(19) Europäisches Patentamt
European Patent Office
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(11) **EP 4 345 012 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.04.2024 Bulletin 2024/14

(21) Application number: **23197477.5**

(22) Date of filing: **14.09.2023**

(51) International Patent Classification (IPC):
B65B 9/12 *(2006.01)* ***B65B 31/02*** *(2006.01)*
B65B 31/04 *(2006.01)* ***B65B 55/04*** *(2006.01)*
B65B 55/10 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B65B 55/04; B65B 9/12; B65B 31/02; B65B 31/045; B65B 55/103

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **30.09.2022 IT 202200020154**

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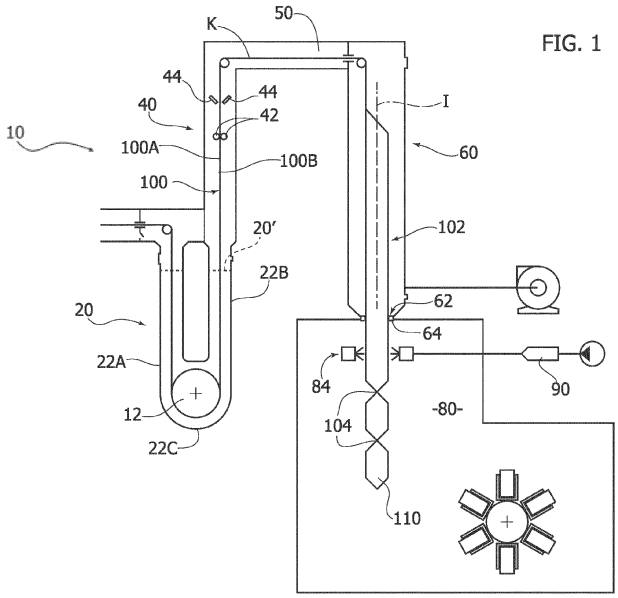
(54) METHOD FOR PRODUCING CONTAINERS FILLED WITH A PRODUCT AND SEALED

(57) Described herein is a method for producing containers filled with a product and sealed, the method comprising the steps of: moving a web (100) of packaging material along a work path (K); folding the web (100) about a main axis (I) parallel to the work path (K) so as to form a tube (102); welding together opposite edges of the web (100) parallel to the main axis (I) so as to seal the formed tube (102) longitudinally; filling with product the formed and sealed tube (102); subjecting a liquid lubricant (L) to a sanitizing operation via a sterilizing substance and/or via a filter (92) with antipathogenic action; spraying the sanitized liquid lubricant (L) onto an outer surface (102A) of the formed and sealed tube (102); and, starting from the lubricated tube (102), obtaining single semi-finished containers (110) filled with product.

FIG. 1



EP 4 345 012 A1

Description

[0001] The present invention regards a method for producing containers filled with a product and sealed starting from a web of packaging material, the method comprising the steps of:

- moving the web of packaging material along a work path;
- folding the web about a main axis parallel to the work path so as to form a tube;
- welding together opposite edges of the web parallel to the main axis so as to seal the tube longitudinally;
- filling the formed and sealed tube with product;
- spraying a liquid lubricant onto an outer surface of the formed and sealed tube; and
- starting from the formed and sealed tube, obtaining single semi-finished containers filled with product.

[0002] A fundamental aspect of a method of the type referred to above consists in guaranteeing that the inside of the tube formed during the process, into which the product to be packaged is directly dispensed, will be protected from any external contamination that might in fact jeopardize the quality of the product itself.

[0003] For this purpose, the aforesaid tube, obtained with the web of packaging material, is formed within a controlled-pressure sterile environment.

[0004] On the other hand, the single semi-finished containers are, instead, obtained in a chamber in contact with the external environment, set downstream of the aseptic chamber, using a welding, forming, and cutting unit. The liquid lubricant sprayed onto the outer surface of the tube, which has the function of favouring proper operation of the aforesaid welding, forming, and cutting unit, is applied on the tube in the above chamber downstream of the aseptic chamber, precisely to prevent contamination of the inside of the tube with the liquid lubricant.

[0005] A gasket element is also set at the outlet section that sets the two chambers in communication and is traversed by the tube formed and filled with product, precisely to avert entry of contaminants into the aseptic chamber.

