CONTROLLED GAS PACKAGING

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Appl. No.: 09/977,999

Filed: Oct. 17, 2001

Foreign Application Priority Data
Oct. 17, 2000 (NZ) 507613

Publication Classification

(51) Int. Cl. B65B 31/00
(52) U.S. Cl. 53/434; 53/512

ABSTRACT

A method and apparatus for controlled or modified atmosphere packaging of products such as foodstuffs, whereby the product (17) is weighed prior to or in the packaging machine and regulating the amount of gas inserted into the package in proportion to the weight of the product. User controlled variables may be used to determine the amount of gas to be injected into a package for a given weight or size of package, typically 1.5 to 1.75 liters of Carbon Dioxide per Kg of meat cut depending upon the type of meat, number/size of voids and bag size.
CONTROLLED GAS PACKAGING

FIELD OF INVENTION

[0001] This invention relates to method and apparatus for packaging, and has particular application to the packaging of spoilable materials, e.g. foodstuffs, and in particular meat cuts in a controlled or modified atmosphere bag.

BACKGROUND

[0002] Previous methods of packaging spoilable material have involved packing the product within a plastic bag or the like, evacuating the bag, then injecting a standard amount of gas or gas mixture in place of the air. This is sometimes called "controlled atmosphere packaging" or "modified atmosphere packaging". One example of such machines is our Captech machine described in U.S. Pat. No. 4,926,614. Prior art machines required operators to inspect the product prior to gas injection. In some cases a small pack could be overfilled with injected gas leading to ballooning or bursting of the bag. In other cases the bag would be underfilled, resulting in crushing of the pack when the gas was absorbed by the meat.

OBJECT

[0003] It is an object of this invention to provide an improved packaging method and/or apparatus, or one, which will at least provide the food industry with a useful choice.

STATEMENT OF INVENTION

[0004] In one aspect the invention provides a method of controlling the amount of gas injected into a package by determining the weight of the product, and automatically varying the amount of gas injected in proportion to the weight of the product.

[0005] Preferably the method involves setting a user determined variable to regulate the desired amount of gas per weight or type of product, and combining this setting with the weight of the product, which preferably is automatically weighed in the packaging machine or prior to the product reaching the packaging machine.

[0006] In another aspect the invention provides apparatus for controlled or modified atmosphere packaging of products, including: means for weighing a product to be packaged; means for insertion of a product into a package; means for evacuating the package; means for injecting a gas into the package; means for regulating the amount of gas injected based on information on the weight of product from the weighing means and means for sending the package.

[0007] Preferably the weighing means provides an output to a control device such as microprocessor which in turn can be used to control the amount of gas injected into the package.

[0008] Preferably the weighing means is closely associated with the apparatus. In one version of the invention, the weighing means can form part of the packaging machine, and in another aspect, the weighing means can be a weigh station situated prior to the packaging machine, more preferably its forms part of a conveyor conveying product to the packaging machine so that the weight of the product is determined before the product reaches the packaging machine.

[0009] Preferably the packaging machine has provision to enable the user to set the amount of gas per weight of product, as the user may wish to vary the amount of gas per weight of product depending upon type of product, its capability of absorbing the injected gas, the number and type of voids associated with the product, the size of the bag, or the physical size or shape of the product.

[0010] By way of example, the packaging of meat there is an industry "rule of thumb" that lamb or beef cuts will absorb about one liter of carbon dioxide per kilogram of meat. Based on this figure, some Meat Processors prefer to inject about 1.5 liters of carbon dioxide per kilogram of meat, while some may prefer to set their machine to attempt to insert 1.75 liters of carbon dioxide per kilogram of meat. It is difficult to ensure the meat cuts are precisely the same weight, and for example a meat pack intended to contain 10 kg of meat on average, may contain anywhere between 8 kg-11.5 kg of meat.

DRAWINGS

[0011] These and other aspects, which should be considered in all its novel aspects will become apparent from the following description, which is given by way of example only, with reference to the accompanying drawings, in which:

[0012] FIG. 1 illustrates a schematic view of a preferred packaging apparatus.

