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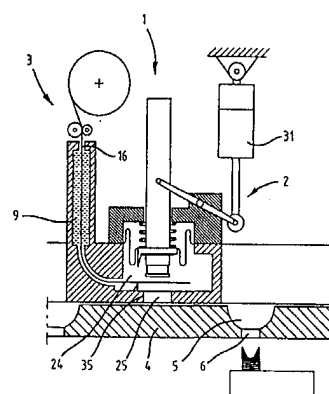
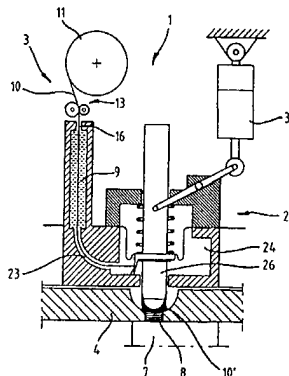
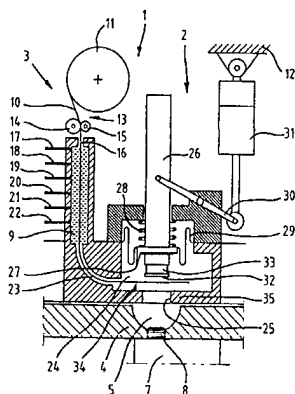
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(54) Title: A METHOD AND AN APPARATUS FOR APPLYING A COVERING LAYER OVER A POURING OPENING

(57) Abstract

The disclosure relates to a method and an apparatus for applying a covering layer over a pouring opening in a prefabricated packaging container filled with sterile contents, thermosealable covering layer portions being separated from a carrier and, during the simultaneous forming of pull tabs (10''), being transferred to and sealed over the package neck (8) of the filled packaging container (7). The applicator (1) includes an applicator assembly (2) with a reciprocating transfer device (26) which is provided with cutting means (27) for the strip (10), and also an inductor (33) for thermosealing thereof to the package neck (8). The applicator (1) also includes a sterilisation apparatus (3) for chemical sterilisation of the strip (10).



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A METHOD AND AN APPARATUS FOR APPLYING A COVERING LAYER OVER A POURING OPENING

TECHNICAL FIELD

5 The present invention relates to a method of applying a covering layer over the pouring opening of a packaging container, and also to an apparatus for reducing the method into practice.

BACKGROUND ART

10 Packaging containers of the single-use disposable type intended for consumer beverages such as milk, juice or the like are available in a multiplicity of different designs, for example plastic bottles or flexible packaging containers which are produced by folding and sealing of laminates comprising layers of paper, plastic and possibly also aluminium
15 foil. Other types of packaging containers also occur on the market and all share the common feature that they are provided with some form of opening arrangement. One such commonly occurring arrangement is a prefabricated pouring opening which is possibly provided with a projecting neck, and a screw or press cap which, like the neck, may be manufactured from
20 thermoplastic, injection moulded material. In order to ensure that the consumer receives a package that has not previously been opened, these opening arrangements are normally provided with some form of so-called tamper-proof device, i.e. a device which indicates prior opening, in that a safety fitting, for example a ring or a diaphragm, has been ruptured or
25 visibly deformed. A simple version comprises a covering layer of, for instance, an aluminium foil and/or plastic which is located under the cap and sealed to the packaging container or to the neck extending around the pouring opening. Thus, the covering layer is connected only to the neck, which implies that the consumer, having removed the cap manually, must
30 tear off or otherwise penetrate the covering layer in order to permit emptying of the contents of the packaging container, which gives the consumer a satisfactory guarantee that the package has not previously been opened.

35 In the high output capacity machines for producing and filling packaging containers of the above-outlined type which are currently in operation, the handling of small, individual cover layer parts is a particular

problem. Since such covering layer portions are manufactured from an extremely thin and flexible material, for example aluminium foil or thermoplastic-coated aluminium foil, the individual layer components do not possess sufficient mechanical strength that they can readily be handled using, for example, mechanical gripping devices. The limited size and the demand on accurate application also make it difficult to carry out such application at high speed. For example, it is crucially important that the pouring opening of the packaging container is really covered and that the seal around the neck opening is effected with the layer component in the correct position and correctly oriented. A further difficulty arises in that type of packaging and filling machine which produces aseptic packaging containers, i.e. packaging containers which are interiorly sterile and are intended to be filled with sterile contents of long shelf life, since the demands on hygiene in handling of the covering layer are extreme indeed. The handling of the covering layer must, in such cases, take place in a closed space, and as few details and parts as possible should come into contact with the covering layer, so as to reduce the risk of its becoming contaminated. The placing of the covering layer in the correct position (possibly with a projecting gripping portion) in the correct orientation must also take place in a closed, sterile space, which further impedes rapid and rational handling and application of the covering layers to the individual packaging containers.

