

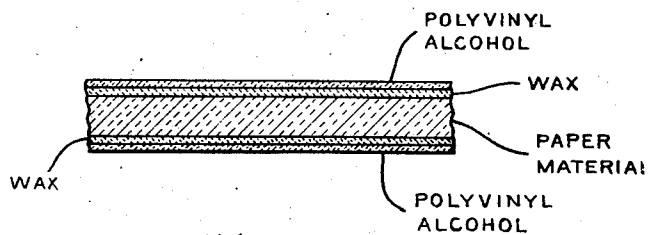
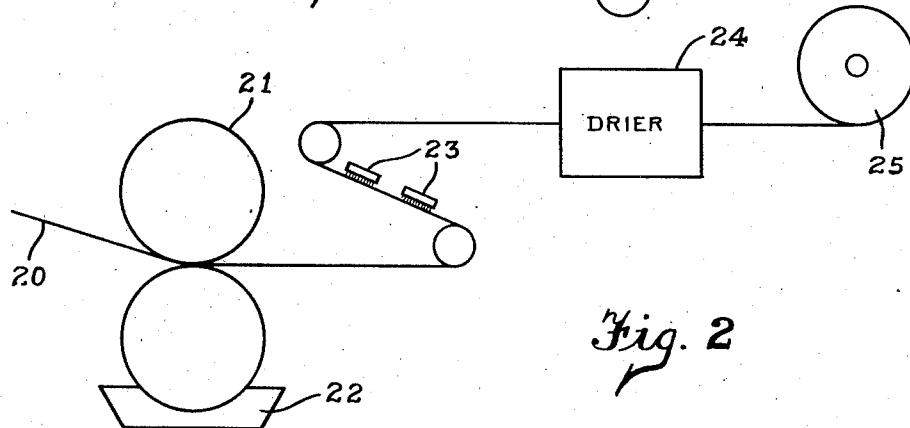
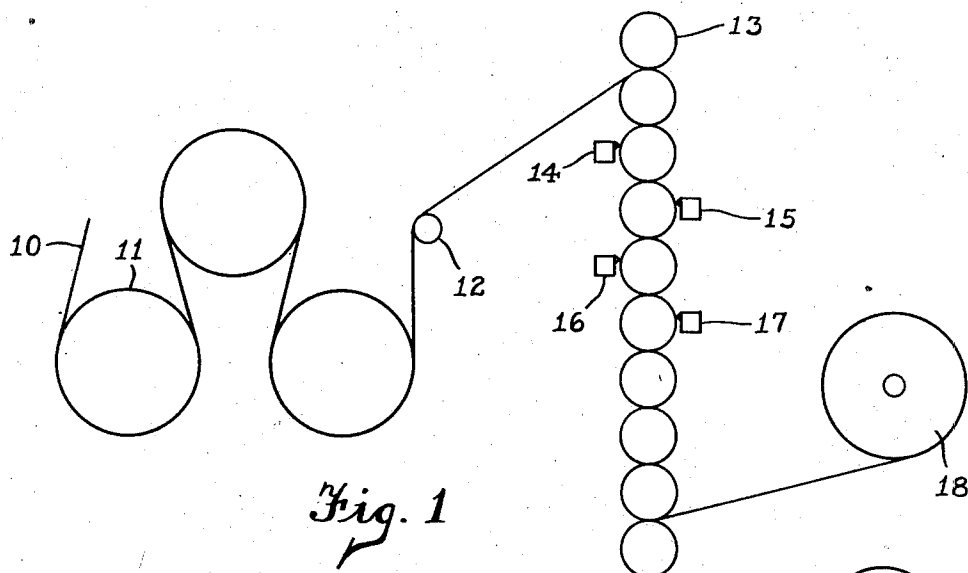
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PAPER MANUFACTURE

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PAPER MANUFACTURE

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5 Claims. (Cl. 92-40)

This invention relates to paper and more particularly to the manufacture of paperboard.

It is a principal object of the invention to provide an inexpensive sheet of paperboard which is both greaseproof and highly resistant to the passage of moisture and suitable for use in the manufacture of cartons, containers and the like.

It is also an object to provide a simple and economical process for the production of such a sheet of paper.

It is a further object to provide a process for effecting the application of a coating of moisture-proof wax material and of a film-forming greaseproof material under such conditions that each coating is formed and maintained essentially impervious and without deleterious reaction as a result of the application of the other coating.

It is a further object to provide such a process which may be carried out in highly economical manner on the paper machine.

Other objects and advantages will be apparent from the following description, the accompanying drawing, and the appended claims.

In the drawing,

Fig. 1 is a view showing diagrammatically the preferred manner of carrying out the present invention as a part of the continuous paper making operation;

Fig. 2 is a diagrammatic view showing the carrying out of the invention after the web leaves the paper machine; and

Fig. 3 is an enlarged sectional view through a sheet of paper material produced in accordance with the present invention.

