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MANUFACTURE OF COATED MATERIALS AND PRODUCT

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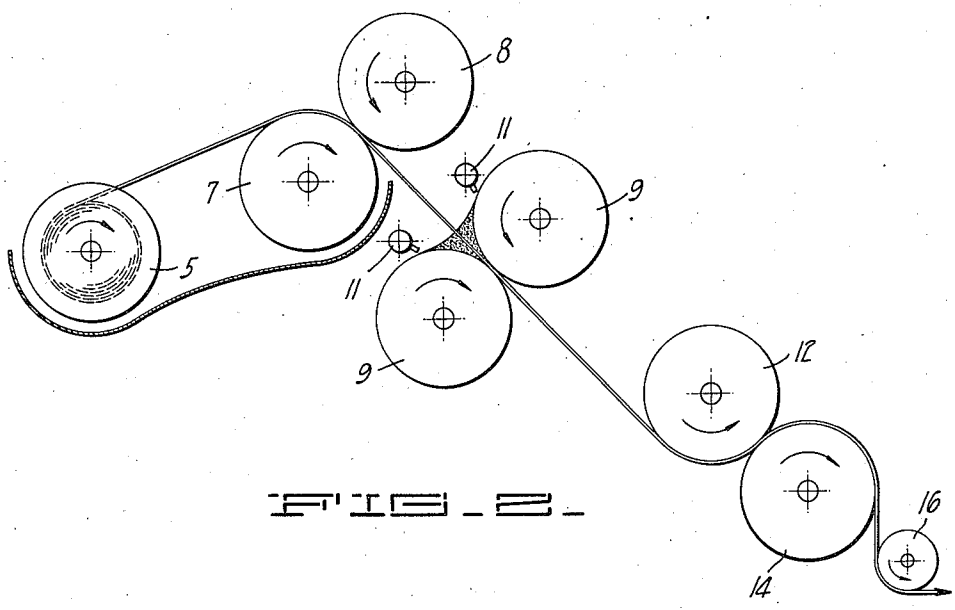


FIG. 2.

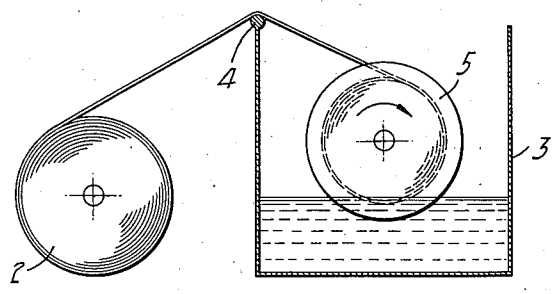


FIG. 1.

INVENTORS
Arnold O. Beckman, William A. Bush and Harry Rubin.
BY
Jas. M. Naylor.
ATTORNEY

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MANUFACTURE OF COATED MATERIALS AND PRODUCT

Arnold O. Beckman, Altadena, and William A. Bush, and Harry Rubin, Los Angeles, Calif.

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6 Claims. (Cl. 91—70)

This invention relates to the manufacture of a suitable wrapping material useful in the wrapping of such commodities as bread. In wrapping bread, as well as other like products, a substantially transparent yet relatively inexpensive wrapper is required. Such a wrapper should desirably be heat sealing so that it can be wrapped cheaply. It should also be relatively stable over a long period of time, so that the wrappers can be made up and stored in quantities.

It is in general the broad object of the present invention to provide for the transparentizing of a suitable paper base and this with a composition which can be heat sealed and which is nevertheless so non-tacky that it can be stored in piles under pressure without adjacent sheets sticking together. This last property is known as "non-blocking."

In accordance with the present invention we have determined that a paper is readily transparentized and coated if a plurality of coats are applied thereto. To this end we preferably first apply to the paper a tacky coating (preferably having substantially the same index of refraction as the base sheet) and then a non-tacky coating as the outer surface coat. The non-tacky coating protects goods and adjacent sheets against the tacky coating, while disruption of the non-tacky coating permits the tacky coating to be employed for heat sealing and like purposes.

