ABSTRACT OF THE DISCLOSURE

An improved method for vacuum packaging an uncooked red meat article is provided, in which a shrinkable plastic film bag containing the meat article and having an open top is progressively subjected to a peripheral pressure exerted by a fluid at a temperature not so cold as to stiffen the film but not warm enough to detrimentally affect the surface of the meat or to shrink the film. The open top of the bag is maintained in communication with the atmosphere. The air in the bag is expelled rapidly through the open top under the pressure of the fluid onto the bag. The bag is then closed and, if desired, heat shrunk.

The present invention relates to the packaging of articles in plastic film, more particularly in bags made from such film and in the evacuation of air from said bags during the packaging operation.

It is important to remove air from tight fitting plastic film packages, particularly from those containing food articles such as meat, poultry and the like. Evacuation of the air prevents bridging of the film between protruding parts of food articles when they have irregular shapes such as between the wings and thighs of poultry or between bones of a red meat cut, for example, and it generally promotes a better shrink and cling of the film to the surface of the product which prevents or at least retards oxidation and deterioration of the meat. Also, evacuation reduces expansion of air inside the packaging film if the food product is subsequently cooked in the package. Heretofore, evacuation of plastic film packages has been effected in various manners. According to a well known method described in British Pat. No. 554,048 and in U.S. Pat. No. 2,876,112, a food article is placed in a plastic film bag or pouch, the pouch is then lowered and dipped into a heated liquid bath. Under the action of the hot liquid, the pouch shrinks about the enclosed article and air contained in the pouch is forced out through an open portion in the top of the pouch, the open portion being kept out of the hot bath. If desired, the bath is heated to temperatures above the heat sealing temperature of the plastic film from which the pouch is made, which permits sealing of the open top portion of the pouch at the end of the drying operation. The attractive simplicity of this method, however, is offset by several disadvantages. It is difficult to control the combined evacuation and shrinking operation: when the liquid bath is heated to temperatures high enough to make the film shrink, shrinkage frequently takes place before satisfactory level of evacuation has taken place which results in undesirable pockets of air entrapped in the package, particularly in the case of irregularly shaped articles. If immersion in the heated bath is extended beyond about 5 seconds to try to obtain a better evacuation of the air, the surface of the enclosed food article (meat) is cooked which is unacceptable in fresh meat packaging. In the packaging of uncooked red meat articles, not only cooking but simple discoloration of the surface of the red meat is unacceptable. Furthermore, since the meat packing houses are usually maintained at cool or cold temperatures, vaporization of liquid from the hot bath inevitably takes place, and the resulting condensation and dripping of liquid from the ceiling and walls of the room may become unacceptable from a sanitary point of view and dangerous from a safety point of view.

In order to avoid these disadvantages, another method has been more commonly used in which evacuation is effected by placing a food article in a bag, or a pouch, of plastic film, introducing an evacuating nozzle into the bag and drawing a vacuum on the bag, and closing the evacuated bag at a point adjacent to the packaged food article while maintaining a vacuum on the opening of the bag. The main disadvantage of this procedure is that it is difficult to prevent random tensioning of the film around the food article before evacuation is completed, which results in the formation of undesirable pockets of entrapped air in the bag. Another disadvantage is the risk of premature necking of the film at the mouth portion of the bag with concomitant interruption of the necessary free path for the air flowing out of the bag. Premature tensioning and necking of the film can only be prevented or overcome by time-consuming additional manipulations of the bag and/or of the evacuating nozzle.

It is an object of this invention, therefore, to provide a method for packaging a food article in a plastic film bag which eliminates the risks of cooking or discoloring the surface of a red meat article, of premature tensioning and necking of the plastic film during evacuation of the bag and the concomitant formation of pockets of entrapped air in the resulting package.

It is another object of this invention to provide a method for progressively and smoothly evacuating a plastic film bag containing a food article which avoids excessive manipulations of the package and prevents reentry of air into the evacuated package.

The objects of the invention are achieved by progressively subjecting a shrinkable plastic film bag containing a red meat article and having an open mouth to a peripheral pressure exerted by a fluid at a temperature well below the shrinkage temperature of the film and expelling air from the bag through its open mouth. The fluid pressure is progressively applied onto the bag from the bottom up. The bag is thereafter closed and may, if desired, be subjected to a conventional heat treatment to shrink the film.

