(12) STANDARD PATENT (11) Application No. **AU 2007241433 B2**
(19) AUSTRALIAN PATENT OFFICE

(54) Title
Process and device for printing containers

(51) International Patent Classification(s)
B65C 9/46 (2006.01) ***B67B 3/00*** (2006.01)

(21) Application No: **2007241433** (22) Date of Filing: **2007.04.03**

(87) WIPO No: **WO07/121835**

(30) Priority Data

(31) Number	(32) Date	(33) Country
10 2006 019 441.1	**2006.04.24**	**DE**

(43) Publication Date: **2007.11.01**
(44) Accepted Journal Date: **2011.10.27**

(71) Applicant(s)
KHS GmbH

(72) Inventor(s)
Till, Volker

(74) Agent / Attorney
Watermark Patent and Trade Marks Attorneys, Level 2 302 Burwood Road, Hawthorn, VIC, 3122

(56) Related Art
US 2005/248618 A1
WO 2004/056658 A

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum
Internationales Büro

(43) Internationales Veröffentlichungsdatum
1. November 2007 (01.11.2007)

PCT

(10) Internationale Veröffentlichungsnummer
WO 2007/121835 A1

(51) Internationale Patentklassifikation:
B65C 9/46 (2006.01) *B67B 3/00* (2006.01)

(21) Internationales Aktenzeichen: PCT/EP2007/002999

(22) Internationales Anmeldedatum:
3. April 2007 (03.04.2007)

(25) Einreichungssprache: Deutsch

(26) Veröffentlichungssprache: Deutsch

(30) Angaben zur Priorität:
10 2006 019 441.1 24. April 2006 (24.04.2006) DE

(71) Anmelder *(für alle Bestimmungsstaaten mit Ausnahme von US)*: **KHS AG** [DE/DE]; Juchostrasse 20, 44143 Dortmund (DE).

(72) Erfinder; und

(75) Erfinder/Anmelder *(nur für US)*: **TILL, Volker** [DE/DE]; Fischbacherweg 30, 65719 Hofheim am Taunus (DE).

(81) Bestimmungsstaaten *(soweit nicht anders angegeben, für jede verfügbare nationale Schutzrechtsart)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Bestimmungsstaaten *(soweit nicht anders angegeben, für jede verfügbare regionale Schutzrechtsart)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), eurasisches (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), europäisches (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

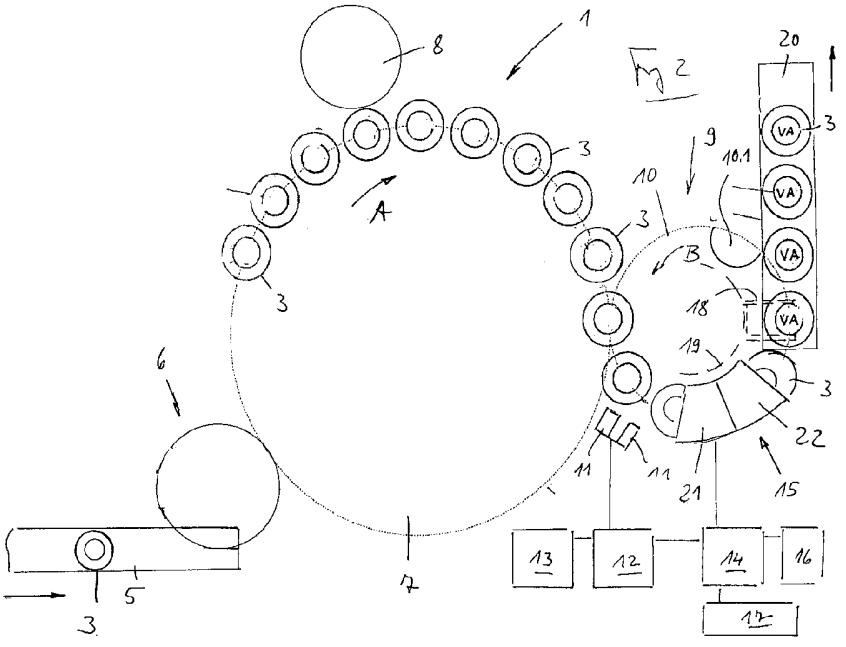
Erklärung gemäß Regel 4.17:
— *Erfindererklärung (Regel 4.17 Ziffer iv)*

Veröffentlicht:
— *mit internationalem Recherchenbericht*

[Fortsetzung auf der nächsten Seite]

(54) **Title:** PROCESS AND DEVICE FOR PRINTING CONTAINERS

(54) **Bezeichnung:** VERFAHREN SOWIE VORRICHTUNG ZUM BEDRUCKEN VON BEHÄLTERN



(57) **Abstract:** The invention relates to a process for the application of at least one imprint (VA) on a container surface, for example, the seal of a container (4), using at least one printing station (15) with at least one electrically-controlled printing unit (21).

