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(54) **A FORMING DEVICE AND METHOD FOR FORMING A PACK INTO A FINISHED PACKAGE, A FOLDING UNIT FOR FORMING SEALED PACKAGES OF POURABLE FOOD PRODUCTS.**

(57) The invention relates to a forming device (42) for feeding along a forming path (B) a pack (3) which has at least one portion (6) to be folded into a finished package (2). The forming device (42) comprises a first surface (46a) and a second surface (46b) opposite to each other and adapted, in use, to cooperate respectively with a front wall (15) and a rear wall (10) opposite to each other of the pack (3) to be folded. The first surface (46a) comprises an at least partially concave forming section (8)

adapted, in use, to cooperate with a top portion of the front wall (15) of the pack (3), such that an inward deformation of the top portion of the front wall (15) is prevented during forming of the pack (3). The invention also relates to a folding unit (1) for forming sealed packages (2) of pourable food products, to a method for forming a pack (3) which has at least one portion (6) to be folded into a finished package.

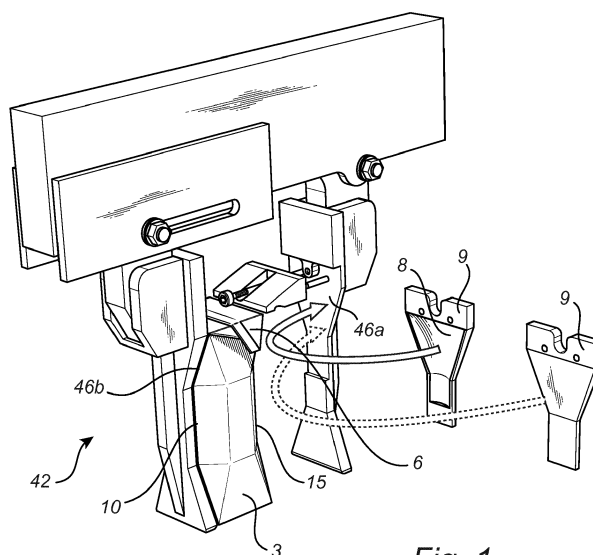


Fig. 1

Description

Technical field

[0001] The invention relates to a forming device and method for forming a pack into a finished package. The invention also relates to a folding unit for forming sealed packages of pourable food products, and to a package.

Background art

[0002] As is known, many liquid or pourable food products, such as fruit juice, UHT (ultra-high-temperature treated) milk, wine, tomato sauce, etc., are sold in packages made of sterilized packaging material.

[0003] A typical example is the parallelepiped-shaped package for liquid or pourable food products known as Tetra Brik Aseptic (registered trademark), which is made by folding and sealing laminated strip packaging material.

[0004] The packaging material has a multilayer structure comprising a base layer, e.g. of paper, covered on both sides with layers of heat-seal plastic material, e.g. polyethylene. In the case of aseptic packages for long-storage products, such as UHT milk, the packaging material also comprises a layer of oxygen-barrier material, e.g. an aluminum foil, which is superimposed on a layer of heat-seal plastic material, and is in turn covered with another layer of heat-seal plastic material forming the inner face of the package eventually contacting the food product.

[0005] Packages of this sort are normally produced on fully automatic packaging machines, on which a continuous tube is formed from the web-fed packaging material. The web of packaging material is sterilized on the packaging machine, e.g. by applying a chemical sterilizing agent, such as a hydrogen peroxide solution, which, once sterilization is completed, is removed from the surfaces of the packaging material, e.g. evaporated by heating. The web so sterilized is then maintained in a closed, sterile environment, and is folded and sealed longitudinally to form a tube, which is fed vertically.

[0006] In order to complete the forming operations, the tube is filled with the sterilized or sterile-processed food product, and is sealed and subsequently cut along equally spaced cross sections.

[0007] More precisely, the tube is sealed longitudinally and transversally to its own axis.

[0008] Pillow packs are so obtained, which have a longitudinal seal, a top transversal seal and a bottom transversal seal.

[0009] More specifically, the pillow packs comprise a parallelepiped-shaped main portion, a top end portion and a bottom end portion. The top end portion and the bottom end portion taper from the main portion towards the top transversal seal and the bottom transversal seal, respectively. Each one of the top end portion and the bottom end portion has substantially triangular flaps projecting from opposite sides of the main portion and a rec-

tangular tab projecting from a relative sealing line.

[0010] Packaging machines of the above type are known, on which the pillow packs are turned into folded packages by automatic folding units.