The method of the invention will now be more particularly described with reference to the accompanying drawing wherein:

FIGS. 1 and 2 are schematic perspective views of a plastic film bag containing a red meat article showing progressive steps of evacuation of the air in the bag according to an embodiment of the invention wherein the fluid employed is air;

FIG. 3 is a cross-section view of an apparatus for evacuating the air from a plastic film bag containing a red meat article according to another embodiment of the invention wherein the fluid employed is air;

FIG. 4 is a cross-section view of another apparatus for evacuating the air from a plastic film bag containing a red meat article wherein the fluid employed is also air; and

FIG. 5 is a view similar to that of FIG. 4 showing the bag in the apparatus at the end of the evacuation step.

For the packaging of primal cuts of red meat, the plastic film from which the bag is made should preferably be substantially impervious to oxygen to insure satisfactory preservation of the meat. The film may be made from polyesters or other polymers such as vinylidene chloride polymers or copolymers, from mixtures of at least 50% by weight vinylidene chloride polymers and/or copolymers with other polymeric resins well known to those skilled in the art, as long as the film obtained from these mixtures is soft, flexible and impervious to air and oxygen. Laminates may also be used, such as vinylidene chloride film laminated with polyethylene film,
or polyethylene film coated with a vinylidene chloride composition. Polyvinylidene chloride film is preferred for use in the invention. The film may be between 1 mil and 5 mils and preferably between 1.5 to 2.5 mils thick. The bag should be of a size larger than is required to accommodate the article, i.e., of a size sufficient to contain the food article without causing the bag to be more than 10% larger than is required to accommodate the article. On the other hand, if the bag is of a size too small for the article, it is difficult to obtain an effective vacuum because air may remain entrapped in folds of excess film. It has been found generally that a satisfactory vacuum may be obtained by using bags of a size 45% larger than is required to accommodate the article.

The fluid may be a liquid, such as a water bath or a salt water bath, or a stream of air at high velocity. It must be maintained at a temperature above that at which the film stiffens but below that at which the film shrinks. When a bath is used, it must be kept at a temperature below the shrinkage temperature of the film, but not cold enough to stiffen the film and to prevent its collapse against the article. In the packaging of uncured red meat, it is essential to avoid discoloration of the surface of the meat article by heat. Discolored meat is commercially unacceptable and the meat article must be trimmed of all the discolored portions before sale to the consumer, which is very costly. A noticeable increase of the temperature of the surface of the red meat article, which might very easily occur during discoloration takes place, should also be avoided because it could affect the quality of the meat on storage. Thus, the bath should not be at a temperature below the shrinkage temperature of the film, but also at a temperature which will not detrimentally affect the surface of the meat article. It has been found that sizes obtained when the bath is maintained at a temperature within a range of from 40° F. to 100° F. and preferably from 55° F. to 85° F. with a vinylidene chloride film bag. The same temperature ranges may be used when air is employed as the fluid.

Other requirements for optimum operation are the rate and time of exposure to the fluid of the bag containing the article. In order to produce an effective evacuation of the air, the bag is subjected to the peripheral pressure exerted by the fluid to permit progressive and full wiping action of the fluid on the periphery of the bag, thus collapsing the bag. In this manner, the article is in contact with the fluid from all sides and the fluid pressure is transmitted to the article. The fluid pressure may be adjusted to provide the optimum conditions for the introduction of the article into the bag.

Referring to the drawing, FIGS. 1 and 2 illustrate schematically a preferred practice of the method of the invention. A plastic film bag 10, containing a red meat article 12, and having an open mouth 14, is progressively lowered into a water bath 16 contained in a tank 18. An operator, with one hand, holds the meat and bag in the manner shown in the drawing in such a manner that the meat article 12 is entirely below the surface of the water, and with the other hand holds the open mouth 14 of the bag outside of the bath. Under the pressure of the water, the bag is collapsed and forced to conform to the shape of the meat article, and the air is expelled from the bag 10 through its open mouth. After evacuation, the bag is closed below the surface of the water, such as by gathering the neck portion of the bag and closing it with a metal clip, for example. After the clipping operation, as it is called, the bag is removed from the bath. In this manner, air is expelled from the closed bag. The closed bag may, if desired, be thereafter subjected to a conventional heat shrinking operation. For example, the bag may be contacted with a stream of hot air, or sprayed with, or dipped in, a hot liquid such as hot water. If desired, only the portion of the bag closed with a clip may be heat shrunk, to provide a more hermetic closure.

