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MANUFACTURE OF MULTI-PLY PAPER BOARD

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This invention relates to the manufacture of multi-ply paper board in which a sized and water resisting paper liner is used. The invention resides more particularly in the use of silicate adhesives with sized papers, specifically the rosin sized papers of the Fourdrinier type, which contains the size evenly distributed therethrough, rendering the entire paper very resistant to moisture.

Silicate adhesives have been used almost exclusively in the manufacture of both the corrugated paper and solid fiber boards, and have proved the most desirable adhesive when the liners for the board are made from unsized paper stock or where they are sized only on one side.

With the introduction into the paper board manufacture of the sized paper of the Fourdrinier type, which is now fast supplanting the other types of liners because of its strength, cost, and water resisting properties, difficulty has been experienced with the use of the silicate adhesives.

When used on the paper board machines, it was found that the silicate adhesives would not set quickly enough to form a firm bond between the water resisting liner and the filler in the interval of time after the application of the adhesive and before the board passed through the cutters. The cutter would disrupt the bond at a time when the silicate was still wet, yet when it had reached a stage where re-adhesion would not take place.

Various concentrations of silicate were tried, as well as the different kinds of silicates, but only by slowing down the machines to a point where it was commercially impractical could the silicate adhesives be used. In order to get the speed necessary for commercial production, the manufacturers were then forced to revert to the use of glues.

Silicate adhesives are much more desirable than glues in this particular art, where most of this type of paper board is used in making shipping containers, for the reason that the silicate adhesives are odorless, vermin proof, not subject to decay, more resistant to fire, and are cheaper.

It is known that the silicate, when used as an adhesive, functions by losing a certain amount of water. Penetration of the one surface to which the adhesive is applied is not sufficient. When used in the pasting machines, sufficient water must be abstracted from the silicate between the time of its application and when that part reaches the cutter, so that the bond is firm enough to resist the slight strain on the partially cemented layers that are being cut. Where the liner and filler are both unsized paper, the absorption of the water from the adhesive is rapid from both sides of the silicate film. Where the liner is of sized stock and not water absorbent, there is difficulty experienced.

We find that by depositing in the surface of the sized paper liner to which the silicate is to be applied a substance which will aid the sized paper in taking up some of the moisture from the adhesive film or render the fibers of the paper on that surface water absorbent, the silicate will then dry sufficiently fast to permit its use on the paper board machines.

Wetting agents such as the alkali metal salts of alkylated naphthalene sulfonic acids and soluble rosin soaps, which, when dried will readily absorb moisture and also cause the silicate to wet the paper rapidly, have been found to give the desired result when deposited and dried on the surface of the paper. Alkaline substances which will react with the rosin size in the paper to make the rosin size soluble also give the desired result. The alkaline materials, however, unless very carefully used, are apt to weaken the paper structure and usually tend to discolor it, due to the chemical action which takes place.

We have found that by applying a very dilute solution of the sodium salt of isopropyl naphthalene sulfonic acids to the side of the paper to be pasted, and then permitting it to dry on the paper, the silicate adhesive, when later applied, readily penetrates the surface and dries rapidly, effecting the desired bond within the time necessary for it to be used on the paper board machines. Solutions as low as .015% up to .5% of the sodium salt of naphthalene sulfonic acids are sufficient when the one surface of the paper is only slightly moistened with such solution. More concentrated solutions may be used, but are not necessary, and add materially to the cost of the treatment.

The wetting and water absorbing material is preferably applied at the time the paper is made, although it may be applied at any later time. Drying of the wetting agent on the paper liner prior to the application of the silicate is preferred so that more rapid absorption of the water from the silicate will take place, for a slight excess of moisture in the paper at the time the silicate is used retards its time of setting.

The amount of the wetting and absorbing agent applied to the paper should be, preferably, only enough to penetrate the surface so that the size in the body of the paper will not be affected and will retain its water resisting property.