[0011] Folding units are known, for example from the International Application No. WO2008122623 in the name of the same Applicant, which substantially comprise a rotary conveyor that receives pillow packs to be folded at an inlet station, conveys the pillow packs to be folded along an arc-shaped folding path, and outputs folded packages at an output station. The folding units comprises a first folding unit which interacts with portions of the packs travelling along the folding path to perform a folding operation onto the packs, a heating device for heating the flaps of the packs travelling along the folding path, and a second folding device for pressing the flaps of each pack travelling along the forming path onto respective walls, as flaps cool.

[0012] In greater detail, the rotary conveyor comprises a plurality of angular-spaced forming devices, which grip the packs at the inlet station, and feeds the packs along the forming path to the output station.

[0013] Each forming device comprises two flat surfaces which face each other and cooperate, in use, respectively with a front wall and a rear wall of the main portion of the relative pack to be folded.

[0014] One problem that frequently occurs in known filling machine relates to the final forming and folding of the pack into a package. For various reasons, the top portion of the front wall of the package tends to bend inwardly, i.e. towards the inside of the package, and therefore to create a concave surface in the front wall of the finished package. Such an undesired shape is likely to complicate post-application of components, such as an opening device, to the top portion of the front wall.

Summary of the invention

[0015] It is an object of the present invention to mitigate, alleviate or eliminate one or more of the above-identified deficiencies in the art and disadvantages singly or in any combination and solve at least the above mentioned problem.

[0016] According to a first aspect of the invention, these and other objects are achieved in full, or at least in part, by a forming device for feeding along a forming path a pack which has at least one portion to be folded into a finished package. The forming device comprises a first surface and a second surface opposite to each other and adapted, in use, to cooperate respectively with a front wall and a rear wall opposite to each other of the pack to be folded. The first surface comprises an at least partially concave forming section adapted, in use, to cooperate with a top portion of the front wall of said pack, such that an inward deformation of the top portion of the front wall is prevented during forming of the pack.

[0017] In other words, the forming section is configured to allow the top portion of the front wall to expand out-

wardly into the forming section during forming of the pack without permanently deforming the pack. This will result in a planar final configuration of the top portion of the front wall. The top wall of the pack and a top portion of the front wall of the pack may thus be controlled to form a desired angle between each other to facilitate post-application of components to these surfaces. The post-application normally consist of attaching an opening device having a frame extending on two inclined planes to the package. Now, the opening device can be properly applied to the package since the angle between the above-mentioned planes will match the angle between the top wall and the front wall, particularly the top portion of the front wall, of the package. This way, the potential problem of leakage after first opening of the opening device will be eliminated.

[0018] By giving the forming section a suitable shape, depending on the circumstances, the final shape of the top portion of the front wall of the package can be controlled to match any potential post-application components and filling configurations. In order to be able to adapt the forming section to different types of packages and post-application components, the first surface may comprise a replaceable element incorporating the forming section.

[0019] Furthermore, the extent of the concave shape of the forming section may be varied by replacing one replaceable element with another. By changing the extent of the concave shape of the forming section, the angle between the top wall and the front wall of the package may be controlled. An increased extent of the concave shape will result in a larger angle between the top wall and front wall of the package, and the other way around.

[0020] In one embodiment, the replaceable element incorporating the forming section may be replaced with a replaceable element having a planar surface. In this case, the forming section will accordingly be planar, which is a suitable solution for some packages.

[0021] The forming device may further comprise a first body incorporating the first surface and a second body incorporating the second surface, wherein the first body and the second body, respectively, has a first end zone and a second end zone opposite to the first end zone. In one preferred embodiment of the invention, the first end zone may be connected to a driving element and incorporate the forming section.

[0022] According to a second aspect of the invention, the objects are achieved in full, or at least in part, by a folding unit for forming sealed packages of pourable food products. The folding unit comprises at least one forming device as described above, and at least one folding device interacting, in use, with the pack along the forming path and adapted to fold the at least one portion.

[0023] The folding unit may further comprise a heating device for heating, in use, unfolded flaps of said pack. The folding device is arranged downstream from the heating device along the path and comprises pressure

devices, for example a pair of pressure devices. The pressure devices are movable between an operative position in which pressing surfaces press the flaps of the pack onto relative walls of the pack to be folded, and a rest position in which the relative pressing surfaces are detached from the pack.

[0024] According to a third aspect of the invention, the objects are achieved in full, or at least in part, by a package for containing a food product formed by means of a forming device as described above and/or folded by means of a folding unit as described above.

[0025] The top portion of the front wall of the package may be adapted to receive an opening device.

[0026] According to a fourth aspect of the invention, the objects are achieved in full, or at least in part, by a method for forming a pack which has at least one portion to be folded into a finished package. The method comprises the step of constraining the pack between a first surface and a second surface of a forming device arranged opposite to each other and adapted, in use, to cooperate respectively with a front wall and a rear wall of the pack to be folded. The first surface comprises an at least partially concave forming section. The method further comprises the step of forming the pack by allowing a top portion of the front wall of the pack to expand outwardly into the forming section without permanently deforming the pack, and the step of folding the at least one portion of the pack into the finished package.

