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(54) **A DRINKING STRAW STRUCTURE, A SEALING DEVICE FOR FORMING THE DRINKING STRAW STRUCTURE AND A LIQUID FOOD PACKAGE**

(57) A drinking straw structure (100) is disclosed. The drinking straw structure (200) comprising: a U-shaped drinking straw (220) comprising a first portion (221), a second portion (222) and a bending portion (223), wherein the first and second portions (221, 222) are connected via the bending portion (223), and a drinking straw wrap (240) enclosing the U-shaped drinking straw (220), wherein the first and second portions (221, 222) of the U-shaped drinking straw (220) extend substantially parallel along a longitudinal axis (LA) of the drinking straw structure (200), the drinking straw wrap (240) comprising: a main seal (241) being arranged along a circumference of the drinking straw wrap (240) thereby forming a first unsealed area (242) of the drinking straw wrap (240), and a longitudinal seal (243) extending in a longitudinal direction (LD) of the drinking straw structure (200) from the main seal (241) at a first edge (247) of the drinking straw wrap (240) along a longitudinal seal length (LSL).

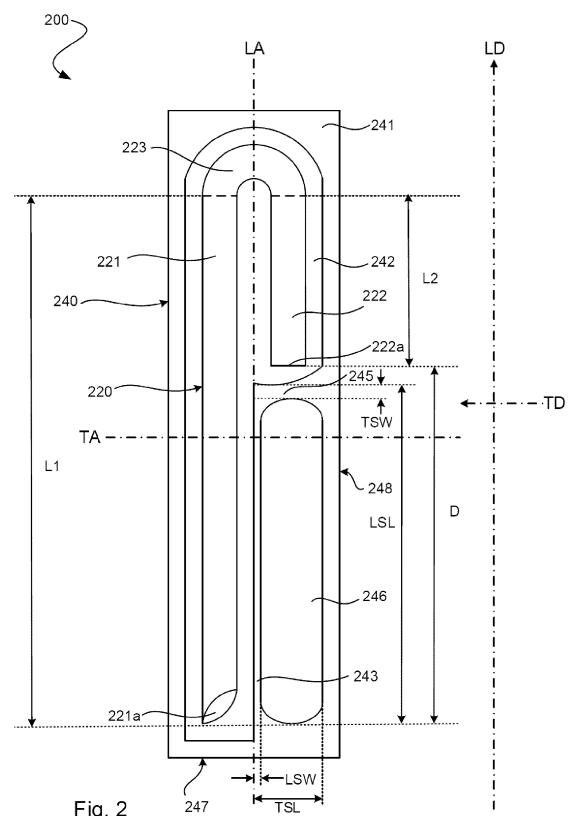


Fig. 2

Description

Technical Field

[0001] The invention generally relates to a drinking straw structure. More particularly, it is related to a drinking straw structure comprising a drinking straw and a drinking straw wrap. The invention also relates to a sealing device for forming the drinking straw structure. The invention also relates to a method for forming the drinking straw structure. The invention also relates to a liquid food package comprising the drinking straw structure.

Background Art

[0002] Liquid food packages holding drinkable food products and having a drinking straw attached to an outside surface of the liquid food package are well-known in the art. The straw is usually wrapped in an auxiliary package which is adhered to the liquid food package. When the straw is intended to be used, the auxiliary package should be torn and the straw is taken out, preferably pushed out from the auxiliary package.

[0003] Even though liquid food packages with adhered drinking straws have been used by consumers for decades, there is room for improvement. For instance, a challenge with today's liquid food packages with drinking straws is that the auxiliary package with the drinking straw is easily removed from the liquid food package and there is a risk of losing the auxiliary package with the straw before using the drinking straw or when the drinking straw is taken out from the auxiliary package. Thereby the auxiliary package may end up in the environment as a litter, especially when the auxiliary package is made from synthetic materials like plastic films. A further challenge is, especially when the drinking straw is a U-shaped drinking straw, that when the drinking straw is being pushed out from the auxiliary package, it generates high forces to the auxiliary package which may provide for that the auxiliary package may be unintentionally removed from the liquid food package. A yet further challenge is, also especially when the drinking straw is a U-shaped drinking straw, the drinking straw may be squeezed and/or damaged when the drinking straw is being pushed out from the auxiliary package. For example, it is due to guiding two distal ends of the U-straw into the same narrow exit channel and the same exit point on the wrap by sealed area.

[0004] For these reasons, there is a demand for a drinking straw and an auxiliary package that are capable of being separated from each other with a reduced risk of losing the auxiliary package and to being able to push the drinking straw out from the auxiliary package with a reduced risk of damaging the drinking straw.

Summary

[0005] It is an object of the disclosure to provide a drink-

ing straw structure including a drinking straw and an auxiliary package in form of a drinking straw wrap that are capable of being separated from each other without the risk, or at least with a reduced risk, of losing the drinking straw wrap from the liquid food package.

[0006] Another object is to provide a drinking straw structure in which the drinking straw is capable to be pushed out from the drinking straw wrap without the risk, or at least with a reduced risk, of damaging the drinking straw.

[0007] Another object is to provide a drinking straw structure which is environmentally friendly.

[0008] Another object is to provide a cost-efficient drinking straw structure.

[0009] According to a first aspect it is provided a drinking straw structure for a liquid food package holding a drinkable food product, the drinking straw structure comprising: a U-shaped drinking straw comprising a first portion, a second portion and a bending portion, wherein the first and second portions are connected via the bending portion, and a drinking straw wrap enclosing the U-shaped drinking straw, wherein the first and second portions of the U-shaped drinking straw extend substantially parallel along a longitudinal axis of the drinking straw structure, the drinking straw wrap comprising: a main seal being arranged along a circumference of the drinking straw wrap thereby forming a first unsealed area of the drinking straw wrap, and a longitudinal seal extending in a longitudinal direction of the drinking straw structure from the main seal at a first edge of the drinking straw wrap along a longitudinal seal length (LSL).

[0010] The U-shaped drinking straw is herein also referred to as a straw. The drinking straw wrap is herein also referred to as a wrap. The straw is preferably used for drinking a drinkable food product held in the liquid food package in an easy way.

[0011] The drinking straw structure may also be referred to as a drinking straw assembly, a drinking straw unit, a drinking straw arrangement etc. Thus, it should be understood that the drinking straw structure comprises the straw and the wrap which together form one unit, which in turn may be attached to an outside surface of the liquid food package. The drinking straw structure may preferably be adhered to the outside surface of a liquid food package.

[0012] The bending portion of the straw may be formed as a corrugated portion and/or an extendable portion. Thereby, the length of the bending portion may be adjustable and thus also the length of the straw. The bending portion is preferably U-shaped when the straw is arranged in the wrap. The straw is preferably arranged in the first unsealed area formed by the main seal arranged along the circumference of the wrap. The unsealed area may be formed as a cavity in which the straw is arranged. In this context, the term "the first and second portions of the straw are substantially parallel" should be interpreted as the portions having a main component along the longitudinal axis of the drinking straw structure such that the

portions are arranged substantially parallel.

[0013] The wrap may be formed by two films which are sealed to each other by the main seal and the longitudinal seal and thereby also forming the unsealed area in which the straw is arranged. Preferably, the wrap is assumed as roughly a rectangle and hence also the first unsealed area. However, it should be noted that other shapes may be used as well. The longitudinal seal is configured to seal the two films along the longitudinal seal. Preferably, the main seal and the longitudinal seal are sealed by heat sealing. Other sealing techniques such as ultrasonic welding may be used to advantage.

