

UNITED STATES PATENT OFFICE

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MAKING PRODUCTS OF FINELY DIVIDED VEGETABLE MATERIAL

No Drawing.

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The invention relates to the making of various products such for example as shingles, wall boards and deadening felt from wood or other vegetable material in finely divided form. There are billions of feet of wood lost annually in the waste from saw mills and manufacturing plants using the lumber and destroyed in refuse burners to get rid of it. By the present invention these waste products of various kinds of wood can be made valuable.

For this purpose, the wood in shredded form or in the form of a pulp or semi-pulp made by chemical or by grinding methods, or in a mixture of any of the above forms, is treated with a saccharide (and, if desired, with other materials hereinafter described) and shaped into the desired products. The saccharide penetrates the fibres or particles of wood, building up and strengthening them and preventing their subsequent shrinking, and acts as a binder to cement them together.

When wood pulp is used, it is made in any usual way either by chemical or mechanical disintegration of the wood and mixture with a solvent. Such a pulp itself contains binding material and for this reason requires the use of less saccharide than is required for the shredded wood. In using a semi-pulp, the wood chips are softened by the solvent in a digester but are not reduced to the same fineness as in complete pulp. This semi-pulp may also be run through a shredder to reduce the chips which were not previously reduced to sufficient fineness. Also a weaker material and a shorter time are used in semi-pulping than in complete pulping. The shredded material referred to is distinguished from the pulp or the semi-pulp by being in small elongated chips or splinters, which may be as long as an inch or thereabouts, each chip or splinter containing a number of wood fibres. I can use any wood with good results, including in the term "wood" any other vegetable fibrous material such for example as corn stalks, sugar cane stalks, straws and grasses.

The process of making the shredded material is to run the wood slabs, trimmings,

edgings, shavings and so forth through a "hog" in order to break up the wood, after which it is run through a shredder or rod mill in order to reduce it to the required degree of fineness.

The wood finely divided in any of the ways described is then put in an open or closed tank and immersed in a solution composed of water and a monosaccharide or a disaccharide, or a combination of these two saccharides in order to set up osmosis and plasmolysis for the purpose of penetrating the wood fibres with these saccharides. To this solution, a polysaccharide is added which has little or no osmosis or plasmolysis action but which coats the particles with a cementing material that binds the wood particles together thus creating a homogeneous mass. While not limited thereto, for the monosaccharide mentioned I may use dextrose and for the disaccharide I may employ sucrose. Either one or a combination of the two are used for the important function of causing the impregnating materials, hereinafter referred to, to penetrate the innermost fibres of the finely divided wood particles.

This solution, together with the wood immersed in it, is then subjected to heat and raised to a temperature of 180° F. to 212° F., or a higher temperature, and maintained at a desired temperature for a period of 30 to 90 minutes, during which time the wood particles are completely penetrated with the treating materials.

It is then allowed to cool and the solvent is drained off. The mass is shaped according to the desired product. Shingles and similar shapes are best formed under pressure in moulds. For sheets of wall board, the mass may be run out on a belt and passed through rolls to form it into sheets of any desired thickness and width and cut into proper lengths. The coarser material such as semi-pulp or shredded wood or mixtures thereof will form products of less density than those made of the complete pulp. These may be used as deadening felt to fill the spaces between joists of a wall and may be cut to fit such spaces exactly so that they may be laid up in the wall during the building thereof at

practically no expense for labor. For this class of materials, the binder and the pressure used may be so regulated that parts of the product may be torn off easily so as to fit into a given space. The coarser material makes the mass comparatively loose with numerous air cells so that it is an excellent product for heat insulation, sound deadening and similar uses.

After this material has been moulded or pressed or rolled, it is then passed through driers and dried under heat down to the desired degree of dryness for commercial use as shingles, wall boards, felt or other products.

The saccharides may be utilized also as carriers for certain organic and inorganic salts and dyes contributing advantageous qualities to the product. By mixing these with the saccharides, they are caused to penetrate the wood and are thus distributed uniformly throughout the mass. For example, in combination with the saccharide, I may add a fire-resisting salt or salts to make the product fireproof completely; or I may add a decay-proofing salt or salts to make the product decay-proof; or I may add an insect-proofing or vermin or rodent proofing salt or salts to make the product insect-proof or vermin or rodent-proof; or I may add a moisture-resisting material to make the product moisture and water resisting; or I may add an electric insulating material to improve the dielectric qualities of the product; or I may add any combination of these to produce a combination of these results; or I may add a dye in order to give the product any desired color.

