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A food packaging and a method for treating the same

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(54) Title: A FOOD PACKAGING AND A METHOD FOR TREATING THE SAME			
(57) Abstract			
<p>A method for heat preservation of a container filled with material is accomplished by means of heating and a pressure which is maintained during the holding time of the preservation process. The container of a material of laminate type is, after the holding time of heat preservation, subjected to a supporting pressure during the cooling time of the process. A container intended to contain goods for heat preservation by means of heating and pressure comprises a base layer (1), an inner layer (3), and a barrier layer (4) between the base layer and the inner layer, and at least one layer consists of a plastic with memory.</p>			

## A FOOD PACKAGING AND A METHOD FOR TREATING THE SAME

The present invention relates to a method for treating a container for foods as well as to the container itself. More specifically the invention relates to a method for heat preservation of a container filled with a material, the heat preservation being accomplished by means of heating and a pressure which is maintained during the holding time of the preservation process.

Completed containers for consumers or for individual portions of the non-disposable type have existed for a long time within the packaging technology. After their first use these containers are intended to be returned and prepared for a new use. Foods are nowadays often filled and transported in containers of a throw-away type, i.e. containers intended to be used only once and then discarded or recycled.

The demand on a container intended for foods is - whether it shall be used once or several times - that it should be easy to manufacture and handle as well as be designed and constructed in such a way that it gives the best protection possible to the product which is to be filled and transported in the container. A good product protection implies among other things that the container should be sufficiently mechanically strong and dimensionally stable in order to withstand the outer influences which it is exposed to during normal handling without being deformed or destroyed. Furthermore, the container should be sufficiently physically and chemically impermeable in order to prevent a transport of liquid and/or gases through the walls of the container.

Furthermore, it is often required that the container is constructed in such a way that it allows aseptic filling of a product which is sterilized and filled under sterile conditions in a likewise sterilized container which after filling is sealed in such a way that while stored before

being consumed the filled product is not reinfected by harmful micro-organisms. In other cases it is required that the foodstuff should be heat preserved in its container.

Concerning heat preserved products, these have for a long time been packed in jars, and the most common raw material is sheet iron or tin-plate. Autoclavable jars are also manufactured from steel and aluminium. The raw material for jars is thus expensive and the manufacturing costs are large.

10 Glass containers have also been used for all kinds of foods for a long time. However, the problem with glass containers is that they are very sensitive to blows and impacts and therefore require special care in order not to be destroyed while handled. If they are shattered they can furthermore cause injuries during a subsequent handling and consumption. Moreover, glass containers are usually manufactured cylindrically and can for that reason not be effectively stored.

20 Nowadays, bottles and jars of other materials also exist. Rigid plastic containers can be manufactured rather inexpensively and with a simple technique. Plastic is stronger than glass and more corrosion resistant than metals. Furthermore, it is lighter than both glass and metal.

25 There is thus a need for an inexpensive sterile stacking container which can be sterilized.

30 The known laminated throw-away containers often consist of several material layers which together endow the container its desired properties. In this connection a laminate means a material which is constructed of more than two layers joined together. By combining materials with different properties the laminate can obtain such a state which would not be achieved with one material only.

35 Thus, a known package material consists of a base layer of paper or cardboard, which gives the container

mechanical strength and dimensional stability, and of outer layers of polyethylene which make the container liquid impermeable. In order to supplement the container with impermeability properties against for example gases and

5 other substances the package material is provided with at least one additional layer of a material with desired properties, e.g. aluminium or a barrier polymer. A package material of the laminated type described becomes more complicated in its construction the higher and more well-

10 balanced the demands on the completed container are for the purpose of achieving optimal protection of the product to be filled. However, known containers of a packaging laminate with a liquid absorbing fibre layer cannot be used for heat treatment with moist heat without the desired

15 mechanical rigidity of the packaging laminate and thus the dimensional stability of the container being impaired or lost.

Autoclaving of closed containers with a filling material has not previously been performed, the containers

20 being manufactured from a laminate containing cardboard or paper.

In a simultaneously filed patent application a container is described which is manufactured from a laminated material, the container being intended for heat

25 treatment with moist heat.