[Fortsetzung auf der nächsten Seite]

WO 2007/121835 A1

Zur Erklärung der Zweibuchstaben-Codes und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

(57) Zusammenfassung: Die Erfindung bezieht sich auf ein Verfahren zum Aufbringen wenigstens eines Aufdrucks (VA) auf eine Behälterflache, beispielsweise einen Behälterverschluss (4), unter Verwendung wenigstens einer Druckstation (15) mit wenigstens einer elektrisch ansteuerbaren Druckeinheit (21).

PROCESS AND DEVICE FOR PRINTING CONTAINERS

FIELD OF THE INVENTION

The present invention relates to a process for printing bottles or similar containers, and a device for carrying out the process.

BACKGROUND OF THE INVENTION

A print head is used for printing flat printed matter by generating a plurality of pixels in a line in close succession or respectively at a minimal distance from one another, for example at least one hundred and fifty pixels per inch on a surface of the printed matter to be printed, by means of a plurality of individually controlled individual nozzles. The active print width of this print head, also known as "Tonejet", depends only on the capacity of the computing power of a computer driving the pressure head. Print heads from 1.7 to 6.8 inch print width (corresponding to 256 bit control or respectively 1024 bit control) are possible. This pressure head enables printing a two-dimensional imprint with sufficiently large area by relative motion between the surface to be printed and the pressure head only in a single axial direction.

It is frequently called for to apply closures, for example crown cork or screw closures which have an imprint, for example in the form of an emblem, a trade mark or the like, to bottles or similar containers such that the imprint on the closure has a preset orienting with respect to the remaining layout of the bottle or respectively of the container, for example with respect to one or more labels or other layout characteristics.

To achieve this it has already been put forward for a labelling machine for labelling bottles to align the upright bottles prior to applying the labels by rotating them about their vertical bottle axis such that the imprint on the bottle closures in each case has preset orienting whenever the bottles reach the labelling unit, so that after labelling the imprint on the bottle closures and the layout formed by the labelling have the preferred coherent orientation.

This existing procedure does presuppose however not only optical detection of the random orienting of the imprint, but also subsequent mechanical aligning or respectively rotation of the bottles about their bottle axis, necessitating

i.a. a relatively expensive motor drive of every turntable serving as stand space for the bottle, with correspondingly expensive control. There is accordingly a need for improved techniques for printing upon containers.

SUMMARY OF THE INVENTION

The present invention in one aspect provides a process for applying an imprint to a container surface of a container using a printing station having at least one electrically controlled printing unit, the process comprising:

securing a container against rotation about an axis while the container is conveyed via a transporter;

detecting a container layout or at least one layout characteristic while the container is secured against rotation;

determining an orientation of the container layout or the layout characteristic following the step of detecting;

applying an imprint to a container surface or the container layout in a preferred orientation;

wherein the applied imprint is electronically aligned with respect to the container based upon the determined orientation of the container layout or layout characteristic and a stored reference of the container layout or the layout characteristic.

The present invention in another aspect further provides A device for printing containers on a container surface, the device having:

a transport arrangement for moving containers;

securing means for securing the containers against rotation about an axis (FA) of the container;

at least one print station having at least one electronically controlled printing unit for printing the containers;

detecting means for detecting an arbitrary orientation of a container layout or at least one layout characteristic;

wherein the applied imprint is electronically aligned with respect to the container based upon the determined orientation of the container layout or layout characteristic and a stored reference of the container layout or the layout characteristic.

Based on purely random orienting of the containers with respect to the layout characteristics already present on this container, for example labelling already applied, a particular feature of the inventive process comprises the at least one imprint being applied for example on the closure solely by electronic aligning or rotating of the lithograph present in digital form on the container surface oriented vertically or transversely to the container axis, such that the resulting imprint has the preferred orientation with respect to the remaining layout of the container. Aligning or rotating the containers preferably upright during printing about their container axis is not required. As a result, no expensive control drives are necessary. Rather, aligning of the imprint with respect to the remaining layout of the respective container is undertaken purely electronically or software-based.