There is thus a general need in the art to provide a method and an apparatus for applying covering layers to packaging containers, which make it possible also in the manufacture of aseptic packaging containers to ensure in a rapid, simple and reliable manner, that each individual layer portion is placed in the correct position and with the correct orientation and is welded or secured in place in a faultless manner, such that the pouring opening can be completely unsealed and opened with complete reliability.

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OBJECTS OF THE INVENTION - THE METHOD

One object of the present invention is to realise a method of applying a covering layer over a pouring opening, which makes it possible, in a simple and rational manner, reliably to handle the covering layer in order, in as few working stages as possible, to form, transfer and seal a covering layer portion to the pouring opening of a packaging container.

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A further object of the present invention is to realise a method of applying a covering layer over a pouring opening, the method making it possible to supply the layer portions by means of a carrier from which they are removed, formed, transferred and sealed in the correct position over the pouring opening of a packaging container.

Yet a further object of the present invention is to realise a method of applying a covering layer over a pouring opening, the method being suitable also in the production of aseptic packaging containers intended to be filled with sterile contents.

Still a further object of the present invention is to realise a method of applying a covering layer over a pouring opening, the method making for sterile treatment of the covering layer and the application thereof on the packaging container under sterile conditions.

SOLUTION

The above and other objects have been attained according to the present invention in that a method of applying a covering layer over the pouring opening of a packaging container has been given the characterizing feature that the layer portion of desired surface area is separated from a carrier and temporarily connected to a reciprocating work surface whose surface area is less than the surface area of the layer portion, whereafter a section of the layer portion projecting outside the work surface is folded parallel with the direction of movement by means of a stationary folding device, and the layer portion is connected to an edge region surrounding the pouring opening.

Preferred embodiments of the method according to the present invention have further been given the characterizing features as set forth in appended subclaims 2 to 6.

OBJECTS OF THE INVENTION - THE APPARATUS

One object of the present invention is further to realise an apparatus for carrying the method into effect, i.e. an apparatus which makes it possible to transfer a covering layer portion of the desired configuration and size to the pouring opening of a packaging container, and to seal the covering layer portion to the edge region of the pouring opening.

A further object of the present invention is to realise an apparatus of

the above-outlined type, the apparatus making it possible to transfer with great precision a layer portion to and seal it over the pouring opening of a packaging container.

Yet a further object of the present invention is to realise an apparatus of the above-outlined type, the apparatus being of simple construction and of such design that the covering layer may be handled reliably with the aid of few parts coming into contact with the covering layer.

Still a further object of the present invention is to realise an apparatus of the above-outlined type, the apparatus making it possible to sterilise the covering layer and handle and also apply it under sterile conditions without the risk that the covering layer and/or the pouring opening of the packaging container comes into contact with bacteria from the ambient atmosphere.

SOLUTION

The above and other objects have been attained according to the present invention in that an apparatus for applying a covering layer over the pouring opening of a packaging container has been given the characterizing feature that it includes an applicator with a reciprocating transfer device with a work surface, a stationary folding device disposed along the path of the movement of the transfer device, and means for sealing a layer portion to an edge region surrounding the pouring opening.

Preferred embodiments of the apparatus according to the present invention have further been given the characterizing features as set forth in appended subclaims 8 to 13.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

One preferred embodiment of both the method and the apparatus according to the present invention will now be described in greater detail hereinbelow, with particular reference to the accompanying, schematic Drawings which show only those parts and details indispensable to an understanding of the invention. In the accompanying Drawings:

Fig. 1 is a schematic side elevation, partly in section, through an applicator according to the invention, during three succeeding work phases (Figs. 1A-C);

Fig. 2 is a perspective view of an upper portion of a packaging container with a neck which has been provided with a covering layer portion

according to the present invention; and

Fig. 3 is a schematic top plan view of the neck according to Fig. 2, the correct position for a planar, unfolded covering layer portion having been indicated by means of ghosted lines.

5 The method and the apparatus according to the present invention are intended to be utilised in a filling and packing machine of the type which, with or without a forming stage, handles and fills prefabricated packaging containers via a pouring opening.

10 The method and the apparatus according to the invention are particularly adapted for use together with such machines of the type as are utilised for handling packages intended for sterile contents under aseptic conditions. Above all, the method and the apparatus according to the invention are intended to be employed in a filling and packing machine of the type which is illustrated and described in Swedish Patent No. 9400506-3,
15 to which reference is made for further details as regards the design, construction and function of the machine.

