

UNITED STATES PATENT OFFICE

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WATER-RESISTANT FIBER PRODUCT AND PROCESS OF MANUFACTURE

No Drawing.

Application filed May 12, 1928. Serial No. 277,382.

My invention relates to a novel process for producing a water resistant, strong, durable, vegetable fiber product and includes such process and the product resulting therefrom.

5 Many kinds of vegetable fiber are available for use in this process and in general it may be stated that all vegetable fiber which is suitable for use in pulp and paper making may be used, and the raw material
10 may be converted into pulp in any desired manner.

It is obvious that it is of great advantage to cheapen the cost of manufacture so that the product can be placed on the market at
15 a low price and used for purposes in which large quantities are dealt with, for example, the roofing and flooring of buildings, and the exterior and interior walls thereof, although the product is also highly useful for
20 the manufacture of high grade and expensive articles of all kinds, for example, incubators, cabinets, furniture, boats, etc., in fact everything for which hard or soft wood or vegetable fiber products have been or can
25 be used. By reason of the cheapness of this new product and its imperviousness to moisture, many new uses are made possible and a new field of manufacture is opened.

One of the most desirable raw materials
30 for the production of vegetable fiber for use in this process is wood, which may be obtained cheaply and in large quantities as a waste product from saw mills. This material may be converted into fiber pulp by
35 various methods known to paper makers, for example, grinding or other methods. Preferably, however, I make use of the process disclosed in U. S. Patents No. 1,578,609, granted March 30, 1926, and No. 1,663,505,
40 granted March 20, 1928, by which a very finely divided pulp containing the natural cementitious material of the wood is obtained, and which is adapted for the production of a finished product of maximum
45 strength and general utility, as illustrated, for example, by the second of the above patents.

In order that my process may be fully understood, I will describe its application to
50 the manufacture of board or product of sim-

ilar form, although obviously it is not limited to such use or product, and may be used in the production of articles molded or pressed into any desired form with various degrees of density to adapt them to special
55 or particular uses.

Having preferably obtained by the process of said patent a pulp of natural fiber which desirably contains, in addition to cellulose, a substantial proportion of lignins, and which may be refined or beaten to any desired degree by passage in a water bath through mechanical refiners or beaters, I incorporate therewith while still in the water bath a water insoluble ingredient or size.
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The material which I prefer to use on account of cheapness is known in commerce as petrolatum, or petroleum jelly. It is a hydrocarbon obtained from petroleum and melts at a temperature of about 125° F. It ordinarily contains as much as 35 per cent. of paraffin, the remainder being principally hydrocarbons of the same series as paraffin and of about the same melting point. It is cheaper than paraffin. The latter substance melts at
65 about the same temperature as petrolatum and is a complete equivalent of petrolatum in this process. There are also other hydrocarbons melting at 120° F. and upwards which are capable of use.
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The water bath containing the fiber at the point where the insoluble melted size is added should be at a temperature sufficient to prevent the congealing of the size, for example with paraffin or petrolatum melting at 125°
75 F. the bath may be at or above 130° F. The mixture of fiber, water and melted size is thereupon subjected to agitation sufficient to cause the size to be completely distributed throughout the mass of fiber. For example,
80 the agitation may be obtained by passing the pulp through the ordinary beaters, grinders, and the like through which it is taken in the usual course of pulp treatment, or the agitation ordinarily obtained in a paper mill stock
85 chest will suffice.

Upon incorporating with fibrous vegetable pulp a quantity of paraffin or petrolatum to the extent of about 1/2 to 10 per cent. of the weight of dry fiber and agitating, some kind
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of association or union apparently takes place between the hydrocarbon or hydrocarbons and the fiber, whereby substantially every trace of the hydrocarbons is taken up by the fiber and disappears from the bath liquid.

