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(54) **COATING DEVICE**

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## Description

**[0001]** The present invention, which is the result of work done by the inventor as consultant for Carlsberg Brewery, relates to a bottle treatment system comprising a bottle washing apparatus and a coating device for applying a coating to an outer surface of a bottle, such as a glass or plastic bottle.

**[0002]** Bottles, especially returnable bottles, such as bottles for beer or soft drinks, are subject to rough handling at the brewery during bottling, conveying etc and during transport to shops, by the consumer, and during recycling to the brewery. This rough handling may lead to surface damage of the bottle, or even breakage of the bottle. Surface damage, such as abrasion, will deteriorate the look of the bottle in that the bottle will look old and worn. Furthermore a worn surface will adversely affect inspection of the bottles, especially automatic inspection, as the worn surface will constitute a barrier for a light source normally used for the inspection.

**[0003]** Breakage of bottles is of course another serious problem, as any content in the bottle will be lost, as well as the bottle itself, and cleaning is needed. If the bottle is made of glass the pieces of broken glass require caution during cleaning and sweeping up to minimize the risk of cuts.

**[0004]** It is a known measure to apply a so-called "anti-scuffing" coating to the bottle. The coating provides a bottle having an outer surface with an improved resistance to scuffing.

**[0005]** The prior art includes a complicated coating system adapted for mounting as a section of a bottle conveyor system in a brewery or the like. In this prior art coating system, the bottles are divided into e.g. 10 parallel rows of single lines. The bottles are rotated while they pass a vertical liquid-filled sponge, whereby the vertical surfaces of the bottle are coated. A disadvantage of this prior art system is that it introduces a bottleneck in the conveyor system, as the bottles are divided into parallel rows, which may lead to accumulation. Such bottlenecks are highly undesirable, as the risk of jamming of the conveyor system increases, and the risk of break of bottles increases, which further increases the risk of jamming in the conveyor system. Retrofitting such a coating system into an existing conveyor system is furthermore a relatively complicated and extensive operation, and thus expensive.

**[0006]** Another prior art coating system comprises an air-controlled nozzle mounted on a driving mechanism across a bottle conveyor. Bottles are coated on one side as the nozzle advances between the rows of bottles and on the other side as the nozzle returns. This system is also relatively complicated and necessitates a relatively complicated driving and control mechanism. Furthermore this system requires that the bottles are aligned in rows in cross-wise direction of the conveyor.

**[0007]** Yet another prior art coating system comprises two or more air-controlled spray nozzles mounted on op-

posite sides of a bottle conveyor. The bottles are coated from both sides as they pass the nozzles, which spray continuously. It is however a disadvantage that the bottles pass the nozzles with a velocity as this makes it difficult to apply an even coating layer on the bottles. The continuous spraying leads to a high rate of waste of coating material, which increases the cost and the need for cleaning around the spray nozzles. Furthermore the continuous spraying creates an aerosol of coating material, which may enter the bottles and possibly contaminate the content of the bottle.

**[0008]** US patent no. 5,686,188 discloses a coating method and system for applying a topcoat to glass bottles. The coat is a heat- or UV-curable acrylic material, which is sprayed on the bottle, solvents flashed off and the remaining solids cured with heat or UV-light. It is stated that the resulting coating is at once scratch and abrasion resistant, impact resistant and retains a high gloss throughout its life. The coat may be applied after labelling to protect the label of the bottle. This coating system is intended for operation in bottle production, whereas it is unsuitable for applying a coat to a bottle in a bottle recycling facility. The system requires curing of the applied coat by heat or UV-light, rendering the system relatively complex and thus expensive.

**[0009]** US patent no. 3,952,698 relates to a can treating system for washing and coating metal can bodies immediately after the can bodies are drawn and subsequently washed and rinsed. The coating is applied simultaneously to both the inside and the outside can surfaces by spray nozzles arranged above and below a conveyor transporting the can bodies. The coating is applied to the metal cans to avoid attack by the contents, i.e. for corrosion proofing. The coating is subsequently cured by passing the can bodies through an oven, and the coating can hence be seen as a painting of the can bodies. This coating system is intended for operation in can production, whereas it is unsuitable for applying a coat to a bottle in a bottle recycling facility. The system requires curing of the applied coat by heat, rendering the system relatively complex and thus expensive.

