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CONTAINER

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8 Claims. (Cl. 99—178)

This invention relates to a container for packaging hot flowable materials which, when cooled, become solid or semi-solid.

Our container is provided throughout the interior surface thereof with a continuous, flexible, thermoplastic coating which serves to protect materials, such as foods, packaged therein against moisture loss, mold growth or other undesirable deterioration. Our container may be formed from any suitable sheet materials which are coated with a composition, prepared from suitably selected ingredients, so as to have predetermined characteristics that will be explained more fully hereinafter. Our coating is of such character that it will remain intact and substantially unchanged from its original condition after the molten material has been poured and congealed in our container.

The coated sheet materials are fabricated into any suitable type of container construction, such as bags, tubes, cans, cartons and the like, so as to present throughout the interior thereof a continuous coating against which the molten material is poured. When the container is made of flexible sheet materials, it is desirable to support the container in a rigid receptacle having a complementary contour, so as to support the walls of the container during filling and packaging operations, thereby preventing distortion or bulging of the container walls in the finished package. After the hot molten material is poured into the receptacle, the open end may be hermetically sealed in any suitable manner, such as by heat-sealing the overlapped margins, or by bringing together suitable portions of the container wall with the coating in face to face contact and then sealing such portions under heat and/or pressure.

Our container is adapted particularly for packaging hot molten foods, which, when cooled, congeal to a solid or semi-solid condition, including process cheese, jellied foods, such as souse, mock chicken, tongue, pork loaf, head cheese, bullion, consommé, fruits and vegetables, jams, preserves, chili con carne. We may also package in our container, soaps, cold creams, and similar materials.

In order to produce a successful package using our container, say for packaging process cheese for which it is particularly adapted, it is important to utilize a suitably selected sheet material provided with a coating having predetermined characteristics, particularly with respect to heat-sealability, flexibility, moistureproofness, adherence to base sheet, freedom from blocking, freedom from taste and odor, and adapted to remain substantially intact and unimpaired when hot molten materials are poured into contact therewith and then congealed.

The type of base sheet used is of importance in making successful packages with our con-

tainer, particularly for perishable products such as process cheese. By "base sheet" we mean the sheet material, such as paper, fiberboard, foil and films, to which our coating is applied. This sheet material should have good strength and flexibility, waterproofness, freedom from taste and odor and, preferably gasproofness and transparency. The sheet material should not be affected by the coating or by the substances packaged. Either a porous sheet, such as bond paper, or a dense sheet, such as Cellophane (regenerated cellulose) or glassine, may be used. In using porous sheets, the pores should be filled with some substance, such as wax, in order to prevent absorption of the coating composition either when applied or when remelted during heat-sealing; also to reduce the tendency for mold to develop on the package. Adhesion of the coating is usually better with the porous, fibrous type of sheets. Other properties such as strength, flexibility, resistance to abrasion, gasproofness and transparency are usually better with a dense type of sheet, such as Cellophane. Waterproof sheets are preferred, because they serve to prevent our coating, applied to such sheets, from separating therefrom if condensation of moisture should occur on the outer surface of the package. It is particularly undesirable that such separation should occur in process cheese packages which may be kept at temperatures ranging from 30° F. to 110° F. and relative humidities ranging from about 20 to about 100%. If a cold cheese package is taken from a refrigerator and allowed to stand in a humid room, moisture is likely to condense on the outer surface of the container, and if the base sheet is not waterproof, the coating may separate therefrom and adhere to the cheese when the sheet is removed. If the coating is not of the self-sustaining film type, it will be difficult to remove the coating from the cheese. We therefore prefer to use a waterproof base sheet for making our container.

In order to produce successful packages, we have also discovered, after considerable experimentation, that the coating composition should have certain critical characteristics which have been ignored until now and not fully understood. The most significant of these properties is needle penetration, which is measured by A. S. T. M. method D5-25. This test measures the hardness of a material and records in $\frac{1}{10}$ millimeters the depth of penetration of a standard needle under certain prescribed conditions of time, temperatures and weight on the needle. The softer a composition, the greater will be the penetration of the needle.

