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(54) SYSTEM AND METHOD FOR HANDLING A BAG ARRANGEMENT

(57) A system (100) for handling a bag arrangement (102) comprising an outer bag (104) enclosing an inner bag (106). The system comprises a cutting station (108) comprising a suction head (200) and a cutting blade arrangement (300). The suction head (200) is arranged to lift the outer bag (104), thereby forming a vertical distance (V-D) between the outer bag (104) and the inner bag (106). The cutting blade arrangement (300) is arranged radially inside the suction head (200), thereby providing for that the outer bag (104) is cut open while lifted from the inner bag (106).

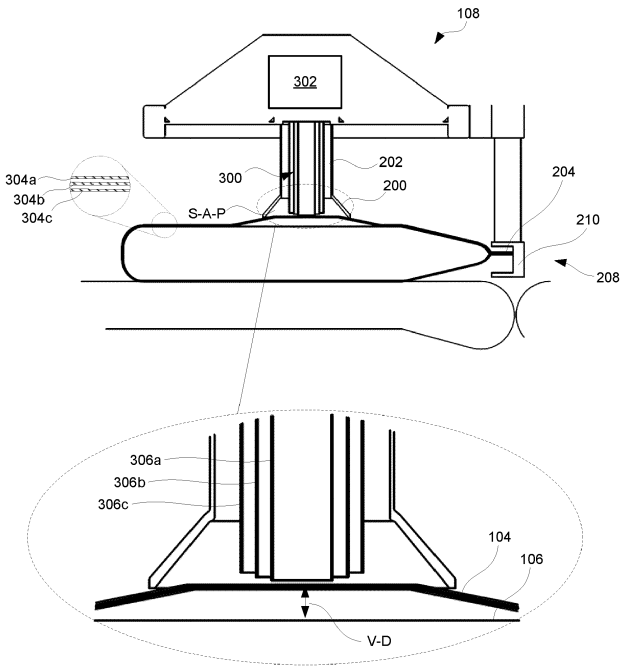

Fig. 3

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Description

Technical Field

[0001] The invention generally relates to equipment and methods for handling bags, such as bags used for transporting food products. More particularly, it is related to a system for handling a bag arrangement comprising an outer bag enclosing an inner bag, and a method for handling such bag arrangement.

Background

[0002] In some parts of the world milk productions are at very high levels. To be able to transport the milk being produced in these parts to other parts of the world, it is common practice to turn the milk into milk powder by using a drying tower or other equipment suitable for the purpose. By turning the milk into powder, both weight and volume are reduced, which results in more efficient transportation. In addition, by removing water from the milk, the milk is less susceptible to be negatively affected by microorganisms, which has the positive effect that there is no need for refrigeration during transportation. In addition to milk, it is also common practice to turn whey, which is a bi-product from cheese production, into whey powder. The whey powder is rich in protein and can be used as an ingredient in different food products.

[0003] Once turned into powder, the powder is often packed in bags for storage and/or for shipment to producers that use the powder as an ingredient. To provide for that the powder is not contaminated during transportation it is common to pack this in a plastic bag. In order to protect the plastic bag during transportation, it can be enclosed by a bag made of kraft paper or other material suitable for protecting the plastic bag. By having this type of bag arrangement with an inner bag holding the food product and an outer bag enclosing the inner bag, it is possible to keep the food product hygienically safe and also to reduce the risk of having the bag arrangement damaged during transportation. Often the outer bag has multiple layers made or craft or other cellulose based materials.

[0004] When the bag arrangement containing the food product in powder form has been received at e.g. a site producing recombined milk products, the product is typically released from the bag arrangement by first removing the outer bag. Usually this is made manually by a number of operators cutting or tearing the outer bag open such that the inner bag is exposed. In a subsequent station, the inner bag can be opened and the food product, e.g. milk powder, can be tipped into a mixer or other suitable equipment for producing recombined food products.

[0005] The bag arrangement often holds 25 kg of food product. As an effect, the manual work of opening the outer bag is generally hard work, and it is not unusual that the persons working with the task of removing the outer bag experience problems with shoulders and back. In addition to injuries, there is also a risk that the inner bag is damaged when the outer bag is manually removed, which may contaminate the product inside the inner bag. Based on the above, there is a need to find a solution to how the outer bag can be removed in an operator-friendly and secure manner where sanitary conditions are maintained.

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, for a bag arrangement that has an outer bag which encloses an inner bag that holds a food product, a way to efficiently remove the outer bag without damaging the inner bag. An effect of reducing damages to the inner bag is that a risk for machine failures downstream this station can be reduced. In addition, by avoiding puncturing of the inner bag, food safety risks can be reduced.

[0007] According to a first aspect it is provided a system for handling a bag arrangement comprising an outer bag that encloses an inner bag. The system comprises a cutting station that has a suction head and a cutting blade arrangement. The suction head is arranged to lift the outer bag by applying a suction force on the outer bag, for forming a vertical distance between the outer bag and the inner bag. The cutting blade arrangement is arranged inside the suction head, for cutting the outer bag open while lifted from the inner bag.

[0008] An advantage with having the cutting blade arrangement located inside the suction head is that cutting can be made while having the outer bag lifted from the inner bag, thereby reducing the risk of damaging the inner bag. Using the suction head, that is, using sub-atmospheric pressure to lift the outer bag with respect to the inner bag, is advantageous in that the outer bag can be grabbed without risking that the inner bag is damaged.

[0009] The cutting blade arrangement may comprise m number of circular blades of different diameters, wherein the circular blades are grouped such that a circular blade of a smaller diameter is located inside a circular blade of a larger diameter, for cutting m number of layers when the outer bag is a multi-layer bag that comprises m number of layers. Having a dedicated circular blade for each layer comes with the positive effect that that the cutting of the different layers can be made in a controlled manner, reducing a risk that all layers are not adequately cut through, or that cutting is done also through the inner bag. Having the circular blades of smaller diameters placed inside those with larger diameters provides for that the sub-atmospheric pressure can be maintained during the course of cutting the different layers.

[0010] The m number of circular blades may be located at a respective different height, wherein the circular blades are arranged such that a circular blade of a smaller diameter is placed at a lower height than a circular blade

of a larger diameter, for cutting the m number of layers sequentially starting with a lowermost circular blade cutting open an outermost layer of the m number of layers, such that diameters of openings cut in the m number of layers increase for each layer being cut. By having the innermost circular blade also being the lowermost circular blade, i.e. the circular blade closest to the outer bag before the cutting has started, provides for that a cutting order from smaller openings to larger openings will provided in a convenient way. Put differently, by having the cutting blade arrangement designed in this way provides for that a risk of deviating from the cutting order can be reduced.

[0011] The cutting station may further comprise a suction pipe connected to the suction head, and a pump arranged to form a sub-atmospheric pressure inside the suction pipe and the suction head when in contact with the outer bag, for transporting away, via the suction pipe, outer bag pieces cut off from the outer bag by the cutting blade arrangement. By having the suction head and the suction pipe arranged to transport away cut off pieces from the outer bag, there is no need for manually collecting these pieces. Further, by using the suction head and suction pipe also for this purpose, one and the same system can provide for that the outer bag can be cut without damaging the inner bag, as well as provide for that the cut off pieces are taken care of in an efficient manner.