**[0010]** US-A-3509852 discloses a coating machine for bottles with movable spray heads.

**[0011]** It is an object of the invention to provide a bottle treatment system comprising a relatively simple coating device, which may be retrofitted in a bottle handling system with limited intervention in the system. This object is solved by the bottle treatment system of claim 1.

**[0012]** The coating device for applying a coating to an outer surface of a bottle, such as a glass or plastic bottle is adapted for mounting at an exit of a bottle washing apparatus, said coating device comprising spaced spray nozzles arranged on opposite sides of an exit line for bottles leaving the bottle washing apparatus. The exit of the bottle washing apparatus may be seen as the entry to the brewery or factory, i.e. the conveyor system, filling stations, inspection, labelling etc. Use of a coating device at an exit of a bottle washing apparatus is particularly

advantageous in that by coating the bottles at this early point, the coating will confer maximum protection against scuffing, as the bottles are protected from their entry in the system. The feature that the coating device is mounted at an exit of the bottle washing apparatus facilitates retrofitting on existing installations with minimum intervention in the existing installation. Thus the functioning of the existing installation will not be deteriorated.

**[0013]** At the exit of the bottle washing apparatus, the bottles are slightly wet, which is found to be advantageous for the application of the coating. Furthermore the bottles are still at an elevated temperature as a result of the preceding washing process, which is also found to be advantageous.

**[0014]** The spray nozzles may supply a coating material without any contact with the bottle, which could restrict the functioning of the system. Furthermore a spray nozzle is not prone to contamination, as there is no direct contact between the bottle and the spray nozzle.

**[0015]** The feature that the coating device comprises spaced spray nozzles arranged on opposite sides of an exit line for bottles leaving the bottle washing apparatus provides a number of advantages. Hereby an efficient coating is provided, in that the bottles are sprayed on both sides simultaneously. Furthermore, each spray nozzle is arranged between exits to cover bottles leaving two adjacent exits.

**[0016]** If considered necessary or advantageous, the spray nozzles may be provided with a shield to avoid spray to enter an opening of the bottle. As an alternative or supplement, the coating device may comprise a protection shield arranged above the bottles to at least partially cover any openings in the top thereof.

**[0017]** To facilitate inspection and cleaning, the coating device may comprise a hinge to be tiltable or swingable away from an active operating position.

**[0018]** If considered necessary or advantageous, the coating device may comprise locking means for locking the coating device in the operating position, to avoid the potential risk of inadvertently tilting or swinging the coating device away from the operating position.

**[0019]** In a particularly simple example, the spray nozzles continuously spray a coating material, however to reduce the waste of coating material, the coating device may comprise spray actuation means for triggering spray, so the nozzles are activated at the presence or potential presence of a bottle at a coating position, whereas the nozzle spray is discontinued when a bottle is not present or cannot be present at the coating position.

**[0020]** The coating material may be any suitable material, such as a liquid mixture of water and polyethylene, which is found to provide a number of advantages, such as ease of application by spraying, cost of coating material, and anti-scuffing features of resulting coating. Furthermore, an anti-scuffing coating of this material will stay on the bottles, until the bottles return to the washing apparatus again, where the coating is washed off, without any detrimental effect.

**[0021]** According to an embodiment, the coating device further comprises heating means for heating the coating material to an application temperature in the range of 50-80°C, preferably approximately 60°C. The heating reduces the risk of contamination of the bottle by bacteria or the like in the coating material, as most bacteria are killed at elevated temperatures.

**[0022]** To control opening and closing of the spray nozzles, the coating device may further comprise back-pressure valves arranged at the nozzles, whereby dripping of the nozzles in closed position is eliminated.