[0014] The longitudinal seal is preferably arranged as extending inside of the first unsealed area as having sections of the first unsealed area on its both sides. The longitudinal seal is preferably centrally arranged of the wrap seen along a transverse direction such that, when the straw is pushed out from the wrap, the first portion and the second portion being arranged on opposite sides of the longitudinal seal. By directing the first and second portions on opposite sides of the longitudinal seal provides for that the first and second portions are pushed out from the wrap at different positions along the first edge of the wrap. Thereby, the forces provided on the wrap when the straw being pushed out from the wrap is divided along the first edge of the wrap. Thus, the forces being divided along the main seal of the first edge of the wrap. This is advantageous in that it enables for, when the drinking straw structure is adhered to the liquid food package, that the straw may be able to be pushed out from the wrap in an easy and efficient way with a reduced risk of losing the wrap from the liquid food package before, during, and after the straw is pushed out from the wrap. This is further advantageous in that the wrap may be discharged with the liquid food package with a reduced risk of losing the wrap that may end up in the environment, especially when the wrap is made from synthetic materials like plastic films. Thus, the drinking straw structure is advantageous in that it may enable a reduced risk of littering.

[0015] In addition, by being able to push out the straw from the wrap by arranging the first portion and the second portion of the straw on opposite sides of the longitudinal seal, the risk of damaging the straw when pushing it out from the wrap due to guiding both portions of the straw toward the same side of the longitudinal seal, meaning into the same exit route and exit point similar to the prior art may be reduced. In addition, by reducing the forces applied to the seal, the wrap may be kept to the liquid food package in an easier way.

[0016] The longitudinal seal is further advantageous in that it allows for the straw to be kept in a desired way when pushing it out from the wrap. Thus, the position of the straw when pushing it out from the wrap is controllable in an easy and efficient way due to the longitudinal seal.

[0017] Thus, the drinking straw structure provides an improved drinking straw structure compared to conventional drinking straw structures.

[0018] The first portion of the U-shaped drinking straw may be longer than the second portion of the U-shaped drinking straw thereby a distal end of the first portion may be arranged further away from the bending portion than a distal end of the second portion. Thus, the distal end of the first portion may contact and tear the main seal earlier than the distal end of the second portion, so dividing the force needed to tear the main seal and to take the straw out of the wrap may facilitate to take the straw out the wrap without causing the separation of the wrap from the liquid food package.

[0019] The first portion of the straw is preferably inserted into the liquid food package before drinking the liquid food product held in the liquid food package. The distal end of the first portion may be a cut tip. The cut tip may be cut and shaped to have a sharp edge. The cut tip may be able to tear a weakened area of the liquid food package and break the liquid food package material. The weakened area is usually a hole laminated with thin layers of materials, such as polymer and aluminum or other barrier materials. The cut tip may be obtained by cutting one end of the straw along a hypothetical line angled compared to the longitudinal axis thereby forming a tip angle.

[0020] The distal end of the second portion may be a suction tip from which the consumer may drink the drinkable food product contained in the liquid food package.

[0021] The longitudinal seal may have a longitudinal seal width of 1-3 mm as seen along a transverse axis being transverse to the longitudinal axis. This is advantageous in that it allows for a stable seal which is both easy to open as well as being robust.

[0022] The longitudinal seal may have a longitudinal seal length of 10-100 mm as seen along the longitudinal axis. This is advantageous in that it allows for a stable seal which is both easy to open as well as being robust.

[0023] The longitudinal seal length may be shorter than a distance between the respective distal ends of the first and second portions of the U-shaped drinking straw seen along the longitudinal axis. This is advantageous in that it allows for that the distal end of the first portion of the straw may break or penetrate a portion of the main seal of the wrap without being influenced by the longitudinal seal, for instance by avoiding the contact of the longitudinal seal to the bending portion and/or the second portion.

[0024] The drinking straw wrap may further comprise a transverse seal extending in a transverse direction of the drinking straw structure from the main seal at a second edge of the drinking straw wrap.

[0025] This is advantageous in that it allows for the straw to be pushed out from the wrap in an easy way providing lower forces compared to conventional solutions. By having both the transverse seal and the longitudinal seal, the forces provided on the wrap when pushing out the straw from the wrap are divided at different seals, i.e., the main seal and the transverse seal, of the wrap.

[0026] Preferably, when the straw is being pushed out from the wrap, the distal end of the first portion of the straw breaks a portion of the main seal at the first edge of the wrap and the distal end of the second portion breaks a portion of the transverse seal. Thereafter, the distal end of the second portion breaks a further portion of the main seal at the first edge. The further portion of the main seal is different than the portion of the main seal through which the distal end of the first portion of the straw is pushed out.

[0027] The transverse seal may have a transverse seal width of 1-3 mm as seen along the longitudinal axis. This is advantageous in that it allows for a stable seal which is both easy to open as well as being robust.

[0028] The transverse seal may have a transverse seal length of 5-30 mm as seen along the transverse axis. This is advantageous in that it allows for a stable seal which is both easy to open as well as being robust.

[0029] The transverse seal may extend to the longitudinal seal. Preferably, the transverse seal extends to the longitudinal seal such that the transverse seal and the longitudinal seal are arranged end to end with each other. It should be noted that the transverse seal may extend to any other portion of the longitudinal seal as well such that the edge of the transverse seal comes in contact with the longitudinal seal in any other way than edge to edge or end to end. It should also be noted that the longitudinal seal may extend to any portion of the transverse seal such that the edge of the longitudinal seal comes in contact with the transverse seal in any other way than edge to edge or end to end.

[0030] On the other hand, for an end-to-end contact, the transverse seal may support the longitudinal seal in the transverse direction against any possible force applied on the longitudinal seal by the first portion of the straw during for instance transporting or similar.

[0031] A portion of the main seal at the first edge of the drinking straw wrap, a portion of the main seal at the second edge of the drinking straw wrap, the longitudinal seal and the transverse seal may form a second unsealed area being separate from the first unsealed area. Preferably, the second unsealed area is assumed as roughly a quadrilateral, for instance a rectangle. The second unsealed area in the form of a quadrilateral preferably having right angled edges may provide the advantage of supporting the longitudinal seal by the transverse seal in the transverse direction against any possible force applied on the longitudinal seal by the first portion of the straw during for instance transporting or similar. However, it should be noted that other shapes may be used as well.

[0032] The U-shaped drinking straw may be made of paper-based material or synthetic-based material. Preferably, the straw is made from a paper-based material. Paper-based material is environmentally friendly and can be recycled in a simple manner. Since paper-based materials are relatively weaker compared to the synthetic-based materials, the beforementioned advantages may be more visible for the paper-based straws. It may be

noted that the straw may be made of other materials.

[0033] The drinking straw wrap may be made of paper-based material or synthetic-based material. Preferably, the wrap is made from a synthetic material, e.g., a plastic material. The synthetic material should be robust enough to not crack in distribution. The synthetic material is suitable to be used in a sealing device configured to form the seals of the wrap. Synthetic-based material may form a robust wrap for the straw which is easy to open.

[0034] According to a second aspect it is provided a sealing device for forming a drinking straw structure according to the first structure, the sealing device comprising a sealing roller and an abutment device, the sealing device being configured to: receive the U-shaped drinking straw being arranged between a first film and a second film, the first and second films being configured to form the drinking straw wrap, the U-shaped drinking straw being arranged such that the first portion and the second portion of the U-shaped drinking straw extend substantially parallel along a longitudinal axis of the drinking straw wrap, and provide the main seal, sealing the first film to the second film, and extending along the circumference of the drinking straw wrap and the longitudinal seal, sealing the first film to the second film, and extending in the longitudinal direction of the drinking straw structure from the main seal at the first edge of the drinking straw wrap by compressing the sealing roller towards the abutment device thereby forming the drinking straw structure.