If the coating composition used, say, on sheet materials for making cheese containers, is softer than the maximum critical penetration limit, then difficulty may be experienced in cutting and

handling the blanks; they may block (i. e., stick together) under warm storage conditions, and they may produce poor heat-seals when formed into containers. If the composition is harder than the minimum critical penetration limit, difficulty may be experienced in handling and using the blanks at low temperatures, since the flexibility may be such that the coating will crack when flexed and will separate from the base sheet. Furthermore, the adhesion of the coating to the base sheet may be poor, so that when the sheet material is removed from the cheese, the base sheet will separate readily from the coating, leaving the coating adhered to the cheese.

We have found that our coating composition will be hard enough to avoid objectionable blocking and sticking if its needle penetration at 77° F. does not exceed 60. Our coating within the specified penetration values also will not become soft and cause difficulty at elevated operating temperatures by sticking to machine parts which may contact the coating during the container forming or packaging operations. Likewise, the coating will be soft enough to give the required flexibility and adhesion to the base sheet if its needle penetration at 45° F. is not less than 10. These maximum and minimum penetration limits are specified at the different temperatures at which the characteristics mentioned will come into play as critical for our purposes. In accordance with our invention it is possible to compound a variety of coating compositions, all of which will give satisfactory performance, providing the needle penetration values fall within the above specified limits.

It is important to prevent undesirable flow of the coating on the base sheet when molten materials, such as process cheese, are poured against it, otherwise the continuity and smoothness of the coating will be impaired, which may result in loss of moistureproofness and likelihood of mold growth. With coating compositions which melt to give low-viscosity liquids, the melting point of the coating must be above the maximum temperature it will attain through contact with the hot material. With compositions containing wax and modifiers, which melt to viscous liquids, somewhat higher temperatures than the melting point of the unmodified wax can be tolerated, because this increased viscosity produced by the modifier, prevents undesirable flow of the coating. Any coating complying with the aforementioned qualifications will therefore remain substantially intact and unimpaired when hot molten material is placed in contact therewith and then congealed.

It is also important that a coating be used which will form seals readily with heat and/or pressure without flowing away from the sealed area. The coating should provide good strong seals that will not separate readily when containers are formed from the coated sheet material or when the package is handled under usual conditions. The seals should be airtight to prevent mold growth, access of air to the contents of the package, or undesirable loss of moisture. The coating should have the penetration values previously discussed in order to produce seals of the required strength and adhesiveness.

Suitable coatings for our containers may be made from a selected microcrystalline wax, blended microcrystalline waxes, or microcrystalline wax, suitably modified by the addition of selected ingredients, so that the coating composition will in each case have the critical penetration and

other characteristics previously discussed. Microcrystalline waxes are generally found in high boiling or residual fractions of petroleum oils. The waxes are commonly removed by centrifuging with solvents or by cold-settling from solvents, or they may be filtered out in the presence of well-known solvents. These waxes may be processed further by recrystallization to alter their properties.

If any microcrystalline wax is not suitable for coating our container base sheet, its properties may be modified by blending with harder or softer waxes, petrolatum, or oils, so as to bring the properties of the coating composition within our previously specified critical limits. We may blend the microcrystalline wax with paraffin wax, carnauba wax, beeswax, candelilla wax, montan wax, mineral, vegetable and animal oils, and hydrogenated oils. We prefer to use coating compositions having a drop melting point of about 140° F. or above as determined by A. S. T. M. standard method D127-30.

In our coating we prefer to use waxes which form relatively small crystals when crystallized slowly. When hot molten materials are packaged in our containers the coating may melt and then cool slowly to solidification. Slow cooling of some waxes may tend to form large crystals which cause loss of flexibility, adhesiveness and sealing strength of the coating. It is important that our coating should withstand heating within the temperature limits previously described and subsequent slow cooling without substantially impairing the original properties of the coating.

