(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 205 925 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
05.07.2023 Bulletin 2023/27

(21) Application number: **22213363.9**

(22) Date of filing: **14.12.2022**

(51) International Patent Classification (IPC):
B26D 1/00 *(2006.01)* ***B26D 7/02*** *(2006.01)*
B26D 3/00 *(2006.01)* ***B26D 7/26*** *(2006.01)*
B65B 9/10 *(2006.01)* ***B65D 5/70*** *(2006.01)*
B65D 75/58 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B26D 7/025; B26D 1/0006; B26D 3/00; B26D 7/2614; B65B 9/10; B26D 2001/0053; B26D 2001/006; B65D 75/5816

(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: **30.12.2021 EP 21218318**

(71) Applicant: **Tetra Laval Holdings & Finance S.A.**
1009 Pully (CH)

(72) Inventors:
- **HERMODSSON, Göran**
  221 86 Lund (SE)
- **MOSSBERG, Ulf**
  221 86 Lund (SE)
- **GULLBERG, Michael**
  221 86 Lund (SE)

(74) Representative: **Tetra Pak - Patent Attorneys SE**
AB Tetra Pak
Patent Department
Ruben Rausings gata
221 86 Lund (SE)

(54) A KNIFE, A FILLING MACHINE AND A METHOD FOR FILLING AND SEALING A PACKAGE

(57) A knife (200) for cutting through a body of packaging material at a transversal sealing area of the body. The knife (200) comprises a serrated edge (210) having a number of cutting teeth (211, 214) for cutting through the packaging material such that a first cut surface (112) and a second cut surface (218) of the packaging material (101) are formed. A first and a second blade surface (204, 206) extend from a respective side of the serrated edge (210) and the serrated cutting edge (210) comprises a notch-cutting tooth (212) arranged to cut out a notch (108) in the first cut surface (112).

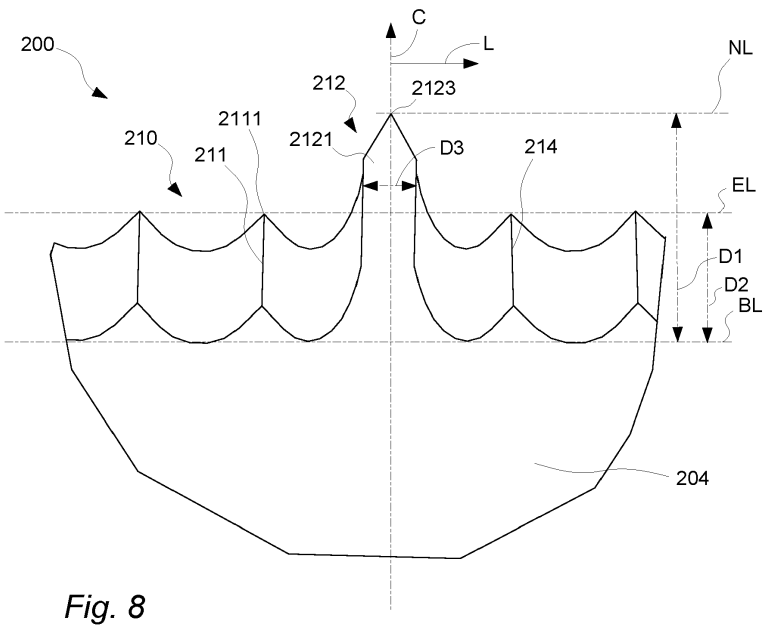

Fig. 8

EP 4 205 925 A1

Description

Technical Field

[0001] The invention relates to packaging technology. More particularly, it is related to a knife for cutting through packaging material, a filling machine comprising such knife and a method for filling and sealing a package.

Background Art

[0002] Roll-fed packaging machines are well known within the field of packaging, in particular in the field of liquid food packaging. A well-known example in the field of liquid food packaging is the filling machines, also referred to as packaging machines, introduced on the market in the 1940's by Tetra Pak®. In short, in these machines, today sold under the name Tetra Pak® A3, a reel of carton-based packaging material is received. Once docked to the filling machine, a web of packaging material is unwound from the reel. After being sterilized, e.g. by using hydrogen peroxide, the web is formed into a tube. While holding the tube vertical it is filled with food product, e.g. milk, via a product filling pipe extending into an interior of the tube from above. By continuously and transversally seal and cut off pieces from a lower end of the tube, packages filled with food product can be formed at an impressive speed.

[0003] During the years the roll-fed packaging machines have been used, various knives for cutting off the packages have been applied. Today it is known to use a knife with a serrated edge. It is also known to have an edge with a raised mid-portion of the edge. By having this raised mid-portion, the tube of packaging material is first cut in a mid-section of the tube and thereafter the two peripheral ends of the tube are cut. Using the serrated edge in combination with having the mid-portion raised is known to provide for reliable cutting.

[0004] All knives used for cutting have not been made for completely cutting off the packages. Knives for providing perforated pattern are also known. By using such knife, a number of packages connected to each other is provided, i.e. a string of packages can be formed. Consumers can thereafter tear off package by package from the string along the perforated patterns between the packages formed by the knife.

[0005] Even though different knives for cutting a tube of packaging material to create individual packages is known, there is a need to provide improved knives that offer even better or added functionality during the packaging or for the package itself.

Summary

[0006] It is an object of the invention to at least partly overcome one or more of the above-identified limitations of the prior art. In particular, it is an object to provide a knife that assists in providing a package that is easy to open for a consumer, but still can be produced cost-efficiently and in a food safe manner in a roll-fed packaging machine. Still an object is to present a knife that provides for that such package can be produced and that can be installed in existing filling machines.

[0007] According to a first aspect it is provided a knife for cutting through a body of packaging material at a transversal sealing area of the body. The knife comprises a serrated edge having a number of cutting teeth for cutting through the packaging material such that a first cut surface and a second cut surface of the packaging material are formed, a first and a second blade surface extending from a respective side of the serrated edge, and at least one attachment portion for fixing the knife to a cutting apparatus. The serrated cutting edge comprises a notch-cutting tooth arranged to cut out a notch in the first cut surface.

[0008] An advantage with having the notch-cutting tooth such that the notch in the first cut surface can be provided is that the notch facilitates the opening of the package for a consumer. More particularly, the notch provides a starting point for tearing the package open. Having the possibility to form this notch at the same time as two subsequent packages are separated, and not in a separate device, provides for costefficiency. From an environmental standpoint, since the notch can form part of an opening arrangement of a package not involving any plastic material, an advantage with the knife is that this provides for that opening arrangements with low carbon footprints can be achieved.

[0009] The notch-cutting tooth may be, as seen in a cutting direction of the knife, be longer than the cutting teeth. The notch-cutting tooth may be at least 25% longer than the than the cutting teeth. The notch-cutting tooth may be at least 1 mm longer than the cutting teeth.

[0010] The notch-cutting tooth may comprise a first tooth surface that is flush with the first blade surface and extends, in the cutting direction of the knife, beyond the tip of an adjacent cutting teeth.

