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(54) Preservation process.

(57) A process and apparatus for packaging goods comprising placing the goods in a container (1) connecting the container to both a source (14) of preserving gas and a source (16) of vacuum and subjecting the goods to a plurality of pulsing operations whereby during each pulse a minor amount of air is abstracted from the container (1) and replaced by a preserving gas and thereafter sealing the container.

EP 0 253 434 A2

PRESERVATION PROCESS

This invention relates to an improved process of protecting and preserving goods and more particularly but not exclusively to the packaging of foodstuffs.

Foodstuffs and other goods are frequently packaged by placing the goods in a bag made of thermoplastics material, for example polyethylene then connecting the bag to a source of vacuum to extract as much as possible of air contained not only in the bag but also air trapped within the goods themselves. By this means the goods are protected from any deteriorating influence of atmospheric air. This procedure suffers nevertheless from a major defect in that during the extraction process the walls of the bag are pressed so firmly by atmospheric pressure onto the goods that in many instances they become damaged or compressed to an undesirable extent.

Another procedure which has been adopted and which overcomes the danger of damage is to place the goods in an unsealed container which can be a bag or container having readily deformable walls or in some other form of container having rigid walls. The container together with the goods are then placed in a chamber provided with walls strong enough to withstand atmospheric pressure. The chamber is then connected to a source of vacuum and the pressure is reduced to a predetermined level depending on the nature of the goods to be protected. During the process of exhaustion the pressure within the unsealed container and the chamber remain the same. Consequently the contents of the container are not subjected to any compression and therefore remain undamaged. When the pressure both within the chamber and within the container has been reduced to a certain predetermined level depending upon the requirements of the goods to be protected a preserving gas is then admitted into the chamber and enters also the unsealed container. When the pressure in the chamber has reached atmospheric it is opened and the container is then removed and sealed.

This process thereby prevents the goods from becoming damaged by compression. However the costs of equipment required for operating the process are high. Consequently it is economic mainly when large quantities of goods having similar packaging requirements are to be processed. A further disadvantage is that a major proportion of the preserving gas which is injected into the chamber does not enter the containers and is therefore wasted. The process is also slow because chambers which are large enough to contain a sufficient number of containers to be commercially useful have to be relatively large and are therefore slow to evacuate.

Another known process comprises placing the goods in a container having air tight walls and then inserting a hollow probe through a wall. A major proportion of the air is then extracted from the container and replaced by a preserving gas. The probe is then removed and the hole is sealed. This process has the disadvantage in that it cannot be used for the packaging of foodstuffs or other goods in covered plastics trays or other containers having semi-rigid walls because during the removal of air the container becomes crushed by atmospheric pressure. Furthermore the removal of the probe results in the contents of the container being exposed to the atmosphere prior to sealing.

Another disadvantage of this method is that it does not permit sufficient control to be exercised easily over the precise composition of the preserving gas. Most preserving gases consist of a mixture of nitrogen oxygen and carbon dioxide. However the precise amounts of them which are used in a preserving gas depends to an important extent on the nature of the food to be preserved. Consequently if different forms of food are to be preserved a need arises for the composition of the gas to be varied easily.

According to the present invention we provide both a process and an assembly of devices whereby goods can be packaged more effectively than has been possible hitherto with existing techniques.

Accordingly this invention provides a process of packaging goods comprising placing the goods in a container connecting the container to both a source of preserving gas and a source of vacuum and subjecting the goods to a plurality of pulsing operations whereby during each pulse a minor amount of air is abstracted from the container and replaced by a preserving gas and thereafter sealing the container.

A further embodiment of this invention comprises an arrangement of devices for carrying into effect the above process comprising a container having an opening communicating through a valving means with both a source of preserving gas and a source of vacuum and a pulse counter for controlling the operation of the valving means and means for sealing the container.

This invention is illustrated but not restricted by the following drawing in which

Figure 1 shows in schematic form one method of carrying into effect the process of the invention for the preservation of fruit.

In figure 1 a tray (1) one third of its volume of which is filled with fruit (2) is partly sealed with a lid (3). The lid and tray are both made from thermoplastics sheet material, for example polyvinylidene dichloride. Tray (1) is provided with a flange extension (4) which forms part of a valve (5) having an opening (6) which communicates by a channel (not shown) in the flange with the interior of the tray. The upper surface of the flange extension is located below a head of a heater (7) and above a plunger (8) of a solenoid contained within a heat sealer assembly (9) the rim (10) of which defines with the lower part of a heater assembly (11) a nip which is in air-tight engagement with flange extension (4). The interior of tray (1) therefore communicates with sealer assembly (9) through valve (5) and the assembly in turn is connected by conduit (12) through valve (13) to a source of preserving gas which in the present case is a cylinder (14) of carbon dioxide. Conduit (12) is also connected through valve (15) to a vacuum pump (16) which conveniently is of an electrically operated diaphragm variety. Both valves (13 and 15) are connected to a timer (17) which is itself connected through a pulse counter (18) to the solenoid plunger (8). The timer (17) determines the length of period during any single cycle of operations during which either of valves (13 and 15) is open, i.e. the length of period during which air is either being extracted from the tray or gas is being admitted into the tray. The pulse counter ensures that after a given number of cycles to which it has been set by an operative the valve which happens currently to be in operation when this number has been reached is closed and the sealing mechanism is brought into action. A pulse consists of one cycle of operations during which a minor part of the air in a container or a mixture of air and preserving gas is abstracted from the container and replaced by preserving gas.

