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(71) Applicant: **APV CORPORATION LIMITED**
Westfield Road
Peterborough, Hampshire PE3 6TA(GB)

(72) Inventor: **Perryment, Alan John**
Byways, Market Lane
Burston, Diss, Norfolk(GB)

(74) Representative: **Dummett, Thomas Ian Peter et al**
Dummett Copp & Co. 14 The Square
Martlesham Heath Ipswich Suffolk, IP5 7SL(GB)

(54) Method for sealing containers.

(57) The present invention relates to a method for the thermal treatment of a foodstuff contained in a rupturable container, said container comprising a basal tray member and an upper cover member secured to the tray member, which method comprises passing the container through a thermal treatment zone, characterised in that the container fed to the treatment zone is only partially sealed so as to permit venting of any expansion or contraction of the contents of the container during the thermal treatment, and in that the container is sealed whilst within or immediately adjacent the thermal treatment zone once the contents of the container have been reached the desired temperature.

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METHOD FOR SEALING CONTAINERS

The present invention relates to a method for sealing containers, notably to a method for sealing containers containing a foodstuff which has been pasteurised or heat sterilised, so as to preserve the integrity of that container.

BACKGROUND TO THE INVENTION

Many foodstuffs are presented in a cooled or chilled state for sale to the public. In order to preserve the foodstuff, this is packed in a sealed container. However, with the current awareness of potential contamination or bacterial degradation of the foodstuff it is required that the foodstuff be sterilised or pasteurised by heat or other treatment before the goods are offered for sale. In one method for achieving this, the foodstuff is passed through a microwave heating tunnel or chamber where the foodstuff is heated to the desired temperature and retained at that temperature for a required period.

Whilst this treatment may reduce the problems of contamination with salmonella, lysteria and other bacteria, physical problems arise in that the foodstuff must be presented in a container for transport, storage and sale which protects the foodstuff against fresh contamination after the heat treatment. Typically, such a container is provided as a rigid or semi-rigid plastics tray in which the foodstuff lies, and a transparent cover which is heat sealed around its periphery to the tray. If the foodstuff is packed in the container after the heat treatment, there is a risk that the foodstuff may pick up new contamination during the packing operation. On the other hand, if the foodstuff is heat treated when sealed into its container, problems arise in that the heat treatment will cause the release of steam from the foodstuff and expansion of air in the airspace around the foodstuff within the container. This may cause the container to burst, since it is of only light weight construction, destroying the integrity of the container.

In order to reduce this problem, it has been proposed to fabricate the container from heavier gauge material so that it will resist the expansion during the heat treatment. However, this imposes cost penalties and requires the use of different manufacturing techniques, which are unacceptable for operators who already have existing foodstuff packing equipment.

We have now devised a simple and effective method by which the problem of expansion can be reduced and the integrity of the container maintained after the heat treatment and which does not require additional specialised equipment.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides a method for the thermal treatment of a foodstuff contained in a rupturable container, said container comprising a basal tray member and an upper cover member secured to the tray member, notably by heat sealing the upper cover member to the tray member, which method comprises passing the container through a thermal treatment zone, characterised in that the container fed to the treatment zone is only partially secured to the tray member so as to permit expansion or contraction of the contents of the container during the thermal treatment, and in that the container is sealed whilst within or immediately adjacent the thermal treatment zone once the contents of the container have been reached the desired temperature.

As indicated above, it has hitherto been considered essential that the container of foodstuff should be totally sealed as soon as practical after the contents have been placed in the container so as to avoid the risk of contamination of the foodstuff. The method of the invention runs contrary to this established criterion by only partially sealing the container prior to the thermal treatment and completing the sealing during or immediately after the thermal treatment.

The invention can be applied to a wide range of foodstuffs and containers therefor, notably to prepared foodstuffs and meals. For convenience, the invention will be described hereinafter in terms of the heat treatment of a meal portion, for example a chicken portion or a portion of chilli con carne, held in a generally rectangular plan shape container. The container of the invention is rupturable, that is it would break when subjected to the stress of the expansion or contraction of the contents and the air space above them when subjected to the thermal treatment. Such containers are typically made from a sheet plastic or other comparatively fragile material and metal can or other subtantial and rigid containers are not included within the term container as used herein. Furthermore, the contents of the container do not fill the container as is required in a tin can or similar filling and processing line, but there is an appreciable air space, typically 10 to 50% of the volume of the container, over the contents of the containers for use in the method of the invention.