[0006] The present applicant has, however, noted that the containers produced according to the known methods of the type referred to above may at times not meet the requisites of sterilization envisaged, notwithstanding the solutions resorted to in order to prevent any contamination of the inside of the tube from which the single semi-finished containers are obtained.

[0007] Hence, the present applicant initially thought of solving the above technical problem both by testing more vigorous processes of cleaning and sterilization of the production machine and by increasing the frequency with which this type of processes are performed in the machine.

[0008] However, the above attempts did not provide a conclusive solution; the problem referred to in fact represented, and what is more in a random way that was difficult to foresee.

[0009] After an intense experimental activity, the present applicant understood that, notwithstanding the solutions described above, a source of contamination of the semi-finished containers is represented precisely by the liquid lubricant.

[0010] In particular, the present applicant discovered that the liquid lubricant, when sprayed onto the outer surface of the tube, is able to infiltrate in the form of droplets in suspension into the aseptic chamber in which formation of the tube takes place. In particular, the present applicant was able to note that, by way of the oscillation of the walls of the tube generated by the operations of sealing and cutting of the tube itself, there is brought about a sort of pumping action on the part of the tube itself. This pumping action creates a retrograde movement of the droplets of liquid lubricant from the chamber in which the sealing and cutting unit operates to the aseptic chamber.

[0011] Consequently, the present applicant understood that it is possible to solve in a simple and effective way the technical problem mentioned at the start, hence without resorting to complicated solutions for closing hermetically any passage of the liquid lubricant between the aseptic chamber and the chamber downstream, by operating directly on the liquid lubricant before this is sprayed against the outer surface of the tube.

[0012] In the present description, as likewise in the claims annexed thereto, some terms and expressions are to be considered, except where otherwise explicitly indicated, as having the meaning given in the ensuing definitions.

[0013] In an apparatus or unit for processing an object that advances in a direction of feed along a work path, a first position is said to be "upstream" of a second position when the first position precedes the second position with reference to the direction of feed of the object; vice versa, the second position is said to be "downstream" of the first position in so far as it follows the first position once again with reference to the direction of feed of the object.

[0014] According to a first aspect, the present invention regards a method for producing containers filled with a product and sealed starting from a web of packaging material.

[0015] Preferably, the method comprises the step of moving said web of packaging material along a work path.

[0016] Preferably, the method comprises the step of folding said web about a main axis parallel to said work path, in particular so as to form a tube.

[0017] Preferably, the method comprises the step of welding together opposite edges of said web, in particular so as to seal longitudinally said formed tube; said opposite edges are preferably parallel to the main axis.

[0018] Preferably, the method comprises the step of filling said formed tube with said product.

[0019] Preferably, the method envisages the step of

subjecting a liquid lubricant to a sanitizing operation.

[0020] Preferably, said sanitizing operation includes the step of introducing into said liquid lubricant a sterilizing substance. Preferably, said sanitizing operation includes the step of subjecting said liquid lubricant to a filtering operation using a filter with antipathogenic action. In an equally preferred way, said sanitizing operation includes the steps of introducing into said liquid lubricant a sterilizing substance and subjecting said liquid lubricant to a filtering operation using a filter with antipathogenic action.

[0021] Preferably, after said sanitizing operation, the method envisages the step of spraying the sanitized liquid lubricant onto an outer surface of said formed and sealed tube.

[0022] Preferably, the method envisages the step of obtaining, starting from said formed and sealed tube, single semi-finished containers filled with said product.

[0023] Thanks to the aforesaid characteristics, the method described herein is able to solve the technical problem mentioned at the outset in a simple way that has little or no impact on the structure of the machine, i.e., that does not require complex modifications to be made to the structure of the machine that is to implement the method itself.

[0024] According to a second aspect, the present invention concerns a machine for producing containers filled with a product and sealed starting from a web of packaging material.

[0025] The machine preferably comprises a feed system for feeding said web, in particular for moving said web along a work path.

[0026] The machine preferably comprises a first forming chamber. Preferably, in the forming chamber the web is worked to obtain a formed and sealed tube. Preferably, in the forming chamber the formed and sealed tube is filled with product.

[0027] The machine preferably comprises a further chamber. Preferably, in the further chamber, starting from said formed and sealed tube, single semi-finished containers filled with said product are obtained. Preferably, said further chamber is set downstream of said forming chamber along said work path.

