United States Patent [19]

Champeau

[11] **3,769,116**

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[54] **METHOD OF MAKING A BUILDING MATERIAL FROM WASTE STOCK FROM A PAPERMAKING PROCESS**

[76] Inventor: **Charles A. Champeau,** 1005 Lafollette St., Little Chute, Wis. 54140

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[21] Appl. No.: **198,808**

[52] **U.S. Cl.**..... **156/62.8,** 156/62.2, 156/94, 161/268, 161/270, 162/147, 162/189, 162/190

[51] **Int. Cl.**..... **B32b 5/26,** D21f 1/82, D21f 11/04

[58] **Field of Search**..... 156/62.2, 62.4, 62.6, 156/62.8, 94; 161/268, 269, 270; 162/147, 189, 190, 191, 150

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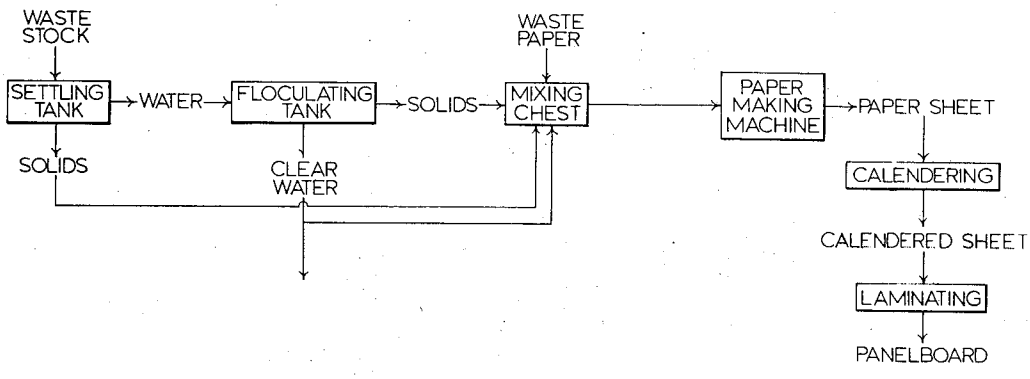
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Primary Examiner—Daniel J. Fritsch
Attorney—Andrus, Sceales, Starke & Sawall

[57] **ABSTRACT**

A method of making a building material, such as panel board, by utilizing waste stock from the papermaking industry. The major portion of the solids are separated from the waste stock by a settling treatment and the resulting effluent is subjected to floculation to separate the remaining solids. The solids are then blended together and additional cellulosic fibers and water, if necessary, are added to the mixture. The mixture is then passed through a papermaking machine to produce paper sheet and the paper sheets are subsequently laminated into a panel board, or other materials for the building industry.

