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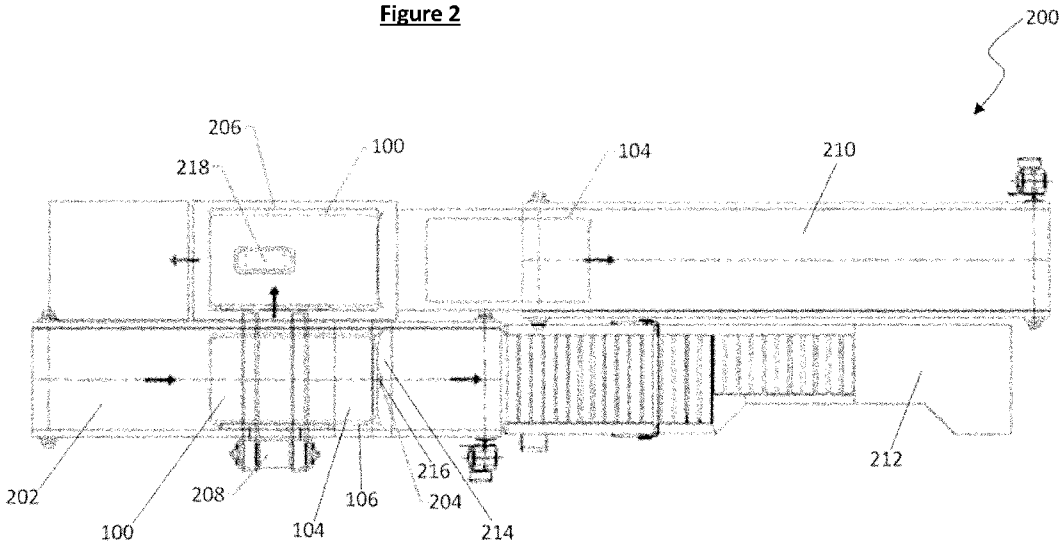
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(54) Title: APPARATUS AND METHOD FOR PROCESSING OF STEP TOP GLUED BAGS

Figure 2



(57) Abstract: The present invention relates to a method, system, and a heating system for use with the system for the purpose of processing of step top glued bags, and in particular the opening and removal of the paper layer of such bags. These types of bags should be understood to consist of a plastic liner or plastic bag which, in turn is protected by the outer layer of paper. The liner is bonded to the paper layer through spots of adhesive. The invention involves the application of heat to the top of the bag, which deactivates the adhesive in this area. The bag can then be tilted or otherwise manipulated to allow the liner to slide out from the paper layer, which can then be removed.

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APPARATUS AND METHOD FOR PROCESSING OF STEP TOP GLUED BAGS

Statement of Corresponding Applications

This application is based on the provisional specification filed on 31 August 2018 in relation to New Zealand Patent Application No. 745912, and the complete specification filed on 12 June 2019 in relation to New Zealand Patent Application No. 754260, the entire contents of which are incorporated herein by reference.

Field of Invention

The present invention relates to an apparatus and method for the processing of step top glued bags. The invention has particular application to the stripping of the outer layer of step top glued bags.

Background to the Invention

In the food industry, it is common practice to store product, for example milk powder or flour, in large double-layered bags. These have an outer layer which provides a degree of protection during transportation and storage and an inner layer to ensure the product is contained within a hygienic environment. This is particularly important should the outer layer be damaged or become dirty or otherwise contaminated.

In most cases, the outer layer is one to three plies of paper, while the inner layer is in the form of a plastic liner or plastic bag. This plastic liner is maintained within the paper layer through the use of strategically placed spots and beads of adhesive glue applied during manufacture. At the upper end of the bag, forming its opening, glue is located along its edges and these are folded over and bonded closed. These types of bags are referred to as a “step top glued bag”.

When such a bag is being processed, for example by being introduced to a food manufacturing facility, the outer layer of paper is removed leaving the sealed plastic liner containing the food product to be conducted to a hygienic area of the facility.

During this process, it is important that the plastic liner does not come in contact with the exterior surfaces of the outer layer. It will be appreciated that these exterior surfaces may have come into contact with dirt, pathogens, and other contaminants which would be undesirable to enter the more hygienic areas of the food manufacturing facility.

Therefore, the removal of the outer layer is typically the first step of the processing of the bag and is performed at a specified "de-bagging" station. This is typically housed in a medium hygienic environment within the food processing facility, and the person removing the bag will be dressed accordingly.

Once the paper layer has been removed, the plastic liners are then moved by conveyor or other transported to a more secure hygienic environment, for example a food preparation area, for emptying. This process can also involve the plastic bag being treated with UV radiation as a final precautionary measure to minimise risk of contamination of the plastic bag.

It can be relatively difficult to automate the removal of the outer layer of a step top glued bag, due many vagaries in the position of the bag, the position of the plastic liner within the outer layer of paper, the potential shifting of its contents and so on. Therefore, manner of removing the outer layer of the bag is entirely a manual process, performed by human workers.

However, this is not ideal for it means that the bag removal process is subject to the working hours of the workers, down time through rest breaks, and absenteeism. This can affect the overall throughput of the food manufacturing facility.

There is also the risk that the worker themselves may potentially come into contact with and contaminate the outer surfaces of the inner liner during the removal of the paper layer. This could compromise the quality of the food product.

Care must also be taken when removing the outer layer, particularly if instruments are used to assist in the process. Such instruments typically are knives or similar sharp implements, which run the risk of puncturing the inner plastic liner if the user does not take sufficient care.

Object of the Invention

It is an object of the present invention to provide an apparatus and method to facilitate the automation or semi-automation of the removal of the outer layer of paper from a step top glued bag.

It is an object of the present invention to provide an apparatus and method to facilitate the removal of the outer layer of paper from a step top glued bag with minimal contamination risk to the inner layer of the step top glued bag.

Alternatively, it is an object of the invention to provide an apparatus and method to quickly remove the outer layer of paper from a step top glued bag without requiring the manipulation of sharp implements.

Alternatively, it is an object of the invention to at least provide the public with a useful choice.

Disclosure of Invention

According to one aspect of the present invention, there is provided a method of processing a step top glued bag, wherein the step top glued bag includes an outer paper layer and an inner plastic liner containing a powdered product, the method including the steps of:

a) presenting a pinched end of the bag to a heating station;

b) heating the pinched end of the bag to between 60°C to 450°C;

c) gripping the outer paper layer; and

d) tilting the bag towards the pinched top end thereby allowing the plastic inner liner to force open the pinched end of the paper layer and slide out.

According to another aspect of the present invention, there is provided system for processing a step top glue bag, wherein the step top glued bag includes an outer paper layer and an inner plastic liner containing powdered product, the system including:

a de-bagger, wherein the de-bagger includes:

an infeed conveyor for transporting one or more step top glued bags;

a heating station for receiving a pinched end of the bag, wherein the heating station is configured to heat the pinched end of the bag to between 60°C to 450°C and

a tilt table, wherein the table is configured to pivot a bottom end of the bag upwards.