[0011] By having the notch-cutting tooth arranged in this way provides for that a distinct notch can be formed in the first cut surface. Further, by having the knife arranged in this way less difference in length between the notch-cutting tooth and the cutting teeth, that is, the other teeth of the serrated edge, is needed to form the notch.

[0012] The notch-cutting tooth may comprise a second tooth surface that is flush with the second blade surface and extends, in the cutting direction of the knife, beyond the tip of an adjacent cutting teeth.

[0013] The first tooth surface that is flush with the first blade surface may extend, in the cutting direction of the knife, at least 1 mm beyond the tip of an adjacent cutting teeth.

[0014] The first tooth surface that is flush with the first blade surface may have a width D3, in a direction that is transverse to the cutting direction of the knife, that is at least 0,4 mm.

[0015] The notch-cutting tooth may comprise a front

edge that is slanted relative the cutting direction of the knife by an angle α within the range of 80°-100°.

[0016] The cutting teeth may be single-beveled, with the bevel located on the same side as the first blade surface.

[0017] The cutting teeth may comprise a respective front edge that is slanted relative the cutting direction of the knife by an angle that is within the range of 25°-65°.

[0018] All cutting teeth may have the same length, or have a respective length that deviates at most 10% from a mean value of the lengths of the cutting teeth.

[0019] The attachment portion may be arranged for fixing the knife to a cutting apparatus with the first blade surface upwards, such that it faces the uppermost cut surface of the first cut surface and a second cut surface of the packaging material.

[0020] According to a second aspect it is provided a filling machine for filling and sealing packages. The filling machine comprises a longitudinal sealing unit arranged to form a tube from a web of packaging material, a product filling pipe arranged to fill food product into the tube, and a cutting and sealing unit, comprising a cutting apparatus, arranged to transversally seal and cut the tube for forming individual packages filled with the food product. The cutting and sealing unit comprises a knife according to the first aspect.

[0021] The filling machine may further comprise a tube guiding unit arranged to guide the tube with respect to the knife such that a guiding line of the packaging material is aligned with the notch-cutting tooth of the knife.

[0022] An advantage with having the tube guiding unit is that the tube may be directed such that the notch, provided during cutting, is aligned with the guiding line provided in the packaging material before cutting, e.g. in a converting factory producing packaging material.

[0023] According to a third aspect it is provided a method for filling and sealing a package. The method comprises forming the tube from a web of packaging material, filling food product into the tube, and transversally sealing and cutting the tube for forming individual packages filled with the food product. The cutting comprises cutting the tube with a knife according to the first aspect.

[0024] The method may further comprise guiding the tube with respect to the knife such that a guiding line of the packaging material is aligned with the notch-cutting tooth of the knife.

[0025] As above, an advantage with having the tube guided with respect to the knife is that the tube may be directed such that the notch, provided during cutting, is aligned with the guiding line provided in the packaging material before cutting, e.g. in a converting factory producing packaging material.

[0026] Still other objectives, features, aspects and advantages of the invention will appear from the following detailed description as well as from the drawings.

Brief Description of the Drawings

[0027] Embodiments of the invention will now be described, by way of example, with reference to the accompanying schematic drawings, in which

Fig. 1 is a perspective view of an upper part of a package.

Fig. 2 is a cross-sectional view of a transversal sealing unit.

Fig. 3 is a perspective view of a knife and a tube before cutting.

Fig. 4 is a perspective view of the knife and the tube of Fig. 3 after cutting.

Fig. 5 is a perspective view of a knife.

Fig. 6 is a top view of the knife of Fig. 5.

Fig. 7 is a bottom view of the knife of Fig. 5.

Fig. 8 is an enlarged view of a notch-cutting tooth of the knife of Fig. 5.

Fig. 9 is a cross-sectional view along line A-A in Fig. 6, showing the notch-cutting tooth.

Fig. 10 is a cross-sectional view along line B-B in Fig. 6, showing a cutting teeth.

Fig. 11 is a schematic view of a filling machine.

Fig. 12 is a flowchart illustrating a method for filling and sealing the package.

Detailed Description

[0028] Fig. 1 illustrates an upper part of a package 100 by way of example. The package 100 can be a carton package, that is, a package made of a carton-based packaging material 101.

[0029] As illustrated, the package 100 comprises a top fin 102 and a main body 104 in which food product is held. Even though not illustrated, a bottom fin may be provided in a similar way in an opposite end of the package 100. In the top fin 102 there is a transversal sealing 106. The transversal sealing 106 may be achieved in different ways. For instance, by using so-called induction heating, a current may be induced in the packaging material 101 such that plastic layers of the packaging material are melted. By pressing the tube together horizontally, the melted plastic layers of the packaging material 101 can be formed into the transversal sealing 106.

[0030] Unlike known food packages, the package 100 illustrated in Fig. 1 is provided with a notch 108. A benefit with having the notch 108 is that this can facilitate the opening of the package 100. Put differently, the notch 108 provides for that a top edge of the top fin 102, also referred to as first cut surface 112, is split in two parts. This is advantageous in that when a consumer is grabbing one part of the top fin 102 with one hand and another part of top fin 102 with the other hand and the two parts are pulled apart, the notch 108 facilitates that the top fin 102 is torn where the notch 108 is located. By providing a notch 108 more controlled opening of the package 100 is achieved. In addition, by providing the notch 108, eld-

erly people or other persons with muscle constraint may be able to open the package 100 without the need for a pair of scissors or other tool.

[0031] In addition, to facilitate for the consumer, a guiding line 110 may be provided as a guide when tearing open the package 100, i.e. tearing the top fin 102 and part of the main body 104. The guiding line may be a line that has been printed on the package material, or may be a perforated line, a crease line or a line formed by a plastic material. When the guiding line 110 is a crease line or semi-perforated line it also acts as a weakening line. The weakening line may be provided by a number of perforations placed after one another in a carton layer of the packaging material 101. In addition to a carton layer, the packaging material 101 may comprise at least an inner plastic layer and an outer plastic layer between which the carton layer is laminated.

[0032] When producing the package 100 illustrated in Fig. 1, a transversal sealing unit, that is, a cutting and sealing unit 809, as illustrated in Fig. 2 and also in Fig. 11, may be used. As illustrated in Fig. 11, the transversal sealing unit 809 may be placed downstream a longitudinal sealing unit 804 in which a web of packaging material 101 is folded into a tube and provided with a longitudinal sealing such that the tube is formed.