[0028] The machine preferably comprises a spraying unit, in particular for spraying a liquid lubricant onto the outer surface of the formed tube. Preferably, the spraying unit is set in the further chamber.

[0029] The machine preferably comprises a sanitizing unit. Preferably, the sanitizing unit is configured for subjecting the liquid lubricant to a sanitizing operation. Preferably, the sanitizing operation is performed before the liquid lubricant is sprayed by said spraying unit.

[0030] Preferably, the sanitizing unit includes a dosing device, in particular for introducing a sterilizing substance into said liquid lubricant. Preferably, the sanitizing unit includes a filter with antipathogenic action, preferably configured for being traversed by said liquid lubricant and for carrying out a filtering operation on the latter.

[0031] In an equally preferred way, the sanitizing unit includes the dosing device and the filter that performs an antipathogenic action.

[0032] Thanks to the aforesaid characteristics, the machine described herein is able to solve the technical problem mentioned at the outset, without any need to resort to complex systems or devices for protecting the aseptic chamber of the machine from any possible entry of the liquid lubricant.

[0033] According to one or more of the aforesaid aspects, the present invention may comprise one or more of the characteristics described in what follows.

[0034] Preferably, the sanitizing operation is designed to reduce any bacterial charge that might be present in the liquid.

[0035] In one or more embodiments, the web of packaging material is wound off a reel.

[0036] In one or more embodiments, the method envisages obtaining, starting from the formed and sealed tube, single semi-finished containers filled with product after the sanitized liquid lubricant has been sprayed onto the outer surface of the formed and sealed tube. Alternatively, in one or more embodiments, the method envisages obtaining, starting from the formed and sealed tube, single semi-finished containers filled with product, while the sanitized liquid lubricant is sprayed onto the outer surface of the formed and sealed tube.

[0037] In one or more embodiments, said sterilizing substance comprises at least one of the following: peroxide, peracetic acid, and citric acid.

[0038] In one or more embodiments, said filter comprises a filtering diaphragm. Preferably, the filtering diaphragm includes an antipathogenic substance.

[0039] In one or more embodiments, said antipathogenic substance comprises silver ions.

[0040] In one or more embodiments, in the forming chamber the web is folded about a main axis parallel to the work path, in particular so as to obtain the formed tube. In one or more embodiments, in the forming chamber, opposite edges of the web that are parallel to the main axis are welded together, in particular so as to seal the formed tube longitudinally, in particular to obtain the formed and sealed tube.

[0041] In one or more embodiments, said machine comprises a supply duct for supplying said liquid lubricant to said spraying unit.

[0042] In one or more embodiments, said dosing device comprises a nozzle. Preferably, the nozzle faces the inside of said supply duct. In one or more embodiments, said dosing device comprises a pump unit, in particular for supplying said sterilizing substance to said nozzle.

[0043] Thanks to the aforesaid characteristics, the sanitizing unit can also be readily integrated into an already existing machine.

[0044] In one or more embodiments, said sanitizing unit comprises a mixing chamber. Preferably, the mixing chamber is connected to an upstream end of said supply duct. Preferably, in the mixing chamber said sterilizing

substance is introduced into said liquid lubricant, in particular before said liquid lubricant is supplied to said spraying unit through said supply duct.

[0045] Thanks to the above characteristics, the sanitizing unit can also be readily integrated into an already existing machine.

[0046] It is pointed out that some steps of the method described above may be independent of the order of execution referred to, except where there is expressly indicated as necessary a sequentiality or simultaneity between two or more steps. Moreover, some steps may be optional. Moreover, some steps may be carried out in a repetitive way, or else may be carried out in series or in parallel with other steps of the method.

[0047] The annexed claims form an integral part of the teaching provided herein.

[0048] Further characteristics and advantages of the present invention will emerge clearly from the ensuing description, with reference to the annexed drawings, which are provided purely by way of non-limiting example and in which:

- Figure 1 is a schematic illustration of an example of the machine described herein;
- Figure 2 illustrates a sanitizing unit of the machine described herein according to a first embodiment; and
- Figure 3 illustrates a sanitizing unit of the machine described herein according to a second embodiment.

[0049] As specified above, the machine described herein operates for producing containers filled with a product and sealed starting from a web of packaging material.