[0012] The system may further comprise a top fin aligner arranged to, when the outer bag comprises a main body and a top fin, receive the top fin and to exert forces onto the top fin to thereby pull the top fin in a direction from the main body. By having the top fin aligner, it is possible to align the bag arrangement before cutting, thereby providing for that the opening made in the outer bag is made in a position of the outer bag in which it is possible to achieve the vertical distance such that the cutting can be made without damaging the inner bag. Such position may for instance be in a central position of the main body of the outer bag.

[0013] The top fin aligner may comprise a roller, driven by a roller motor, arranged to grip the top fin and to pull this towards the top fin aligner. An advantage with having the roller is that the bag arrangement can be pulled into the top fin aligner with a small risk of being damaged, while also reducing a risk that the bag arrangement is misaligned when cutting is initiated.

[0014] The cutting station may further comprise a top fin cutter attached to the top fin aligner and arranged to cut off at least a portion of the top fin from the main body of the outer bag. The top fin cutter combined with the cutting blade arrangement provides for that the outer bag can be removed in a reliable manner.

[0015] The system may further comprise an outer bag removal station comprising a tearing arrangement that has a first and a second hook-shaped element arranged to be inserted into an opening in the outer bag that is provided by the cutting station, and to hook onto a first and a second edge section of the opening in the outer bag. A motor arrangement is configured to move the first and second hook-shaped element in a direction away from each other, for tearing the outer bag open in a tearing direction from the first and second edge section to a first and second end point of the outer bag, respectively. An advantage with having the first and second hook-shaped elements is that these can grab the edge sections of the opening provided by the cutting station and thereafter efficiently provide for that a longitudinal opening is formed in the outer bag.

[0016] The tearing direction may extend along a longitudinal direction of the bag arrangement such that a longitudinal opening can be provided in the outer bag. The first and second hook-shaped element each may comprise two sub-elements, wherein the sub-elements of the first hook element are arranged to be moved apart from each other in a transversal direction of the bag arrangement when the first hook-shaped element is in the first end point, and the sub-elements of the second hook-shaped element are arranged to be moved apart from each other in the transversal direction, when the second hook-shaped element is in the second end point, wherein the transversal direction is perpendicular to the longitudinal direction. By having the same elements used for both providing the longitudinal opening and thereafter, by being split into their sub-elements, provide for that sides of the outer bag is moved away from the inner bag, and/or providing for that transversal slits are provided, a cost efficient and reliable outer bag removal can be achieved.

[0017] The outer bag removal station may further comprise a first and a second folding arm arranged to fold away a first and a second side of the outer bag, formed by the longitudinal opening, such that the inner bag is exposed. By having the folding arms, an even more reliable removal of the outer bag can be achieved.

[0018] The system may further comprise a bag lifting station for an inner bag, said lifting station (112) having a lifting arm provided with a suction head arrangement arranged to attach to the inner bag. An advantage with using the suction head arrangement for lifting the inner bag is that the inner bag can be lifted in a secure and reliable manner.

[0019] The outer bag may be made of paper, such as kraft paper, and the inner bag may be made of plastic. An advantage with having the outer bag made of a non-oil based material is that the environmental footprint can be improved. As an effect, having the system described above, provides for that more environmentally friendly bag arrangements can be used. Further, since the outer bag removal is made in a more controlled manner when using the system compared to using manual labor, it is made possible to use a thinner plastic bag as the inner bag.

[0020] According to a second aspect, it is provided a method for handling a bag arrangement comprising an outer bag that encloses an inner bag, by using a system comprising a cutting blade arrangement and a cutting

station that has a suction head, wherein the cutting blade arrangement is arranged inside the suction head. The method comprises attaching the suction head to the outer bag, lifting the outer bag from the inner bag by applying a suction force on the outer bag by using the suction head such that a vertical distance between the two is formed, and cutting an opening in the outer bag by using the cutting blade arrangement while the outer bag is lifted from the inner bag. The same features and advantages presented above with respect to the first aspect also apply to this second aspect.

[0021] The cutting blade arrangement may comprise m number of circular blades of different diameters, wherein the circular blades may be grouped such that a circular blade of a smaller diameter is located inside a circular blade of a larger diameter, for cutting m number of layers when the outer bag is a multi-layer bag that comprises m number of layers. The step of cutting the opening in the outer bag by using the cutting blade arrangement may comprise m number of sub-steps in which each of the layers of the outer bag is cut individually by a dedicated circular blade of the m number of circular blades.

[0022] The method may further comprise exerting, when the outer bag comprises a main body and a top fin, forces onto the top fin to thereby pull the top fin in a direction from the main body.

[0023] Still other objectives, features, aspects and advantages of the invention will appear from the following detailed description as well as from the drawings.

Drawings

[0024] 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 a system for handling a bag arrangement.
Fig. 2 is a side-view of the system.
Fig. 3 is a view of a cutting station of the system.
Fig. 4 is a perspective view of the cutting station.
Fig. 5A is a side view of an outer bag removal station and a tearing arrangement with a first and a second hook-shaped element.
Fig. 5B is a side view of the outer bag removal station and the tearing arrangement with the first and second hook-shaped element moved apart.
Fig. 6A is a front view of the outer bag removal station and the tearing arrangement showing two sub-elements of the first hook-shaped element moved apart.
Fig. 6B is a front view of the outer bag removal station and the tearing arrangement with a first and a second folding arm folded down.
Fig. 7 is a flowchart illustrating a method for handling the bag arrangement.

Description

[0025] With reference to Fig. 1, a system 100 for handling a bag arrangement 102 is illustrated in a perspective view. The bag arrangement 102 comprises an outer bag 104, e.g. a bag made of kraft paper, enclosing an inner bag 106, e.g. a plastic bag. By having the inner bag 106, a food product held inside the inner bag 106 can be securely shielded from the environment, thereby reducing a risk of having unwanted particles ending up in the food product. The outer bag 104 provides extra protection and reduces the risk of having the inner bag damaged during transportation. By having the outer bag 104 paper-based, less plastic material is needed for the bag arrangement 100 as a whole, which improves the environmental footprint compared to the alternative of having one thick plastic bag and no outer bag. Further, by having the system 100 for removing the outer bag instead of removing this manually, it is possible to provide more consistent bag opening which provides for using a relatively thinner inner bag and hence, in case the inner bad is made of plastic, an improved environmental footprint can be achieved.

[0026] After the food product, e.g. milk powder, has been packed in the bag arrangement 102 and transported to a production site, the bag arrangement 102 is often taken care of in two steps. In a first step, the outer bag 104 is removed and in a second step the inner bag 106 is opened such that the food product can be released. In the first step, the outer bag 104 should be removed in a secure manner such that the inner bag 106 is not damaged. Further, the outer bag 104 should be removed in such a way that there is no or low risk for failure, e.g. low risk that the outer bag 104 is getting stuck such that an operator must manually remove the outer bag and restart the system 100.

