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MANUFACTURE OF PAPER, PAPERBOARD, BUILDING BOARDS, ROOFING AND FLOORING SHEETS AND CLOTHS, AND THE LIKE.

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According to the present invention certain species of sea weed are treated to produce a glutinous material which is incorporated with fibrous products with or without the addition of rubber in an emulsified condition, and/or gummy or gelatinous substances, in the manufacture of paper, paper boards, floor, roof and wall coverings, and products of a similar nature, whether the same be produced by felting as in paper making practice or by filling or surfacing hessian or like fabrics with pulpy felting or coagulated material.

Only certain species of marine growth are usable for this purpose, viz, *Macrocystis pyrifera*, *Nereocystis leutkeana*, *Pelagophycus porra*, *Porphyra lacciniata*, *Rhodymenia palmata*, and *Ulva latissima;* these species for brevity are hereinafter referred to as "kelp", and the term "kelp" is not used in this specification to indicate the larger range of species of sea weed to which it is usually applied. The claims which follow are accordingly to be read subject to this definition and are to be limited in their interpretation accordingly.

The fibrous stock used is selected according to the nature of the final product required. Thus, for paper, paper boards, and other products of a papery nature a fibrous stock such as commonly used by paper makers is selected, but in the manufacture of coarser products, such for instance, as building and lining plates, sheets, tiles, wall cloths and floor cloths, the fibrous stock used may consist more or less of sawdust, leather waste, jute fibre, bark fibres, sugar cane trash fibre, or other vegetable fibre. There may be associated with a mixture of kelp product and such fibre a proportion of a wax or glue, gelatine, gums, resins or like gummy or gelatinous materials which are used in various known paper making processes. When rubber is used it is prepared from coagulated rubber or latex which is ordinarily obtained in trade in sheeted or creeped condition or latex in virgin form. The final product constituted of these substances, selected according to the destined use of the manufactured goods, is formed into sheets, slabs, tiles, or boards of the desired shape and dimensions by paper making processes or by spreading or settling in appropriate moulds under compression or by rolling. Thus, in the case of paper and paper boards the ordinary methods of the paper or paper board maker would be resorted to, whilst in the case of wall plates, floor plates, tiles, and the like, moulding under compression would be resorted to, and in the case of floor cloths, roofing cloths, and the like, spreading of the product on a cloth or felt sheet backing and subsequent rolling would be resorted to.

The kelp is prepared by first washing it twice or oftener in fresh water to remove attached sand, crusted salt, and other foreign matter, and it is then brought to a pulpy jelly-like condition by maceration or digestion in water which has been slightly alkalized. This breaking down of the kelp is promoted by boiling. When the boiling is effected in open vessels it may be continued for a period of 24 hours more or less, but when the boiling is conducted under pressure a proportionately reduced time of treatment suffices. In the case of maceration, without boiling, steeping and agitation in fresh water, preferably warmed, for a period of several days is necessary. In whatever method the breaking down of the kelp is effected, a liquor and a pulpy jelly are produced. If this double product be allowed to stand over a few hours the liquor will be absorbed into the pulpy jelly and the whole product may then be used, but the pulpy jelly may be used without the liquor, in which case the liquor may be utilized in the maceration or digestion of subsequent quantities of kelp, or may be used with rubber to produce a surfacing dope.

The fibre stock is incorporated with the kelp jelly in a beating machine, but advantage may be taken of the boiling operation, when it is used, to effect incorporation of the fibre with the jelly during the preparation of the jelly. Similarly, advantage may be taken of the agitation of the kelp in the maceration operation to effect incorporation with the fibre by introducing the fibre into the macerating apparatus so that an intimate mixing is effected as maceration proceeds.

The rubber is brought to a colloidal condition by means of colloidal clay, such for instance as kaolin. The rubber is first finely shredded and subjected to soaking and agitation in water until it has swelled very substantially. Then, colloidal clay is introduced into the beating or mixing machine in which this rubber is contained, and the beating continued. The proportion of clay to rubber desirable is about 1 part of clay to 3 parts of rubber calculated as in the dry condition for each of these substances. Sufficient water is used with the clay and the rubber to form a gruel-like mixture and the beating is continued for several hours. The clay and water should be thoroughly intermixed to a thickly putty-like consistency before the rubber is brought into contact with the mixture. The swelling of the rubber continues under this treatment, and its capacity for absorbing water becomes intensified. As the beating proceeds, water is added gradually, and ultimately a complete incorporation of the rubber and the clay is thus effected, the rubber being emulsified. Water may then be added to the emulsion and is readily taken up so that the emulsion may be thinned to any desired consistency. The proportion of rubber to be used with the kelp product and the fibrous stock will vary according to the nature of the final product required. Thus, for instance, for paper and paper board products, a relatively low proportion of rubber suffices to import into these products certain desirable physical characteristics. A proportion below 1% produces notable results, but a higher percentage may be used. In the case of floor cloths and the like a much higher proportion of rubber is desirable from 5% to 20% or even a higher proportion. For intermediate products, such as wall boards, an intermediate proportion of rubber may be used. For paper products a proportion of rubber to paper stock varying from one-half per cent to five per cent is usually to be used. In the preparation of the kelpy pulp the addition of a low proportion of glycerine is found advantageous; it results in augmenting the unctuousness of the pulp and facilitating the spreading and finishing operations.