While we have mentioned particularly the alkyl

naphthalene sulfonic acids and soluble rosin soaps, our invention is not limited thereto, for the use of any wetting agent which may be deposited in the surface of the liners, which is preferably non-volatile, and which will aid in the absorption of the water from the silicate adhesive when it is applied, comes within the purview of our invention. The more volatile wetting agents such as the aromatic and terpinic alcohols, when applied to the paper just prior to the application of the silicate, will effect a wetting of the fibers, but due to the added moisture at that time do not give as good results as those which are present in a state in which they aid in abstracting moisture from the silicate, and are, therefore, not as desirable as those compounds which may be left in the paper fiber in substantially dry form.

As further examples of the wetting agents we have found to be useful, may be mentioned butyl-naphthalene sulfonic acid, Turkey red oil, the condensation product of formaldehyde and naphthalene sulfonic acids, abietene sulfonic acids, or a mixture of abietene sulfonic acid and terpineol as disclosed in application Ser. No. 415,789, of Clyde O. Henke, filed December 12, 1929. These compounds may be used in acid, alkaline or neutral solution.

By the term "deposited" as used in the claims, we mean to include mechanical deposition in dry or wet state or the chemical deposition of the material by reacting on the compounds in the paper with some material which forms the desired wetting or water absorbing agent.

We claim:

1. In the manufacture of multi-ply paper board having a water resisting liner, the step of depositing on the inner face of said liner prior to the application of a silicate adhesive thereto, a water soluble wetting agent.

2. In the manufacture of multi-ply paper board having a water resistant liner, the step of applying to the inner face of said liner a water soluble wetting agent, and drying the same thereon prior to the application thereto of a silicate adhesive.

3. In the manufacture of multi-ply paper board having a water resistant liner, on which a silicate adhesive is used, the step of applying to the inner face of said liner a water soluble, solidifiable sulfonic acid compound.

4. In the manufacture of multi-ply paper board having a water resistant liner, on which a silicate adhesive is used, the steps of applying to the inner face of said liner a water soluble, solidifiable sulfonic acid compound in solution and drying the same prior to the application of the adhesive.

5. In the manufacture of multi-ply paper board wherein one or more of the liner plies are sized, the step of depositing on the inner side of the sized liner an alkali-metal salt of an alkyl naphthalene sulfonic acid.

6. In the manufacture of multi-ply paper board wherein one or more of the liner plies are sized, the step of depositing on the inner side of the sized liner an alkali metal salt of an alkyl naphthalene sulfonic acid, and drying the same prior to the application thereto of a silicate adhesive.

7. In the manufacture of multi-ply paper board wherein one or more of the liner plies are sized, the step of applying to the inner side of the sized liner a compound which renders the surface fibers of the liner water absorbent.

8. In the manufacture of multi-ply paper board wherein one or more of the liner plies contain a rosin size, the step of applying to the inner side of the liner an alkaline material which forms a thin water-soluble rosin compound, and drying the same thereon prior to the application of a silicate adhesive.

9. In the manufacture of a multi-ply paper board wherein one or more of the liner plies are sized, the step of rendering the inner side of the liner pervious to moisture, by depositing thereon an alkali salt of rosin acids.

10. A multi-ply paper board comprising at least one sized and water resistant liner having deposited on its inner surface a water soluble wetting agent, the plies being bound together by a silicate adhesive.

11. A sized and water resistant liner for multi-ply paper board having deposited on one side thereof a water-soluble wetting agent.

12. A sized and water resistant liner for multi-ply paper board having deposited on one side thereof a water soluble wetting agent, comprising an alkali metal salt of a naphthalene sulfonic acid.

13. A sized and water resistant liner for multi-ply paper board having deposited on one side thereof a water soluble wetting agent comprising a rosin soap.

14. A water resistant paper sheet having a water soluble wetting agent deposited on one side thereof.

15. A water resistant paper sheet having a water soluble salt of a naphthalene sulfonic acid deposited on one side thereof.

16. A water resistant rosin sized sheet of paper having a dried alkali metal salt of a rosin acid deposited on one side thereof.

17. A homogeneously rosin sized paper liner for paper board manufacture, having deposited on one side thereof the sodium salt of an alkyl naphthalene sulfonic acid.

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