May 2, 1944. G. E. GOTT ET AL 2,348,176

PACKAGING PROCESS

Filed Dec. 12, 1938 2 Sheets-Sheet 1

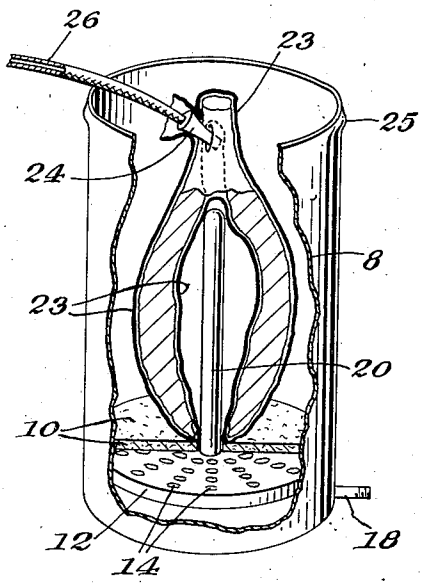


Fig. 3

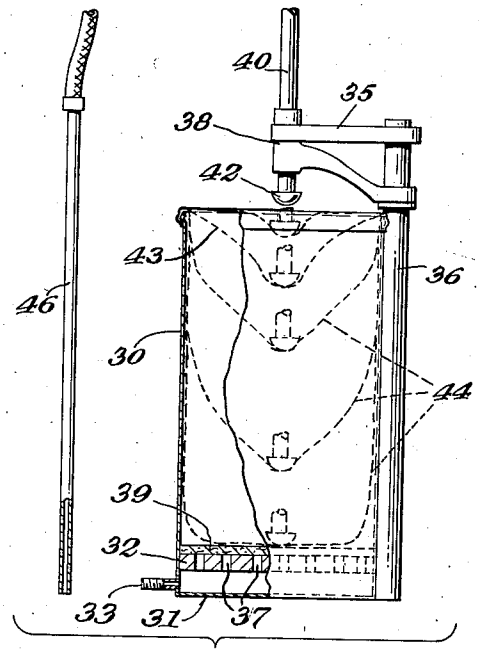


Fig. 4

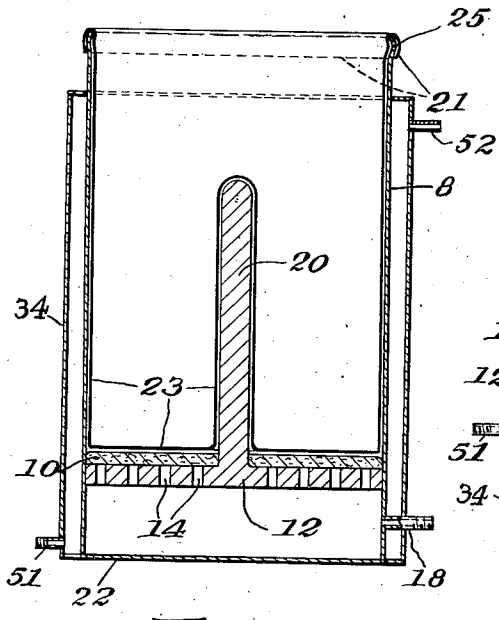


Fig. 1

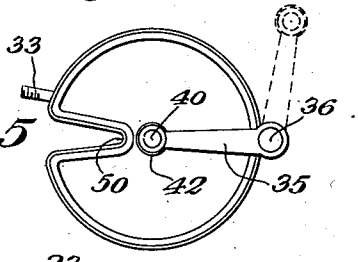


Fig. 5

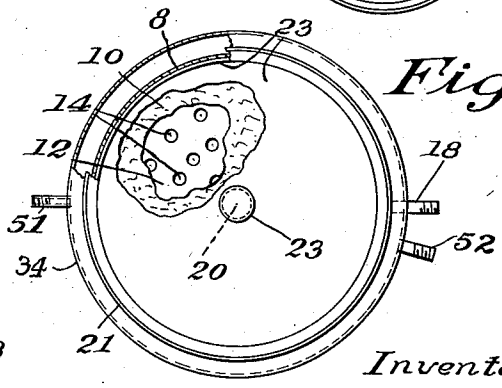


Fig. 2

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PACKAGING PROCESS

Filed Dec. 12, 1938 2 Sheets-Sheet 2

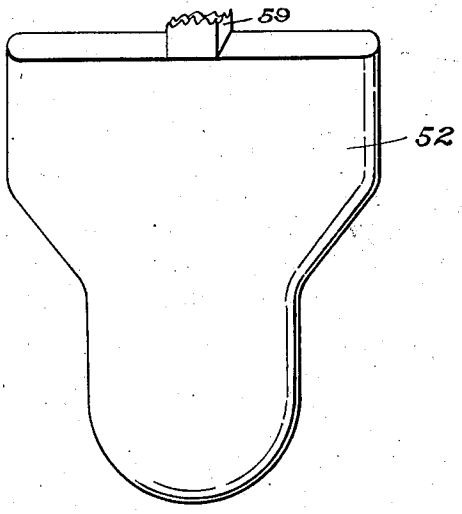


Fig. 6

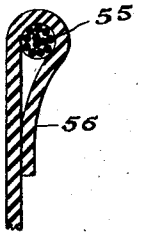


Fig. 10

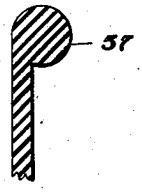


Fig. 9

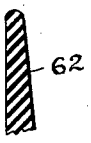


Fig. 8

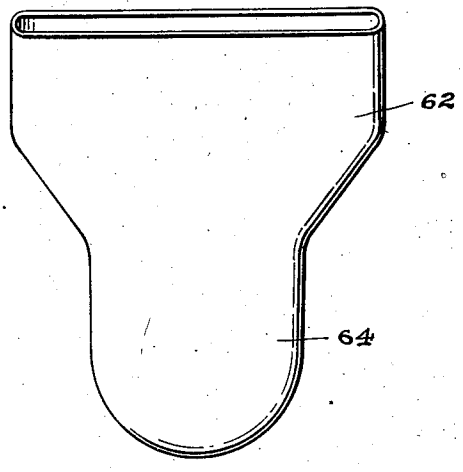


Fig. 7

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UNITED STATES PATENT OFFICE

2,348,176

PACKAGING PROCESS

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Application December 12, 1938, Serial No. 245,298

6 Claims. (Cl. 99—174)

The present invention relates to the packaging of materials—and particularly to the packaging in thin, flexible bags which prevent contamination during freezing and moisture loss during storage of such food products as must be refrigerated.

Although the process and apparatus of this invention are generally useful in applying such bags to all types of materials, they are particularly useful in applying them to meat carcasses and dressed meats which are to be preserved by freezing or by chilling. For convenience in description, therefore, and without implying any restriction upon the type of material which may be packaged by this invention, we shall describe both apparatus and process with reference to the preservation of meat.