[0033] By using the transversal sealing unit 809, the top fin 102 and the bottom fin may be formed at the same time. In the example illustrated, this is achieved by having a heat sealing unit 502, e.g. an inductor, placed on one side of a tube 201 of packaging material 101, also referred to as body of packaging material, and an anvil 504 placed on opposite side. The anvil 504 may be provided with two dollies 506a,b placed vertically apart. Between the two dollies 506a,b, room is provided for a cutting apparatus 500 comprising a knife 200. This knife 200 can be fed through a horizontal channel 510 of the anvil 504 in a cutting direction C through the tube 201 and into a groove 508 provided in the heat sealing unit 502. The cutting direction C is the direction that is transverse to the direction L along which an edge of the knife 200 extends. When the knife 200 has a serrated edge, then the cutting direction C is the direction that is transverse to the direction L along which the serrated edge extends. The cutting direction may then also be the direction along which the cutting teeth 211, 214 of the serrated edge extend. By using the knife 200, when the tube 201 has been sealed together in a transversal sealing area 207, the transversal sealing area 207 can be cut into two parts, thereby forming the top fin 102 of one package and the bottom fin of another package.

[0034] Even though exemplified herein as the transversal sealing unit, other types of cutting and sealing units 809 may also be used. In addition, even though explained above with respect to induction heat sealing, other types of sealing technology may also be used, e.g. ultrasonic sealing.

[0035] It is also possible to have separate devices for providing transversal sealings and for cutting. In case such approach is chosen, the cutting apparatus 500 comprising the knife 200 and a motor for moving this back and forth can be provided as a separate device downstream a transversal sealing device comprising the heat sealing unit 502, the anvil 504 and a motor for moving the two between a closed and an open state.

[0036] Fig. 3 illustrates a perspective view of the knife 200 and the tube 201 in isolation before cutting, that is, before the knife 200 divides the tube 201 in the transversal sealing area 207. The knife 200 may be seen as a cutting blade provided with a spine 203, facing away from the tube 201 during cutting, and a serrated edge 210 facing the tube 201 during cutting and extending in a longitudinal extension L perpendicular to the cutting direction C. During operation, i.e. when installed in the transversal sealing unit or other cutting apparatus 500, a first blade surface 204 may be facing upwards and a second blade surface 206 may be facing downwards. To assure that the knife 200 is securely fastened, attachment portions 208a,b, herein exemplified as holes, may be provided.

[0037] The serrated edge 210 has cutting teeth 211 and to provide for that the notch 108 can formed during the cutting, a notch-cutting tooth 212 is provided. As illustrated in Fig. 3 and more in detail in Fig. 8, the notch-cutting tooth 212 may be longer, as seen in the cutting direction C, than the cutting teeth 211.

[0038] Fig. 4 illustrates another perspective view of the knife 200 and the tube 201 in isolation, but after the cutting has been made. As illustrated, due to the notch-cutting tooth 212, the notch 108 can be formed in the package 100. In addition, a second cut surface 218, i.e. a bottom edge, is also formed. Even though the packages 100 are formed upside down in the example illustrated, it is also possible to form the packages upright.

[0039] By having the attachment portions 208a,b arranged to interact with the cutting apparatus 500, the knife 200 can be mounted securely such that a placement of the notch 108 in the first cut surface 112 can be controlled in detail. The attachment portions 208a,b, possibly in combination with a contour of the knife, may be arranged such that the knife 200 can only be mounted with the first blade surface 204 facing upwards, thereby reducing the risk that the notch 108 is incorrectly provided in the second cut surface 218, i.e. in the bottom fin of the package 100.

[0040] Fig. 5 illustrates the knife 200 in further detail. As illustrated, the notch-cutting tooth 212 can be longer than the cutting teeth 211, 214 of the serrated edge 210. The notch-cutting tooth 212 may be at least 25% longer that the cutting teeth 211, 214. In absolute numbers, a difference in length between the notch-cutting tooth 212 and the cutting teeth 211, 214 may be at least 1 mm.

[0041] As illustrated, the knife 200 may be single-beveled. Put differently, the cutting teeth 211, 214 may be single-beveled with a bevel placed on the first blade surface 204.

[0042] The cutting teeth 2111, 214 may be of equal

length, that is, all teeth but the notch-cutting tooth 212 of the serrated edge 210 may be of equal length. In case the cutting teeth 211 are not of equal length, they may all differ less than ±5% in length from a mean length of the cutting teeth 211, 214.

[0043] Fig. 6 illustrates the knife 200 seen from above with the first blade surface 204 facing upwards, that is, in accordance with how the knife is arranged in the transversal sealing unit 500 illustrated in Fig. 2. Fig. 7 on the other hand illustrates the knife 200 seen from below, showing the second blade surface 206.

[0044] Fig. 8 illustrates the notch-cutting tooth 212 and adjacent cutting teeth 211, 214 in further detail. The notch-cutting tooth 212 can comprise as first tooth surface 2121, which forms part of the first blade surface 204, or put differently is flush with the first blade surface 204. Further, the first tooth surface 2121 can be arranged to extend, in the cutting direction C, beyond a tip 2111 of an adjacent cutting tooth 211. The first tooth surface 2121 may extend at least 1 mm beyond the tip 2111 of the adjacent cutting tooth 211.

[0045] The notch-cutting tooth 212 can further comprise a second tooth surface 2122 (see Fig. 7 and Fig. 9) that forms part of the second blade surface 206, or put differently is flush the second blade surface 206. As illustrated, the cutting tooth 212 may have a length D1, measured from base line BL of the serrated edge 210 to a notch-cutting tooth tip line NL, and the adjacent cutting teeth 211, 214 may have a length D2, measured from the base line BL to an end line EL, i.e. a cutting teeth tip line. The length D1 of the cutting tooth 212 may, as illustrated, be greater than the length D2 of the cutting teeth 211, 214. Further, as illustrated, all cutting teeth 211, 214 may have the same length D2.

[0046] Further, the first tooth surface 2121 may have a width D3, in a direction L that is transverse to the cutting direction C, that is at least 0,4 mm.

[0047] Fig. 9 illustrates a cross-sectional view along the line A-A illustrated in Fig. 6. As illustrated, a front edge 2123 of the notch-cutting tooth 212 may be without bevel. The front edge 2123 may also be provided with a bevel, but less slanted than a bevel of the cutting teeth 211, 214 or a bevel on the second blade surface 206. The front edge 2123 may be slanted relative the cutting direction C by an angle α within the range 80° to 100°.

[0048] Fig. 10 illustrates a cross-sectional view of a cutting tooth that is similar to the cutting teeth 211, 214, seen along the line B-B illustrated in Fig. 6.

[0049] As illustrated, the cutting tooth may comprise a respective front edge 2113 that is slanted relative the cutting direction C by and angle β that is within the range of 25°-65°. The cutting teeth 211, 214 adjacent the notch-cutting tooth 212 may be slanted in the same way.

[0050] In Fig. 11 a filling machine 800 is illustrated. A web 802 of packaging material 101 can be provided, e. g. the web can be provided from a reel of packaging material. In a longitudinal sealing unit 804, the web 802 can be formed into the tube 201 by directing the web 802 and also continuously provide a longitudinal sealing, i.e. attaching the two longitudinal edges of the web together. By holding the tube 201 vertical it is made possible to fill it with food product 807 via a product filling pipe 806. From the longitudinal sealing unit 804, the tube 201 can be directed by a tube guiding unit 808 into the cutting and sealing apparatus 809, illustrated more in detail in Fig. 2.