Where it is desired to provide a sheet of paper material having properties of both grease and moistureproofness through the use of coating materials, it has usually been customary for the greaseproofing qualities to be developed by means of solutions incorporating the use of organic solvents. Such solvents, however, have a decided effect upon paraffin wax, a material which is available inexpensively, and which is highly useful for providing resistance to penetration of moisture.

In accordance with the present invention a sheet of paper is produced which has such characteristics that both high moistureproofness and high resistance to the penetration of grease are developed, and without the use of solvents for the application of the greaseproof coating such as would deleteriously affect the formation of an impervious moistureproofing film of wax. The solvent utilized for the application of the greaseproof coating is water, and provision is made for

completely forming the sheet while on the paper machine, and as a part of the regular paper forming operations.

In the practicing of the invention a sheet of paperboard is formed in the normal manner upon a cylinder forming machine and after being suitably dried is brought to the calender zone where it is passed through the usual machine calendars. To provide the desired high degree of resistance to penetration of moisture, a wax such as paraffin wax is applied to the sheet and uniformly and homogeneously spread thereover in the form of an impervious surfacing film completely laying the fuzz on the sheet and forming an impervious film free of pin holes and the like so that the passage of moisture is retarded or prevented. In order to provide for the simple and inexpensive application of such wax to the sheet, it is preferably applied in the form of an aqueous emulsion of paraffin wax. Such an emulsion is applied by means of press rolls located in the drier section or is supplied to the calender boxes on the calender stack. The particles of paraffin are deposited primarily upon the surface of the sheet, the suspending medium being absorbed into the body of the sheet, and under the elevated temperature condition usually utilized in the calendaring operation, the particles of wax are readily fluxed and coalesce to form a complete film as described.

Immediately following such application of paraffin, a solution is applied to the sheet which will provide the desired high qualities of resistance to the penetration of grease; the solvent for such material being water and thus adapted to be handled directly on the paper machine. The material so utilized for the production of the greaseproof surfacing film is one which is soluble or colloiddally soluble in water and preferably comprises a water solution of polyvinyl alcohol, a polymerized organic compound which is soluble in water to give a clear solution, and which has excellent film-forming properties when applied to a sheet of paper material. This material may be made up in water solution containing 5 to 25 parts by weight with approximately 95 to 75 parts of water, to give a solution having the thickness and spreading characteristics as desired.

It is likewise subject to being plasticized by means of the incorporation of varying quantities of plasticizing agents. For example, varying degrees of plasticity and flexibility of the formed film may be secured by incorporating varying amounts of glycerin, for example up to about

eight parts by weight to each ten parts of polyvinyl alcohol in the formula above given.

Such a solution may be conveniently applied in the form of a thin film, to the surface of a sheet of paper immediately following its continuous formation on the paper machine and before the final machine calendering operation, thereby greatly simplifying the process of production, and avoiding the necessity for a separate step to effect the coating of a previously formed sheet. Since the solvent is water, it may be handled directly on the paper machine where the suspending medium normally used in the formation of a sheet is likewise water.

Such a solution may be conveniently applied in the form of a thin rapidly-developing impervious film to the waxed surface of the sheet of paper. The film is developed rapidly, and hence such solution may be supplied to one of the water boxes on the calender stack, the high pressure under which the calenders operate providing for the application of a thin film having great covering power. If added greaseproofness is desired, subsequent calender boxes may be similarly provided with the solution, thereby effecting the application of multiple coats in immediate succession. Application of moisture in excess in the calender zone tends to cause it to wrap the calender, and hence it is usually found desirable to effect not more than three such applications of polyvinyl alcohol solution of 15% consistency in immediate succession. However, if desired the sheet may be removed from the paper machine and a further and heavier application of surfacing film of polyvinyl alcohol effected thereon by means of coating rolls, press rolls, brushes, and the like.

Since the greaseproof surfacing film is applied through the utilization of an aqueous solvent, entirely eliminating the necessity for an organic solvent, the application of the surfacing film over the wax coating does not deleteriously affect the impervious wax coating in any way, even a thin wax coating remaining substantially unaffected in the presence of an overlying coating of the character of and applied in the manner described herein. Similarly if desired an additional overlying wax coating may be applied over the greaseproof surfacing film. Where for example it is desired to have a highly moisture resistant outer surface, coupled with adequate grease resistance, a further wax emulsion application may be effected upon the surface of the film of polyvinyl alcohol material applied as described above.

In addition to utilization of wax alone, there may be incorporated along therewith a material adapted to provide properties of grease resistance thereto, such as a proteinaceous material, in greater or less degree depending upon the relative importance for the product desired of having high moistureproofness or high grease resistance. Where higher greaseproofness is desired with somewhat reduced moistureproofness the proportion of protein to paraffin may be increased for example up to three parts by weight of protein to one of paraffin; and where lesser greaseproofness with a high degree of moistureproofness is desired, the proportion of paraffin to protein may be increased for example up to about three to one, or even to the complete elimination of protein.

