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FIBROUS PRODUCT AND METHOD OF MAKING THE SAME

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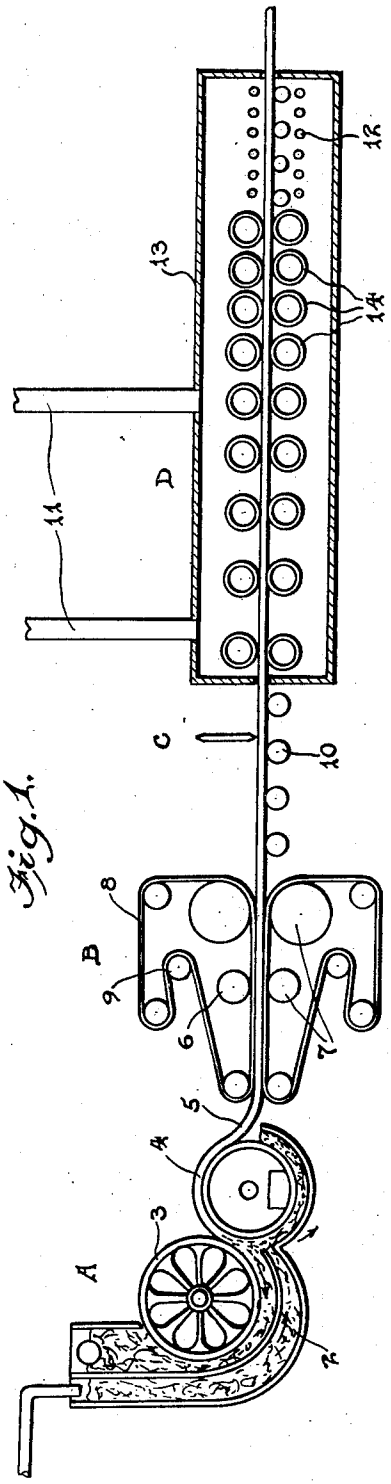


Fig. 1.

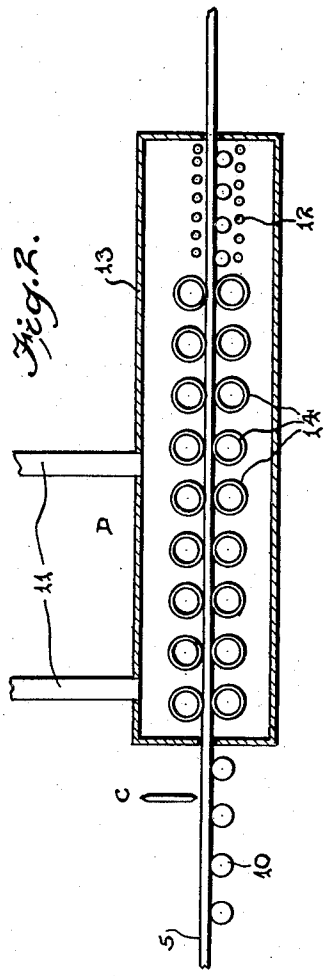


Fig. 2.

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FIBROUS PRODUCT AND METHOD OF MAKING THE SAME

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21 Claims. (Cl. 92—39)

This invention relates to fiber products and the method of making the same and more particularly to board like bodies which have high tensile strength and which have a small coefficiency of expansion in the presence of moisture.

The process is designed to make use of what is now generally considered a waste material, namely forest waste, comprising tree tops, limbs, bark and needles, as well as saw mill waste, comprising slabs, edgings, short butting blocks, slats, shavings and the like and one advantage of the process is that by the use of this material in the manner hereinafter set forth it is possible to obtain excellent product at very much less cost.

Another object of the invention is a fiber product adapted for use in construction of buildings and for various other purposes.

A further object of the invention is to provide an improved process of forming the fibrous products from pulp stock which consists in subjecting the fibrous pulp stock to elements to form a web, subjecting the web to pressure to remove the surplus fluid and applying heat and pressure to the fibrous product to complete the operation.

In practising the process I first comminuted the raw waste material by the use of an ordinary chipper to which it is fed by gravity or other suitable means and it is preferred that the chips produced be of a size from five-eighths to three-quarters of an inch with the grain and one-eighth to one-quarter inch across the grain.

