

UNITED STATES PATENT OFFICE

2,031,036

COMPOSITION OF MATTER AND METHOD
OF ITS PRODUCTIONCarl G. Dreyman, Pittsburgh, Pa., assignor to
Grant Paper Box Company, a corporation of
PennsylvaniaNo Drawing. Application May 17, 1934,
Serial No. 726,110

5 Claims. (Cl. 154—50)

This invention consists in a composition of matter having adhesive and water-proofing properties, and in the method of its production. This new composition is useful in sheeted form, particularly in the packaging of goods for the market. The composition of matter may be prepared and sold in bulk, to be applied by the purchaser as an adhesive for uniting plies of paper, or for uniting a sheet of metal foil to a ply of paper; or to be applied as a surface coating of moisture-proof character upon a supporting sheet of paper, card-board, or other material.

A sheet or film formed of the composition of matter of my invention and constituting a component part of the wall of a container for the packaging of material prevents ingress of atmospheric moisture to packaged material such in nature as to suffer damage or deterioration by such ingress (as, for instance, breakfast food); similarly such a sheet or film so applied will be effective in preserving moist packaged material (such as cake, for example) from deterioration in consequence of escape of moisture.

The impervious film or sheet will ordinarily be spread upon a sheet of relatively rigid fibrous material, as, for example, a sheet of paper or cardboard (of which latter material the cartons and containers of such food substances as I have mentioned are commonly formed); and, since the material of which the impervious sheet is formed is suitable and adequate to such end, I preferably employ it as the adhesive, uniting layers or plies of fibrous material built up for the purpose in view. Accordingly, the invention finds utility in the form of a sheet or film of impervious material spread upon and integrated with a sheet of fibrous material; and, yet more specifically, in the form of a sheet of film of impervious material spread upon and between and effecting the union of two sheets or plies of fibrous material.

Moisture-proof paper, as a rule, is made by impregnating or coating paper with paraffin. In some instances paraffin is used as an adhesive to unite two sheets or plies of paper; but for most purposes the adhesive afforded by paraffin is not strong enough. Still less suitable is paraffin for uniting layers of cardboard.

I have found that amorphous, substantially saturated compounds formed from high-boiling-point, non-saturated petroleum derivatives by polymerization and possibly by condensation, and which are known as petrolatum, have properties that, modified by certain additions, render them adequate, when extended to the form of sheet or film, not only to withstand penetration by moisture, but also to adhere to sheets of fibrous material upon which they may be extended, and to unite sheets of such material between which they may be spread and incorporated. Lately,

higher melting substances have been separated from petrolatum and mineral oil and are sold as "wax", to distinguish them from other, crystalline, saturated hydrocarbons, sold as "paraffin." The melting-points of these substances vary from 120° to 170° F. But while their adhesive power is greater than that of the crystalline paraffins, still they are not always adequate as intercalated films, uniting layers or plies of cardboard. By a systematical investigation I have found that there exists a relationship between the adhesive power of organic compounds and their viscosity at elevated temperature; and, as a result, I have succeeded in elaborating means by which I not only have been able to increase the viscosity and adhesive power of these compounds, but also to increase their plasticity. This invention, accordingly, embraces, first, a material to be used as the basis of a compound, which shall have adhesive properties, and which, when extended in the form of a sheet or film shall resist the passage of moisture-laden air. This material preferably consists of amorphous, substantially saturated compounds that have been formed from high boiling-point, non-saturated petroleum derivatives by way of polymerization and possibly by condensation (which products in the raw state are known commercially as petrolatum); and, more specifically, those higher melting substances separated therefrom and sold as petroleum wax. The invention, further, embraces a procedure in consequence of which the adhesive power and plasticity of these amorphous, substantially saturated compounds is increased. Such procedure consists in dissolving a lesser or greater amount of a substance that, on cooling to about the temperature at which the coating is applied, or just before solidification, forms in the compound a colloidal suspension or gel. I shall use the term colloidal suspension as inclusive of a gel.

These colloidal suspensions or gels may be produced by adding to the base material certain substances, which at low temperature are not at all or only partly soluble in the base material, but which can be rendered soluble either by increasing the temperature, or by adding also an intermediary substance in which both the base material and the gel-forming substance are soluble.

As substances which will form colloidal suspensions or gels I may mention: metal stearates, natural and artificial resins (such as coumarone resin), modified phenol-formaldehyde resins, glycol-phthalic acid resins, and other condensation and polymerization products on the market, as also copal and other gums, and so on. Among these coumarone resin, phenol-formaldehyde resin, and copal gum are best; and of these three I have found coumarone resin very satisfactory. In using coumarone resin a solvent should also

be employed, and a suitable (and non-volatile) solvent is ester gum.

There are other intermediary substances, solvents both of the base material and of the added substance, that may be employed: for example, rosin.