According to another aspect of the present invention, there is provided a heating station for use with an system for processing a step top glue bag, wherein the step top glued bag includes an outer paper layer and an inner plastic liner containing powdered product, wherein the heating station includes:

a receptacle, wherein the receptacle is configured to receive a pinched end of the bag; and

a heating means, wherein the heating means is configured to heat the pinched end of the bag to between 60°C to 450°C.

The present invention relates to a method, system, and a heating system for use with the system for the purpose of processing of step top glued bags, and in particular the opening and removal of the paper layer of such bags. These types of bags should be understood to consist of a plastic liner or plastic bag which, in use, contains the powdered product, which in turn is protected by the outer layer of paper.

Although reference is made throughout the remainder of the present invention to an outer layer of paper, i.e. a single layer of paper, this should not be read as limiting. In some step top glued bags, the outer layer of paper may be comprised of two or more plies, i.e. individual layers, of paper. Collectively, these should be understood to comprise the outer layer of the bag. In the packaging industry, Kraft paper is often used for this outer layer.

Step top glued bags are often used to store up to 25 kilograms worth of powered product and in these embodiments are approximately 850 millimetres long, 450 millimetres wide and 160 millimetres high. These dimensions are provided by way of example and are not meant to be limiting.

Supplied as flat packs to the relevant processing factories, these bags are intended to be manipulated by robotic equipment when filling the plastic liner with the powdered product.

The powdered product may be any product that required to remain substantially uncompromised by contaminants during storage and transportation.

In exemplary embodiments, the powdered product is a food product or a constituent of a food product. For example, the powdered product may be flour or sugar. In exemplary embodiments, the powdered product is milk powder. However, it should be appreciated that this is not meant to be limiting.

Step top glued bags are manufactured in such a way that their base is fully sealed, in what is known in the industry as a 'block bottom', along with an open end into which product is introduced. The plastic liner is held in place within the paper layer using a plurality of spots or small strips of low adhesive glue. These contact the exterior surface of the plastic liner and the inner surface of the paper layer.

Proximate the top end of the bag, spots of adhesive are arranged in series to bond the plastic liner to the paper layer. This is to ensure that when the plastic liner is opened, it does so with the paper layer. This prevents any product from falling in between the respective inner liner and outer layer when the former is being filled with powdered product.

The plastic liner is then sealed by the application of heat to its upper, open, end. This heat renders an elongate strip of the plastic liner molten and, upon cooling, this forms a heat seal. This application of heat to the plastic liner is achieved without it affecting or burning the paper layer of the bag.

Once the plastic liner filled and sealed, the top end of the paper layer, to which a glue strip has been applied, is folded over and glued upon itself in a manner similar to sealing an envelope. This top end should be understood to be the pinched end of the bag.

For some bags, an additional process is involved, which calls for the use of a pressure wheel that acts on the heat seal applied to the plastic liner while it is still molten. This scores the heat seal and helps separate the top of the plastic liner from the top of the paper layer. This can facilitate easy removal of the plastic liner from the paper layer although it is prone to not being adequately formed.

The invention will now be referred to as a de-bagger. It will be understood that the de-bagger may be incorporated into an overall manual, semi-automated, or fully-automated de-palletising and bag handling system or apparatus, particularly those handling 25 kilogram bags.

The de-bagger includes a conveyor to conduct the bags from an unloading or de-palletising station for delivery to the de-bagger machine which incorporates the heating station. Conveyors suitable for use with the de-bagger will be readily known to persons skilled in the art.

In exemplary embodiments of the invention, the conveyor is a standard infeed conveyor that will present the bag to a 'conditioning conveyor'. This conditioning conveyor will utilise rollers or the like to both loosen the powder and the plastic liner from around the paper layer helping to restrict, as much as is practical, the contact between the plastic liner and the paper layer (other than where they are bonded). It also prepares the pinched end of the bag for uniform presentation to the next station, which in exemplary embodiments of the invention is the heating station. However, this is not meant to be limiting and the infeed conveyor may instead deliver the bag straight to the heating station.

Preferably, along the infeed conveyor, and/or the conditioning conveyor if present, at least proximate the heating station, are guides. These guides may be in the form of rails or the like which assist in orientating the bag on the conveyor to ensure that its pinched end is correctly presented to the heating station.

The heating station should be understood to include a heating means arranged to apply heat to the pinched end of the step top glued bag. It should be appreciated that the heating means may take a variety of configurations depending on the facility with which the de-bagger is to be used. Depending on

the embodiment of the invention, the application of heat may be achieved using indirect or direct heating methods as required.

In one embodiment, the heating means may be a flow of heated air created using electric elements or the like.

Alternatively, the heating means may be heated element bars or infrared heating. Persons skilled in the art will readily appreciate other ways of heating that would be applicable for use with the present invention.

In exemplary embodiments of the invention, the heating station includes a receptacle configured and dimensioned to receive the pinched end of the bag and the heating means is positioned within or proximate this receptacle. The receptacle may be in the form of a manifold or shroud-like structure with a relatively elongate slot that receives the pinched end of the bag. As such, in use, the pinched end of the bag is within the interior of the receptacle and receiving heat applied by the heating means.

The receptacle helps channel and direct the heat applied by the heating means onto the pinched end of the bag for greater efficiency and minimisation of heat loss.

In exemplary embodiments, the heating station may also include a clamping mechanism that closes along the width of the pinched end to both grip the bag for further manipulation during the heating process or afterwards, and/or to seal against heat loss during the heating process.

When heat of an appropriate temperature is applied to the pinched portion of the bag for a certain period of time, it becomes sufficiently heated such that the adhesive strips and/or spots in this area soften and become temporarily deactivated. This deactivation of the adhesive means that the bonding between the plastic liner and the paper layer at the pinched end of the bag is reduced or becomes non-existent.

The temperature to achieve this is in the range of 60°C to 450°C, when applied for a period of two to 30 seconds. Persons skilled in the art will appreciate that the temperature may be selected with a specific

period of time for which it is to be applied. For example, the temperature may be 400°C but only applied for two seconds. Alternatively, the temperature may be 100°C, but applied for 25 seconds. The latter scenario may be suitable for plants with a relatively low throughput so the extra time taken for heating the pinched end of the bag is less critical than for a plant with a high throughput.

However, the use of higher temperatures, such as 400°C, may require greater health and safety precautions. For example, at 300°C, certain grades of paper will spontaneously ignite without the presence of a bare flame.

In exemplary embodiments, the temperature applied to the pinched end of the bag is in the range of 160°C to 250°C, when applied for a period of two to 30 seconds. The inventors have found that this is a good compromise between safety and throughput.

As will be appreciated from the preceding discussion, this temperature range is not meant to be limiting, and the temperature and timing for its application, may be determined by the desired throughput of the de-bagger. The length of time that heat may be applied could also be determined by the type or even manufacture of the adhesive strips and/or stops used at the pinched end of the bag.