The printing unit is designed such that it generates the respective print image aligned with the container surface, depending on control by an electronic control device or respectively print electronics (computer), specifically according to an electronic print mask or a print mask formed software-based by a data set and stored for example in a memory of the print electronics. Altering this print mask also enables problem-free changing or conversion of the imprint, specifically in any regard, i.a. content, graphic, colour, image, but also with respect to size and form. The invention accordingly also offers the possibility of altering and/or updating the respective imprint without any problems when necessary, specifically for example depending on the respective product and/or the respective trademark.

The printing unit preferably has at least one pressure head which is preferably designed as a "Tonejet" pressure head or as a pressure head corresponding to such a "Tonejet" pressure head. On a print area which is arranged during printing opposite the area to be printed at minimal distance from this area, this type of pressure head has a plurality of individual nozzles, provided closely successively in a print head longitudinal axis and in each case formed by a nozzle aperture and by an electrode assigned to each nozzle aperture. The printing ink present in the pressure head exits at each individual nozzle or

case consecutively on container carriers which are provided on the circumference of a rotors 7 driven circumferentially in the direction of the arrow A about a vertical machine axis. By way of the rotary rotor 7 the bottles 3 are moved past at least one labelling unit 8, on which the glued labels 2 are transferred to the bottles 3, so that the labels 3 are pressed or brushed respectively onto the respective bottle 3 appropriately, for example by successive press and/or brush elements, not shown here. The bottles 3 labelled for example in the usual manner known to the expert with the rotary rotor 7 then reach the container outlet 9 or respectively enter an outlet or transport star 10 there, which has on its circumference a number of sockets 10.1 respectively for a bottle 3 and likewise is driven about a vertical machine axis synchronously though counter to the rotor 7, i.e. in the direction of the arrow B.

The bottles 3 in each case received by a socket 10 are held torsion-free in the transport star 10 or respectively in its sockets 10.1 such that they cannot rotate about their vertical bottle axis FA.

The bottles 3 arranged as such in the sockets 10.1 are moved by the transport star 10 past one or more optoelectric sensors 11, forming part of a sensor or image recognition and processing system 12, by which the labels 2 applied to the bottles 3 and/or distinctive areas or layout characteristics 2.1 of the labels are detected and by comparison of the signals supplied by the sensors 11 to data stored in a memory 13 of the image recognition system 12 the respective and preferably random orienting of the label of each bottle 3 taken up torque-proof in a socket 10.1 is determined. This information corresponding to orienting of the respective label 2 is forwarded to print electronics 14 (e.g. computer) which then actuates a printing unit 15 to produce an imprint on the topside 4.1 of the closure 4. This imprint is designated generally in Figure 2 by the letters CI (= closure imprint) and can be designed in any form e.g. graphic and/or colour. It is however essential here though that controlled by the information of the image processing system 12, the imprinting on the topside 4.1 of the closures 4 of the bottles 3 further held torsion-free in the sockets 10.1 is carried out such that this imprinting CI has a preset alignment to the respective label 2, for example to the distinctive areas 2.1 of the label 3. This aligning occurs purely software-based via corresponding "electronic" rotating or aligning of the printed image generated by the

printing unit 15. Mechanical aligning or rotating of the bottles 3 about their bottle axis FA is not required.

The print mask for the respective imprint CI is stored in a memory 16 of the printer electronics 14 such that if required mere electronic adjustment or program change alters the type of closure imprint (CI) without any problems, without the exchange of mechanical elements, such as e.g. print masks, being necessary. The respective print mask required for applying the imprint CI can be called up from the memory 16 via an input unit 17 or respectively selected and/or altered for the printing procedure.

The sensors 11 are for example electronic cameras which deliver an image signal to the image processing system 12, in which the respective camera image is compared as an actual value to an image stored in the memory 13 as nominal value and the orienting of the respective label 2 is determined form this. Other systems are also conceivable, for example scanner devices or systems, with which distinctive areas or elements 2.1 of the respective label 3 are scanned, for example image components, such as e.g. image edges or image transitions in the label typical for the label 3, or additional markings applied to the label, for example those which at the same time also serve other purposes, for example barcodes identifying the product, information on manufacturers, manufacture dates etc.

A clamping device, which is provided on every socket 10.1 and schematically illustrated in Figure 2 by 18 serves to retain the bottles 3 torque-free in the respective socket 10.1, for example. The clamping devices 18 can be controlled by a control curve 19. Along with the transport star 10 the bottles 3 printed on their closures 4 reach a transporter 20 via which the bottles 3 are forwarded for further use or respectively to another station, for example a packer.