[0035] The sealing device may be further configured to provide the transverse seal, sealing the first film to the second film, and extending in the transverse direction of the drinking straw structure from the main seal at the second edge of the drinking straw wrap by compressing the sealing roller towards the abutment device thereby forming the drinking straw structure. Therefore, any aspect stated below also may suit for the transverse seal.

[0036] Preferably, the sealing roller is a heated sealing roller such that the respective seal or seals may be provided by heat sealing. Preferably, the abutment device is a cold abutment device. The abutment device is configured to provide a sealing pressure towards the wrap together with the sealing roller. The abutment device may to advantage be made of a flexible or resilient material such as rubber, an elastomeric material or similar.

[0037] This is advantageous in that it allows for the sealing device to be able to form the main seal and the longitudinal seal as discussed above.

[0038] The sealing roller may have a sealing mold or pattern. The sealing mold may comprise elevated portions configured to form the main seal and the longitudinal seal in an easy and efficient way. The sealing mold may further comprise an elevated portion configured to form the transverse seal in an easy and efficient way. The sealing roller may further comprise a cavity in order to form the first unsealed area as discussed above. When forming the drinking straw structure, the straw is preferably arranged in the cavity of the sealing roller, having a

first film below and a second film on top of the straw in order to from the wrap. The sealing roller may be formed by attaching elevated portions to an outside surface of the sealing roller thereby forming the elevated portions of the sealing roller and the cavities are formed between the elevated portion. The sealing roller may be formed by removing material from the outside surface of the sealing roller thereby forming the cavities. The elevated portions are thereby arranged at the sealing roller where no material has been removed.

[0039] The sealing roller and the abutment device may be retrofitting parts configured to be introduced in conventional sealing devices.

[0040] According to a third aspect it is provided a method for forming a drinking straw structure according to the first aspect. The method comprising: arranging the U-shaped drinking straw between a first film and a second film, the first and second films being configured to form the drinking straw wrap, the U-shaped drinking straw being arranged such that the first portion and the second portion of the U-shaped drinking straw extend substantially parallel along the longitudinal axis of the drinking straw wrap, and providing the main seal, sealing the first film to the second film, and extending along the circumference of the drinking straw wrap and the longitudinal seal, sealing the first film to the second film, and extending in the longitudinal direction of the drinking straw structure from the main seal at the first edge of the drinking straw wrap.

[0041] The method may further comprise providing the transverse seal, sealing the first film to the second film, and extending in the transverse direction of the drinking straw structure from the main seal at the second edge of the drinking straw wrap.

[0042] According to a fourth aspect it is provided a liquid food package for holding a liquid food product, the liquid food package comprising: a main body for holding the liquid food product, and a drinking straw structure (200) according to the first aspect being attached to an outside surface of the main body.

[0043] Effects and features of the second and third aspects are largely analogous to those described above in connection with the first aspect.

[0044] Still other objectives, features, aspects and advantages will appear from the following detailed description as well as from the drawings.

Brief Description of the Drawings

[0045] Embodiments will now be described, by way of example, with reference to the accompanying schematic drawings, in which

Fig. 1 is a perspective view of a liquid food package comprising a drinking straw structure.

Fig. 2 illustrates a drinking straw structure.

Fig. 3 illustrates an arrangement of drinking straw structures.

Fig. 4 is a perspective view of a sealing device for forming a drinking straw structure.

Fig. 5 is a detailed view of a sealing roller and an abutment device which are comprised in the sealing device as illustrated in Fig. 4.

Fig. 6 is a flowchart illustrating steps of a method for forming a drinking straw structure.

Detailed description

[0046] With reference to figure 1 a liquid food package 100 is illustrated by way of example. The liquid food package 100 is for holding a drinkable food product or a liquid food product. The liquid food package 100 is formed as a rectangular bottle formed by a carton-based main body 102. The carton-based main body 102 is preferably made of carton-based laminate. It should be noted that the liquid food package 100 may be formed in any suitable way, from any suitable material, as long as it is configured to hold the drinkable food product, preferably in an easy and safe way.

[0047] The liquid food package further 100 comprises a drinking straw structure 200 which is further illustrated and discussed in connection with figures 2 and 3. The drinking straw structure 200 is attached to an outside surface 104 of the main body 102. The drinking straw structure 200 is preferably adhered to the outside surface 104 of the main body 102. The drinking straw structure 200 may be glued to the outside surface 104 of the main body 102.

[0048] The liquid food package 100 further comprises a weakened area 106. The weakened area 106 is arranged on a top surface 108 of the main body 102, or another suitable position known in the art. The weakened area 106 is usually a hole laminated with thin layers of materials, such as polymer and aluminum or other barrier materials.

[0049] With reference to figure 2, the drinking straw structure 200 as introduced in figure 1 is illustrated by way of example. The drinking straw structure 200 comprises a U-shaped drinking straw 220, herein also referred to as a straw 220, and a drinking straw wrap 240, herein also referred to as a wrap 240.

[0050] The straw 220 comprising a first portion 221, a second portion 222 and a bending portion 223. The first and second portions 221, 222 are connected via the bending portion 223. The straw 220 is preferably formed as one unit, wherein the first portion 221, the second portion 222 and the bending portion 223 are integrally formed. The dotted lines between the first portion 221 and the bending portion 223 and between the second portion 222 and the bending portion 223 are only for illustrative purposes. The first portion 221 has a first length L1 seen in a longitudinal direction LD. The second portion 222 has a second length L2 seen in the longitudinal direction LD. The second length L2 is short than the first length L1 and thus, the first portion 221 is longer than the second portion 222 seen along a longitudinal axis LA.

[0051] The first portion 221 comprises a distal end 221a. In this context, the distal end should be seen as a distal end of the first portion 221 in relation to the bending portion 223. The distal end 221a of the first portion 221 may be a cut tip. The cut tip is cut and shaped to have a sharp edge. The cut tip is able to tear the weakened area 106 of the liquid food package 100 and break the liquid food package material. The cut tip may be obtained by cutting one end of the straw 220 along a hypothetical line angled compared to the longitudinal axis LA thereby forming a tip angle.

[0052] The second portion 222 comprises a distal end 222a. In this context, the distal end 222a should be seen as a distal end of the second portion 222 in relation to the bending portion 223. The distal end 222a of the second portion 222 may be a suction tip from which the consumer is configured to drink the drinkable food product held in the liquid food package 100. As the first portion 221 is longer than the second portion 222, the distal end 221a of the first portion 221 is arranged further away from the bending portion 223 than the distal end 222a of the second portion 222. Thereby, the distal end 221a of the first portion 221 and the distal end 222a of the second portion 222 are arranged at a distance D from each other seen along the longitudinal axis LA.

[0053] Although not illustrated, the bending portion 223 may be a corrugated portion having an adjustable length.

[0054] The straw 220 is enclosed by the wrap 240. The straw 220 is arranged inside the wrap 240 such that the first portion 221 and the second portion 222 are arranged in parallel along the longitudinal axis LA of the drinking straw structure 200. Although the wrap 240 is illustrated as being of a rectangular shape, the wrap 240 may have any suitable shape. The wrap 240 is preferably formed by a first film 401 and a second film 402 (illustrated in figure 4). The straw 220 is arranged between the first and second films 401, 402.

[0055] The wrap 240 comprises a main seal 241. The main seal 241 is arranged along a circumference of the wrap 240. The main seal 241 forms a first unsealed area 242. Put differently, the unsealed area 242 is surrounded by the main seal 241.