A large number of microcrystalline wax blends may be prepared suitably for coating our container blank. The following table gives typical wax compositions, suitable for coating Cellophane for use in packaging process cheese. In this table the characteristics of each coating composition are given under the heading "Coating compositions"; the characteristics and amounts by weight of the ingredients used in each composition are given under the heading "Ingredients."

Table

No.	Coating compositions			Composition	Ingredients drop M. P., °F.	Needle prepara- tions 77° F.
	Drop M. P., °F.	Needle prepara- tions				
		77° F.	45° F.			
1	168	45	13	60% microcrystalline wax	117	17
				40% microcrystalline wax	131	Over 300
2	185	40	13	45% microcrystalline wax	194	13
				55% microcrystalline wax	131	Over 300
3	159	45	14	75% microcrystalline wax	162	25
				25% microcrystalline wax	119	Over 300
4	161	57	32	70% microcrystalline wax	164	13
				30% petrolatum	136	Over 300
5	173	36	17	90% microcrystalline wax	177	17
				10% mineral oil		
6	169	43	21	70% microcrystalline wax	177	17
				15% microcrystalline wax	156	34
				15% petrolatum	136	Over 300

¹ Determined by A. S. T. M. Standard Method D127-30.

Instead of blending microcrystalline waxes for coating purposes, we may modify the microcryst-

talline waxes by the addition of a water-insoluble metallic soap of the higher fatty acids, such as the stearate, oleate or palmitate of aluminum. The metallic soap, when properly compounded with the wax, increases the viscosity of the wax. We have found that technical aluminum distearate, in amounts from about 3% to about 20% by weight of the coating composition, enables us to produce compositions having the desired viscosity as disclosed in copending application Serial No. 467,466 filed November 30, 1942.

The increased viscosity of our composition enables us to bring materials in contact with the coating at temperatures higher than the melting point of the microcrystalline wax used in the composition, without undesirable flow occurring. For each composition of microcrystalline wax and aluminum stearate there is a critical temperature below which the molten composition will granulate, that is, it will become non-homogeneous and free wax tends to separate. It is therefore advantageous to add a granulation inhibitor to this composition, such as ester gum (glycerol esters of rosin) or Amberol ST137 (unmodified phenol-formaldehyde resin). We have found it advantageous to add ester gum in amounts ranging from about 3 to about 20% by weight of the composition, and in about the same proportion as the amount of aluminum stearate used. The ester gum in the composition facilitates production of smooth coatings on the base sheet and also serves to maintain the coating in substantially unaltered condition during the packaging operations.

The following is an example of a composition suitable for coating moistureproof Cellophane to make containers for packaging processed cheese:

	Percent
Microcrystalline wax (M. P. 140-2° F.)	92
Aluminum distearate	3
Ester gum	5

In preparing this composition, the wax is melted and heated to about 180° F. The aluminum stearate and ester gum are then added and dispersed in the wax by stirring. The mixture is then stirred and heated at about 250° F. until it is homogeneous and suitable for smooth coating. This composition has a needle penetration value of 14 at 45° F. and 35 at 77° F.

The viscosity of the coating composition is adjusted so as to produce smooth coatings on the particular base sheet being coated. This composition may be applied in molten condition to the base sheet by any suitable means, such as a hot doctor roll, and then congealed by chilling. Powdered starch, talc or other inert materials may be dusted on the coating to facilitate handling of the coated sheet. Containers made of this sheet material are particularly adapted for packaging process cheese which may be poured into the container at a temperature from about 150-180° F. Although this temperature is higher than the melting point of the wax used in the coating composition, undesirable flow of the coating will not occur on account of the increased viscosity produced by the addition of aluminum stearate.

The use of aluminum stearate in wax, especially in the presence of ester gum, often results in a coating which may become brittle in the light or when employed as a wrapper for certain types of cheese. We have found that this embrittlement can be minimized or prevented

by the incorporation in the coating composition of various aging inhibitors, such as hydroquinone, Santovar A (alkylated polyhydroxy phenol), or tetramethylthiuramdisulphide.