The printing station 15, which is arranged fixed on the transport star 10 above the motion path of the bottles 3 or respectively the closures 4, comprises a printing unit 22 and a unit 23 for drying of the respective imprint CI or respectively printed image following the latter in the direction of rotation B, specifically depending on the printing ink used for pressure by heating or respectively heat treatment or UV treatment etc.

The printing station 15 may also contain other means contributing to increasing the sharpness and/or contrast of the respective imprint CI, e.g. corona devices. There is also the possibility to provide devices between the individual print heads 24 to dry the printing ink applied with the respective pressure head for example of a colour set of multicolour printing at least to the extent where another colour set can be printed without intermingling of the printing inks.

The printing unit 22 according to Figures 3 and 4 comprises several print heads 24 which transversely or respectively vertically to the direction of rotation B of the transport star 10 at a minimal distance above the horizontal plane E (printing plane) are arranged, on which the closures 4 move.

In this embodiment the print heads 24 are designed as electrostatic print heads. For multicolour printing there are at least three print heads provided, each of which aids in printing a colour set of multicolour printing. The print heads thus contain in their colour scheme different printing inks, e.g. red, blue and yellow. There is also the possibility of providing more print heads 24 on the printing unit 22, for example a fourth pressure head 24 for black printing ink.

As Figures 3 and 4 show, each pressure head 24 substantially comprises a housing 25, which forms i.a. a closed interior space 26 for receiving the liquid or viscous printing ink. Each housing 25 is designed such that the interior space 26 tapers to a lower housing section 25.1 in the manner of a funnel or wedge. On this housing section 25.1, which extends over the entire length of each print head 24 or respectively its housing 25 and is oriented parallel to a housing or print head longitudinal axis DL and thus also parallel to the printing plane E, there is a plurality of individually controlled individual nozzles 27 provided for targeted application of the printing ink, specifically in at least a row in the direction of the print head longitudinal axis DL successively and in tight formation, such that for example one hundred and fifty individual nozzles 27 per inch or more are formed on the housing section 25.1. With the housing section 25.1 exhibiting the individual nozzles 27 each pressure head 24 is arranged in the abovementioned preset minimal distance above the topside of the closures 4 to be printed or respectively the printing plane. During printing the closures 4 are continuously moved past the respective pressure head 24 in the direction of rotation B. The already mentioned orienting of the

print heads 24 orients the direction of movement B transversely, though preferably vertically to the print head longitudinal axis DL of the print heads 24. In the illustrated embodiment the print heads 24 are arranged parallel to one another with their print head longitudinal axes DL in a horizontal direction, specifically preferably in a common horizontal plane.

Each individual nozzle 27 comprises an aperture 28 and a needle-like electrode 29 assigned to this aperture 28, which is arranged axially with the axis of the respective aperture 28 and terminates at minimal distance from this aperture 28 inside the housing interior 26. Each pressure head 24 is further designed such that at least during the printing procedure the printing ink contained in the housing interior 26 is queued up against the apertures 28 of the individual nozzles 27 at a specific hydrostatic pressure. But in view of the viscosity and/or the surface tension of the printing ink the cross-section of the aperture 28 is selected such that printing ink does not exit from the apertures 28 when the individual nozzle 27 is not activated, despite the hydrostatic pressure.

The electrodes 29 can be controlled individually via the print electronics 14, specifically such that when the individual nozzle 27 is not activated the corresponding electrode 29 is at the same electric potential as the printing ink in the housing interior 26. When an individual nozzle 27 is activated the voltage potential of the assigned electrode 29 is altered by corresponding activating or respectively control by the print electronics 14, either temporarily or pulsed, so printing ink is brought out to generate a pixel 30 on the respective closure 4 that via the aperture 28.

Since the print heads 24 with their print head longitudinal axis DL are arranged transversely or respectively vertically to the direction of movement B of the closures 4, the respective print transfer CI is performed in each case in rows extending vertically to the longitudinal extension or respectively vertically to the direction of movement B of the closures 4, specifically advancing in the direction of movement B. Activating the individual nozzles 27 is possible at a higher speed. For printing, only a single relative motion between the closures 4 and the respective pressure head 24 is required, specifically only the advance motion of the bottles 3 with the transport star 10. For these reasons high print output is achievable such that the labelling machine 1 can also

operate at high output. The respective print image is generated purely digitally in the print electronics 14 by corresponding control of the individual nozzles 27.