DESCRIPTION OF PREFERRED EMBODIMENTS

When it is intended to be employed in the filling machine described in
20 the above-mentioned patent (a machine of the aseptic type), an applicator 1 according to the invention comprises, on the one hand an applicator assembly 2 and an integral sterilisation apparatus 3. The applicator assembly 2 and the sterilisation apparatus 3 are a self-contained unit which is placed immediately above a packing rotor 4 which constitutes part of the filling
25 machine. The packing rotor 4 includes, in its upper surface, a number of cup-shaped recesses 5 which merge into through-going holes 6 (Fig. 1C) which discharge at the lower surface of the rotor 4. Immediately beneath the rotor 4, there is a number of packaging containers 7 of the type illustrated and described in the above-mentioned patent specification, i.e. substantially
30 parallelepipedic (as yet not finally formed) packaging containers which, at their upper ends, have a projecting, preferably threaded package neck 8. The package neck 8 has a cylindrical region whose outer diameter is such that a package neck 8 inserted in the hole 6 of the rotor 4 in a gas-tight manner abuts against the inner surface of the hole 6, whereby the upwardly open
35 package neck is screened off from the ambient air. The packing rotor 4 is rotary stepwise such that the recesses 5 may in sequence be placed in

position beneath the applicator assembly 2, as will be described in greater detail below.

The sterilisation apparatus 3 includes an elongate sterilisation chamber 9 for a covering strip 10 which is supplied to the apparatus according to the invention from a reel 11 which is freely rotatably suspended in the frame 12 of the machine. The strip 10 includes a layer of aluminium foil, and also at least one thermoplastic layer which is located on that side of the strip which is to be connected to the packaging container. Immediately above the chamber 9, there is a driver 13 which includes a driving wheel 14 and a counter-pressure roller 15 cooperating therewith. The driving wheel 14 and the counter-pressure roller 15 are located on either side of the covering layer strip 10 in order, possibly with the assistance of a friction-increasing coating, to make for advancement of the strip from the reel 11 in direction towards the chamber 9. The driving wheel 14 is connected to an electric drive motor (not shown).

At the upper end of the chamber 9, i.e. immediately beneath the driver 13, there is disposed a sluice gate 16 of per se known construction, i.e. a labyrinth seal or a slot-shaped aperture with a number of sealing devices (not shown) extending towards the covering layer strip 10. The chamber 9 is provided with a number of inlets and outlets (shown only in Fig. 1A), namely - seen from above, or in the direction of movement of the strip 10 - an inlet 17 for sterile air, an outlet 18 for spent sterile air, an inlet 19 for sterile air carrying sterilisation agent, for example hydrogen peroxide in gaseous form, or the like, an outlet 20 for spent sterilisation agent, an inlet 21 for sterile drying air and an outlet 22 for spent drying air. Between each respective pair of inlet and outlet tubes, the chamber 9 may possibly be divided off by means of additional flexible sealing devices abutting against the covering layer strip 10 (however, this feature is not shown on the Drawings).

At the lower end of the sterile chamber 9, there is disposed a curved channel or conduit 23 which, from a substantially vertical starting position immediately beneath the sterile chamber 9, curves through 90° so as to discharge horizontally in a working chamber 24 which is provided with inflows (not shown) for sterile air so as to create a given, constant excess pressure and thereby prevent bacteria from penetrating into the working chamber 24. At its lower region, the working chamber 24 has a circular

working aperture 25.

At the upper region of the working chamber 24, there are disposed the moving parts of the applicator assembly 2, in the form of a substantially vertically reciprocating transfer device 26, a likewise vertically reciprocating
5 cutter device 27 and a cutter spring 28 which is in the form of a helical compression spring abutting against the upper surface of the cutter device 27 and the lower surface of the upper wall of the working chamber 24 and actuating the cutter device 27 to the position illustrated in Fig. 1A in which it abuts against heels (not shown) on the outside of the transfer device 26. The
10 upper wall is provided with an aperture for the upper region of the transfer device 26, and a diaphragm 29 which extends between the wall of the working chamber 24 and the cutter device 27 and ensures that the working chamber 24 is insulated from the through passage for the transfer device 26. By the intermediary of a lever 30, the upper portion of the transfer device 26
15 extending out of the chamber 24 is connected to a pneumatic driving cylinder 31 which, via a suspension point in the frame 12, is operative on activation to displace the transfer device 26 reciprocally in the vertical direction.