[0027] The system 100 illustrated by way of example in Fig. 1 provides for that the bag arrangement can be opened in a controlled and reliable manner. As illustrated, the system 100 can comprise a cutting station 108, in which the outer bag 104 is cut open. Once cut open, an outer bag removal station 110 can be used for removing the outer bag 104 such that the inner bag 106 is exposed. After having exposed the inner bag 106, an inner bag lifting station 112 can be used for lifting away the inner bag 106. As illustrated, the bag arrangement 102 can be transported between the stations on a conveyor belt 114 in a feeding direction FD. Another option, even though not illustrated, is to have the stations moved while the bag arrangement 102 is stationary. For instance, this could be achieved by having the stations mounted on robotic arms.

[0028] Fig. 2 illustrates the system 100 from a side view in further detail. As illustrated, the cutting station 108 can comprise a suction head 200 placed on a suction pipe 202. The suction head 200 can be arranged to attach to the outer bag 104 such that this is lifted from the inner bag 106. The outer bag 104 can comprise a top fin 204 and a main body 205. To make sure that the outer bag

104 is cut open in a consistent and reliable manner a top fin aligner 208 connected to a frame 206 of the cutting station 108 can be used. In the example illustrated, the top fin aligner 208 comprises a U-shaped element 210. By receiving the top fin 204 in the U-shaped element 210 and having the outer bag 104 conveyed in the feeding direction FD by the conveyor belt 114, the outer bag 104 can be aligned.

[0029] Once having the outer bag 104 cut open, which will be further illustrated in Fig. 3, the bag arrangement 102 is forwarded to the outer bag removal station 110. In this station, a first and a second hook-shaped element 212a, 212b can be inserted into an opening of the outer bag 104, made in the cutting station 108, and placed such that these grab opposite edges of the opening in the outer bag 104. Once hooked onto the outer bag 104, the first and second hook-shaped element 212a, 212b can be moved apart such that a longitudinal opening is made in the outer bag 104. After having made the longitudinal opening, the sub-elements of the first and second hook-shaped elements 212a, 212b can be moved transversally such that two transversal slits are provided, a top transversal slit next to the top fin 208 and a bottom transversal slit next to a bottom of the outer bag 104. This procedure is illustrated in further detail in fig 5A and 5B, and described in further detail below.

[0030] Once having used the first and second hook-shaped elements 212a, 212b for making the longitudinal opening and the top and bottom transversal slits, a first and a second folding arm 214a, 214b can be used for folding away the outer bag 104. As illustrated, the first and second folding arm 214a, 214b can be U-bent rods attached to the frame 206 and arranged to be moved rotationally around axes of rotation parallel with the feeding direction FD such that flaps, formed by the longitudinal opening and the two transversal slits, are folded away on either side of the conveyor belt 114. This procedure is further illustrated in Fig. 6A and 6B, and also described more in detail below.

[0031] In the inner bag lifting station 112, placed downstream the outer bag removal station 110, a lifting arm 216 provided with a suction head arrangement 218 can be used for lifting the inner bag 106 from the conveyor belt 114. As illustrated, the suction head arrangement 218 can comprise a plurality of suction heads such that a plurality of attachment points are provided.

[0032] Fig. 3 is a view of the cutting station 108. As illustrated, a cutting blade arrangement 300 can be placed radially inside the suction pipe 202 and the suction head 200. An advantage with having the cutting blade arrangement 300 placed inside the suction head 200 in this way is that when pumping out air from the suction pipe 202 and the suction head 200 by using a pump 302, the outer bag 104 can be lifted from the inner bag 106, herein illustrated by a vertical distance V-D, onto the cutting arrangement 300. In this way, the outer bag 106 can be cut without risk, or at least with low risk, of damaging the inner bag 106.

[0033] As illustrated, the cutting blade arrangement 300 can comprise a number of circular blades 306a-c of different diameter. The blades 306a-c can be grouped such that circular blades of smaller diameter 306a are placed inside circular blades of larger diameter 306c. Having several circular blades is beneficial if the outer bag 104 is a multi-layer bag comprising a number of layers 304a-c. By having the number of blades 306 a-c corresponding to the number of layers 304a-c, there may be one dedicated blade for each layer. The circular blades 306a-c are driven by a motor (not shown) that rotates the blades around a vertical axis. The part of the circular blades 306a-c which contact the outer bag 104 are preferably sharp.

[0034] The circular blades 306a-c can be placed at different heights. More particularly, the blades can be arranged such that circular blades of smaller diameter 306a are placed at a lower height than circular blades of larger diameter 306c. An advantage of this is that the number of layers 304a-c can be cut sequentially starting with a lowermost circular blade cutting open an outermost layer 304a. Diameters of openings cut in the number of layers can increase for each layer being cut. An advantage with having small holes cut first is that this allows the suction head 200 to maintain the outer bag 104 lifted from the inner bag 106.

[0035] By having the suction pipe 202, outer bag pieces cut off from the outer bag 104 by the cutting blade arrangement 300 can be transported away from the outer bag 104 via the suction pipe 202.

[0036] Fig. 4 is a perspective view of the cutting station 108. The U-shaped element 210 may act as a top fin cutter 400 that cuts off the top fin 204 along its length. For this purpose the element 210 may have a knife having its edge directed towards the fin 204, in the transversal direction TRA-D of the bag arrangement 102. The element 210 is movable in the transversal direction TRA-D by a linear motor the is arranged on the frame 206 that carries the element 210

[0037] To make sure that the top fin 204 of the outer bag 104 is fully received by the U-shaped element 210, motor driven rollers 402 provided inside the U-shaped element 210 can be used to pull in the top fin 204 towards the U-shaped element 210. The rollers 402 may be driven by any suitable motor 404 and are arranged opposite each other, such that the top fin can be received in between the rollers. The rollers then rotate in opposite directions to accomplish the pulling. As can be seen in the figures, the top cutter has a first arm that pulls the fin and keeps it in position, while a second arm pulls the fins and cuts it in the transversal direction TRA-D by moving in that direction, along the frame to which the arms are connected. Obviously, the first arm needs only pulling rollers while the second arm advantageously has both pulling rollers and a knife.

[0038] Fig.5A illustrates the outer bag removal station 110 in further detail, more particularly it is illustrated a tearing arrangement 500 comprising the first and second

hook-shaped elements 212a, 212b. The first and second hooks-shaped elements 212a, 212b may in turn comprise a first and a second hook component 502a, 502b, respectively. These two hook components can be arranged to grab a first and a second edge section of 504a, 504b of an opening 506 formed by the cutting blade arrangement 300 in the cutting station 300. The first and second hook component 502a, 502b may be pivotally arranged and connected to linear motors such that the hook components can be inserted into the opening 506 and then pivoted such that the edge sections 504a, 504b are adequately grabbed.

