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METHOD OF MAKING A WATERPROOF
FELTED SHEET

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The invention relates to a bonded waterlaid felted fibrous sheet, and particularly pertains to a felted fibrous sheet in which the bonding agent is precipitated upon and around each of the fibers to sheath and encase them within a uniform film covering of bonding material. This material also functions to bond and secure the interlaced fibers in their felted relationship, thereby making it possible to felt a single homogeneous sheet of any desired thickness which is uniform in character throughout its thickness.

The practice heretofore has been to first fabricate a felted sheet and then impregnate same with the bonding material or to incorporate the bonding material in the beater where it is mixed with the fibrous stock in the beating operation, the beaten and bonded pulped mass then being fabricated into a felted sheet. The latter method is preferred over the sheet impregnating method due to the tremendous savings in cost in bonding the paper pulp stock rather than the felted sheet fabricated from the pulp stock. One main objection to bonding the paper pulp stock before felting same into a sheet is that under the present methods the bonding material which is incorporated in the pulp stock is agglomerated therein with the fibers surrounding the agglomerated particles, and thus only a limited amount can be used in view of which the bonded felted sheet is lacking in strength, poorly flexible, imperfectly bonded, and is not of uniform character and quality throughout its thickness. The bonding material is broken up in separated particles which are segregated with separated small mass portions through this pulped mass and in the felt sheet fabricated therefrom.

The aim of this invention is to provide a paper pulp stock in which the individual fibers are encased in a uniform film of bonding material, and in that coated condition are then felted with the bonding material coextensive with the thickness of the felted sheet, and uniformly distributed over the fibers to bond them together in their interlaced felted position and give the felted sheet a uniform and homogeneous character and quality.

The invention generally described comprises forming a beaten pulped mass from a felted stock composed of a feltable fibrous material, preferably organic, a bonding composition, and a material which can be hydrated to form a substantially jelly-like condition and has an affinity or attraction for the feltable fibrous material and also for the bonding composition. These are the essential components of the felt pulp stock.

More specifically described a magnesium silicate of fibrous character, typifying any suitable material which can be hydrated into a substantially jelly-like mass and has high affinity for rubber, is placed in a paper-making beater or other suitable equipment and beaten until it is refined or reduced to a substantially jelly-like condition. For refining the asbestos fiber to this condition, the bars or blades of the beater roll are adjusted to come in contact with each of the bars or blades of the bed plate. The asbestos fiber is beaten with water until very few, if any, of the original fiber-like characteristics of the fibers are retained. Canadian chrysotile or magnesium silicate fiber has very few impurities contained therein and is particularly suitable for being refined to a jelly-like mass of magnesium silicate. This refined material may be conveniently referred to as an inorganic jelly. Some acid, such as sulphuric, hydrochloric, or the like, may, if desired, be added to reduce the asbestos material to this jelly-like condition.

Feltable fibrous pulp stock is added to the jelly-like mass of magnesium silicate in the beater and agitated for being uniformly and intimately mixed therewith, with the jelly-like material coating the fibers of the fibrous pulp stock, which is practically pure cellulose. Other similar feltable fibrous material is suitable. This mixing or beating operation coats each of the feltable fibers with a mono-molecular coating of the inorganic jelly.

Bonding material is incorporated in the beater with inorganic jelly coated feltable fibers. Rubber and various rubber substitutes such as chloroprene, mixed polymers of butadienes and resins, are suitable bonding materials.

Rubber in latex form of water emulsion or dispersion is particularly suitable. Ammonia is mixed with the latex as it comes from the tree to serve as a preservative and stabilizer. Its concentration in this commercial form is about sixty per cent (60%) solids. For use in connection with the present invention, it may be diluted to about twenty per cent (20%) solids, with some vulcanizing and anti-oxidation agents dispersed therein. These agents are preferably uniformly mixed with and distributed through the latex before same is added to the jelly coated cellulose fibers in the beater. A dispersion of sulphur, zinc oxide and anti-oxidant typifies a suitable vulcanizing and anti-oxidant agent. The bonding material in emulsion or dispersion form is preferably slowly added in the beater to be mixed and pre-

precipitated upon the jelly coated fibers while the latter are being agitated. The attraction of the jelly like film of magnesium silicate for the particles of bonding material in this dispersion or emulsion causes this precipitation. Any latex which has not precipitated out on the jelly coated fibers can be forced out of the water on the fibers by incorporating some such material as aluminum sulphate solution. This forces out only those obstinate rubber particles which have not precipitated out on the jelly coating, thereby retaining only those which are distributed upon the fibers.

When the water in the beater is clear, the stock is ready to be felted into a sheet by conventional methods of paper manufacture and vulcanized. The prepared fibrous stock is non-tacky, will not adhere to and gum up the paper making apparatus, and can be handled on conventional paper making machines like any conventional felt stock furnish.

A sample furnish which has been found suitable comprises about three hundred (300) pounds of asbestos fiber, about seven hundred (700) pounds of feltable fibrous stock, about four hundred and eighty (480) pounds of rubber solids, and about sixty (60) pounds of vulcanizing agent. These proportions and materials are merely representative and illustrative and not critical. They may be varied in wide ranges.

The jelly-like condition to which the magnesium silicate is reduced in the presence of water by beating or with acid treatment gives it the quality of being attracted to the cellulose fibers and also attracts the rubber particles in the emulsion. The property of the magnesium silicate in this form acts as an intermediary binder between the rubber and the cellulose fibers and causes the rubber to be deposited in a uniform film around the fibers without agglomerates forming.

The foregoing detailed description and the one preferred formula therein given for carrying out the invention are not to be understood as a limitation, as other equivalent materials may be used and the proportions of same may be varied without departing from the spirit of the invention.

I claim:

1. A method of making a water-proof felted sheet comprising, beating Chrysotile asbestos fibers with water until the mixture is free from fiber-like characteristics and assumes a jelly-like state, mixing with the asbestos water mixture cellulose fibers in a quantity at least twice as great as the amount of asbestos in said mixture whereby to coat the cellulose fibers with asbestos and provide a precipitating agent thereon, mixing rubber latex containing a vulcanizing agent with the asbestos coated cellulose fibers whereby to precipitate rubber in a uniform coating on the coated cellulose fibers, felting the mixture into a sheet, and drying the sheet at an elevated temperature to vulcanize the rubber.

2. The method of making a water-proof felted product which comprises beating Chrysotile asbestos fibers with water until the mixture is free from fiber-like characteristics and assumes a jelly-like state, mixing with the asbestos water mixture cellulose fibers in a quantity substantially greater than the amount of asbestos in said mixture whereby to coat the cellulose fibers with asbestos and provide a precipitating agent thereon, mixing an emulsion of a rubber material with the asbestos coated cellulose fibers whereby to precipitate the rubber material in a uniform coating on the coated cellulose fibers, and felting the mass of rubber material coated fibers.

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