The thermal treatment can be carried out using a wide range of methods, for example by steam

autoclaving, by infrared or radiant heating. However, the invention can be applied to freezing methods where the bacteria are killed by rapid freezing of the foodstuff within the container, since this can cause contraction of the air space above the contents, leading to collapse of the container cover. The invention is of especial application in the heat teatment of the container using microwave energy in a tunnel or other chamber through which the container is transported on a rubber or other conveyor mechanism. For convenience, the invention will be described hereinafter in terms of the use of such a heat treatment method.

The thermal treatment is carried out using conventional techniques and equipment, except as stated below. Thus, the container will typically be subjected to microwave radiation at frequencies of from 750 to 2500 mHz, eg. 896 or 2450 mHz. to achieve a temperature of at least sufficient to kill the desired bacteria. Typically, the temperature achieved will be at least 72 °C, preferably 75 to 90 °C and this temperature will typically be maintained for from 1 to 6 minutes. The container will usually be held in a holding region for a period of from 1 to 10 minutes once the contents have reached the desired temperature. The heating equipment and its method of operation are those conventionally used in the food processing field.

The container comprises a conventional basal tray and transparent cover made from any suitable material. Typically, the tray will be made from a food grade polyvinyl, polyester or polystyrene resin as conventionally used in the food industry; and the lid or cover from a similar plastic or from any other suitable material, for example a polyterephthalate resin. The meal portion is placed in the tray and the cover then affixed using conventional techniques, for example by adhesive or crimping the cover and tray together along their contacting peripheries. Since these are well known in the art, they will not be described in any detail herein. However, the invention is of especial application where the cover is secured to the tray member by means of friction or heat welding of the two components. For convenience, the invention will be described hereinafter in terms of a cover which is heat sealed to the basal tray member.

The heat sealing is conveniently achieved by locating the rim of the filled tray in a supporting recess or frame and bringing a suitably shaped heat sealing bar or die into contact with the rim of the tray so as to trap the edge of the cover or lid between the bar or die and the edge of the tray. The bar or die is heated to cause fusion of the cover or lid to the tray. The heating can be achieved by any suitable method, for example by heating the bar or die by an air jet, by an infra red heater or by induction heating.

However, as stated above, the cover or lid is not fully sealed to the tray. For example, the bar or die sealer used to seal one of the edge junctions between the tray and the cover does not extend for the full length of that junction or has a break along its length, so that there are one or more discontinuities in the heat seal. Typically, the discontinuity in the seal between the tray and the cover will be from 0.5 to 20, preferably 5 to 10, mms long to provide an adequate vent through which expansion can occur during the heat treatment stage. If desired, there may be more than one vent to a container, as when the cover is attached to the tray by a series of tack welds, but it will usually be preferred that there is only one such vent. The optimum size of the vent aperture will depend upon the nature of the foodstuff within the container and also upon the rate and level of the temperature rise during the heat treatment. Thus, for foodstuffs which readily evolve water vapour, it may be possible to use a vent aperture length of 5 mms with heating tempertures in the range 72 to 75 °C, whereas with a drier foodstuff the vent aperture may be smaller. In general we prefer to use a vent aperture length of from 5 to 15 mms for most foodstuffs with heating temeratures in the range 75 to 95 °C.

The vent may be merely an unsealed butt join between the cover and the tray. However, the cover frequently carries a peripheral flange or shoulder which locates upon the upstanding rim of the tray or vice versa. In such a case, the unsealed portion of the rim of the cover can be formed from a flexible material which adopts a shape closely aligned to that of the rim of the tray it contacts. The overlap between the tray and cover material will thus act as a temporary loose seal which can be readily blown open as the contents of the container expand.

For convenience, the invention will be described hereinafter in terms of a container in which the cover or lid is made from a semi-rigid thermoplastic material so that there is a positive aperture between the cover and tray at the unsealed vent.