[0013] FIG. 2 illustrates a top view of conveyer and gas filling machine.

[0014] FIG. 3 illustrates a front elevation of the conveyer and gas-filling machine of FIG. 2.

[0015] In example 1 the weighing means can be part of the chamber, but in the case of example 2 the weighing means can be situated prior to the chamber.

EXAMPLE 1

Weighing Means

[0016] In this example weighing of the product to be packaged can take place as the product enters the chamber—preferably before evacuation takes place. A weigh scale 12A can be situated on or form part of the base 12 of the chamber. Information on the weight of the product can then be used to automatically adjust the amount of gas to be injected into the package—see below.

[0017] By way of example we use a chamber 10 defined by a removable cover 11 and a base 12, although any other type of gas flushing apparatus can be used with this inventive concept.

[0018] Gas passages are provided, connecting the apparatus to a vacuum source 23 and one or more gas sources 24. One passage 25 includes a snorkel 13 intended for connection with a container held in the chamber 10, as detailed below, and a second passage 14 provides access to the chamber 10 itself. In some applications, it may be desirable to provide pairs of passageways, one connected to the vacuum source and one to a gas source. Alternatively, as shown single passageways may be used with appropriate valves to switch the passageway between the two functions.
Preferably the chamber 10 is of a size able to comfortably accommodate a box 15 and heat sealable bag 16 with its contents 17.

In its preferred form the apparatus includes clamping and sealing apparatus for the bag 16, inside the chamber 10, separate and independently movable from the cover 11. This apparatus includes clamping bars 18 mounted around the snorkel 13 for temporarily clamping the mouth of the bag around the snorkel 13, and sealing bars 19 positioned beyond the snorkel 13 for sealing the mouth of bag 16 between the snorkel and the product 17.

One or both sealing bars 19 are movable, preferably by the use of a pneumatic cylinder 20, such that the mouth of the bag can be left open or sealed shut between the snorkel 13 and the product 17. The upper clamping bar 18 and sealing bar 19 can be mounted on a pivotable jaw 21 with a handle 22 by which it may be moved up or down. All this apparatus is contained in the chamber 10 along with the product 17 and its packaging, and is covered by the lid 11. An airtight seal is formed between the lid 11 and the base 12 in normal use.

It is preferable for the clamping bars 18 to be positioned behind the sealing bars 19 as shown, rather than in front of them. If the clamping bars 18 were positioned in front of the sealing bars 19 with the snorkel 13 protruding through them, it would be necessary to withdraw the snorkel before sealing the bag, and furthermore a small pocket of air would inevitably be trapped between the clamping bars and the seal, and would be released into the bag upon removal of the clamping bars. With the arrangement of the present invention the snorkel is not required to move, and there is no air entrapment at the mouth of the bag.

In use, the product 17 to be packed is placed within a heat sealable bag 16 and box 15, and then placed within the chamber 10. The chamber has appropriate seals about its edge, so that the chamber itself can be evacuated as well as the bag. The bag is placed within the chamber 10 and the mouth of the bag 16 fitted over the snorkel 13. The bag is then clamped off across the snorkel with the pair of clamp bars 18.

Evacuation

The chamber 10 and the bag 16 are evacuated, preferably simultaneously, so that the bag is completely emptied. By controlling the pressure within the chamber as the bag is evacuated, the bag can be controlled so that it does not collapse too soon, cutting off communication between contents and the snorkel 13. Preferably both the chamber and the bag are evacuated from the same source, but the snorkel 13 is narrower than the passageway 14. This means that the chamber is evacuated faster than the bag, and the bag expands inside the chamber as it is emptied, rather than collapsing. This prevents air being trapped in pockets in the bag. Alternatively, the bag and the chamber could be evacuated at the same rate. Even if the bag empties slightly faster than the chamber and collapses as a result, the difference between the air pressure in the bag and the air pressure around it will not be great enough to trap air inside.