[0039] After the first and second edge sections 504a,b have been grabbed, the first and second hook-shaped elements 212a, 212b can be moved apart such that the longitudinal opening of the outer bag 104 can be formed, i.e. the elements 212a, 212b are moved away from each other in a longitudinal direction LON-D. To facilitate the tearing, which may also be referred to as cutting, the first and second hook component 502a, 502b may be have sharpened sections facing the outer bag 104 when the first and second hook-shaped elements 212a, 212b are moved apart. As illustrated in Fig. 5B, a motor arrangement 510, herein exemplified by two motors, can be arranged to provide for that the first and second hook-shaped elements 212a, 212b are moved from a central position with both hook components 502a, 502b placed in the opening 506, as illustrated in Fig. 5A, to a peripheral position with the first hook-shaped element 212a placed in a first end point 508a and the second hook-shaped element 212b placed in a second end point 508b.

[0040] After the longitudinal opening is provided by the first and second hook-shaped elements 212a, 212b and the two elements are placed in the first and second end point 508a, 508b, respectively, the first and second hook-shaped element 212a, 212b can be moved away from each other in the transversal direction TRA-D, to a respective outer part of the frame. This can be made possible by that the first hook-shaped element 212a comprises two sub-elements 600a-b and that the second hook-shaped element 212b comprises two sub-elements, wherein each pair of sub-elements are arranged to be moved apart transversally, i.e. in a transversal direction TRA-D. As illustrated in Fig. 6A, by splitting up the first and second hook-shaped elements 212a, 212b into their sub-elements 600a-d, the outer bag 104 can be moved away such that the inner bag 106 is exposed. By moving the sub-elements 600a-d apart transversally, the outer bag 104a can be torn apart, or cut in case the sub-elements 600a-d have sharpened edges.

[0041] Basically, each of the first and second hook component may comprise a respective set of hook-shaped elements, i.e. the outer bag removal station has in total four hook-shaped elements. Each of these hook-shaped elements are arranged on a respective arm that is attached to a frame of the outer bag removal station. The arms are operated by linear motors. The arms first move in pairs the longitudinal direction away from the opening that was cut by the cutting station, with arms of one pair moving in the same direction, opposite the direction by which the other pair or arms is moved. A long cut is then formed. Next the arms in each pairs of arms are separated by moving outwardly in the transversal direction TRA-D, thereby ripping open the outer bag. Thereafter the hook-shaped elements release the outer bag.

[0042] With reference to Fig. 6B, in a step subsequent to the transversal movement of the sub-elements 600a-d of the first and second hook-shaped components 502a, 502b, the first and second folding arms 214a, 214b can be used for folding away a first and a second side 602a, 602b of the outer bag 104. In this way, a risk that the outer bag 104 hinders lifting of the inner bag 106 by the bag lifting station 112 can be further reduced.

[0043] Fig. 7 is a flowchart illustrating a method 700 for handling the bag arrangement 112. In a first step 702, the suction head 200 can be attached to the outer bag 104. Thereafter, in a second step 704, the outer bag 104 can be lifted from the inner bag 106 by applying a suction force such that the vertical distance V-D is formed. Once having formed the vertical distance V-D, in a third step 706, the opening 506 in the outer bag 104 can be provided by cutting with the cutting blade arrangement 300 while the outer bag 104 is lifted from the inner bag 106.

[0044] The third step 706 may, if the outer bag 104 is a multi-layer bag, comprise multiple sub-steps in which each of the layers of the outer bag 104 is cut individually by a dedicated circular blade of the cutting arrangement 300.

[0045] Optionally, in a fourth step 708 forces are exerted, when the outer bag 104 comprises a main body 205 and a top fin 204, onto the top fin 204 to thereby pull the top fin 204 in a direction from the main body 205. This makes it more easy to cut off the top fin, as previously described.

[0046] 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 system (100) for handling a bag arrangement (102) comprising an outer bag (104) that encloses an inner bag (106), said system (100) comprising

   a cutting station (108) comprising a suction head (200) and a cutting blade arrangement (300), wherein

   the suction head (200) is arranged to lift the outer bag (104) by applying a suction force on the outer bag (104), for forming a vertical distance (V-D) between the outer bag (104) and the inner

bag (106), and
the cutting blade arrangement (300) is arranged inside the suction head (200), for cutting the outer bag (104) open while lifted from the inner bag (106).

2. The system according to claim 1, wherein the cutting blade arrangement (300) comprises m number of circular blades (306a-c) of different diameters, wherein the circular blades (306a-c) are grouped such that a circular blade of smaller diameter is located inside a circular blade of larger diameter, for cutting m number of layers (304a-c) when the outer bag (104) is a multi-layer bag that comprises m number of layers.

3. The system according to claim 2, wherein the m number of circular blades (306a-c) are located at a respective different height, wherein the circular blades (306a-c) are arranged such that a circular blade of a smaller diameter is placed at a lower height than a circular blade of a larger diameter, for cutting the m number of layers sequentially starting with a lowermost circular blade cutting open an outermost layer of the m number of layers, such that diameters of openings cut in the m number of layers (304a-c) increase for each layer being cut.

4. The system according to any one of the preceding claims, said cutting station (108) further comprising

a suction pipe (202) connected to the suction head (200), and
a pump (302) arranged to form a sub-atmospheric pressure (S-A-P) inside the suction pipe (202) and the suction head (200) when in contact with the outer bag (104), for transporting away, via the suction pipe (202), outer bag pieces cut off from the outer bag (104) by the cutting blade arrangement (300).

5. The system according to any one of the preceding claims, further comprising a top fin aligner (208) arranged to, when the outer bag (104) comprises a main body (205) and a top fin (204), receive the top fin (204) and to exert forces onto the top fin (204) to thereby pull the top fin (204) in a direction from the main body (205).

6. The system according to claim 5, wherein the top fin aligner (208) comprises a roller (402), driven by a roller motor (404), arranged to grip the top fin (204) and to pull this towards the top fin aligner (208).

7. The system according to claim 5 or 6, wherein the cutting station (108) further comprises a top fin cutter (400) attached to the top fin aligner (208) and arranged to cut off at least a portion of the top fin (204) from the main body (205) of the outer bag (104).

8. The system according to any one of the preceding claims, said system further comprising an outer bag removal station (110) which has a tearing arrangement (500) comprising

a first and a second hook-shaped element (212a-b,) arranged to be inserted into an opening in the outer bag (104), provided by the cutting station (108), and to hook onto a first and a second edge section (504a-b) of the opening in the outer bag (104), and
a motor arrangement (510) configured to move the first and second hook-shaped element (212a-b) in a direction away from each other, for tearing the outer bag (104) open in a tearing direction from the first and second edge section (504a-b) to a first and second end point (508a-b) of the outer bag (104), respectively.

9. The system according to claim 8, wherein the tearing direction extends along a longitudinal direction (LON-D) of the bag arrangement (102) such that a longitudinal opening is provided in the outer bag (104), wherein the first and second hook-shaped element (212a-b) each comprises two sub-elements (600a-b, 600c-d), wherein the sub-elements (600a-b) of the first hook element (212a) are arranged to be moved apart from each other in a transversal direction (TRA-D) of the bag arrangement (102) when the first hook-shaped element (212a) is at the first end point (508a), and the sub-elements (600c-d) of the second hook-shaped element (212b) are arranged to be moved apart from each other in the transversal direction (TRA-D), when the second hook-shaped element (212b) is at the second end point (508b), wherein the transversal direction (TRA-D) is perpendicular to the longitudinal direction (LON-D).

