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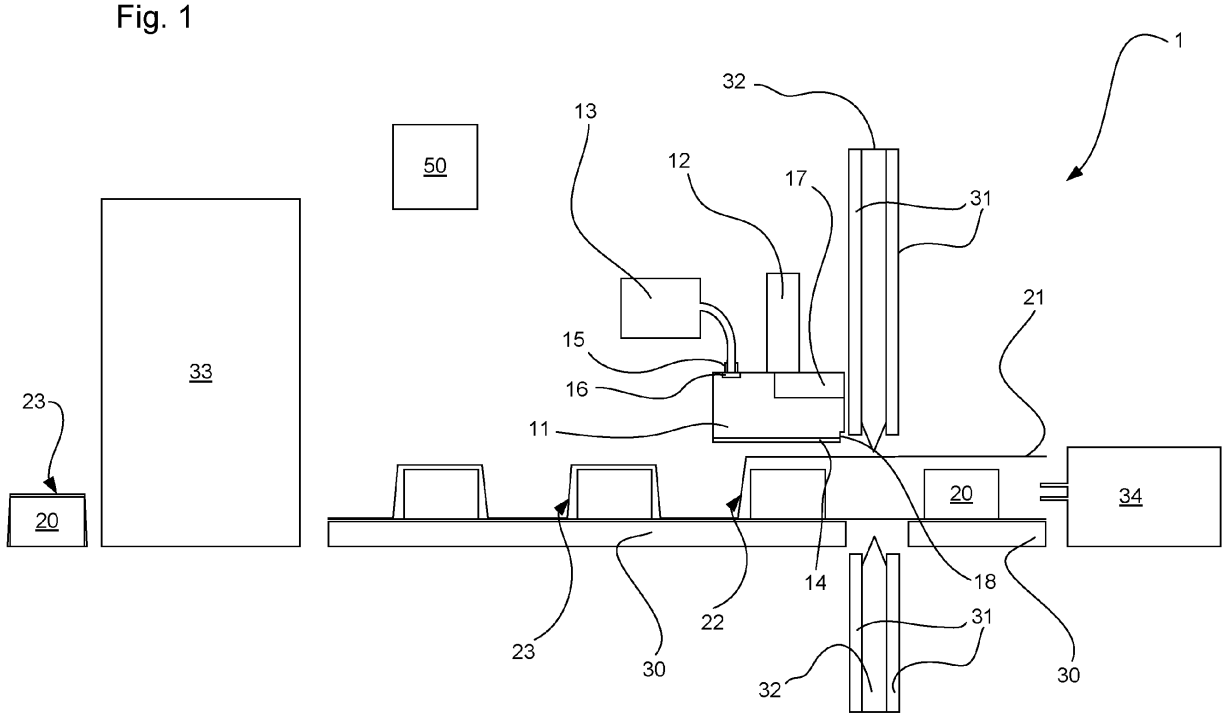
(54) Packaging apparatus and method of expelling gas

(57) A packaging apparatus comprises a pressure chamber; an actuator configured to move the pressure chamber between a second position, in which the pressure chamber houses a package, and a first position, in which the package is unconstrained by the pressure chamber; and a pressuriser configured to increase the pressure within the pressure chamber to greater than the pressure outside of the pressure chamber. Gas is expelled from the package. The package may then be sealed and shrunk in a heat tunnel.

Fig. 1



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Description

Technical Field

[0001] The present invention relates to a packaging apparatus comprising a pressure chamber, and a method of expelling gas from a package for a packaging process. Optionally, the packaging apparatus comprises a horizontal form fill and seal machine. The pressure chamber expels the gas from the package. The package may then be sealed and, optionally, undergo heat shrinking.

Background Art

[0002] A packaging apparatus may be used to package a food product. A tube of plastic wrap is continuously fed through a bag/package forming, filling and sealing apparatus. The product is deposited into the tube and the leading edge of the packaging is sealed. Then the tube is sealed at the trailing edge (at the upstream end) of the package and is severed from the continuously moving tube of packaging.

[0003] The tube can be provided as a tube, or be formed from two webs that are sealed longitudinally at two longitudinal edges, or be formed from a single web that is folded over and sealed along its longitudinal edges.

[0004] Sealing jaws can be used to seal one end of the package. The sealing jaws also form an adjacent seal, which comprises the opposite end of the next following package. Gas is trapped in the package in the space between the product and the seals. The problem is how to reduce the amount of gas in the package prior to the time it is sealed.

[0005] It is desirable to deflate the package so as to reduce the package volume. Additionally, evacuation of the gas from the package improves packaging appearance after heat shrinking and also reduces the possibility of deterioration of the product due to exposure to oxygen. For example, some foods such as cheese tend to oxidise or mould over a period of time if sufficient oxygen is contained within the package.

[0006] One way of deflating packages is to puncture the package with small holes after the goods are sealed therein. The small holes allow the excess air within the package to be expelled by mechanical application of force or simply by the force of gravity settling the products during shipment and the like, or, preferably, by heat shrinking the packaging material. However, this particular solution to the problem is unacceptable when foods are contained within the package. The pinholes allow the ingress of contaminates or environmental air containing oxygen from outside the package. Stickers are later used to cover the pinholes.

[0007] Another way of deflating packages is a vacuum drawn on the inside of the package or container through the fill opening. The vacuum extracts the excess air or other gas and collapses the plastic sidewalls just prior to the sealing of the opening. However, use of this system will slow the process due to the time required to evacuate gas from the fill tube. These systems also require the installation of equipment within the fill tube to close the tube off from the atmosphere. This additional equipment reduces the tube diameter, which may cause plugging due to product bridging.

[0008] A further way of deflating packages is to provide mechanical force directly to the outside of the package immediately before the sealing takes place. Examples of this are sponge rubber or coiled springs which engage the outside of the package to expel excess gas immediately prior to the time the sealing jaws engage and seal the fill opening.