At the lower end of the transfer device 26, there is a work surface 32
20 which is substantially planar and possibly provided with a vacuum aperture for connection to a vacuum source (not shown). Immediately adjacent the work surface, there is provided an inductor 33 which is connectable to a voltage source in order to make for induction heating of a metallic object which is located in contact with the work surface 32, i.e. preferably a
25 corresponding portion of the covering layer strip 10. With the aid of the driving cylinder 31 and the lever 30, the transfer device 26 is displaceable between an upper position illustrated in Fig. 1A and a lower position illustrated in Fig. 1B. In the upper position, the forward end of the covering layer strip 10 is located between the work surface 32 and the working
30 aperture 25. Immediately adjacent the working aperture 25, there is a cutting edge 34 which is turned to face upwards and is intended to cooperate with the cutter device 27. The work surface 32 is of such diameter or surface area that is slightly less than the diameter or surface area of the working aperture 25. The difference in size between the outer dimension of the work surface 32
35 and the inner dimension of the working aperture 25 amounts to slightly more than twice the thickness of the covering layer strip 10, as will be

described in greater detail below. Both the sterilisation apparatus 3 and the applicator assembly 2 (including the cutter device 27) are thus, with their active parts (i.e. parts coming into contact with the strip), enclosed in a continuous chamber 9, 24, which is provided with sluice gates and is
5 supplied with sterile air at excess pressure in order to ensure perfect hygiene and prevent bacteria from penetrating from outside.

On application of a covering layer over a pouring opening in accordance with the method according to the present invention, use is made of the apparatus according to the present invention, e.g. together with a
10 filling machine of the type described in Swedish Patent No. 9400506-3, in other words an aseptic packing and filling machine which, during simultaneous reforming, fills prepared packaging containers with previously sterilised, liquid contents and seals the packages. The individual packaging containers 7 are inserted in the flat-laid state into the filling machine, they
15 being placed at uniform intervals with their upper surface in contact with the underside of the packing rotor 4 and with their projecting package neck 8 inserted into each respective hole 6 in the rotor, the package necks 8 sealingly abutting against the inside of the hole 6. In such instance, the recess
5 in the rotor 4 forms, together with the working chamber 24, the conduit or
20 channel 23 and the sterilisation chamber 9, a closed space in which sterile atmosphere is maintained by means of a certain excess pressure so that bacteria from the ambient atmosphere are prevented from penetrating. Between the packing rotor 4 and the underside of the applicator assembly 2,
25 there is a slight space which, however, is insulated in a per se known manner with the aid of aspirated sterile air in such a manner that bacteria cannot penetrate this way into the working chamber 24.

The pertinent packaging containers may be of any optional type, solely on condition that they display a package neck of such dimensions that it can be applied into the holes 6 of the recesses 5. The packaging containers
30 which are described in connection with the above-mentioned patent specification are, however, of the type which is manufactured by cutting, sealing and folding of laminated packaging material, preferably comprising layers of paper, thermoplastic and aluminium foil. The packaging material has previously been double-folded and sealed along its edges, and also
35 provided with the package neck 8 which is injection moulded from thermoplastic material, preferably polyethylene. The flat-laid packaging

containers are sterilised by, for example, radiation sterilisation and are provided with a membrane (not shown) sealing the package neck 8. In connection with the filling operation, which takes place in a filling station located along the packing rotor 4 a slight distance ahead of the applicator assembly 2 (seen in the direction of rotation of the rotor), this membrane is penetrated by a filler pipe designed for this particular purpose, which, during simultaneous forming, fills the packaging containers 7 with the intended volume of contents. The rotor 4 is thereafter revolved one step so that the pertinent, recently filled packaging container 7 will be placed immediately beneath the applicator assembly 2. This position is illustrated in Fig. 1A. When the packaging container 7 is located in the applicator station, a covering layer portion 10' (Figs. 2, 3) is separated from the covering layer strip 10 and, under simultaneous reforming, is transferred to and sealed against the upper edge of the package neck 8. The reforming entails that parts of the covering strip portion 10' projecting outside the neck 8 are folded upwards such that they form pull tabs 10'' which are easily accessible to the consumer when the cover layer portion 10' is to be torn off from the neck 8. When the packaging container 7 has thus, after filling, been provided with a covering layer portion 10' sealed in gas-tight fashion to the neck 8, the rotor 4 is once again revolved one step so that the pertinent packaging container 7 may be removed from the rotor and transferred to a cap applicator station in which the neck 8 is provided with a prefabricated cap, for example a screw cap. The packaging container is thereafter finished, such that, after possible supplementary final forming, it may be discharged from the machine and transported further to, for example, a point of sale.