Briefly summarizing, the tacky undercoat serves the following purposes:

(*a*) Having approximately the same index of refraction as cellulose it makes the paper transparent.

(*b*) Being permanently tacky, it seals most coatings that are desirable in every respect but that of adhering to the paper.

(*c*) Being permanently tacky it lends to the paper the property of heat sealing if the surface coat is destroyed in any way, i. e., chemically by chemical reaction of solution, physically by scraping, rubbing, or heat.

(*d*) If applied at a temperature above the boiling point of water, it displaces most of the water in the sheet and will, therefore, keep the sheet from becoming brittle even when subjected to higher temperatures almost but not quite sufficient to decompose the paper, and also due to this property of displacement and due to the water resistance of the substance itself it lends greater waterproofness and moistureproofness to the sheet itself.

(*e*) It seals the microscopic pores and fibres (or "whiskers"), tying them down for the covering action of the second or top coat, thus preventing the formation of wicks.

(*f*) It limits the quantity of the top coat which can and need be applied.

The non-tacky top coat serves the following purposes:

(*a*) Keeps the tacky undercoat from blocking the sheets.

(*b*) Provides a surface which has a high gloss.

(*c*) Provides a surface which can be printed upon by most inks that do not dry by penetration.

(*d*) Provides a surface which will heat seal paper on itself.

(*e*) Aids in the waterproofing of the sheet, because of its wax oil and cellulose ether components and moistureproofing due to the wax and oil components.

(*f*) Reduces cost due to the nature of the composition, i. e., low cost constituents are 85%, high cost constituents are only about 15%.

(*g*) Provides an attractive surface due to its glossy appearance.

(*h*) Completes the process of transparentizing by leveling the surface and making it homogeneous, thus not refracting the light in all directions, but allows the light to pass through in parallel beams.

As a suitable first coating, we have successfully employed such materials as a mineral oil (a highly refined paraffin hydrocarbon having a small, if any, sulfonatable residue); a paraffin wax; a mixture of mineral oil and rosin, varying between 70% mineral oil down to 30% mineral oil with the balance rosin. If difficulty is encountered due to oxidation, an anti-oxidant such as hydroquinone can be added, usually 0.5%–1% of this sufficing. We have also successfully employed Staybelite, a hydrogenated rosin made by Hercules Powder Company. This we have employed with a mineral oil in the proportions of from 0% to 70% of the rosin, the balance being mineral oil to which may be added a small amount of an anti-oxidant such as hydroquinone. We have also employed castor oil, and talloel (a product sometimes referred to as liquid rosin). Almost any vegetable oil can be used if it is of sufficient clarity. Because of the susceptibility of vegetable oils to oxidation, it is desirable that anti-oxidants be employed.

For greatest durability we prefer to use a mixture of Staybelite and castor oil, or castor oil and talloel. A first coating of even greater stability can be secured by using the condensation product of a bleached refined castor oil and

phthalic anhydride. Such a product is that manufactured by California Flaxseed Company as "castor oil phthalate," as #91, a synthetic plasticizer composed mainly (78%) of a condensation product of bleached refined castor oil and phthalic anhydride.

We have also successfully used Pliolite dissolved in liquid petrolatum as a first coating, particularly where a very high resistance to moisture vapor penetration is desirable.

As the top coating or outer coating, the following constituents can be employed:

1. A compatible or partially compatible resin. As a suitable composition we have made up one comprising from 0% to 75% of natural gum resin modified by a glycerin-olefin-dicarboxylic acid ester in the proportions of 71% of the former to 29% of the latter components. Such a resin is that known as #225, manufactured by California Flaxseed Company. Instead of #225, a resin known as #157, manufactured by California Flaxseed Company can be employed. This resin is composed of rosin reacted with glycerol in the ratio of 90.8% rosin to 9.2% glycerin, to the point where the acid number is from 11 to 13. Its softening point is 190° F. and the melting point is 195° F. It is commonly known as estergum.