Of course, any suitable material which can be reduced to a pulpy condition may be used and the means for reducing it to such condition may be any that is desired. Economically it is preferred that waste material be used and that it be chipped prior to grinding. The preferred manner of treating the waste material is to place such material in a globe digester with an alkaline solution, such as soda ash. The amount of soda ash used falling within the range of 2 to 6 per cent. The material is cooked in the digester under pressure ranging from 125 pounds to 175 pounds per square inch for approximately 3 hours. The material may be mechanically broken up into the desired size and placed in a digester and subjected to steam cook without any chemical. This way of preparing the wood or woody material has proved very satisfactory and is very economical. The material after it is discharged from the digester is reduced to pulp by any suitable means, preferably an apparatus similar to that disclosed in my patent granted March 22, 1932, #1,850,832.

It is to be understood that any desired chemical may be used and in any amount that may be found to be satisfactory.

The raw material may be first chipped and then subjected to the process of reducing it to fibers as set forth in my patent above referred to.

After the material has been reduced to pulpy condition it is formed into the desired shape, preferably into a sheet, and the sheet subjected to pressure to reduce the moisture contents. Reducing the moisture contents is a matter of convenience and economically it has been found best to reduce the moisture contents within the range of 50 to 65 per cent.

The sheet after having the moisture contents reduced is then subjected to heat and pressure to finish the operation.

For the purpose of this application it has been elected to set forth certain structures and certain methods of producing the same but it is to be understood that they are presented for illustrative purposes only and are not to be accorded any interpretation such as might have the effect of limiting what is claimed as the invention short of its true and comprehensive scope of the art.

To enable others skilled in the art to fully comprehend the underlying features of the invention that they may embody the same various modifications a drawing depicting the preferred form has been annexed as a part of this disclosure and in such drawing, similar reference characters denote corresponding parts throughout all the views.

Fig. 1 is a view diagrammatically illustrating an apparatus for making the fibrous product and Fig. 2 is a sectional view of the modified form of pressing and drying apparatus.

To fully understand the advantages of the novel steps of the method of making fibrous products as well as the new product itself references will be made to methods heretofore used. In known methods of making fibrous products, which have some of the characteristics of the fibrous product produced according to the method here disclosed, it has been necessary to sever the wet sheet and subject it to heat and pressure over considerable length of time. The various products heretofore produced would not hold nails and if they would, very poorly. The new product produced according to my method overcomes the disadvantages of the fibrous products heretofore known.

If desired binders from extraneous sources may be commingled with the pulp before it is formed into a sheet but the invention in its broad embodiment is free of binders from extraneous sources. If insect and fungi resisting fibrous prod-

ucts are desired some toxic agent should be incorporated in such products. This may be done by commingling the toxic agent with the pulp stock or in introducing it to the formed sheet prior to pressing.

The fibrous pulp is preferably formed into a relatively thick sheet depending upon the thickness of the finished product desired and a sheet so formed is subjected to squeezing device to remove the surplus water. The sheet after it has been subjected to this action is passed through pressing means to complete the operation.

In Fig. 1 there is illustrated an arrangement of an apparatus for producing the improved fibrous product and for carrying out the novel process. This apparatus is shown comprising a suitable felting machine A, pressing or squeezing rolls B, cutoff device C, pressing and heating means D.

The felting machine here shown comprises a suitable tank 2, and to which the fibrous pulp stock is delivered from a suitable source, not shown. The pulp is deposited on the surface of and fed upwardly between the cylinders 3 and 4, and is thus formed into a web or sheet 5, which then passes through the pressing or squeezing device B, to remove the surplus liquid or water. The sheet may, if desired, be passed through a pre-heating means to raise the temperature of the moisture remaining in the sheet. If desired the sheet may be severed by cut-off means C, or the sheet severed into the desired size after it is discharged from the heating and pressing means. In fact, the sheet may be severed at any time that it is found advantageous and most economical. The sheet or sheets are now subjected to heat and pressure to complete the operation. The heat and pressure used depending upon the qualities of the fibrous product desired. The fibrous products after they are discharged from the heating and pressing means may be passed through humidifying chamber to add to the products an amount of moisture equal to the normal moisture contents that would be absorbed from the atmosphere. The squeezing device B, may be of any form desired, but the arrangement shown in Fig. 1 has proven highly satisfactory. This arrangement consists of rolls 6 and 7, round which is mounted a screen like member 8, adapted to be mounted on members 9.

