A METHOD AND DEVICE FOR DISTRIBUTING MATERIAL TO A CONTAINER

Abstract: A device for cleaning the interior upper surfaces of an upwards open container (3) in linear movement in a packaging machine, comprises a distribution wheel (1) rotatable around a generally horizontal axle, nozzle heads (2) arranged on the distribution wheel for rotation therewith, positioning means (21, 23) for keeping the nozzle heads (2) in a generally horizontal position during said rotation, conduit means (19, 24, 21) for supplying said material through the distribution wheel to the nozzle heads, and control means for only supplying the material to the nozzle head (2) being in or near the lowermost position on the distribution wheel (1) during its rotation.
A METHOD AND DEVICE FOR DISTRIBUTING MATERIAL TO A CONTAINER

Field of the Invention

The present invention relates to a method and device for supplying or distributing material to an upwards open container in linear movement in a packaging machine.

Background of the Invention

The type of container with which the invention is concerned is preferably a parallelepipedical container of laminated material, whose main constituent is cardboard.

When material is to be supplied or distributed to the container, its side and bottom have already been sealed in a way well-known in the art, whereas its top is still open.

The method and device according to the invention can be utilized for different materials to be supplied or distributed to the container, but a preferred utilization is for a cleaning fluid, like steam.

When the container has been filled with for example foodstuff, it shall be closed and sealed at its top end. For accomplishing a proper sealing the interior upper surfaces in the sealing area of the container have to be clean. Depending on the product filled in the container the product residues may be solid or liquid, which means that the cleaning has to be very effective. Also, the operation speed of the packaging machine may be very high, for example seven containers per second. Altogether, this puts great demands on the method and device to be used for this cleaning.

The Invention

A method for fulfilling the great demands may according to the invention be characterized in that a nozzle head horizontally held on a distribution wheel, which rotates at such a pace that the peripheral speed of the nozzle head substantially corresponds to the linear speed of the container, is brought down in the container
and in that concurrently herewith the nozzle head distributes the material, preferably cleaning fluid, like steam, in the container.

A satisfactory cleaning result of all the actual surfaces is obtained, if the cleaning fluid is distributed under pressure around the periphery of the nozzle head.

If the external cross-sectional shape of the nozzle head corresponds to the internal cross-sectional shape of the container, the distribution of the cleaning fluid will be very uniform and effective.

A device for supplying or distributing material, preferably a cleaning fluid, like steam, is according to the invention characterized by

a distribution wheel rotatable around a generally horizontal axle,

nozzle heads arranged on the distribution wheel for rotation therewith,

positioning means for keeping the nozzle heads in a generally horizontal position during said rotation,

conduit means for supplying said material through the distribution wheel to the nozzle heads, and

control means for only supplying the material to the nozzle head being in or near the lowermost position on the distribution wheel during its rotation.

The nozzle heads are hereby preferably equidistantly arranged on the distribution wheel, so that the distribution wheel can rotate at a constant speed, when the containers are at a constant distance from each other.

In a practical embodiment the number of nozzle heads is six, but other numbers are equally possible.

In a preferred embodiment the positioning means for each nozzle head may comprise

a head shaft, on which the nozzle head is arranged and which is rotatably journalled in the distribution wheel, and
a gear assembly for always keeping the head shaft in a certain position in relation to the distribution wheel at the rotation thereof. Further, in a preferred embodiment the conduit means and control means comprise

a non-rotatable swivel in a rotatable swivel housing in the centre of the distribution wheel, to which swivel the material is supplied, and

a hollow arm from the swivel housing to each head shaft, which has a bore for conducting the material from the hollow arm to the nozzle head.

In this embodiment there is a swivel axle with an internal tube for conducting the material to the swivel.

As the demands on hygiene are very stringent, the swivel axle tube and the arms are preferably made of a condensation-preventing, isolating and hygenic material, like Teflon™.

The swivel, which thus may be made of Teflon™, is preferably provided with a generally vertical, spring-biassed slide valve for conducting the material to the arm leading generally vertically downwards. This slide valve can easily can be replaced when worn out.