The above indicate the characteristics of the resins included in the composition. Various other suitable equivalent resins can be employed. Circular No. 545 of National Paint, Varnish and Lacquer Association lists some hundred-odd resins and gives their compatibility with ethyl cellulose.

2. A cellulose ether, such as ethyl cellulose, from 9% to 25%. In place of ethyl cellulose, any other suitable cellulose ether can be employed, such as benzyl cellulose, or ethyl benzyl cellulose.

3. A wax compatible or partly compatible with the cellulose ether employed. Such a wax is candelilla wax. This is included to the extent of from 0% to 12%. Utilized to this extent, a glass clear film will be secured. Greater percentages can be employed if the clarity and gloss of the film can be diminished. Montan wax can be used in the same percentage as candelilla wax.

4. A plasticizing agent such as castor oil or talloel from 0% to 25% for the castor oil and from 0% to 10% for the talloel.

The following materials, of minor import, can be employed to advantage:

5. Incompatible ingredients are added to reduce the melting point of the mixture to aid in its manufacture and application to a base sheet, and to lubricate the surface so that the surface feels smooth and non-tacky. For this purpose, paraffin waxes or oils in the amount of from 0% to 10% are usually employed.

6. An anti-oxidant, so that oxidation products in low concentration will not discolor the film appreciably. As such a shift material we mention hydroquinone. This gives appreciable retardation of oxidation with amounts from 0.5% to 1%. The nature and function of anti-oxidants is well known in the art and therefore one skilled in the art will have no difficulty in selecting suitable materials. The anti-oxidant is used when the resin has a readily oxidizable portion and the oxidation products are insoluble and infusible in the rest of the component. Such a product is the #225 resin aforementioned; this resin, having a non-reacted double bond, is susceptible to chemical action, particularly oxidation. A sufficient quantity of anti-oxidants, usually a quantity of the order of 1%, is employed to prevent undue brittleness and loss of heat-sealing properties and provide a careful control of oxidation.

7. A resinous acid. Rosin or hydrogenated rosin can be employed to provide this constituent. In the case of some resins, such as the #225, not completely compatible, the addition of up to 10% of the total mass of a resinous acid will cause the mixture to become homogeneous and compatible. The amount of resin acid used depends on the compatability of the difficulty soluble resin employed. Rosin can be employed for this because of its high abietic acid content.

8. A fatty acid such as the linseed oil fatty acids or perilla oil fatty acids, or other suitable high molecular weight fatty acids. If linseed oil is used in the mixture it will be partly incompatible with the cellulose ether, but addition of 3% of a fatty acid makes the mixture compatible and homogeneous. This applies to many vegetable oils which may be used as plasticizing agents and their fatty acids.

The following are listed as compositions which have been employed successfully and which embody the present invention:

	Per cent
#225	50
Rosin	8.3
Candelilla wax	7.5
Low melting point paraffin wax	7.5
Mineral oil	7.5
Bleached refined castor oil	10

This composition ages somewhat rapidly but is otherwise useful.

	Per cent
Ethyl cellulose	12
Castor oil bleach, ref	12
Mineral oil	5
Candelilla wax	12
Staybelite	10
#157	20
#225	28
Hydroquinone	1

This composition ages fairly well.

	Parts
Ethyl cellulose	25
Castor oil	20
Candelilla wax	35
#225	25

This composition is very tough and flexible and can be produced with a high gloss.

The preferred composition is as follows:

	Per cent
High visc. ethyl cellulose	15
Castor oil bleached, refined	15
Candelilla wax	15
#225	55

This composition would not heat seal #2 glassine by itself, but did heat seal it when applied over the tacky impregnated paper.

The following composition was employed:

	Per cent
Ethyl cellulose	22
Rosin W	55
Montan wax bleached	23

It resulted in a cloudy cake that was quite flexible. It provides an opaque coat as will be presently explained.