The sheet is carried along from the time it is formed until the operation is complete by a suitable conveyer means such as live rolls 10. The means of severing the sheet into the desired length and width may be of any desired construction which will economically perform its function.

The heating and pressing enclosing means 13, is preferably provided with means 11, for permitting the steam which is formed from the moisture in the sheet to escape. Preferably the pressing rolls are arranged as shown in Fig. 1 but they may be arranged in any other desired manner. The rolls may be heated by steam or they may be heated by direct means or in fact by any means by which the desired temperature may be obtained. The number of rolls may be varied but it has been found that a series of rolls, is advantageous from the standpoint of economical operation. Located adjacent the end of the rollers is a series of heated coils 12, which will be designated as curing coils. The curing coils may be eliminated if desired but it has been found preferable that they be used. The fibrous product as discharged from the curing step may be passed through a humidifier and to any other treating process that may be desired.

The above method described for producing the fibrous product is that which has been found most economical and is the preferred means for carrying out the method of making the fibrous products but it is to be understood that the fibrous products may be pressed by any suitable device, such as the hydraulic press, in which a substantially constant temperature is maintained.

It is preferred that the temperature of the heating and pressing rolls progressively decrease as the moisture contents decrease, that is, the temperature of the first rolls may be as high as that which will not char the wet fibrous material and the temperature of the last rolls being greater than 212° F. Very satisfactory results have been obtained by having the upper or lower series of rolls heated to the desired temperature, while on the other set of rolls the temperature may vary from zero to 210° F. If this arrangement is used the temperature of the last rolls, particularly the last pair of rolls, both lower and upper, must have a temperature above 212° F.

The surface of the finished product may be and preferably is smooth and such that it may be easily coated or painted. The density of the products may vary over a considerable range from below unity to above unity depending upon the pressure and the material or materials used.

It will be obvious to those skilled in the art that many variations in the steps and combination of steps constituting the process as well as in the procedure of treatment may be made which fall within the scope of this invention and without departing from the spirit thereof.

The term toxic agent as used herein is intended to cover any material that will repel termites and fungi. The term binders from an extraneous source is intended to cover vegetable, mineral, and animal matter that is desirable.

What I claim is:

1. The method of making fibrous products from waste fibrous material which comprises mechanically breaking up the fibrous material, reducing it to a pulpy mass, manipulating the mass to form a sheet from a water bath, removing the surplus moisture from the sheet and subjecting the sheet to the application of heat and pressure, said heat decreasing as the moisture contents of the sheet decreases.

2. A method of utilizing waste fibrous material including tree tops and needles in the making fibrous boards which comprises mechanically breaking up the fibrous waste material, subjecting the fibrous material to treatment under pressure by the action of steam, mechanically reducing the cooked material to a pulpy condition, manipulating the mass to form a board, and subjecting the board to the simultaneous application of heat and pressure.

3. The method of utilizing waste woody material which consists in mechanically breaking up of the waste material, subjecting the waste material to the action of an alkaline solution, ranging from 2 to 6% for a period of approximately 3 hours, mechanically reducing the cooked material to a pulpy condition, manipulating the pulp to form a relatively thick fibrous product and subjecting the fibrous product to the simultaneous application of heat and pressure.

4. A process of utilizing waste wood or woody material which consists in mechanically breaking up of the waste material, subjecting the waste material to cooking under pressure in the pres-

ence of an alkaline solution for a period of approximately 3 hours, grinding the cooked material to reduce it to a pulpy condition, manipulating the mass to form a boardlike fibrous product and thereafter subjecting such products to the simultaneous application of heat and pressure to complete the operation.

5. The process of utilizing waste wood or woody material, which consists in mechanically reducing such waste material into a pulpy condition, manipulating the pulpy material to form a fibrous product and thereafter subjecting the fibrous product to the application of heat and pressure, said heat decreasing progressively as the moisture contents of the fibrous material is decreased.

6. The process of making fibrous products which consists in mechanically breaking up of fibrous material, mechanically disintegrating said material to reduce it to a pulpy condition, manipulating the pulpy material to form fibrous products and subjecting such fibrous products to the application of heat and pressure by means of pressing members, each of said pressing members being heated to different temperatures.

7. A method of making fibrous products from wood or woody material which includes reducing the material to a pulpy condition, commingling with the pulpy material a binder from an extraneous source, manipulating the pulpy material to form fibrous product and subjecting the fibrous product to the application of heat and pressure, said heat decreasing as the moisture contents of the fibrous product decreases.