**[0023]** If considered advantageous, the coating device may comprise means for tilting the spray nozzles during spraying, whereby the spray can perform a sweeping motion on the bottle, to produce a uniform coating.

**[0024]** In the following the invention will be explained in more detail by way of example and with reference to the drawing, in which

Fig. 1a is a cross-section of an exit end of a washing apparatus with a coating device,

Fig. 1b is a front view of the washing apparatus with the coating device,

Fig. 2 is an enlarged schematic front view of the coating device,

Fig. 3 is an enlarged schematic side view of the coating device, and

Fig. 4 is an enlarged schematic plan view of the coating device.

**[0025]** In Fig. 1a can be seen a cross-section of an exit end of a washing apparatus 2 for bottles. After washing the bottles 3 are discharged to an exit area, which may hold a line of two-three bottles from each exit. Each bottle 3 delivered from the washing apparatus 2 pushes the outermost bottle onto an accumulation conveyor 4 bringing the bottles to the next station. A coating device 5 is arranged above the bottles 3 at the exit of the washing apparatus. As schematically illustrated, the coating device may comprise a spray nozzle 6 arranged between two exits, as seen in Fig. 1b, adapted for applying a water soluble anti-scuffing polish or shine to the outer surface of the bottles. The coating device 5 is mounted above the accumulation conveyor 4 and may comprise a hinge means 7 to enable at least a part of the coating device to be tiltable or swingable from an active position to a passive position 8, in which the spray nozzles may be inspected and cleaned, if necessary.

**[0026]** A frontal view of the exit end of the washing apparatus for bottles is illustrated in Fig. 1b. As can be seen the coating device 5 is mounted on a rack 9 extending in the full width of the washing apparatus 2. The rack 9 may be mounted permanently or releasably on the washing apparatus, such as by means of bolts, above the exit. The coating device 5 also extends in the full width of the washing apparatus, and spray nozzles 6 are arranged between the exits from the washing apparatus. The spray nozzles 6 face downwards and the spray noz-

zles 6 are arranged at a level substantially aligned with the top of the bottles, so the bottles 3 are spray-coated from the top down. To minimize the risk of any coating material entering the bottles, the spray nozzles are arranged to coat from approximately 10 mm below the opening downwards.

**[0027]** Fig. 2 is a schematic front view of a coating device. Bottles 3 from the washing apparatus are delivered to the exit between partitions 10. The coating device comprises a feed conduit 11 and a number of spray nozzles 6, each arranged substantially with equal spacing to adjacent lines of bottles 3, so each spray nozzle 6 may apply coating to two bottles. As illustrated a screen 12 may be arranged around each spray nozzle 6, to prevent any stray jets from the spray nozzles from entering the opening of the bottles. Such stray jets may for example result from clogging of the spray nozzle.

**[0028]** Fig. 3 illustrates a side view of a line of three bottles 3, which have just left a washing apparatus. The bottles 3 travel in the direction indicated by the arrow, when a new bottle exits the washing apparatus, to enter an accumulation conveyor bringing the bottles to the next station. Two of the bottles are standing still for about 2-3 seconds, in which time period the bottles may be coated with a coating material by the spray nozzles 6, which are supplied with coating material through the feed conduit 11. The spray nozzles 6 may be provided with a back-pressure valve (not shown) to control the spraying, to turn off the spray nozzles and avoid dripping when the spray nozzles are not spraying. Actuation of the spray nozzles may be provided by a signal from the washing apparatus, or a sensor, such as a photo cell (not shown) detecting the presence of bottles at a coating position. Alternatively the spray nozzles may spray continuously, making the device particularly simple, however increasing the consumption of coating material.

**[0029]** In Fig. 4 the arrangement of the coating device of Fig. 2 and 3 is depicted from above. The bottles 3 travel in the direction indicated by the arrow, when a new bottle exits the washing apparatus, to enter an accumulation conveyor 4 bringing the bottles to the next station. Spray nozzles 6 are arranged above the partitions between the lines of bottles 3 leaving the bottle washing apparatus. At this position, each spray nozzle is able to partially coat a number of bottles 3.