[0027] The top portion of the front wall of the pack, after the step of forming, is substantially planar.

[0028] The top portion of the front wall of the package may be adapted to receive an opening device.

[0029] Generally, all terms used in the claims are to be interpreted according to their ordinary meaning in the technical field, unless explicitly defined otherwise herein. All references to "a/an/the [element, device, component, means, step, etc.]" are to be interpreted openly as referring to at least one instance of the element, device, component, means, step, etc., unless explicitly stated otherwise.

Brief description of the drawings

[0030] The above objects, as well as additional objects, features and advantages of the present invention, will be more fully appreciated by reference to the following illustrative and non-limiting detailed description of preferred embodiments of the present invention, when taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a perspective view of a forming device for feeding a pack along a forming path to form a finished package according to a first aspect of one exemplary embodiment of the invention.

Fig. 2 is a side view of the forming device of Fig. 1 when holding and forming a pack into a package.

Fig. 3 is a side view of a folding unit for forming sealed packages of pourable food products according to a

second aspect of one exemplary embodiment of the invention.

Fig. 4 is a perspective view of a finished package according to a third aspect of one exemplary embodiment of the invention.

Detailed description of preferred embodiments of the invention

[0031] Fig. 1 and 2 illustrate a forming device 42 for feeding along a forming path B (Fig. 3) a pack which has at least one portion 6, to be folded into a finished package 2. The forming device 42 comprises a first surface 46a and a second surface 46b opposite to each other and is adapted, in use, to cooperate respectively with a front wall 15 and a rear wall 10 opposite to each other of said pack 3 to be folded. The first surface 46a comprises an at least partially concave forming section 8 adapted, in use, to cooperate with a top portion of the front wall 15 of the pack 3, such that an inward deformation of the top portion of the front wall 15 is prevented during forming of the pack 3.

[0032] The concave shape of the forming section 8 will allow the top portion of the front wall 15 to expand outwardly into the forming section 8 during forming of the pack 3 without permanently deforming the pack 3. This will result in a planar final configuration of the top portion of the front wall 15. By controlling the shape and size of the forming section 8, the top wall 17 of the pack 3 and the top portion of the front wall 15 of the pack 3 may be controlled to form a desired angle to facilitate post-application of components to these surfaces.

[0033] The forming device 42 has a driving element 20 that moves the forming device 42 in the forming path B. The pack 3 is formed into a corresponding package 2 while being advanced along the forming path B. In more detail, the forming device 42 has a first body 44a incorporating the first surface 46a and a second body 44b incorporating the second surface 46b. The forming section 8 of the first surface 46a is arranged adjacent to the portion of the first body 44a that is connected to the drive element 20 of the forming device 42.

[0034] The first surface 46a further comprises a replaceable element 9 which incorporates the forming section 8. This way, the forming section 8 can be given any suitable shape depending on the package 2 to be folded and finalized. That is, the final shape of the top portion of the front wall 15 of the pack 3 can be controlled to match any potential post-application components and filling configurations. In the present embodiment, the replaceable element 9 has been chosen to give the forming section 8 a concave shape while the shape of the second surface 46b is planar. The concave shape will allow the top portion of the front wall 15 of the pack 3 to expand outwardly into the forming section 8 during forming of the same.

[0035] The forming device 42 also comprises a first member 45a and a second member 45b. The first mem-

ber 45a and the second member 45b comprise, respectively, the first surface 46a and the second surface 46b which face each other.

[0036] The first surface 46a and the second surface 46b cooperate, respectively, with the front wall 15 and the rear walls 10 of relative pack 3, so as to hold pack 3 along the forming path B.

[0037] Specifically, the first surface 46a cooperates with the front wall 15 of pack 3 intended to form the front wall 15 of the folded package 2 and the surface 46b cooperates with the rear wall 10 of pack 3 intended to form the rear wall 10 of the folded package 2.

[0038] In detail, the first surface 46a is bounded by a rectilinear radial outer edge 50 and a rectilinear radial inner edge 51 which are opposite to each other, and by a pair of edges 52 (only one of which shown in Fig. 2) which are opposite to each other and extend between the radial outer edge 50 and the radial inner edge 51.

[0039] The second surface 46b is, in the embodiment shown, planar.

[0040] In the embodiment shown, the replaceable element 9 is distinct from the first member 45a and releasably connectable to the first member 45a. In this way, a replaceable element 9 provided with a forming section 8 having a certain shape may be replaced with another replaceable element provided with a forming section having a different shape.