Regardless of the temperature used, it will be understood that it should be less than the minimum ignition temperature for the paper that is used for the paper layer of the step top glued bag.

The de-bagger may include an urging means to urge or otherwise articulate the bag away from the heating station once the application of heat ceases. This may be the clamping mechanism that is present in exemplary embodiments of the heating station. However, in other embodiments of the present invention, this urging means may be in the form of a pushing bar or vertical plate which acts upon the bag in order to move it away from the heating station.

In exemplary embodiments of the invention, when the bag initially is presented to the heating station, the heating station will extend via a pneumatic cylinder to encompass the pinched end of the bag and the clamping mechanism grips the bag. The cylinder will retract, pulling the bag longitudinally on to the

next station, which in exemplary embodiments of the invention is the tilt table discussed below, while the heating step also takes place.

The de-bagger includes a tilt table. This will be understood to mean a structure which is configured to pivot or otherwise raise the step top glued bag from a generally horizontal condition, to an angled condition. In exemplary embodiments of the invention, the tilt table is configured to have a range of motion of between 30° to 90° from the horizontal.

It will be appreciated that the tilt table raises the bag such that its base is upper most while the pinched end is lowermost.

In exemplary embodiments, the de-bagger includes gripping means. These should be understood to be configured to engage with the exterior surfaces of the paper layer.

Preferably, the gripping means are vacuum clamps, as will be known to persons skilled in the art, and which apply a suction force to the exterior surfaces of the paper layer, thus securing it in place.

When the tilt table pivots the step top glued bag such that its base is elevated, this allows the plastic liner, acting under gravity, to put pressure on the pinched end of the bag. As the adhesive securing the folds of the paper layer have become deactivated, or at the very least significantly weakened, through the application of heat from the heating means, as have the adhesive spots between the plastic liner and the interior surface of the paper layer at the pinched end of the bag, this allows the plastic liner to slide out from the outer layer under its own weight.

In some embodiments of the invention, the tilt table may include a pushing mechanism, such as a pneumatic cylinder, to assist in the ejection of the plastic liner from the outer layer of the bag. Preferably, this pushing mechanism acts against the base of the bag.

However, it should be appreciated that in some embodiments of the invention no tilting of the tilt table is required, for it could be possible to extrude the plastic liner out of the paper layer horizontally by

pushing in from the base of the bag using a pneumatic cylinder while holding the bag using the gripping means described above.

In exemplary embodiments of the invention, proximate the tilt table is provided an out-feed conveyor. It will be understood when the plastic liner slides out of the paper layer, it is deposited onto the out-feed conveyer. This will transport the plastic liner for further processing as required, which may involve it being sterilised, opened and so on.

In the meantime, the paper layer, which has been retained through the use of the gripping means, is removed for disposal.

It will be appreciated that this process is relatively easy to automate for persons skilled in the art. The de-bagger may also be optimised to minimise the overall cycling time of the step top glued bags from which the outer layer is to be removed.

Further aspects of the invention, which should be considered in all its novel aspects, will become apparent to those skilled in the art upon reading of the following description which provides at least one example of a practical application of the invention.

Brief Description of the Drawings

One or more embodiments of the invention will be described below by way of example only, and without intending to be limiting, with reference to the following drawings, in which:

Figure 1 is a cross-section of the pinched end of a step top glued bag with which the present invention is to be used;

Figure 2 is a schematic plan view of one embodiment of the present invention in the form of a de-bagger;

Figure 3 is a side view schematic of the embodiment of Figure 2, with the step top glued bag at the heating station;

Figure 4 is an end view schematic of the embodiment of Figures 2 and 3, with the step top glued bag at the tilt table;

Figure 5 is a further end view schematic of the embodiment of Figures 2 to 4, with the plastic liner of the step top glued bag on the out feed conveyor;

Figure 6 is a schematic plan view of an alternative embodiment of the present invention; and

Figure 7 a side view schematic of the embodiment of Figure 6.

Detailed Description of the Drawings

The invention is to be used with a specific type of bag known as a step top glued bag (100), the upper portion of which is illustrated in Figure 1. This shows the cross-section of the pinched end (102) of the bag and it will be seen that it includes a plastic liner (104) and a paper outer layer (106). Collectively these form the double-layers of the bag.

At the pinched end (102) of the bag (100), these are held together by a series of adhesive spots (110), with the flap (108) of the paper layer (106) receiving a glue strip (112). Once the plastic liner (104) has been filled with the desired product, a heat sealing means is applied to bond the two sides of the plastic liner together using electric heated bars (not shown) or the like.

The heat involved is transferred through the paper layer (106) without affecting its integrity. In some embodiments, the plastic liner (104) will be scored along the heat seal while it is still molten using a pressure wheel. This can serve as a line of separation to render the plastic liner free of any attachment to the paper layer at the pinched end (102).

Once the plastic liner (104) has been sealed, heat is then applied directly to the flap (110) of the paper layer (106) at the pinched end (102), which results in the activation of the adhesive strips (112) and spots (108) in this area. This bonds the open ends of the paper layer closed.

Figures 2 to 5 shows one embodiment of the invention, in the form of a de-bagger (200), in various schematic views.

The de-bagger (200) includes an infeed conveyor (202) for delivering the step top glued bags (100) to be processed to a heating station (204), which includes a tilt table (206). It also includes a pushing mechanism (208) to move the bag, once it has been treated by the heating station, to the tilt table.

Proximate the tilt table (206) is the outfeed connector (210) that will conduct the plastic liner (104) from which the outer layer (106) of paper has been removed, further into the factory (not shown) with which the de-bagger (200) is to be used for further processing. In the event of a mechanical failure, the invention is also provided with a manual stripping table (212). This is arranged to the rear of the heating station (204), although it will be appreciated that this is not meant to be limiting and the stripping table could be located elsewhere. This provides an area where, if necessary, the bags could be processed or inspected by a human worker.

Explanation of the removal of the outer layer (106) of paper from the plastic liner (104) of a step top glued bag (100) shall now follow with reference to Figures 2 to 5.

The bag arrives from its point of delivery via the infeed conveyor (202). This may be belt driven, rollers, or a series of plates or the like.

The heating station (204), with its tilt table (206), is positioned at one end of the infeed conveyor (202). The heating station has a housing (214) with an opening (not visible) that receives the pinched end (102) of the bag (100), which will be understood to be its top end. Air, heated to a temperature of 160°C to 250°C, is applied to the pinched end by being introduced to the housing through a nozzle (216). This heated air deactivates or at least weakens the adhesive that secures both the folds of the pinched end, as well as the adhesive spots securing the plastic liner to the interior surfaces of the paper layer in this area. This does not affect the heat seal of the plastic liner.

Although the use of heated air is described here, it should be appreciated that the housing may just as easily incorporate additional or alternative forms of heating, such as heated element bars or infrared heating. The use of the housing helps minimise loss of heat as much as possible to avoid inefficiencies.

However, it will be appreciated that a certain amount of heat may always be lost through the opening that receives the pinched end of the bag.