It was found that the tolerance for waxes in these compositions varied from about 10% for

montan wax to almost 20% for candelilla wax. The tolerance refers to the amount of wax being added to the composition before the film became cloudy.

	Per cent
Ethyl cellulose, medium viscosity	15
Candelilla wax	20
Castor oil bleached, refined	5
#157	30
X rosin	30

This composition has a very slight cloud—tears paper on heat seal, has fair gloss, does not fly from paper when rattled, does not block when subjected to 3 lb. pressure per sq. in. over a period of 8 days with intermittent inspection, and is quite flexible.

In case an opaque coating is desired, this can be produced by using a very high wax content, in which case the opaqueness is due to the wax. Waxes tend to crystallize in the coating, and thus render the mass opaque. Pigments can also be incorporated, as can dyes, so that almcst any color can be obtained.

In the drawing accompanying and forming a part hereof, Figures 1 and 2 respectively provide schematic representations of the apparatus and steps employed in applying the first and second coats.

In applying the material, the paper to be coated is preferably first run from a roll 2 through a bath of the first coating composition carried in a tub or vessel 3. The bath is usually heated to a temperature of 180° to 212° F. so that the composition flows readily. At the higher temperature water is driven out of the base sheet. A smoothing rod or drag 4 is employed to adjust tension on the paper base sheet. The heated bath and the tension remove moisture and entrained air from the sheet which is subject to the bath and penetration of the coating material for from 5 to 20 minutes. The material is wound up on reel 5 which is either used as a storage reel or else a feed reel for the second or top coating. Thereafter reel 5 is utilized to feed the material, the coated sheet, on into the operation for applying the second coating. Referring to Figure 2, reel 5 carrying a suitable supply of paper preferably, though not necessarily pre-coated with the tacky base, feeds the sheet between rolls 7 and 8. Roll 7 is heated to about 210° F., preferably just below 212° F. Beneath it a heated drip pan, heated to a temperature of 180°–210° F., is provided. The material, passing over roll 7, is fed on between this roll and an unheated roll 8, usually made of Neoprene and Thiokol. These serve to smooth out the first coat and remove any excess. Roll 7 is slightly below roll 8 so that excess material drains toward roll 7.

The hot sheet then passes on between hot metal rolls 9, where the second coating composition is applied. The molten material to be applied to the paper or base sheet as a second coat, at a temperature of about 340° F., is fed on from feed means 11. The rolls 9 are at about 340° F., they serve to apply a thin coat of the material to the base sheet. The feeding means 11 includes orifices releasing the coating composition from a constant level reservoir, so that the coating material is fed at a uniform rate. A substitute for the means 11, which may be preferred, would be to dip the sheet into a suitable vessel of the second coating material, under a conventional smoothing roll or drag, and from thence draw it between the hot metal rolls 9. It will be appreciated that there are many mechanical means which can be used with substantially equal efficacy, hence the means shown and described are to be deemed illustrative only. The thickness of the coating is determined (1) by the length of time which the base sheet is in contact with the coating material, (2) the temperature and (3) the pressure applied by rolls 9, and (4) the amount of the previous tacky material applied to the surface. By regulating these various factors the thickness of the material on the base sheet, after application of the first tacky coating, can be regulated.

From the hot metal rolls 9 the coated sheet passes over an ironing roll 12, and a second ironing roll 14. These run at a rate faster than that at which the coated base material moves, to iron the material, apply a gloss and smooth surface to it, at a temperature of about 240° F., ironing out inequalities, making the coating homogeneous whereby it does not refract light in all directions but permits it to pass in parallel beams. It is placed so that the material is not positively engaged, but is nevertheless smoothed and ironed by the rolls. Thereafter the material is passed over a roll 16 and onto the roll of finished coated material being assembled.