[0056] The wrap 240 further comprises a longitudinal seal 243. The longitudinal seal 243 extends in the longitudinal direction LD of the drinking straw structure 200 from the main seal at a first edge 247 of the wrap 240. The longitudinal seal 243 is arranged in parallel with the first portion 221 of the straw 220. The longitudinal seal 243 has a longitudinal seal width LSW of 2 mm as seen along a transverse axis TA, being transverse to the longitudinal axis LA. Other longitudinal seal widths, such as a longitudinal seal width of 1-3 mm, may be used to advantage. The longitudinal seal 243 has a longitudinal seal length of 60 mm as seen along the longitudinal axis LA. Other longitudinal seal lengths, such as a longitudinal seal length of 10-100 mm, may be used to advantage.

[0057] The wrap 240 further comprises a transverse seal 245. The transverse seal 245 extends in the trans-

verse direction TD of the drinking straw structure 200 from the main seal 241 at a second edge 248 of the wrap 240 to the longitudinal seal 243. The longitudinal seal 243 and the transverse seal 245 are arranged end to end with each other. The transverse seal 245 has a transverse seal width TSW of 2 mm as seen along the longitudinal axis LA. Other transverse seal widths, such as a transverse seal width of 1-3 mm, may be used to advantage. The transverse seal 245 has a transverse seal length of 15 mm as seen along the transverse axis TA. Other transverse seal lengths, such as a transverse seal length of 5-30 mm, may be used to advantage.

[0058] It is further illustrated in figure 2 that a portion of the main seal 241 at the first edge 247 of the wrap 240, a portion of the main seal 241 at the second edge 248 of the wrap 240, the longitudinal seal 243 and the transverse seal 245 forms a second unsealed area 246. The second unsealed area 246 is separated from the first unsealed area 242. The second unsealed area 246 is arranged in parallel with the first portion 221 of the straw 220 seen along the longitudinal axis LA of the drinking straw structure 200. The second unsealed area 246 is arranged in line with the second portion 222 of the straw 220 seen along the longitudinal axis LA of the drinking straw structure 200. Thus, when the straw 220 is pushed out from the wrap 240, the first portion 221 of the straw 220 breaks a portion of the main seal at the first edge 247 of wrap 240 and the second portion 222 of the straw 220 breaks the transverse seal 245 of the wrap 240, preferably at different times, for instance by a delay in time. Thereafter, the second portion 222 is moved within the second unsealed area 246 before breaking a further portion the main seal 241 at the first edge 247 of the wrap 240. The further portion of the main seal 241 at the first edge 247 is different than the portion of the main seal 241 at the first edge 247. Thus, the second end 222 breaks the main seal 241 at the first edge 247 at a different position of the main seal 241 than the first portion 221.

[0059] The straw 220 may be made of paper-based material or synthetic-based material. The wrap 240 may be made of paper-based material or synthetic-based material.

[0060] With reference to figure 3, an arrangement 300 of drinking straw structures 200 is illustrated by way of example. The depicted arrangement 300 comprises eight drinking straw structures 200 arranged in two rows, wherein each row comprises four drinking straw structures 200. The drinking straw structures 200 of the respective row are connected to each other. The rows of drinking straw structures 200 are also connected to each other. The arrangement 300 comprises three perforated vertical lines 302 and one perforated horizontal line 304. The perforated lines 302, 304 are arranged along at least a portion of the main seal 241 of the respective drinking straw structure 200. The perforated lines 302, 304 are preferably formed by using a toothed knife or toothed roller after the arrangement 300 has been formed.

[0061] In practice, a large number of drinking straw structures 200 are preferably formed after each other when forming an arrangement 300 of drinking straw structures 200. In other words, hundreds or thousands of drinking straw structures 200 may be connected after each other in an arrangement 300 of drinking straw structures 200. Similarly, a plurality of drinking straw structures 200 may be connected side by side in an arrangement 300 of drinking straw structures 200. For instance 3, 6, 10, 12 or 20 drinking straw structures 200 may be connected side by side in an arrangement 300 of drinking straw structures 200.

[0062] Preferably, the drinking straw structure 200 is formed as the arrangement 300 of drinking straw structures 200 that can be fed to a straw structure application device to attach a liquid food package. Before attaching a drinking straw structure 200 to the liquid food package 100 as discussed above, a single drinking straw structure 200 is torn off from the arrangement 300 along the perforated lines 302, 304.

[0063] Each drinking straw structure 200 of the arrangement 300 comprises the features as discussed in connection with figure 2.

[0064] It should be noted that the arrangement 300 may comprise any number of rows and any number of columns of drinking straw structures 200.

[0065] With reference to figure 4, a sealing device 400 is illustrated by way of example. The sealing device 400 is for forming the drinking straw structure 200 as discussed above. As illustrated in figure 4, the sealing device 400 is forming the arrangement 300 of drinking straw structures 200 as discussed in connection with figure 3.

[0066] The sealing device 400 comprises a sealing roller 410 and an abutment device 430 which both are illustrated and discussed in further detail in connection with figure 5. The sealing device 400 further comprises a further roller 450 and a straw provider or applicator 470. As illustrated in figure 4, the abutment device 430 and the further roller 450 are configured to rotate in opposite directions as illustrated by the arrows of the abutment device 430 and the roller 450, respectively, wherein the abutment device 430 and the roller 450 are separated by a first gap G1. The abutment device 430 and the sealing roller 410 are configured to rotate opposite direction as further illustrated by the arrows of the abutment device 430 and the sealing roller 410, respectively. The surface area of the sealing roller 310 and the surface area of the abutment device 430 meet in a point P1.

[0067] The sealing device 400 is configured to receive a first film 401 via the abutment device 430 and a second film 402 via the further roller 450. Due to the opposite directions of rotation of the abutment device 430 and the further roller 450, the films 401, 402 are moved towards each other and towards the first gap G1 formed between the abutment device 430 and the roller 450. It is to be noted that the abutment device 430 and the further roller 450 are rotated at different rotational speeds such that the first film 401 and the second film 402 are fed towards

the first gap G1 formed between the abutment device 430 and the further roller 450 at corresponding or similar speeds. Before the films 401, 402 are moved towards each other and towards the first gap G1, the straw provider 470 is configured to provide straws 220 to the first film 401. When the sealing device 400 is forming the arrangement 300 of drinking straw structures 200, the straw provider 570 provides straws 220 to the first film 401 at a predetermined interval. Thereby, when the films 401, 402 are moved towards each other, the one or more straws 220 are arranged between the films 401, 402 which are configured to form the drinking straw wrap 240. The one or more straws 220 are arranged between the films 401, 402 at predetermined intervals.

[0068] Due to the opposite directions of rotation of the abutment device 430 and the sealing roller 410, the films 401, 402 and the straw 220, which is arranged between the films 401, 402, are moved towards the point P1. In the point P1, the sealing roller 410 is pressed towards the abutment device 430 such that the respective seal 241, 243, 245 is provided. It is to be noted that the abutment device 430 and the sealing roller 410 are rotated at different rotational speeds such that the first film 401 and the second film 402 are fed towards the point P1 at corresponding or similar speeds.

[0069] Thus, the sealing device 400 is configured to provide the main seal 241, the longitudinal seal 243 and the transverse seal 245, thereby sealing the first film 401 to the second film 402, as said above. The sealing device 400 is configured to provide the respective seal 241, 243, 245 by pressing the sealing roller 410 towards the abutment device 430 thereby forming the drinking straw structure 200. The sealing roller 410 is pressed towards the abutment surface 430 at the point P1.

[0070] The sealing roller 410 is a heated sealing roller. The abutment device 430 and the further roller 450 are cold devices.

[0071] Although not illustrated or discussed, it should be understood that the sealing device 400 may typically comprise other components than the sealing roller 410, the abutment device 430, the roller 450 and the straw provider 470.