[0009] However, the often irregular surfaces of the product within the package tend to cause uneven wear of the foam rubber and uneven elongation of the springs. As a result of the uneven wear and deterioration from the close proximity to the heated sealing elements, the long term manufacturing standards may not be maintained at the desired level. Additionally, fragile products are easily crushed by exterior mechanical applications of force. Additional drawbacks of using mechanical force via sponge rubber are poor hygiene because the sponge remains wet after cleaning the apparatus with water thereby providing ideal media for bacterial growth, and that the sponge can push the film into contact with the product thereby worsening the appearance of the product. For example, in the case of meat, blood may soil the interior of the film.

[0010] Also, variations of the product size can cause problems for mechanical deflators. When using mechanical deflators, correction of these variations requires a shutdown of the machine to modify the deflation force or position. This is because it is necessary to provide different pressure pads individually shaped for the packages and products to be processed.

[0011] US 4,964,259 discloses a process and apparatus for forming, filling, sealing and deflating a package of goods prior to the time the fill opening is sealed. The system includes a blast of air against the exterior flexible sidewalls of the package thereby to bring the sidewalls of the package closer together before sealing, thereby to reduce the amount of trapped gas sealed in the package.

[0012] An aim of the present invention is to provide a packaging apparatus comprising a pressure chamber. Another aim is to provide a method of expelling gas from a package for a packaging process.

Summary of invention

[0013] According to the invention, there is provided a packaging apparatus comprising a pressure chamber, an actuator and a pressuriser. The actuator is configured to move the pressure chamber between a first position, in which a package is unconstrained by the pressure chamber, and a second position, in which the pressure chamber houses the package. The pressuriser is config-

ured to increase the pressure within the pressure chamber to greater than the pressure outside of the pressure chamber.

[0014] Accordingly, it is possible to provide a package with little trapped gas without having to compromise hygiene by puncturing the package or using mechanical force. The same pressure chamber can be used for packaging packages of many different shapes and sizes.

[0015] Optionally, the pressure chamber comprises a gasket that extends along a part of an edge of an opening of the pressure chamber so as to form a seal with a facing surface of the packaging apparatus, preferably a conveyor belt, that the pressure chamber comes into contact with.

[0016] Accordingly, the pressure inside the pressure chamber can be increased rapidly by preventing a large amount of gas, preferably air, from escaping the pressure chamber.

[0017] Optionally, there is a gap at one of the ends, preferably at the upstream end, of the pressure chamber such that the increase in pressure forces gas from within the package through the gap.

[0018] Accordingly, the gas can be expelled from the package and can be force backwards (in an upstream direction) through the open end of the packaging tube. The gas has an easy escape route, thereby facilitating expulsion of the gas from the package to be sealed.

[0019] Optionally, the pressuriser comprises a gas blower configured to introduce a flow of gas, preferably air, into the pressure chamber via a gas inlet.

[0020] Accordingly, the equipment required to increase the pressure in the pressure chamber can be a conventional piece of equipment, such as a simple blower. This helps to reduce the manufacturing costs of the packaging apparatus. Additionally, the gas flow provides for a quicker cooling of seals at the ends of the package.

[0021] Optionally, the pressure chamber comprises a gas diffuser over the gas inlet configured to reduce the turbulence of the flow of gas into the pressure chamber.

[0022] Accordingly, the gas diffuser helps to reduce the possibility of the inflow of gas moving the product around in the pressure chamber or disrupting the flow path for the gas that is expelled from the package through the tube of packaging.

[0023] Optionally, the gas blower comprises a fan.

[0024] Accordingly, the source of the gas that is used to increase the pressure inside the pressure chamber does not have to be pressurised. Instead, it is volume of gas, preferably of air, that is used to increase the pressure. This means that expensive equipment is not required for making the packaging apparatus.

[0025] Optionally, the packaging apparatus comprises a porous member disposed within the pressure chamber so as to contact the package when the pressure chamber is in the second position.

[0026] Accordingly, the porous member can hold the product in place. This helps to reduce the possibility of the product and packaging being blown about by turbulent gas flows inside the pressure chamber. Additionally, the porous member can help to expel the gas from the package.

[0027] Optionally, the packaging apparatus comprises a form fill and seal machine. Optionally, the form fill and seal machine is a horizontal form fill and seal (HFFS) machine. Optionally, the packaging apparatus comprises a conveyor belt for supporting the package in a tube sealed at one end.

[0028] Accordingly, the present invention is compatible with existing packaging technology. The packaging can be a formed tube and the pressure chamber can be incorporated into such a packaging stream. For example, the pressure chamber can be immediately downstream from the sealer.

[0029] Optionally, the actuator is configured to move the pressure chamber such that the pressure chamber moves along with the conveyor belt and, preferably, also along with the sealing jaws.

[0030] Accordingly, the conveyor belt does not have to stop rotating for the packaging process to continue. The pressure chamber can be used to expel the gas from the packaging as the package moves on the conveyor belt.

[0031] According to the present invention, there is provided a method of expelling gas from a package for a packaging process. The method comprises the steps of (a) moving a pressure chamber from a first position, in which a package is unconstrained by the pressure chamber, to a second position, in which the pressure chamber houses the package, and (b) increasing the pressure within the pressure chamber to greater than the pressure outside of the pressure chamber so as to expel gas from the package.

[0032] Accordingly, it is possible to provide a package with little trapped gas without having to compromise hygiene by puncturing the package or using mechanical force. The same pressure chamber can be used for packaging packages of many different shapes and sizes.

[0033] Optionally, the pressure within the pressure chamber is increased to within the range of from about 1.1 to about 2, preferably from about 1.2 to about 1.5 times the pressure outside of the pressure chamber.

