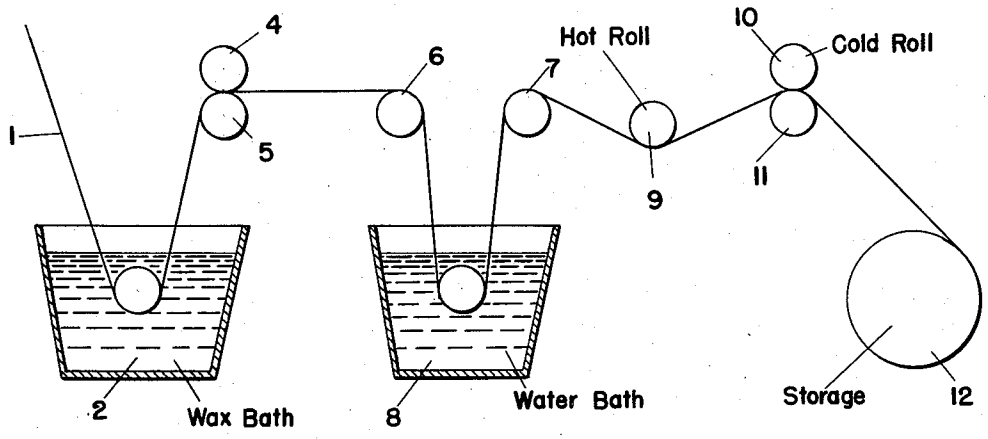
April 14, 1959 J. D. TENCH 2,882,182

METHOD OF PREPARING A WAX COATED FIBROUS SHEET MATERIAL

Filed Aug. 30, 1955

Fig. 1



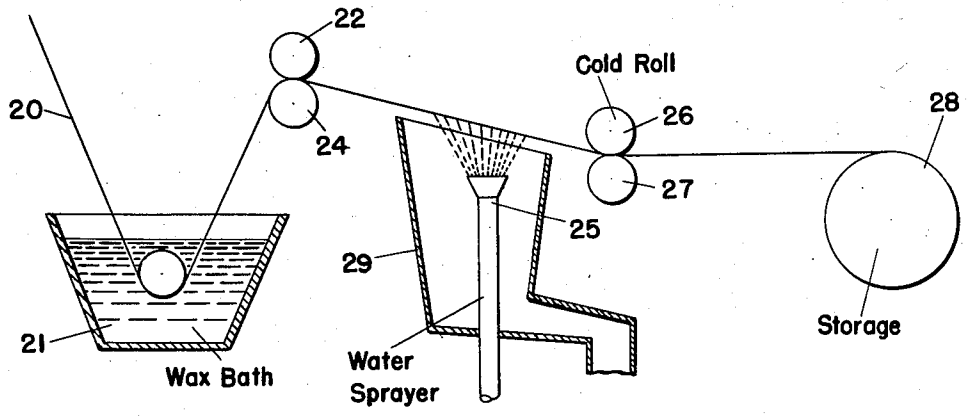


Fig. 2

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METHOD OF PREPARING A WAX COATED FIBROUS SHEET MATERIAL

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3 Claims. (Cl. 117—64)

This invention relates to wax coated fibrous sheet materials and to processes for applying wax coatings to fibrous sheet materials. More particularly the invention relates to a process for applying wax coatings to fibrous sheet materials such as paper so that a product having high gloss and high water vapor resistance are obtained.

Waxes and wax compositions have long been used to coat paper and the like. Two methods for coating have generally heretofore been used. In one method molten wax is applied to sheet material and the molten wax relatively slowly solidified such as by passing the sheet material containing molten wax over chilled rolls. Coated sheet material so prepared has good water vapor resistance but exhibits poor gloss and is not resistant to scuffing. Hence the resulting product suffers serious drawbacks when used in wrapping products such as cereals, breads, frozen foods, and the like. Another method for applying wax coatings to sheet material is to apply molten wax to the sheet material and rapidly solidify the wax to solid state such as by shock chilling, e.g., by passing the sheet material containing molten wax through a water bath. The products so prepared generally exhibit good gloss and resistance to scuffing, but do not have good water vapor resistance. Hence the resulting product also suffers serious disadvantages when used as above described in that the wrapped products, such as cereals, absorb moisture which passes through the wax coated sheet material.

