

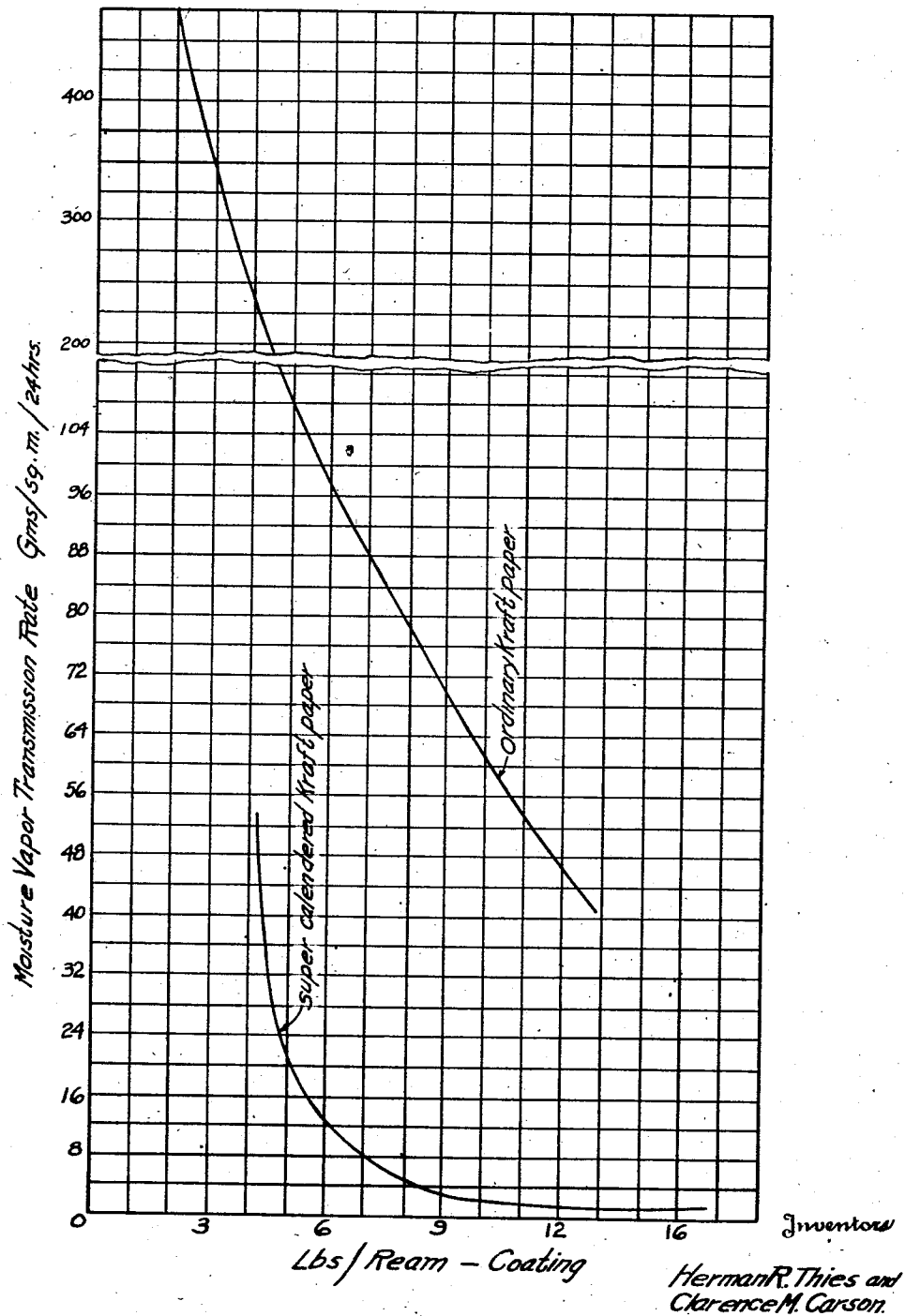
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MOISTUREPROOFED KRAFT PAPER

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MOISTUREPROOFED KRAFT PAPER

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Although kraft paper has been widely used in wrapping, etc. it has been impossible to moisture-proof this paper commercially with a moisture-proofing lacquer, because it is so absorbent that it cannot be coated economically. It requires so much coating per square foot that the cost of the coated sheet is prohibitively high. Moreover, the sheet is stiffened by the amount of coating required. A moistureproof product has been made by uniting two sheets of kraft paper with a layer of asphalt, but the number of places where such a sheet can be used is limited.

For some time there has been a water-finished kraft on the market, and this has sometimes been referred to as a calendered kraft. Even after this treatment the kraft is so absorbent that it is impractical to coat it with a moistureproofing lacquer.