The closures 4 are printed in the printing unit 22 for example in such a way that the imprint CI and/or the graphic and/or colour design or layout of the respective closure 4 is produced totally by the printing unit 22 on the neutral closure 4, or an imprint already present on the closures 4 is complemented with the printing unit 22 in a preferred manner, for example provided with a linguistic, colour and/or graphic addition.

Various advantageous possibilities, i.e. inter alia the possibility of rapid conversion of the imprint CI on different products, adapting the size of the respective imprint to the size of the closures 4 etc. result from printing the closures 4 first in the labelling machine 1 and by control of the printing unit 22 or respectively of the print heads 24 of the print electronics 14 using digital or respectively data-specific stored print forms or print masks. Problem-free changing of the imprint CI is also possible merely by re-programming or program modification. In particular, there is also the possibility of altering the imprint CI via an ongoing process, for example in the extreme case reconfiguring the print image for each closure 4, in particular also in such a way that each print image or respectively each imprint CI is then composed of a constant, uniform component and variable content and/or information.

Drying or respectively setting of the printing ink takes place in the unit 23 in the direction of motion or rotation B following the printing unit 22, specifically by heating or by another suitable method, for example by curing under UV light etc.

It is understood that to generate clear printed images or imprints CI, control of the print heads 24 or respectively of the individual nozzles 27 is synchronised with the rotary motion of the transport star 10.

The invention was described hereinabove in terms of an embodiment. It is understood that numerous changes and modifications are possible without departing from the scope of the underlying idea of the invention.

It was assumed hereinabove that the imprint CI on the closures 4 is carried out in each case in an orientation corresponding to the orientation of the labels 2. There is basically also the possibility that markings or distinctive design features of these containers provided on the bottles 3 or similar containers are used as criterion for orienting the respective imprint. Also with such implementation the containers or bottles 3 are fed past the at least one sensor 11 of the image processing system 12 in a random, uncontrolled or aligned orienting, so that purely random orienting of the respective container is detected, and the imprint CI is then completed in the required orienting with the printing station 15 through corresponding control of the printing unit 22 or respectively through corresponding electronic rotating of the printed image.

In basic terms, the part of the labelling machine 1 described as an example and formed by the transport star 10 or another transporter, which enables torque-free transporting of the containers or bottles 3, of which at least one sensor 11, the image processing system 12, the electronic print control or respectively print electronics and the electrically controlled printing station 15, can also form a standalone machine which for example is then connected downstream of a labelling machine and/or to which the containers already provided with a layout can be fed.

Also if the invention were described as above in connection with printing closures 4 on bottles, the invention can also be applied to other containers, specifically not only for printing container seals, but also for printing other container surfaces, in particular those which lie vertically to a container axis in planes.

In terms of the present invention is it provided that the print mask for the respective imprint CI contains the complete graphic, text and/or pictorial design of the area to be printed.

It is also provided within the scope of the present invention that the print mask for the respective imprint CI contains only part of the graphic, text and/or pictorial composition of the area to be printed.

Legend

1 labelling machine
2 label
3 bottle
4 closure
5 transporter
6 container intake
7 rotor
8 labelling unit
9 container outlet
10 transport star
10.1 socket
11 image sensor
12 image-processing system
13 memory
14 print electronics
15 printing station
16 memory
17 input device
18 clamping device
19 control curve
20 transporter
21 printing unit
22 unit for drying der printing ink
22 printing unit
23 unit for drying der printing ink
24 print head
25 housing
25.1 housing section
26 interior space
27 individual nozzle
28 aperture
29 electrode
30 pixel

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A process for applying an imprint to a container surface of a container using a printing station having at least one electrically controlled printing unit, the process including:

securing a container against rotation about an axis while the container is conveyed via a transporter;

detecting a container layout or at least one layout characteristic while the container is secured against rotation;

determining an orientation of the container layout or the layout characteristic following the step of detecting; and

applying an imprint to a container surface or the container layout in a preferred orientation;

wherein the applied imprint is electronically aligned with respect to the container based upon the determined orientation of the container layout or the layout characteristic and a stored reference of the container layout or the layout characteristic.

2. The process as claimed in claim 1, wherein at least one visual feature of a container serves as a layout characteristic.

3. The process as claimed in claim 1, wherein at least one shape feature of the container serves as a layout characteristic.

