2 of the modular type are obtained and able to be selectively installed/replaced by the slider 3 in a rapid and simple way even by non-specialized operators.

[0042] Flexible tubes 9 are provided to connect the tanks 8 to the respective print heads 5 and to allow to feed the print material to the latter.

[0043] In accordance with possible solutions of the present invention, the feed members 19 can also com-

prise pumping devices 10 to pump the print material from the tank 8 toward the print head 5, and recirculating devices 11 of the print material configured to recirculate the print material in the print head 5 and prevent it from drying out.

[0044] Removable attachment means 13, preferably of the rapid attachment type, are associated with the support plate 12 of each modular printing unit 2 and are configured to allow a selective connection of the support plate 12 to the respective support slider 3.

[0045] The removable attachment means 13 can be chosen from a group comprising snap-in type means, bayonet means and suchlike.

[0046] The removable attachment means 13 are also suitable to cooperate with corresponding rapid connection means 14, provided on the slider 3 and suitable to allow the installation, on the latter, of a plurality of modular printing units 2 as defined above.

[0047] In this way, by connecting only an electric power connector 15 to each printing unit 2, it is possible to supply energy and command the functioning of the respective print head 5. The electric power connector 15 is installed on the support plate 12. All the other functional components to deliver the print material are installed on the support plate 12. Therefore, when the type of printing needs to be modified, it is sufficient to remove a specific support plate 12 from the slider 3 and replace it with another.

[0048] In accordance with a possible formulation of the present invention, the rapid connection means 14 provided on the slider 3 comprise slots with differentiated diameters.

[0049] As explained above, the feed members 19 of the print material comprise the pumping device 10 and the recirculating device 11 in order to feed the ink to the print head 5. The pumping device 10 can possibly be integrated in the recirculating device 11.

[0050] Each printing unit 2 can also comprise control boards 16, 17, installed on the support plate 12 and provided to control the functioning at least of the respective print head 5 and the feed members 19, and in particular the pumping devices 10 and the recirculating devices 11.

[0051] The control boards 16, 17 can be connected to the electric power connector 15.

[0052] In accordance with a possible solution, the tank 8 of each printing unit 2 is located, during use, above the print head 5, so as to allow to feed by gravity of the print material toward the feed members 19 and the print head 5.

[0053] It is clear that modifications and/or additions of parts may be made to the printing unit 2 for a printing apparatus 1 and the corresponding apparatus 1 as described heretofore, without departing from the field and scope of the present invention.

[0054] For example, the conformation and the disposition of the rapid attachment means 13 and 14 could be different, provided that their purpose of temporarily holding the printing units 2 anchored to the slider 3 is retained.

The support plate 12 could also be any shape whatsoever, as long as it maintains its ability to support the functional parts of the printing units 2.

[0055] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of printing unit 2 for a printing apparatus 1, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Printing unit for a printing apparatus (1) to print at least one substrate (18), said printing unit comprising at least a containing tank (8) to contain at least a print material, a print head (5) to deliver said print material onto said substrate (18) and feed members (19) connected between said tank (8) and said print head (5) in order to feed said print material, **characterized in that** it comprises a support element (12) on which said tank (8), said print head (5) and said feed members (19) are installed, said support element (12) being selectively and releasably installable on a slider (3) of said printing apparatus (1) configured to move said printing unit with respect to said substrate (18).
2. Unit as in claim 1, **characterized in that** said support element (12) is provided with removable attachment means (13) configured to allow a selective connection of said support element (12) to said slider (3).
3. Unit as in claim 2, **characterized in that** said removable attachment means (13) are chosen from a group comprising snap-in or bayonet means or suchlike.
4. Unit as in any claim hereinbefore, **characterized in that** said feed members (19) comprise a pumping device (10) to pump the print material from said tank (8) toward said print head (5), and print material recirculating devices (11), configured to recirculate the print material in the print head (5).
5. Unit as in any claim hereinbefore, **characterized in that** it comprises control boards (16, 17) installed on said support element (12) and provided to control the functioning at least of the print head (5) and the feed members (19).
6. Unit as in any claim hereinbefore, **characterized in that** it comprises an electric feed connector (15) installed on said support element (12).
7. Unit as in any claim hereinbefore, **characterized in that** said tank (8) is located, during use, above said print head (5).