10 Claims, 2 Drawing Figures



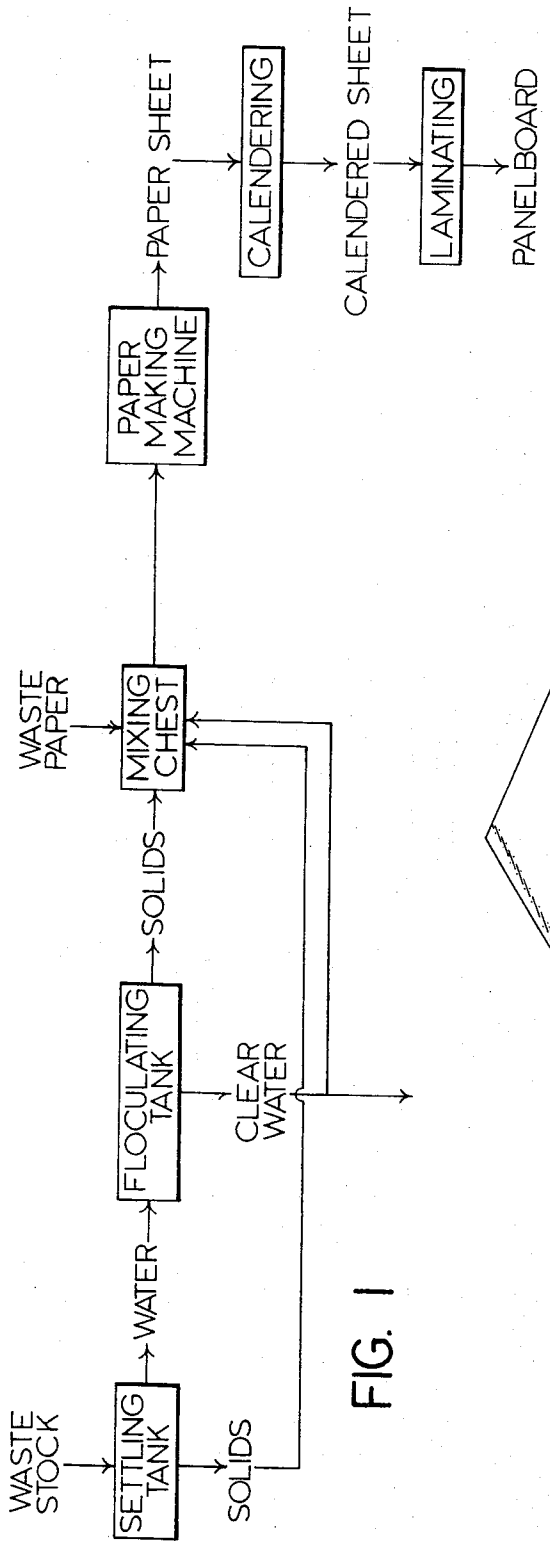


FIG. 1

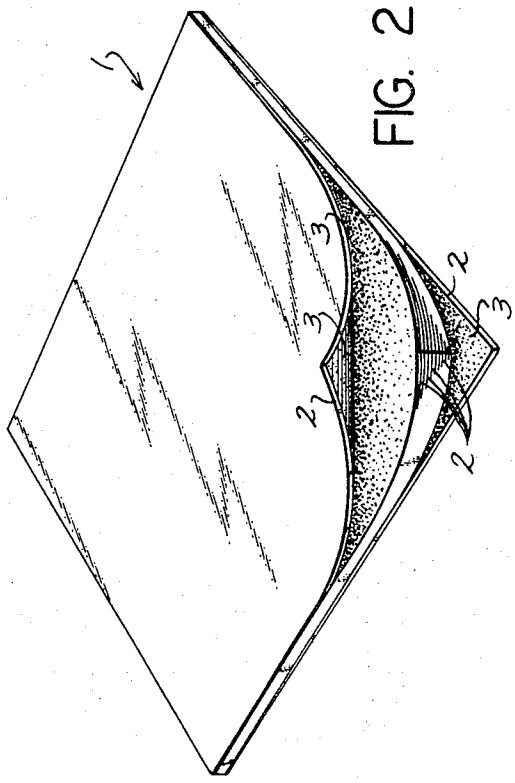


FIG. 2

INVENTOR.
CHARLES A. CHAMPEAU

METHOD OF MAKING A BUILDING MATERIAL FROM WASTE STOCK FROM A PAPERMAKING PROCESS

BACKGROUND OF THE INVENTION

During the normal papermaking process there are substantial quantities of waste stock which are generated. For example, following the cooking or digesting operation the cooked stock is screened to remove non-fibrous materials such as knots, bark, and the like. A second phase of waste stock removal occurs prior to the stock being supplied to the forming wire in the papermaking machine and the stock is then passed through saturated cleaners which remove waste components.

Another form of waste stock is the water extracted from the paper web during the forming and pressing operations in the papermaking process. This extracted water contains fibrous materials, as well as clays and other additives which were added to the stock during the digesting process. A further source of waste stock in the papermaking process is the excess coating material which is applied to some forms of paper, during or after the paper web is passed through the dryer section of the papermaking machine. All of these waste stocks are relatively non-uniform in character and contain various proportions of cellulosic fibers, as well as clay and other additives.

In a papermaking plant having four papermaking machines approximately 100,000 pounds of solid waste material is generated per day. This large quantity of waste material has presented substantial problems in disposal. In the past, the waste stock has been discharged into rivers or streams, but due to the recent efforts to control polution of the waterways the papermaking industry is looking for alternate disposal methods.

Incineration of the solid waste material is not practical, due to the fact that the waste material contains a substantial portion of noncombustible materials. Secondly, incinceration processes can result in air pollution problems, unless expensive anti-pollution equipment is utilized.

Disposal of the solid waste has also been accomplished by land fill disposal methods. However, landfill disposal methods are costly due to the necessary handling and transporting of the waste, and below grade disposal sites can cause contamination of ground water.

Due to the difficulties in disposal of the papermaking waste, it is advantageous to develop a use for the waste stock. However, no satisfactory method of recovery and use of waste stock has been developed, largely because the waste stock contains substantial portions of clay, binders and other additives, in addition to the cellulosic material.