4. The process as claimed in any one of claims 1 to 3, wherein the imprint is applied to a closure of the container.

5. The process as claimed in any one of claims 1 to 4, further including partially altering the imprint following printing.

6. The process as claimed in any one of claims 1 to 5, further including applying one or more of heat and ultraviolet radiation to the applied imprint to assist in drying or setting the applied imprint.

7. A device for printing containers on a container surface, the device having:

a transport arrangement for moving containers;

securing means for securing the containers against rotation about an axis of the container;

at least one print station having at least one electronically controlled printing unit for printing the containers; and

detecting means for detecting an arbitrary orientation of a container layout or at least one layout characteristic;

wherein the applied imprint is electronically aligned with respect to the container based upon the determined orientation of the container layout or layout characteristic and a stored reference of the container layout or the layout characteristic.

8. The device of claim 7, wherein the device forms part of a labelling machine.

9. The device of claim 7 or 8, wherein the transporter has sockets for receiving containers.

10. The device of any one of claims 7 to 9, wherein the transporter is a transport star, which is arranged to be rotated about a vertical axis.

11. The device of any one of claims 7 to 10, wherein the detecting means is an optoelectronic sensor system.

12. The device of any one of claim 12, wherein the optoelectronic sensor is an electronic camera or scanner.

2007241433 18 Aug 2011

13. The device of any one of claims 7 to 12, wherein the at least one print station has at least one electrostatic pressure head having a plurality of controlled individual nozzles for targeted delivery of printing ink.

14. The device of any one of claims 7 to 13, further including means for applying one or more of heat and ultraviolet light to the applied imprint to assist in drying or setting the applied imprint.

15. A process for applying an imprint to a container surface of a container using a printing station having at least one electrically controlled printing unit, the process substantially in accordance with the invention described herein with reference to the accompanying drawings.

16. A device for printing containers on a container surface, the device substantially in accordance with the invention described herein with reference to the accompanying drawings.