The bags which have heretofore been proposed have been formed of such substances as vulcanized rubber, and analogous substances, vulcanized rubber fabric, and, more recently, unvulcanized rubber. After placing the meat in such a bag the air is exhausted from the interior of the bag and the bag hermetically sealed. Since the bag and meat are in intimate contact, little or no resistance to heat transfer is interposed and very quick freezing may be brought about by immersing the whole package in a freezing fluid or drenching it with a cold spray. The impermeable nature of the bag material permits the use of brines and such fluids which otherwise cannot be used in the direct freezing of meat.

Although it is possible to make rubber bags sufficiently large to protect a side of beef either by dipping on a full size form or by joining calendered sheets, this procedure has no economic significance. The rigid economies characteristic of the food distribution industry prohibit the use of bags made by such expensive procedures. Consequently, to permit the use of dipping forms of reasonable size, to utilize existing dipping equipment, and particularly to reduce the amount of rubber required for each bag, it has been proposed to form a relatively thick coat of deposited rubber upon a small dipping form and after drying the rubber, inflate the bag, stretching all dimensions and thinning its walls to such an extent that the membrane which ultimately covers the meat is but from .002" to .003" thick. Experience has shown that such thin films of rubber are amply thick to protect the meat properly and to withstand all normal handling provided that they are not under substantial tension when finally in place.

Because rubber after stress has the ability to return to a size approximating its original, unstressed dimensions, it has been found necessary to inflate the bag to a size several times that of the cut of meat to be enclosed so that when the stress is released the bag will have dimensions which are approximately those of the meat to be enclosed. This procedure is referred to as super-inflation.