[0041] In another embodiment, not shown, the forming section is obtained directly in the first member 45a.

[0042] Each forming device 42 further comprises a slanted element 48 projecting from the radial inner edge 51 of the first surface 46a of the member 45a towards the second surface 46b and extending transversally to the second surface 46b.

[0043] Each element 48 comprises a surface 49 extending from the first surface 46a towards the second surface 46b. The surface 49 cooperates with each pack 3 which is moved along the forming path B by the respective forming device 42.

[0044] Fig. 3 illustrates a folding unit 1 for forming sealed packages 2 of pourable food products. The folding unit 1 comprises a rotary conveyor 40 rotating around an axis C. The rotary conveyor 40 supports at least one forming device 42 as described above. In the embodiment shown, the rotary conveyor 40 supports a plurality of forming devices 42. The folding unit 1 further comprises at least one folding device 55, 65 interacting, in use, with the pack 3 along the forming path B and being adapted to fold the at least one portion 6.

[0045] A pressure device 66 of the folding device 65 is movable back and forth along an axis G radial to axis C between a work position, in which it presses the flaps of each pack 3 onto the walls of the pack 3, and a rest position, in which it is detached from the flaps.

[0046] Pressure elements 67 are movable back and forth between a work position, in which relative surfaces press respective flaps of each pack 3 onto respective walls, and a rest position, in which they are detached

from the flaps to permit travelling of pack 3 along path B.

[0047] The movement of the pressure elements 67 is synchronized in a not shown manner with the movement of the pressure device 66. When the pressure device 66 and the pressure elements 67 are in respective work positions, each pressure element 67 extends between the first surfaces 46a and the second surface 46b of the forming device 42 which is arranged at a station B5.

[0048] More specifically, the forming path B extends from a loading station B₁, where the conveyor 40 receives each pack 3 from an input conveyor 80, to an unloading station B₂, where the conveyor 40 unloads a relative package 2 onto an output conveyor.

[0049] From the loading station B₁ to the unloading station B₂, the forming path B also comprises a first portion, along which rails interact with each pack 3 to convert the pack 3 from a pillow configuration to a configuration in which the portions 6 are pressed towards each other to fold walls of portions 6, and to fold tabs onto respective walls, a station B₃ where an interacting surface interacts with each pack 3 to fold the flaps about fold lines, and a second portion, along which rails interact with each pack 3.

[0050] From the second portion to the unloading station B₂, the forming path B also comprises a station B₄ where a heating device 60 heats the flaps of each pack 3, preparatory to heat sealing them onto respective walls, a third portion, along which rails fold the flaps of each pack 3, the station B₅ where the pressure device 66 and the pressure elements 67 of the folding device 65 fold the flaps of each pack 3 onto relative walls, and a fourth portion terminating at the unloading station B₂, and along which rails keep the flaps pressed onto the walls to prevent accidental detachment of the flaps as they cool.

[0051] Fig. 4 illustrates a finished package 2 according to one exemplary embodiment of the invention. The package 2 has been provided with an opening device 14 after the final forming and folding of the same. In this case, the post-application consists of attaching the opening device 14 to the top wall 17 and the front wall 15 of the package 2. The opening device 14 has a frame extending along two inclined planes of the package 2, in particular a first portion 18 attached to the top wall 17 of the package 2 and a second portion 19 attached to the front wall 15 of the package 2. Here, the opening device 14 has been able to be properly attached to the package 2 since the angle between the two inclined planes, i.e. the angle between the first portion 18 and the second portion 19 matches the angle between the top wall 17 and the top portion of the front wall 15 of the package 2. This way, the potential problem of leakage will be eliminated.

[0052] It is understood that other variations in the present invention are contemplated and in some instances, some features of the invention can be employed without a corresponding use of other features. Accordingly, it is appropriate that the appended claims be construed broadly in a manner consistent with the scope of the in-

vention.

[0053] For instance, the at least partially concave forming section may be an at least partially curved forming section.

[0054] The present invention can be used in connection with any suitable type of filling machine and is not limited to the type of forming device 42 or folding unit 1 described above. One example is a filling machine having a final folding unit constituted by a continuous chain device. This type of final folding unit comprises an articulated chain looped about and meshing with gears, and supporting a number of plates, for example flat rectangular plates, each of which projects from the chain and cooperates with and pushes a pack 3 to feed it along a path. Here, the concave forming section 8 could be provided in connection with the plates in order to prevent an inward deformation of the top portion of the front wall during forming of the pack 3 into a finished package 2.