For making this product decay and insect resistant and vermin proof, I may use sodium fluoride, zinc chloride, arsenic, or dinitrophenol, or other suitable toxic salts, poisons or decay and insect and vermin proofing substance.

For fireproofing this product, I may use ammonium sulphate, ammonium phosphate, sodium borate, or any other suitable fireproofing substance.

For making the product water and moisture proof, I may use a polysaccharide of the higher molecular weight of a non-soluble nature or gypsum plaster or a mineral or animal or vegetable oil, or any other waterproofing substances.

For adding to the dielectric qualities and also moisture proofing quality of the product, I may use liquid rubber or latex, or any other substance that will increase the dielectric qualities. In the case where liquid rubber or latex is used, I may add to the solution an alkaline material to neutralize acids in the solution produced by the acids from a number of species of wood, so that the latex or liquid rubber will not coagulate.

For increasing the insulating qualities, I

may use asbestos fibre or any other insulating material.

The finely divided wood may be treated in an open tank without pressure, or it may be treated in a closed tank with or without pressure, and when pressure is used it may be by means of air or steam or hydrostatically applied, or created by the expansion of the solution by heat.

In a specific example of my process to which, however, my invention is not limited, I immerse finely divided wood in a solution consisting of water to which is added 20% of the water by weight of a monosaccharide, 3% to 10% of a polysaccharide, 10% of ammonium sulphate, 2% of sodium fluoride and one-hundredth of 1% of pontacycle green dye. This solution with its contained finely divided wood is then heated to the boiling point and boiled for 30 minutes and then it is allowed to cool to about 160° and after most of the solution is drained off and recovered to be used over again, there is added to the wet mass of treated shredded wood 5% to 10% of a prepared polysaccharide which is thoroughly mixed by agitation. The treated material is then run out into a mould and subjected to a pressure and is then removed from the mould and placed in a drier to remove the moisture contained therein. The product is then ready for the market and is found to possess the following qualities.

It will not flame. It nails without splitting. It will not warp nor split. It will not decay. Gypsum plaster will adhere to it. It is dyed green throughout its structure. It is light in weight. It has heat insulating qualities equivalent to those of asbestos.

Various other additions may be made to the product either with the saccharide or saccharides or with the fire-resisting and other salts and dyes referred to. Such materials, for example, are gypsum, casein, gelatin, rosin, or other cementing material, or mineral or vegetable or animal oils. The solution may have an alkaline salt or other alkaline material added to it in order to reduce it from an acid to a neutral condition.

Where it is to receive a coat of plaster, holes or recesses may be formed in the board so that the plaster will enter and form keys which hold its weight and tie it to the board. Such holes may be round, square, straight or oblique,—in fact of any shape to form the desired connection with the plaster; and they may be produced by pressing, punching or rolling them in the sheet. The described material may be used also as a partition board or a panel board, and for such purpose may be faced on one or both faces with metal. This may be, for example, sheet steel or other metal cemented onto the face of the fibrous board either by the binding element of the composition or with the aid of a sup-

plementary cementing medium. Or the metal may be deposited on the fibrous material in the form of liquid or spray or in various other ways. Such a metal faced product is fire-proof and may be used not only for partitions or panels but also for shingles and other articles.

Various modifications of the product and process may be made by those skilled in the art without departing from the invention as defined in the following claims.

What I claim is:—

1. A manufactured product consisting of a finely divided fibrous material treated with a monosaccharide and with the particles thereof bound together.

2. A manufactured product consisting of a finely divided fibrous material treated with a disaccharide and with the particles thereof bound together.

3. The product of claim 1 treated also with a disaccharide.

4. A manufactured product consisting of finely divided fibrous material treated with a saccharide and a polysaccharide and with the particles thereof bound together.

5. A manufactured product consisting of finely divided fibrous material treated with a saccharide and with the particles thereof bound together, and treated also with a decay-proofing material.

6. A manufactured product consisting of finely divided fibrous material treated with a saccharide and with the particles thereof bound together and treated with material which is resistant to insects and vermin.

7. A manufactured product consisting of finely divided fibrous material treated with a saccharide and with the particles thereof bound together and treated with a dielectric material.

8. A manufactured product consisting of finely divided fibrous material treated with a saccharide, said material having a heat insulating material added thereto and with all the particles bound together.

9. A manufactured product consisting of finely divided fibrous material treated with a saccharide and with a dye and with the particles thereof bound together.

In witness whereof, I have hereunto signed my name.

ARTHUR P. ALLEN.