[0050] The product may preferably be a liquid or else a granular material.

[0051] With reference to the embodiment of Figure 1, the machine described herein and designated as a whole by the reference number 10, comprises a feed system for supplying a web 100 of packaging material and for feeding the web 100 along a work path K.

[0052] Preferably, the web 100 is fed from a reel (not illustrated) and develops as a single continuous web along the entire work path K.

[0053] The machine 10 comprises a tank 20 that is set along the work path K and contains a bath 20' (represented in the figures with a dashed line). The web 100 that advances along the work path K is immersed in the bath 20'.

[0054] The bath 20' may, for example, be constituted by a sterilizing and/or sanitizing liquid.

[0055] In one or more preferred embodiments, like the one illustrated, the tank 20 has a generic U shape, comprising a first branch 22A, upstream, a second branch 22B, downstream, and a bottom region 22C, which connects the two branches and housed within which is a deflector roller 12, belonging to the system for feeding the web 100 and configured to determine a reversal of the direction of advance of the web 100 (from a top-down direction to a bottom-up direction).

[0056] Vertically extending above the downstream branch 22B is a drying chamber 40 for drying the web 100 after it has come out of the bath 20'.

[0057] In a way in itself known, the drying chamber 40 is equipped with a series of drying devices configured for drying two opposite faces 100A, 100B of the web 100 that advances inside the drying chamber 40 along the work path K. For instance, the drying chamber 40 may comprise a pair of opposed squeezing rollers 42, which operate for compressing the web 100, in a direction transverse to the work path K, so as to expel the liquid absorbed by the web 100 in the bath 20'. Moreover, the drying chamber 40 may comprise a pair of heads 44 for delivery of air, preferably heated air, which are arranged on the two opposite sides of the web 100, to deliver a jet of air against the opposite faces 100A, 100B of the web 100.

[0058] Downstream of the drying chamber 40, along the work path K, the machine 10 comprises a forming chamber 60, within which the web 100 is formed to obtain the containers 101 filled with product and sealed.

[0059] In one or more preferred embodiments, like the one illustrated, the forming chamber 60 comprises a forming device (not illustrated) for folding the web 100 to form a tube about a main axis I that extends in a direction parallel to the work path K inside the forming chamber 60 itself. Moreover, provided within the forming chamber 60 are sealing means for fixing together the opposite longitudinal edges of the web 100 so as to close the web 100 and obtain a vertical tube 102 sealed laterally.

[0060] The formed and sealed tube 102 is filled with the product to be packaged and extends downwards until it reaches a further chamber 80, set downstream of the forming chamber 60.

[0061] Within the further chamber 80 there operates a sealing and cutting unit (not illustrated), which provides in succession, on the formed and sealed tube 102, sealing bands 104 transverse to the axis I that are to define on the tube 102 single semi-finished containers 110, sealed and filled with the product. In addition, the unit itself cuts the single semi-finished containers 110 off the tube 102.

[0062] It should be noted that the aforementioned forming device and sealing and cutting unit may be of a known type, and they will consequently not be described herein in detail so as not to burden the present treatment.

[0063] In one or more preferred embodiments, like the one illustrated, the machine 10 further comprises a passage 50 for paper, for passage of the web 100, which extends along the work path K and connects together the drying chamber 40, in particular a downstream end thereof, and the forming chamber 60, in particular an upstream end thereof.

[0064] It is pointed out that the forming chamber 60 is to constitute - according to modalities already known in

the art, which will consequently not be illustrated herein in detail - an aseptic environment, so as to safeguard the tube 102, which is formed and sealed inside said forming chamber 60, and the product that is dispensed into the tube 102 itself from any possible contamination on the part of external agents.

[0065] Set at the outlet 62 of the forming chamber 60, which sets in communication the latter with the further chamber 80 and is traversed by the tube 102 already formed, sealed, and filled with the product, is a gasket element 64 that performs the function of closing the passage formed between the outer surface 102A of the tube 102 and the inner edges of the outlet 62.

[0066] In addition, precisely to prevent passage of external agents from the further chamber 80 to the forming chamber 60, the latter is at a pressure higher than atmospheric pressure at which, instead, the further chamber 80 is.

