

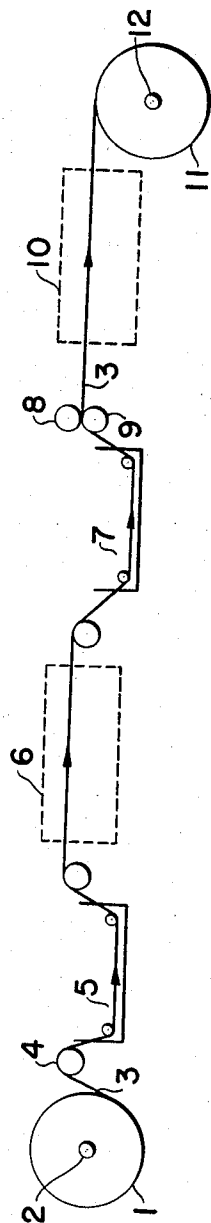
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SEPARATORS FOR ELECTRICAL STORAGE BATTERIES

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SEPARATORS FOR ELECTRICAL STORAGE BATTERIES

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6 Claims. (Cl. 117—76)

This invention relates to the manufacture of separators for electric storage batteries from paper pulp.

The main object of the present invention is to devise a method of producing material intended for use in making separators which gives greatly increased flexibility, whilst maintaining sufficient mechanical strength for the separator in use and extensive permeability.

The present invention consists in the manufacture of separator material, for use in making separators for electric storage batteries, from paper pulp impregnated with a polyvinyl latex or rubber latex.

According to the present invention a method of manufacturing separator material for use in making separators for electric storage batteries from paper pulp is characterised by impregnating a paper sheet with a latex selected from the group consisting of polyvinyl latices and rubber latex to the extent of between 5-25%, drying the impregnated sheet, impregnating the dried sheet with an aqueous solution of a water soluble resin selected from the group consisting of water soluble phenol and cresol resins to give a resin solids content of 10-30%, the total solids left in the sheet as a result of the two impregnations being 35-40% and finally drying the doubly impregnated sheet to a moisture content of approximately 5 to 10%.

In order to facilitate the impregnation of the sheet with the latex, a small proportion e. g. 1-5% of a water soluble wetting agent may be incorporated in the latex. Experiments have shown, however, that if the wetting agent is incorporated in the paper pulp instead of in the latex, the desired impregnation cannot be achieved, since the wetting agent fundamentally alters the nature of the sheet formed from the pulp.

The invention also comprises the dried latex impregnated paper pulp separator material, having a latex content of from 5 to 25%.

By imparting flexibility to the material, shrinking or cracking in the dry state is substantially eliminated.

In order that the invention may be more clearly understood one preferred embodiment thereof in the manufacture of ribbed separators will now be described by way of example, with reference to the accompanying diagrammatic drawing which illustrates a method of preparing separator material in accordance with the invention.

A roll of paper formed from a paper pulp material is indicated at 1, the roll being rotatable about an axis member indicated at 2. On unwinding the roll, the paper indicated at 3 passes over a roller 4 and into a bath generally indicated at 5, in which the paper is floated on the surface of a polyvinyl latex, with which is admixed a small proportion e. g. 1-5% of a water soluble wetting agent, for example, the sulphonated oil sold on the open market under the registered trademark "Calsolene" H. S., until the sheet picks up about 25% of the latex. Polyvinyl chloride latices have been found to be very satisfactory.

The impregnation of the paper sheet with latex en-

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ures the final separator having great flexibility, which is a particularly desirable attribute in the material during the formation of ribs, particularly if the material is passed as a web between rib forming cylinders, for example, when progressively formed over fins, which method of manufacture is the subject of copending application Serial No. 377,207 of Joseph Dowse and Harry Holt, Jr., filed August 28, 1953, where flexibility is required to allow the web to accept simultaneously the deformations over the fins and the curvature of a drum.

The impregnated sheet is then dried to a moisture content of approximately 10%, by passing the ribbon through a tunnel type of drier indicated at 6, and thereafter impregnated with an aqueous solution of a water soluble resin of a concentration of about 40%, for example, a phenolic resin such as a phenolformaldehyde resin, which resin is capable of being polymerised to form an acid-resisting polymer.

The essential characteristics of the acid-resistant medium are that the resin shall resist battery acid, coat the fibres well, and react to a relatively inert, infusible stage resin in the presence of heat, and it will be understood that other water soluble resins possessing these characteristics, such as, for example, the furfuraldehyde resins and creol resins, may equally well be employed in carrying out the present invention.