[0072] With reference to figure 5, the sealing roller 410 and the abutment device 430 as introduced in connection with figure 4 are illustrated and discussed in further detail by way of example.

[0073] When the sealing roller 410 is pressed towards the abutment device 430, the sealing roller 410 and the abutment device 430 create a sealing pressure together such that the seals 241, 243, 245 are being formed by heat sealing. The seals 241, 243, 245 are formed by the heated sealing roller 410. In other words, the heated sealing roller 410 locally melts and thus welds the first film 401 and the second film 402 together. The sealing roller 410 and the abutment device 430 illustrated in figure 5 are configured to form two rows of drinking straw structures 200 in parallel.

[0074] As illustrated in figure 5, the abutment device

430 comprises a plurality of slots 430a, 430b. For reasons of simplicity, only two slots 430a, 430b are illustrated. It should however be noted that the abutment device 430 typically comprises as many slots 430a, 430b as needed in order to form a full circle forming the complete abutment device 430 as illustrated in figure 4. The slots are preferably rubber slots. Each slot 430a, 430b comprises two cavities 431. Each cavity 431 is configured to receive a straw 220 from the straw provider 470 before being moved towards the first gap G1. The straw 220 is arranged on the first film 401 as discussed above.

[0075] The sealing roller 410 comprises a plurality of elevated portions 441 configured to form the main seal 241 of the respective drinking straw structures 200. The sealing roller 410 further comprises a plurality of elevated portions 443 for forming the longitudinal seal 243 of the respective drinking straw structure 200. The sealing roller 410 further comprises a plurality of elevated portions 445 for forming the transverse seal 245 of the respective drinking straw structure 200. The depicted elevated portions 441, 443 and 445 are integrally formed in the depicted sealing roller 410. The elevated portions 441, 443 and 445 may however be formed separately. The elevated portions 441, 443 and 445 may be formed of separate parts. The elevated portions 441, 443 and 445 may exhibit different shapes to advantage.

[0076] The sealing roller 410 comprises a plurality of first cavities 411 and a plurality of second cavities 412. The sealing roller 410 and the abutment device 430 being arranged such that, in the point P1, the cavity 431 of the abutment device 430 coincides with a first cavity 411 of the sealing roller 410 thereby forming the first unsealed area 242 of the drinking straw structure 200 when the first and second films 401, 402 are sealed to each other. The second cavities 412 is for forming the second unsealed area 246 of the drinking straw structure 200 when the first and second films 401, 402 are sealed to each other.

[0077] With reference to figure 6, a flowchart illustrating a method 600 for forming the drinking straw structure 200 by way of example. The method 600 comprises a first step S602 in which the U-shaped drinking straw 220 is arranged between the first film 401 and the second film 402, wherein the films 401, 402 are configured to form the drinking straw wrap 240. The U-shaped drinking straw 220 is arranged such that the first portion and the second portion of the U-shaped drinking straw 220 extend substantially parallel along the longitudinal axis LA of the drinking straw wrap 240. Thereafter, in a second step S604, the main seal 241 and the longitudinal seal 243 is provided on the wrap 240 thereby sealing the first film 401 and the second film 402.

[0078] The main seal 241 and the longitudinal seal 243 may be formed simultaneously or separately.

[0079] Optionally, the transverse seal 245 may be provided on the wrap 240 thereby sealing the first film 401 and the second film 402.

[0080] The main seal 241, the longitudinal seal 243

and the transverse seal 245 may be formed simultaneously or separately.

[0081] Even though illustrated and described in a certain order, other orders may also be used.

[0082] 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 drinking straw structure (200) for a liquid food package (100) holding a drinkable food product, the drinking straw structure (200) comprising:

a U-shaped drinking straw (220) comprising a first portion (221), a second portion (222) and a bending portion (223), wherein the first and second portions (221, 222) are connected via the bending portion (223), and

a drinking straw wrap (240) enclosing the U-shaped drinking straw (220), wherein the first and second portions (221, 222) of the U-shaped drinking straw (220) extend substantially parallel along a longitudinal axis (LA) of the drinking straw structure (200), the drinking straw wrap (240) comprising:

a main seal (241) being arranged along a circumference of the drinking straw wrap (240) thereby forming a first unsealed area (242) of the drinking straw wrap (240), and a longitudinal seal (243) extending in a longitudinal direction (LD) of the drinking straw structure (200) from the main seal (241) at a first edge (247) of the drinking straw wrap (240) along a longitudinal seal length (LSL).

2. The drinking straw structure (200) according to claim 1, wherein the first portion (221) of the U-shaped drinking straw (220) is longer than the second portion (222) of the U-shaped drinking straw (220) thereby a distal end (221a) of the first portion (221) is arranged further away from the bending portion (223) than a distal end (222a) of the second portion (222).

3. The drinking straw structure (200) according to claim 1 or 2, wherein the longitudinal seal (243) has a longitudinal seal width (LSW) of 1-3 mm as seen along a transverse axis (TA) being transverse to the longitudinal axis (LA).

4. The drinking straw structure (200) according to any one of the preceding claims, wherein the longitudinal seal (243) has the longitudinal seal length (LSL) of

10-100 mm as seen along the longitudinal axis (LA).

5. The drinking straw structure (200) according to any one of the preceding claims, wherein the longitudinal seal length (LSL) is shorter than a distance (D) between the respective distal ends (221a, 222a) of the first and second portions (221, 222) of the U-shaped drinking straw (220) seen along the longitudinal axis (LA).
6. The drinking straw structure (200) according to any one of the preceding claims, wherein the drinking straw wrap (240) further comprises a transverse seal (245) extending in a transverse direction (TD) of the drinking straw structure (200) from the main seal (241) at a second edge (248) of the drinking straw wrap (240).
7. The drinking straw structure (200) according to claim 6, wherein the transverse seal (245) has a transverse seal width (TSW) of 1-3 mm as seen along the longitudinal axis (LA).
8. The drinking straw (200) according to any one of claim 6 or 7, wherein the transverse seal (245) has a transverse seal length (TSL) of 5-30 mm as seen along the transverse axis (TA).
9. The drinking straw structure (200) according to any one of claims 6-8, wherein the transverse seal (245) extends to the longitudinal seal (243).
10. The drinking straw structure (200) according to claim 9, wherein a portion of the main seal (241) at the first edge (247) of the drinking straw wrap (240), a portion of the main seal (241) at the second edge (248) of the drinking straw wrap (240), the longitudinal seal (243) and the transverse seal (245) form a second unsealed area (246) being separate from the first unsealed area (242).
11. The drinking straw structure (200) according to any one of the preceding claims, wherein the U-shaped drinking straw (220) is made of paper-based material or synthetic-based material.
12. The drinking straw structure (200) according to any one of the preceding claims, wherein the drinking straw wrap (240) is made of paper-based material or synthetic-based material.
13. A sealing device (400) for forming a drinking straw structure (200) according to any one of the preceding claims, the sealing device (400) comprising a sealing roller (410) and an abutment device (430), the sealing device (400) being configured to:

receive a U-shaped drinking straw (220) being

arranged between a first film (401) and a second film (402), the first and second films (401, 402) being configured to form the drinking straw wrap (240), the U-shaped drinking straw (220) being arranged such that a first portion (221) and a second portion (222) of the U-shaped drinking straw (220) extend substantially parallel along a longitudinal axis (LA) of the drinking straw wrap (240), and provide a main seal (241), sealing the first film (401) to the second film (402), and extending along a circumference of the drinking straw wrap (240) and a longitudinal seal (243), sealing the first film (401) to the second film (402), and extending in a longitudinal direction (LD) of the drinking straw structure (200) from the main seal (241) at the first edge (247) of the drinking straw wrap (240) by compressing the sealing roller (410) towards the abutment device (430) thereby forming the drinking straw structure (200).