By "water vapor resistance," and terms of similar import as used herein, is meant the resistance of the coated material to the passage of water vapor therethrough, and is measured as the quantity of water in grams passing through a square meter of coated material in 24 hours from an atmosphere of about 90% humidity to an atmosphere of about 5% humidity, the temperature being maintained at about 100° F. (TAPPI test T464m–45). As illustrative of the water vapor resistance of the coating products heretofore prepared as above described, the product having good resistance to water vapor will generally permit from 0.5 to 5.0 grams of water to pass through a square meter of material in 24 hours, whereas the material having poor water vapor resistance will generally permit from 20 to 30 grams of water to pass in the same test.

An object of the invention is to provide a process for applying wax coatings to fibrous sheet materials to produce a coated sheet material having on one side thereof a wax coating of high gloss and on the opposite side a wax coating having high water vapor resistance. A further object is to provide as a new article of manufacture a fibrous sheet material having on one side a wax coating of high gloss and good scuff resistance and on the opposite side a wax coating of high water vapor resistance. Another object is to provide a wax coated laminated fibrous sheet material having on one or both sides a wax coating of high gloss, with the intercalated wax film providing a wax coating of high water vapor resistance. Other objects and their achievement, in accordance with the invention will be apparent from the following specification.

It has now been found that a wax coated sheet material having high gloss and good water vapor resistance can be prepared by coating both sides of a sheet material with molten wax and thereafter separately controlling the rate of cooling of the molten wax on the opposite sides of the coated sheet material. The molten wax on one side is rapidly solidified to provide a wax coating of high gloss, while the wax on the opposite side is relatively slowly solidified to provide a wax coating of high water vapor resistance. The resulting coated sheet material is especially suitable for wrapping materials such as cereals, breads, frozen foods, and the like, the side of the coated sheet material having high gloss being on the outside of the package. This presents a high gloss surface, having good sales appeal and resistance to scuffing on the package outside, and high resistance to passage of moisture vapor is obtained.

Figures 1 and 2 are somewhat schematic diagrams illustrating embodiments of the invention, and are described hereinafter.

In accordance with an embodiment of the invention a fibrous sheet material is continuously passed through a bath of molten wax. Fibrous sheet materials such as opaque bread-wrap stock, freezer-wrap stock, and the like, which are generally from 18 to 50 pounds per ream, give good results. The wax load carried by the sheet material is preferably adjusted to a desired value by appropriate means such as by passage through appropriate rolls to squeeze off excess wax. Generally a wax load of from about 13 to 16 pounds per ream gives good results. The wax coated sheet material is then passed through a water bath maintained at a temperature so that the molten wax is rapidly completely solidified. It will be understood that partial solidification of the wax may occur on passage of the sheet material from the wax bath to the water bath. The sheet material containing the solidified wax coating is then passed adjacent heat means such as a hot roll, infra-red lamp, or the like, so that the wax coating on one side is converted at least in part to the molten state. Because wax is a poor heat conductor, the wax coating on the opposite side is not affected by this application of heat. The rate of cooling of the molten wax is controlled so that it is relatively slowly cooled, such as by contact with air or by contacting with a cold roll or a combination of such means. It is preferred to partially solidify the wax in air and then pass in contact with a cold roll to complete the solidification. By this operation the resulting wax coated sheet material exhibits a wax coating on one side having high gloss and good scuff resistance, while the opposite side exhibits a wax coating having high water vapor resistance.