**[0030]** Commonly bottles are coated with a so-called cold end lube after manufacture. This cold end lube protects the bottles from scuffing until the bottles enter the washing apparatus for the first time. In the washing apparatus the cold end lube is washed off, so the clean bottles are virtually unprotected from scuffing. With the coating device according to the invention, the bottles are coated immediately after leaving the washing apparatus, i.e. before any scuffing of the bottles can take place. This means that the bottles are protected by an anti-scuffing coating all the way through their entire life cycle.

**[0031]** The benefits of the invention are evident with regard to glass bottles, but also with returnable plastic

bottles, such as PEN-bottles, the benefits are pronounced.

**[0032]** The present invention has been tested with good results on a Simonazzi bottle washing apparatus, which delivers 78 bottles every 3 seconds. The coating device was installed without alteration or modification of the washing apparatus. It was found that the coating device worked well and did not deteriorate the functioning of the washing apparatus or other parts of the installation. The bottles were coated with 0.4 ml of TEGOGLAS® 3000 plus (an aqueous polyethylene dispersion) supplied by ATOFINA Vlissingen B.V., PO Box 70, NL-4380 AB Vlissingen, The Netherlands. This amount was found to be a good compromise, as more coating makes it difficult to label the bottles, and less coating does not provide the necessary anti-scuffing protection. It is expected that the coated bottles will reduce noise generation, as the rattling noise of the bottle will be moderated. Further an increased flow of bottles with fewer disturbances is expected, and less breakage due to scuffing and abrasion. Moreover it is likely that consumption of water in the detection or inspection station can be reduced. Normally the bottle outer surface must be wetted by sprinkling with water to enable inspection of worn bottles, but with coated bottles this step is expected to be unnecessary, as the coating will mask the scuffing marks, so inspection is possible without wetting the bottle outer surface.

**[0033]** At present, the preferred type of spray nozzle is a so-called flat spray nozzle having a spray angle at 3 bar of 80° and a capacity of 0.07 litres per minute at 3 bar. However, other types of spray nozzles may be used, such as a so-called hollow cone nozzle, which could be used to spray the bottles when they are stationary, however with a considerable waste of coating material. Also air atomizing nozzles could be used, such as nozzles having a flat or circular spray pattern, however considerable amounts of mist would result, which may be unfavourable.

## Claims

1. A bottle treatment system comprising a bottle washing apparatus (2) and a coating device (5) for applying a coating to an outer surface of a bottle (3), such as a glass or plastic bottle, **characterized in that** said coating device (3) is mounted at an exit of the bottle washing apparatus (2), said coating device comprising spaced spray nozzles (6) arranged on opposite sides of an exit line for bottles leaving the bottle washing apparatus (2), said spray nozzles (6) are arranged between exits to cover bottles (3) leaving two adjacent exits, said spray nozzles (6) face downwards and are arranged at a level substantially aligned with the to of the bottles, so that the bottles (3) are spray-coated from the top down.

2. A bottle treatment system according to claim 1,

wherein the spray nozzles (6) are provided with a shield (12) to avoid spray to enter an opening of the bottle (3).

3. A bottle treatment system according to claim 1 or 2, said coating device comprising a hinge (7) to be tiltable or swingable away from an active operating position. 5
4. A bottle treatment system according to claim 3, said coating device comprising locking means for locking the coating device in the operating position. 10
5. A bottle treatment system according to any of the claims above, wherein the coating device comprises spray actuation means for triggering spray. 15
6. A bottle treatment system according to any of the claims above, wherein the coating material is a liquid mixture of water and polyethylene. 20
7. A bottle treatment system according to any of the claims above, wherein the coating device comprises heating means for heating the coating material to an application temperature in the range of 50-80°C, preferably approximately 60°C. 25
8. A bottle treatment system according to any of the claims above, said coating device further comprising back-pressure valves arranged at the spray nozzles (6). 30
9. A bottle treatment system according to any of the claims above, wherein the coating device comprises means for tilting the spray nozzles during spraying. 35