[0034] Accordingly, it is not necessary to provide expensive equipment that would be required to increase the pressure inside the pressure chamber to an extremely high pressure.

[0035] Optionally, the packaging process further comprises the step of sealing the package after expelling the gas from the package.

[0036] Accordingly, the sealed package can have relatively little trapped gas, if desired. This prevents ballooning and improves the appearance of the package.

[0037] Optionally, the packaging process further comprises the step of heat shrinking the package after sealing the package, preferably through a shrink tunnel.

[0038] After the shrinking step, the packaging is formed tightly around the product. This gives a good finished

pack appearance.

Brief description of drawings

[0039] Figure 1 depicts an embodiment of the present invention, with the pressure chamber in the first position; and

[0040] Figure 2 depicts the embodiment of Figure 1, with the pressure chamber in the second position.

Description of embodiments

[0041] Figure 1 depicts an embodiment of the present invention. The packaging apparatus 1 comprises a pressure chamber 11, an actuator 12 and a pressuriser 13. The pressure chamber 11 is configured to house a package 22. The pressure chamber 11 partially encloses a region in which the pressure can be raised relative to the surrounding environment. The pressure chamber 11 demarcates a region to be pressurised from the immediate environment.

[0042] The actuator 12 is configured to move the pressure chamber 11 between a first position and a second position. In the second position the pressure chamber 11 houses the unsealed package 22. Optionally, in the first position, the unsealed package 22 is unconstrained by the pressure chamber 11. Figure 1 depicts the pressure chamber 11 in the first position. Figure 2 depicts the pressure chamber 11 in the second position.

[0043] The pressuriser 13 is configured to increase the pressure within the pressure chamber 11 to greater than the pressure outside of the pressure chamber 11.

[0044] An exemplary operation of the pressure chamber 11 is described below. The operation of the pressure chamber 11 may repeat in cycles. For convenience, the start of the cycle will be taken as when the pressure chamber 11 is in the first position.

[0045] The actuator 12 moves the pressure chamber 11 from the first position to the second position. In the second position the pressure chamber 11 houses the unsealed package 22. The pressuriser 13 increases the pressure within the pressure chamber 11 to greater than the pressure outside of the pressure chamber 11. This causes gas inside the package 22 to be expelled from the package. The arrows in Figure 2 indicate the flow of gas that is expelled from the package 22. Optionally, the package 22 may then be sealed to form a sealed package 23.

[0046] The actuator 12 moves the pressure chamber 11 from the second position to the first position. Optionally, the packaged product 20 may then be moved away from the pressure chamber 11 and another product 20 may replace it. Then, the operation cycle of the pressure chamber 11 can be repeated.

[0047] Optionally, a conveyor belt 30 transports the packages 22 through the packaging apparatus 1. In this case, the actuator 12 may be configured to move the pressure chamber 11 such that the pressure chamber 11 moves along with the conveyor belt 30. Hence the pressure chamber 11 can house the package 22 as the conveyor belt 30 transports it. The actuator 12 moves the pressure chamber 11 in the transverse direction at substantially the same speed as the surface of the conveyor belt 30. Optionally, the packaging apparatus comprises at least two conveyor belts 30. One conveyor belt 30 is configured to transport the product 20 upstream of the sealer 31 and cutter 32. Another conveyor belt is configured to transport the product 20 downstream of the sealer 31 and cutter 32.

[0048] In the above, the term unsealed package 22 means that the package 22 is not sealed completely from its surroundings. The package 22 may comprise a seal at least one edge of the package. However, the package 22 has at least one edge that is unsealed such that the product 20 inside the package 22 is in fluid communication with the region that is outside the package 22. The packaging may comprise a tube sealed at one end.

[0049] According to the present invention, it is possible to evacuate a greater percentage of gas from the package 22 compared to using the systems of the prior art. In particular, the pressure chamber 11 can be used to produce packages 22 with less residual gas compared to the use of air blasts through orifices. This is particularly important for unsupported products 20 such as cheese or processed meat chinks. This is because for unsupported products 20, a full contact package 22 appearance is desirable.

[0050] The present invention allows gas to be evacuated from the package 22 without perforating the package. Therefore, there is no need to apply a barrier label later in the packaging process to seal the perforation. Hence the cost of packaging is not increased by the use of the barrier labels and the risk of contamination prevented.

[0051] The present invention is advantageous over systems that involve the use of mechanical pressure such as via a sponge or a foam pad. In particular, use of a foam pad, for example, is not hygienic because the foam pad can become contaminated, thus requiring periodical replacement. The foam pad (or other means for producing a mechanical force) has to make contact with the packaging (e.g. film 21) in order to expel the gas from the package. This can result in fouling of the packaging and compromises presentation. The present invention allows the gas to be expelled from the package 22 without compromising presentation. This is because none of the components of the pressure chamber 11 need to contact the packaging in order to expel the gas from the package.

[0052] Furthermore, one size of the pressure chamber 11 of the present invention can be applied to products 20 and packages 22 of many different sizes. In contrast, a foam pad is not as flexible in that the foam pad should be redesigned for each specific application to a particular product 20. The pressure chamber 11 of the present invention can be used to give good results even for products 20 having relatively complicated structures, such as

a whole bird (poultry) disposed on a tray.

[0053] Additionally, the function of the present invention is not particularly sensitive to small changes in the position of the pressure chamber 11 with respect to the product 20 in the unsealed package. This improves the consistency of the gas expulsion process. In contrast, the setting of a foam pad is more crucial to the effectiveness of the foam pad, and the setting of the foam pad is operator sensitive.