[0051] In addition to the cutting apparatus 500, the heat sealing unit 502 and the anvil 504 illustrated in Fig. 2, the cutting and sealing apparatus 809, which also may be referred to as transversal sealing unit, may comprise one or several motors 810 arranged for moving the heat sealing unit 502 and the anvil 504 towards each other and away from each other during production of the packages 100. Before the sealing, the anvil 504 is moved in an anvil direction D-A, and the heat sealing unit 502 is moved in a sealing unit direction D-S, opposite to the anvil direction D-A. In line with the other examples presented herein, the packages 100 are produced upside down with the first cut surface 112, in which the notch 108 is proved, facing downwards and the second cut surface 218 facing upwards.

[0052] Fig. 12 is a flowchart illustrating a method 900 for filling and sealing the package 100. In a first step 902, the tube 201 can be formed from the web of packaging material 101. In a second step 904, the food product 807 can be filled into the tube 201. In a third step 906 and fourth step 908, the packages 100 can be formed by transversally sealing the tube 201 and thereafter cutting the tube 201 into the packages 100. For cutting, the knife 200 described above can be used.

[0053] Optionally, in a fifth step 910, the tube 201 can be guided with respect to the knife 200 such that the guiding line 110 of the packaging material 101 is aligned with the notch-cutting tooth 112 of the knife 200, thereby providing for that the notch 108 of the first cut surface 112 is aligned with the guiding line 110.

[0054] From the description above follows that, although various embodiments of the invention have been described and shown, the invention is not restricted thereto, but may also be embodied in other ways within the scope of the subject-matter defined in the following claims.

Claims

1. A knife (200) for cutting through a body (201) of packaging material (101) at a transversal sealing area (207) of the body (201), the knife (100) comprising

   a serrated edge (210) having a number of cutting teeth (211, 214) for cutting through the packaging material (101) such that a first cut surface (112) and a second cut surface (218) of the packaging material (101) are formed,
   a first and a second blade surface (204, 206) extending from a respective side of the serrated

edge (210), and
at least one attachment portion (208a, 208b) for fixing the knife (200) to a cutting apparatus (500), **wherein**
the serrated cutting edge (210) comprises a notch-cutting tooth (212) arranged to cut out a notch (108) in the first cut surface (112).

2. The knife (200) according to claim 1, wherein the notch-cutting tooth (212) is longer than the cutting teeth (211).

3. The knife (200) according to any preceding claim, wherein the notch-cutting tooth (212) is at least 25% longer than the than the cutting teeth (211).

4. The knife (200) according to any preceding claim, wherein the notch-cutting tooth (212) is at least 1 mm longer than the cutting teeth (211).

5. The knife (200) according to any preceding claim, wherein the notch-cutting tooth (212) comprises a first tooth surface (2121) that is flush with the first blade surface (204) and extends, in the cutting direction (C) of the knife (200), beyond the tip (2111) of an adjacent cutting teeth (211)

6. The knife (200) according to claim 5, wherein the notch-cutting tooth (212) comprises a second tooth surface (2122) that is flush with the second blade surface (206) and extends, in the cutting direction (C) of the knife (200), beyond the tip (2111) of an adjacent cutting teeth (211).

7. The knife (200) according to claim 5 or 6, wherein the first tooth surface (2121) that is flush with the first blade surface (204) extends, in the cutting direction (C) of the knife (200), at least 1 mm beyond the tip (2111) of an adjacent cutting teeth (211).

8. The knife (200) according to any of claim 5 - 7, wherein the first tooth surface (2121) that is flush with the first blade surface (204) has a width (D3), in a direction (L) that is transverse to the cutting direction (C) of the knife (200), that is at least 0,4 mm.

9. The knife (200) according to any preceding claim, wherein the cutting teeth (211) are single-beveled, with the bevel located on the same side as the first blade surface (204).

10. The knife (200) according to any preceding claim, wherein all cutting teeth (211) have the same length (D2), or have a respective length (D2) that deviates at most 10% from a mean value of the lengths of the cutting teeth (211).

11. The knife (200) according to any preceding claim, wherein the attachment portion (208a, 208b) is arranged for fixing the knife (200) to a cutting apparatus (500) with the first blade surface (204) upwards, such that it faces the uppermost cut surface (112) of the first cut surface (112) and a second cut surface (218) of the packaging material (101).

12. A filling machine (800) for filling and sealing packages (100), the filling machine (800) comprising

a longitudinal sealing unit (804) arranged to form a tube (201) from a web of packaging material (101),
a product filling pipe (806) arranged to fill food product (807) into the tube (201), and
a cutting and sealing unit (809), comprising a cutting apparatus (500), arranged to transversally seal and cut the tube (201) for forming individual packages (100) filled with the food product (807), wherein the cutting and sealing unit (809) comprises
a knife (200) according to any preceding claim.

13. The filling machine according to claim 12, comprising a tube guiding unit (808) arranged to guide the tube (101) with respect to the knife (200) such that a guiding line (110) of the packaging material (201) is aligned with the notch-cutting tooth (212) of the knife (200).

14. A method (900) for filling and sealing a package (100), said method comprising

forming (902) a tube (201) from a web of packaging material (101),
filling (904) food product (807) into the tube (201), and
transversally sealing (906) and cutting (908) the tube (201) for forming individual packages (100) filled with the food product (807), wherein the cutting (908) comprises cutting the tube (201) with
a knife (200) according to any one of claims 1-13.

15. The method according to claim 14, comprising
guiding (910) the tube (201) with respect to the knife (200) such that a guiding line (110) of the packaging material (101) is aligned with the notch-cutting tooth (212) of the knife (200).