#### Patentansprüche

1. Flaschenbehandlungssystem, das eine Flaschenwaschvorrichtung (2) und eine Beschichtungsvorrichtung (5) zum Aufbringen einer Beschichtung auf eine Außenfläche einer Flasche (3) wie einer Glas- oder Kunststoffflasche umfasst, **dadurch gekennzeichnet, dass** die Beschichtungsvorrichtung (3) an einem Ausgang der Flaschenwaschvorrichtung (2) montiert ist und beabstandete Sprühdüsen (6) umfasst, die an gegenüberliegenden Seiten einer Ausgangsstraße für die Flaschenwaschvorrichtung (2) verlassende Flaschen angeordnet sind, wobei die Sprühdüsen (6) zwischen Ausgängen angeordnet sind, um zwei benachbarte Ausgänge verlassende Flaschen (3) abzudecken, wobei die Sprühdüsen (6) nach unten weisen und auf einer Ebene angeordnet sind, die auf das obere Ende der Flaschen im Wesentlichen ausgerichtet sind, so dass die Flaschen (3) von oben bis unten sprühbeschichtet werden. 40 50 55

2. Flaschenbehandlungssystem nach Anspruch 1, wobei die Sprühdüsen (6) mit einer Abschirmung (12) versehen sind, um zu vermeiden, dass Spray in eine Öffnung der Flasche (3) eindringt.
3. Flaschenbehandlungssystem nach Anspruch 1 oder 2, wobei die Beschichtungsvorrichtung ein Scharnier (7) umfasst, das aus einer aktiven Betriebsposition wegklappbar oder wegschwingbar sein soll.
4. Flaschenbehandlungssystem nach Anspruch 3, wobei die Beschichtungsvorrichtung Verriegelungsmittel umfasst, um die Beschichtungsvorrichtung in der Betriebsposition zu verriegeln.
5. Flaschenbehandlungssystem nach einem der obigen Ansprüche, wobei die Beschichtungsvorrichtung Sprühbetätigungsmittel zum Auslösen von Spray umfasst.
6. Flaschenbehandlungssystem nach einem der obigen Ansprüche, wobei das Beschichtungsmaterial ein flüssiges Gemisch aus Wasser und Polyethylen ist.
7. Flaschenbehandlungssystem nach einem der obigen Ansprüche, wobei die Beschichtungsvorrichtung Heizmittel zum Erhitzen des Beschichtungsmaterials auf eine Aufbringtemperatur im Bereich von 50-80°C, vorzugsweise ungefähr 60°C, umfasst.
8. Flaschenbehandlungssystem nach einem der obigen Ansprüche, wobei die Beschichtungsvorrichtung ferner an den Sprühdüsen (6) angeordnete Gegendruckventile umfasst.
9. Flaschenbehandlungssystem nach einem der obigen Ansprüche, wobei die Beschichtungsvorrichtung Mittel zum Kippen der Sprühdüsen während des Sprühens umfasst.