[0054] According to the present invention, the gas is expelled from the package 22 by an overall pressure change in the region surrounding the package 22. This is different from expelling gas by applying pressure to a particular portion of the package 22 via, for example, a blast of air. The present invention is advantageous over such systems in that pressure is applied substantially equally to the entire external exposed surface of the package 22. Hence, it is possible to expel gas from substantially every pocket within the package 22. In contrast, the use of a blast of air is effective on only the portion of the package 22 that the blast of air is directed at.

[0055] The pressure chamber 11 of the present invention is simple, relatively inexpensive and is easy to maintain.

[0056] The pressure chamber 11 is configured to house the package 22. The pressure chamber 11 may be open at one side such that the package 22 can enter the pressure chamber 11 via that side. In the case of an HFFS machine, this side may be the bottom side. When the pressure chamber 11 moves from the first position to the second position, the pressure chamber 11 moves over and/or around the package 22 so as to house the package 22.

[0057] The pressure chamber 11 may have any size according to the size of the package to be enclosed.

[0058] For instance the pressure chamber 11 may have a length within the range of from about 0.2m to about 0.4m. The pressure chamber 11 may have a width within the range of from about 0.1 m to about 0.2m. The pressure chamber 11 may have a height within the range of from about 0.05m to about 0.2m.

[0059] In the case that the package 22 is disposed on a horizontal surface, the pressure chamber 11 is configured to extend over the package 22. The pressure chamber 11 comes into contact with the horizontal surface, preferably a conveyor belt 30, so as to house the package 22. In the second position, the package 22 is almost completely encapsulated by the combination of the surface and the pressure chamber 11. In the second position, the product 20 within the package 22 remains in fluid communication with the environment outside the pressure chamber 11. This allows the gas that is in the package 22 along with the product 20 to be expelled from the package 22 and out of the pressure chamber 11.

[0060] Optionally, the pressure chamber 11 comprises a gasket 14 that extends along a part of an edge of an opening in the pressure chamber 11. The purpose of the gasket 14 is to form a seal between the part of the edge of the pressure chamber 11 and a facing surface (e.g. a conveyor belt 30) of the packaging apparatus 1. Desirably, the gasket 14 forms a gastight seal between the edge of the pressure chamber 11 and the surface. However, the gasket 14 may not extend around the entire edge around the opening of the pressure chamber 11 through which the product 20 enters the pressure chamber 11. This is to allow a gap 18 through which the expelled gas can exit the pressure chamber 11.

[0061] Alternatively, the gasket 14 may extend around substantially the entire edge of the opening of the pressure chamber 11. In this case, the pressure chamber 11 comprises an expulsion opening to allow the expelled gas to escape the pressure chamber 11. For example, the expulsion opening may be disposed in the end of the pressure chamber 11 closest to the sealer 31 (e.g. sealing jaws) of the packaging apparatus 1.

[0062] Optionally, the gasket 14 comprises an elastomer. However, the material or construction of the gasket 14 is not particularly limited. The gasket 14 should be able to form a seal with a facing surface.

[0063] The actuator 12 is configured to move the pressure chamber 11 between the first position and the second position. In the second position the pressure chamber 11 extends over the product 20. Optionally, when the pressure chamber 11 is in the second position, the product 20 is mostly enclosed by the combination of the pressure chamber 11 and a surface on which the product 20 is disposed. In the second position, the region inside the pressure chamber 11 is in fluid communication with the environment surrounding the pressure chamber 11.

[0064] Optionally when the pressure chamber 11 is in the second position, the product 20 is in fluid communication with the environment surrounding the environment on only one side of the product 20. For example, in the case of an HFFS machine, the product 20 may be in fluid communication with the environment at the side of the pressure chamber 11 adjacent to the sealing bars (or sealing jaws). This end of the pressure chamber 11 may be completely open. Alternatively, the end may be closed except for a gap between the end face and the surface on which the product 20 is disposed.

[0065] Optionally, the pressure chamber 11 comprises a porous member 17 disposed within the pressure chamber 11. The porous member 17 may be connected to the inside surface of the pressure chamber 11. For example, the porous member 17 may comprise a sponge. The porous member 17 may have a length within the range of from about 0.1 m to about 0.2m. The purpose of the porous member 17 is to overcome the effects of any turbulence within the pressure chamber 11. The porous member 17 contacts the package 22 so as to hold the product 20 in place relative to the pressure chamber 11.

[0066] The porous member 11 can also help to expel gas from the package 22 by applying mechanical pressure to a region of the package 22.

[0067] Optionally, the actuator 12 moves the pressure chamber 11 substantially in a vertical direction between

the second position and the first position. The actuator 12 may move the pressure chamber 11 vertically downwards from the first position to the second position. In the second position, the pressure chamber 11 contacts the surface on which the product 20 is disposed so as to encapsulate the product 20.

[0068] After the expulsion step, the actuator 12 moves the pressure chamber 11 vertically upwards away from the surface. When the pressure chamber 11 is in the first position, the product 20 can move along the surface underneath the pressure chamber 11. Hence in the first position, the distance between the pressure chamber 11 and the surface is at least is great as the vertical dimension of the product 20.

[0069] As mentioned above, the actuator 12 is optionally configured to move along with the conveyor belt 30. This transverse motion combined with the vertical motion between the first position and the second position produces a box-type motion.

[0070] The actuator 12 repeats the above steps so as to repeat the gas expulsion cycle of the present invention. Optionally, the process is continuous. In this case, a line of products 20 can be continuously transported along the conveyor belt 30 during the packaging process. Optionally, movement of the pressure chamber 11 is synchronised with movement of the sealer 31 and cutter 32. In Figure 1 and Figure 2, the direction of transportation of the products 20 is from right to left.