In a preferred embodiment the swivel axle is arranged in a tubular, rotatable shaft assembly for the distribution wheel, said shaft assembly having a gear wheel assembly for its rotation and being journalled by bearings in a bearing tube for rigid mounting in a framework of the packaging machine.
Brief Description of the Drawings
The invention will be described in further detail below under reference to the accompanying drawings, in which

Fig 1 is a perspective view of a relevant portion of a packaging machine with a distribution wheel according to the invention,

Fig 2 is a schematic perspective illustration of how nozzle heads of the distribution wheel can cooperate with filled packages in the packaging machine,

Fig 3 is a perspective, partly sectional view of the distribution wheel,

Fig 4 is a perspective view of the distribution wheel (from another direction as compared to Fig 3) with a cover removed,

Fig 5 is a sectional side view of the distribution wheel,

Fig 6 is an enlarged sectional side view of the distribution wheel portion marked VI in Fig 5,

Fig 7 is an enlarged sectional side view of the lower distribution wheel portion in Fig 5,

Fig 8 is a perspective exploded view of one of the nozzle heads, and

Fig 9 is a perspective view of the assembled nozzle head (to a larger scale than Fig 8).

Detailed Description of a Preferred Embodiment
A relevant portion of a packaging machine is shown in Fig 1. The machine is intended for filling and closing parallelepipedical or brick-shaped containers, preferably made of cardboard material. The filled material may preferably be foodstuff. After filling but before closing of its upper closure each container passes - from left to right in Fig 1 - a rotating distribution wheel 1 to be further described below. This distribution wheel has a
number of nozzle heads 2, also to be further described below.

By the design of the distribution wheel 1, each of the nozzle heads 2 always maintains a horizontal position - as shown - during the rotation in the counter-clockwise direction in Fig 1 of the wheel, like a so called Ferris wheel.

As is schematically shown in Fig 2 (where the number of simplified nozzle heads 2 is four, whereas the number in a preferred embodiment is six), the distribution wheel 1 rotates in a counter-clockwise direction at such a pace that the peripheral speed of the nozzle heads 2 substantially corresponds to the linear speed from left to right in the drawing of containers 3 arriving under the wheel 1 in filled condition. For the purpose of cleaning the interior of the upper portion of each container above the filled material - a portion that will then be used for forming the upper closure of the container, as is suggested in Fig 2 - the lowermost nozzle head 2 is brought down for example 10 mm in the container. In this operational stage cleaning fluid, preferably steam, is distributed through a slot around the entire periphery of the nozzle head.

This steam is distributed through the distribution head 1 to the correct nozzle head 2 with the correct timing in a way to be described, but it may already here be noted that a supply line 4 for the steam is shown in Fig 1.

The distribution wheel 1 with its nozzle heads 2 is shown in its entirety in Figs 3-5, to which reference now is made. The description below will be concentrated to portions of the wheel being of particular relevance for the invention, whereas other portions are more briefly described.

A bearing tube 10 is to be rigidly mounted in a framework of the packaging machine. Rotatably mounted in the tube 10 by means of bearings 11 is a tubular shaft
assembly 12 being provided at its end to the left in the drawings with a gear wheel assembly 13 to be rotatably driven by an electric motor (not shown) in the framework.

A generally disc-shaped wheel housing 14 with a cover 15 to the left in the drawings is connected to the shaft assembly 12 for rotation therewith by means of screws 16 (Figs 3 and 4). The screws 16 also fasten a swivel housing 17 to the wheel housing 14.

Non-rotatably mounted within the shaft assembly 12 is a tubular swivel axle 18 connected at its end to the right in the drawings with a swivel 19 in a cylindrical bore in the swivel housing 17, rotating with the wheel housing 14. A pipe 20 for conducting steam to the swivel 19 is arranged in the swivel axle 18. The pipe 20 is preferably made of Teflon™ for preventing condensation therein and for providing thermal insulation in relation to surrounding parts, which are made of steel or similar materials. Also, the hygienic aspect is of greatest importance. The swivel 19 is provided with a wear ring 19' of Teflon™ (Fig 6).

Generally speaking, care has been taken in the construction to maintain the temperature and pressure of the steam let in from the supply line 4 (Fig 1) to the left hand end of the pipe 20 and let out through the nozzle heads 2. For this purpose there is for example an air slot between the shaft assembly 12 and the swivel axle 18.

The end of the swivel axle 18, to which the supply line 4 is connected, is - like the bearing tube 10 - supported by the machine framework.

Each nozzle head 2 is non-rotatably supported by a head shaft 21, extending through a bore in the wheel housing 14 and rotatably journalled in relation thereto by bearings 22.

As already stated, each nozzle head 2 is to maintain a horizontal position throughout the rotation of the distribution wheel 1. For this purpose there is provided in
the wheel housing 14 a gear assembly 23 of a design which is per se conventional. This gear assembly 23 is thus not further described and is most clearly shown in Fig 4, where the cover 15 has been removed for revealing the interior design.