As above-mentioned, instead of evacuating the air contained in the bag by progressively immersing it into a water bath, evacuation may be effected by subjecting the bag to a stream of high velocity air peripherally directed at the bag and progressively applied, beginning with the bottom of the bag and terminating with its top portion. This other embodiment of the method of the invention is illustrated in FIGS. 2 to 4 which show two alternative apparatuses, respectively, for carrying it out.

In FIG. 2, there is shown an air ring, similar to the air rings commonly used in the extrusion of tubular thermoplastic films, and generally indicated at 20. The air ring 20 comprises a cup-shaped chamber 22 communicating with compressed air conduits 24. The air conduits 24 are connected to a source of compressed air (not shown). The lower part of the chamber 22 has an upper wall 26, an inner, cylindrical wall 28, and a bottom wall 30. An annular slot opening 27 is provided in the wall 26 for exit of high compressed air from the chamber 22. A disc 32 having a central circular opening 34 is disposed in spaced parallel relationship with the upper wall 26 of the chamber 22 to define an annular distributed passage 36 for the compressed air from the chamber 22 through the annular opening 27. The circular opening of the disc 32 and the inner, cylindrical wall 28 form a cylindrical passage 38 for a plastic film bag 10 containing a meat article 12. The opening 34 is preferably chamfered to direct the compressed air flowing through the passage 36 obliquely and upwardly toward the centerline of the air ring 20. The bag 10 containing the meat article 12 is progressively thermostated through the passage 38 at a rate of less than 1 foot per minute, the bottom of the bag being supported by any convenient means, such as a downwardly moving forked platform, for example (not shown). Under the pressure of the air flowing at high velocity from the annular distributing passage 36 and peripherally impinging onto the wall of the bag 10, the air in the bag is progressively expelled, as the wall of the bag is forced to collapse and is progressively wiped against the meat item.

A further embodiment of the method of the invention, wherein air evacuation is effected by progressively lowering a bag containing meat item into a chamber while a plurality of streams of high velocity air are directed at the bag, as illustrated in FIGS. 4 and 5. A double-wall chamber 40 is mounted on a frame 42. The chamber 40 has an inner side wall 44 and an outer side wall 46 defining a passage 45 for compressed air. The outer side wall 46 is connected to an air conduit 48 communicating with a source of compressed air (not shown). The inner side wall 44 of the chamber 40 is provided with a plurality of vertically spaced-apart air nozzles 50 obliquely directed towards a central opening 52 in the top wall 54 of the chamber. The opening 52 has a periphery larger than the periphery of the bag 10 containing the meat article 12.

A platform 56 is provided to support and lower the bag 10 with the meat article 12 from the opening 52 down to the bottom part of the chamber in a predetermined controlled rate of less than 1 foot per minute. The platform 56 is preferably made of a screen or of a
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Foraminous material to permit free passage therethrough of the upwardly directed compressed air around and about the bag. The shape of the platform is not critical; it may be flat or forked, for example. It depends on the shape of the bagged article. Means are provided for raising and lowering the platform 56, such as a screw thread 58 cooperating with a threaded bushing 60 and a roller chain drive 62 actuated by a gear-motor 64 fastened to the frame 42. The platform 56 may be adapted to be rotated as it is lowered and may also be restrained from rotation. Other means may also be used for lowering and raising the platform, such as a pneumatic cylinder, for example.

The operation of the apparatus shown in FIGS. 4 and 5 is very simple. High velocity streams of air flow into the chamber 40 from the upwardly directed nozzles 50. They periropically impinge onto the wall of the bag beginning with the bottom, as the bag is progressively lowered through the chamber. The open mouth 14 of the bag is maintained outside of the chamber in communication with the atmosphere. As in the preceding embodiments, the bag is progressively collapsed against the meat article and forced to conform to the shape of the article under the pressure of the high velocity streams of air, and the air contained in the bag is progressively expelled through the open mouth of the bag. When the desired degree of evacuation has been attained, the bag is closed, such as with a metal clip, before being removed from the chamber to prevent re-entry of air into the bag. The closed bag may, if desired, be thereafter heat shrunk in conventional manner.

In the embodiments of FIGS. 3 to 5, the velocity of the compressed air streams may easily be determined by those skilled in the art. It has been found that with an air ring of 4 inches in diameter and a bag containing an article of about 3.5 inches in diameter, a velocity of about 2400 feet per minute was satisfactory. It depends on the size of the bag to be evacuated and on the shape of the meat articles in the bags.