[0067] Within the further chamber 80, in a position upstream of the region where the aforesaid sealing and cutting unit operates on the tube 102 formed and sealed laterally, there is located a spraying unit 84 that has the function of spraying a liquid lubricant L onto the outer surface 102A of the tube 102 in order to facilitate the subsequent operations carried out by the aforesaid sealing and cutting unit. The liquid lubricant L may, for example, be water.

[0068] According to an important characteristic of the solution described herein, before the liquid lubricant L is sprayed against the outer surface of the tube 102, it undergoes a sanitizing operation designed to reduce the bacterial charge that might be present therein. For this purpose, the machine 10 comprises a sanitizing unit 90, configured for subjecting the liquid lubricant L to a sanitizing operation before it reaches the spraying unit 84.

[0069] In a first embodiment illustrated in Figure 2, the sanitizing operation envisages subjecting the liquid lubricant L to a filtering operation using a filter with antipathogenic action.

[0070] In this case (Figure 2), the sanitizing unit 90 comprises a filter 92 with antipathogenic action that is configured for subjecting the liquid lubricant L to a filtering operation. In one or more preferred embodiments, like the one illustrated, the filter 92 is set directly in a position along a duct 95 that supplies the liquid lubricant L to the spraying unit 84 in order to intercept the flow of liquid lubricant L directed to the spraying unit 84, without any need to provide any deflection of the flow. Preferably, the filter 92 comprises a filtering diaphragm including an antipathogenic substance, for example silver ions.

[0071] According to an alternative embodiment, the sanitizing operation includes, instead, introduction into the liquid lubricant L of a sterilizing substance. Said substance may be constituted by at least one of the following: peroxide, paracetic acid, and citric acid. In general, the aforesaid substance may in any case have any composition that will be able to exert a sterilizing effect on the liquid lubricant L and that will be compatible with the requirements of the specific applications, with particular reference to the requirements linked to the type of product packaged.

[0072] In this case, with reference to Figure 3, the sanitizing unit 90 may comprise a dosing device 94 that introduces the sterilizing substance directly into the supply duct 95. The dosing device 94 may, for example, comprise a nozzle 94A facing the inside of the supply duct 95, and a pump 94B designed to supply the sterilizing substance to the nozzle 94A. In an alternative embodiment, the sanitizing unit 90 may, instead, comprise a mixing chamber - not illustrated - where the sterilizing substance is added to the liquid lubricant L in stationary conditions of the liquid, for example once again via a dosing device similar to the device 94. The mixing chamber may be connected to an upstream end of the supply duct 95, via which the liquid lubricant L, with the sterilizing substance added thereto, can then be supplied to the spraying unit 84.

[0073] In view of the foregoing, it will be understood that the sanitizing operation according to the solution described herein makes it possible to solve the technical problem discussed at the outset in a simple and reliable way, and without making any modification to the chambers 60 and 80 of the machine.

[0074] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary, even significantly, with respect to what has been illustrated herein purely by way of non-limiting example, without thereby departing from the scope of the invention, as defined by the annexed claims.

Claims

1. A method for producing containers filled with a product and sealed, starting from a web (100) of packaging material, the method comprising the steps of:

    - moving said web (100) along a work path (K);
    - folding said web (100) about a main axis (I) parallel to said work path (K) so as to form a tube (102),
    - welding together opposite edges of said web (100), said opposite edges being parallel to said main axis (I), so as to seal longitudinally said formed tube (102);
    - filling said formed and sealed tube (102) with said product;
    - subjecting a liquid lubricant (L) to a sanitizing operation that includes at least one of the following steps:

        i. introducing into said liquid lubricant (L) a sterilizing substance; and
        ii. subjecting said liquid lubricant (L) to a filtering operation using a filter (92) with antipathogenic action;

- after said sanitizing operation, spraying said sanitized liquid lubricant (L) on an outer surface (102A) of said formed and sealed tube (102); and
- starting from said formed and sealed tube (102), obtaining single semi-finished containers (110) filled with said product.

2. The method according to claim 1, wherein said sterilizing substance may comprise at least one of the following: peroxide, paracetic acid, and citric acid.

3. The method according to claim 1 or claim 2, wherein said filter (92) comprises a filtering diaphragm including an antipathogenic substance.