Claims

1. A forming device (42) for feeding along a forming path (B) a pack (3) which has at least one portion (6) to be folded into a finished package (2), said forming device (42) comprising
a first surface (46a) and a second surface (46b) opposite to each other and adapted, in use, to cooperate respectively with a front wall (15) and a rear wall (10) opposite to each other of said pack (3) to be folded,
wherein said first surface (46a) comprises an at least partially concave forming section (8) adapted, in use, to cooperate with a top portion of said front wall (15) of said pack (3), such that an inward deformation of said top portion of said front wall (15) is prevented during forming of the pack (3).
2. The forming device (42) according to claim 1, wherein said forming section (8) is configured to allow said top portion of said front wall (15) to expand outwardly into said forming section (8) during forming of said pack (3) without permanently deforming said pack (3).
3. The forming device (42) according to claim 1, or 2, and further comprising a first body (44a) incorporating the first surface (46a) and a second body (44b) incorporating the second surface (46b).
4. The forming device (42) according to claim 3, wherein each of said first body (44a) and said second body (44b) has a first end zone and a second end zone opposite to said first end zone.
5. The forming device (42) according to claim 4, wherein said first end zone of said first body (44a) is connected to a driving element (20) for driving said form-

ing device (42) along a forming path (B) and incorporates said forming section (8).

6. The forming device (42) according to any one of the preceding claims, wherein said first surface (46a) comprises a replaceable element (9) incorporating said forming section (8).
7. The forming device (42) according to claim 6, wherein said replaceable element (9) incorporating said forming section (8) may be replaced with another replaceable element incorporating another forming section having a shape different from the shape of said forming section (8).
8. The forming device (42) according to claim 7, wherein said another forming section is a planar surface.
9. A folding unit (1) for forming sealed packages (2) of pourable food products, comprising:
 - at least one forming device (42) according to any one of the claims 1 to 8, and at least one folding device (55, 65) interacting, in use, with said pack (3) along said forming path (B) and adapted to fold said at least one portion (6).
10. The folding unit according to claim 9, and further comprising a heating device (60) for heating, in use, unfolded flaps of said pack (3), wherein said at least one folding device (65) is arranged downstream from said heating device (60) along said forming path (B).
11. A package (2) for containing a food product formed by means of a forming device according to any one of claims 1 to 8 and/or folded by means of a folding unit according to claim 9, or 10.
12. The package (2) according to claim 11, wherein said top portion of said front wall (15) of said package (2) is adapted to receive an opening device.
13. A method for forming a pack (3) which has at least one portion (6) to be folded into a finished package (2), comprising the steps of
 - constraining said pack (3) between a first surface (46a) and a second surface (46a) of a forming device (42) arranged opposite to each other and adapted, in use, to cooperate respectively with a front wall (15) and a rear wall (10) of said pack (3) to be folded, said first surface (46a) comprising an at least partially concave forming section (8),
 - forming said pack (3) by allowing a top portion of said front wall (15) of said pack (3) to expand outwardly into said forming section (8) without permanently deforming said pack (3), and
 - folding said at least one portion (6) of said pack (3) to form said finished package (2).

14. The method according to claim 13, wherein said top portion of said front wall (15) of said pack (3), after the step of forming, is substantially planar.

- 5 15. The method according to claim 13, or 14, wherein said top portion of said front wall (15) of said package (2) is adapted to receive an opening device.