Although the air ring of FIG. 3 and the air chamber of FIGS. 4 and 5 are disposed to permit passage therethrough of the bag 10 along a vertical line, they could be disposed so as to permit passage of the bag along a horizontal, or an oblique, line if desired.

The method of the invention will now be illustrated in the following examples.

EXAMPLE I

Four primal beef top round cuts of approximately the same size were placed in identical polyvinylidene chloride film bags having a length of 32 in. and a flat width of 18 in. The film had a thickness of 1.9 mils. The bags were of a size about 20% larger than required to accommodate the beef cuts. Four water baths at different temperatures were placed in a refrigerated room at 30° F. Each bag containing a beef cut was progressively immersed in one of the four baths at a rate of 1 foot per second and then kept in the water with the meat fully submerged for 2 seconds to evacuate the air contained in the bags. After 2 seconds immersion, the bags were conventionally closed with a metal clip fastened around the top portion of the bags in the water. The distance from the clip to the top edge of each bag was kept the same as much as possible. The clip is generally placed at such a distance that it will be close to the meat cut after the bag has been shrunk. In this Example and in the following ones, the clips were fastened about 3 inches above the meat.

The internal pressure in the chamber was then measured in inches of mercury, which corresponded with the internal, absolute pressure of the bag. The lower the number indicating the pressure, the greater the relative vacuum in the package. A perfect vacuum is 0 inches of mercury and 30 inches of mercury is essentially equal to atmospheric pressure.

After the vacuum in the bags was measured, the bags were shrunk in conventional manner by dipping them into hot water at 195° F. for about 2 seconds.

The results of these tests are tabulated below:

**TABLE I**

<table>
<thead>
<tr>
<th>Water bath (temp. ° F.)</th>
<th>Internal absolute pressure (inches Hg) in the bag after evacuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>18</td>
</tr>
<tr>
<td>54</td>
<td>12</td>
</tr>
<tr>
<td>64</td>
<td>10</td>
</tr>
<tr>
<td>74</td>
<td>11</td>
</tr>
</tbody>
</table>

The bags tended to stiffen at temperatures above 50° F.

Five primal beef short loin cuts of approximately the same size were placed in the same type of polyvinylidene chloride film bags 18 inches wide and 32 inches long. The film had a thickness of 1.9 mils. The bags were of a size about 25% larger than required to accommodate the beef cuts in a snug fit.

The bags containing the meat cuts were then hydrostatically evacuated, closed and shrunk by following exactly the same procedure as described above. The results of the tests appear in Table II below:

**TABLE II**

<table>
<thead>
<tr>
<th>Water bath (temp. ° F.)</th>
<th>Internal absolute pressure (inches Hg) in the bag after evacuation</th>
</tr>
</thead>
<tbody>
<tr>
<td>44.1</td>
<td>15</td>
</tr>
<tr>
<td>55</td>
<td>14</td>
</tr>
<tr>
<td>65</td>
<td>13</td>
</tr>
<tr>
<td>85</td>
<td>12</td>
</tr>
</tbody>
</table>

The bags tended to stiffen at temperatures above 50° F.

**EXAMPLE II**

Tests were carried out with commercially available bags made from polyvinylidene chloride film of various thicknesses. Eighteen primal beef short loin cuts as identical as possible in size and weight were placed in polyvinylidene chloride film bags 18 inches wide and 32 inches long. The only difference between the bags was the thickness of the films which was respectively 1.9 mils (Bags No. 1), 2.15 mils (Bags No. 2), and 1.5 mils (Bags No. 3). There were 6 bags of each film thickness. All the bags containing the meat cuts were hydrostatically evacuated and closed, following the procedure described in Example I and using water baths at various temperatures. In all the bags, the closing clip was positioned at a distance of 22 inches from the bottom seal of the bags. The internal absolute pressure in each bag was measured before shrinking the bags, following the procedure described in Example I.

The results of these tests are shown in Table III below:

**TABLE III**

<table>
<thead>
<tr>
<th>Bath water (temp. ° F.):</th>
<th>No. 1 bags</th>
<th>No. 2 bags</th>
<th>No. 3 bags</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>18</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>36</td>
<td>18</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>37</td>
<td>18</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>38</td>
<td>18</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>39</td>
<td>18</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>40</td>
<td>18</td>
<td>18</td>
<td>14</td>
</tr>
</tbody>
</table>

This example shows that hydrostatic evacuation according to the method of the invention may be satisfactorily
carried out with bags made from polyvinylidene chloride film of various thicknesses indicated by the same degree of effectiveness. It is advantageous to use heavier gauge film to protect the heavy primal cuts of beef.