Between the swivel housing 17 and each head shaft 21 there is an arm 24 with a longitudinal bore 24°. The arm 24 is preferably made of Teflon™ for the reasons stated above. At its outer end the arm 24 is connected to a swivel connection 25 rotatably arranged on the head shaft 21 and made of Teflon™. The head shaft 21 has a bore 21° with which the bore 24° of the arm 24 can communicate in a certain position, as explained more fully below.

At its inner end the bore 24° of the arm 24 can communicate by a swivel housing bore 17° with a longitudinal bore 26° in a slide valve 26 arranged in a transverse opening in the swivel 19 and made of Teflon™. The slide valve 26 has transverse holes 26", so that communication is established from the tube 20 through the slide valve 26 to the arm 24, when the latter is in the position in front of the slide valve bore 26°. The slide valve 26 is biassed by a compression spring 27 in the vertical direction, so that sealing against the swivel head 17 is established and that wear of the slide valve 26 can be compensated for. When the slide valve 26 has been worn out, it can be replaced. The design appears most clearly in Fig 6.

Fig 7 is a view to a larger scale of the head shaft 21 and its mounting in the wheel housing 14 and further of the arm 24, the swivel connection 25, and the nozzle head 2. The nozzle head 2 is attached to the end of the head shaft 21 by means of a head screw 28, which extends from the bottom of the head 2 through a central bore 29 therein and a transverse end bore 30 of the head shaft 21, and a
top nut 28A cooperating with threads on the screw 28. The end of the head shaft bore 21° is closed by a plug 31.

The head shaft bore 21° is provided with a transverse bore 21", which is always vertical and opening upwards due to the previously described design for holding the nozzle head 2 horizontal. This means that when the distribution wheel 1 is rotating, only the nozzle head 2 in its lower dead center (as shown in Fig 7) will be provided with steam through the arm bore 24°, the transverse bore 21", the head shaft bore 21°, the transverse end bore 30, and the central bore 29 of the nozzle head 2 itself.

Reference is now primarily made to Figs 8 and 9. The nozzle head 2 is composed of an upper part 32 and a lower part 33. At its lower surface the upper part 32 has a steam chamber 34, in which the head bore 29 opens. In the steam chamber there are a number of distance bosses 34°. The upper surface of the lower part 33 is flat. The two mentioned surfaces of head parts 32 and 33 are precision machined for fitting together with high accuracy.

At mounting a certain distance between the two head parts 32 and 33 is provided by means of a shim 35, which generates a nozzle or slit 36 (Fig 9) around the entire circumference of the nozzle head 2 with a width corresponding to the thickness of the shim 35. A typical thickness of the shim 35 is 0.1 mm. The position of the two head parts 32 and 33 in relation to each other and of the shim 35 can be set by two or more guide pins 37 in corresponding holes in the two head parts.

From the different figures, especially Figs 1, 5, and 7-9, it appears that the nozzle head 2 has vertical side surfaces in the region of the circumferential nozzle or slit 36 and that the nozzle head portion therebelow is inwardly tapered so as to facilitate proper entrance in the container to be cleaned. Further, the cross-sectional shape and size of the nozzle head 2 at the slit 36 correspond to
those of the container, so that steam emerging through the slit 36, when the nozzle head 2 is introduced in the upper part of the container, will hit the interior wall of the container and clean it, both mechanically via the steam and by the action of moisture and heat.

An important aspect of the design is that the hygiene shall be maintained at all times. For that reason it shall be easy to dismount and mount parts that may have to be cleaned at intervals. Each nozzle head 2 may be removed from its head shaft 21 by unscrewing the nut 28A and removing the head screw 28. The head shaft 21 can be removed by pushing it in against the bias of a compression spring 38 (Fig 7) and turning it from a bayonet fitting in the area of the spring; the bayonet fitting will ensure a proper position for the shaft 21 at remounting. When the shaft 21 has been removed, the swivel connection 25 and the arm 24 may be removed.

The swivel 19 (with adjoining parts) is also easy to remove for maintenance and cleaning.

In order not to make the description too long and detailed certain parts, especially sealings and O-rings, are not described. It is believed that the drawings are illustrative enough for a person skilled in the art to understand their positions and functions.

As already stated, the peripheral speed of the nozzle heads 2 of the distribution wheel 1, rotating at a constant pace during operation, is substantially the same as the linear speed of the containers. Also, the nozzle heads move in synchronism with the containers, which means that a nozzle head passes almost vertically down into an approaching container and then after a while leaves the container in the opposite manner when the latter moves away from the area of the distribution wheel.

During its descent into the container to the maximum depth - for example 10 mm - the nozzle head 2 emits steam
through its nozzle or slit 36, whereafter normally the steam distribution is stopped. This is primarily obtained by a suitable adjustment of the angular position of the swivel 19 with its slide valve 26.