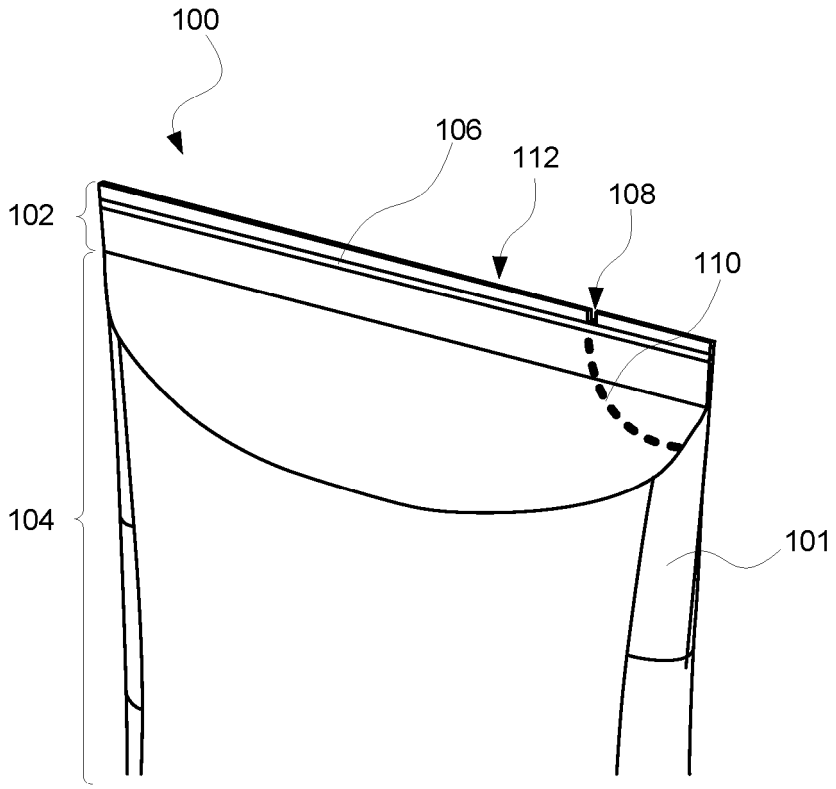
100
106
112
108
110
102
104
101

Fig. 1

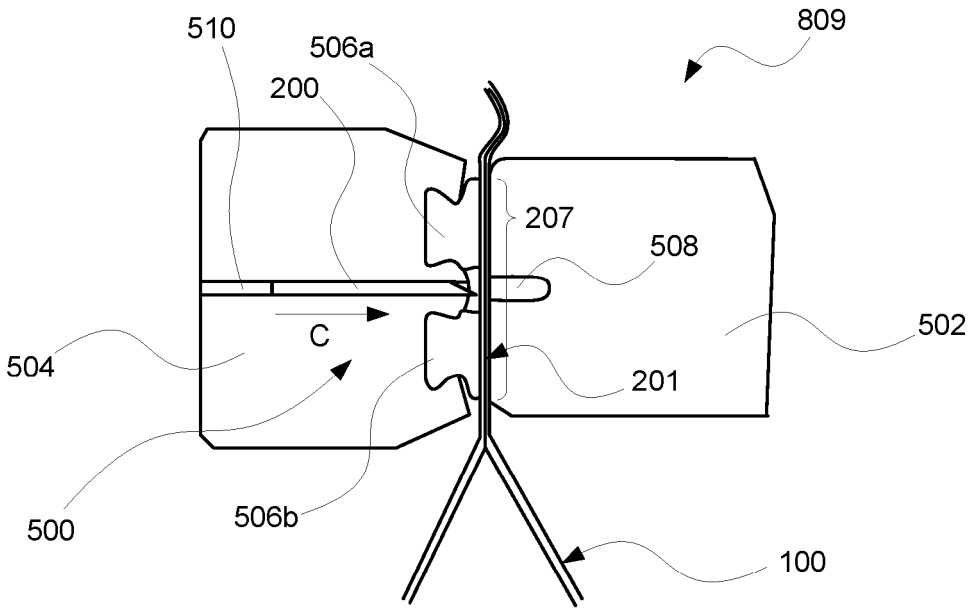
510
506a
200
809
207
508
502
C
504
201
500
506b
100

Fig. 2

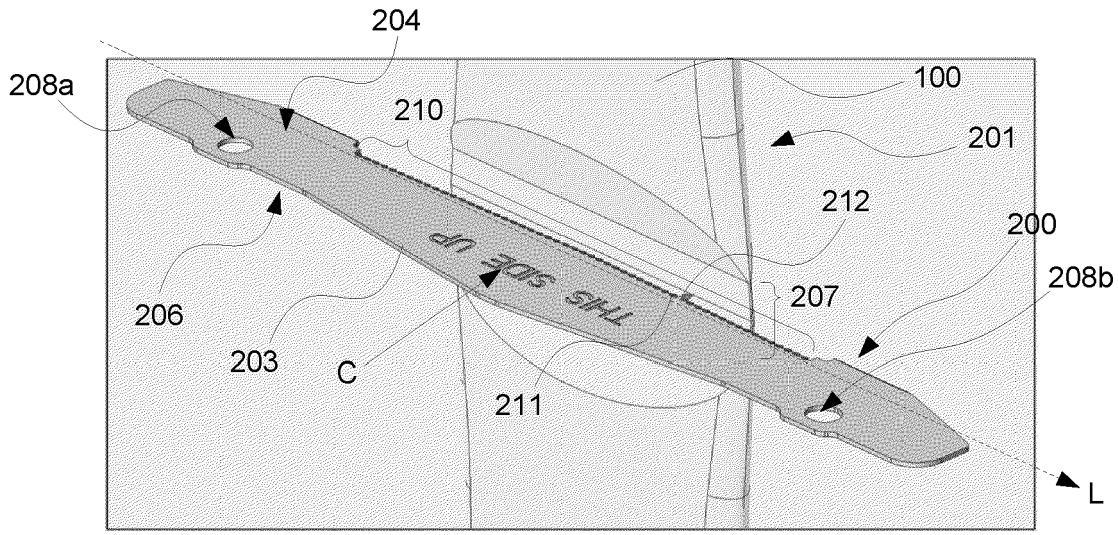
204
208a
210
100
201
212
200
208b
207
206
203
C
211
L
THIS SIDE UP

Fig. 3

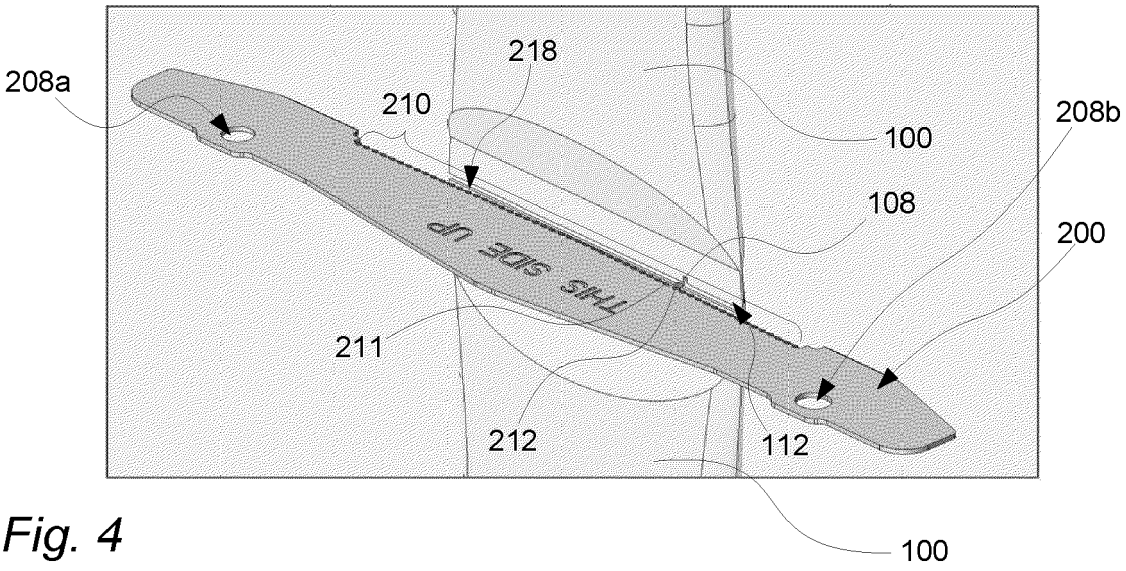
218
208a
210
208b
100
108
200
211
212
112
100
THIS SIDE UP