When a desired vacuum level in the chamber is achieved, a vacuum pressure switch 26 stops the evacuation and holds the chamber at that vacuum level. The evacuation of the bag continues through the nozzle 13, and the bag collapses as a result. When the desired vacuum level in the bag is reached a second pressure switch 27 is activated. The chamber and the bag are then refilled. The use of pressure switches to turn the system on and off allows the vacuum level to be accurately determined and achieved without undue stress being put on the bag in the process. By using the same vacuum source to evacuate both chamber and bag it is easy to avoid having any great difference between the pressures in each.

To speed up the last stages of evacuation of the bag, it may be found desirable to refill the chamber slightly after activation of the first pressure switch and initial collapse of the bag, to put greater pressure on the bag and squeeze the last of the air out. Such collapsing of the bag could result in entrapment of air, but because the bag is already substantially evacuated at this stage this will in general not be a problem.

This system also allows visual checking, in that the bag can be seen to inflate and collapse within the chamber (given one or more windows in the chamber lid or walls) at different times in the process. If, for example, the proper vacuum is not achieved in the bag for any reason, it will not collapse even if a partial reduction of pressure has occurred, because the internal pressure will still be greater than that in the chamber.

Gas Filling

When the bag is fully empty, or as empty as the vacuum pump can make it within the desired cycle time, the chamber and the bag are refilled, preferably at the same rate. This time the bag is filled with a selected gas or gas mixture introduced through the nozzle 13. In the case of packaging meat the gas is commonly carbon dioxide, although other gases or gas mixtures may be used. Depending upon the nature of the contents of the bag other gas mixtures may be used to control the storage, ripening, or other qualities of the item stored within the bag.

While the bag is being filled with a gas or gas mixture, the chamber is also filled, most conveniently with air, although other gases could be used. By filling the chamber at a controlled rate at the same time as filling the bag, it is possible to balance the pressure between the gas within the bag, and the air within the chamber. This allows the bag to be filled accurately with a metered quantity of gas, and also avoids undue pressure being placed on the bag.

The amount of gas injected into the bag can be controlled by the microprocessor, which determines the amount of gas based on the user settings and the weight of the product. For example, one meat processor may wish to achieve set rates of 1.5 liters of Carbon Dioxide per Kg of meat cuts, whilst another may prefer to achieve fill volumes of 1.7 liters of Carbon Dioxide per Kg of meat cuts. By entering the required settings the machine can calculate the required amount of gas based on the weight of the product. This has not been possible in prior art equipment where the average pack size may be for example 10 kg but packs may range in size from 8 kg to 11.5 kg for example.

When atmospheric pressure has been reached in the chamber, the cover 11 of the chamber can be removed, and the sealing bars 19 brought together to seal the bag 16. If two...
chambers are used together, the cover 11 can be shifted to the second chamber at this stage, and evacuation of another bag commenced while the first is being sealed. When the bag is sealed, the clamping bars 18 can be released and the bag removed from the chamber.

[0032] This example has the advantage that the bag can be well evacuated to leave a very low amount of residual air, and then accurately filled with a known quantity of gas, and avoids the disadvantages of prior vacuum packaging methods in which the bag is exposed to atmospheric pressure during the vacuum and gas flushing operations. It also has the advantage that only the bag is filled with the required amount of gas calculated on the weight of the product and any user settings, and no gas is allowed to escape into the chamber. It is also believed that the bags are less likely to be damaged in the operation as there can be little or no stress on the bag during filling.

EXAMPLE 2

[0033] In this example, any type of packaging machine can be used, and for example it may be a packaging machine 10 of the type illustrated and described with reference to FIG. 1, so that the product can be inserted into a package, the package evacuated and then gas filled to provide a controlled atmosphere prior to sealing of the bag. (Except that the weigh station 12A is replaced by external weigh station 54 situated prior to the product reaching the packaging machine).

[0034] FIGS. 2 and 3 show the use of such as machine, in association with an indexing in feed conveyor 50 and an output conveyor 51.

[0035] Preferably the indexing in feed conveyor has an associated weight station 54 situated beneath the conveyor belt so that the product is weighed just before it enters the packaging machine.