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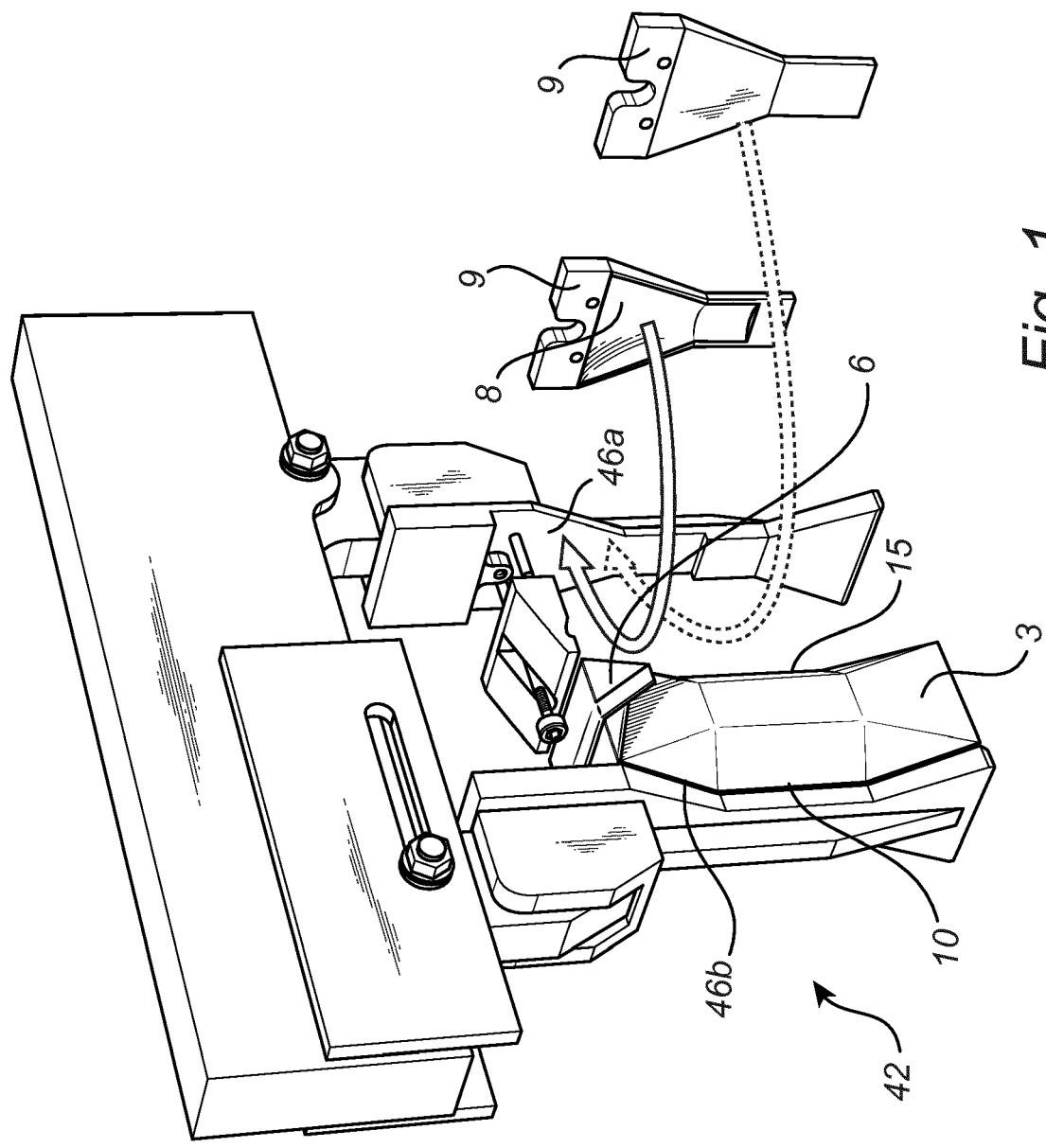