#### Revendications

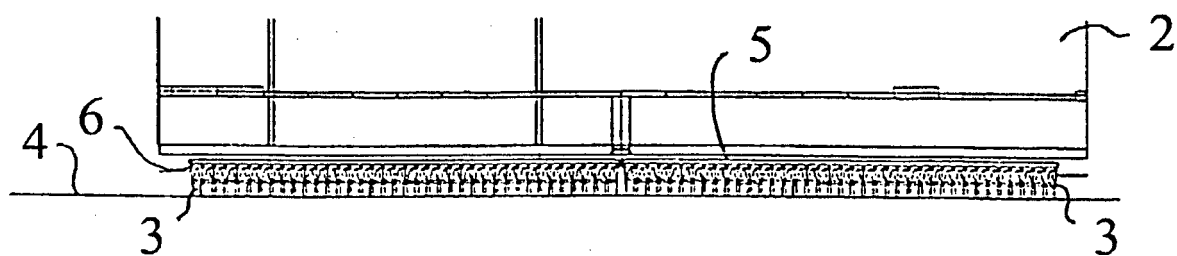
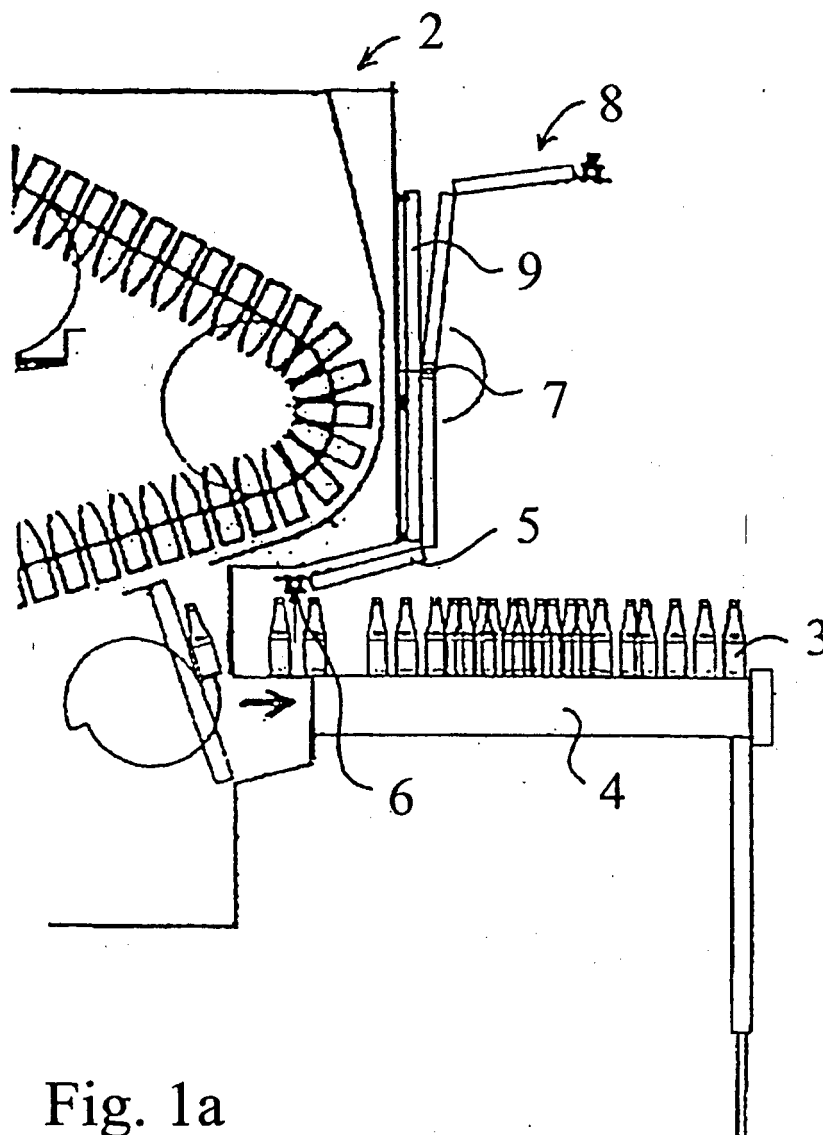
1. Système de traitement de bouteilles comprenant un appareil de lavage de bouteilles (2) et un dispositif de revêtement (5) pour appliquer un revêtement sur une surface extérieure d'une bouteille (3) telle qu'une bouteille en verre ou en plastique, **caractérisé en ce que** ledit dispositif de revêtement (5) est monté au niveau d'une sortie de l'appareil de lavage de bouteilles (2), ledit dispositif de revêtement comprenant des buses de pulvérisation espacées (6) disposées sur des côtés opposés d'une ligne de sortie pour des bouteilles quittant l'appareil de lavage de bouteilles (2), lesdites buses de pulvérisation (6) étant disposées entre des sorties de manière à couvrir des bouteilles (3) quittant deux sorties adjacen-

tes, lesdites buses de pulvérisation (6) étant tournées vers le bas et étant disposées à un niveau substantiellement aligné avec le haut des bouteilles, de telle sorte que les bouteilles (3) soient revêtues par pulvérisation de haut en bas.