The handling and application of the covering layer strip 10 in the applicator 1 takes place in the described filling machine and the apparatus according to the invention in the following manner. The covering layer strip 10 is placed in the form of the reel 11 in connection with the upper infeed end of the sterile chamber 9 provided with the sluice gate 16. With the aid of the driver 13, the strip is fed stepwise down through the sterile chamber 9 and further via the curved channel or conduit 23 to the working chamber 24 where, at the same rate as the rate of advancement, it is severed and transferred to the package neck 8. The driver 13 thus pushes the strip 10 through the above-mentioned chamber and no additional advancement device is necessary, since the strip 10 partly consists of relatively rigid

aluminium foil which is capable of transferring sufficient driving forces to overcome any possible frictional inertia or resistance from guide means (not shown) during the advancement operation. As a result of this design and construction, the risk is avoided that the strip 10 comes into contact with additional drive means on its way through the chambers 9 and 24, which is important to maintain a high standard of hygiene in a simple manner.

Once the strip 10 has been fed with the aid of the driver 13 past the sluice gate 16, the pertinent strip portion is located in the sterile chamber 9, whose first region (with the aid of sterile air heated to approximately 70-80°C and fed in via the inlet 17) heats the strip such that, after having passed the first region of the chamber 9, it is substantially at the above temperature. The sterile air is evacuated via the outlet 18 which is located a slight distance beneath the inlet 17. On the continued passage of the strip 10 through the sterile chamber 9, it is exposed to gaseous or vaporised hydrogen peroxide (H₂O₂, approximately 70-90°C), which is fed in from a conventional peroxide source (not shown) via the inlet 19. Evacuation of the hydrogen peroxide mixture takes place via the outlet 20 located immediately beneath. At the lower end of the sterile chamber 9, the strip 10 finally passes through a passage in which sterile drying air at a temperature of approximately 70-90°C is aspirated in via the inlet 21 in order, after having ensured drying of excess hydrogen peroxide from the covering layer strip 10, to be evacuated via the outlet 22 located at the lower end of the sterile chamber 9. Hereafter, the covering layer strip 10 has passed through the sterile chamber 9 and, after completed sterilisation, is located in the sterile space which is defined by the curved channel 23.

As previously mentioned, the strip 10 is advanced stepwise with the aid of the driver 13, each step corresponding to one strip length which somewhat exceeds the corresponding width dimension of the work surface 32 or the package neck 8, as is apparent from Fig. 1A. When the strip is located in the position illustrated in Fig. 1A, the driving cylinder 31 is activated by being placed in communication with a compressed air source of conventional type (not shown). By the intermediary of the lever 30 pivotally suspended in the frame 12, the driving cylinder hereafter activates the transfer device 26 so that this is displaced downwards through the working chamber 24 (Fig. 1B). The forward, planar work surface 32 of the transfer device 26 will, in such instance, come into contact with the forward portion

of the strip 10 which may be retained against the work surface 32 with the aid of vacuum ducts (not shown). Immediately after the strip 10 has come into abutment against the work surface 32 the cutting edge of the cutter device 27 comes into contact with the strip so that, with the aid of the cutting edge 34 located beneath the strip, a front covering layer portion 10' is severed from the covering layer strip 10. On the continued movement of the transfer device 16 in a direction towards the package neck 8, the cutter device 27 remains in abutment against the edge 34 until the transfer device 26 is located in its lower position. The severing of the covering layer portion 10' from the strip 10 preferably takes place with the aid of slightly obliquely offset cutting devices, whereby the layer portion 10' will have polygonal configuration, and preferably the substantially rhomboid form illustrated in Fig. 3. The larger parts of the covering layer portion 10' projecting outside the outer periphery of the neck 8 will hereby form substantially triangular pull tabs 10" which, to facilitate opening for the consumer, are folded upwards so that, in the double-folded state, they are positioned beneath the screw cap subsequently applied on the neck 8. The upward folding of the pull tabs 10" takes place with the aid of the apparatus according to the present invention when the work surface 32 with the adhering covering layer portion 10' passes through the aperture 25 whose peripheral edge functions as the folding device 35. Since, as was mentioned previously, the working aperture 25 is of slightly greater surface area than the work surface 32, the parts of the covering layer portion 10' extending outside the working aperture 25 will be folded parallel with the direction of movement, i.e. upwards during the passage through the working aperture 25. When the transfer device reaches its lower position, the central part of the covering layer portion 10' formed by the preferably circular working aperture will thereby have a diameter which corresponds to the outer diameter of the neck 8. The central, circular part of the covering layer portion 10' will also be located in the correct application position in relation to the neck 8 and will be displaced by the transfer device 26 into abutment against the upper edge surface of the neck 8. In such instance, the inductor 33 is activated by being placed in communication with a power source such that high frequency heating of the aluminium foil layer of the covering layer portion 10' will create a circular, heated region which corresponds to the upper edge surface of the neck 8. The heating of the aluminium layer in turn heats the upper

edge of the neck 8 (consisting of thermoplastic), such that this edge melts and makes for sealing between the lower, thermoplastic-coated surface of the covering layer portion 10' and the neck 8. By suitable abutment pressure created by the driving cylinder 31, a gas- and liquid-tight seal takes place of the covering layer portion 10' and the upper edge of the neck 8, which ensures that the packaging container 7 is sealed and closed in bacteria-tight fashion such that its neck 8 may thereby be removed from the sterile chamber, which takes place once the packing rotor 4 has been revolved through an additional step. Hereafter, the neck is, as was previously mentioned, fitted with a screw cap whereupon the packaging container is, possibly after additional forming, ready for shipment.