Fig. 4

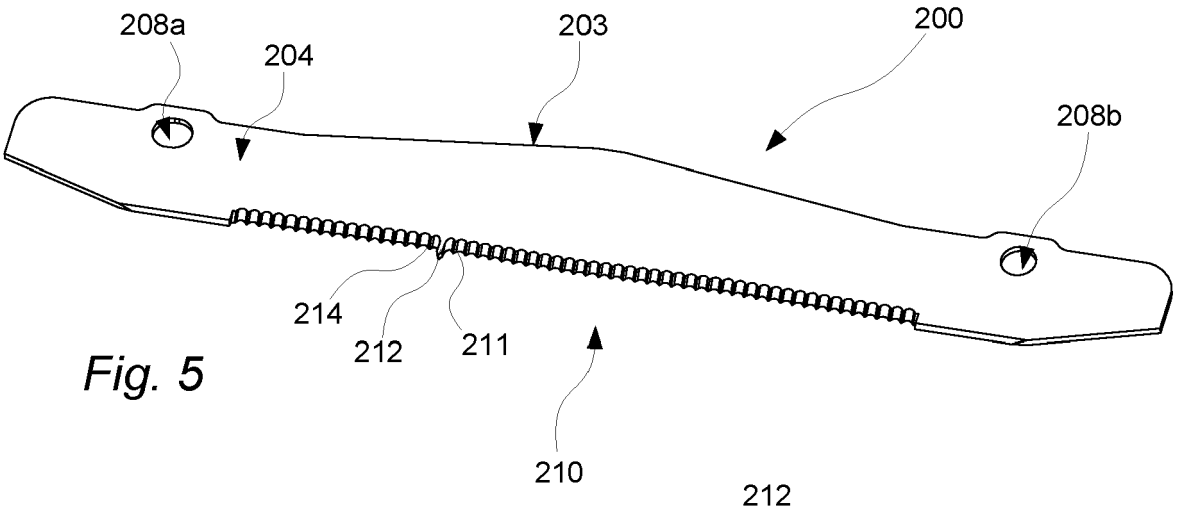

Fig. 5

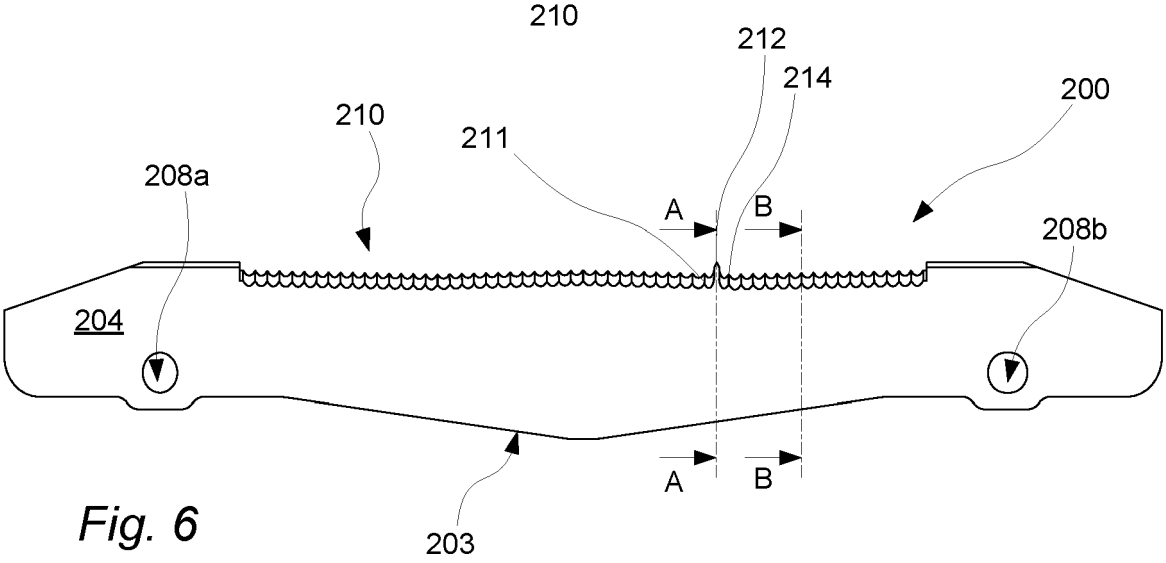

Fig. 6

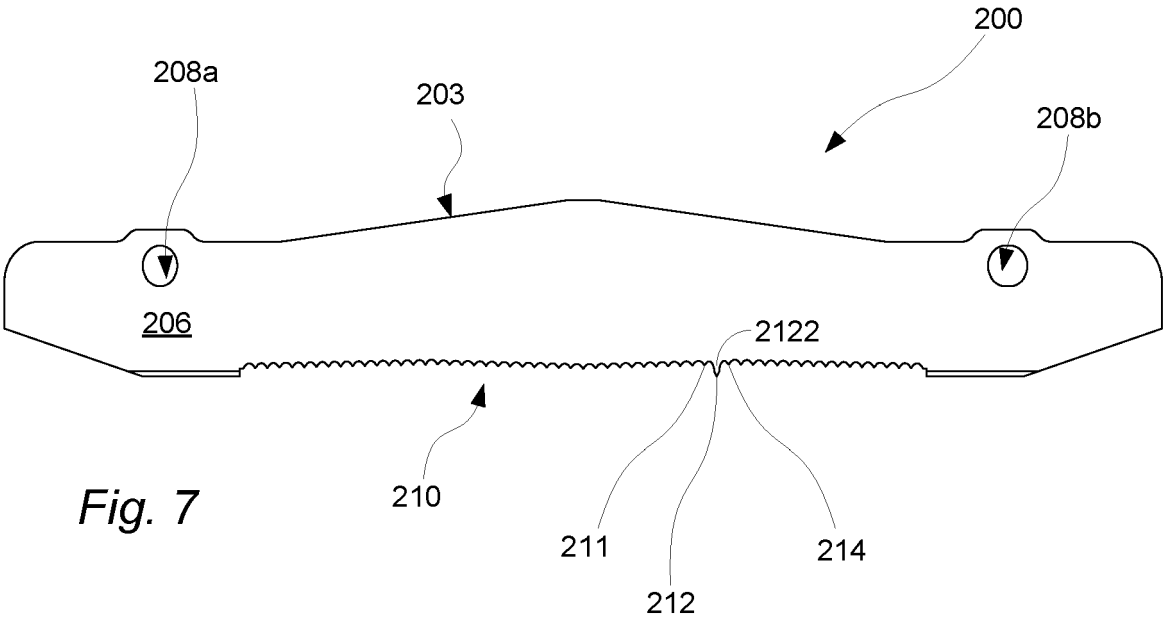

Fig. 7