The sheet is allowed to take up from 30 to 10% of resin solids, the impregnation being effected by floating the paper sheet on the surface of the aqueous solution of the resin in a warm resin bath generally indicated at 7.

By floating the paper sheet on the resin bath, the resin is absorbed from the underside of the paper, and the aqueous solution passes through the paper by diffusion, thus eliminating the occlusion of air bubbles which might occur if the sheet was dipped directly into the liquid.

After leaving the resin bath 7, the paper sheet passes between squeeze rollers which extract surplus resin solution, the pressure applied being such as to leave in the paper sheet after it has been dried a residue equal to about 10-30% of the dried paper pulp material. The squeeze rollers preferably are constituted by an upper roller 8 of steel and a rubber-surfaced lower roller 9.

A tunnel type of drier indicated at 10 effects the necessary drying of the impregnated paper sheet, that is, leaving in the sheet a moisture content of from 5 to 10%. The sheet material is finally reeled into a roll 11, which roll rotates as it is being developed about an axial member 12.

By using the apparatus described, separators may be produced having improved flexibility, as well as possessing great mechanical strength and extensive electrolyte permeable areas.

I claim:

1. A method of manufacturing separator material for use in making separators for electric storage batteries from paper pulp, characterised by impregnating a paper sheet with a latex selected from the group consisting of polyvinyl latices and rubber latex to the extent of between 5 to 25%, drying the impregnated sheet, impregnating the dried sheet with an aqueous solution of a water soluble resin selected from the group consisting of water soluble phenol and cresol resins to give a resin solids content of 10 to 30%, the total solids left in the sheet as a result of the two impregnations being 35 to 40% and finally drying the doubly impregnated sheet to a moisture content of approximately 5 to 10%.

2. A method of manufacturing separator material for use in making separators for electric storage batteries from paper pulp, characterised by impregnating a paper sheet with a polyvinyl chloride latex to the extent of

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between 5 to 25%, drying the impregnated sheet, impregnating the dried sheet with an aqueous solution of a water soluble resin selected from the group consisting of water soluble phenol and cresol resins to give a resin solids content of 10 to 30%, the total solids left in the sheet as a result of the two impregnations being 35 to 40% and finally driving the doubly impregnated sheet to a moisture content of approximately 5 to 10%.

3. A method of manufacturing separator material for use in making separators for electric storage batteries from paper pulp, characterised by impregnating a paper sheet with a latex selected from the group consisting of polyvinyl latices and rubber latex to the extent of between 5 to 25%, said latex having from 1 to 5% of a water soluble wetting agent incorporated therein, drying the impregnated sheet, impregnating the dried sheet with an aqueous solution of a water soluble resin selected from the group consisting of water-soluble phenol and cresol resins to give a resin solids content of 10 to 30%, the total solids left in the sheet as a result of the two impregnations being 35 to 40% and finally drying the doubly impregnated sheet to a moisture content of approximately 5 to 10%.

4. A method of manufacturing separator material for use in making separators for electric storage batteries from paper pulp, characterised by impregnating a paper sheet with a polyvinyl chloride latice to the extent of between 5 to 25%, said latice having from 1 to 5% of a water soluble wetting agent incorporated therein, drying the impregnated sheet, impregnating the dried sheet with an aqueous solution of a water soluble resin selected from the group consisting of water soluble phenol and cresol resins to give a resin solids content of 10 to 30%, the total solids left in the sheet as a result of the two impregnations being 35 to 40% and finally driving the

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doubly impregnated sheet to a moisture content of approximately 5 to 10%.

5. A method of manufacturing separator material for use in making separators for electric storage batteries from paper pulp, characterised by impregnating a paper sheet with a latex selected from the group consisting of polyvinyl latices and rubber latex to the extent of between 5 to 25%, drying the impregnated sheet, impregnating the dried sheet with an aqueous solution of a phenolformaldehyde resin to give a resin solids content of 10 to 30%, the total solids left in the sheet as a result of the two impregnations being 35 to 40% and finally drying the doubly impregnated sheet to a moisture content of approximately 5 to 10%.

6. A method of manufacturing separator material for use in making separators for electric storage batteries from paper pulp, characterised by impregnating a paper sheet with a polyvinyl chloride latice to the extent of between 5 to 25%, said latice having from 1 to 5% of a water soluble wetting agent incorporated therein, drying the impregnated sheet, impregnating the dried sheet with an aqueous solution of a phenolformaldehyde resin to give a resin solids content of 10 to 30%, the total solids left in the sheet as a result of the two impregnations being 35 to 40% and finally drying the doubly impregnated sheet to a moisture content of approximately 5 to 10%.

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