14. A method (600) for forming a drinking straw structure (200) according to any one of claims 1-11, the method (600) comprising:

arranging (S602) a U-shaped drinking straw (220) between a first film (401) and a second film (402), the first and second films (401, 402) being configured to form a drinking straw wrap (240), the U-shaped drinking straw (220) being arranged such that a first portion (221) and a second portion (222) of the U-shaped drinking straw (220) extend substantially parallel along a longitudinal axis (LA) of the drinking straw wrap (240), and providing (S604) a main seal (241), sealing the first film (401) to the second film (402), and extending along a circumference of the drinking straw wrap (240) and a longitudinal seal (243), sealing the first film (401) to the second film (402), and extending in a longitudinal direction (LD) of the drinking straw structure (200) from the main seal (241) at the first edge (247) of the drinking straw wrap (240).

15. A liquid food package (100) for holding a liquid food product, the liquid food package (100) comprising:

a main body (102) for holding the liquid food product, and a drinking straw structure (200) according to any one of claims 1-12 being attached to an outside surface (104) of the main body (102).

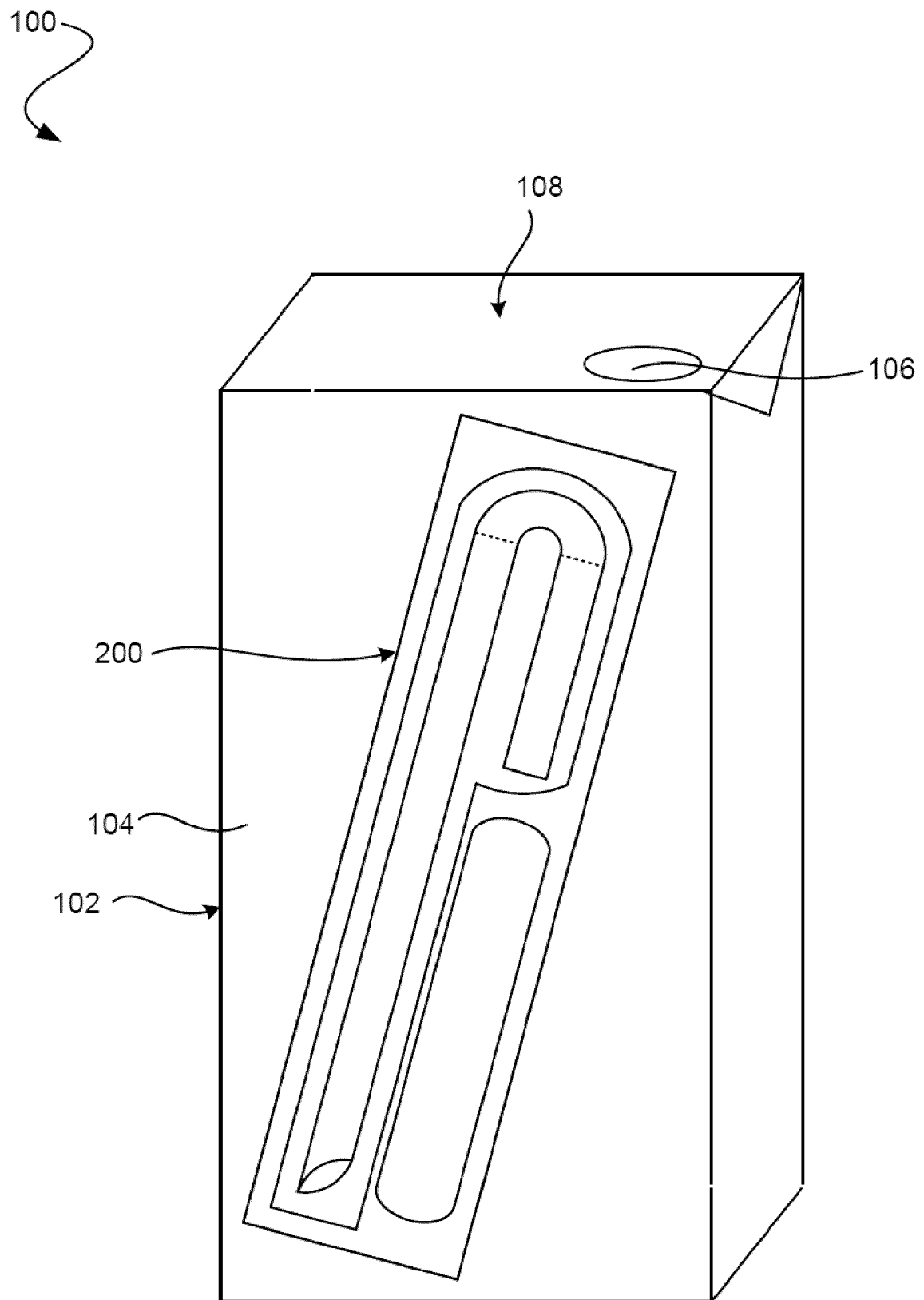
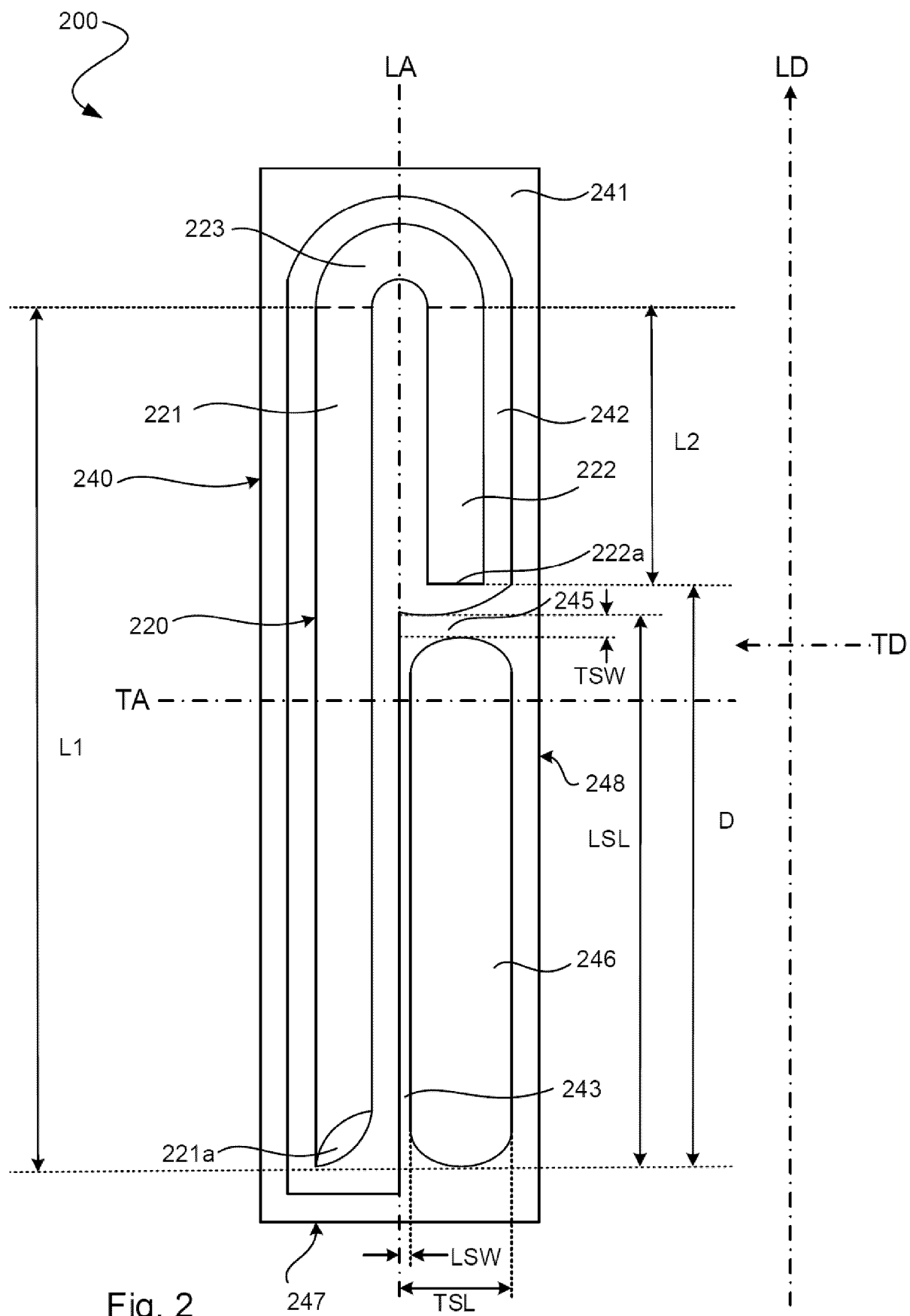