Molten foods, such as process cheese, have been packaged successfully in our container. The food is protected effectively against deterioration, moisture loss, mold growth, or other undesirable spoilage. Our container serves to package satisfactorily, perishable foods which must be refrigerated when kept for long periods of time or when kept at normal room conditions. The container wall will adhere tenaciously to the food packaged therein and yet it can be peeled readily therefrom with the coating adhering to the sheet material. When only a portion of the package is cut or sliced for use, the remaining portion of the container wall will continue to adhere to the food in contact therewith, thus avoiding spoilage of the remaining food.

The mass of food is sealed completely in our container so that no gas or molds can come in contact with the food. Furthermore, since the coating of our container is moistureproof, no substantial amount of the original moisture content is lost. No rind or hard layers will form on the surface of such foods, as cheese. Our coating will remain flexible at low refrigerating temperatures ordinarily used for storing foods and will continue to adhere to the food at such temperatures. Our coatings will not separate from the base sheet under the conditions previously discussed.

The thermoplastic property of our coating permits construction of any desired containers for packaging the food by heat-sealing suitable portions of the coated blank without requiring use of external adhesives which may contaminate the food. Our coating forms strong seals which will not open or separate under ordinary conditions of handling. The coating also serves to seal the container hermetically after it is filled with the molten food so as to protect the food effectively against contamination.

We prefer to use transparent sheet materials for forming our containers, in order to display the food or other materials packaged therein. Our coating does not impair the transparency of such sheet materials. The sheet material may be suitably printed with any desired indicia. Containers can be made of any suitable size and contour. Foods packaged in our containers may be handled in a sanitary manner, since the package is sealed tightly and is protected against all sources of contamination. Our coating is non-toxic and will not impart any objectionable taste, odor or color to the food in contact therewith.

It is understood that many modifications and changes may be made within the spirit of our invention, which are intended to be included broadly within the scope of the following claims.

We claim:

1. A container for packaging hot flowable materials congealable upon cooling to a solid condition, formed from a sheet material provided with an adherent, continuous, flexible, thermoplastic coating, arranged so as to present said coating throughout the interior surface of the container, said coating being formed from a composition comprising microcrystalline wax, said coating composition having a penetration value (A. S. T. M. method D5-25) not less than 10 at 45° F., and not greater than 60 at 77° F., said coating having the characteristics of remaining intact and unimpaired when the hot molten ma-

terial is placed in contact therewith and then congealed, said coated sheet material inhibiting moisture loss from the material packaged in the container and being peelable from the congealed material with the coating adhering to said sheet material.

2. A container for packaging hot flowable foods congealable upon cooling to a solid condition, formed from a sheet material of regenerated cellulose provided with an adherent, continuous, flexible, thermoplastic coating, arranged so as to present said coating throughout the interior surface of the container, said coating being formed from a composition comprising microcrystalline wax, said coating composition having a penetration value (A. S. T. M. method D5-25) not less than 10 at 45° F. and not greater than 60 at 77° F., said coating having the characteristics of remaining intact and unimpaired when the hot molten food is placed in contact therewith and then congealed, said coated sheet material inhibiting moisture loss from the food packaged in the container and being peelable from the congealed food with the coating adhering to said sheet material.

3. A container for packaging hot flowable foods congealable upon cooling to a solid condition, formed from a sheet material provided with an adherent, continuous, flexible, thermoplastic coating, arranged so as to present said coating throughout the interior surface of the container, said coating being formed from a composition comprising microcrystalline wax and a modifying agent, said coating composition having a penetration value (A. S. T. M. method D5-25) not less than 10 at 45° F. and not greater than 60 at 77° F., said coating having the characteristics of remaining intact and unimpaired when the hot molten food is placed in contact therewith and then congealed, said coated sheet material inhibiting moisture loss from the food packaged in the container and being peelable from the congealed food with the coating adhering to said sheet material.