When a closed non-flexible container is heated with its goods the pressure within the container will rise since the contents of the container and its gases will expand and since the vapour pressure of water will increase. This

30 increase of pressure is partly compensated for by the expansion of the container itself. However, the container will explode during the heat treatment if it is completely filled up. In order to avoid this the containers are only filled to about 95 % of the volume of the container, an

35 extra space (which is called head-space) being formed over

the goods. The water vapour pressure in the container is predetermined for the heat treatment temperature contemplated. On the other hand, the partial pressures of the other gases can be reduced by the removal of air from the 5 goods before filling as well as from the extra space before sealing the container.

The purpose of the invention is thus to provide a method for heat preserving, preferably by means of moist heat, a container filled with goods which is manufactured from a 10 packaging laminate without the above mentioned drawbacks.

In order to achieve this purpose the invention provides a method for heat preserving a container filled with food stuff, the heat preservation being accomplished by means of heating and applying a pressure which is maintained during 15 the holding time of the heat preservation process, said container being constructed of a laminate material having at least one layer of plastic which consists of a material selected from the group consisting of polyolefins, polyesters, polyamides, polyvinyl alcohols, polycarbonates 20 and acrylic polymers, the method characterised in that the container deforms during the heat treatment and the container is subjected to a supporting pressure during the cooling time of the process after the holding time of the heat preservation whereby the container maintains a shape adopted 25 by the container during the heat preservation.

The invention also relates to a container for exercising the method, the container intended to contain food stuff for heat preservation by means of heating and pressure, wherein the container is constructed of a laminate material comprising at 30 least a base layer, an inner layer and a barrier layer between the base layer and the inner layer and that at least one layer consists of a plastic which consists of a material selected from the group consisting of polyolefins,

polyesters, polyamides, polyvinyl alcohols, polycarbonates and acrylic polymers, said container deforming at a heat preservation temperature and pressure and maintaining the deformed shape when cooled.

5 In order to explain the invention in more detail reference is made to the accompanying drawing in which

Fig. 1 schematically shows a cross section through a packaging laminate according to the invention in the form of a sheet or a web.

10 When exercising the method according to the invention a packaging laminate shown in Fig. 1 can be used. Like conventional packaging laminates the laminate comprises a relatively thick strengthening base layer 1 and an inner coating 3. Preferably, the packaging laminate also includes 15 an outer coating 2.

By the addition of additional layers to the laminate containers intended for individual products can be tailored. In order to achieve an optimal protection for the product to be filled in the container a package material of the 20 laminated type described will from reasons easily realized be complicated in its construction and composition and thus be more complicated the higher and more subtle the demands are on the completed container. After folding containers according to the invention have plane surfaces and a 25 geometric configuration suitable for the purpose, which usually is parallelepipedic.

Of importance for the invention is that the container to be preserved includes a laminate containing a plastic with memory. In this connection a plastic with memory means a 30 polymer material which is deformed at a suitable temperature and when chilled retains its deformed shape. Such a plastic may also be described as a plastic which is locked in the form (or shape) obtained during heat treatment.

Such a plastic with memory is preferably included in one of the layers in the packaging laminate according to Fig. 1, but it can also be included in the other layers which are 5 indicated below.

According to the invention polyolefins, polyesters, polyamides, polyvinyl alcohols, polycarbonates or acrylic polymers can be used as a plastic with memory.

Examples of useable polyolefins are low density 10 polyethylene, medium density polyethylene, high density polyethylene, metalized high density polyethylene, polypropylene, oriented polypropylene, metalized (usually with aluminium) oriented polypropylene, a polypropylene copolymer and ethylene/vinyl alcohol, i.e. a copolymer of 15 ethylene and vinyl alcohol (EVOH).

Examples of useable polyesters are polyethylene naphtalate, polybutene terephthalate, polyester, oriented polyester, metalized (usually with aluminium) oriented polyester and amorphous polyester, the polyester for example 20 being polyethylene terephthalate.

Examples of useable polyamides are PA 6, PA 66 and Nylon MXD6.

An example of useable acrylic polymer is polyacrylonitrile.

25 The heat treatment can be accomplished by means of dry air, water or steam as heat transfer medium. Preferably, a heat treatment is used with moist heat at a

pressure above the atmospheric in autoclaves which are filled with water or steam. In this way the treatment can take place at such a high temperature as more than 100 °C. In connection with a heat treatment in an autoclave the 5 process can be divided into a rise time, a holding time and a cooling time. The rise time is the time from the beginning of the heating until the desired temperature has been obtained. At a pressure above the atmospheric of 0.5 bar the steam has a temperature of about 110 °C and at a 10 pressure above the atmospheric of 1.1 bar the temperature is about 121 °C. After the holding time, the time at which the desired temperature is kept constant, the pressure above the atmospheric in the autoclave is lowered to the normal atmospheric pressure, and during the cooling time 15 the temperature is lowered by means of cooling of the autoclave.