Since both the sterilisation of the covering layer strip 10 and its handling (cutting, transfer and sealing) take place in a sterile space (the chamber 9, 23 and 24), it will be ensured that the sterility of the packed contents is maintained. Since only a minimal number of moving parts is located in the chamber 9, 23, 24, a high standard of hygiene and high level of operational reliability will moreover be ensured. All drive means have, in addition, been placed outside the chamber, which further increases operational reliability. The forming of the central part and pull tabs 10" of the covering layer portion 10' in immediate connection with application moreover ensures the requisite accuracy and exactness of application.

The present invention should not be considered as restricted to that described above and shown on the Drawings, many modifications being conceivable without departing from the scope of the appended Claims.

WHAT IS CLAIMED IS:

1. A method of applying a covering layer over the pouring opening of a packaging container, characterized in that a covering layer portion (10') of the desired surface area is separated from a carrier and temporarily connected to a reciprocating work surface (32), whose surface area is less than the surface area of the covering layer portion (10'), whereafter a part (10'') of the covering layer portion (10') projecting outside the work surface (32) is folded parallel with the direction of movement, with the aid of a stationary folding device, and the covering layer portion is connected to an edge region surrounding the pouring opening (8).

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2. The method as claimed in Claim 1, characterized in that the covering layer portion (10') is given polygonal configuration by severing from a continuous strip (10).

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3. The method as claimed in Claim 1 or 2, characterized in that the covering layer portion (10') is connected to said edge region with the aid of thermosealing.

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4. The method as claimed in Claim 3, characterized in that the thermosealing takes place by means of induction heating.
5. The method as claimed in Claims 2 to 4, characterized in that the strip of continuous layer portions is advanced by means of a driver (13) which pushes the strip (10) towards the separation and connection point.

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6. The method as claimed in Claim 5, characterized in that the strip (10) is subjected to sterile treatment after having passed the driver (13).

30
7. An apparatus for applying a covering layer over the pouring opening of a packaging container, characterized in that it comprises an applicator (1) with a reciprocating transfer device (26) with a work surface (32), a stationary folding device disposed along the path of movement of the transfer device (26), and means for sealing a covering layer portion to an edge region surrounding the pouring opening.

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8. The apparatus as claimed in Claim 7, characterized in that the folding device consists of a working aperture (25) whose cross-sectional area is less than the surface area of the covering layer portion.
- 5 9. The apparatus as claimed in Claim 7 or 8, characterized in that the sealing device comprises an inductor (33) located in the work surface (32) of the transfer device (26).
- 10 10. The apparatus as claimed in one or more of Claims 7 to 9, characterized in that the work surface (32) is round.
- 15 11. The apparatus as claimed in one or more of Claims 7 to 10, characterized in that it includes a cutter device (27) for separating the covering layer portions (10') from a continuous strip (10), and drive means in the form of a device (13) engaging mechanically with the strip (10) and placed ahead of both the cutter device (27) and the applicator assembly (2), seen in the direction of advancement of the strip (10).
- 20 12. The apparatus as claimed in one or more of Claims 7 to 11, characterized in that the sterilisation apparatus (3) is disposed after the driver (13) but ahead of both the cutter device (27) and the applicator assembly (2).
- 25 13. The apparatus as claimed in Claim 12, characterized in that the sterilisation apparatus (3), the cutter device (27), and the applicator assembly (2) are disposed with their active parts enclosed in an airtight chamber (9, 24) provided with sluice gates (16).