Without committing myself to a particular theory as to how such union takes place, I am inclined to attribute this action to the fact that the fibers in the fibrous mass have a greater affinity for the liquefied hydrocarbon than for the water. This is indicated by the fact that the effluent water is substantially free from any oily film which would be present if it were not taken up by the fiber. This taking up of the size by the fiber would not be expected to take place in view of the fact that the fiber is saturated with the water of the bath, and because the quantity of water in the fluid pulp is enormously in excess of the paraffine hydrocarbon, as for example, in synthetic board making, the hydrocarbon waterproofing material may be, say, 2% by weight of dry fiber, and the fiber, say, 1½% of the weight of water, making the relative weights of the three as 1, 50, and 3283. Notwithstanding this, the selective affinity or absorption of the size by fiber appears to cause the size to go to the fiber and disappear from the bath. By such action what may be termed an artificial cuto-cellulose is produced.

After effecting a thorough mixing of the pulp and paraffin, petrolatum or the like, as described, a wet felted sheet or so-called "wet lap" is formed from the warm pulp in any desired manner, as, for example, in a machine of the Fourdrinier type, which runs continuously and may be provided with means for severing from said sheet suitable lengths for further treatment. This wet lap sheet in process of formation is freed of all water which can be drained therefrom by gravity, aided by suction, pressing rolls, etc., in the said Fourdrinier machine, and such water content is hereinafter referred to as free water. The material which leaves the Fourdrinier machine still contains a considerable proportion of water which is to be removed by pressing and drying. In this wet sheet, substantially all of the petrolatum or paraffin which was added to the pulp bath is present and it seems to be distributed substantially uniformly throughout.

The wet lap sheet is conveyed to a hydraulic press and is there subjected to pressure between heated platens, with preferably a wire screen interposed between the sheet and at least one of the platens to permit ready escape of moisture. A substantial proportion of the water is removed by the compressive action of the press, which is closed with such speed as to apply its full pressure before the material in contact with its platens is brought to a temperature above that at which the water contained therein vapor-

izes, viz, 212° F. at sea level. This is necessary in order to obtain maximum rigidity and strength in the finished product. Such temperature will not be reached while the sheet contains water capable of being expressed by the action of the press. The remaining water content of the wet lap sheet is removed therefrom by evaporation while in the press. The full pressure should remain on the sheet until it has thoroughly dried, whereupon it is removed from the press as finished material.

The product thus obtained is remarkably hard, dense and strong. It has great resistance to penetration by water or water vapor. Such resistance increases with the percentage of petrolatum used in its manufacture, and the product is well adapted for use without paint or other covering as a building material exposed to weather conditions. It does not warp, check, rot, shrink or corrode. It is remarkably free from deterioration and withstands exposure to water and dampness over long periods of time. By reason of the process by which it is incorporated in the product, a very small percentage of petrolatum or equivalent produces a high degree of resistance to moisture.

In case a porous product suitable for use as insulating board, lath or the like is desired, the wet lap sheet formed as previously described may be pressed in the manner disclosed in U. S. Patent No. 1,663,504, granted March 20, 1928, in which spacer blocks are inserted between the press platens so that the movement of the platens is stopped when the blocks are encountered and the fiber sections are compressed and dried in the press to substantially the thickness of said blocks. Only a moderate pressure is required for this purpose.

My invention may be readily applied to the manufacture of paper and paper board, such as container board, etc., by incorporating the hydrocarbon size in the wet pulp in the manner hereinbefore described. The pulp is then formed into paper or paper board in a Fourdrinier machine or cylinder mold machine in the usual manner well known to paper makers.

Among the waterproofing products which can be produced in accordance with the present invention, I would mention artificial or substitute lumber, paper pulp, pulp board, insulating board, wall board, floor board, roofing, building paper, paper, paper board, container board, wrapping paper, liner board, corrugated board suitable for roofing, siding, corrugated board made from straw or extracted chestnut chips, etc.