The aperture is conveniently formed by cutting away part of a conventional heat sealing bar or die used to seal the lid or cover to the tray so that heat sealing between the lid or cover and the tray does not occur at the cut away portion. This can readily be achieved by filing away part of the bar or die so that conventional machinery can readily be modified for use in the method of the invention.

The container is fed to and thermally treated in the microwave tunnel in the conventional manner, at the conventional temperature and for the conventional time required to pasteurise the meal portion within the container. During such heat treatment, some steam may be given off from the meal

portion and the air in the head space above the meal portion within the container will expand. Such expansion will vent through the discontinuity in the seal between the cover and the tray so that minimal expansion stresses are applied to the comparatively fragile cover, which thus remains intact. However, once the food portion has reached the desired treatment temperature, the majority of any venting of the expansion will have taken place and the container can then be sealed to provide a sterile environment within the container.

The sealing can be achieved by any suitable method, having regard to the material from which the tray and cover are made and the vent gap to be sealed. Thus, it will usually be preferred to apply a conventional heated bar sealer to the unsealed area. However, other sealing methods, for example a hot air sealer or the application of a thermoplastic sealer to the vent gap can be used. For convenience, the invention will be described hereinafter in terms of the use of a conventional heat sealer bar technique in which a heated bar is slid over the area to be sealed.

The vent gap can be sealed whilst the container is still within the heating zone. However, this may impose problems due to the interaction of the microwave energy on any metal components of the heat sealing mechanism. It is therefore preferred that the heat sealing be carried out when the container is retained in a holding zone at the desired temperature for the dwell time required to destroy the bacteria in the meal portion. Such dwell time is usually achieved by carrying the container out of the immediate range of the microwave heater elements but retaining them within the thermally insulated tunnel so that comparatively little heat is lost from the container. The heat sealer can be located within this dwell area of the tunnel and can be operated in the conventional manner.

Once the container has been sealed and the meal portion has dwelt at the desired temperature for the desired time, the container is discharged from the microwave tunnel in the conventional manner. If desired, and adequate sterility provisions have been made, the heat sealing of the container can take place immediately after the container is discharged from the tunnel, but before the contents of the container have begun to contract to any significant extent.

The method of the invention reduces the problems of rupture of the conventional fully sealed containers during the thermal treatment and requires the minimum of change to the conventional operations and equipment. The invention can thus be applied to existing container filling and sealing lines and to existing thermal treatment operations by simple modification of the container sealers and by the provision of a container sealer mechanism to a conventional microwave tunnel or other conventional thermal treatment equipment.

The invention therefore also provides a microwave tunnel which incorporates a mechanism for sealing a container within the tunnel. Preferably, the sealing mechanism is a bar heat sealer located within the dwell section of the tunnel.

By sealing the container after the majority of the expansion has been vented, the sealed container will be under slight vacuum once the contents have cooled to ambient temperature. Subsequent inspection of the container will readily establish whether this vacuum has been retained or not. Containers produced by the method of the invention can thus be readily inspected at the point of sale by the purchaser to ensure the status of the container without the need for expensive bacterial testing equipment or specialist expertise.

The invention will now be illustrated by way of example only in the following examples in which all parts and percentages are given by weight unless stated otherwise.

Samples of a range of pre-prepared meals, for example chicken portions with potatoes and gravy, chilli con carne, and lasagne or spaghetti meals, were filled individually into rectangular plan shape trays made from crystalline or amorphous polyester resins. The weights of the samples ranged from 200 to 450 gms. The containers were covered by lids of the polyterephthalate ester resin sold under the trande mark Melinex 850 and the covered containers were fed to a support frame where the edges of the trays were supported under a heated die. The edges of the trays and lids heat were sealed together by applying the heated die thereto. The die had a section 10mms long cut away from one longitudinal section thereof so that the resultant heat seal between the tray and cover had a 10 mms vent aperture therein.