KHS GMBH

WATERMARK PATENT & TRADEMARK ATTORNEYS

P3879AU00

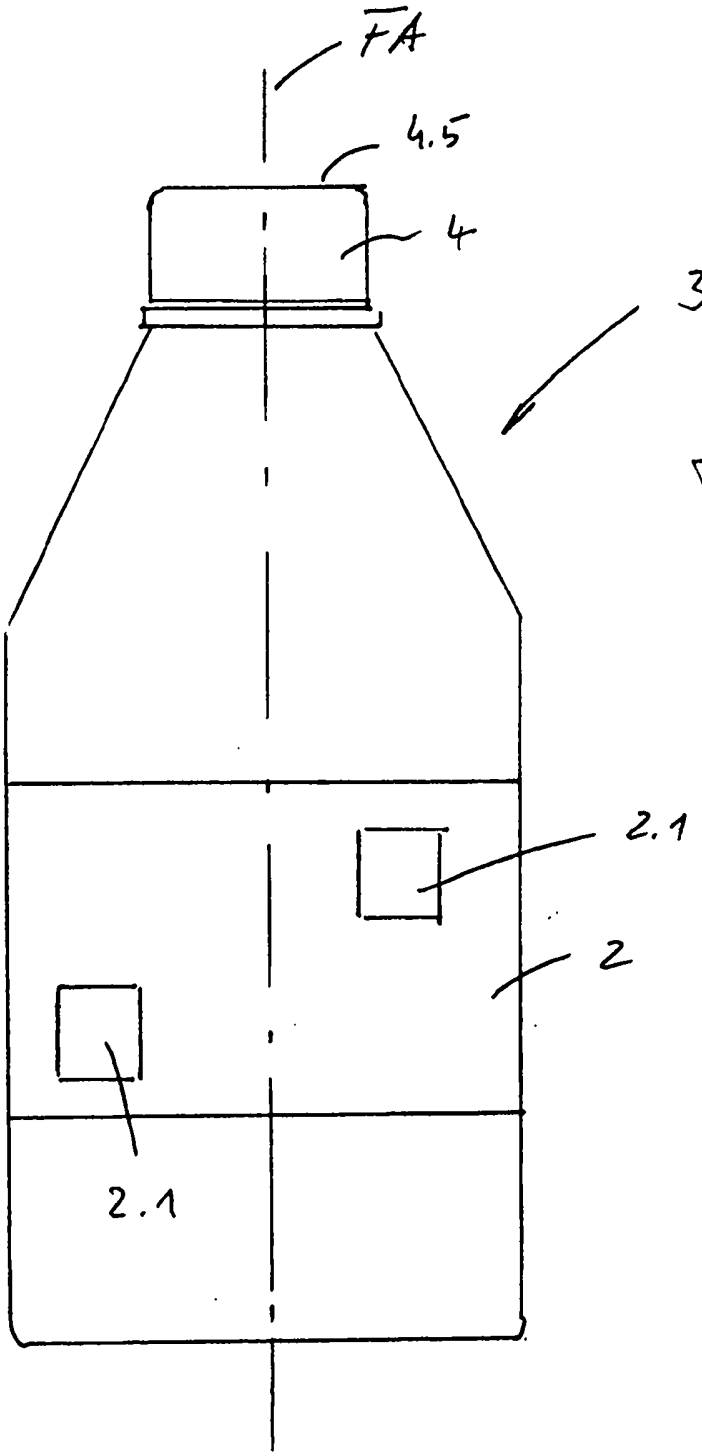
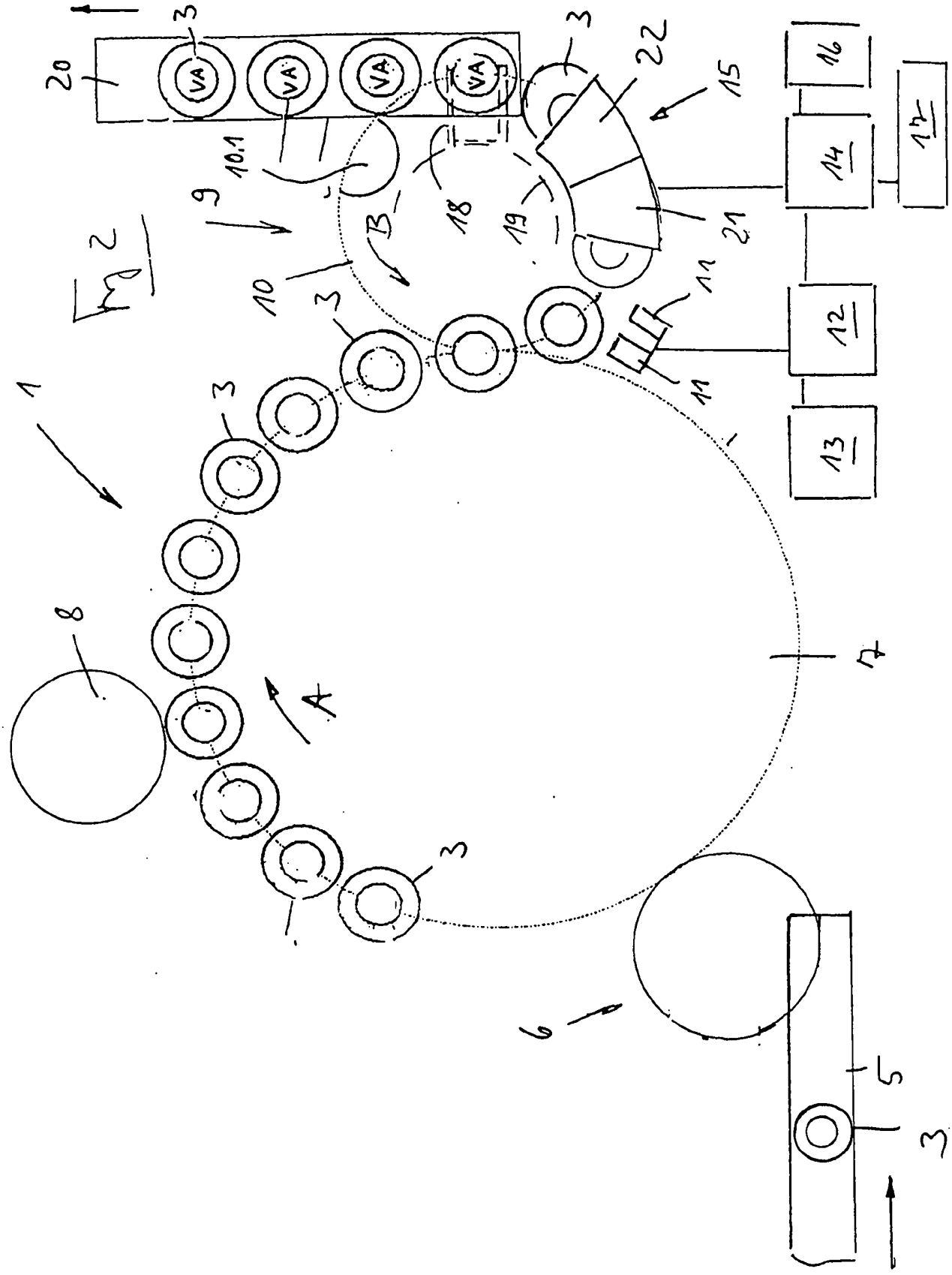