There may be added to the kelp-fibre or kelp-fibre rubber magma, appropriate proportions of bodying and surfacing agents, such as resin, glues, metallic soaps, resin soap, blood, sodium or potassium silicate, cements, casein, stearin, paraffin, or other oleaginous substances, and where colloidal rubber is not used in the manufacture a colloidal clay may also be used as an additional ingredient. It is practicable to use large proportions of Portland cement. Keen's cement, plaster of Paris, or like cements when the product is destined for use as building boards.

For the manufacture of moulded boxes and receptacles and packings a plastic material which sets hard when dry is produced by incorporating up to about 50% of kelp pulp, 45% sawdust, 5% blood, and optionally to augment flexibility a minor proportion of rubber, and desirably also a proportion of paper-maker's pulp substituted for portion of the sawdust.

In the fabrication of these products into sheets, plates, boards, or the like, some tree water is squeezed out. After the product has been taken from the paper machine, or paper board machine, or the press or rolls in which it was manufactured, it may be subjected to calendering, and is dried and aged for a few days before being applied to its destined uses. When rubber forms an ingredient, there may be associated with it a proportion of a vulcanizing agent and the paper or other final product may be submitted to a cold vulcanizing process as a finishing operation and there may also be associated with it in the beating operation a proportion of blown linseed oil or other oxidizable oil. Hardening and waterproofing may also be effected by treating the final products with formalin, cuprammonium, or other known reagent operating as a precipitant, and surfacing may be effected by superficially treating the final products with a dope liquor consisting of kelp liquor which was reserved in the breaking down of the kelp; this liquor being mixed with a proportion of rubber emulsified in the manner described or with rubber latex. A limited proportion only of the strong liquor is required in relation to the rubber, the desirable proportion varying from 5% to 20%.

The physical characteristics of the product necessarily vary according to the proportion of kelpy material which is incorporated with the pulp or fibre, and will vary also according to the character and finish of the goods and the nature of the pulp or fibre which is used. The proportion of kelp calculated in relation to the weight of the finished product in the case of coarse paper pulp products, or sawdust, in the making of ceiling boards, lining boards, and the like may be advantageously between 15% and 30%. For roofing tiles, oil cloth fillings and the like, the proportion of kelpy material may be increased up to 50% in relation to the dry weight of the pulp or fibre stock with which it is associated. When the proportion of kelpy material is high, the final product is leathery-like and semi-flexible but has sufficient rigidity for all practical purposes of use when it is moulded in thin sheets.

Instead of emulsified rubber, rubber latex or dispersed rubber may be used in any of the formulæ and methods which have been described.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A composition of matter consisting essentially of a fibrous stock incorporated with a pulpy jelly obtained by macerating or digesting prewashed kelp, and containing a proportion of rubber.

2. A composition according to claim 1, containing a proportion of glycerine.

3. A composition of matter consisting of fibrous stock and paper-maker's pulp incorporated with a pulpy jelly obtained by macerating or digesting prewashed kelp, and containing a proportion of rubber.

4. A composition according to claim 3, containing a proportion of glycerine.

5. A composition of matter according to claim 1, containing a limited quantity of a bodying and surfacing agent.

6. A composition of matter according to claim 1, containing a proportion of glycerine and a limited quantity of a bodying and surfacing agent.

7. A paper sheet or board formed from a composition consisting of fibrous stock incorporated with kelp pulp having the surface thereof treated by application thereto of liquid obtained by macerating or digesting kelp.

8. A paper sheet or board formed from a composition consisting of fibrous stock incorporated with kelp pulp having the surface thereof treated by application thereto of liquid obtained by macerating or digesting kelp, to which liquid, rubber has been added.

9. A paper sheet or board formed from a composition consisting of fibrous stock incorporated with kelp pulp and containing glycerine, having the surface thereof treated by application thereto of liquid obtained by macerating or digesting kelp.

10. A paper sheet or board formed from a composition consisting of fibrous stock incorporated with kelp pulp and containing glycerine having the surface thereof treated by application thereto of liquid obtained by macerating or digesting kelp, to which liquid, rubber has been added.

11. A paper sheet or board formed from a composition consisting of fibrous stock incorporated with kelp pulp and a proportion of rubber, having the surface thereof treated by application thereto of liquid obtained in macerating or digesting kelp.

12. A paper sheet or board formed from a composition consisting of fibrous stock incorporated with kelp pulp and a proportion of rubber, having the surface thereof treated by application thereto of liquid obtained in macerating or digesting kelp, to which liquid, rubber has been added.

In testimony whereof I have signed my name to this specification.

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