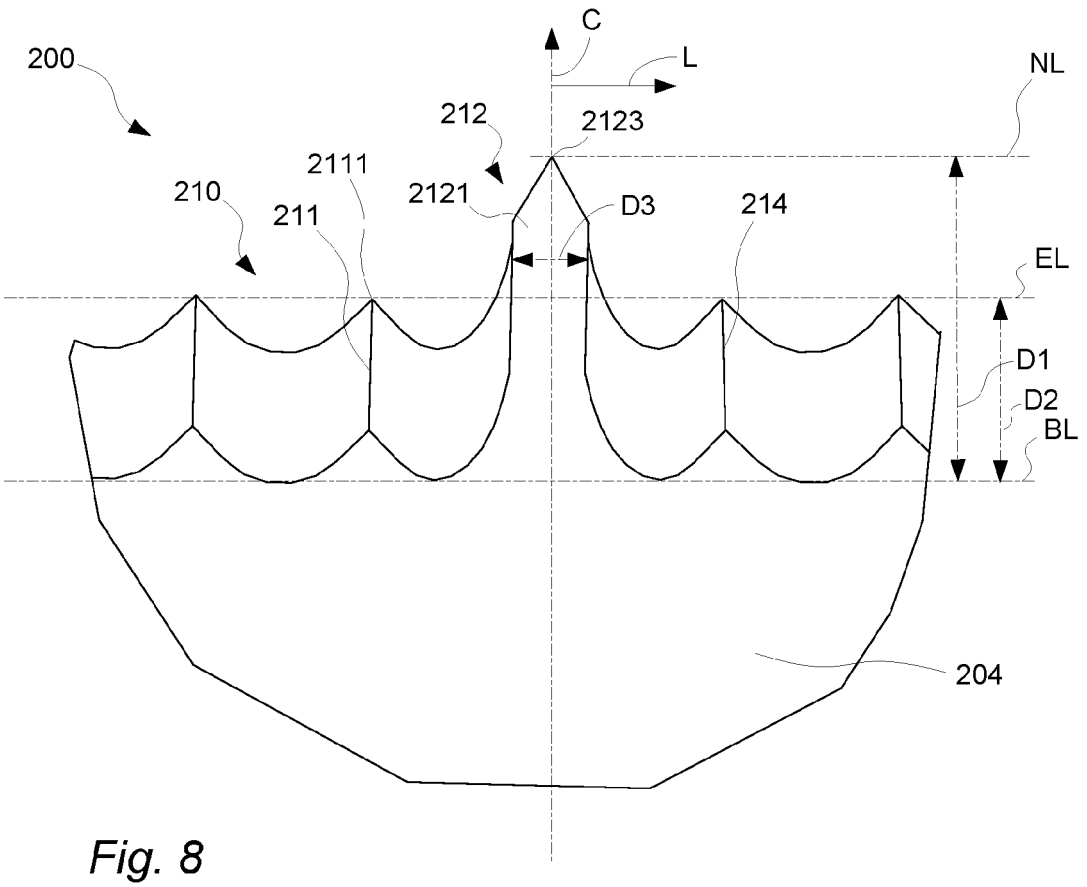

Fig. 8

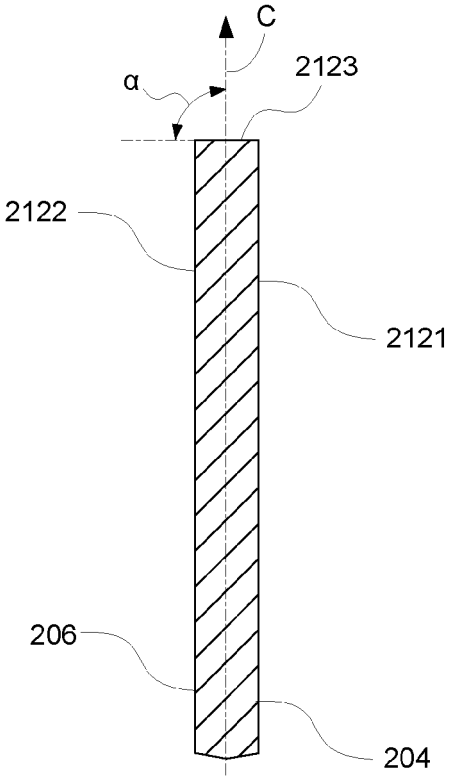

Fig. 9 (A-A)

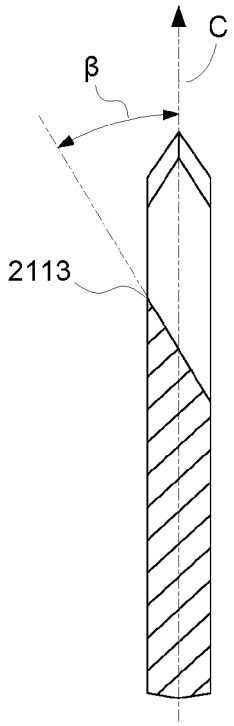

Fig. 10 (B-B)