[0071] However, the transportation of the products 20 may not be continuous. For example, a controller 50 may be configured to stop the conveyor belt 30 momentarily while the pressure chamber 11 is in contact with the conveyor belt 30. This allows a short time for the gas to be expelled from the package 22 and for the package 22 to be sealed and cut before the conveyor belt 30 is restarted. In this case, the actuator 12 may not move the pressure chamber 11 in the transverse direction along with the movement of the conveyor belt 30.

[0072] The pressuriser 13 may be any means for increasing the pressure inside the pressure chamber 11 relative to the pressure outside of the pressure chamber 11. Optionally, the pressuriser 13 is configured to increase the pressure inside the pressure chamber 11 to a pressure within the range of from about 110kPa to about 200kPa. The pressure of the environment surrounding the pressure chamber 11 may be substantially atmospheric pressure, namely about 100kPa. The pressure within the pressure chamber 11 may be increased to within the range of from about 1.1 to about 2.0 times the pressure outside of the pressure chamber 11. However, any pressure above the pressure outside the pressure chamber can be used.

[0073] Optionally, the pressuriser 13 comprises a gas blower. For example a simple 1.5kW gas blower may be used as the pressuriser 13. Optionally, the gas blower comprises a fan. In an embodiment, the pressuriser 13 provides a flow of gas at a temperature lower than the ambient temperature. This aids the effect of cooling the seals at either end of the package 22. The cooling effect of the flow of gas on the seals is particularly advantageous in operations in which the sealing is performed at high temperature (e.g. when packaging a whole bird), or operations in which the product 20 to be packaged is heat sensitive.

[0074] Desirably, the pressuriser 13 is capable of producing a large volume of gas, preferably air, that is fed into the pressure chamber 11. The volume of gas fed into the pressure chamber 11 by the pressuriser 13 replaces the volume of gas that is expelled from the package. Provided that the pressuriser 13 can produce a sufficiently large volume of gas, the pressure of the source of gas fed into the pressure chamber 11 by the pressuriser 13 does not have to be particularly high.

[0075] Alternatively, the pressuriser 13 may comprise a store of gas at high pressure. The high-pressure gas can then be fed into the pressure chamber 11. However, tests have shown that the provision of a large volume of gas into the pressure chamber 11 rather than the provision of high pressure gas into the pressure chamber 11 is more effective at increasing the pressure inside the pressure chamber 11 quickly. This is because it is difficult to supply the volume of gas to the pressure chamber 11 required to increase the pressure in a short space of time. Use of a high volume of gas that originates from a relatively low-pressure source is advantageous over use of highly pressurised gas because it is less expensive. This is because pressurised gas (e.g. air) can be expensive, thereby increasing the packaging costs.

[0076] Optionally, the pressure chamber 11 comprises a gas inlet 15. The gas inlet 15 is connected to the pressuriser 13. The pressuriser 13 feeds gas into the pressure chamber 11 via the gas inlet 15. Optionally, the gas inlet 15 is disposed in the side of the pressure chamber 11 opposite to the open side through which the product 20 enters the pressure chamber 11. This is the top side in the case of an HFFS machine. Optionally, the gas inlet 15 is disposed in the half of the pressure chamber 11 that is furthest from the sealer 31.

[0077] Desirably, the gas inlet 15 comprises a gas diffuser 16. The purpose of the gas diffuser 16 is to reduce the turbulence of the gas as it is fed into the pressure chamber 11. Such turbulence can otherwise lead to negative results. Optionally, the gas diffuser 16 comprises a plate that comprises a plurality of holes. The holes may be formed in a substantially regular pattern across the plate. The holes may have an average diameter within the range of from about 0.5mm to about 2mm.

[0078] Desirably, the pressuriser 13 is capable of feeding gas into the pressure chamber 11 while the pressure chamber 11 is in motion. Optionally, the pressuriser 13 is stationary with respect to the packaging apparatus 1. The pressuriser 13 does not move when the pressure chamber 11 moves. The pressuriser 13 is connected to the pressure chamber 11 via a flexible pipe. The flexible pipe takes up the change in tension when the pressure chamber 11 moves between the second position and the

first position.

[0079] The pressuriser 13 is configured to increase the pressure within the pressure chamber 11 to greater than the environmental pressure. When the pressure in the pressure chamber 11 is raised, the package 22 is pressed. The packaging may be pressed towards the outer surface of the product 20. As a result, gas inside the package 22 is forced away from the product 20 and out of the pressure chamber 11.

[0080] When the pressure inside the pressure chamber 11 is greater than the pressure outside of the pressure chamber 11, the flow rate of gas from the interior of the pressure chamber 11 to the surrounding environment is greater than the flow rate of gas from the environment into the pressure chamber 11.

[0081] Optionally, the packaging apparatus 1 comprises an HFFS machine. The HFFS machine may comprise a conveyor belt 30 for supporting and transporting the packages 22 in a horizontal direction.

[0082] The product 20 may be within a package. The package 22 is unsealed when the gas is expelled from the package. The packaging may comprise a film 21. For example, the product 20 may be wrapped or partially wrapped in a film 21. The film 21 extends around the product 20. Gas is enclosed with the product 20 by the film 21.

[0083] The product 20 may be disposed on a surface. The surface may extend substantially in the horizontal direction. The surface may comprise the upper surface of a conveyor belt 30. The conveyor belt 30 may be a continuous conveyor belt 30. For example, the conveyor belt 30 may be suspended between at least two rollers. The conveyor belt 30 may transport the product 20 in a horizontal direction.

[0084] Optionally, the product 20 is disposed in a tray. The tray supports the product 20. Optionally, the tray comprises walls that extend substantially vertically from the base of the tray to a height greater than the vertical dimension of the product 20. Alternatively, the tray height may be less than or equal to the height of the product 20. The packaging extends around the tray. Optionally, the tray comprises a material selected from a list consisting of polystyrene, or other thermoplastic material such as PET, or cardboard. Desirably, the tray is rigid. The tray may be solid or foamed. The tray can be any colour.

