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2,714,562

SELF-SEALING WRAPPING MATERIAL

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13 Claims. (Cl. 117—68.5)

This invention relates to a wrapping material adapted for wrapping small articles such as a sandwich or other comestible, for example, and more particularly to a self-sealing wrapping material for wrapping a comestible to maintain its moisture content. In its preferred aspects the invention relates to a self-sealing wrapping material which is adapted to encase an article in the form of a closed envelope and thereby seal the article to not only maintain its moisture content but to protect the same against outside moisture, dust, gas and other foreign matter.

Self-sealing wrapping material of the type to which the present invention relates are known. One such self-sealing wrapping material comprising a flexible porous paper backing having a self-sealing coating of a cohesive, substantially non-adhesive material thereon is described in United States patent application of Bertram L. Trillich, Serial No. 125,973, filed November 7, 1949, now Patent No. 2,529,060. I have found that when the backing is of a porous nature no special problems arise in the application to, and the formation on, the backing of a suitable self-sealing material. When, however, the backing is of a non-porous character problems arise at times. Thus for example, natural rubber is one of the most effective self-sealing materials for flexible porous backings such as paper, but with a flexible non-porous backing material such as cellophane, glassine paper, greaseproof paper and aluminum foil, natural rubber is not entirely suitable for at times it does not adhere sufficiently tenaciously to the non-porous backing. The adhesion between the rubber and the backing is low. In consequence the rubber tends to separate from the backing, especially when a seal is once made and then broken. In addition, delamination of a natural rubber film of cohesive material on a non-porous backing not infrequently takes place on standing. In general, a wrapping material of a non-porous character having thereon a coating of natural rubber as the cohesive material, has proven unsatisfactory because of adhesion failures between the rubber and the backing and because these wrapping materials have little, if any, re-seal value.

In contrast to natural rubber, polar synthetic rubbers have excellent adhesion to flexible, non-porous backing materials, but such rubbers have at times proven to be objectionable, self-adhering coatings for these non-porous backings for two reasons. Some of these synthetic rubbers have not proven to be sufficiently cohesive at low pressures and room temperatures to meet commercial requirements, while others which are sufficiently cohesive exhibited strong tendencies to adhere to ordinary materials such as paper, cellophane, wood, glass, metal, and the like. Because of these adhesive tendencies the wrapping materials are sticky to the touch and are objectionable for this reason. They are further objectionable because when the wrapping material is used in roll form the roll tends to block. This means that the cohesive material has adhered to the backing of the adjacent turn with

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which it is in contact and cannot be unrolled without tearing of the sheet.

In accordance with the present invention I have prepared a self-sealing wrapping material having a non-porous backing, which has none of the objections noted above. This wrapping material is not tacky to the touch and will not block when rolled in roll form for dispensing purposes. This wrapping material may be sealed readily and resealed many times without delamination of the cohesive coating from the backing. Other advantages of the invention will be apparent from the following detailed description of the invention.

The wrapping material of the present invention consists essentially of a paper-thin flexible backing such as a flexible film, foil or sheet of a non-porous material carrying on one side thereof a flexible coating or film of self-adhering material which is substantially dry to the touch and substantially non-tacky but which is cohesive even under light pressure, and yet which is for all practical purposes non-adhesive to a surface such as paper, cellophane, metal, wood, glass, etc., devoid of said material.

The flexible non-porous backing sheet may be a film, sheet or foil of cellophane, aluminum, glassine paper, greaseproof paper, a rubber hydrohalide such as rubber hydrochloride (Pliofilm), polyethylene, copolymers of polyvinyl chloride and polyvinyl acetate, copolymers of polyvinyl chloride and acrylonitrile, polyvinylidene chloride alone and in combination with polyvinyl chloride or with polyvinyl alcohol or with any other vinyl compounds capable of forming foils or films, cellulose acetate, cellulose nitrate and other cellulose derivatives, hard papers, specifically hard sized papers, which permit of no surface penetration or very little surface penetration, and the like.