Fig 1


20
3
VA
VA
VA
VA
10.1
9
10
B
18
19
22
15
16
14
17
21
11
12
13
1
8
A
4
6
5
3

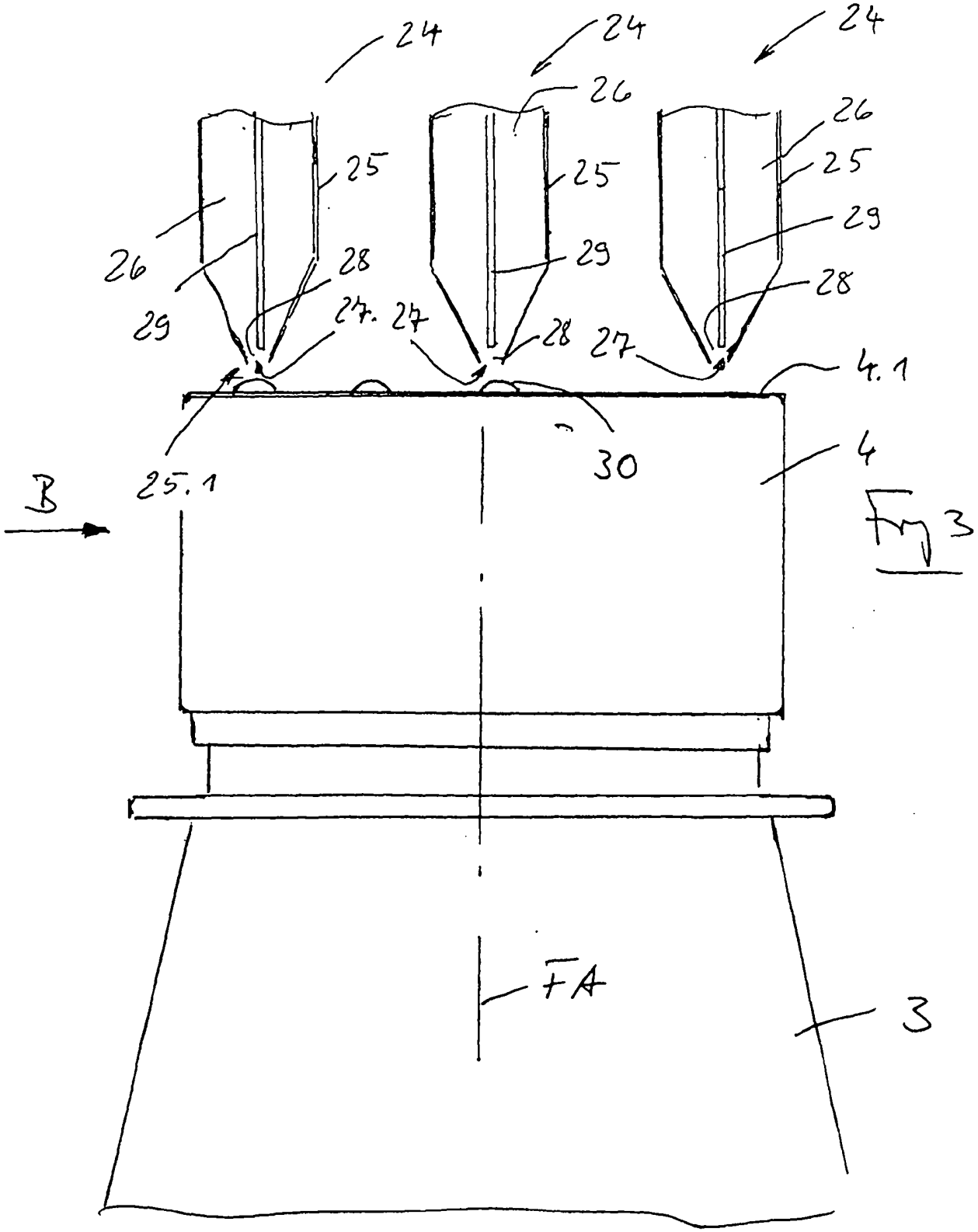


Fig 3

Fig 4