After a sufficient period of time, typically two to 30 seconds when the temperature being applied is in the range of 160°C to 250°C, the pushing mechanism (208) applies a force to the side of the bag (100) to move it to the tilt table (206).

At the tilt table (206), a gripping means, in the form of vacuum grippers (218), is activated, and by way of a suction force, grips the exterior surface (i.e. the paper layer) of the bag (100) at select points. Once a firm grip has been achieved, the tilt table will pivot, as shown in Figure 3, to a near vertical orientation. As it does so, the grippers, positioned at the end of robotic, articulated arms (not shown), maintain suction force on the paper layer to keep it in a secure condition.

The pinched end (102) of the bag (100) has been significantly weakened through the deactivation of the adhesive in this area. This means the weight of the plastic liner (104) applies sufficient pressure, under gravity, to force the pinched end of the bag open. The plastic liner is able to slide free of the paper layer and be guided onto the outfeed conveyor (212) as shown in Figures 4 and 5.

To assist in this movement onto the outfeed conveyor (212), a suction bag puller (220) may be applied to the plastic liner (104). However, this will only apply minimal force in order to prevent damage or otherwise to the plastic liner as it is important that it remains structurally sound to prevent any contamination of the contents. It will be seen that the tilt table (206) is positioned such that it is elevated relative to the out-feed conveyor. This allows gravity to assist in the movement of the plastic liner as it is moved from the tilt table.

In the meantime, the vacuum grips (218), having still retained the outer paper layer, delivers it to a waste paper chute or bin (222) for removal.

This process can be made more compact and automated for optimisation of the removal of the outer layer from successive step top glued bags. For example, one bag could be located at the heating station,

while another bag is already present on the tilt table, as shown in the embodiment illustrated in Figures 6 and 7. In these figures, features common with the previous embodiment described retain their numbering.

In this embodiment of the be-bagger (600), the infeed conveyor (202) delivers the bags directly to the tilt table (206). The housing (214) of the heating station (204) is positioned at the far end of the tilt table to receive the pinched end of the bags. It is able to move away from the tilt table via a piston (602), a necessary feature since as can be seen in Figure 7, the tilt table pivots forward once the pinched end of the bag has been heated via the introduction to the nozzle (216) of air heated to a sufficient temperature and applied for a sufficient period of time.

Under gravity, the plastic liner (104) is able to slide out of the paper layer (106) to either the outfeed conveyor (210) or the manual stripping table (212). A diverter flap (604) is operable to direct the plastic liner to the desired location. In the meantime, the vacuum grippers (218) retain the paper layer and it is removed to the waste paper chute (222).

This arrangement, with the manual stripping table arranged partially under the de-bagger (600) optimises the spatial arrangement of the various aspects of this embodiment, making it ideal for facilities with spacing constraints.

Unless the context clearly requires otherwise, throughout the description and the claims, the words “comprise”, “comprising”, and the like, are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense, that is to say, in the sense of “including, but not limited to”.

The entire disclosures of all applications, patents and publications cited above and below, if any, are herein incorporated by reference.

Reference to any prior art in this specification is not, and should not be taken as, an acknowledgement or any form of suggestion that that prior art forms part of the common general knowledge in the field of endeavour in any country in the world.

The invention may also be said broadly to consist in the parts, elements and features referred to or indicated in the specification of the application, individually or collectively, in any or all combinations of two or more of said parts, elements or features.

Where in the foregoing description reference has been made to integers or components having known equivalents thereof, those integers are herein incorporated as if individually set forth.

It should be noted that various changes and modifications to the presently preferred embodiments described herein will be apparent to those skilled in the art. Such changes and modifications may be made without departing from the spirit and scope of the invention and without diminishing its attendant advantages. It is therefore intended that such changes and modifications be included within the present invention.

Claims

1. A method of processing a step top glued bag, wherein the step top glued bag includes an outer paper layer and an inner plastic liner containing a powdered product, the method including the steps of:

   e) presenting a pinched end of the bag to a heating station;

   f) heating the pinched end of the bag to between 60°C to 450°C;

   g) gripping the outer paper layer; and

   h) tilting the bag towards the pinched top end thereby allowing the plastic inner liner to force open the pinched end of the paper layer and slide out.

2. The method as claimed in claim 1, wherein prior to step a), the step top glued bag is placed on a conveyor, wherein the heating station is at an end of the conveyor.

3. The method as claimed in either claim 1 or claim 2, wherein in step b), the heat is applied to the pinched end of the bag for a period of two to 30 seconds.

4. The method as claimed in any preceding claim, wherein in step b), the heat applied to the pinched end of the bag is from 160°C to 250°C.

5. The method as claimed in any preceding claim, wherein in step d), a pushing mechanism acts against a bottom end of the bag.

6. A heating station for use with an apparatus for processing a step top glue bag, wherein the step top glued bag includes an outer paper layer and an inner plastic liner containing powdered product, wherein the heating station includes:

   a receptacle, wherein the receptacle is configured to receive a pinched end of the bag; and

   a heating means, wherein the heating means is configured to heat the pinched end of the bag to between 60°C to 450°C.

7. The heating station as claimed in claim 6, wherein the receptacle is configured as a manifold with an elongate slot configured to receive the pinched end of the bag.

8. The heating station as claimed in claim 7, wherein the heating means is located within an interior of the manifold.

9. The heating station as claimed in claim 7, wherein the heating means is located externally of the manifold, and wherein the manifold includes a conduit to allow passage of heated air to an interior of the manifold.

10. The heating station as claimed in any one of claims 6 to 9, wherein the heating means is one of hot air blower; electric elements; heated element bars; or infrared heaters.

11. The heating station as claimed in any one of claims 6 to 10, wherein the heating station includes a clamping mechanism for the pinched end of the bag.

12. An apparatus for processing a step top glue bag, wherein the step top glued bag includes an outer paper layer and an inner plastic liner containing powdered product, the apparatus including:

a de-bagger, wherein the de-bagger includes:

an infeed conveyor for transporting one or more step top glued bags,

a tilt table, wherein the table is configured to pivot a bottom end of the bag upwards, and wherein the apparatus includes a heating station as claimed in any one of claims 6 to 11.

13. The apparatus as claimed in claim 12, wherein the heating station is at an end of the conveyor.

14. The apparatus as claimed in either claim 12 or claim 13, wherein the tilt table is proximate the heating station.

15. The apparatus as claimed in any of claims 12 to 14, wherein the apparatus includes a pushing mechanism for the tilt table.

16. The apparatus as claimed in any one of claims of 12 to 15, wherein the apparatus includes a gripping means to engage with an exterior surface of the bag in use to move it from the conveyor to the heating station.

17. The apparatus as claimed in claim 16, wherein the gripping means is a clamping mechanism included in the heating station.

18. The apparatus as claimed in any one of claims 12 to 17, wherein the apparatus includes an out-feed conveyor proximate the tilt table.