The effect that is brought about when colloidal suspensions or gels are formed in such base material as has been specified is best illustrated by giving the viscosity determination, made with the Saybold universal viscosimeter at 210° F., expressed in seconds, of a number of specific substances.

	Viscosity
15 1. Paraffin, melting-point 132° F.....	38''
2. Paraffin 75% } Ester gum 25% }	48''
3. Petroleum wax, melting-point 165° F....	65''
4. Petroleum wax with 1% aluminum stearate	77''
20 5. Petroleum wax 75% } Ester gum 24% } Aluminum stearate 1% }	90''
25 6. Petroleum wax 75% } Ester gum 17% } Coumarone resin 8% }	120''

The adhesive quality of substances 1 and 2 is practically nil; substance 3 sticks better. Substances 4, 5 and 6 are adequate for my purposes; and of them it is to be remarked that adhesiveness increases at about equal rate with viscosity.

In typical performance of the invention, 1% of aluminum stearate is dissolved in amorphous petroleum wax heated to a temperature of 220° F. A clear solution results, which gelatinizes on cooling.

Again, 75 parts of petroleum wax and 15 parts of ester gum are heated to 200° F. and to them, when so heated and rendered fluid, 10 parts of coumarone resin are added. The temperature is then gradually raised to 285° F. and kept there until all solids have disappeared. The coumarone resin is now present in saturated solution and, when the solution is slightly cooled, the resin either separates as a colloidal suspension, or forms a gel. Such a condition is indicated in the high viscosity figure of 120'', given in the foregoing table. As compared with the base material alone, the so prepared material is superior, both in adhesive quality and in plasticity. After the compound has been cooled to about 240° F., it is spread to the form of sheet or film, either upon a sheet of paper or other fibrous material, or as the intercalated bond between plies of cardboard. For plying purposes I preferably use the apparatus and method described in my co-pending application Serial No. 693,110, filed October 11, 1933. In operating such machinery, the compound being maintained at the temperature stated, the webs of paper may be caused to travel at a speed of 180 to 200 feet a minute.

Instead of forming the colloidal suspension or gel within the substance of the base material, it may be formed separately and afterward stirred in.

The base material that I employ has a melting-point that ranges, as I have said, from 120° to 170° F. By making selection in this matter of melting-point of the base material, and by varying the ratio of the added coumarone resin (or its equivalent) it is possible to attain in the

finished compound a melting-point that ranges from 140° to 190° F. And within this range choice will be exercised and the procedure adapted, according to season (whether for summer or winter use), or according to the climate of the country to which the packaged goods are to be shipped.

The petroleum wax base may be modified by dilution with paraffin, and by such modification the cost may be diminished. The degree to which such dilution may be carried is in one aspect of the matter unlimited: that is to say, paraffin may take the place of petroleum wax, even to complete displacement (100%), and still the colloidal suspension that is the essential feature of the invention may be effected, and with the good result that I have discovered,—namely, that of increasing the water-proofness or moisture-resisting property of the material. While it is true that paraffin alone might serve as a base for carrying the colloidal suspension, and with advantage, in that paper coated with it would be found to be superior in its moisture-proofness to paper coated with paraffin that carries no colloid, still the paper would be found to be like ordinary paraffin paper, in that the coating would crack readily at folds. It is, therefore, requisite for the ends in view that in the base material petroleum wax shall be present to the amount of at least 20%. Petroleum wax, present in the base as a fractional ingredient, or as itself constituting the single component, is requisite both in that its water-proof character is superior to that of paraffin; and in that it is plastic, whereas paraffin is brittle. A base that includes 20% of petroleum wax and upward will be found to be satisfactory, even where the coated paper is to be folded and creased.

I claim as my invention:

1. A container wall for the packaging of material including a sheet or film composed substantially of amorphous petroleum wax of an apparent melting-point of 120°–170° F., carrying a suspended colloid.

2. A container wall for the packaging of material including a sheet or film of a base substance composed of an amorphous petroleum wax of an apparent melting-point of 120°–170° F. and paraffin, the wax being present in a quantity not less than 20%, such base substance carrying a suspended colloid.

3. A container wall for the packaging of material including a sheet or film composed substantially of an amorphous petroleum wax of an apparent melting-point of 120°–170° F., carrying a suspended colloid, and two sheets of fibrous material, the sheet or film of said wax intercalated between the sheets of fibrous material and constituting a film of adhesive uniting the whole.

4. A container wall for the packaging of material including a sheet or film composed substantially of amorphous petroleum wax of an apparent melting-point of 120°–170° F., carrying a resin in the condition of colloidal suspension.

5. A container wall for the packaging of material including a sheet or film composed substantially of a mixture of amorphous petroleum wax of an apparent melting-point of 120°–170° F. and ester gum, carrying in colloidal suspension a resin.

CARL G. DREYMAN.