[0036] Information on the way the product can be fed to the microprocessor (not shown here but represented by numeral 30 in FIG. 1) which in turn controls the evacuation of the bag and the amount of gas injected, once the bag has been evacuated.

ADVANTAGES

[0037] By this means it is possible to more accurately determine the amount of gas to be inserted into the bag, based on the weight of the product.

[0038] This has the advantage that a production line can pack the meat packs, and fill them with the required amount of gas more accurately, and at a faster rate than conventional controlled atmosphere packaging lines. Conventional lines require the operator to visually inspect, and in some cases to manually adjust the amount of gas per package based on the visual indication of the size of the package. This slows down the process, and unless the operator is extremely careful, will result in the ballooning or bursting of some packages where excess gas is injected into a smaller pack size, or too little gas is injected into a pack resulting in the absorption of the gas into the meat during transport, and subsequent crushing of the package. In neither case the end result is acceptable.

[0039] Whilst it is possible to regulate the amount of gas precisely based on the exact weight of the package, we prefer to determine a number of weight bands for example, 8-8.5 kg, 8.5-9 kg, 9-9.5 kg, 9.5-10 kg, 10-10.5 kg, 10.5-11 kg, 11-11.5 kg and 11.5-12 kg and to determine if the weight of the package falls within one of these bands, and then to inject a predetermined amount of gas into the package in proportion to the amount specified for that particular weight band. In addition the gas to be injected can be varied depending upon the type of product, the transit time from packing to retail display and purchased by the consumer. In some cases we prefer to inject both carbon dioxide and nitrogen, so that the amount of gas can be controlled carefully, allowing the carbon dioxide to be absorbed by the meat during transport, whilst the nitrogen remains as a buffer gas preventing crushing of the package (which would be the case if only carbon dioxide was present and it was fully absorbed by the meat).

[0040] By setting the parameter relating to the type of product to be packed (for example ground beef which has a greater surface area than a meat cut) and then using the automatic weighing, and automatic regulation of the gas to be injected in proportion to the information on a package weight, it is possible to greatly speed up the controlled atmosphere packing of food products (and in particular meat) whilst at the same time minimising the risk of damage or spoilage to the product.

VARIATIONS

[0041] Whilst it is preferred the weighing of the product occurs in the chamber as in example 1, or shortly prior to the chamber by having a weighing station associated with the indexing and feed conveyor 50, it is possible to weigh the combined package or their contents separately, some distance from the machine, for example when the meat cuts have been prepared, and then transmit this information to the microprocessor. In either event the total package weight (or the aggregate weight of the individual meat cuts making up that package will be fed to the microprocessor so that the required amount of gas can be injected automatically.

[0042] Finally, it will be appreciated that various alterations or modifications maybe made to the foregoing without departing from the scope of this invention.

We claim:

1. Apparatus for controlled or modified atmosphere packaging of products, including means for weighing a product to be packaged; means for insertion of a product into a package; means for evacuating the package; means for injecting a gas into the package; means for regulating the amount of gas injected based on information on the weight of product from the weighing means and means for sending the package.

2. Apparatus as claimed in claim 1, wherein the weighing means provides an output to a control device such as microprocessor which in turn can be used to control the amount of gas injected into the package.

3. Apparatus as claimed in claim 1, wherein the weighing means forms part of the packaging machine.

4. Apparatus as claimed in claim 1, wherein the weighing means is a weigh station situated prior to the packaging machine.
5. Apparatus as claimed in claim 1, wherein the weighing means is closely associated with the apparatus.

6. Apparatus as claimed in claim 1, wherein the weighing means is associated with a conveyor conveying product to the packaging machine so that the weight of the product is determined before the product reaches the packaging machine.

7. Apparatus as claimed in claim 1, wherein the packaging machine has a manual control to enable the user to set the amount of gas per weight or type of product.

8. A method of controlling the amount of gas injected into a package by determining the weight or type of product, and automatically varying the amount of gas injected based on the weight of the product.

9. A method as claimed in claim 8, wherein the method involves setting a user determined variable to regulate the desired amount of gas per weight of product, and combining this setting with the weight of the product.