Otherwise, the bag will be under too great tensional stress after it is applied to the meat and may split or tear. In other words, to enclose any given cut of meat, a larger dipping form and more rubber would have to be used if this step of super-inflation were not interposed. Although its advantages are obvious, super-inflation of the bags is an unwieldy industrial procedure.

We have discovered that these difficulties can be overcome by fixing the size of the bag either during expansion or contraction at about the right dimensions, and, that this can be accomplished by chilling the bag and thus overcoming the contractile forces.

A further peculiarity of rubber-like masses makes the process even more difficult to handle. When fluid pressure is applied against a sheet of rubber, the sheet starts to stretch outwardly at its weakest point. The entire remaining surface stays immobile and unstretched, but the outward movement continues in the area of greatest weakness until the rubber in this limited area alone reaches, approximately, its limit of extensibility. Thereafter, expansion continues and the strain spreads progressively across the whole surface by the process of borrowing rubber progressively from the adjacent unstressed area.

It is evident, therefore, that it is impossible to give a bag as a whole a definite permanent set unless the whole bag has been stressed approximately to its limit of extensibility. Reaching this limit without exceeding it and bursting the bag is a delicate operation and one which is ill adapted for quantity production.

A principal object of the present invention is to provide a process and apparatus for producing expanded bags of rubber material which are uniformly stretched to less than the maximum extensibility of the rubber; to provide a process and apparatus which avoids the necessity for expanding the bag greatly beyond the size finally desired, and which permits the use of bags of an initial size much smaller than the meat and smaller than heretofore has been possible.

A further object of the invention is to devise a process of enclosing large meat cuts or carcasses in thin, flexible bags which will result in bags which are not under substantial stress after they have been applied. A further object of the invention is to provide a process and apparatus for expeditiously applying stretchable, flexible bags to meat cuts or carcasses or other food products. A further object of the invention is to provide a bag suitable for use with the process and apparatus of the invention and which will minimize the danger of bursting the bag during application. Other objects of the invention will

become apparent from the following specification and from the annexed drawings forming a part thereof, in which

Figure 1 is a vertical section;

Figure 2 is a plan view;

Figure 3 is a perspective view partly broken away of the apparatus of this invention;

Figure 4 is an elevation of a modified apparatus;

Figure 5 is a plan view of a further modified apparatus;

Figure 6 is a perspective view of a dipping form suitable for forming the bags of this invention by dipping;

Figure 7 is a perspective view of a bag of this invention;

Figure 8 is a sectional view of a bag of this invention;

Figure 9 is a sectional view of a modified bag; and

Figure 10 is a sectional view of a further modified bag.

The apparatus will be specifically described later, but in general terms, we secure the first objects of our invention and may use a minimum weight of rubber and minimum size of form without need of super-inflation or the necessity of reaching the limit of extensibility of the bag by expanding the bag into a chamber or container just large enough to receive the largest cut of meat of the kind to be packaged. Thus, a safe limit to expansion is imposed on the bag and maximum extension in the weakest area is avoided, for whenever such an expanding area touches the walls of the chamber not only is all outward movement stopped by the wall, but the friction is sufficient to prevent any thinning down or sliding of the rubber mass. Other areas of the bag then begin to expand.

In this way the dimensions of the bag are fixed and are held while the meat is being inserted therein. The most convenient method of expanding the bag is to exhaust the air between the walls of the container and the bag and maintain a lowered pressure upon the outside wall of the bag until the meat has been properly placed.

This phase of the invention prevents overexpansion of the bag and permits the foodstuff to be placed therein easily and without danger of tearing or puncturing the bag, for the container backs the bag and securely reinforces it during this operation. In many cases, however, it will be found that the bag is under too great tension as it covers the foodstuff and particularly in the case of meat cuts, bones may ultimately puncture the shrunken bag. We have discovered that if the bag is chilled at about the time it is expanded, the contractile force which at normal temperatures causes the bag to return towards its unstretched condition will be checked. For example: A bag made of our preferred material, one type of unvulcanized rubber, which is initially 11 inches long, when stretched to a length of 42 inches will, at room temperature, return to a length of about 17 inches. At 35° F. it will return to about 34 inches and at 15° F. it will scarcely return at all.

Remembering that during refrigeration the meat or foodstuff is to be maintained well below 50° F., it can be seen that at no time thereafter will rubber which has been applied to meat in a cold condition return to such a degree that it will be under too great stress.

Bags of any material which is flexible and stretchable may be used in our process. The most satisfactory materials for this purpose known to use at the present time are either pure or a modified unvulcanized rubber.