8. The process of treating wood or woody material to form fibrous products, which includes cooking the material under pressure in the presence of an alkaline solution, reducing the cooked material to a pulpy condition, commingling with the pulpy material a binder from an extraneous source to increase the fibrous product water resisting qualities, manipulating the mass to form a fibrous article and subjecting the fibrous article to the simultaneous application of heat and pressure, said heat decreasing as the moisture is driven off from the fibrous product.

9. A method of utilizing waste fibrous material in the making of fibrous boards or panels which includes mechanically breaking up of the fibrous material, mechanically reducing the fibrous material to a pulpy condition, commingling with the pulp an insecticide and fungi resisting material, manipulating the pulpy material to form a fibrous product, and subjecting the fibrous product to pressure at the same time that heat is progressively decreased as the moisture contents of the fibrous product is reduced.

10. A method of making fibrous products such as slabs or blocks which consists in subjecting such material to a cooking operation under pressure in a solution of soda ash in the order of 2 to 6 per cent, mechanically reducing the cooked material to a pulpy condition, commingling with the pulpy material a binder from an extraneous source, manipulating the pulpy material to form the fibrous products and subjecting the fibrous products to the application of heat and pressure and thereafter curing the fibrous products by passing it between heated coils.

11. A process of utilizing waste fibrous material which consists in disintegrating such waste material to form it into a pulpy condition, manipulating the pulpy material to form a fibrous slab and thereafter subjecting the fibrous slab to heat and pressure until substantially freed from moisture and homogeneous and then subjecting the fibrous slab to a curing operation.

12. A process of making fibrous products from wood or woody material, which consists of mechanically dividing the material, subjecting the woody material to treatment in a digester, reducing the material to a pulpy condition, manipulating the pulpy material to form a fibrous product, removing the surplus moisture, passing the fibrous product between heated rolls, each of said rolls being maintained at different temperatures and then subjecting the fibrous product to a curing operation.

13. A process for utilizing waste fibrous material which consists in disintegrating such waste fibrous material to form it into a pulpy condition, manipulating the pulpy material to form a fibrous slab, heating the slab to raise the temperature thereof, subjecting the hot fibrous slab to the simultaneous application of heat and pressure and thereafter subjecting the fibrous slab to a curing operation.

14. A process for making fibrous products from wood or woody material which consists in reducing the material to a pulpy condition, manipulating the pulpy material to form a board like fibrous product, heating the fibrous product, passing the hot fibrous product between heated rolls, each of said rolls being maintained at different temperatures.

15. The process of treating fibrous material which consists in reducing the material to a pulpy condition, manipulating the mass to form a fibrous product and subjecting the fibrous product to the application of heat which decreases as the moisture contents decreases.

16. A process for manufacturing fibrous products such as slabs and blocks which comprises reducing woody material of the class described to a pulpy condition, forming a slab from the pulpy mass, subjecting the slab to simultaneous application of heat and pressure by rotatable members, said rotatable members being maintained at definite temperatures, and subjecting the pressed product to a heat curing operation.

17. A process for manufacturing hard stiff board-like fibrous products which comprises reducing woody material to a pulpy condition, forming a board from the pulpy material, subjecting the moist board to simultaneous application of heat and pressure, said heat and pressure applied intermittently whereby steam generated by one application of heat and pressure escapes before heat and pressure is again applied, and subjecting the pressed board to a heat curing operation.

18. A process for manufacturing boards and the like from woody material of the class described which comprises reducing the material to a pulpy condition, manipulating the pulpy mass to form a board-like body, simultaneously applying heat and pressure to the moist board, and subjecting the pressed product to a curing operation between heated coils.

19. A new article of manufacture, a hard, dense, water-resisting board resulting from simultaneous application of heat and pressure and thereafter a heat curing operation, to a pulp board made from waste fibrous material including tree tops and needles and having distributed throughout the board a water proofing material from an extraneous source.

20. A hard, dense, homogeneous, water-resisting board resulting from simultaneous application of heat and pressure and thereafter a heat curing operation, to a woody pulp board contain-

ing water proofing material from an extraneous source.

21. An artificial wood having high tensile strength and great water resisting properties, made from waste woody material by disintegrating and pulping means, treating the material with a water proofing substance, subjecting the material to a felting process, subjecting the felted material to heat and pressure, and curing the pressed product between heated coils.

GEORGE H. ELLIS.