We claim:

1. In the manufacture of a coated structure from an impregnatable base sheet having a surface, the steps of applying to said surface a first coating of rosin dissolved in a non-volatile oil, said first coating being tacky when cold and being applied at a temperature whereat said material is a liquid and moisture in said base is substantially eliminated, and applying to said surface, coated as aforesaid, a second coating composed mainly of a natural resin acid-glycerin reaction product with ethyl cellulose dissolved therein, said second coating being miscible with said first coating on said base sheet to provide a normally non-tacky coated surface but which, upon localized heat application, is capable of bonding to itself, said second coating being applied in a molten condition and at a temperature whereat it mixes with said first coating on said surface, and thereafter ironing the coated sheet at an elevated temperature to iron out inequalities and homogenize the applied coatings.

2. In the manufacture of a coated structure from an impregnatable base sheet, the steps of applying to the base as a first coating a heated material fluid but stable at an elevated temperature of application of about 200° F. and which penetrates said base and is normally tacky when cold, said first coating material comprising rosin dissolved in a non-volatile oil, applying to said base, coated as aforesaid, as a second coating a heated material fluid but stable at an elevated temperature of application of about 300° F. and compatible and miscible with said first coating on said sheet and normally non-tacky when cold, said second coating comprising ethyl cellulose and a resin in which ethyl cellulose is soluble, and heating the sheet, coated as aforesaid to homogenize said coatings.

3. In the manufacture of a coated structure from an impregnatable base sheet having a surface, the steps of applying to said surface a first coating of a material comprising rosin dissolved in a non-volatile oil by maintaining said material in contact with said sheet for from five to twenty minutes at a temperature of from about 180° to 210° F. and applying to said surface, coated as aforesaid, a second coating composed mainly of

a natural resin acid-glycerin reaction product and ethyl cellulose and miscible with said first coating on said base sheet to provide a normally non-tacky coated surface but which, upon localized heat application, is capable of bonding to itself, said second coating being applied in a molten condition and at a temperature of about 340° F. whereat it mixes with said first coating on said surface, and thereafter ironing the coated sheet at an elevated temperature of about 240° F. to iron out inequalities and homogenize the applied coatings.

4. In the manufacture of a coated structure from an impregnatable base sheet having a surface, the steps of applying to said surface a first coating of rosin dissolved in castor oil as a solvent, said first coating being tacky when cold and being applied at a temperature whereat said material is a liquid and moisture in said base is substantially eliminated, and applying to said surface, coated as aforesaid, a second coating composed of about 55% of ester gum, about 20% ethyl cellulose and about 25% wax and miscible with said first coating on said base sheet to provide a normally non-tacky coated surface but which, upon localized heat application, is capable of bonding to itself, said second coating being applied in a molten condition and at a temperature whereat it mixes with said first coating on said surface, and thereafter ironing the coated sheet at an elevated temperature to iron out inequalities and homogenize the applied coatings.

5. In the manufacture of a coated structure from an impregnatable base sheet having a surface, the steps of applying to said surface a first coating of rosin dissolved in castor oil as a solvent, said first coating being tacky when cold and being applied at a temperature of about 200° F., and applying to said surface, coated as aforesaid, a second coating composed of about 55% of ester gum, about 20% ethyl cellulose and about 25% wax and miscible with said first coating on said base sheet to provide a normally non-tacky coated surface but which, upon localized heat application, is capable of bonding to itself, said second coating being applied in a molten condition and at a temperature of about 300° F. and whereat it mixes with said first coating on said surface, and thereafter ironing the coated sheet at an elevated temperature to iron out inequalities and homogenize the applied coatings.

6. A paper sheet impregnated with a first tacky coating of rosin dissolved in a non-volatile oil and a second non-tacky coating composed mainly of a natural resin acid-glycerin reaction product with ethyl cellulose dissolved therein, said coatings being at least partially homogenized to ensure that said sheet is translucent, non-tacky and non-blocking but, upon localized heat application, is heat sealing to itself.

ARNOLD O. BECKMAN.
WILLIAM A. BUSH.
HARRY RUBIN.