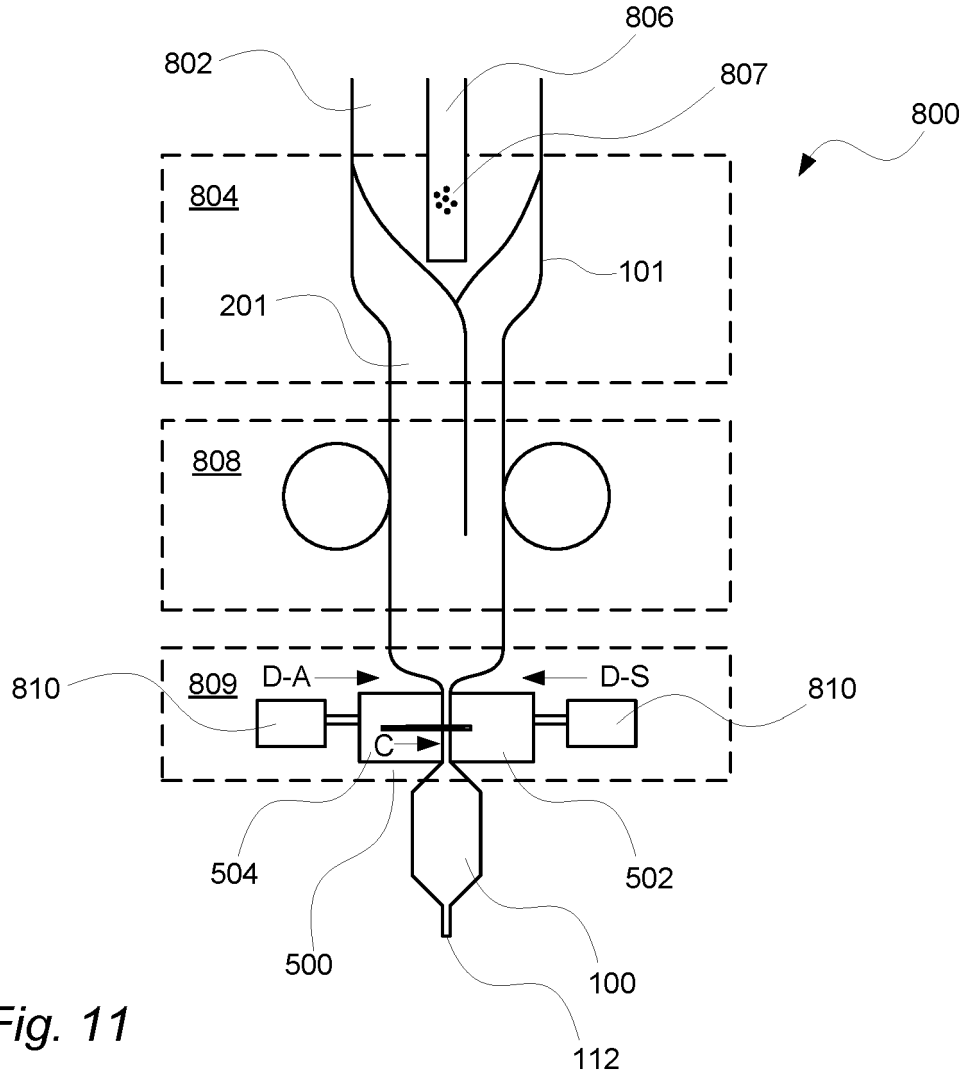
806
802
807
800
804
101
201
808
809
D-A
D-S
810
810
C
504
502
500
100
112

Fig. 11

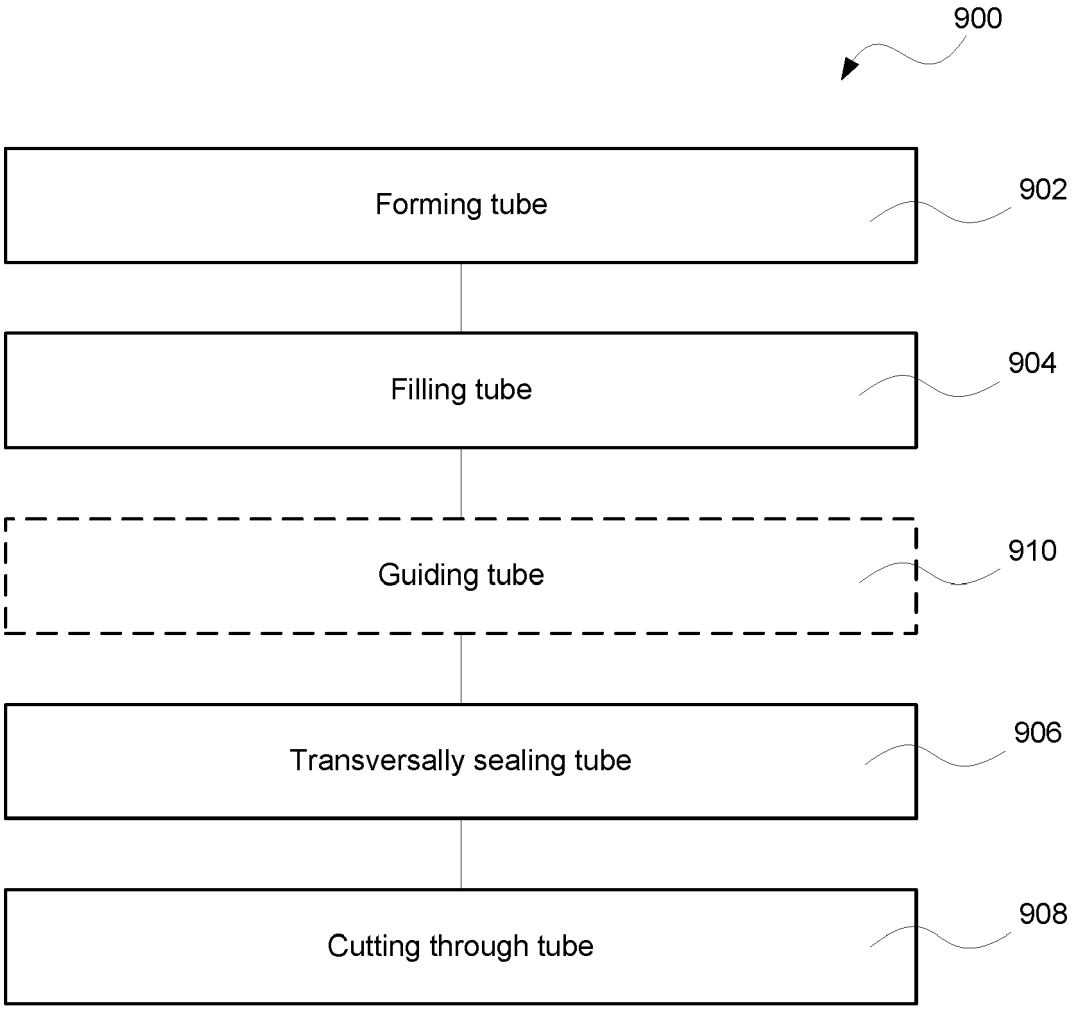
900
Forming tube
902
Filling tube
904
Guiding tube
910
Transversally sealing tube
906
Cutting through tube
908

Fig. 12

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 22 21 3363

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y A	US 5 934 048 A (BOURESSA DONALD L [US]) 10 August 1999 (1999-08-10) * column 4, line 33 - column 6, line 67; figures 1-11 *	1,10,11 9,12-15 2-8	INV. B26D1/00 B26D7/02 B26D3/00 B26D7/26
Y A	WO 2015/028198 A1 (TETRA LAVAL HOLDINGS & FINANCE [CH]) 5 March 2015 (2015-03-05) * page 3 - page 6; figures 1-10 *	9,12-15 1	B65B9/10 B65D5/70 B65D75/58
A	WO 2015/086209 A1 (TETRA LAVAL HOLDINGS & FINANCE [CH]) 18 June 2015 (2015-06-18) * page 2, line 35 - page 4, line 26; figures 1-6 *	1,12	

TECHNICAL FIELDS SEARCHED (IPC)

B26D
B65B
B65D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 March 2023	Maier, Michael

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 21 3363

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

24-03-2023

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5934048 A	10-08-1999	NONE	
WO 2015028198 A1	05-03-2015	CN 105492173 A	13-04-2016
		EP 3038801 A1	06-07-2016
		JP 6673830 B2	25-03-2020
		JP 2016533978 A	04-11-2016
		US 2016207654 A1	21-07-2016
		WO 2015028198 A1	05-03-2015
WO 2015086209 A1	18-06-2015	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82