4. The method according to claim 3, wherein said antipathogenic substance comprises silver ions.

5. A machine (10) for producing containers filled with a product and sealed, starting from a web (100) of packaging material, the machine comprising:

- a system for feeding said web (100), for moving said web (100) along a work path (K);
- a forming chamber (60), in which said web (100) is worked to obtain a formed and sealed tube (102), and said formed tube (102) is filled with said product;
- a further chamber (80) set downstream of said forming chamber (60) along said work path (K), wherein, starting from said formed and sealed tube (102), single semi-finished containers (110) filled with said product are obtained;
- a spraying unit (84), set in said further chamber (80), for spraying a liquid lubricant (L) onto an outer surface (102A) of said formed tube (102); and
- a sanitizing unit (90), configured for subjecting said liquid lubricant (L) to a sanitizing operation, before said liquid lubricant (L) is sprayed by said spraying unit (84);

said sanitizing unit (90) including at least one of the following:

- a dosing device (94) for introducing a sterilizing substance into said liquid lubricant (L); and
- a filter (92) with antipathogenic action, configured for being traversed by said liquid lubricant (L) and for carrying out a filtering operation on the latter.

6. The machine according to claim 5, comprising a supply duct (95) for supplying said liquid lubricant (L) to said spraying unit (84).

7. The machine according to claim 6, wherein said dosing device (94) comprises a nozzle (94A) facing the inside of said supply duct (95) and a pump unit (94B) for supplying said sterilizing substance to said nozzle (94A).

8. The machine according to claim 6 or claim 7, wherein said sanitizing unit (90) comprises a mixing chamber connected to an upstream end of said supply duct (95), in which said sterilizing substance is introduced into said liquid lubricant (L) before said liquid lubricant (L) is supplied to said spraying unit (94) through said supply duct (95).

9. The machine according to any one of claims 5 to 8, wherein said filter (92) comprises a filtering diaphragm including an antipathogenic substance.

