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METHOD OF PACKAGING

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This invention relates to packaging. More particularly
it relates to a method of producing skin tight coverings
on items packaged therein.

Various thermoplastic films are used extensively for
wrapping and packaging. In the protective packaging of
foods particularly poultry, meats, and meat food products
for frozen storage or storage under refrigerating condi-
tions the covering must be skin tight so that there will
be substantially no pockets of entrapped air between the
covering and the surface of the packaged item.

Bags made of films of unvulcanized rubber and certain
types of Saran provide tight coverings on items inserted
therein. In use the item was inserted in the bag and
after the open end had been sealed the package was
subjected to a temperature of 100° C. or lower as by
immersion in boiling water for a short interval of time.

The aforementioned materials become brittle at the
temperatures required for storage under refrigerating
conditions or frozen storage and frequently split with the
consequence that the desired results were not obtained
during the life of the package.

Polyethylene film because of its chemical and physical
properties is extensively used for wrapping and packag-
ing. Because of its excellent low temperature durability
it is admirably suited as a protective packaging material
for foods such as poultry, meat, and meat food products
for frozen storage or storage under refrigerating condi-
tion. However, in general, polyethylene film exhibits
little or no shrinkage when subjected suddenly to boiling
water. Recently there has been produced a polyethylene
film which does shrink when suddenly subjected to heat
at 100° C. but for some applications a greater shrinkage
is desired.

An object of this invention is to provide a new and
novel method of shrinking polyethylene film.

Another object of this invention is to utilize the afore-
mentioned method in producing protective skin tight
coverings.

Other and additional objects will become apparent here-
inafter.

The invention is based on the surprising discovery
that polyethylene film which does not shrink when sud-
denly subjected to a temperature of not over 100° C.
will shrink when suddenly subjected to a temperature
of over 100° C. and also that polyethylene film which
shrinks when suddenly subjected to a temperature of
not over 100° C. will shrink to a greater extent when sud-
denly subjected to a temperature of over 100° C. In
both cases, very little, if any, wrinkling of the film is
obtained.

The objects of the inventions are accomplished in
general by inserting the item to be packaged in a poly-
ethylene bag and after closing the open end suddenly
subjecting the package to a temperature above 100° C.
but below the melting point of the polyethylene, where-
upon the bag will shrink and intimately conform to the
surface of the item. In the preferred embodiment before
the open end of the bag is closed the interior of the bag

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is evacuated. The period of time during which the bag
is subjected to the shrinking temperature is relatively
small. In general, the heat can be applied for a period
of 5 to 10 seconds. However, satisfactory results have
been obtained by applying the heat for 2 to 3 seconds.
The temperature to which the bag is subjected for ob-
taining shrinkage is above 100° C. and below the melt-
ing point of the polyethylene. The preferred temperature
is approximately eight degrees (C.) below that at which
the film will lose its birefringence when observed be-
tween crossed Nichol prisms on a hot stage microscope
and can be determined empirically whenever desirable
or necessary.

Any appropriate means or method for providing the
desired temperature at which the shrinkage of the bag
is to be effected can be used. The desired temperature
can be obtained through the use of heated air, steam,
convection heating, etc. In the preferred embodiment
the shrinkage is obtained by suddenly submerging the
film in a liquid medium at the desired temperature. Any
liquid medium which does not deleteriously affect the
film constituting the bag and can be heated and main-
tained at the desired shrinking temperature can be used.
The liquid medium can be a heat liquified solid, a pure
liquid, or a solution which can be maintained at the de-
sired shrinking temperature. In general, an aqueous solu-
tion having a boiling point at or above the temperature
at which the shrinking is to be effected is preferred. When
the contents of the package is a foodstuff, the liquid
medium should also be non-toxic. Hereafter are illus-
trative liquid media and the temperatures at which they
were employed for shrinking polyethylene film in accord-
ance with this invention:

Liquid Medium:	Temp. ° C.
Saturated aqueous NaCl soln. ----- (B.P.)	108
Saturated aqueous NaCl soln. -----	105
95% corn syrup, 5% water ----- (B.P.)	104
80% glycerin, 20% water -----	105
60% glycerin, 40% water -----	105
Sat. aqueous sodium acetate soln. -----	105
Tetraethylene glycol -----	105

In order to more clearly show the results obtained by
this invention, there is hereafter set out the percentage
shrinkage of various polyethylene films when subjected
to the temperatures set out.

Polyethylene Film	Thickness (Mils)	Percent Shrinkage at—					
		99–100° C.		105° C.		108° C.	
		MD	TD	MD	TD	MD	RD
A-----	2.0	41	18	50	30	54	31
B-----	2.0	35	23	44	33	46	34
C-----	2.0	35	25	46	32	45	31
D-----	1.9	0	3	25	22	50	53
E-----	2.0	0	0	11	8	58	50
F-----	2.0	50	10	—	—	50	60
G-----	1.8	0	3	—	—	50	50
H-----	2.2	28	29	—	—	48	43
I-----	2.2	21	27	—	—	37	39

MD means machine direction.
TD means transverse direction.
— No measurement.

