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WATER DISPERSION OF POLYMERIZED STYROL AND PRODUCT MADE THEREFROM

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This invention relates to the production of fibre and meta styrol combinations, more particularly to the provision of such combinations in sheet or slab form.

An object of this invention is to provide a process of producing combinations of fibres and styrol, particularly the polymerized variety whereby the styrol is intimately and uniformly associated with the fibres. A further object is to provide a sheet or slab of fibrous material impregnated with polymerized styrol, particularly the tough variety of meta styrol.

Styrol may be used as such or polymerized to varying degrees of hardness and toughness. The various forms of styrol may be used as is found suitable. Where toughness, increased resistance to fracture, increased electrical resistance or increased resistance to water, acids, bases and mineral oils is desirable the normally tough variety termed alpha meta styrol as disclosed by Ostromislensky's Patent No. 1,683,402 is preferably used. Styrol is a thermo-plastic and this allows molding the sheet or slab into any desired form, for instance such as shoe toe boxes, etc.

Accordingly the invention comprises broadly depositing styrol from a solution or dispersion thereof upon a paper-making fibre in pulp form, removing excess solvent or dispersing liquid and subsequently forming the mass into a sheet or slab by drying and calendering or pressing.

The operations may be carried out with the usual paper-making machinery involving the use of a beater for beating the pulp, prior to adding the styrol, until it has nearly reached the condition required to form a satisfactory sheet on any standard type of paper or board making machinery. The beater itself may be used as an agitator for mixing the fibres and styrol or this may be carried out in other mixing apparatus. After thorough mixing of the solution or dispersion of styrol, the styrol is deposited on the fibres. Where the carrier for the styrol is an organic solvent, the deposition is caused by sheeting the pulp and removing the solvent by the use of heat or vacuum or both. Where an aqueous dispersion of styrol is employed, the styrol is deposited in a uniform manner by adding a coagulant for the styrol. Examples of such coagulants are methyl alcohol, barium chloride, alum, ethyl alcohol, acetone. In general it may be said that all coagulating agents for rubber latex serve to coagulate the styrol dispersion.

Styrol in the form of an aqueous dispersion may be prepared as follows: Into an enclosed mixer are introduced 800 grams of dry polymerized styrol (alpha meta styrol). To this are aded 300 grams of xylol and the mixture agitated until a smooth paste is formed. To this mixture is then added 40 grams of ammonium caseinate in the form of an aqueous paste containing approximately 30% by weight of ammonium caseinate. When this paste has been thoroughly incorporated into the mixture, water is added until the paste reverts into a smooth stable dispersion having the meta styrol as the dispersed phase. Instead of ammonium caseinate, other alkali caseinates may be used such as the sodium caseinate. Also instead of the caseinates as protective colloids, soaps of the higher fatty acids may be used such as sodium oleate, ammonium oleate, etc. The fibres are made highly resistant to water because the alkali salt or soaps are largely converted into water insoluble compounds upon reaction with coagulants such as those containing heavy metals and deposited with the styrol. Where the coagulant affects principally the styrol and an ammonium salt or soap is used, parts of this soap or salt may be caused to remain with the fibres so that the subsequent drying where heat is employed will remove the volatile constituent ammonia, leaving a residue also contributing to the fibre increased resistance to water.

The styrol is preferably softened before dispersion and other means, for instance, heat may be employed instead of softeners such as xylol, to accomplish this purpose.

A preferred method of treating fibres is indicated as follows: Cellulosic fibres such as cut cotton rags are placed in a paper beater and beaten until they are sufficiently disintegrated and hydrated; caustic soda is added to bring the beater contents to a

fairly alkaline condition, so as to guard against any premature coagulation of the styrol. For every 100 parts of fibre there is then mixed therewith from 20 to 50 parts of the polymerized styrol in the form of an aqueous dispersion. After thoroughly beating the mixture, alum is added until the pH changes to 4—5.0. The pulp is then run to a wet board-making machine and laid down as a fibre mat. This deposit is wet pressed, dried, and dry pressed to give a suitable paper or board. Sizing such as rosin size, where desired, may be incorporated with the mixture, for example it may be added to the styrol dispersion before adding the same to the beater, or it may be added separately. The proportions of styrol and sizing or filling materials can be varied as may be required by the character of the final sheet or board. The fibre-styrol mixture in the form of sheets from the wet machine when dried at a temperature below the boiling point of water and then each sheet pressed for about 10 minutes at 20# steam pressure with a pressure between platens of approximately 1200# per square inch gives a flat sheet with fairly smooth surfaces on both sides. It is clear of course that higher steam pressures or subsequent desired higher steam pressures may be applied to the sheet, since the styrol of the sheet or board is moldable under heat, or the sheet or board may be first cut and then molded as would be the case in making articles such as shoe toe boxes, etc.