10. The system according to claim 9, wherein the outer bag removal station (110) further comprises a first and a second folding arm (214a-b,) arranged to fold away a first and a second side (602a-b) of the outer bag (104), formed by the longitudinal opening, such that the inner bag (106) is exposed.

11. The system according to claim 8, said system further comprising a lifting station (112) for an inner bag (106), said lifting station (112) having a lifting arm (216) provided with a suction head arrangement (218) arranged to attach to the inner bag (106).

12. The system according to any one of the preceding claims, wherein the outer bag (104) is made of paper, such as kraft paper, and the inner bag (106) is made of plastic.

13. A method (700) for handling a bag arrangement (102) comprising an outer bag (104) that encloses an inner bag (106), by using a system (100) comprising a cutting blade arrangement (300) and a cutting station (108) that has a suction head (200), wherein the cutting blade arrangement (300) is arranged inside the suction head (200), said method comprising

attaching (702) the suction head (200) to the outer bag (104),
lifting (704) the outer bag (104) from the inner bag (106) by applying a suction force on the outer bag (104) by using the suction head (200), such that a vertical distance (V-D) between the outer bag (104) and the inner bag (106) is formed, and
cutting (706) an opening (506) in the outer bag (104) by using the cutting blade arrangement (300) while the outer bag (104) is lifted from the inner bag (106).

14. The method according to claim 13, wherein the cutting blade arrangement (300) comprises m number of circular blades (306a-c) of different diameters, wherein the circular blades (306a-c) are grouped such that a circular blade of a smaller diameter is located inside a circular blade of a larger diameter, for cutting m number of layers (304a-c) when the outer bag (104) is a multi-layer bag that comprises m number of layers,
wherein the step of cutting (706) the opening (506) in the outer bag (104) by using the cutting blade arrangement (300) comprises m number of sub-steps in which each of the layers of the outer bag (104) is cut individually by a dedicated circular blade of the m number of circular blades (306a-c).

15. The method according to claim 13 or 14, said method comprising
exerting (#), when the outer bag (104) comprises a main body (205) and a top fin (204), forces onto the top fin (204) to thereby pull the top fin (204) in a direction from the main body (205).

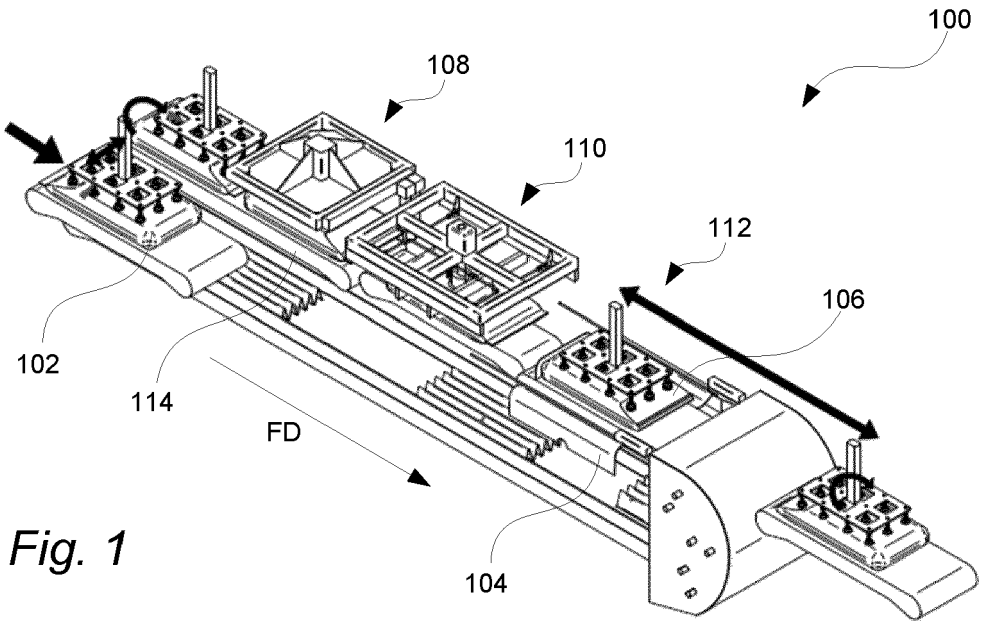
100
108
110
112
106
102
114
FD
104

Fig. 1

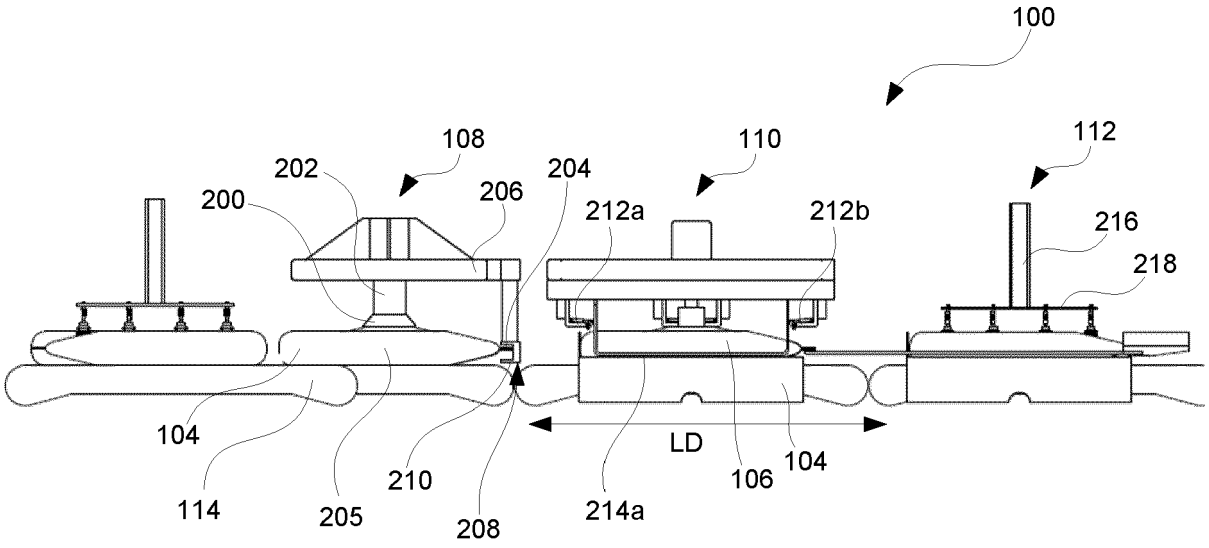
100
108
110
112
202
200
206
204
212a
212b
216
218
104
114
205
210
208
214a
LD
106
104