When a closed container manufactured from a packaging laminate according to the invention is autoclaved a slight deformation of the laminate will be achieved during the 20 holding time, which deformation results in that plane surfaces of the container will obtain a more or less substantial concavity. This concavity of the container can be varied and retained by applying a supporting pressure on the container during the cooling time of the preservation 25 process, the plastic with memory in any of the laminates being locked in the form obtained during the heat treatment. In this connection a supporting pressure means a pressure within the autoclaving vessel, which during the cooling time is of the magnitude of up to 1 bar more than 30 that in the closed container with filling material. The supporting pressure is maintained until the plastic with memory has set, which usually takes place at about 100 °C.

The container can thus be filled at room temperature or lower and can obtain a concave surface without having a 35 negative pressure after the preservation procedure.

An additional advantage of a container according to the invention, the plane surfaces of which having obtained a slight deformation after preservation, is that such a container easily can be fitted into an existing control system.

Cans according to the state of the art are often filled with its contents at 60 °C, after which they are closed and heat preserved. After a cooling to room temperature the lid forms a concavity which indicates that 10 a negative pressure still exists in the can. During microbial spoilage processes the can is expanded (a so called bompage) and this results in that the lid first becomes straight and then bulgingly curved. These changed forms of the lid can be measured and the results of the 15 measurements can be used for shelf life control. Thus, containers according to the invention with their concave surfaces could easily be integrated in a control system of the can industry.

With reference to Fig. 1 the base layer 1 in a 20 container according to the invention preferably consists of a material which can be cardboard, paper, polypropylene, foamed polypropylene, filled polypropylene (e.g. with chalk), polyester, amorphous polyester, filled polyester or filled amorphous polyester, the polyester for example being 25 polyethylene terephthalate.

Furthermore, the cut edges on the packaging laminate in the completed container should be protected according to a simultaneously filed patent application.

In order to withstand the harsh environment of 30 autoclaving the coatings 2 and 3 are according to the invention designed to be heat resistant and to have good vapour barriers. Thus, the outer coating 2 consists of a polymer which can be polypropylene, oriented polypropylene, metalized (usually with aluminium) oriented polypropylene, 35 high density polyethylene, metalized high density

polyethylene, linear low density polyethylene, polyester, metalized (usually with aluminium) oriented polyester or amorphous polyester, the polyester for example being polyethylene terephthalate. The outer coating 2 is not necessary when the base layer consists of another material than paper and cardboard. The inner coating 3 consists of a polymer which can be polypropylene, high density polyethylene, linear low density polyethylene, polyester or amorphous polyester, the polyester for example being polyethylene terephthalate.

Preferably, the packaging laminate according to the invention also has a barrier layer 4 arranged between the base layer 1 and the inner coating 3, which barrier layer 4 is intended to be facing the filling material of the packaging container. The barrier layer can consist of aluminium, a silica coating, ethylene/vinyl alcohol, polyvinyl alcohol, metalized (usually with aluminium) oriented polypropylene, an aluminium oxide coating or metalized (usually with aluminium) oriented polyester, the polyester for example being polyethylene terephthalate.

Furthermore, the packaging laminate according to the invention can have a layer 5 arranged between the base layer and the outer coating 2, which layer 5 can consist of polypropylene, low density polyethylene, medium density polyethylene, high density polyethylene or amorphous polyester, the polyester for example being polyethylene terephthalate. An additional similar layer can be arranged on the other side of the base layer 1.

Finally, the packaging laminate according to the invention can have a coating 6 adjacent one or both sides of the barrier layer 4, which coating 6 can consist of an adhesive plastic, a heat sealable plastic, e.g. polyethylene, a primer or a lacquer. An additional layer can be incorporated between the base layer 1 and the

adjacent coating 6, which layer then preferably consists of one of the above mentioned components for the layer 5.

## THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Method for heat preserving a container filled with food stuff, the heat preservation being accomplished by means of heating and applying a pressure which is maintained during the holding time of the heat preservation process, said container being constructed of a laminate material having at least one layer of plastic which consists of a material selected from the group consisting of polyolefins, polyesters, polyamides, polyvinyl alcohols, polycarbonates and acrylic polymers, the method characterised in that the container deforms during the heat treatment and the container is subjected to a supporting pressure during the cooling time of the process after the holding time of the heat preservation whereby the container maintains a shape adopted by the container during the heat preservation.
2. Method as claimed in claim 1, wherein the supporting pressure during the cooling time is of the magnitude of 1 bar.
3. Method as claimed in claim 1 or claim 2, wherein the heat preservation is accomplished by means of heating with dry air, water or steam as a heat transfer medium.
4. Container intended to contain food stuff for heat preservation by means of heating and pressure, wherein the container is constructed of a laminate material comprising at least a base layer, an inner layer and a barrier layer between the base layer and the inner layer and that at least one layer consists of a plastic which consists of a material selected from the group consisting of polyolefins, polyesters, polyamides, polyvinyl alcohols, polycarbonates and acrylic polymers, said container deforming at a heat preservation temperature and pressure and maintaining the deformed shape when cooled.

5. Container as claimed in claim 4, wherein the laminate material additionally comprises an outer layer.

6. Container as claimed in claim 4 or 5, wherein the plastic which is locked in the form obtained during the heat  
5 treatment is selected from the group consisting of polypropylene, polyethylene terephthalate, amorphous polyethylene terephthalate, oriented polypropylene, metalized oriented polypropylene, high density polyethylene, metalized high density polyethylene, metalized oriented polyethylene  
10 terephthalate, linear low density polyethylene and ethylene/vinyl alcohol.

7. Container as claimed in claim 4, wherein the plastic which is locked in the form obtained during the heat treatment is included in the base layer.

15 8. Container as claimed in claim 4, wherein the plastic which is locked in the form obtained during the heat treatment is included in the inner layer.

9. Container as claimed in claim 4, wherein the plastic which is locked in the form obtained during the heat  
20 treatment is included in the barrier layer.

10. Container as claimed in claim 4, wherein the plastic which is locked in the form obtained during the heat treatment is included in the outer layer.

11. Container as claimed in any one of claims 4 to 10,  
25 wherein the base layer of the laminate material consists of material selected from the group consisting of paper, cardboard, polypropylene, foamed polypropylene, filled polypropylene, polyethylene terephthalate, filled polyethylene terephthalate, amorphous polyethylene  
30 terephthalate, and filled amorphous polyethylene terephthalate, the inner layer of the laminate material consists of a polymer selected from the group consisting of polypropylene, high density polyethylene, linear low density

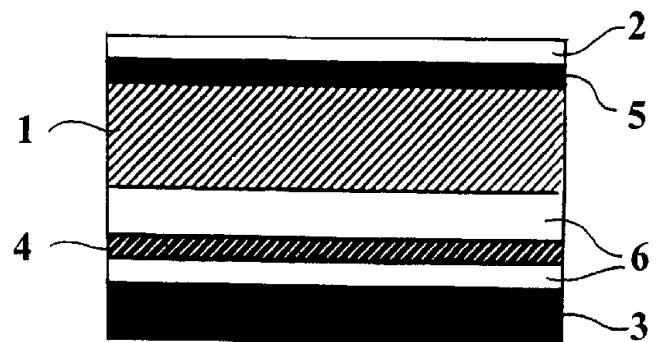
polyethylene, polyethylene terephthalate, and amorphous polyethylene terephthalate, and the barrier layer of the laminate material is selected from the group consisting of aluminium, an aluminium oxide coating, a silica coating, 5 ethylene/vinyl alcohol, polyvinyl alcohol, metalized oriented polyethylene terephthalate, and metalized oriented polypropylene.

12. Container as claimed in claim 5, wherein the outer layer of the laminate material consists of a polymer selected 10 from the group consisting of polypropylene, oriented polypropylene, metalized oriented polypropylene, high density polyethylene, metalized high density polyethylene, linear low density polyethylene, polyethylene terephthalate, metalized polyethylene terephthalate, and amorphous polyethylene 15 terephthalate.

13. A method for heat preserving a container substantially as hereinbefore described with reference to the accompanying drawings.

14. Container substantially as hereinbefore described 20 with reference to the accompanying drawings.

**FIG. 1**



**SUBSTITUTE SHEET**