In another embodiment of the process molten wax is applied to both sides of a fibrous sheet material such as by passing a sheet material through a bath of molten wax. The wax load carried by the sheet material is adjusted to a desired value by appropriate means such as by passage through rolls to squeeze off excess wax. The wax coating on one side of the sheet material is then rapidly cooled, the rate of cooling being regulated by contacting with water such as by applying a water spray thereto. It will be understood that the molten wax may partially solidify in passing from the wax bath to the spray, but that the spray rapidly completes solidification of the wax on the side of the fibrous material which it contacts. The wax coating on the opposite side is then cooled slowly by regulating the rate of cooling such as by contact with air or by passage in contact with a cold roll, or by a combination of such means. The resulting wax-coated product has the same characteristics and properties as above described.

Attention is now directed to the accompanying figures which illustrate embodiments of the invention.

In Figure 1, numeral 1 indicates a fibrous sheet material passing through molten wax bath 2. The wax load is adjusted by passage through rolls 4 and 5 although other means can be used if desired. The coated sheet material then passes over roll 6, provided for convenience, and through water bath 8 wherein the molten wax coatings, which may have been partially solidified in passage from wax bath 2 to water bath 8, is completely and rapidly solidified. The temperature of the water is maintained at a value appropriate to effect such conversion at a desired rate. From water bath 8 the sheet material passes over roll 7, provided for convenience, and then passes with one side in contact with hot roll 9. Hot roll 9 melts at least a portion of the wax on the contacted side, and preferably melts a major portion of the wax on such side. This operation is performed so that the wax coating on the opposite side is not appreciably affected. Thereafter the sheet material passes in contact with cold roll 10. An additional roll 11 is provided for convenience and such additional roll may also be a cold roll. It will be understood that in passage from hot roll 9 to cold roll 10 the wax, which is at least in part in the molten state, may partially solidify, and cold roll 10 be provided to complete the solidification. From the cold roll operation the resulting product is passed to storage 12.

Figure 2 illustrates another embodiment of the invention in which figure 20 represents a fibrous sheet material passing through molten wax bath 21. Rolls 22 and 24 provide adjustment of the wax load carried by the sheet material. The coated sheet material is passed over sprayer 25, conveniently located in container 29, so that a spray of water is directed against the underside of the coated sheet material. The wax on the sheet material contacting the water spray is rapidly solidified to solid form, but it will be understood that solidification may occur in part in passage from the wax bath to the water spray. Container 29 is conveniently provided to collect and remove water after its application to the sheet material. Thereafter the sheet material passes in contact with cold roll 26. Roll 27 is provided for convenience and may also be a cold roll. It will again be understood that the wax on the side opposite the water spray may be solidified in part in passage from the wax bath to cold roll 26, and that cold roll 26 completely solidifies the wax on such side. From cold roll 26 the coated sheet material passes to storage 28. The resulting product exhibits the characteristics and properties above described.

Both paraffin waxes and microcrystalline waxes, and blends thereof, can be employed in the process of the invention. Other materials can be blended with the paraffin wax, the microcrystalline wax, or blends thereof, in order to obtain particularly advantageous results. Such added materials for example can advantageously be polyethylene, polyisobutylene, resins, butyl rubber and the like.

In order to illustrate a preferred mode of carrying out the process of the invention, a sheet of opaque bread-wrap stock (25 pounds per ream) is continuously passed through a bath of molten wax containing 45 parts of a paraffin wax having a melting point of about 142° F., 50 parts of a microcrystalline wax having a melting point of about 170° F., and about 5 parts of polyethylene having a molecular weight of about 12,000. The temperature of the bath is advantageously maintained, in this instance, at about 210° F. From the wax bath the sheet material is passed through rollers to adjust the wax load thereon to a value of about 14 pounds per ream. The sheet material is then passed through a water bath maintained at a temperature of about 40° F. wherein the wax is rapidly completely solidified. One side of the sheet material is then continuously contacted with a hot roll maintained at a temperature of about 175° F. so that a major portion of the wax on the contacting side is converted to the molten state. The sheet material then passes in contact with a cold roll so that the wax so-converted to the molten state is relatively slowly solidified. It is advantageous, however, to permit the molten wax coating from the hot roll contacting to partially solidify before contacting with the cold roll so that wax will not adhere to the cold roll. From the cold roll the hot material is passed to storage.