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2. Système de traitement de bouteilles selon la revendication 1, dans lequel les buses de pulvérisation (6) sont pourvues d'un écran (12) pour éviter que le produit pulvérisé n'entre dans une ouverture de la bouteille (3). 10
3. Système de traitement de bouteilles selon la revendication 1 ou 2, ledit dispositif de revêtement comprenant une charnière (7) pouvant être inclinée ou pivotée à l'écart d'une position de fonctionnement active. 15
4. Système de traitement de bouteilles selon la revendication 3, ledit dispositif de revêtement comprenant des moyens de verrouillage pour verrouiller le dispositif de revêtement dans la position de fonctionnement. 20
5. Système de traitement de bouteilles selon l'une quelconque des revendications précédentes, dans lequel le dispositif de revêtement comprend des moyens d'actionnement de pulvérisation pour déclencher la pulvérisation. 25
6. Système de traitement de bouteilles selon l'une quelconque des revendications précédentes, dans lequel le matériau de revêtement est un mélange liquide d'eau et de polyéthylène. 30
7. Système de traitement de bouteilles selon l'une quelconque des revendications précédentes, dans lequel le dispositif de revêtement comprend des moyens de chauffage pour chauffer le matériau de revêtement à une température d'application dans la plage de 50 à 80° C, de préférence d'environ 60° C. 35
8. Système de traitement de bouteilles selon l'une quelconque des revendications précédentes, ledit dispositif de revêtement comprenant en outre des soupapes de contrepression disposées au niveau des buses de pulvérisation (6). 40
9. Système de traitement de bouteilles selon l'une quelconque des revendications précédentes, dans lequel le dispositif de revêtement comprend des moyens pour incliner les buses de pulvérisation au cours de la pulvérisation. 45

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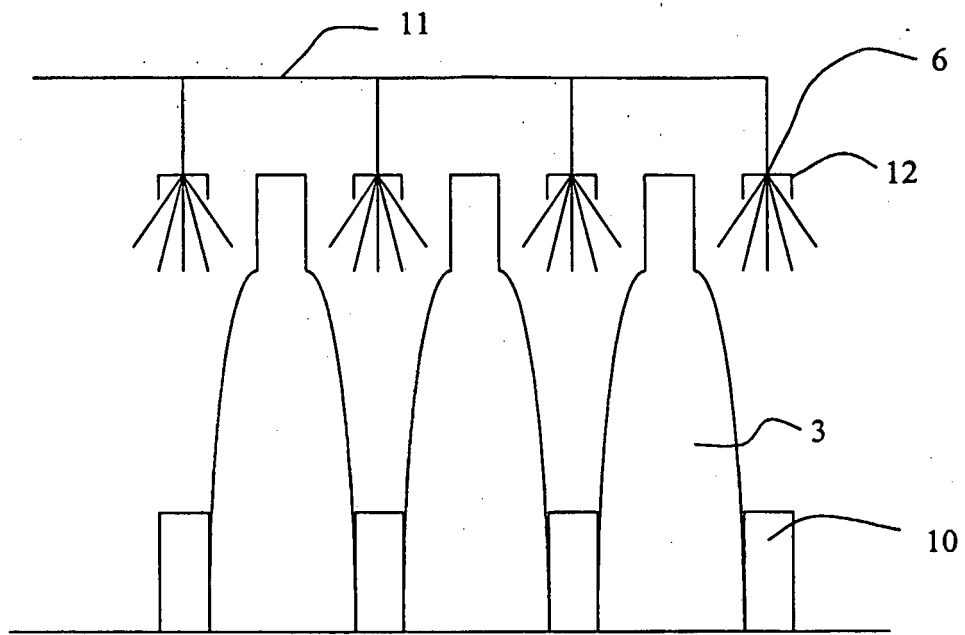