AMENDED CLAIMS
received by the International Bureau on 18 November 2019 (18.11.2019)

1. A method of processing a step top glued bag, wherein the step top glued bag includes an outer paper layer and an inner plastic liner containing a powdered product, the method including the steps of:

   a) presenting a pinched end of the bag to a heating station;

   b) heating the pinched end of the bag to between 60°C to 450°C;

   c) gripping the outer paper layer; and

   d) tilting the bag towards the pinched top end thereby allowing the plastic inner liner to force open the pinched end of the paper layer and slide out.

2. The method as claimed in claim 1, wherein prior to step a), the step top glued bag is placed on a conveyor, wherein the heating station is at an end of the conveyor.

3. The method as claimed in either claim 1 or claim 2, wherein in step b), the heat is applied to the pinched end of the bag for a period of two to 30 seconds.

4. The method as claimed in any preceding claim, wherein in step b), the heat applied to the pinched end of the bag is from 160°C to 250°C.

5. The method as claimed in any preceding claim, wherein in step d), a pushing mechanism acts against a bottom end of the bag.

6. A heating station for use with an apparatus for processing a step top glue bag, wherein the step top glued bag includes an outer paper layer and an inner plastic liner containing powdered product, wherein the heating station includes:

   a receptacle, wherein the receptacle is configured to receive a pinched end of the bag; and

   a heating means, wherein the heating means is configured to heat the pinched end of the bag to between 60°C to 450°C.

7. The heating station as claimed in claim 6, wherein the receptacle is configured as a manifold with an elongate slot configured to receive the pinched end of the bag.

8. The heating station as claimed in claim 7, wherein the heating means is located within an interior of the manifold.

9. The heating station as claimed in claim 7, wherein the heating means is located externally of the manifold, and wherein the manifold includes a conduit to allow passage of heated air to an interior of the manifold.

10. The heating station as claimed in any one of claims 6 to 9, wherein the heating means is one of hot air blower; electric elements; heated element bars; or infrared heaters.

11. The heating station as claimed in any one of claims 6 to 10, wherein the heating station includes a clamping mechanism for the pinched end of the bag.

12. An apparatus for processing a step top glue bag, wherein the step top glued bag includes an outer paper layer and an inner plastic liner containing powdered product, the apparatus including:

a de-bagger, wherein the de-bagger includes:

an infeed conveyor for transporting one or more step top glued bags,

a tilt table, wherein the table is configured to pivot a bottom end of the bag upwards, and wherein the apparatus includes a heating station as claimed in any one of claims 6 to 11.

13. The apparatus as claimed in claim 12, wherein the heating station is at an end of the conveyor.

14. The apparatus as claimed in either claim 12 or claim 13, wherein the tilt table is proximate the heating station.

15. The apparatus as claimed in any of claims 12 to 14, wherein the apparatus includes a pushing mechanism for the tilt table.

16. The apparatus as claimed in any one of claims of 12 to 15, wherein the apparatus includes a gripping means to engage with an exterior surface of the bag in use to move it from the conveyor to the heating station.

17. The apparatus as claimed in claim 16, wherein the gripping means is a clamping mechanism included in the heating station.

18. The apparatus as claimed in any one of claims 12 to 17, wherein the apparatus includes an out-feed conveyor proximate the tilt table.