8. Printing apparatus for printing on at least a substrate (18), **characterized in that** it comprises at least a slider (3), selectively movable with respect to said substrate (18), and on which a printing unit (2) as in any claim hereinbefore is installed in a selectively releasable manner. 5
9. Printing apparatus as in claim 8, **characterized in that** said slider (3) is provided with rapid connection means (14) suitable to cooperate with removable attachment means (13) provided in said support element (12). 10
10. Printing apparatus as in claim 8 or 9, **characterized in that** it comprises a plurality of said printing units (2), each releasably installed on said slider (3). 15

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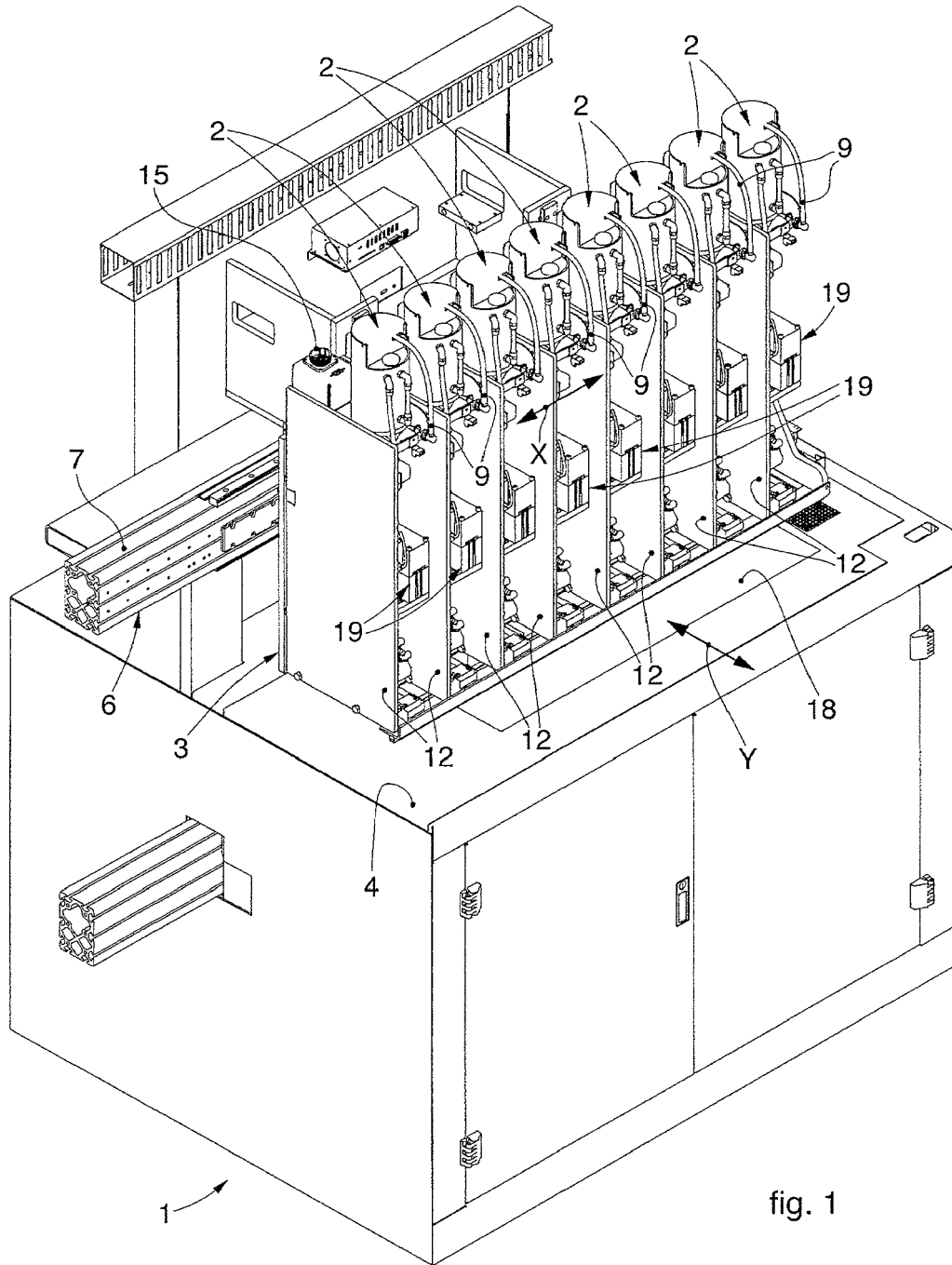
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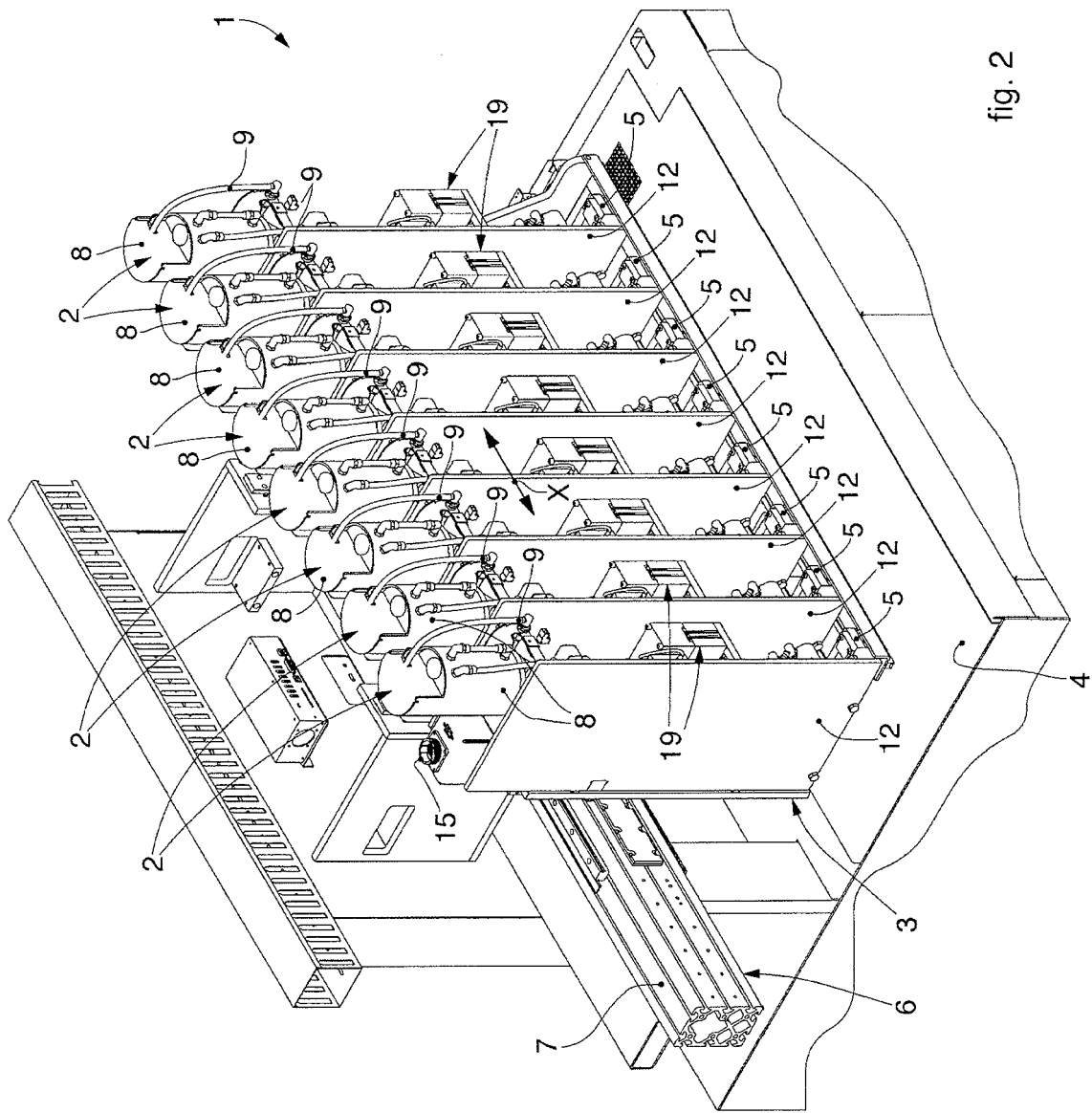
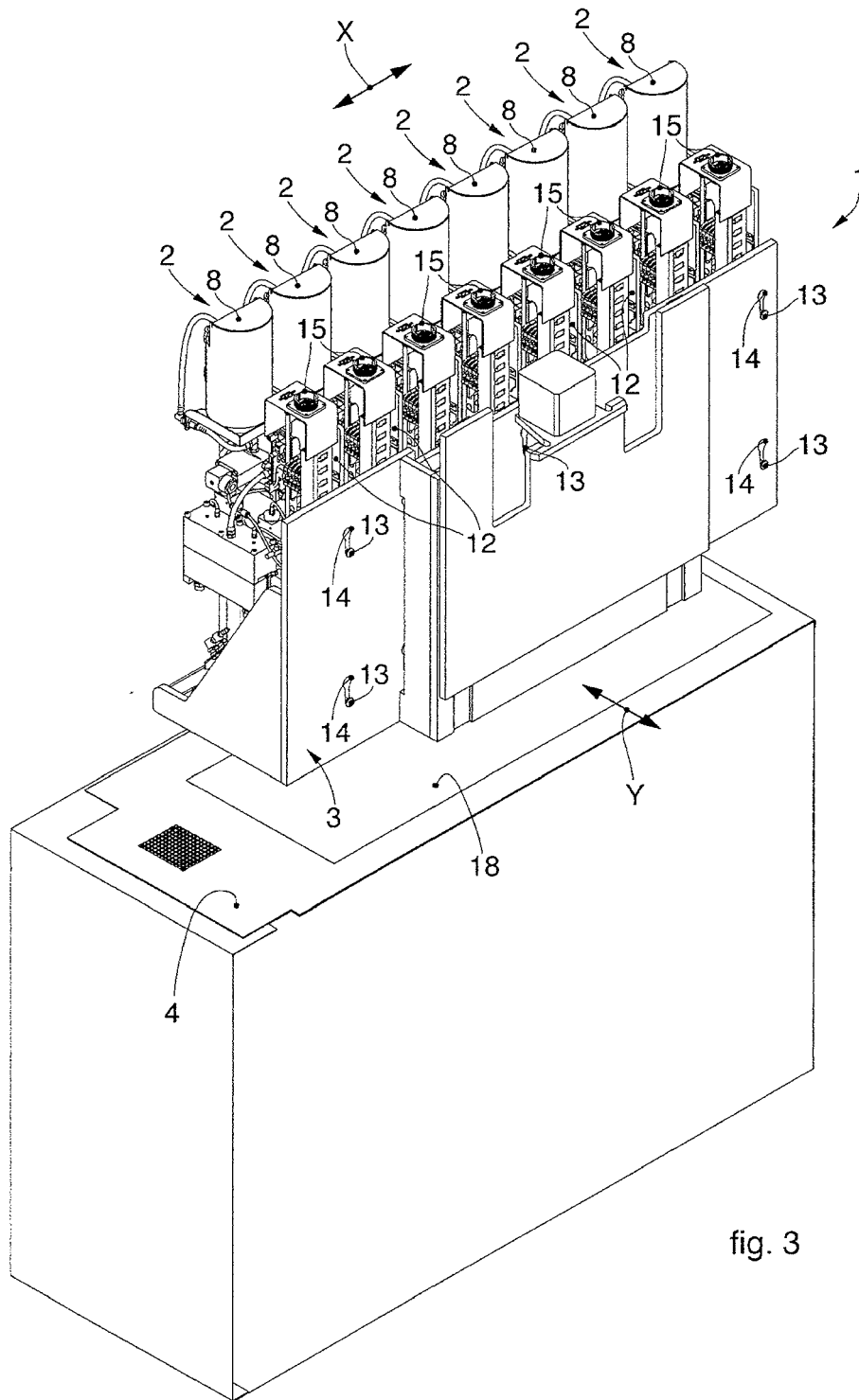