Paper, cardboard and the like, which is to be later subjected to be formation treatment as for example, to be fabricated into containers and the like, has the advantage of being readily worked. The fact that the hydrocar-

bon is distributed throughout the mass of material in liquid form and prior to its concentration or felting together results in a much more complete distribution of this material throughout the entire body than when attempted to be incorporated in a congealed state with wet pulp or with a finished board by usual penetration methods, thereby effecting a saving in respect to the quantity used. Upon application of heat and pressure, the paraffin or hydrocarbon content permits freer working of the material than would otherwise be possible, and this quality can be obtained to much greater advantage by the present process than by penetration treatment of the dry paper, or other product after fabrication. In making artificial lumber, about 1½ per cent. of paraffin or 2 per cent. of petrolatum of the weight of dry fiber gives good results.

The waterproofing material should be one which is insoluble in water. I consider that the affinity of fiber or its capacity for taking up or absorbing the waterproofing material in preference to water, will be exercised to better advantage where the waterproofing material is not mixable with water.

In order to obtain with a minimum quantity of size a paper or paper board very highly resistant to water, the size may be incorporated in the wet pulp from which it is made, as hereinbefore described. The dry finished product may then be treated with melted paraffin or equivalent to give it a surface coating thereof on either or both sides, in the usual manner for the surface sizing of paper or paper board with paraffin.

Having now described my invention, what I claim is:

1. A process for producing a water resistant fiber product which comprises the agitating of unsized vegetable fiber pulp in a water bath containing water greatly in excess of the fiber content and free, undissolved paraffin or equivalent hydrocarbon having a melting point of about 125° F. in the proportion of ½ to 10% of paraffin to the weight of dry fiber, maintaining said water bath at a temperature sufficient to prevent congealing of the hydrocarbon material during such agitating and separating the free water from said pulp.

2. A process for producing a water resistant fiber product which comprises the agitating of unsized vegetable fiber pulp in a water bath containing water greatly in excess of the fiber content and free, undissolved paraffin or equivalent hydrocarbon having a melting point of about 125° F. in the proportion of ½ to 10% of paraffin to the weight of dry fiber, maintaining said water bath at a temperature sufficient to prevent congealing of the hydrocarbon material during such agitating, and felting the pulp into sheets in a wet machine.

3. A process for producing a water resistant fiber product which comprises the agitating of unsized vegetable fiber pulp in a water bath containing water greatly in excess of the fiber content and free, undissolved paraffin or equivalent hydrocarbon having a melting point of about 125° F. in the proportion of ½ to 10% of paraffin to the weight of dry fiber, maintaining said water bath at a temperature sufficient to prevent congealing of the hydrocarbon material during such agitating, felting the pulp into sheets in wet machine, removing water therefrom by expression, applying heat and pressure to said sheet, and maintaining the pressure thereon until it is dry.

4. A process for producing a water resistant fiber product which comprises the agitating of unsized vegetable fiber pulp containing a substantial percentage of lignin in a water bath containing water greatly in excess of the fiber content and free, undissolved paraffin or equivalent hydrocarbon having a melting point of about 125° F. in the proportion of ½ to 10% of paraffin to the weight of dry fiber, maintaining said water bath at a temperature sufficient to prevent congealing of the hydrocarbon material during such agitating, felting the pulp into sheets in wet machine, removing water therefrom by expression, applying heat and pressure to said sheet, and maintaining the pressure thereon until it is dry.

5. A water resistant fiber product composed of cellulose fiber, a substantial percentage of lignin, and uncombined paraffin or equivalent hydrocarbon having a melting point of about 125° F., the percentage of hydrocarbon being ½ to 10% of the weight of dry fiber, the individual fibers having been exposed to the hydrocarbon in melted condition in presence of water in quantity greatly in excess of the fiber content, and thereafter felted together, separated from free water and dried.

In testimony whereof, I have signed my name hereto.

WILLIAM H. MASON.