According to this invention kraft paper is super-calendered, i. e., it is passed through a high pressure, hot calender, such as, for example, a calender of the type ordinarily employed for glassine paper, and this super-calendered kraft is then coated with a moistureproofing lacquer. Because such calendering tends to embrittle the paper a plasticizer such as glycerine, etc. may be added to it to keep its moisture content up. Super-calendered kraft has such a glaze on its surface that its power of absorbing liquids is greatly reduced. A few pounds of a moisture-proofing lacquer per ream of paper will render this type of kraft very resistant to the passage of water-vapor. The paper itself is cheap, and it can be super-calendered for not more than one cent per pound, and because it can be made moistureproof by a very thin coating of lacquer, a low cost moistureproof sheet is obtained which has a wide range of usefulness.

Moistureproof super-calendered kraft is immediately replacing more expensive materials and is being used where paper products have not heretofore been employed, because no moisture-proof paper of sufficient strength was available. The combination of high strength and moisture-proofness of the type produced by a lacquer coating has not heretofore been available in a paper product. Many uses for this new sheet have already been found. For example, it may be used where metal foils are now used, as, for example, in the insulation of telephone cables and in wrap-

ping of photographic films, etc. It may be used as a liner for barrels and for strawboard cartons and for freight cars, etc. It may be used as the inner ply of multiple-ply kraft bags, such as those used for packaging salt, lime, calcium sulphate, calcium chloride and other hygroscopic chemicals, etc. It may be used for wrapping automobile or airplane parts for export. There are numerous possible uses for it where it is desired either to keep moisture in a packaged product or to protect a packaged product from the moisture vapor in the atmosphere.

There are various grades of kraft on the market. Any of these may be super-calendered and lacquered to form the moisture-proof sheet of this invention. By holding a sheet of kraft paper to the light it will be observed that in certain of them the fibers are bunched together whereas in others the fibers are more uniformly distributed. The degree of distribution of the fibers is determined by the treatment of the pulp in the beater. A kraft in which the fibers are more evenly distributed than in ordinary kraft requires less lacquer per ream to produce any desired moisture resistance; and is therefore preferred in making the moisture proof sheet of this invention. The weight of the sheet which is lacquered may vary. For example, it may be twenty or sixty pounds, more or less, per three-thousand square foot ream. Both bleached and white super-calendered kraft may be used.

A wide variety of coating materials may be used for moistureproofing. Wax alone is unsatisfactory, because it cracks when the paper is wrinkled or creased. Wax may be used advantageously with a film-forming lacquer, such as a cellulosic product, e. g., nitrocellulose; or a rubber derivative, e. g., Marbon B, the product manufactured by the Marbon Corporation of Gary, Indiana, which is made by dissolving rubber in cresol and treating the solution with hydrogen chloride as described in McKenzie United States Patent No. 2,230,359; or a cyclized rubber such as one of the moistureproofing Pliolite compositions, sold by The Goodyear Tire & Rubber Company of Akron, Ohio (which may be made by treating rubber with chlorostannic acid or tin tetrachloride as described in Endres United States Patent No. 2,052,391). A chlorinated rubber, such as Parlon, etc., or rubber hydrochloride

may be used as the moistureproofing coating. Isolac (phenol sulphonic acid derivative of rubber) may be used where its reddish color is not objectionable. A coating of a synthetic material, such as a polyvinyl derivative may be used. Other coatings which may be used include ethyl cellulose, etc. Although the film-forming materials may be used without wax a more moisture-proof product will ordinarily be obtained by compounding wax with the film-forming material. Fusible coatings such as those of high wax content may be applied by the hot-melt method. The invention relates more particularly to the use of non-fusible coatings which must be applied in solution.

The following coating compositions when applied to a super-calendered kraft in an amount (on the dry basis) of several pounds per ream, not exceeding about ten or twelve pounds per ream and in some cases not over four or five pounds per ream, will give a coated product of very low moisture transmission. The sheet is preferably coated on both sides, but may be coated on only one side. For example, three to nine pounds of the coatings of Examples 2, 3 and 4, below, one-half applied to each side of a super-calendered kraft, give a moisture transmission as low as one to six grams. The coating is preferably applied as a lacquer, and in driving off the solvent the coating in each instance should be heated to a temperature sufficient to dissolve the wax.

The accompanying graph shows the relative moistureproofness of ordinary kraft paper and super-calendered kraft to which varying amounts of a moistureproofing lacquer were applied. In treating both sheets, an equal amount of the lacquer was applied to each side of the sheet. The moisture-vapor transfer rate of ordinary kraft, uncoated, is several thousand grams per square meter in twenty-four hours. It will be noted that the lacquer coating reduces this very appreciably, but due to recent improvements in technique a moisture-vapor transfer rate of no more than eight grams per square meter per twenty-four hours is now demanded for many uses. This low transfer rate cannot be obtained by coating ordinary kraft. The cost of the amount of lacquer required makes such a procedure unprofitable, and impregnation and coating with such a large amount of lacquer yields a stiff sheet not suited for uses to which the uncoated sheet is adapted. The upper curve shows the effect on the moisture-vapor transfer rate produced by applying different weights of a lacquer coating to both sides of such a sheet.