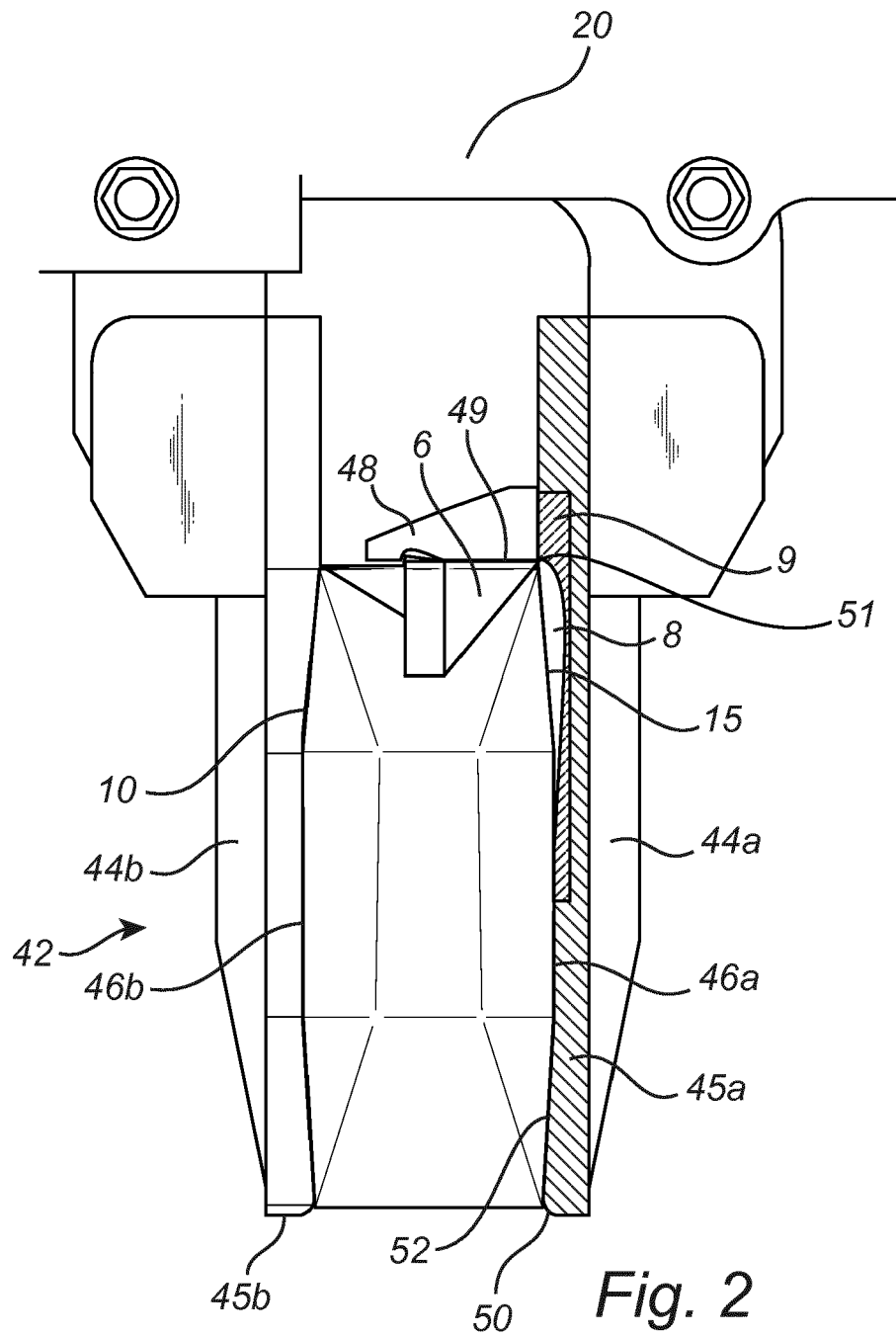
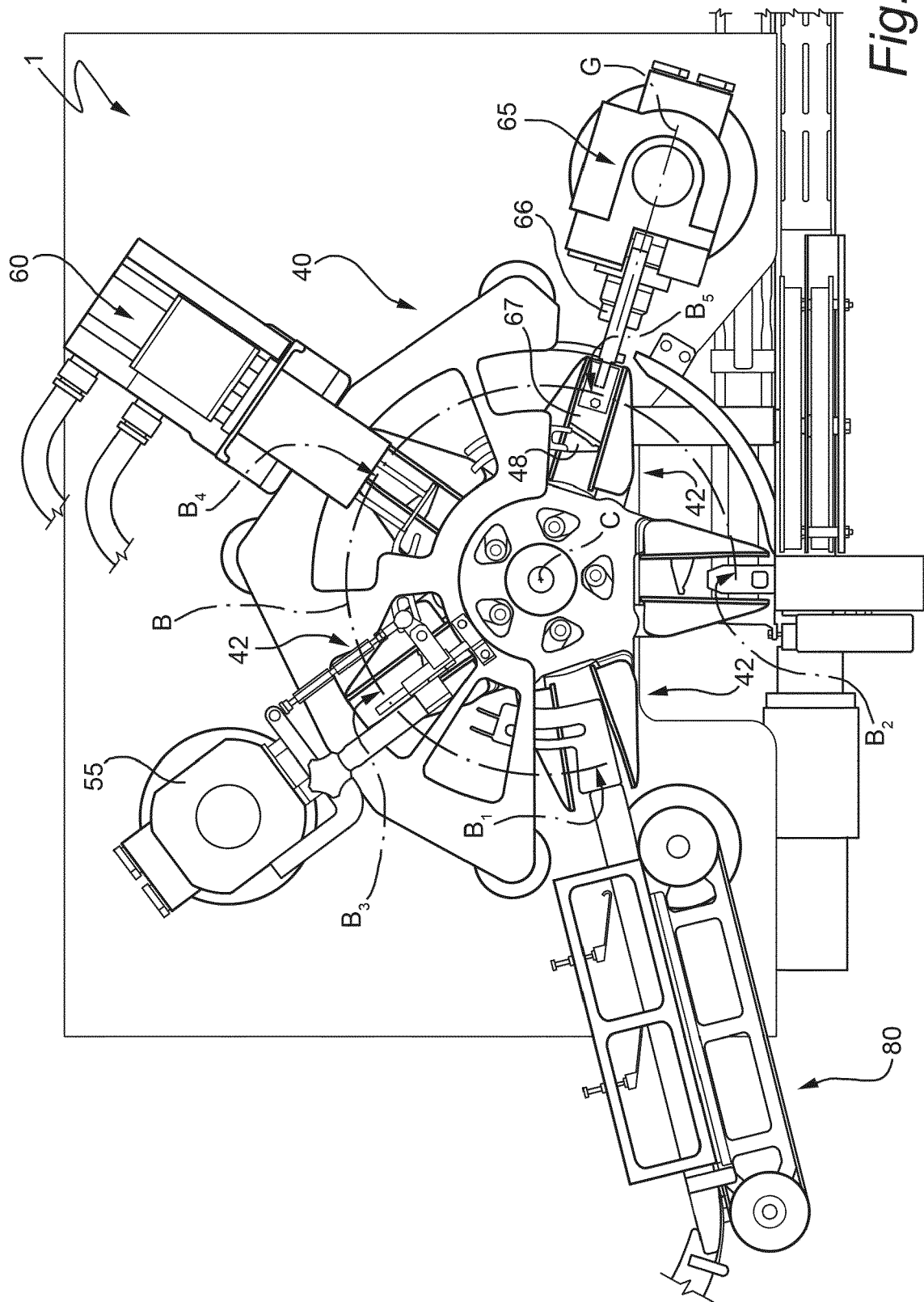