Figure 1

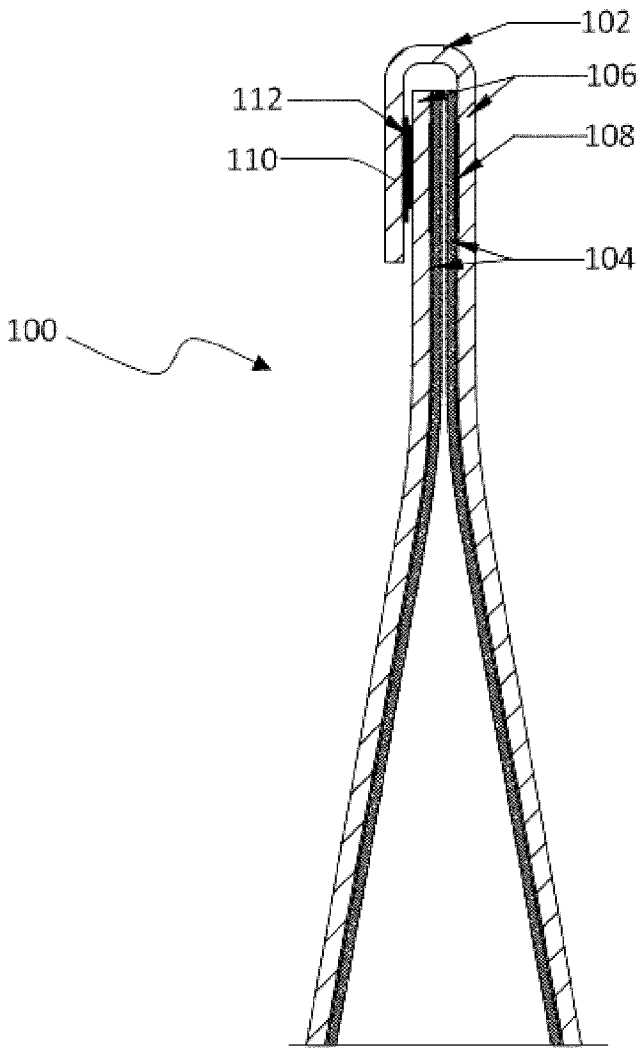


Figure 2

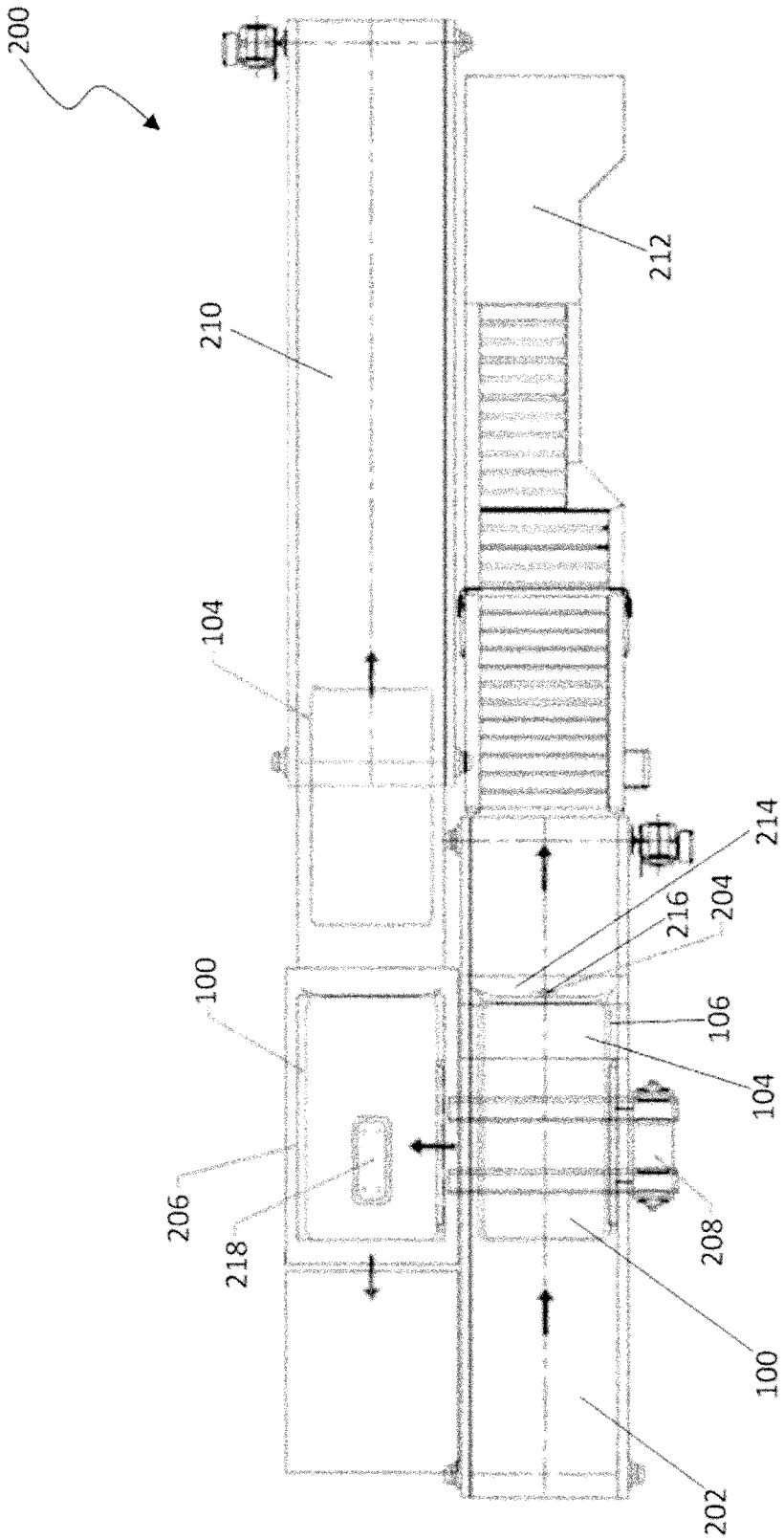


Figure 3

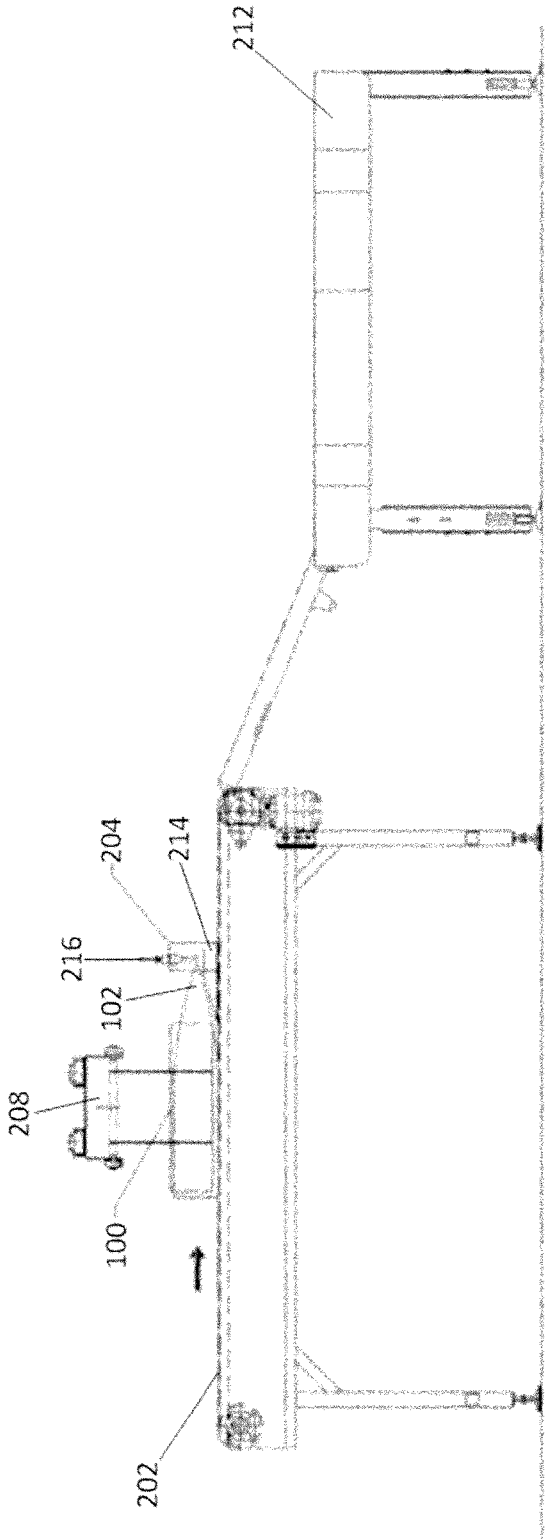


Figure 4

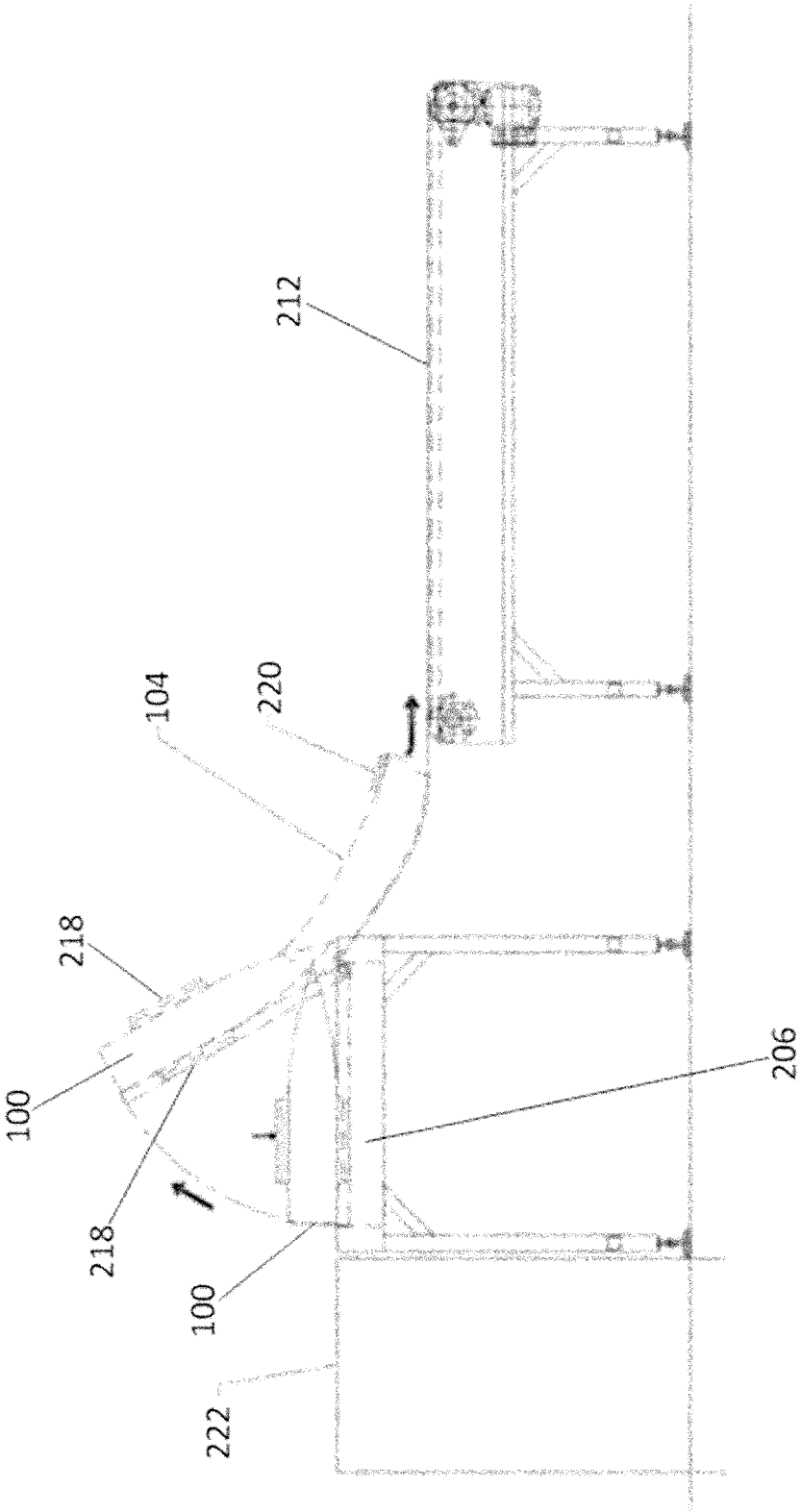


Figure 5

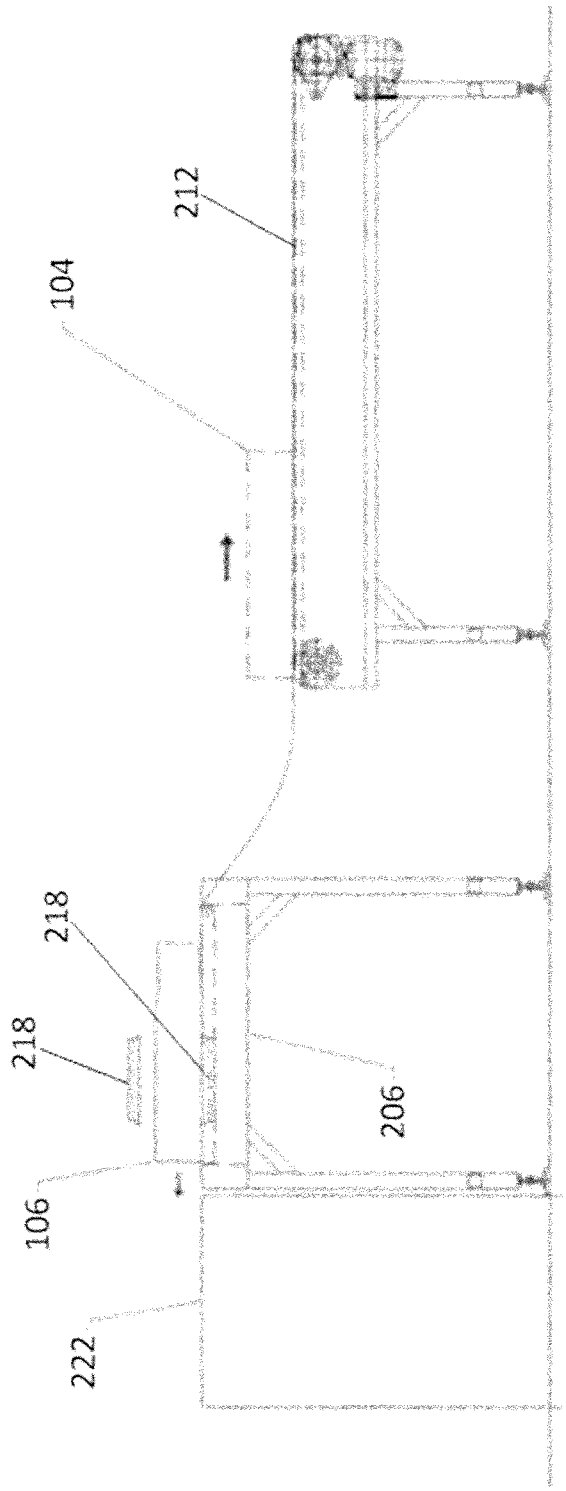


Figure 6

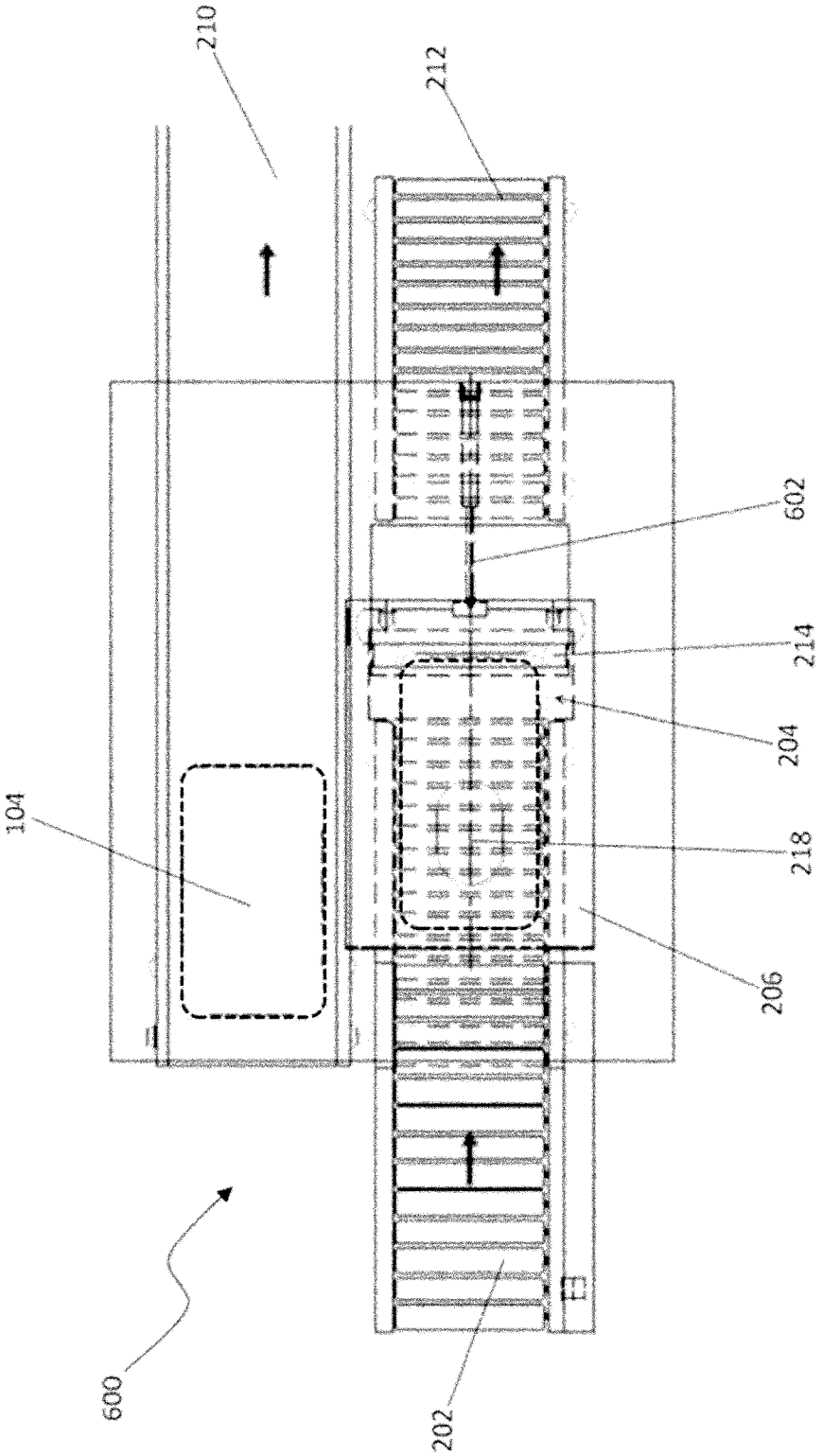
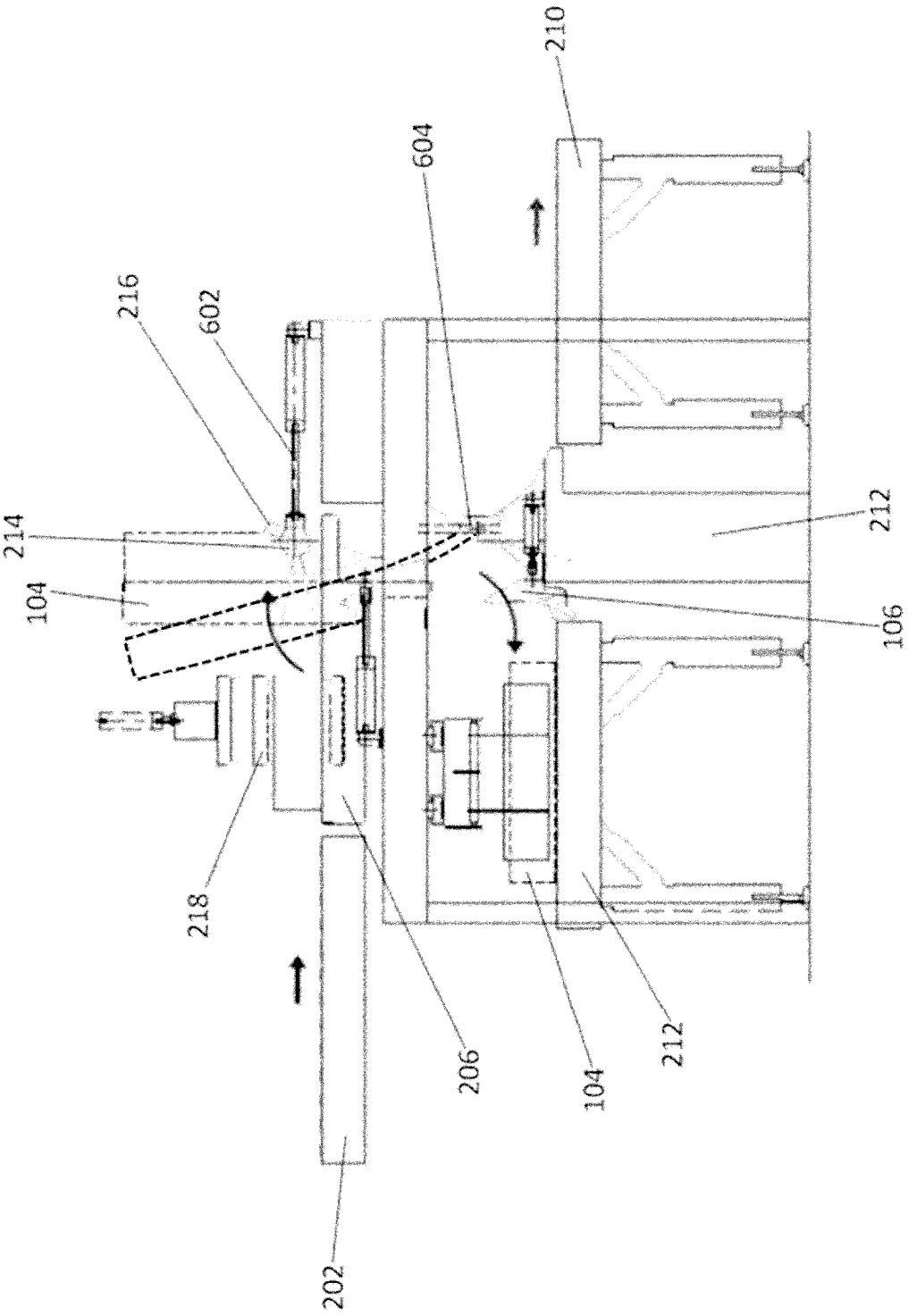


Figure 7



INTERNATIONAL SEARCH REPORT

International application No.
PCT/NZ2019/050114

A. CLASSIFICATION OF SUBJECT MATTER

B65D 75/38 (2006.01) ***B65D 77/04 (2006.01)*** ***B65G 65/23 (2006.01)*** ***B65G 65/40 (2006.01)*** ***B31B 70/62 (2017.01)*** ***B31B 70/64 (2017.01)***

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Databases: PATENTW and $PATEN; B65D75/38, B65D77/04, B65B69/0008, B65G65/23, B65G65/40, B31B70/62, B31B70/64, B31B70/30 & Keywords (bag, glue, adhesive, conveyor) and similar terms.

Applicant (POWDER PROJECTS) and Inventor names (DANCE or MILES) searched in AusPat and INTESS.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of cited documents:

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 October 2019	09 October 2019

Name and mailing address of the ISA/AU	**Authorised officer**
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INTERNATIONAL SEARCH REPORT C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		International application No. **PCT/NZ2019/050114**
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	US 3929275 A (BOLLING ET AL) 30 December 1975	
A	NZ 242034 A (MULTIWALL PACKAGING LTD) 27 September 1993	
A	WO 2003/031281 A1 (CARTER HOLT HARVEY LIMITED) 17 April 2003	

INTERNATIONAL SEARCH REPORT Information on patent family members	International application No. **PCT/NZ2019/050114**

This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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		UY 27482 A1	30 May 2003

End of Annex

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.