The partially sealed containers were then fed in single file on a conveyor through a conventional microwave tunnel operating at 896 mHz and 20Kw to achieve a temperature within the range 75 to 85 °C within the contents of the containers. The dwell time within the heating zone of the tunnel was from 2 to 3 minutes. During the heating stage, steam and air vented from the containers through the vent apertures and rupture of the containers was avoided.

The hot containers passed from the heating zone of the tunnel to a holding zone continuation of the tunnel where they were maintained at an elevated temperature for a period of from 2 to 6 minutes to complete the heat treatment of the contents. Within the holding zone of the tunnel was mounted a heated shoe sealer which was spring biassed to bear against the partially sealed longitudinal edge of the containers. The shoe was heated

to from 150 to 200° C by a hot air jet and caused sealing of the vent aperture to take place as the containers passed under the sealing shoe.

The sealed containers were discharged fromm-the tunnel and allowed to cool in the normal manner. As the contents cooled, a vacuum developed within the container which could readily be detected by the inward bowing of the container lid or cover. This provides a simple and effective means for confirming that the container had not been ruptured during subsequent storage and transport prior to sale.

The invention has been described above in terms of the treatment of a single container. However, it will be appreciated that the invention can be applied to the treatment of a series of containers travelling in a row, in which case the heat sealing means can extend over several containers in each row so that each heat sealing stage can be carried out on a plurality of containers simultaneously.

Claims

1. A method for the thermal treatment of a foodstuff contained in a rupturable container, said container comprising a basal tray member and an upper cover member secured to the tray member, which method comprises passing the container through a thermal treatment zone, characterised in that the container fed to the treatment zone is only partially sealed so as to permit venting of any expansion or contraction of the contents of the container during the thermal treatment, and in that the container is sealed whilst within or immediately adjacent the thermal treatment zone once the contents of the container have been reached the desired temperature.

2. A method as claimed in claim 1 wherein the thermal treatment comprises heating the contents of the container to a temperature and for a time sufficient to pasteurise the contents of the container.

3. A method as claimed in claim 2 wherein the heating is carried out in a microwave tunnel.

4. A method as claimed in any one of the preceeding claims wherein the cover and tray members are made from a thermoplastic material and the cover is heat sealed to the tray member at the junction between the cover and tray members, the heat seal being interrupted by one or more discontinuities which provide vent apertures to permit expansion or contraction of the contents of the container.

5. A method as claimed in claim 4 wherein the sealing of the container subsequent to the heat treatment of the contents is carried out by heat sealing the discontinuities in the initial heat seal by the application of a heat sealer located within the thermal treatment zone.

6. A method as claimed in claim 1 wherein the the partial heat seal to the container is provided by a discontinuity in the heat seal between the tray and the cover which are has an aperture length of betwnne 0.5 and 20 mms.

7. A method for thermally treating a food portion within a thermoplastic tray/cover assembly in which the cover member is heat sealed to the tray member characterised in that there are discontinuities in the heat seal so as to provide vent apertures by which expansion of the contents of the container during the thermal treatment can be vented to minimise the risk of rupture of the container; and in which the container is passed through a microwave tunnel to pasteurise the contents of the container; and in which the discontinuities in the sealing of the container are sealed by the application of a heat sealer thereto once the contents of the container have reached the desired temperature, the said heat sealer being located within the microwave tunnel.

8. A method as claimed in claim 1 substantially as hereinbefore described.

9. A microwave tunnel suitable for use in the method of claim 1 characterised in that it incorporates a mechanism for sealing a container within the tunnel.

10. A microwave tunnel as claimed in claim 9 wherein the sealing mechanism is a bar heat sealer located within the dwell section of the tunnel.

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EUROPEAN SEARCH REPORT

Application Number

EP 90 30 4274

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	GB-A-1 027 874 (CONTINENTAL CAN) * Page 2, line 47 - page 3, line 40, figures 1-3 *	1-5,7	B 65 B 55/16 B 65 B 25/00
Y		8,9	
A	US-A-2 633 284 (MOFFETT) * Column 3, line 24 - column 4, line 10; figures 1-3 *	1,4,7	
Y	US-A-3 889 009 (LIPOMA) * Column 7, lines 28-48; figures 3,4 *	8,9	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	22-06-1990	CLAEYS H.C.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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