[0085] Optionally, the packaging comprises a thin multi-layer film 21. The film 21 may comprise a polyolefin. The film 21 may be a fully extruded shrink film 21. The package 23 provides a barrier to gas passing between the interior of the package 23 to the exterior of the package. Accordingly, the environment inside the package 23 is isolated from the environment outside the package. This helps to preserve food products 20 and avoid contamination. This is good for food hygiene. Optionally, the package 23 provides a barrier to aromas or to gasses. This is particularly useful when the product 20 is a food product 20. Optionally, the package 23 is abuse-resistant.

[0086] Optionally, the packaging is transparent, or at least translucent. This allows a customer to view the product 20 through the packaging. For example, the packaging may comprise a transparent film 21. Optionally, the packaging has an anti-fog property. This ensures high consumer appeal. Optionally, the packaging is printable. This allows labels to be printed directly onto the packaging, which is very convenient.

[0087] The packaging may be formed from a roll of film 21. Optionally, the packaging for the product 20 may be formed by forming a tube from the roll of film 21. Optionally, the packaging apparatus 1 comprises a former configured to form the roll of film 21 into a tube. Optionally, the former forms the tube by forming a longitudinal along the longitudinal edges of the roll of film 21. Optionally, the tube may be formed from two webs of film 21. In this case, the former forms two longitudinal seals along the opposing edges of the two rolls of film 21.

[0088] Optionally, the packaging apparatus 1 comprises a flusher 34. The flusher 34 is configured to flush gas through the tube of film 21 that forms the packaging. The gas flush prevents the tube from collapsing. The gas flush helps to maintain a distance between a product 20 in a tray and the film 21. This helps to improve the hygienic appearance of the film 21 because the film 21 remains untarnished by the product 20. The flusher 34 flushes gas longitudinally through the tube. Optionally, the gas used for flushing comprises about 70% oxygen and about 30% carbon dioxide or other suitably modified atmosphere.

[0089] Additionally, the flush gas allows the product 20 to be packaged in a modified atmosphere. The gas may help to preserve the product 20, prolonging its shelf life. The desired amount of gas inside each sealed package 23 depends on the type of product 20 and the length of shelf life needed.

[0090] Of course the amount of gas that remains in the package 22 following the expulsion process depends on the function of the pressure chamber 11. The pressure chamber 11 can be operated at a higher pressure or for a longer time on the package 22 in order to expel more gas from the package. Optionally the controller 50 is configured to control the pressure in the pressure chamber 11 or the time for which the pressure chamber 11 is in the second position, thereby controlling the amount of gas to be expelled.

[0091] The packaging apparatus 1 may comprise a sealer 31 configured to seal the packaging so as to form a sealed package. When the product 20 is in a sealed package, the interior of the sealed package 23 is isolated from the exterior of the package. Optionally, the sealer 31 comprises sealing bars. The sealer 31 is configured to form a transversal seal in the packaging. In the case of the packaging being formed from a roll of film 21, the sealer 31 forms a transversal seal across the tube of film 21. Optionally, the sealer 31 comprises sealing bars above and below the conveyor belts 30.

[0092] Optionally, the packaging apparatus 1 compris-

es a cutter 32. The cutter 32 is configured to cut the packaging material. For example, the cutter 32 may cut the tube of film 21 once the package 23 has been sealed. The cutter 32 may be positioned adjacent the sealer 31. In particular, the cutter 32 may be disposed near to the sealer 31 such that the sealer 31 seals the only open end of one package 22 (after gas has been expelled from that package), the sealer 31 seals the opposite end of a subsequent package 23 and the cutter 32 separates the two packages 22 substantially simultaneously. Alternatively, the cutter 32 may be positioned further downstream so as to separate the packages 22 after they have been completely sealed. Optionally, the cutter 32 comprises two parts above and below the conveyor belts 30.

[0093] Optionally the pressure chamber 11 is positioned adjacent to the sealer 31. Desirably the pressure chamber 11 is positioned immediately downstream of the sealer 31. The term downstream is relative to the direction of transportation of the products 20 through the packaging apparatus 1.

[0094] The packaging apparatus 1 optionally comprises a shrinking machine configured to shrink the film 21. The shrinking machine may be, for example a shrink tunnel 33, or a hot air tunnel 33. The sealed package 23 is shrunk in the shrinking machine. The shrinking process may involve heating the sealed package. The package 23 may be heated to a temperature within the range of from about 130°C to about 150°C.

[0095] Before the sealed package 23 is shrunk, there may be undesirable gas trapped in the sealed package 23 along with the product 20. Additionally, the sealed package 23 may comprise undesirable "dog ears", where a dog ear is a portion of the packaging that extends away from the product 20 (for example due to the product 20 not being a regular rectangular prism). After the shrinking process the dog ears and the gas second position are reduced. This gives the sealed package 23 a more aesthetic appearance. In the case of cheese, the cheese may consume any residual gas that remains in the sealed package 23 following the shrinking step.

[0096] Optionally, the product 20 is a food product 20. For example, the product 20 may comprise ground meat, cheese, pizza, ready meals, poultry and fish. The product 20 may be substantially dry, as in the case of cheese. For cheese, there is no need for a tray to support the cheese. However, the product 20 may be wet. In this case, it is particularly desirable for the product 20 to be disposed in a tray.

[0097] The packaging process of the invention may be employed to package food products 20 that are to have a shelf life in the region of from about six days to about 14 days, for example.

[0098] Desirably, the packaging apparatus 1 comprises a horizontal form fill and seal machine. However, the packaging apparatus 1 may comprise other types of form fill and seal machines, such as a vertical form fill and seal (VFFS) machine. In a vertical form fill and seal machine, the packages 22 move through the packaging apparatus 1 in a vertical direction during the packaging process.