The lower curve shows the results of a comparable treatment of super-calendered kraft. The super-calendered surface retards penetration or absorption of the lacquer by the kraft, and this facilitates the formation of a skin coating of the lacquer on the surface of the sheet. By retarding penetration and confining the lacquer coating to the surface of the sheet the super-calendered surface produces a skin coating from much less lacquer than is required for the production of a comparable coating on ordinary kraft. Equal amounts of lacquer produce a much more impervious coating on the super-calendered sheet.

The moisture-vapor transmissions specified herein are determined by measuring the rate of moisture transfer between atmospheres of no humidity and one hundred per cent humidity, respectively, at 40° C. for twenty-four hours. The

moisture transmission is expressed in grams per square meter per twenty-four hours.

The following examples are illustrative:

Example 1

	Parts
Cyclized rubber (Pliolite with a distortion point of 55° C.)	15
Paraffin, 134° F.	15
Toluol	70

This formula is designed for use where a non glossy coating is desired.

Example 2

	Parts
Cyclized rubber (Pliolite with distortion point 55° C.)	18.7
Paraffin, 134° F.	3.3
Toluol	78.0

Example 3

	Parts
Cyclized rubber (Pliolite with a distortion point of 25° C.)	18.00
Paraffin, 150° F.	1.80
Antioxidant (monobenzyl para amino phenol)	.72
Toluol	79.48

This coating heat-seals when heated at about 200°-250° F.

Example 4

	Parts
Partially oxidized cyclized rubber (Pliolite, P-1230)	18.7
Paraffin, 134° F.	3.3
White petrolatum (petroleum jelly)	1.0
Toluol	77.0

This coating heat-seals at 300-400° F.

All of these formulas may be modified by using any other paraffin than those specified. Using a higher melting point paraffin there is less tendency for the treated paper to stick together in the roll.

A small amount, e. g., 0.75 part of the reaction product of tetraethylene pentamine and formaldehyde (either paraformaldehyde or Formalin) added to the composition of Example 1, 2, 3 or 4 with either type of paraffin gives a coating which maintains high moisture resistance over a much longer time than the identical Pliolite coating which contains no antioxidant or stabilizer for the cyclized rubber. This particular stabilizer and related compounds such as other aldehyde and ketone derivatives of polyalkylene polyamines are not affected by heat and therefore withstand accelerated oven-aging tests as well as giving prolonged life under normal aging conditions.

A large number of other materials may be compounded with Pliolite and wax to form satisfactory coatings for specific purposes. For instance, suitable coatings may be made using one to twenty-five per cent of such resins as ester gum, cumar, polymerized terpenes, cyclohexanone, Aroclors and rosin esters added as diluents or as gloss producers; and such plasticizers as diamyl naphthalene, tricresyl phosphate, dibutyl sebacate, mineral oil, paraffin oil and many similar liquids may be used in proportions from one to twenty per cent for specific purposes.

Pigments, dyes, etc. may be added to the coatings to produce desired colored effects, although in general colorless, transparent coatings will be preferred.

The same general formulations as in Examples 1 to 4 may be used with the other moistureproofing resins. With Marbon B or Isolac ten to fifteen per cent of paraffin wax may be used. Not over ten per cent of paraffin will ordinarily be used with Parlon.

Example 5 -

	Parts
Ethocel (8 cps.)	10.0
Paraffin	1.5
Castor oil	1.0
Toluol	57.5
Amyl acetate	30.0

All of these solutions may be applied on a conventional type coating machine in which the paper is passed through a tank containing the coating solution, thence over doctor knives or rolls to remove the excess and thence through a drying chamber to remove the solvent. The coated paper may then be rolled up on a shell for storage.

What we claim is:

1. Super-calendered kraft paper skin coated with a moistureproof coating deposited from a

solvent, the kraft being super-calendered to confine the coating to the super-calendered surface and being plasticized to keep its moisture content up.

2. Super-calendered kraft paper coated with a moisture-proof lacquer coating of cyclized rubber, the paper being super-calendered to confine the coating to the super-calendered surface and being plasticized to keep its moisture content up.

3. A moisture-vapor-proof wrapping material consisting of super-calendered kraft paper with a moisture-vapor-proof lacquer skin coating thereon, the paper being super-calendered to confine the coating to the super-calendered surface and being plasticized to keep its moisture content up.

4. A moisture-vapor-proof wrapping material consisting of super-calendered kraft paper with a moistureproof lacquer skin coating of cyclized rubber thereon, the paper being super-calendered to confine the coating to the super-calendered surface and being plasticized to keep its moisture content up.

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