Fig. 2

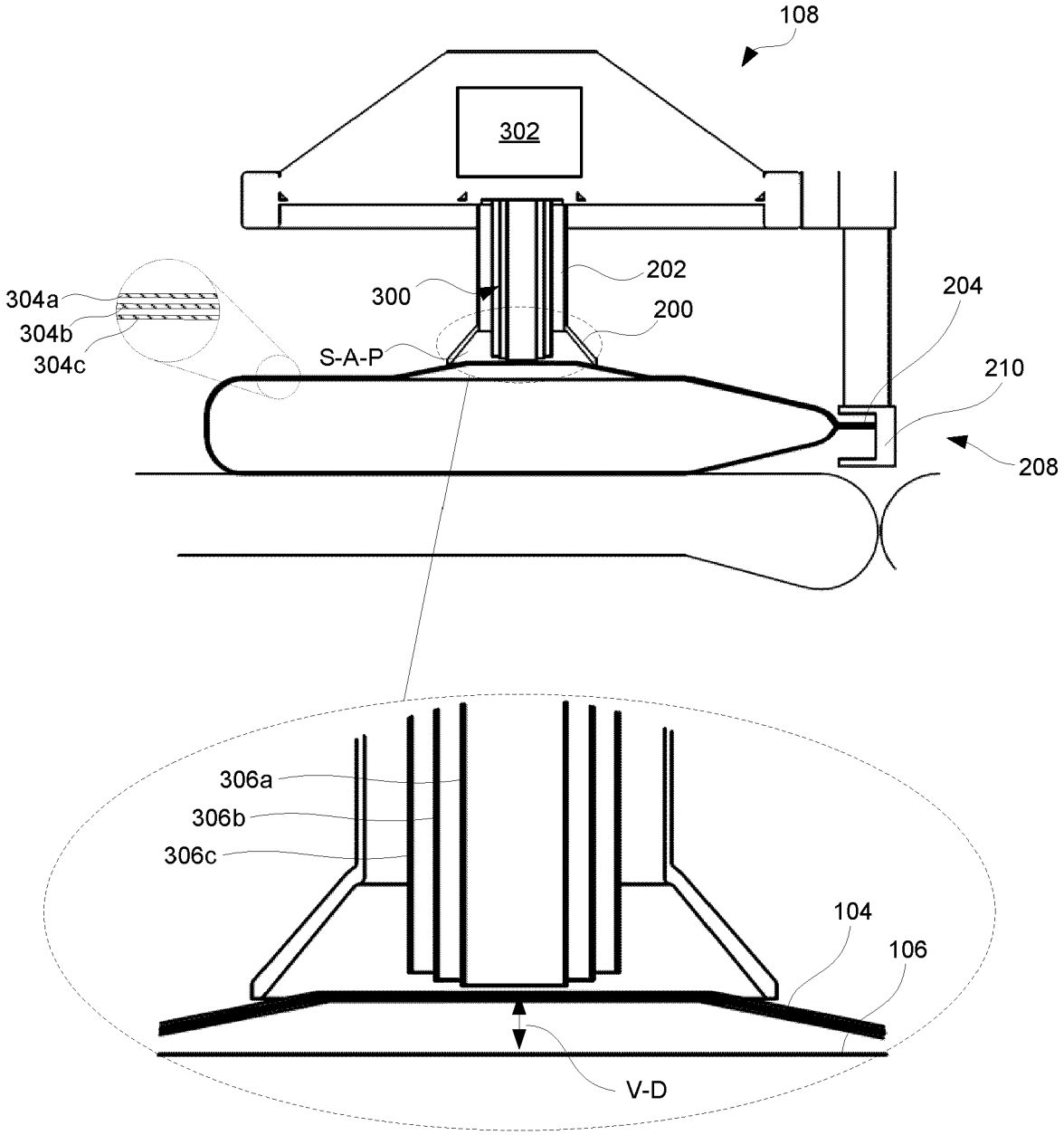
108
302
202
300
200
204
304a
304b
304c
S-A-P
210
208
306a
306b
306c
104
106
V-D