[0099] In the case that the product 20 moves through the packaging apparatus 1 in a vertical direction, the pressure chamber 11 may comprise two sections on either side of the product 20. The two sections can be joined together in the second position so as to house the product 20. As with the horizontal configuration, the product 20 in the package 22 remains in fluid communication with the environment so as to allow gas to be expelled from the package 22 and out of the pressure chamber 11.

[0100] When moving between the second position and the first position, the two sections may move substantially in a horizontal direction so as to encapsulate the product 20.

[0101] In the case that the pressure chamber 11 comprises two sections, the two sections may be substantially the same as each other. Alternatively, one of the sections may comprise a substantially flat surface and the other section may have the same construction as the pressure chamber 11 described in relation to HFFS machines.

[0102] In a VFFS machine, the packaging may be sealed once to form the lower end of a sealed package. The product 20 is then fed into the open-ended package. The top end of the package 22 is then sealed to form a sealed package 23. Before the step of sealing the top end of the package, the process comprises the step of expelling gas from the package.

Claims

1. A packaging apparatus (1) comprising:

   a pressure chamber (11); an actuator (12) configured to move the pressure chamber between a first position, in which a package (22) is unconstrained by the pressure chamber, and a second position, in which the pressure chamber houses the package (22); and a pressuriser (13) configured to increase the pressure within the pressure chamber to greater than the pressure outside of the pressure chamber.

2. The packaging apparatus of claim 1, wherein the pressure chamber comprises a gasket (14) that extends along a part of an edge of an opening of the pressure chamber so as to form a seal with a facing surface of the packaging apparatus that the pressure chamber comes into contact with.

3. The packaging apparatus of any of the preceding claims, wherein there is a gap at the upstream end of the pressure chamber such that the increase in pressure forces gas from within the package through the gap.

4. The packaging apparatus of any of the preceding claims, wherein the pressuriser comprises a gas

blower configured to introduce a flow of gas into the pressure chamber via a gas inlet (15).

5. The packaging apparatus of claim 4, wherein the pressure chamber comprises a gas diffuser (16) over the gas inlet configured to reduce the turbulence of the flow of gas into the pressure chamber.

6. The packaging apparatus of any of claims 4 to 5, wherein the gas blower comprises a fan.

7. The packaging apparatus of any of the preceding claims, comprising a porous member (17) disposed within the pressure chamber so as to contact the package when the pressure chamber is in the second position.

8. The packaging apparatus of any of the preceding claims, comprising a form fill and seal machine.

9. The packaging apparatus of claim 8, wherein the form fill and seal machine is a horizontal form fill and seal machine.

10. The packaging apparatus of claim 9, comprising a conveyor belt (30) for supporting the package in a tube sealed at one end.

11. The packaging apparatus of claim 10, wherein the actuator is configured to move the pressure chamber such that the pressure chamber moves along with the conveyor belt.

12. A method of expelling gas from a package (22) for a packaging process, the method comprising the steps of: moving a pressure chamber (11) from a first position, in which a package is unconstrained by the pressure chamber, to a second position, in which the pressure chamber houses the package; and increasing the pressure within the pressure chamber to greater than the pressure outside of the pressure chamber so as to expel gas from the package.

13. The method of claim 12, wherein the pressure within the pressure chamber is increased to within the range of from about 1.1 to about 2.0 times the pressure outside of the pressure chamber.

14. A packaging process comprising the method of expelling gas of any of claims 12 to 13, further comprising the step of sealing the package after expelling the gas from the package.

15. The packaging process of claim 14, further comprising the step of heat shrinking the package after sealing the package.