SUMMARY OF THE INVENTION

The invention relates to a method of producing building materials, such as panel board, by utilizing the waste stock from papermaking processes. According to the invention, the waste stock from various phases of the papermaking process is initially fed to a settling tank where a substantial portion of the solid material is separated from the stock and the resulting effluent is pumped to a floculation tank which serves to separate the remaining solids from the effluent. The solids from both the settling tank and the floculation tank are

blended in a mixing chest, and depending on the particular composition of the blend, additional cellulosic fibers, water, or other additives, can be mixed with the blended solids to produce a stock. The stock is then passed through a standard papermaking machine to produce paper sheet and a multiplicity of the paper sheets are then laminated together to provide the panel board or other building material.

The method of the invention utilizes all the waste stock from the papermaking process, thereby eliminating the problems of water and air pollution. As the paper from the waste stock can be made in the papermaking plant, the process of the invention eliminates hauling or transporting of the waste stock.

The panel board or other building material produced in accordance with the invention can be utilized for interior or exterior applications and can be employed as sheeting for roofing, flooring, or siding, or can be used as insulating sheathing or structural components. Utilizing waterproof binders during the laminating operation enables the product to be used for exterior purposes, and by applying a hardening coating to the paper sheet, before lamination, the resulting product can be relatively hard and strong and constitute a substitute for plywood.

Other objects and advantages will appear in the course of the following description.

The drawings illustrate the best mode presently contemplated of carrying out the invention.

In the drawings:

FIG. 1 is a flow sheet showing the process of the invention; and

FIG. 2 is a perspective view of a panel board or laminated sheet formed by use of the process of the invention.

As shown in the flow sheet of FIG. 1, waste stock from various sources in a conventional papermaking process is initially supplied to a settling tank. The waste stock can include the cooked ground waste, resulting from screening the stock after digesting or cooking, or waste separated from the stock by saturated cleaners or screens located immediately ahead of the forming wire in the papermaking machine, or waste stock extracted from the paper web during the forming and pressing operations in the papermaking process, or waste stock consisting of excess coating material applied to the paper web during or following the drying section of the papermaking machine.

The waste stock from the various sources not only includes cellulosic fiber material, but also non-fibrous cellulosic materials, such as knots or bark, but also substantial portions of clay, binders and other additives utilized during cooking and coating. The waste stock is non-uniform in character and, on a solids basis, can include from approximately 15 to 65 percent by weight of clays, binders and other additives with the remainder being cellulosic materials. For example, the water extracted from the paper web in the forming section of the papermaking machine may contain, on a solids basis, about 35 percent clay and other additives, while the coating waste may contains 60 percent clay and additives. Moreover, the composition of each type of waste stock can vary substantially from batch to batch.

In the settling tank, the solid materials will settle to the bottom and the effluent, which contains only approximately 5 to 10 percent solids, will overflow from the top of the tank and is pumped to a floculating tank.

According to standard floculating procedures, the effluent is treated chemically which leads to floculation of the solid material as a suspension in the effluent. The floculated solids can be separated from the effluent by various techniques, such as permitting the treated effluent to stand causing floculated solids to settle out of suspension, or by supplying gases to the effluent causing the floculated solids to accumulate at the top of the effluent where they may be skimmed off either continuously or intermittently. The effluent from the floculating tank is substantially clear water which can then be reused in the basic papermaking process. Due to the various impurities in the waste stock the water being discharged from the floculating tank may be colored and can be treated with chlorine or chlorine bleach to move the color prior to reuse.

The solids removed from the waste stock in the settling tank, as well as the solids removed in the floculating tank, are then pumped to a mixing chest where the solids components are blended together. The resulting blend constitutes a new stock to be subsequently passed through a papermaking machine to produce paper sheet. Due to the fact that the waste stock can vary substantially in composition, the blended stock in the mixing chest can also vary widely in composition. The blend is tested by making a sample paper sheet and on the basis of that sheet, it is determined what, if any, additives are required in the new stock. In some cases, additional fibrous material is added to the new stock in the mixing chest and the fibrous additives can be cooked fibers from the papermaking process, or waste paper. Due to the fact that the new stock is to be formed into paper which is ultimately laminated into a building material, it is not necessary to remove the ink or impurities from the waste paper which may be added to the mixing chest.

In some cases, additional water from the floculating tank may be added to the new stock in the mixing chest, while in other cases clay or other additives can be added although usually the percentage of clay and other additives will be more than adequate due to the fact that the waste stock contains high proportions of these ingredients.