The following method is used to determine shrinkage:
A sample of film is cut to a size of 4½ inches by ½
inch, with the greater dimension being parallel to the
direction of extrusion. A weight of 0.5–1.0 grams is
clipped to one end of the sample, and the sample is
marked at a position 4 inches from the free end. The
sample is then held briefly by the free end, so that the
weighted lower end is about 6 inches above the surface
of a well-stirred liquid bath at the temperature in ques-

tion, and allowed to fall freely. A screen about 6 inches below the surface of the hot liquid provides a convenient method of recovering the sample, which should remain submerged for 5 seconds. The percentage of shrink in the machine direction is then determined by measuring the distance between the mark and the free end of the sample.

The test is repeated with a similar sample cut parallel to the transverse direction, in order to determine transverse shrinkage. Expansion is considered to be negative shrinkage for numerical convenience.

The shrinkable bag contemplated by this invention can be made by appropriately sealing one open end of seamless or seamed thin walled tubing with or without gussets as desired. Polyethylene tubing having a wall thickness within the range of .0005 to .0040 inch or more and preferably within the range of 0.0018 to 0.0022 inch has been used. In the preferred embodiment bags made of seamless polyethylene tubing produced by the method disclosed in my copending application Serial No. 486,263 filed February 4, 1955 are used.

The dimensions of the bags are such as will permit quick and ready insertion of the item to be packaged therein and upon shrinking will intimately conform to the item and form a protective skin tight covering with very little if any wrinkling.

The invention is admirably suited for the packaging of eviscerated poultry such as turkeys, chickens, ducks, geese, pheasant, etc. for frozen storage as well as meat food items such as whole meat loaves, smoked butts, whole pieces of sausage, whole cooked hams, smoked picnics (shoulder hams), bone-in and boneless smoked hams, sliced luncheon meats, sliced ham, sliced bacon, sliced sausage, whole slices or wedges of cheese, whole meat carcasses, fresh meat cuts such as chops, steaks, etc. for storage under refrigerating conditions.

In carrying out the method the selected item is inserted in a polyethylene bag of appropriate size and the interior of the package is evacuated in any appropriate manner. The open end is then sealed and the package subjected suddenly to heat at a temperature of over 100° C. for a relatively short interval of time such as for example by suddenly submerging in a liquid medium at a temperature of 102°-108° C. or more for 2 to 3 seconds whereupon the bag will shrink and intimately conform to the surface of the item and form a protective covering substantially free of wrinkles. When the item is for frozen storage the package including the shrunk bag is exposed to an operation wherein the item is quick frozen and thereafter stored under conditions to maintain the item in the frozen state. If the item is one which is to be stored under refrigerating conditions, the package after shrinking of the bag is placed in a cooler at the appropriate temperature. In the event that the solution is one from which substances will precipitate or crystallize on cooling or evaporation, prior to storage the exterior surface of the package is washed with water at room temperature. After shrinking the bag will retain its clinging shape and protective form under a wide range of temperature. It will not become brittle nor will it split upon ordinary handling within the aforementioned temperature range.

The principles of this invention are not restricted to bags made of polyethylene. They are also applicable to bags made of other thermoplastic films such as Pliofilm,

Saran, polymer modified vinyl copolymers, polymer or liquid plasticized polyvinyl chloride, polyethylene terephthalate ("Mylar"), etc. which exhibits little or no shrinkage upon sudden exposure to temperatures at or below 100° C. or to obtain a greater shrinkage than obtained upon sudden exposure to temperatures at or below 100° C. In general the thickness of these films may be within the range of 0.0005 inch to 0.0040 inch or more.

Since it is obvious that various changes and modifications can be made in the above description without departing from the nature and spirit thereof, this invention is not restricted thereto except as set forth in the appended claims.

I claim:

1. In a method of providing a protective skin tight covering the steps which comprise inserting the item to be packaged in a bag formed of polyethylene film and suddenly subjecting the package to a temperature of more than 100° C. and less than the melting point of the polyethylene constituting the film for a short interval of time.

2. In a method as set forth in claim 1 wherein the temperature to which the package is subjected is approximately eight degrees lower than that at which the film will lose its birefringence when observed under crossed Nichol prisms on a hot stage microscope.

3. In a method as set forth in claim 1 wherein the package is suddenly submerged in a liquid medium at a temperature above 100° C. and below the softening point of the resin.

4. In a method as set forth in claim 1 wherein the package is suddenly submerged in a liquid at a temperature which is approximately 8 degrees (C.) lower than that at which it will lose its birefringence when observed under crossed Nichol prisms on a hot stage microscope.

5. In a method as set forth in claim 1 wherein the package is submerged suddenly in a saturated aqueous sodium chloride solution at a temperature of 105° to 108° C.

6. In a method as set forth in claim 1 wherein the package is submerged suddenly in an aqueous glycerine solution containing 60% to 80% glycerine and correspondingly 40% to 20% water, the proportions being by volume.

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Dedication

2,890,552.—*William Ernest Henderson*, Lockport, Ill. METHOD OF PACK-AGING. Patent dated June 16, 1959. Dedication filed May 24, 1971, by the assignee, *Union Carbide Corporation*.

Hereby dedicates to the People of the U.S. the remaining term of said patent.

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