In order to operate the process the fruit is placed in the container (1) and the lid (3) is sealed onto the flange of the tray using a conventional lidding machine. Flange extension (4) is gripped by the nip formed by the lower part of the heater assembly (11) and the upper part (10) of the sealer assembly. The timer (17) and the pulse counter (18) are adjusted so that when valve (15) opens and pump (17) commences to extract air from the tray about 10% of the air is withdrawn during each pulse. Initially there is a small reduction in pressure in the tray but insufficient to cause any substantial or permanent deformation of its walls. At this stage valve (15) is closed and valve (13) opens permitting sufficient amount of carbon dioxide to enter to replace the volume of air extracted. Valve (13) then closes and valve (15) re-opens and the cycle is repeated until the pulse counter in response to the number to which it has been set ensures both valves are closed and activites the solenoid plunger (8) which rises and presses valve (5) against the head of the heater (7) causing valve (5) to become fused to extension flange (4) thus closing opening (6) and effectively sealing the tray without exposing the contents of the tray to the atmosphere.

The functions of the timer (17) and the pulse counter (18) are inter-related. Thus the atmosphere within the container can be varied by a predetermined amount by variation either of the number of the pulses or by variation of time during which each valve is maintained in operation and this is determined by the timer. It is important of course that valve (15) is not maintained open so long that the container or the goods in the container are damaged by atmospheric pressure because of any excessive reduction in pressure within the container. In general the settings on the timer and pulse counter are adjusted so that for each volume of air which has been pumped out of the container an equal volume of preserving gas is pumped into the container. However, under certain circumstances the settings may require to be arranged so that a small negative or positive pressure is left in the container after the completion of the cycle of operations. For most purposes in one pulse from 5 to 15% and preferably about 10% of the air can be removed safely from the container. Prior to the exhaustion process the timer and pulse counter may desirably be programmed so as to create initially an increase in pressure in the container so as to cause the walls of the container to balloon and be forced away from the goods thus enabling air trapped in the goods being replaced more effectively by preserving gas. Based on this percentage and with a knowledge of the composition of the gas which is required in the container at the end of the process and the available capacity within a container partly filled with goods an operative can calculate the number of pulses which are required. Alternatively a number of calibrating experiments can be carried out to determine on a trial and error basis for each size of container the settings for the timer and the pulse counter. In the case of many of the small containers such as trays and bags which are used for the retailing of foodstuffs from 3 to 12 pulses each having a duration of about 1 second has been found to give very good results. Since sealing of the container takes place before it has been disconnected from the sealing unit the contents of the bag do not have an opportunity to become exposed to the atmosphere prior to sealing of the bag. Furthermore since the sealing operation takes place almost immediately after the last pulse the whole process of air replacement and sealing can be accomplished very rapidly, often in less than 10 seconds.

Various forms of container can be employed although bags having flexible walls made of thermoplastics material and trays or boxes or drums having rigid or semi-rigid walls made of such materials, such as cellulose, polyamides, polypropylene and polyesters are preferred. Containers made of permeable material, for example cardboard can also be used provided that they incorporate an air-tight liner. The container preferably incorporates some form of valve including a tublure or other opening which facilitate sealing of the container at the completion of the process.

Various types of vacuum pumps can be used although those that do not utilise oil in their operation, for example diaphragm pumps are to be preferred if as is usually the case oxygen containing gases are to be pumped out of the container. Figure 1 illustrates the use of separate valves for controlling the vacuum and preserving gas. Nevertheless a single compound valve can also be used.

The present process and assembly of devices enables the packaging of a wide range of goods and this is reflected in the variety of preserving gases which can be employed. For the purposes of the present invention any gas or other vapour which is used to replace a part of the atmosphere within the container and has a protective effect on the packaged goods is a preserving gas. Thus for the freshness retention of many forms of foodstuffs replacement of part of the air by argon or nitrous oxide can sometimes be carried out. However, for such goods enrichment of the air in the container by gases normally contained in the atmosphere namely nitrogen oxygen or carbon dioxide is preferred. For example the preserving gas can contain from 25 - 100% of carbon dioxide, 20 - 80% of nitrogen and 10 - 40% of oxygen.

When the goods comprise electrical or electronic components the preserving gas may be ordinary air which has been purified to remove any acidity and moisture. The process can also be used to sterilise medical instruments and materials utilising a mixture of ethylene oxide and carbon dioxide. In all these applications the preserving gas can be used with considerable economy and the goods can be packaged without damage to either the goods or to the container in which they are packed. Furthermore the processes can be effected rapidly with relatively inexpensive equipment.

Claims

1. A process of packaging goods comprising placing the goods in a container connecting the container to both a source of preserving gas and a source of vacuum and subjecting the goods to a plurality of pulsing operations whereby during each pulse a minor amount of air is abstracted from the container and replaced by a preserving gas and thereafter sealing the container.

2. A process according to Claim 1 wherein from 5% to 15% of the air in the container is abstracted during each pulse.

3. A process according to either of claims 1 or 2 wherein the goods are subjected to from 3 to 12 pulsing operations.

4. A process according to any one of the preceding claims wherein the container is heat sealed after the last pulse has been completed.

5. A process according to any one of the preceding claims wherein the container is inflated prior to carrying into effect the pulsing operations.

6. An arrangement of devices for carrying into effect any process claimed in any one of the preceding claims comprising a container having an opening communicating through a valving means with both a source of preserving gas and a source of vacuum and a pulse counter for controlling the operation of the valving means and means for sealing the container.

7. An arrangement of devices according to Claim 6 wherein the valving means is controlled also by a timing device.

8. An arrangement of devices according to either of Claims 6 and 7 wherein the valving means comprises separate valves.

9. An arrangement of devices according to any one of Claims 6 to 8 wherein the opening in the container communicates with a valve forming part of the container.

10. An arrangement of devices according to either of Claims 6 and 9 incorporating a heat sealing device.

11. An arrangement of devices according to Claim 10 wherein the sealing device is connected operably to the pulse counter.

Fig.1.