Fig. 1



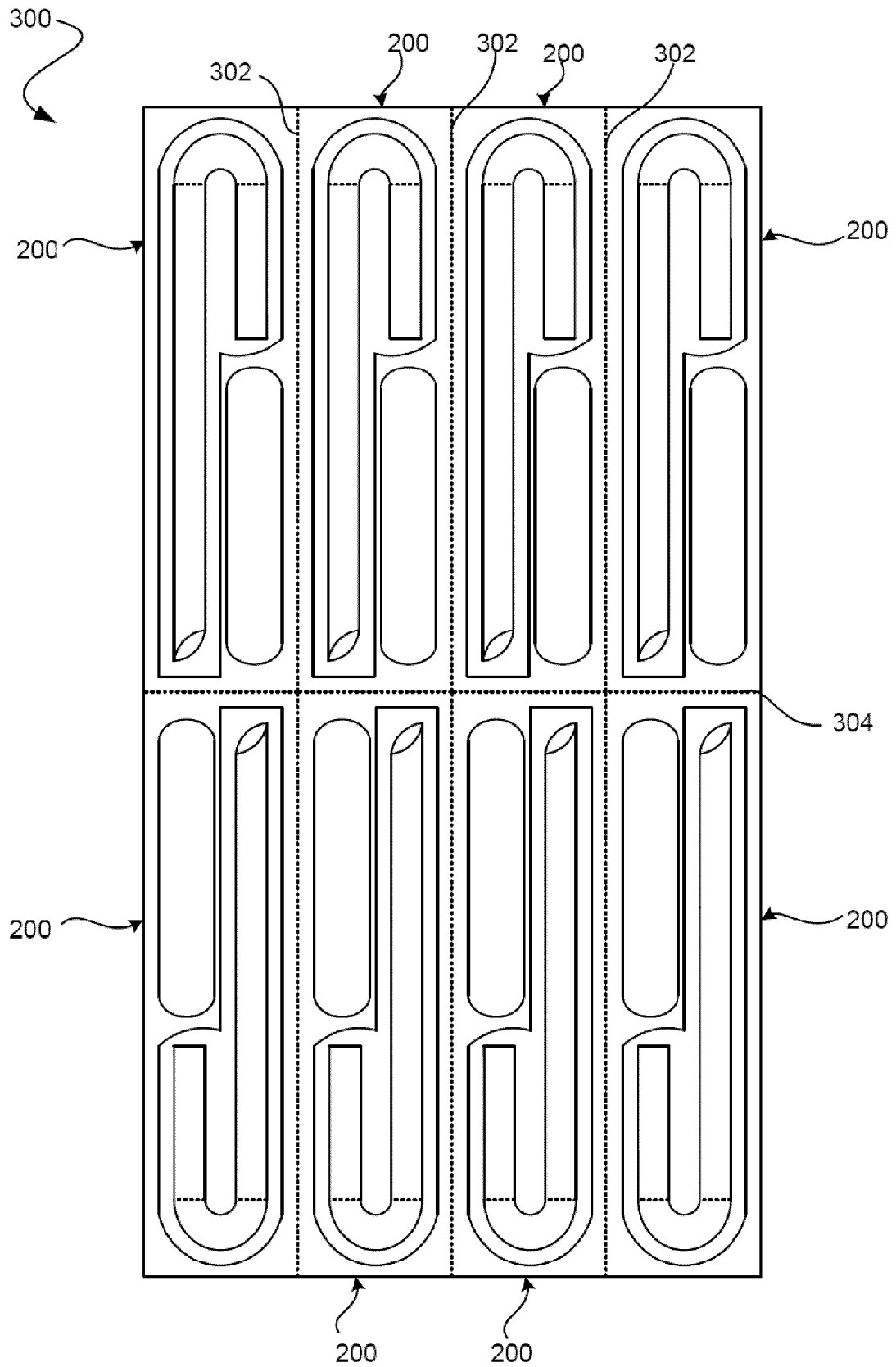


Fig. 3

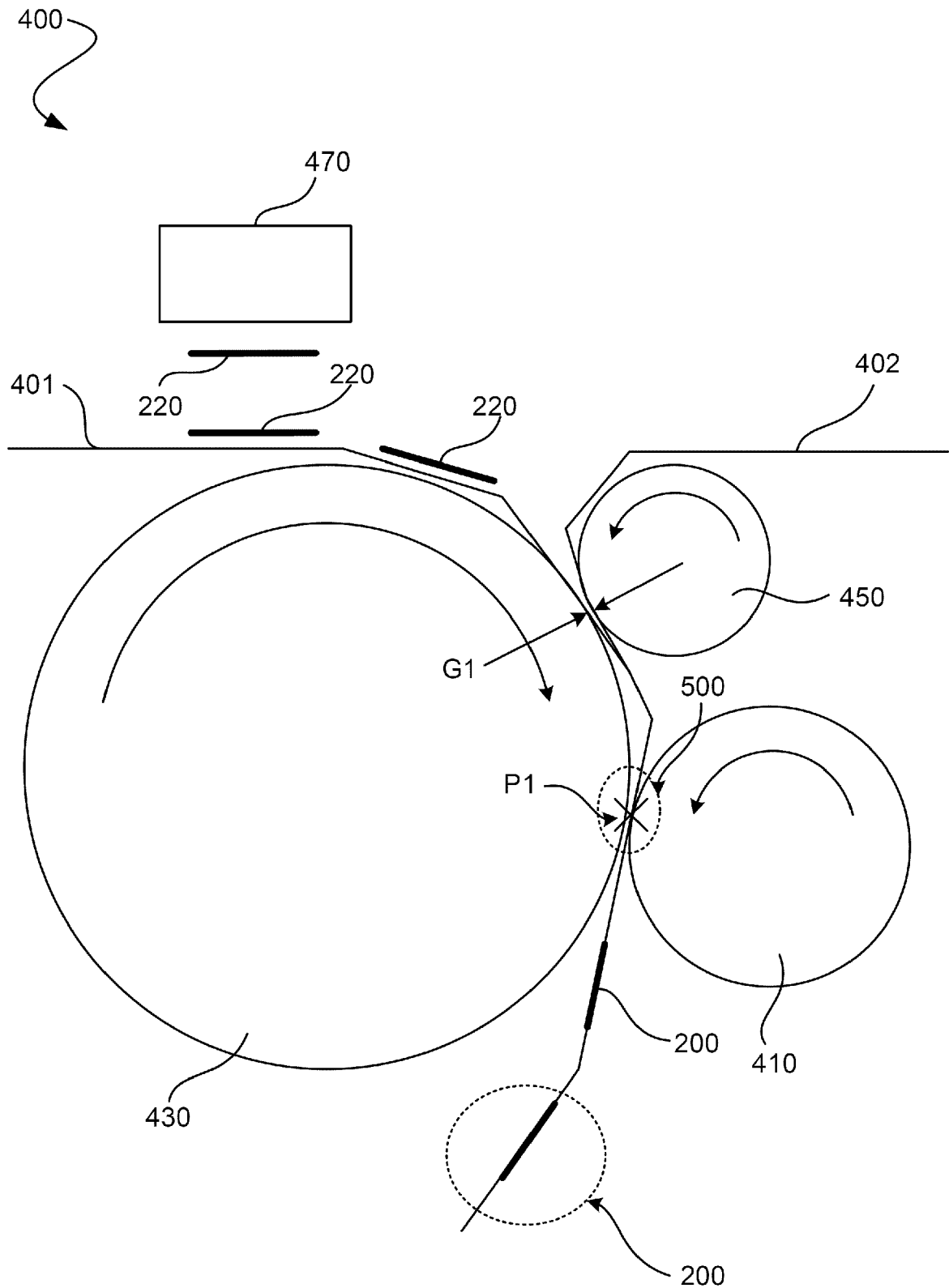


Fig. 4

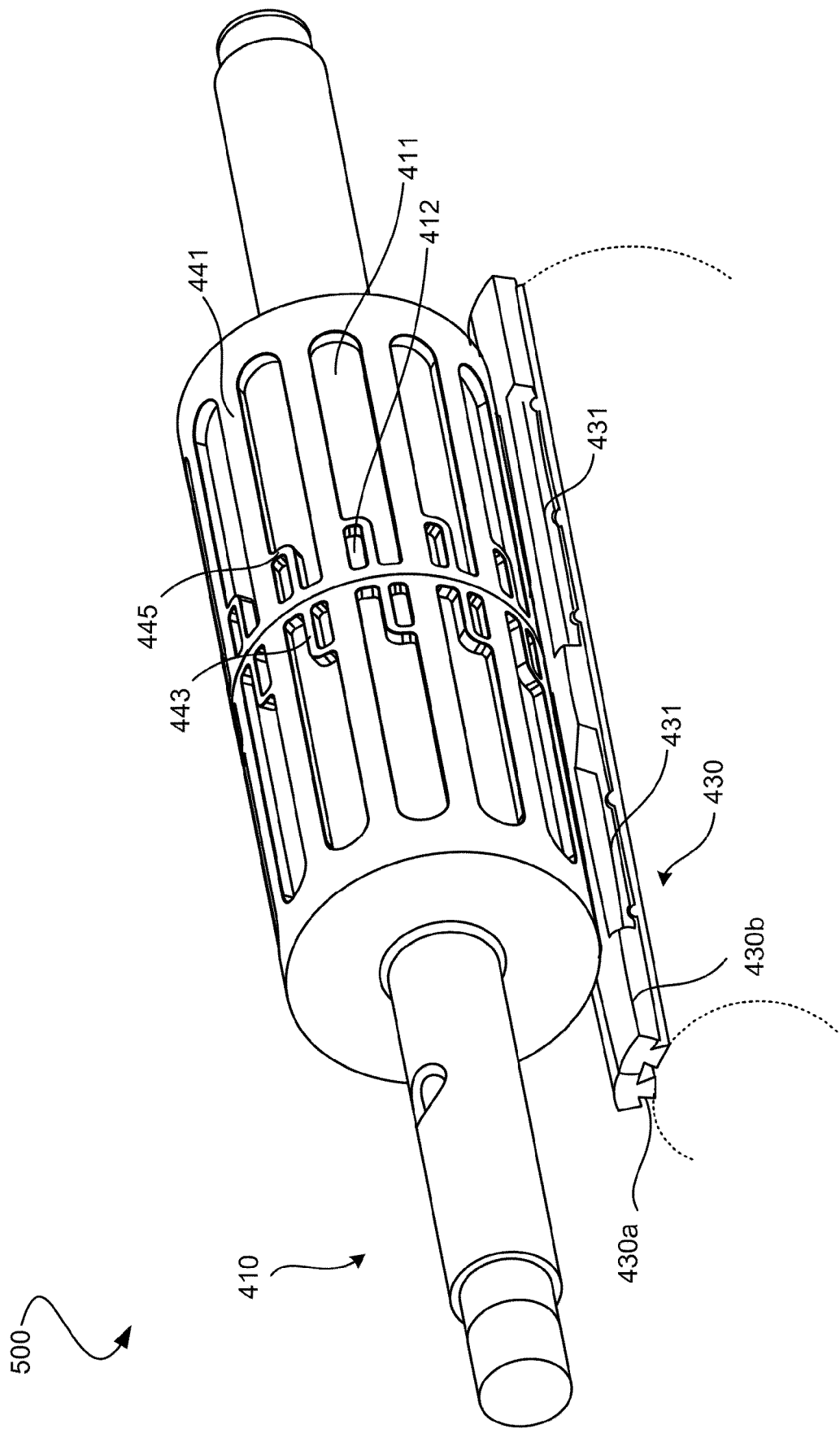


Fig. 5

600

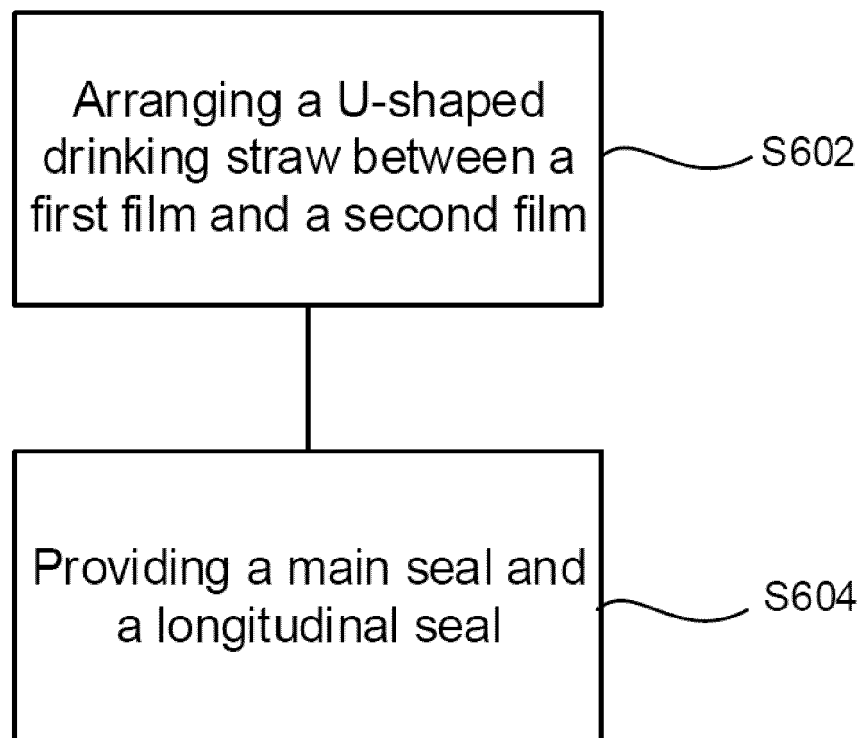


Fig. 6



EUROPEAN SEARCH REPORT

Application Number

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			B65D A47G
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 13 June 2023	Examiner Bridault, Alain
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	

**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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13-06-2023

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