Fig. 3

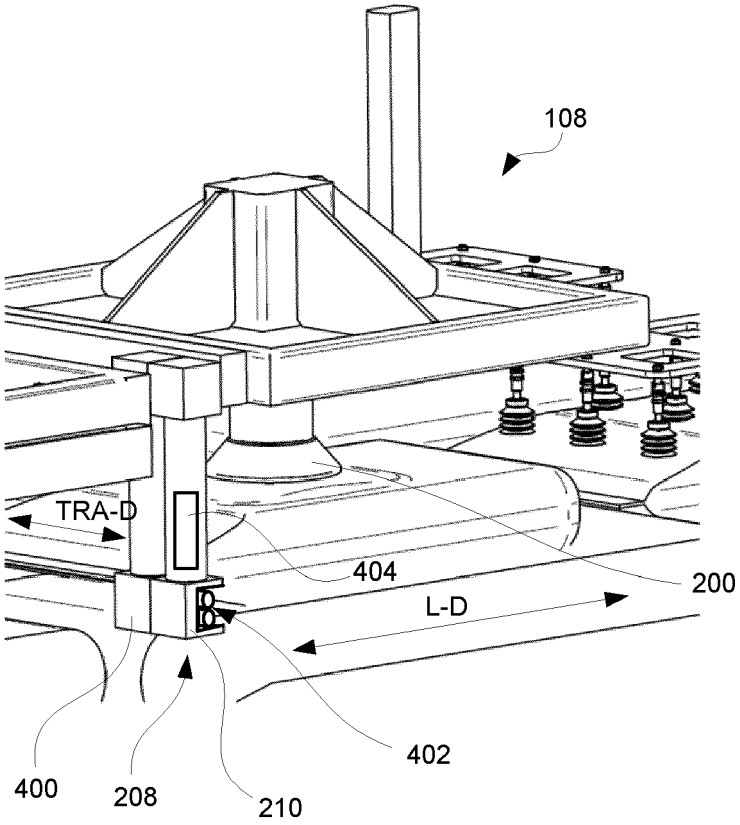

Fig. 4

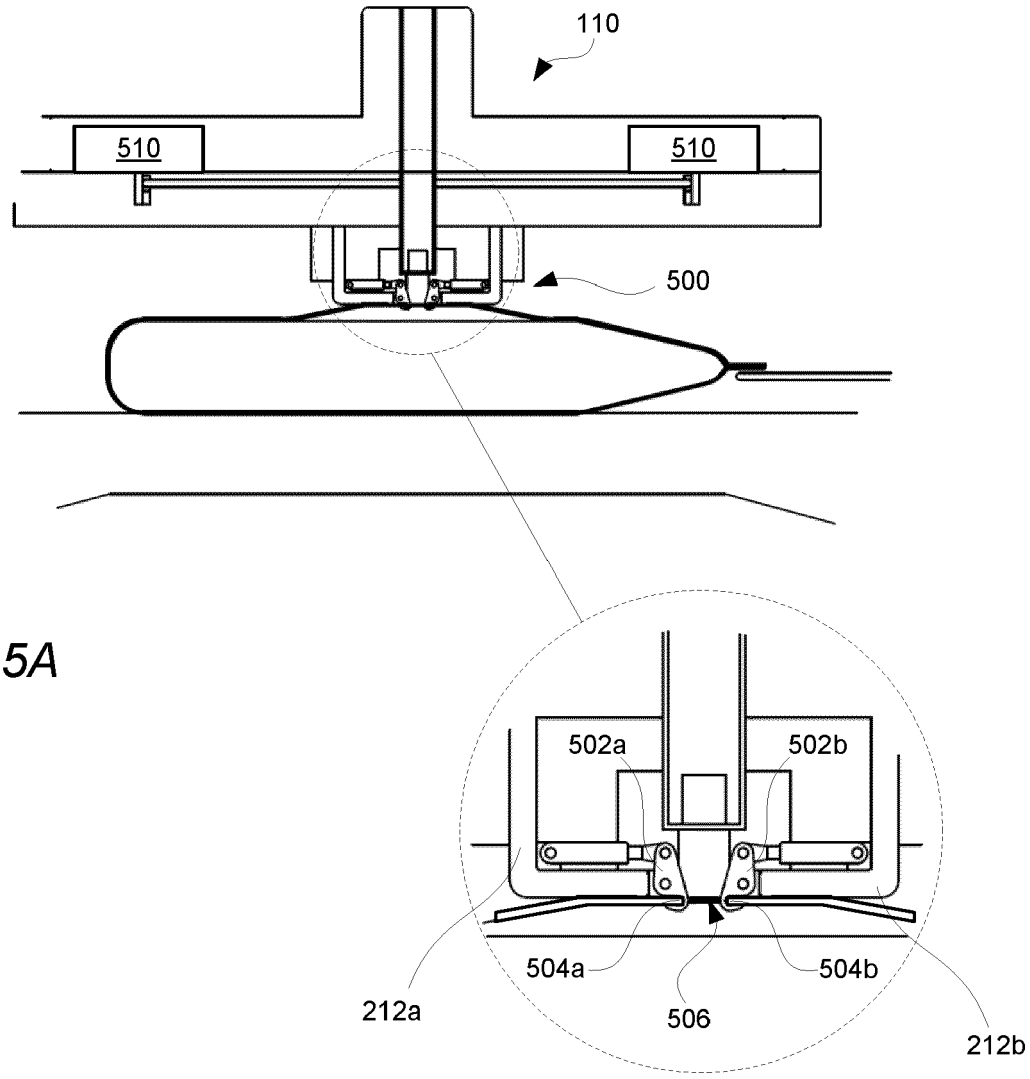
110
510
510
500
502a
502b
212a
504a
506
504b
212b

Fig. 5A

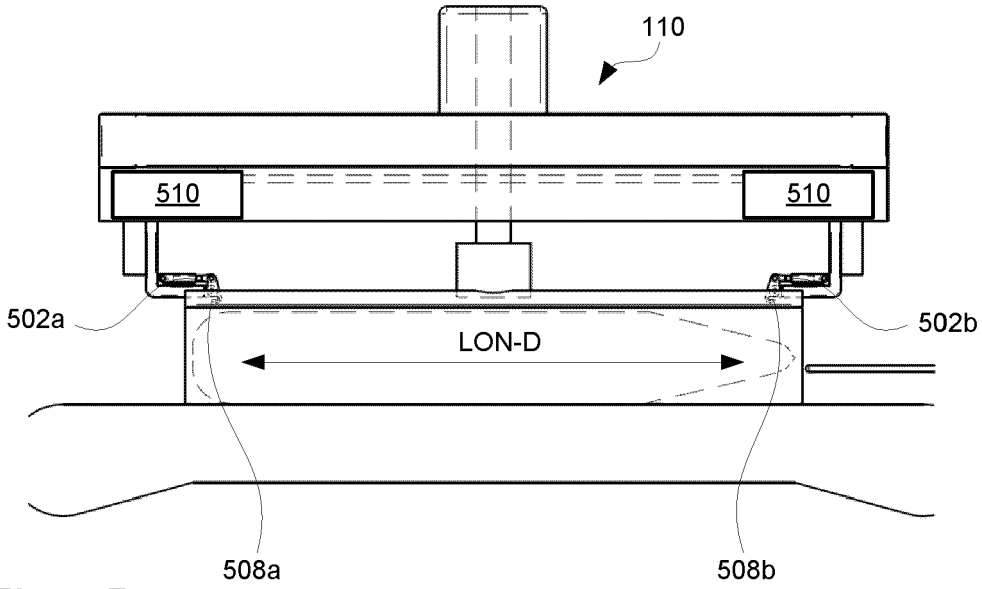
110
510
510
502a
502b
LON-D
508a
508b

Fig. 5B

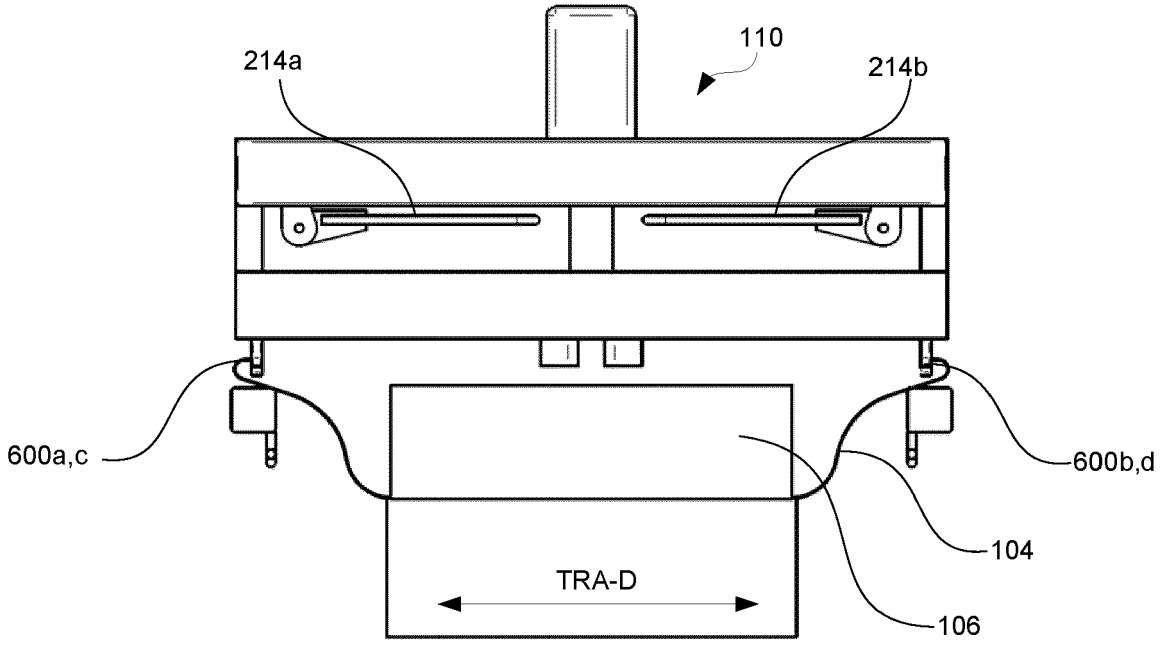
110
214a
214b
600a,c
600b,d
104
TRA-D
106