Fig. 1





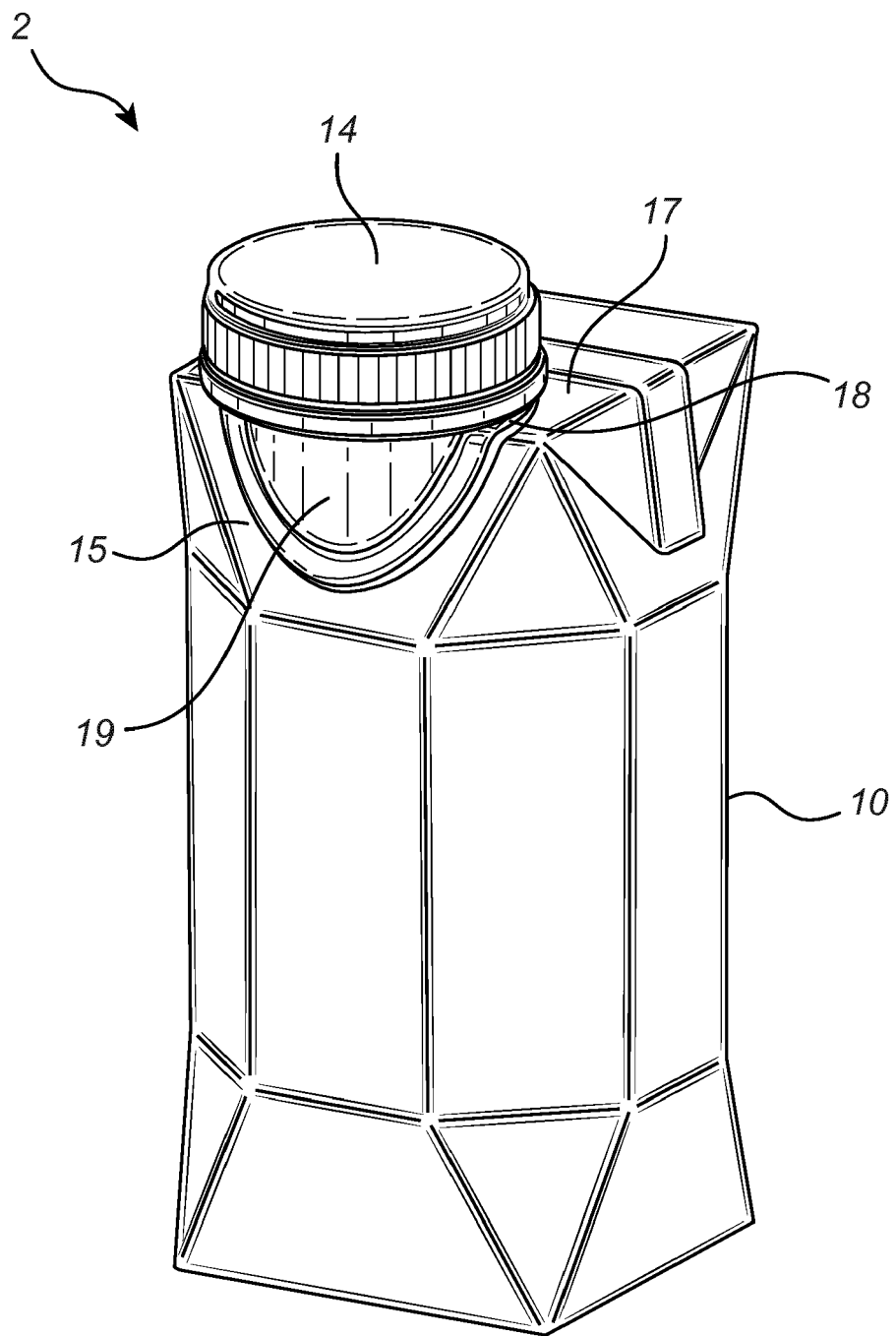


Fig. 4



EUROPEAN SEARCH REPORT

Application Number
EP 16 16 1232

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 8 September 2016	Examiner Schmitt, Michel
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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5 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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