The apparatus of Figures 1, 2 and 3 comprises essentially a hollow cylindrical chamber open at its upper end formed from a side wall 8 and a bottom wall 22, and adapted to have the neck of the bag 23 to be applied snapped over the rim and turned down on the outside at 24 to form an air tight seal between the bag and chamber.

The rim of the chamber is preferably provided with a bead 25 to facilitate engagement of the necks of the bags with the rim. Any construction or arrangement which will keep the neck of the bag from pulling from the edge of the chamber may be used, for example, the bead may be covered with a coating of rubber. An exhaust connection 16 is provided in the side wall 8 near the bottom of the chamber through which the air trapped between the bag and the chamber may be drawn off to expand the bag. In order that the bag may be expanded fully to the shape desired without its pressing against the exhaust opening and closing it off, or being drawn into the exhaust opening and overstretched or ruptured at this point, an air permeable partition is provided in the chamber above the exhaust opening. This partition is formed from a block 12, of wood or other suitable material, having perforations 14 extending through it from top to bottom over substantially the entire area of its upper surface and a layer 10 of felt or other similar air permeable material overlying the block to form a suitable surface for receiving the bottom of the bag as it reaches fully expanded position. The partition may be vertically adjustable within the casing to adapt the apparatus to use with articles of different lengths, if desired.

When bags which have not been previously inflated are expanded by the lowered pressure within the casing, they begin to stretch at the weakest point. If the weakest point is on the side of the bag this action causes the bottom of the bag to be pushed against the wall of the casing where it is held by friction causing the bag to be inflated unequally, or, in extreme cases, to burst. It is desirable to provide means for preventing any such unequal expansion. It is also desirable, if the article to be packaged is generally hollow, such as is the case with dressed carcasses from which the viscera have been removed, to provide means for tucking a part of the bag inside the article so that the bag in finally applied position may cover the inside surfaces of the article without being overstretched in this area. In the apparatus of Figures 1, 2 and 3, both of these results are accomplished by a pin or projection 20 attached to the partition and extending throughout most of the length of the chamber. This pin should be of a size and shape appropriate to the article to be packaged. The pin 20 shown in Figures 1, 2 and 3, is suitable for use in packaging drawn fowl. The pin may have other shapes than that shown depending upon the shape of the cavity in the article to be packaged and should be located in the apparatus at the point toward which it is most convenient to have the cavity face while the bag is being applied.

The apparatus of Figures 4 and 5 is designed for use in packaging large meat cuts and is gen-

erally similar to that of Figures 1, 2 and 3 except that the pin is omitted and a different means for preventing uneven expansion of the bag is employed. The chamber is formed by a cylindrical side wall 30 and a bottom wall 31 and contains an exhaust connection 33 near the bottom of the side wall. The partition is similar to the partition of Figures 1, 2 and 3, and consists of a wooden block 32 having perforations 37 and a felt mat 39 overlying the block. To prevent unequal expansion of the bag, means for guiding the bag as it expands is provided comprising a plunger 40 having an enlarged lower end 42 and supported for free vertical movement along the axis of the casing. The bearing 38 for the plunger may be supported from the ceiling or wall of the room in which the apparatus is located but is preferably supported on some part of the apparatus to form a self-contained unit. In the embodiment selected for illustration, the plunger bearing is supported on a vertical standard 36, attached to the side of the side wall 30, by means of bracket 35. The bracket is rotatable on the standard to permit swinging of the bracket and plunger to one side when an article to be packaged is to be introduced into the chamber.

Generally, it is not practicable or desirable to give the chamber the exact shape of the article to be packaged. When the article is a dressed lamb, which is hollow and has an opening extending along substantially the entire length of one side, it is desirable to provide a chamber shaped, as shown in Figure 5, to extend partially within the animal and shape the bag to conform roughly to both its inside and its outside surfaces. Thus, the casing of Figure 5 is shaped to provide an inwardly extending projection 50 of a length sufficient to bring a part of the bag well within the animal.

In packaging meats, we prefer to carry out the packaging operations at temperatures in the neighborhood of 30–35° F. in order to gain the advantage of the maximum low temperature effect on the material of the bag without incurring the danger of any slow freezing of the meat. However, it is within our invention to use such higher or lower temperatures as may be indicated by the particular circumstances. For chilling the bag, cold may be obtained from the atmosphere of the room or from the walls of the apparatus or from the article itself. If the material or article to be packaged is not susceptible to damage by slow freezing, it is preferable to use lower temperatures, for example, in the neighborhood of 15° F. so that the bags need be stretched only slightly beyond their final size.