fig. 2



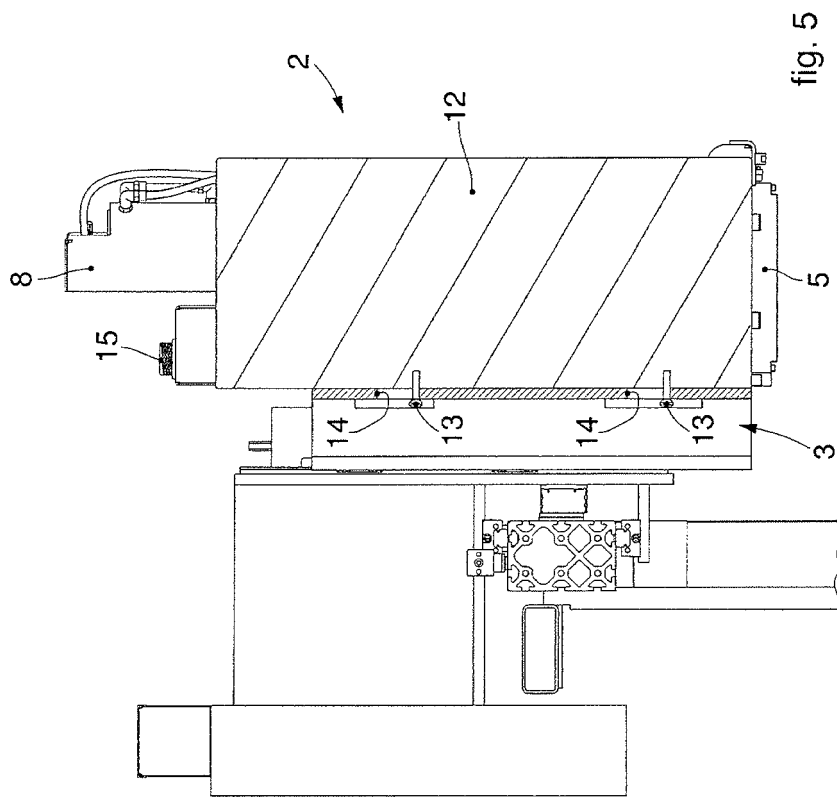


fig. 5

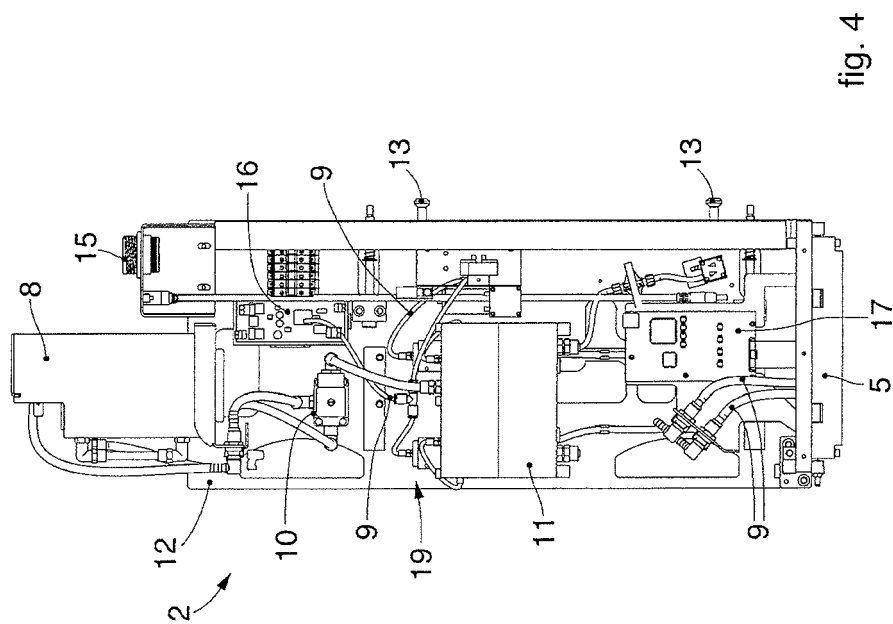


fig. 4



EUROPEAN SEARCH REPORT

 Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 01/87624 A1 (CHAMPION IMAGING SYSTEMS PTY L [AU]; HEWITT GARRY [AU]) 22 November 2001 (2001-11-22) * page 4, lines 19-25a; figures 2,3 * * figure 11 *	1-10	INV. B41J29/02
X	US 2012/044310 A1 (YAJIMA YASUSHI [JP] ET AL) 23 February 2012 (2012-02-23) * paragraphs [0036], [0038]; figure 2 *	1-10	
X	WO 2010/101076 A1 (SII PRINTEK INC [JP]; MURASE TETSUYA [JP]; SADAHI AKIHIRO [JP]) 10 September 2010 (2010-09-10) * abstract; figures 1,5-8,9,10 *	1-10	
X	EP 1 847 397 A2 (ISOWA KK [JP]) 24 October 2007 (2007-10-24) * paragraph [0048]; figure 4 * * paragraphs [0060], [0061]; figures 8,9 *	1	
X	US 4 914 453 A (KANAYAMA YOSHIO [JP] ET AL) 3 April 1990 (1990-04-03) * column 4, line 57 - column 5, line 22; figures 6-8 *	1	TECHNICAL FIELDS SEARCHED (IPC) B41J
X	US 2003/132987 A1 (OGAWA MASAHIKO [JP]) 17 July 2003 (2003-07-17) * the whole document *	1	
X	EP 1 806 232 A1 (TAPEMATIC SPA [IT]) 11 July 2007 (2007-07-11) * paragraphs [0035], [0036]; figures 1,1a *	1	
X	US 2004/125181 A1 (NAKAMURA SHINICHI [JP]) 1 July 2004 (2004-07-01) * the whole document *	1	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 21 March 2016	Examiner Adam, Emmanuel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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

EP 15 20 2527

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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35

40

45

50

55

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
WO 0187624	A1	22-11-2001	EP	1292452 A1	19-03-2003
			JP	2003533379 A	11-11-2003
			NZ	521568 A	25-06-2004