10. The machine according to claim 9, wherein said antipathogenic substance comprises silver ions.

FIG. 1

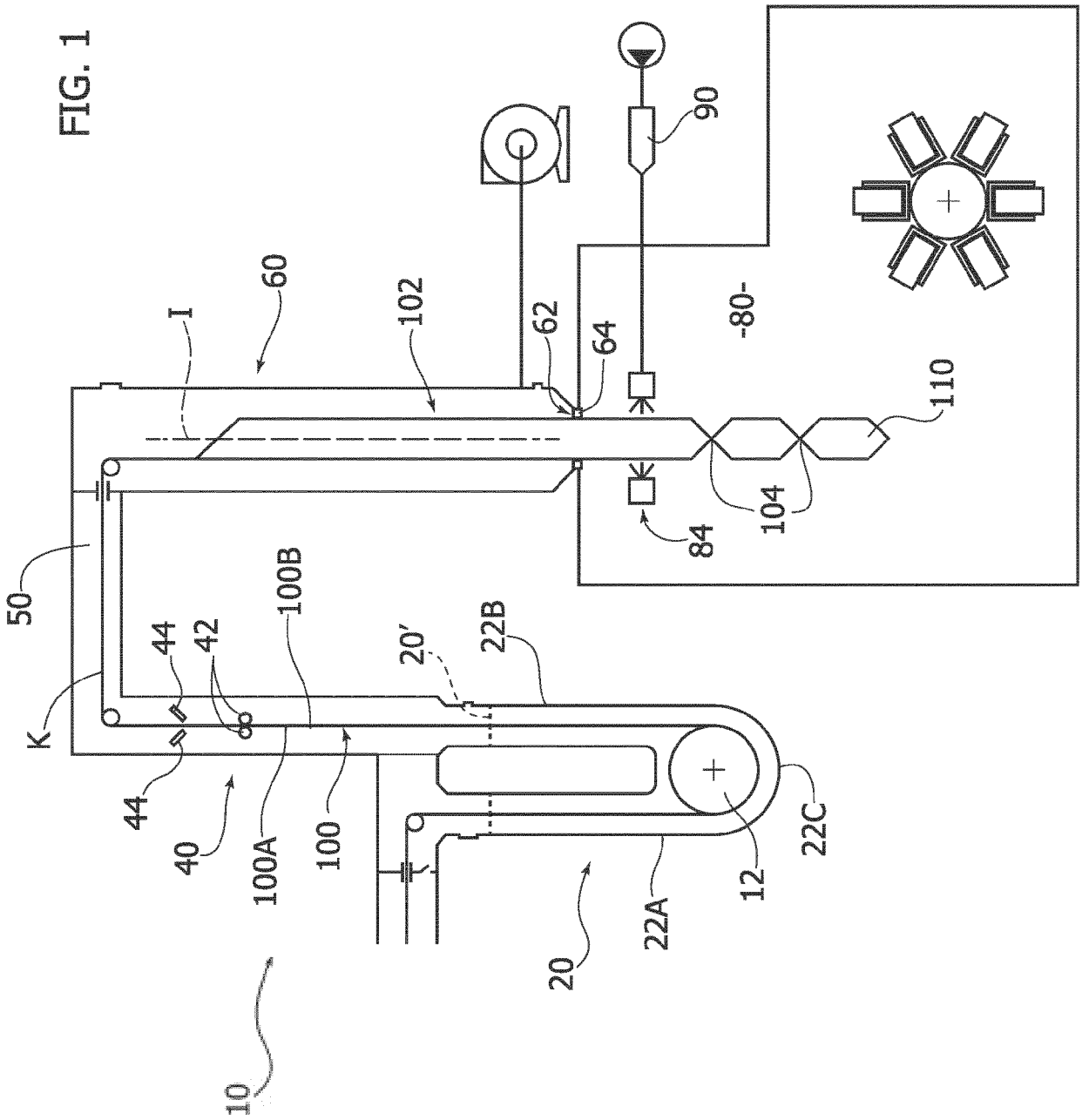

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FIG. 3

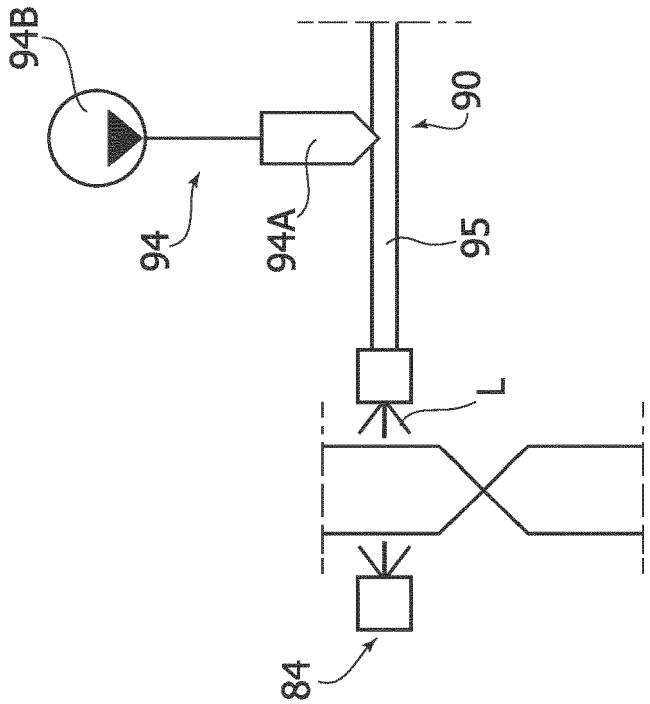
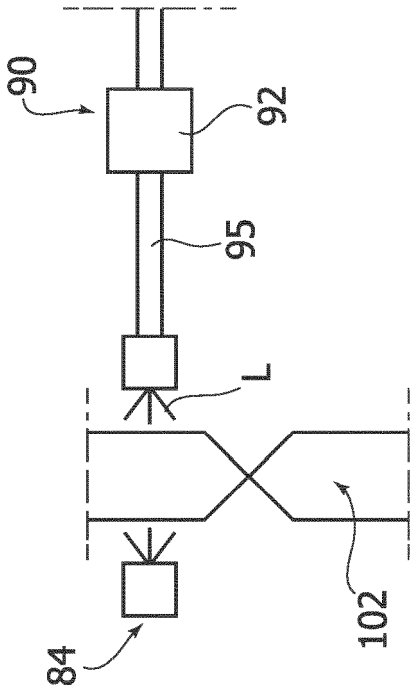


FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 23 19 7477

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

B65B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 December 2023	Ungureanu, Mirela

CATEGORY OF CITED DOCUMENTS

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