Fig. 2

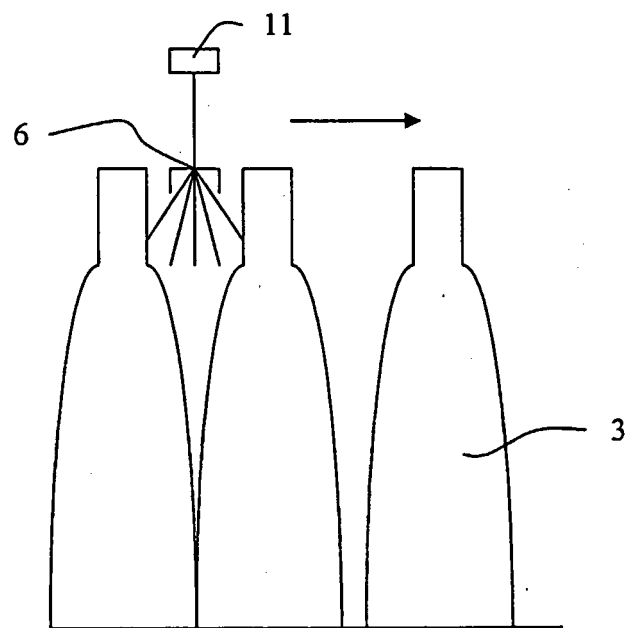


Fig. 3

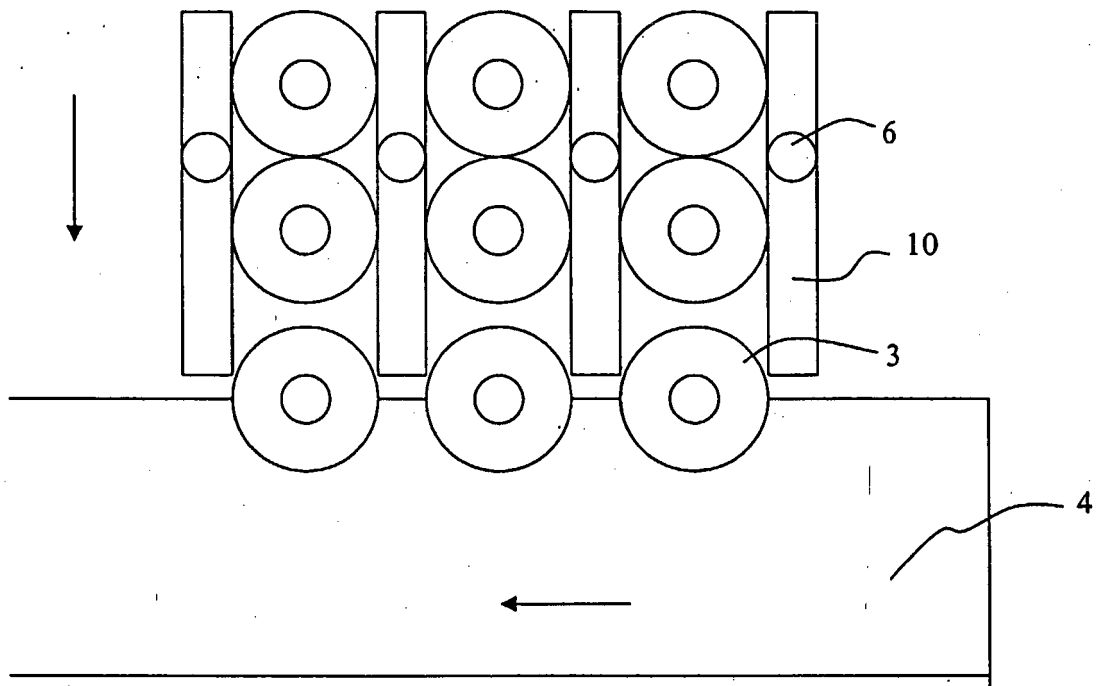


Fig. 4

**REFERENCES CITED IN THE DESCRIPTION**

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