			US	2004027426 A1	12-02-2004
			WO	0187624 A1	22-11-2001

US 2012044310	A1	23-02-2012	CN	102514401 A	27-06-2012
			JP	5531856 B2	25-06-2014
			JP	2012040743 A	01-03-2012
			US	2012044310 A1	23-02-2012

WO 2010101076	A1	10-09-2010	JP	2010208055 A	24-09-2010
			WO	2010101076 A1	10-09-2010

EP 1847397	A2	24-10-2007	AU	2007201656 A1	08-11-2007
			CN	101058244 A	24-10-2007
			CN	101058264 A	24-10-2007
			EP	1847397 A2	24-10-2007
			JP	4923296 B2	25-04-2012
			JP	2007302000 A	22-11-2007
			RU	2007114847 A	27-10-2008
			US	2007247505 A1	25-10-2007

US 4914453	A	03-04-1990	DE	3913456 A1	02-11-1989
			JP	H0716434 Y2	19-04-1995
			JP	H01158132 U	01-11-1989
			US	4914453 A	03-04-1990

US 2003132987	A1	17-07-2003	CN	1537056 A	13-10-2004
			CN	101011882 A	08-08-2007
			JP	3890973 B2	07-03-2007
			JP	2003181352 A	02-07-2003
			KR	20030070028 A	27-08-2003
			TW	565510 B	11-12-2003
			US	2003132987 A1	17-07-2003
			WO	03053698 A1	03-07-2003

EP 1806232	A1	11-07-2007	AT	386642 T	15-03-2008
			DE	602005004935 T2	26-02-2009
			EP	1806232 A1	11-07-2007
			US	2007146458 A1	28-06-2007

US 2004125181	A1	01-07-2004	CN	1496824 A	19-05-2004
			JP	3849676 B2	22-11-2006
			JP	2004141861 A	20-05-2004
			KR	20040030304 A	09-04-2004

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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

EP 15 20 2527

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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21-03-2016

10	Patent document cited in search report	Publication date	Patent family member(s)	Publication date
			TW I236431 B	21-07-2005
			US 2004125181 A1	01-07-2004
15	-----			
20				
25				
30				
35				
40				
45				
50				
55				

EPO FORM P0459

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