The procedure is normally repeated several times per second, as the filling speed in the packaging machine of which the distribution wheel is a part may typically be up to seven containers per second. The operation sequence for the nozzle head in each container may hereby be in the order of 100 ms.

The primary purpose of the steam emitted from the nozzle head is to avoid product disturbances on the internal sealing surfaces in the upper part of the container, or in other words to clean these surfaces to such an extent that the later transversal top sealing of the containers can be carried out in a satisfactory way.

The emitted steam gives its effect by its heat energy, by its condensation into water, and by its kinetic energy:

- it heats up the product residues,
- it dilutes the product residues with condensed steam,
- it emulgates oil and fat residues into the condensed steam,
- it softens dry product residues.
- it removes product residues by the kinetic energy,
- it gives a certain oxygen reduction by steam flushing.

The distribution wheel has above been described in its use for internally cleaning the upper parts of filled containers, but other uses in packaging machines are possible. It would for example be possible to utilize the distribution wheel for filling containers, although in that case the heads would have to be modified.
CLAIMS

1. A method for supplying or distributing material to an upwards open container (3) in linear movement in a packaging machine, characterized in that a nozzle head (2) horisontally held on a distribution wheel (1), which rotates at such a pace that the peripheral speed of the nozzle head (2) substantially corresponds to the linear speed of the container (3), is brought down in the container and in that concurrently herewith the nozzle head distributes the material in the container.

2. A method according to claim 1, characterized in that the material is a cleaning fluid, preferably steam.

3. A method according to claim 2, characterized in that the cleaning fluid is distributed under pressure around the periphery of the nozzle head (2).

4. A method according to claim 3, characterized in that the external cross-sectional shape of the nozzle head (2) corresponds to the internal cross-sectional shape of the container (3).

5. A device for supplying or distributing material to an upwards open container (3) in linear movement in a packaging machine, characterized by a distribution wheel (1) rotatable around a generally horizontal axle, nozzle heads (2) arranged on the distribution wheel for rotation therewith, positioning means (21, 23) for keeping the nozzle heads (2) in a generally horizontal position during said rotation, conduit means (19, 24, 21) for supplying said material through the distribution wheel to the nozzle heads, and
control means for only supplying the material to the
nozzle head (2) being in or near the lowermost position on
the distribution wheel (1) during its rotation.

6. A device according to claim 5, characterized in that the nozzle heads (2) are equidistantly
arranged on the distribution wheel (1).

7. A device according to claim 6, characterized in that the number of nozzle heads (2) is six.

8. A device according to claim 5, characterized in that the positioning means for each nozzle head
(2) comprise
   a head shaft (21), on which the nozzle head is
   arranged and which is rotatably journalled in the
distribution wheel (1), and
   a gear assembly (23) for always keeping the head
   shaft in a certain position in relation to the distribution
   wheel at the rotation thereof.

9. A device according to claim 5, characterized in that the conduit means and control means
comprise
   a non-rotatable swivel (19) in a rotatable swivel
   housing (17) in the centre of the distribution wheel (1),
to which swivel the material is supplied, and
   a hollow arm (24) from the swivel housing (17) to
each head shaft (21), which has a bore (21') for conducting
the material from the hollow arm to the nozzle head (2).

10. A device according to claim 9, characterized by a swivel axle (18) with an internal tube (20)
for conducting the material to the swivel (19).

11. A device according to any of claims 5-10, the
material to be supplied or distributed being a cleaning
fluid, preferably steam, characterized in that
the swivel axle tube (20) and the arms (24) are made of a
condensation-preventing, isolating and hygenic material,
like Teflon™.
12. A device according to claim 9, characterized in that the swivel (19) is provided with a generally vertical, spring-biased slide valve (26) for conducting the material to the arm (24) leading generally vertically downwards.

13. A device according to claim 10, characterized in that the swivel axle (18) is arranged in a tubular, rotatable shaft assembly (12) for the distribution wheel (1), said shaft assembly having a gear wheel assembly (13) for its rotation and being journalled by bearings (11) in a bearing tube (10) for rigid mounting in a framework of the packaging machine.
INTERNATIONAL SEARCH REPORT

International application No. PCT/SE 01/02142

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B65B 55/24
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B65B

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

SE, DK, FI, NO classes as above

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

WPI, PAJ, FULLTEXT, INSPEC, EPOQUE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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[X] Further documents are listed in the continuation of Box C.  [X] See patent family annex.

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Date of the actual completion of the international search: 29 November 2001
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