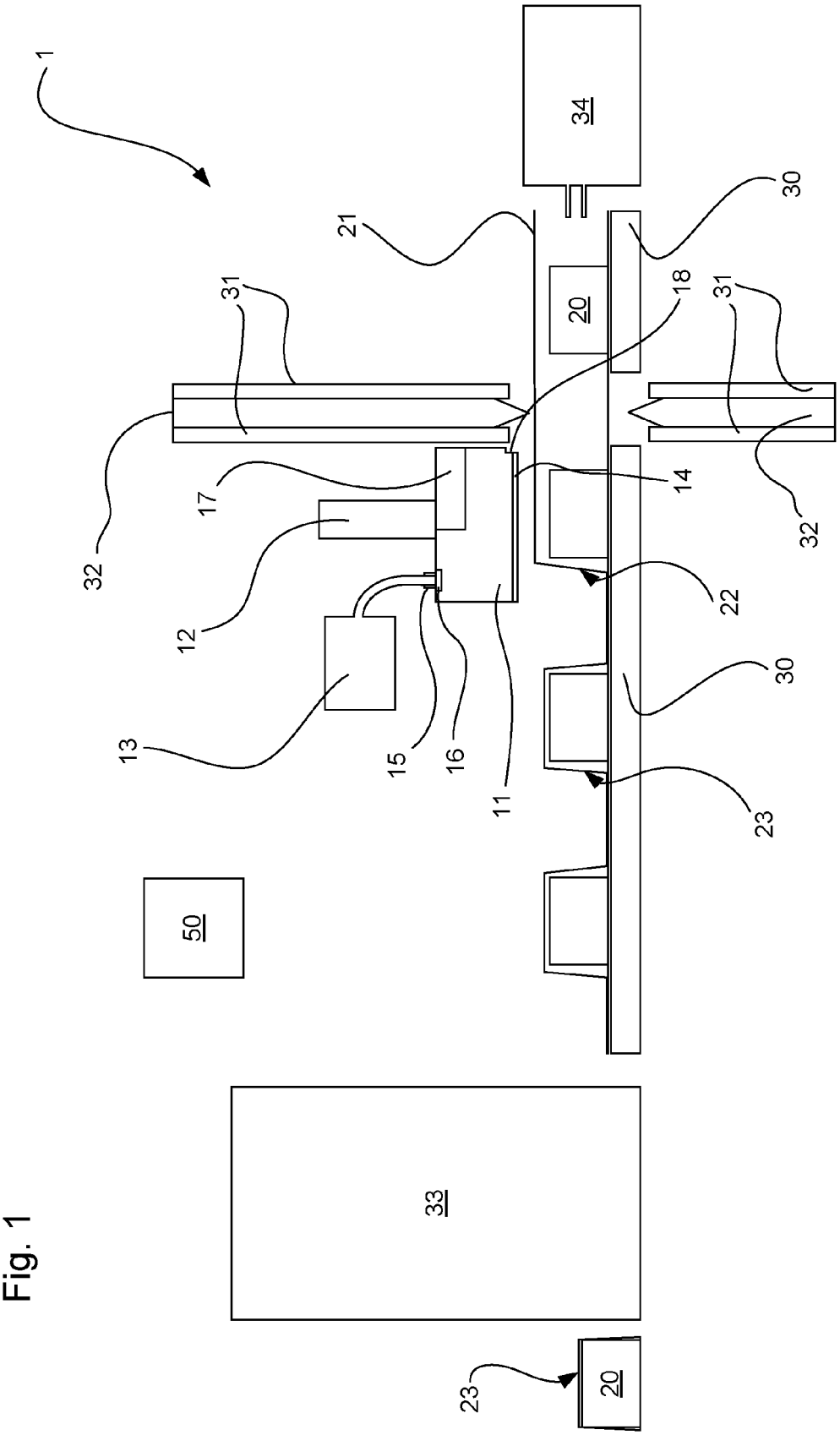

Fig. 1

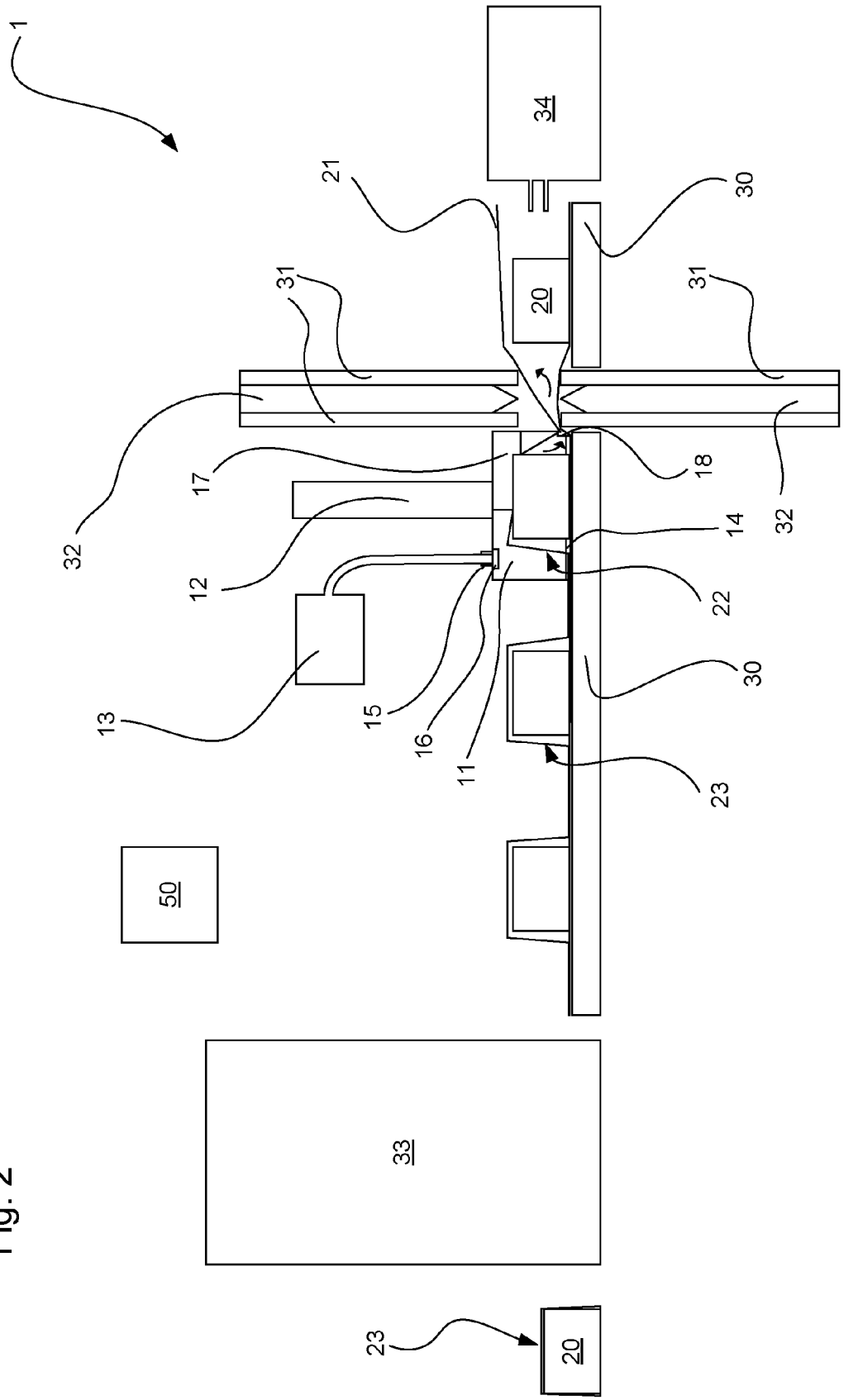

Fig. 2

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EUROPEAN SEARCH REPORT

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Munich	26 January 2012	Yazici, Baris

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