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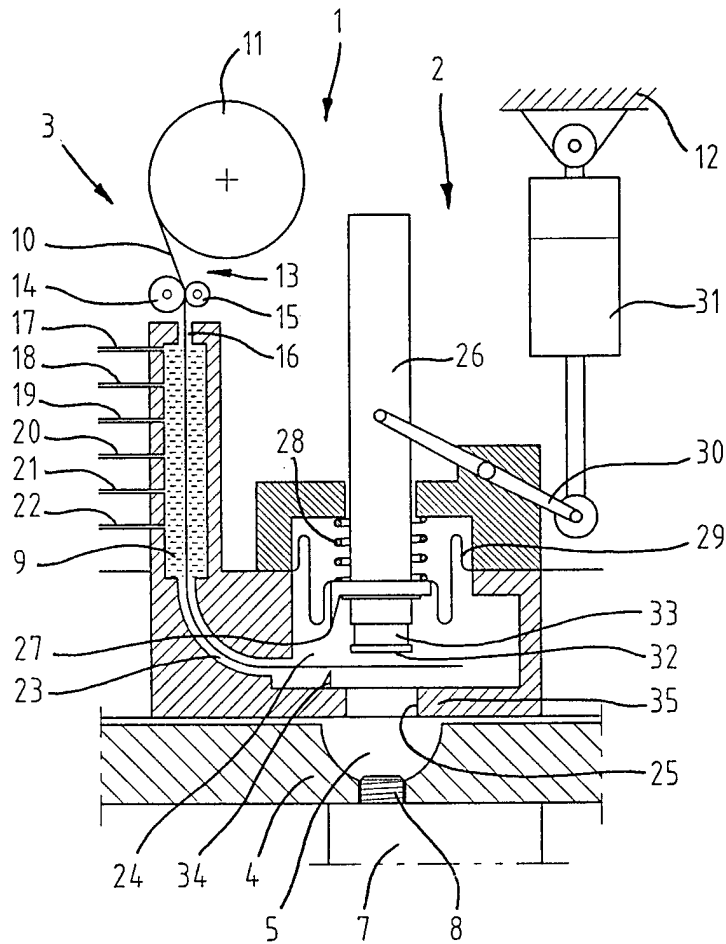
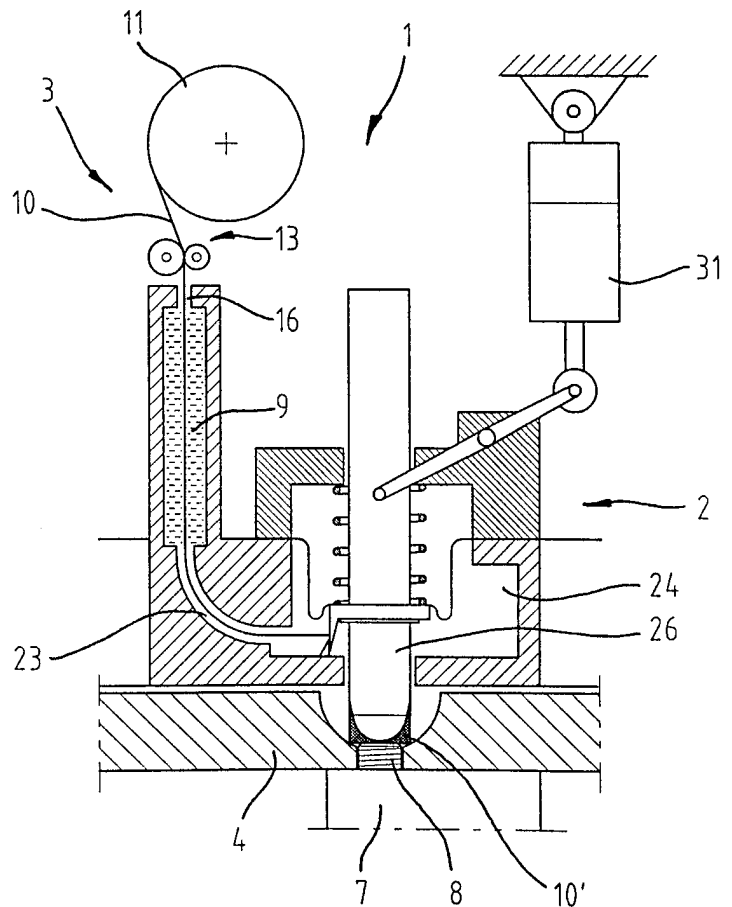