4. A container for packaging hot flowable foods congealable upon cooling to a solid condition, formed from a sheet material provided with an adherent, continuous, flexible, thermoplastic coating, arranged so as to present said coating throughout the interior surface of the container, said coating being formed from a composition comprising microcrystalline wax and an aluminum soap of the higher fatty acids, said coating composition having a penetration value (A. S. T. M. method D5-25) not less than 10 at 45° F. and not greater than 60 at 77° F., said coating having the characteristics of remaining intact and unimpaired when the hot molten food is placed in contact therewith and then congealed, said coated sheet material inhibiting moisture loss from the food packaged in the container and being peelable from the congealed food with the coating adhering to said sheet material.

5. A container for packaging hot flowable foods congealable upon cooling to a solid condition, formed from a sheet material provided with an adherent, continuous, flexible, thermoplastic coating, arranged so as to present said coating throughout the interior surface of the container, said coating being formed from a composition comprising microcrystalline wax, aluminum stearate and ester gum, said coating composition having a penetration value (A. S. T. M. method D5-25) not less than 10 at 45° F. and not greater

than 60 at 77° F., said coating having the characteristics of remaining intact and unimpaired when the hot molten food is placed in contact therewith and then congealed, said coated sheet material inhibiting moisture loss from the food packaged in the container and being peelable from the congealed food with the coating adhering to said sheet material.

6. A container for packaging hot flowable foods congealable upon cooling to a solid condition, formed from a sheet material provided with an adherent, continuous, flexible, thermoplastic coating, arranged so as to present said coating throughout the interior surface of the container, said coating being formed from a composition comprising microcrystalline wax, 3 to 20% by weight of aluminum stearate and 3 to 20% by weight of ester gum, said coating composition having a penetration value (A. S. T. M. method D5-25) not less than 10 at 45° F. and not greater than 60 at 77° F., said coating having the characteristics of remaining intact and unimpaired when the hot molten food is placed in contact therewith and then congealed, said coated sheet material inhibiting moisture loss from the food package in the container and being peelable from the congealed food with the coating adhering to said sheet material.

7. A container for packaging hot flowable foods congealable upon cooling to a solid condition, formed from a sheet material of regenerated cellulose provided with an adherent, continuous, flexible, thermoplastic coating, arranged so as to present said coating throughout the interior surface of the container, said coating being formed from a composition comprising microcrystalline wax, 3 to 20% by weight of aluminum stearate and 3 to 20% by weight of ester gum, said coating composition having a penetration value (A. S. T. M. method D5-25) not less than 10 at 45° F. and not greater than 60 at 77° F., said coating having the characteristics of remaining intact and unimpaired when the hot molten food is placed in contact therewith and then congealed, said coated sheet material inhibiting moisture loss from the food packaged in the container and being peelable from the congealed food with the coating adhering to said sheet material.

8. A container for packaging hot flowable process cheese congealable upon cooling to a solid condition, formed from a sheet material provided with an adherent, continuous, flexible, thermoplastic coating, arranged so as to present said coating throughout the interior surface of the container, said coating being formed from a composition comprising microcrystalline wax, 3 to 20% by weight of aluminum stearate and 3 to 20% by weight of ester gum, said coating composition having a penetration value (A. S. T. M. method D5-25) not less than 10 at 45° F. and not more than 60 at 77° F., said coating having the characteristics of remaining intact and unimpaired when the hot molten cheese is placed in contact therewith and then congealed, said coated sheet material inhibiting moisture loss from the cheese packaged in the container and being peelable from the congealed food with the coating adhering to said sheet material.

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CERTIFICATE OF CORRECTION.

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ALLEN ABRAMS, ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 51-52, in the heading to the table, for the words "Needle preparations" both occurrences, read --Needle penetrations--; line 57, sixth column of table, for "117" read --177--; page 4, second column, line 26, claim 6, for "package" read --packaged--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of June, A. D. 1944.

Leslie Frazer

(Seal)

Acting Commissioner of Patents.