The self-adhering material which is used in accordance with the present invention is a composition containing a mixture of natural rubber and a low molecular weight (below 100,000) acrylic nitrile-butadiene copolymer which exhibits excellent adhesion to the aforesaid backing material, has good cohesive properties, and in the dry state has moderate adhesion to ordinary materials such as paper, cellophane, metal and the like. A preferred low molecular weight copolymer which may be used is a copolymer of a butadiene-1,3 hydrocarbon and an acrylic nitrile, particularly a copolymer made by the polymerization in aqueous emulsion of a monomeric mixture consisting of from 50 to 80% by weight of butadiene-1,3 and from 20 to 50% by weight of acrylonitrile, characterized by possessing a molecular weight below 100,000 and a Mooney viscosity, as determined by the Mooney viscosimeter using the 1.5 inch rotor after 4 minutes at 212° F., between 10 and 35, and also containing from 5 to 50%, based on the weight of copolymer, of a rosin alcohol or a mixture of rosin alcohols. A suitable rosin alcohol may be the technical mixture of hydroabietyl alcohols, sold under the trademark "Abitol" by the Hercules Powder Company.

It is important in accordance with the present invention that the natural rubber and the synthetic rubber be combined in controlled proportions for otherwise the desired quick tack, film strength and minimum tendency to block or stick in a roll are not obtained. In general, the proportions of constituents necessary to obtain these desired results may vary from 10% to 60% of natural rubber and 90% to 40% of the synthetic rubber, based on the dry weight of the constituents. The best results are obtained when the proportions are maintained within the limits of 20% to 45% of natural rubber and 80% to 55% of synthetic rubber, based on the dry weight of the constituents.

The cohesive, substantially non-adhesive film is formed

on the flexible, non-porous backing material by applying to the backing material a coating of an aqueous dispersion or latex of the synthetic rubber in an unvulcanized state in admixture in the desired proportions within the range noted above, with a conventional, commercially available, ammonium-stabilized, unvulcanized natural rubber latex, and drying the same. The mixed latices may or may not contain an anti-oxidant for the rubbers, as desired. The film of rubber deposited from these mixed latices inherently has the desired cohesive, substantially non-adhesive properties, quick tack, film strength, and minimum tendency to block or stick when the coated backing sheet is rolled up in a roll form.

The mixed latices may have incorporated therewith varying small amounts of suitable wetting, spreading and penetrating agents. Thus, for example, from 0.5% to 5%, on a dry weight basis, of a surface active agent may be added to the mixed latices. Examples of suitable surface active agents are sodium lauryl sulphate, sodium cetyl sulphate, the sodium salt of the dioctyl ester of sulfosuccinic acid (Aerosol OT), the sodium sulphate derivatives of 7-ethyl-2-methyl-undecanol-4 (Tergitol 4) and 3,9 diethyl tridecanol-6 (Tergitol-7), decyl benzene sodium sulfonate (Santomerse S), and phenyl-para-toluene sulfonate. There may also be incorporated with the mixed latices varying small amounts, from about 0.5% to 5%, on a dry weight basis, of a resin which serves to add quick tack and cohesive strength to the film of mixed natural rubber and synthetic rubber. A suitable resinous material for this purpose is the sodium resinate compound sold under the trademark "Dresinate 213." There may also be added to the mixed latices varying small amounts of thickening agents, from about 0.5% to 3%, on a dry weight basis. Suitable thickening agents are sodium alginate, borated casein and methyl cellulose.

The cohesive, substantially non-adhesive material is applied to the backing in the form of a film of the mixed rubbers which is preferably deposited uniformly over the entire surface of the backing from the mixed latices of these rubbers. The amount of material so deposited is controlled so that it is not adhesive but becomes cohesive only when an equal amount of the same material is brought into contact with it, such as occurs in making a face-to-face seal in the process of wrapping an article with the wrapping material of the present invention. In general, from both the economical and functional standpoint, the quantity of mixed synthetic rubber deposited as a uniform film on the flexible, non-porous backing material may vary from 0.10 lb./17 x 22—500 ream weight to 1.0 lb./17 x 22—500 ream weight. Somewhat less of the mixed rubbers may be used in the form of a deposited film, but this is not preferred. Larger amounts of such deposited mixed rubbers may be used up to the point where the deposited film is definitely adhesive to the ordinary materials such as paper, cellophane, metal and the like, but such larger amounts are not necessary and may even be wasteful of the material. It is to be appreciated that there may be specific mixtures of the synthetic rubber and the natural rubber, within the range of proportions stated, for obtaining optimum results with specific flexible, non-porous backing sheets. Hence some experimental formulations may be required for a specific backing sheet to achieve optimum results.