The new stock produced in the mixing chest is then supplied to a standard papermaking machine to form paper sheet from the new stock. The resulting paper sheet would not be usually satisfactory for use as paper per se, due to the presence of the large amount of additives and impurities in the new stock. However, the paper sheet produced is satisfactory for lamination to produce the panel board, or other building components, because impurities in the individual paper sheet will not adversely effect the properties of the laminated board.

As shown in the flow diagram, the paper sheet being discharged from the papermaking machine can then be calendered to reduce the bulkiness of the sheet, and depending on the desired properties and ultimate use of the laminated board, a hardening agent can be applied to to one or both surfaces of the sheet. The hardening agent can take the form of a fast drying substance which will produce a relatively hard surface on the paper. Materials such as sodium silicate, shellac or varnish can be employed. While the flow diagram of FIG. 1 shows the paper sheet calendered before the application of the hardening agent, the caldendering can alternately be performed after the application of the hardening agent.

After drying of the hardening agent, the sheet can then be laminated through either continuous or batch type operations to form the panel board or other building components. The lamination can be carried out by applying a conventional binder or adhesive to one or both sides of the paper sheet and then placing cut lengths of the sheet in superimposed or stacked relation. By the application of presure and heat, the sheets will be bonded together to produce the laminated structure 1, as shown in FIG. 2, composed of a multiplicity of paper sheets 2 bonded together by an adhesive or binder 3.

The resulting laminated board having the hardening agent applied to the individual sheets can be used as a substutute for plywood for siding, roofing, flooring, and the like. In addition, the papersheet can be laminated into structural products to be used as a substitute for dimensional lumber or for beams, trusses and the like. Without the use of the hardening coating on the individual sheets, the board can be used as insulating sheathing, dry wall, and the like.

The process of the invention is capable of utilizing all the waste stock from the conventional papermaking process, thereby eliminating the usual problems of water and air contamination which accompany the conventional waste stock disposal methods. While the paper produced from the waste stock would not normally be satisfactory for use as paper per se, the paper shet, when laminated into board or other building material, provides an inexpensive, strong and durable product which has a wide variety of uses.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distincly claiming the subject matter which is regarded as the invention.

I claim:

1. A method of fabricating a building material, comprising separating the major portion of the solids from the cooked waste stock from a paper making process from the the liquid effluent, treating the effluent to separate the remaining portion of the solids from the effluent, forming a new stock from said major portion of the solids and said remaining portion of said solids, passing said new stock through a papermaking machine to form a paper sheet, and laminating a plurality of sheets together to form a building material.

2. The method of claim **1**, wherein said waste stock includes cooked ground wood waste resulting from screening paper stock after cooking, and waste stock extracted from a paper web during the forming operation in the papermaking process.

3. The method of claim **1**, and including the step of adding additional cellulosic fiber material to the new stock.

4. The method of claim **3** wherein the additional cellulosic material is waste paper.

5. The method of claim **1**, and including the step of applying a hardenable coating to the paper sheet prior to laminating the sheets.

6. The method of claim **1**, wherein the sheets are laminated by applying an adhesive to the adjacent faces of the sheets.

7. A method of preparing board from waste stock from a papermaking process, comprising the steps of supplying cooked, ground waste resulting from screen-

ing the paper stock after cooking to a settling tank, supplying waste stock extracted from the paper web during the forming operation in the papermaking process to said settling tank, separating a substantial portion of the solids from said waste stock in said settling tank, feeding said separated solids to a mixing tank, separating the remaining portion of the solids from the effluent in the floculating tank, feeding said remaining portion of the solids from the floculating tank to said mixing tank, mixing said substantial portion of the solids with said remaining portion of the solids in the mixing tank to provide a new stock, feeding the new stock to a papermaking machine to form a paper sheet, and laminating a plurality of sheets together to form a board for building construction.

8. The method of claim **6**, including the step of adding additional cellulosic fibers to the new stock in the mixing tank.

9. The method of claim **7**, wherein said sheets are laminated by applying an adhesive to opposite faces of said sheets.

10. The method of claim **7**, and including the step of applying a coating of a fast drying hardening agent to opposite faces of the paper sheet prior to laminating the sheet, and drying said coating.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,769,116 Dated October 30, 1973.

Inventor(s) CHARLES A. CHAMPEAU

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 5, line 6 (Claim 7) After "tank," insert ---feeding the effluent from the settling tank to a floculation tank,---

Signed and sealed this 21st day of May 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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