**EXAMPLE III**

The following tests were made in order to illustrate the advantages of the method of the invention over conventional evacuation methods.

Several kinds of primal cuts of beef were placed in polyvinylidene chloride film bags 16 to 18 inches wide and 32 inches long. The bags were of a size between 15 and 30% larger than required to accommodate the beef cuts in a snug fit. Each film had a thickness of 1.9 mils.

A first set of these bags containing the meat cuts was evacuated according to the method of the invention by immersion in a water bath at 55°F for a time of 2 seconds at an immersion rate slightly below 1 foot per second, following the procedure described in Example I. The top portion of each evacuated bag was closed, below the surface of the bath, with a conventional metal clip. The closed bags were thereafter dipped into water at 195°F for 1 second and conventionally heat shrunk.

A second set of these bags, respectively containing the same meat cuts as the first set, was evacuated and shrunk simultaneously by immersion in a water bath at 195°F. The evacuated and shrunk bags were then closed in conventional manner.

The vacuum (in Hg absolute pressure) in the bags of the two sets was measured following the procedure described in Example I, with the exception that it was measured after the bags had been heat shrunk. The results appear in Table IV below:

<table>
<thead>
<tr>
<th>Experimental measurement</th>
<th>Initial internal bag pressure (inches Hg)</th>
<th>Excused trim (percent) after storage</th>
<th>Exposed meat color after storage allowing for rubloom</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Evacuated by the method of the invention</td>
<td>Conventionally evacuated with a vacuum nozzle</td>
<td>Evacuated by the method of the invention</td>
</tr>
<tr>
<td></td>
<td>Evacuated by the method of the invention</td>
<td>Conventional vacuum nozzle</td>
<td>Evacuated by the method of the invention</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>8</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td></td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Red/brown</td>
<td>Red/brown</td>
<td>Red/brown</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
<tr>
<td></td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
</tbody>
</table>

1. The weight percent of meat surface darkened during storage and which had to be trimmed off the meat cuts before they were sold to the consumer.

2. Rubloom takes place upon removal of the red meat cut from the oxygen-impermeable bag. When the beef is exposed to the oxygen in the air, oxymyoglobin is formed which gives the meat its red color.

As can be seen from the above results, the appearance of the meat cuts was substantially the same, irrespective of the method employed to evacuate the bags. It strikingly illustrates the advantage of speed achieved by the method of the invention, wherein the number of meat articles packaged per minute is at least 6 times greater than that of meat articles packaged by the conventional vacuum nozzle method.

**EXAMPLE IV**

Storage tests were effected with beef primal cuts packages in polyvinylidene chloride film bags according to the method of the invention and according to the conventional nozzle evacuation, respectively, followed by shrinking in hot water.

The meat cuts were beef top rounds and beef shoulder clods. The size of the cuts was kept as constant as possible. The beef top rounds were packaged in bags having a flat width of 18 inches, a length of 32 inches and of a size 15 to 20% larger than required to accommodate the cuts in a snug fit. The beef shoulder clods were packaged in bags having a flat width of 16 inches, a length of 32 inches and of a size 25 to 30% larger than required to accommodate the cuts. The meat cut packages produced according to the method of the invention were obtained following the procedure of Example I. The meat cut packages conventionally produced were obtained by the following procedure: the open end of each bag was connected to a vacuum nozzle for a time between 20 and 30 seconds. The bags were thereafter closed with conventional metal clips and then dipped into water at 195°F for about 2 seconds and shrunk.

The packages were then stored in a refrigerated room maintained at a temperature of from 30°F to 32°F and for periods of 1, 2 or 3 weeks, respectively, and the appearance of the meat cuts was observed. The results of the storage tests are shown in Table V below:

<table>
<thead>
<tr>
<th>Table V.</th>
<th>Primal beef cut</th>
<th>Stored 20-32°F</th>
<th>Beef shoulder clods</th>
<th>Stored 20-32°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial internal bag pressure (inches Hg)</td>
<td>9</td>
<td>11</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Excused trim (percent) after storage</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Exposed meat color after storage allowing for rubloom</td>
<td>Red/brown</td>
<td>Red</td>
<td>Red</td>
<td>Red</td>
</tr>
</tbody>
</table>

1. Evacuated according to the invention using hydrostatic pressure with water at 65°F. 2 sec. immersion followed by shrinking in water at 195°F.