The following is a desirable formulation of a cohesive, substantially non-adhesive material for application to glassine paper and for a hard sized paper:

	Dry parts
Copolymer	100
Natural rubber.....	50
Dresinate 213.....	3

The following is a desirable formulation of a cohesive, substantially non-adhesive material for cellophane and aluminum foil:

	Dry parts
Copolymer	100
Natural rubber.....	35
Dresinate 213.....	1
Borated casein.....	2

The copolymer referred to in each of the above formulations is the specific low molecular weight butadiene-1,3-acrylonitrile copolymer used in the form of an approximately 35% solids content aqueous latex. Other butadiene-1,3 hydrocarbon and an acrylic nitrile copolymer having a molecular weight below 100,000 may be used in lieu of the specific copolymer of the illustrative examples. In connection with these illustrative examples it is to be noted that they are preferred examples and that the proportions of the rubbers may be varied as noted above and the tackifying agent (Dresinate 213) and the thickening agent (borated casein) may be omitted, if desired.

Where the mixture of the synthetic rubber and the natural rubber approach the upper limit of the range of proportions of the mixture of rubbers, namely 90% of synthetic rubber and 10% of natural rubber, on a dry weight basis, there is some slight tendency toward roll blocking, particularly in the case of an aluminum foil backing sheet. In the case of aluminum foil backing sheets, as well as other flexible, non-porous backing sheets, it may be desirable to provide a release coat of a suitable material on the back of the mixed rubber-coated backing sheet. Very light applications of paraffin wax or microcrystalline wax on the back of the backing sheets have been found to be very effective release agents which prevent roll blocking tendency. These waxes may be applied to the back of the backing sheets either as flexible films deposited from aqueous emulsion, from solvent solution, or by application of these materials in molten form.

The use of the wrapping material of the present invention may be illustrated by way of the wrapping of a sandwich. The sandwich is placed on the cohesive, substantially non-adhesive coating of a piece of a wrapping sheet adjacent one end of the sheet and within the boundaries thereof. The opposite end of the wrapping sheet is then folded over the sandwich so that the marginal portions of the self-adhering coating of the folded sheet are in opposed relationship on three sides of the sandwich. A light pressure is then applied to the opposed surfaces of the self-adhering material by running the fingers lightly around the marginal portions of the folded wrapping sheet, thereby sealing the sheet about the sandwich. Due to the fact that the mixed rubber coating is not adhesive, it does not adhere to the sandwich. The seal formed as described may be readily broken without effecting delamination of the mixed rubber coating and the sheet may be used again as described above or in other manners, as desired.

The present application is a continuation of the parent application Serial No. 187,667, filed on September 29, 1950.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. As a new article of manufacture, a sheet of self-sealing wrapping material adapted completely to encase an article and thereby seal the same, said article comprising a thin, flexible sheet of a non-porous material having on one surface thereof an exposed flexible film of a cohesive, substantially non-adhesive material comprising a mixture of natural rubber and a copolymer of from 50 to 80% by weight of a butadiene-1,3 hydrocarbon and from 20 to 50% by weight of an acrylic nitrile having a molecular weight below 100,000, in the proportion of 10 to 60% of natural rubber and 90 to 40% of the copolymer, on a dry weight basis.

2. As a new article of manufacture, a sheet of self-sealing wrapping material adapted completely to encase an article and thereby seal the same, said article comprising a thin, flexible sheet of a non-porous material

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50 to 80% by weight of a butadiene-1,3 hydrocarbon and

from 20 to 50% by weight of an acrylic nitrile, said copolymer being characterized by having a molecular weight below 100,000 and a Mooney viscosity, as determined by means of the Mooney viscosimeter using the 1.5 inch rotor after 4 minutes at 212° F., between 10 and 35, in the proportion of 10 to 60% of natural rubber and 90 to 40% of the copolymer, on a dry weight basis.

References Cited in the file of this patent

UNITED STATES PATENTS

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2,529,060	Trillich	Nov. 7, 1950
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