Fig 1A

Fig 1B



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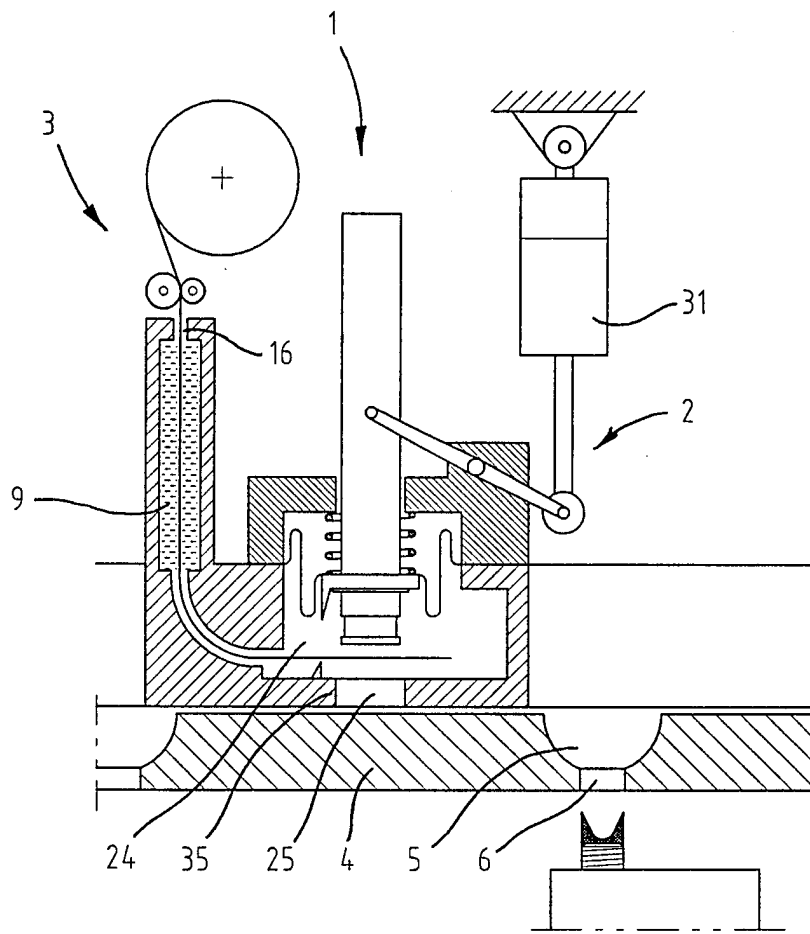


Fig 1C

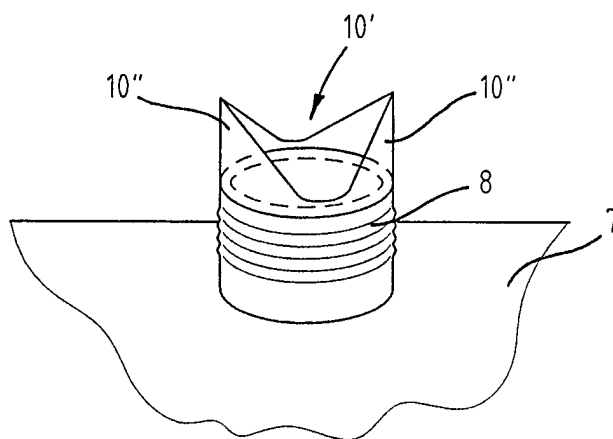


Fig 2

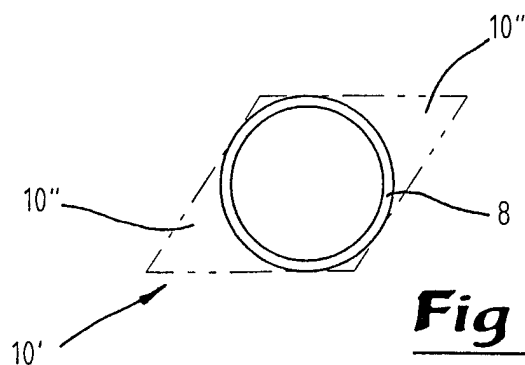


Fig 3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/01831

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B67B 5/00, B65B 7/28

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)

IPC6: B67B, B65B, B65D

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, CLAIMS

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4035987 A (NAKAZATO ET AL), 19 July 1977 (19.07.77), column 5, line 15 - line 19; column 5, line 61 - line 66, figures 1,5 --	1-13
X	US 3286437 A (R.M.COLE), 22 November 1966 (22.11.66), figures 1-3, claim 1 --	1-13
X	WO 8603478 A1 (ROBERTS SYSTEMS, INC.), 19 June 1986 (19.06.86), page 4, line 13 - page 5, line 7; page 6, line 13 - line 20, figures 1-3 --	1-2,5-8, 10-13
A	DE 1097347 B (JULIUS KUGLER & CO.), 12 January 1961 (12.01.61), figures 1-5 --	1-13



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search

17 February 1998

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 97/01831

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 0667284 A (TETRA LAVAL HOLDINGS & FINANCE SA), 16 August 1995 (16.08.95), column 6, line 56 - column 7, line 15, figure 3 --	1-13
A	US 4811550 A (JEAN-CLAUDE HAUTEMONT), 14 March 1989 (14.03.89), figures 1-3,8 --	1-13
A	US 5272854 A (E-FU YE ET AL), 28 December 1993 (28.12.93), column 3, line 15 - line 54, figures 6-8 -----	1-13

INTERNATIONAL SEARCH REPORT

Information on patent family members

03/02/98

International application No.

PCT/SE 97/01831

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