2. Evacuated conventionally using hydrostatic pressure with water heated at 90°F. 6 sec. immersion.

In addition to having a vacuum level inferior to that of the bags evacuated according to the invention, the bags in the second set were not commercially acceptable because, in each instance, the meat was discolored and pockets of entrapped air appeared in all the bags. The air pockets were indicated by spot bridging of the film in the samples, i.e., portions of the films were stretched between protruding parts of the cuts. The immersion time of 5 seconds was selected in order to obtain maximum vacuum, by allowing the entrapped air to bleed from the air pockets.

**EXAMPLE V**

Two sets of four primal beef rib cuts of approximately the same size were placed in identical polyvinylidene chloride film bags having a length of 32 in. and a flat width of 18 in. The film had a thickness of 1.9 mil. The bags were of a size about 20% larger than required to accommodate the beef cuts in a snug fit. The air contained in the bags were evacuated by blowing streams of high velocity air from an air ring.

Each bag was progressively lowered through the central passage in the air ring at a rate of 600 feet per minute for the evacuation of the first, and at a velocity of 4000 feet per minute for the evacuation of the second set. The bags
were then closed and the vacuum in the closed bags was measured following the procedure of Example I. The internal absolute pressure in the closed bags was found to be between about 18 and 10 inches Hg, respectively.

Although the method of the invention has been particularly described with reference to the evacuation of plastic film bags containing red meat articles, it should be well understood that it may be used to evacuate plastic film bags containing red meat articles, it should be well understood that it may be used to evacuate plastic film bags containing other articles as well, such as other kinds of meat products and food articles and not even necessarily food articles, but all irregularly shaped, solid articles which have to be packaged in evacuated, flexible bags.

What is claimed is:

1. In a method for packaging an uncurled red meat article by providing a bag of shrinkable plastic film, said bag having an open mouth and being of a size slightly larger than is required to accommodate the article, placing said article in said bag, evacuating air contained in the bag, and closing the bag, the improvement which comprises:

   providing a bag of a size at least 10% larger than is required to accommodate the article,
   providing a fluid at a temperature above that at which the film stiffens but below that at which the film shrinks,
   progressively subjecting the bag containing the article, to a peripheral pressure exerted by the fluid, from the bottom of the bag up, while maintaining the open mouth of said bag in communication with the atmosphere,
   progressively collapsing the film against the article and expelling the air from said bag through said open mouth,
   the temperature of the fluid and the time of exposure of the bag to said fluid being such as to prevent detrimental changes to at least the surface of the meat.

2. A method claimed in claim 1, in which the fluid is maintained at a temperature between 40 F. and 100° F.

3. A method as claimed in claim 1, in which the bag containing the article is subjected to the fluid pressure for a time of at least 2 seconds.

4. A method as claimed in claim 1, in which the fluid is a stream of air at a velocity of more than 2000 feet per minute.

5. A method as claimed in claim 1, in which the closed bag is heat shrunk.

6. A method as claimed in claim 1, in which the shrinkable plastic film is impervious to oxygen.

7. A method as claimed in claim 1, in which the shrinkable plastic film is selected from the group consisting of a polyester and a vinylidene chloride polymer film.

8. A method as claimed in claim 1, in which the bag has a size up to 45% larger than is required to accommodate the article.

9. A method as claimed in claim 1, in which the fluid is a water bath, the bag containing the article is progressively immersed in the bath until the meat article is entirely below the surface of said bath, and the bag is closed before removing it from said bath to prevent ingress of air thereinto.

10. A method as claimed in claim 9, in which the water bath is maintained at a temperature of from 55° F. to 85° F.

11. A method as claimed in claim 9, in which the article is immersed in the bath for a time up to 5 seconds.

12. A method as claimed in claim 9, in which the bag is closed by clipping a top portion thereof under the surface of the bath.

13. A method as claimed in claim 12, in which the tied top portion of the bag is thereafter subjected to heat and shrink.

References Cited

UNITED STATES PATENTS

2,071,300 2/1937 Gammeter ------------------ 99—174
2,376,583 5/1945 Depoix ------------------ 99—174
2,830,909 4/1958 Hagen ------------------ 99—174
2,876,112 3/1959 Vail ------------------ 99—174
2,966,414 12/1960 Fuster ------------------ 99—174

FOREIGN PATENTS

498,923 12/1953 Canada ------------------ 99—174

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U.S. Cl. X.R.

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