It will be understood that a multiplicity of hot rolls, cold rolls, and additional rolls for convenience in passing the sheet material to the several operations can be used and such use is within the scope of those skilled in the art. It will also be understood that the temperature of the wax bath, of the water bath, the time of immersion in such baths, the temperature of the water spray, the speed with which the sheet material moves through the several operations, and the like, can be related to secure especially advantageous results.

Laminated sheet materials can be prepared in accordance with a further embodiment of the invention. Preferably such laminated materials have a wax coating of high gloss on an outside surface and a film of wax providing high water vapor resistance as the laminant. A preferred process of preparing the laminated material is to coat a sheet material with molten wax and rapidly solidfy the wax such as by passage through a water bath. This produces a product having high gloss but low water vapor resistance, as above described. The so-coated fibrous sheet material is then passed adjacent heat means, such as in contact with a hot roll, to melt a major portion of wax on the contacting side. A second sheet of fibrous material is then applied to the surface of the wax coated sheet material bearing the molten wax. The laminated article is then relatively slowly cooled, such as by contacting with a cold roll, to produce an intercalated wax film of high water vapor resistance. The final laminated product hence has a wax coating of high gloss on one side and an intercalated wax film of high water vapor resistance. The outside surface of the laminated article opposite the surface having a wax coating of high gloss may also have a wax coating if desired, which may be of high gloss or high water vapor resistance, such coatings being prepared as herein described. The laminated products of the invention as especially valuable for the purposes of the coated sheet materials of the invention, as above described.

The invention claimed is:

1. Process for preparing a wax coated fibrous sheet material having on one side a wax coating of high gloss and on the opposite side a wax coating of high water vapor resistance which comprises: (A) passing said sheet material through a molten wax bath whereby coatings of molten wax adhere to each side thereof, (B) passing the so-coated sheet material through a water bath to solidify rapidly the wax coatings, (C) passing the sheet material having coatings of solid wax on each side thereof adjacent a heat source whereby the wax of the wax coating on one side is converted at least in part to the molten state, (D) passing the sheet material adjacent controlled cooling means to solidify slowly the wax of the wax coating converted at least in part to the molten state to produce a wax coated fibrous sheet material having on one side a wax coating of high gloss and on the opposite side a wax coating of high water vapor resistance.

2. Process for preparing a wax coated fibrous sheet material having on one side a wax coating of high gloss and on the opposite side a wax coating of high water vapor resistance which comprises: (A) passing a sheet material through a molten wax bath whereby coatings of molten wax adhere to each side thereof, (B) passing the so-coated sheet material through a water bath to solidify rapidly the wax coatings, (C) passing the sheet material having coatings of solid wax on each side thereof in contact with a hot roll whereby the wax of the wax coating contacting said hot roll is converted at least in

part to the molten state, (D) passing the resulting sheet material in contact with a cold roll to solidify slowly the wax of the wax coating converted at least in part to the molten state to produce a wax coated fibrous sheet material having on one side a wax coating of high gloss and on the opposite side a wax coating of high water vapor resistance.

3. Process for preparing a wax coated fibrous sheet material having on one side a wax coating of high gloss and on the opposite side a wax coating of high water vapor resistance which comprises: (A) passing a sheet material through a molten wax bath whereby coatings of molten wax adhere to each side thereof, (B) applying water to one side of the so-coated sheet material to solidify rapidly the wax on such side, (C) passing the other side of the sheet material adjacent controlled cooling means whereby the wax on such other side is slowly solidified to produce a wax coated fibrous sheet material having on one side a wax coating of high gloss and on the opposite side a wax coating of high water vapor resistance.

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