Referring to the drawing, Fig. 1 shows the carrying out of the invention upon the paper machine, the newly formed web 10 passing through the usual paper machine driers 11, over guide roll 12, and into the machine calender 13.

A suspension of wax emulsion is supplied to water boxes 14 and 15 for application to the two sides of the sheet. Thereafter a solution of polyvinyl alcohol is applied to the two sides of the sheet by supplying such solution to water boxes 16 and 17, additional such means being utilized for successive coating applications, if desired. The sheet is then wound upon roll 18 in condition ready for use.

Fig. 2 shows the arrangement in which a coating of polyvinyl alcohol is applied after the web leaves the paper machine. Here the formed web 20 passes through a pair of nip rolls 21, the lower roll of which dips within a trough 22, picking up the coating solution on its surface and transferring a thin, uniform film thereof to the sheet. Such coating is smoothed and brushed by suitable means 23, and is then dried in drier 24 and wound upon roll 25.

As a specific example showing the preferred manner of practicing the present invention, a white patent coated news backboard having a caliper of .016 inch is treated either on the paper machine during formation or on a separate coating machine following the formation of the sheet with two applications of a wax size of a consistency of 20% solids comprising three parts of 125 meltpoint paraffin wax to one part of protein, and emulsified in water. When applied at the calender, the emulsion is supplied to two of the calender water boxes. Where applied by a size press or other coating device each coat is brushed by the usual brushing operation and dried as on heated dryer rolls or in a heated tunnel by circulating air. In either case a smooth impervious film of wax is provided as a surface sizing. Thereafter the wax sized sheet is given a top coating of a plasticized solution of polyvinyl alcohol and water of 15% consistency by means of a spreader bar, application rolls or the like, or at a subsequent calender water box. Such sheet provides a product of high grease and oil resistance and likewise highly resistant to the passage of moisture, each layer of the composite coating being applied and maintained individually and without deleterious reaction from the other.

While the processes and products herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise processes and products, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A sheet of paper material of the character described having properties of resistance to penetration of both grease and moisture, said sheet having a composite coating thereon each constituent of which is applied and maintained as an impervious surface film irrespective of and without being affected by the other, said coatings including a wax surface sizing film applied as an aqueous emulsion and adapted to provide moistureproofness, and a separately applied overlying film having high greaseproofness and consisting of an aqueous solution of polyvinyl alcohol leaving the wax sizing film substantially intact and adhering to the waxed surface of the sheet to provide a continuous overlying greaseproof film.

2. A process of producing a sheet of paper material having characteristics of resistance to penetration of both grease and moisture which comprises wax sizing said sheet of paper through application of an aqueous emulsion of paraffin

wax to the surface of the sheet under pressure to form a thin film thereon capable of being wetted by an aqueous medium and thereafter applying to the sized surface of the sheet a solution of polyvinyl alcohol in an aqueous solvent adapted to wet the sized surface forming an impervious overlying greaseproof surface film leaving the wax surface film substantially intact.

3. A process of producing a sheet of paper material having retained characteristics of resistance to penetration of both grease and moisture which comprises forming a thin surface film of wax on said sheet of paper through application under pressure of an emulsion of paraffin wax and thereafter applying uniformly to the waxed surface of the sheet a solution of polyvinyl alcohol in an aqueous solvent for grease-proofing and an overlying surface coating of wax on said greaseproof surfacing.

4. A process of forming a sheet of paper having characteristics of resistance to penetration of both grease and moisture which comprises forming a sheet of paper on a forming machine, drying the sheet and without stopping the sheet movement, submitting the sheet to a calendering operation, and during the calendering operation effecting the application of a wax emulsion under

pressure to the surface of the sheet to form a continuous surface application of wax capable of being uniformly wetted by an aqueous medium, and effecting the application of a surface coating layer of polyvinyl alcohol to the waxed sheet from an aqueous solution thereof, the aqueous solvent wetting the waxed surface of the sheet and forming a continuous and substantially homogeneous greaseproofing film thereon.

5. A process of forming a sheet of paper having characteristics of resistance to penetration of both grease and moisture which comprises forming a sheet of paper on a forming machine, drying the sheet and without stopping the sheet movement, submitting the sheet to a calendering operation, and during the calendering operation effecting the application of a wax size to the surface of the sheet from an aqueous suspension of wax under pressure forming a waxed surface on the sheet capable of being wetted and effecting the application of a surface coating layer of polyvinyl alcohol to the waxed sheet from an aqueous solution thereof, said solution wetting the waxed surface to form a continuous overlying film of polyvinyl alcohol thereon.

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