If the process is to be carried out at normal room temperature, the chamber may be cooled by enclosing it in a jacket 34, Figure 1, through which a cooling medium may be circulated. This jacketed apparatus may also be used when the operation is carried out in a cooled room.

The temperature of the chamber walls should be adjusted in accordance with the temperature of the room in which the apparatus is used. At higher room temperatures more heat must be extracted from the bags to bring them to the desired temperature and the temperature of the chamber must be appropriately lower.

In using the apparatus of Figures 1, 2 and 3 to package a chicken or other small fowl, a bag is inserted within the chamber with its neck end upwardly and the neck stretched to the size of the chamber opening and snapped about the upper end of the side wall and turned down on the outside to form a tight seal between the bag and the inside of the chamber. A sufficient vacuum (often about 3" to 8" of mercury) is then drawn within the chamber through exhaust connection 18 to expand the bag downwardly and outwardly against the side wall and bottom of the chamber and about the pin 20. If the center of the bottom of the bag is placed on top of the pin 20 before the bag is expanded, it will expand uniformly in all directions and will not be over-stretched as some one point as would be apt to be the case were it permitted to expand without any guidance. The fowl may now be placed within the bag, neck end upwardly so as to insert the pin 20 together with the part of the bag overlying it into the body cavity of the fowl, as illustrated in Figure 3.

In order to insure covering of the inside surface of the article with the bag, it is preferable to begin the evacuation of the interior of the bag by first exhausting air from within the article. Accordingly, an evacuating nozzle 24 connected to a suitable source of vacuum (often in the neighborhood of 25" of mercury) is inserted within the slit in the neck of the fowl and the bag unsnapped from the casing and gathered tightly about the nozzle. As the air is withdrawn from the inside of the fowl, the part of the bag overlying pin 20 on the inside of the fowl is drawn tightly into intimate contact with the inside surface of the fowl. As the exhausting operation proceeds, the bag collapses about the fowl and is drawn tightly into engagement with most of its exposed surfaces. The neck of the bag may now be twisted between the evacuating nozzle and the fowl, sealed in any convenient manner, and the nozzle removed.

In carrying out our process with the apparatus of Figure 4, substantially the same procedure is followed as with the apparatus of Figures 1, 2 and 3. After the bag 43 has been applied to the upper edge of the chamber, the plunger 40 is swung into position above the bag and allowed to slide downwardly until its lower end rests upon the middle of the bottom of the bag. A sufficient vacuum is then drawn in the chamber to cause the bag to begin to expand. Since the rubber adjacent the neck of the bag is stretched somewhat when the neck is placed over the rim of the chamber wall, expansion of the bag will begin in this area. After the upper part of the bag has expanded into contact with the chamber wall, it is held by friction against further stretching and further expansion of the bag occurs by stretching of the material just below that in contact with the wall.

The bag thus expands progressively downwardly through the successive positions indicated by dotted lines 44. During the expansion the plunger rests under its own weight upon the middle of the bottom of the bag and serves to keep this point on the vertical axis of the chamber as expansion proceeds, and thus to prevent the bottom of the bag from being pushed against the wall and held there by friction should the rubber stretch more rapidly on one side than on the other. This same result may be accomplished without the use of a plunger or other mechanical guiding means by pressing the bottom of the bag downwardly and along the axis of the chamber by hand as the vacuum is applied.

When the bag has been fully expanded, the plunger is drawn upwardly and swung aside to permit introduction of the article into the bag and casing. The article, such as a hind quarter

of beef, is moved into position above the apparatus and lowered into the bag.

A thin tubular evacuating nozzle 46 of a length slightly greater than the depth of the chamber may then be introduced into the bag between the bag wall and the article with its open lower end adjacent the bottom of the bag and the neck of the bag unsnapped from the rim of the chamber wall and gathered tightly against the nozzle and the support for the meat cut if one is used. The air is withdrawn first from the bottom of the bag, and as evacuation proceeds the nozzle is drawn upwardly, assuring that the air will be effectively removed from all parts of the envelope. After the air has been removed, the nozzle is withdrawn completely and the neck of the bag hermetically sealed, as by twisting and securing with a wrapping or clip.