Fig. 6A

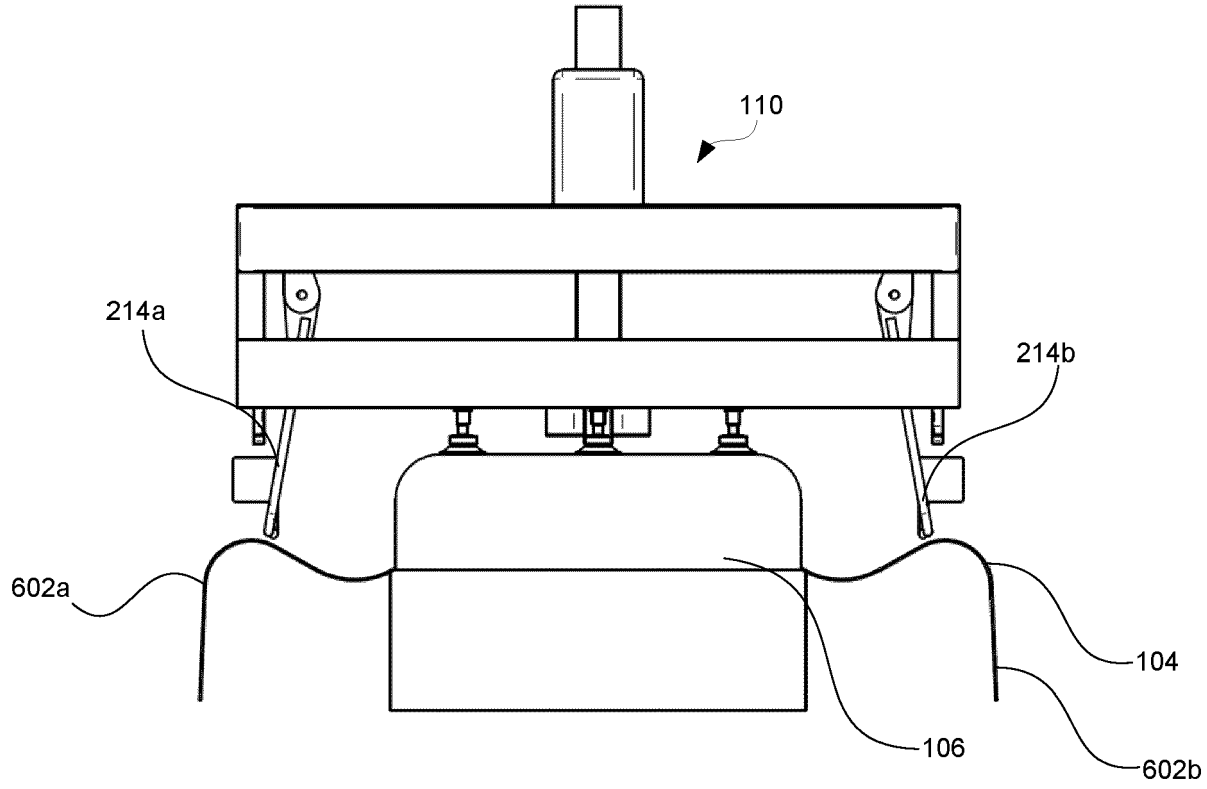
110
214a
214b
602a
104
106
602b

Fig. 6B

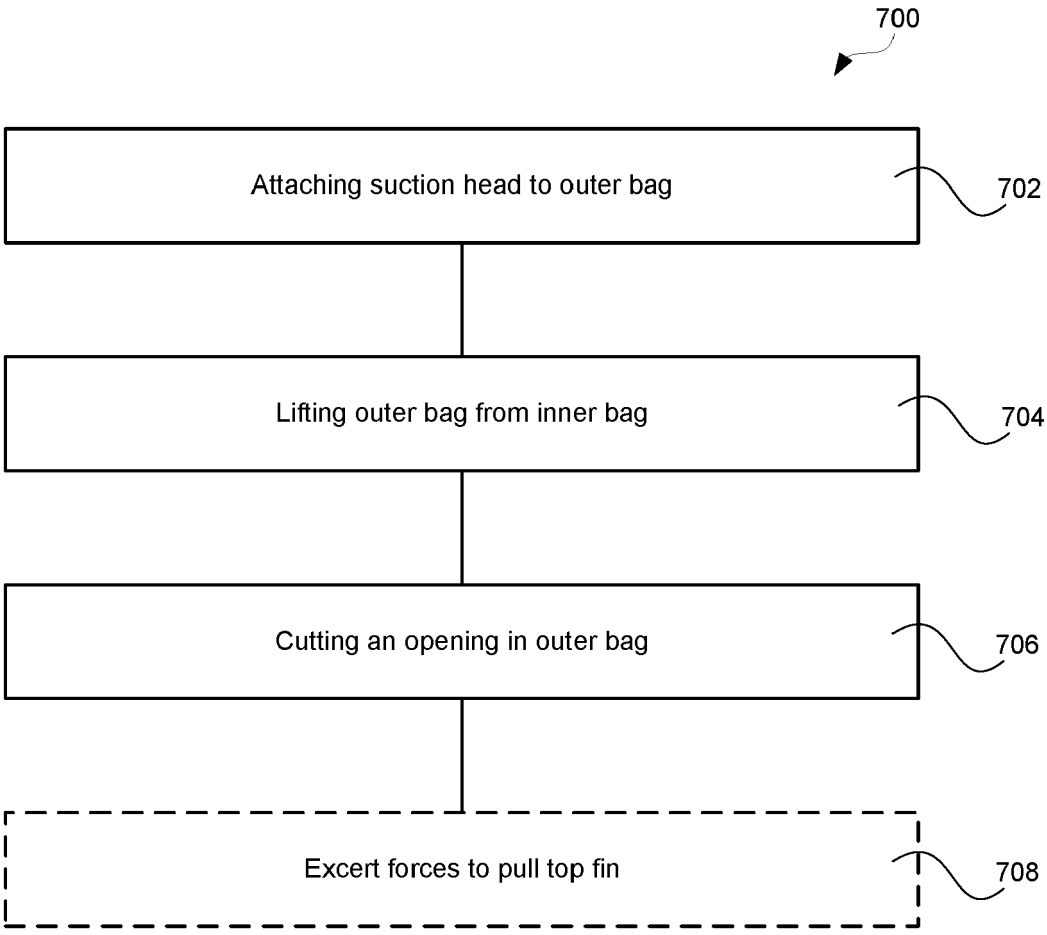
700
Attaching suction head to outer bag
702
Lifting outer bag from inner bag
704
Cutting an opening in outer bag
706
Excert forces to pull top fin
708

Fig. 7

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EUROPEAN SEARCH REPORT

Application Number
EP 23 20 4696

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 December 2023	Dick, Birgit

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