Instead of impregnating the paper with a solution or dispersion of styrol, either of these may be mixed with dispersions or organic solutions of caoutchouc, reclaimed rubber, asphalt, pitches, balata, natural or synthetic resins, etc., or any of these materials may be incorporated with the fibre separately from the styrol as is found expedient. Where an aqueous dispersion is mixed with an organic solution the product is a complex colloidal mixture of an aqueous dispersion and an organosol.

Again instead of impregnating the fibres while in pulp form, the fibres may be impregnated while in sheet, for example a sheet of paper which has not been subjected to heavier pressures may be impregnated with the solution or dispersion of meta styrol.

The fibres treated may be of various kinds, animal, vegetable or mineral, for example cellulosic, asbestos, or leather. It is to be understood that various compounding, filling, sizing, coloring and anti-ageing ingredients may be employed in conjunction with the styrol as is considered desirable for the final product. The products provided herein can be said to consist of fibres as the continuous phase containing uniformly dispersed styrol.

Meta styrol is superior to rubber in resistance to water and in electrical properties. It is much harder at ordinary temperatures so that the product of manufacturing paper by this invention is stiffer, harder, of better electrical resistance and better dielectric properties, particularly at high frequencies, than latex paper. Various homologues of styrol may be used in its stead, including ortho and para methyl styrol, symmetrical meta-meta-dimethyl styrol, etc., with similar results.

Having thus described my invention, what I claim and desire to protect by Letters Patent is:

1. A process of making fibre products which comprises impregnating a mass of fibres with a polymerized styrol compound.

2. A process of making fibre products which comprises impregnating a mass of fibres with a polymerized styrol compound.

3. A process of making fibre products which comprises impregnating a mass of fibres with a normally tough polymerized styrol compound.

4. A process of making fibre products which comprises thoroughly mixing a mass of cellulosic fibres with an aqueous dispersion containing a styrol in finely divided form, depositing the styrol upon the fibres, and drying and forming the mixture into the desired form.

5. A process of making fibre products which comprises thoroughly mixing a mass of cellulosic fibres with an aqueous dispersion containing a styrol in finely divided form, depositing the styrol upon the fibres, and forming the mixture into a sheet or slab.

6. A process of making fibre products which comprises thoroughly mixing a mass of cellulosic fibres with an aqueous dispersion containing a polymerized styrol in finely divided form, depositing the styrol upon the fibres, and forming the mixture into a sheet or slab.

7. A process of making fibre products which comprises thoroughly mixing a mass of cellulosic fibres with an aqueous dispersion containing a normally tough polymerized styrol in finely divided form, depositing the styrol upon the fibres, and forming the mixture into a sheet or slab.

8. A fibre mass having dispersed throughout the mass a styrol compound.

9. A fibre mass having dispersed throughout the mass a meta styrol compound.

10. A fibre mass having dispersed throughout the mass a normally tough polymerized styrol compound.

11. A cellulosic fibre mass having dispersed throughout the mass a normally tough polymerized styrol compound.

12. As a new product a fibre sheet having the fibres uniformly and intimately associated with a styrol compound.

13. As a new product a fibre sheet having the fibres uniformly and intimately associated with a meta styrol compound.

14. As a new product a fibre sheet having the fibres uniformly and intimately associated with a normally tough meta styrol compound.

15. As a new product a cellulosic fibre sheet having the fibres uniformly and intimately associated with a styrol compound.

16. As a new product a cellulosic fibre sheet having the fibres uniformly and intimately associated with a meta styrol compound.

17. As a new product a cellulosic fibre sheet having the fibres uniformly and intimately associated with a normally tough meta styrol compound.

18. A fibre-styrol product having the fibres uniformly and intimately associated with a meta styrol compound.

19. A fibre-styrol product having the fibres uniformly and intimately associated with a normally tough meta styrol compound.

Signed at Passaic, county of Passaic, State of New Jersey, this 24th day of October, 1930.

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