An evacuating nozzle of the type shown by numeral 24 and described in connection with the apparatus of Figures 1, 2 and 3 may be used with the apparatus of Figures 4 and 5 instead of the nozzle 46 if desired, and, it is at present preferred to use a nozzle of this type.

If it is more convenient, the neck of the bag may be sealed before the air is withdrawn and the exhaustion effected through a tube provided on the bag for this purpose by cutting off the end of the tube and inserting the nozzle through the opening thus formed. In this case, the article and covering is removed from the apparatus before the exhausting operation is carried out.

Although a simple cylindrical bag may be used in our process, we prefer to use a bag shaped substantially as shown in Figure 7. These bags are formed to provide a body portion 64 having a cylindrical side wall and a rounded spherical bottom. The side wall is flared upwardly at its upper end to provide an enlarged neck portion 62. When bags of this shape are applied to the apparatus the neck portion 62 is less highly stretched, because of its larger original size, and the bag is less apt to expand in such a way that the bottom is pressed against the wall of the chamber causing the bag to be non-uniformly inflated or to burst. A form suitable for dipping bags of this shape is illustrated in Figure 6. This form consists of a body portion 52 and an extension 59 for supporting the form from a dipping frame. If desired a small pin may be formed on or inserted in the form body to form an exacuating tube on the bag.

While the bags having uniform thickness are satisfactory under most conditions, it has also been found that for small bags it is desirable to have the open end thinner than the closed end and the stock increasing in thickness in this direction as is indicated in Figure 8.

For bags which are to be subjected to particularly rough treatment, as is the case of those to be used on large pieces of meat such as quarters or sides of beef, it is desirable to have the open end of the bag strengthened by a bead which may be either cast in place, as indicated at 57 in Figure 9, or formed by enclosing an elastic band 55 within a turned down cemented hem 56 as shown in Figure 10. Such bags may be stretched by strong workmen without rupture and also tend to adhere more securely to the open end of the container.

We have further discovered and found that the bags after their removal from the meat may be reused merely by heating the bag to such an extent that it returns approximately to its original dimensions. The heating step may be combined with the step of washing the bag. Such contracted bags, even after long use on meat, may be brought approximately into the original condition of a newly manufactured article by this heat treatment.

By following the procedures taught in the foregoing specification and if the dimensions of the bag and apparatus are properly correlated and adapted to the size of the article and the temperature properly adjusted, bags may be expanded, foodstuffs inserted and the package completed and made ready for freezing with a minimum of labor and time, which in the case of small articles such as hams or fowl is now as short as twenty seconds.

We claim as our invention:

1. The process of packaging a food product which comprises expanding an impervious, flexible and stretchable bag, of material which loses its contractibility on chilling, to a size larger than the product, cooling the expanded bag, placing the product in the bag, collapsing the expanded bag on the product, and sealing the bag hermetically.

2. The process of packaging which comprises stretching a flexible and stretchable bag made of material which loses its contractiblity on chilling into contact with a cold surface by lowering the fluid pressure between the bag and surface and placing the material to be packaged in the bag while the bag is in contact with the cold surface.

3. The method of packaging foodstuffs which comprises expanding a bag of flexible and stretchable material which loses its contractibility on chilling, fixing the bag at an expanded size by chilling it and placing the foodstuff in the bag while so fixed.

4. Method of packaging dressed carcasses which comprises expanding an impervious, flexible and stretchable bag by lowering the fluid pressure on its outside below that on its inside, placing the carcass in the bag, conforming the bag approximately to the shape of the carcass by lowering the fluid pressure within the inside of the carcass to draw the bag tightly against the inside surfaces of the carcass, exhausting the remainder of fluid from the bag and hermetically sealing the bag.

5. The process of packaging food products which comprises expanding a bag of unvulcanized rubber to a size larger than the product by lowering the pressure on its outside, fixing the size of the expanded bag by chilling it, inserting the product within the bag, restoring normal pressure to the outside of the bag and sealing the bag hermetically.

6. The process of packaging food products which comprises expanding the neck portion of a flexible and stretchable bag made of a material which on chilling loses its ability to contract into contact with a cold surface, expanding the remainder of the bag into contact with the cold surface progressively from the neck end toward the closed end, placing a food product within the bag while the bag is in contact with the cold surface, sealing the bag hermetically and storing the packaged food product.

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