June 16, 1925. 1,542,559

R. S. KOPP

COMPOSITION BOARD AND METHOD FOR MAKING THE SAME

Filed July 30, 1921 2 Sheets-Sheet 1

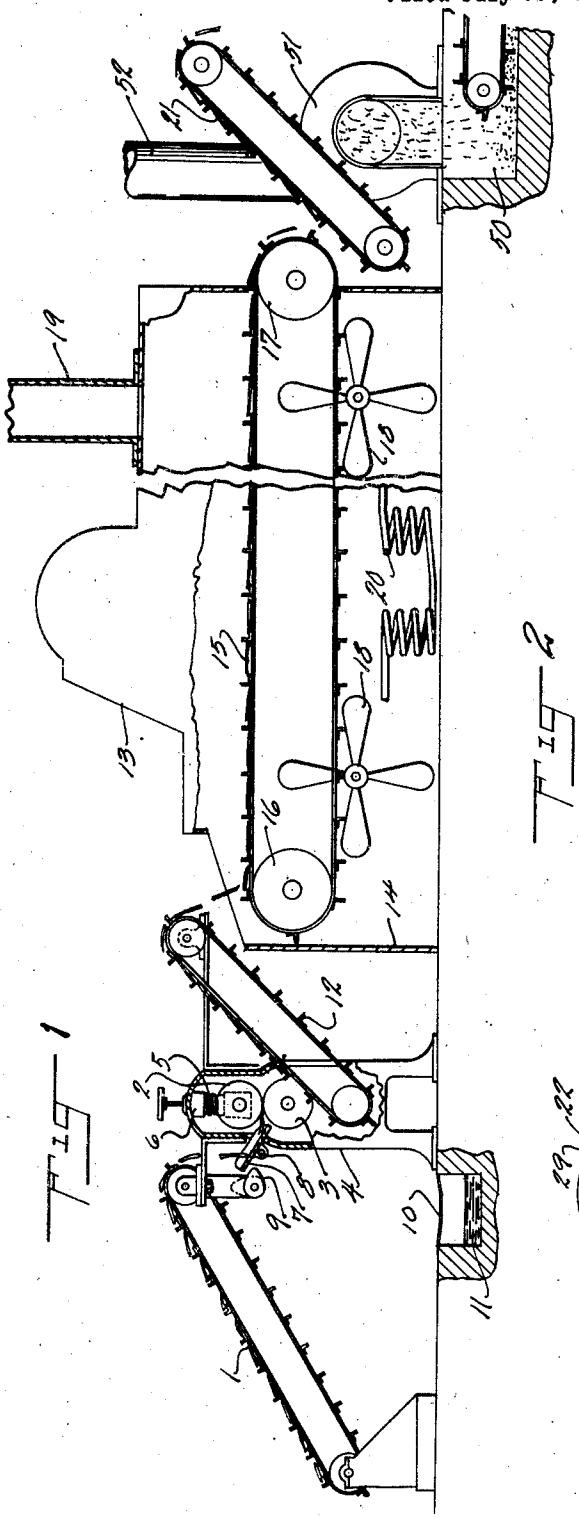


FIG. 1

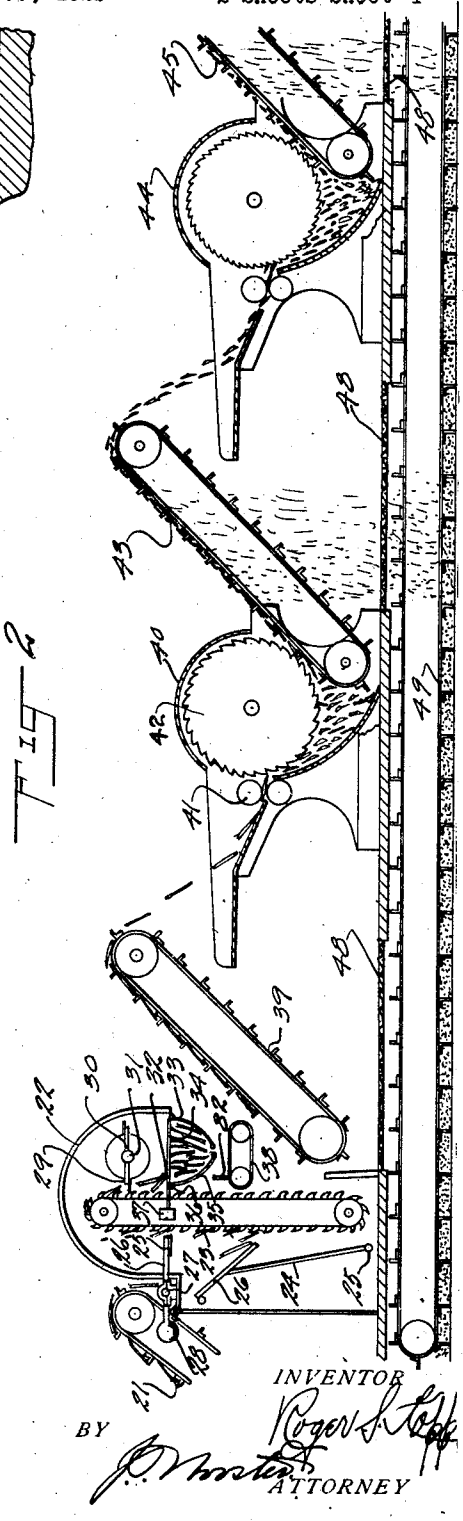


FIG. 2

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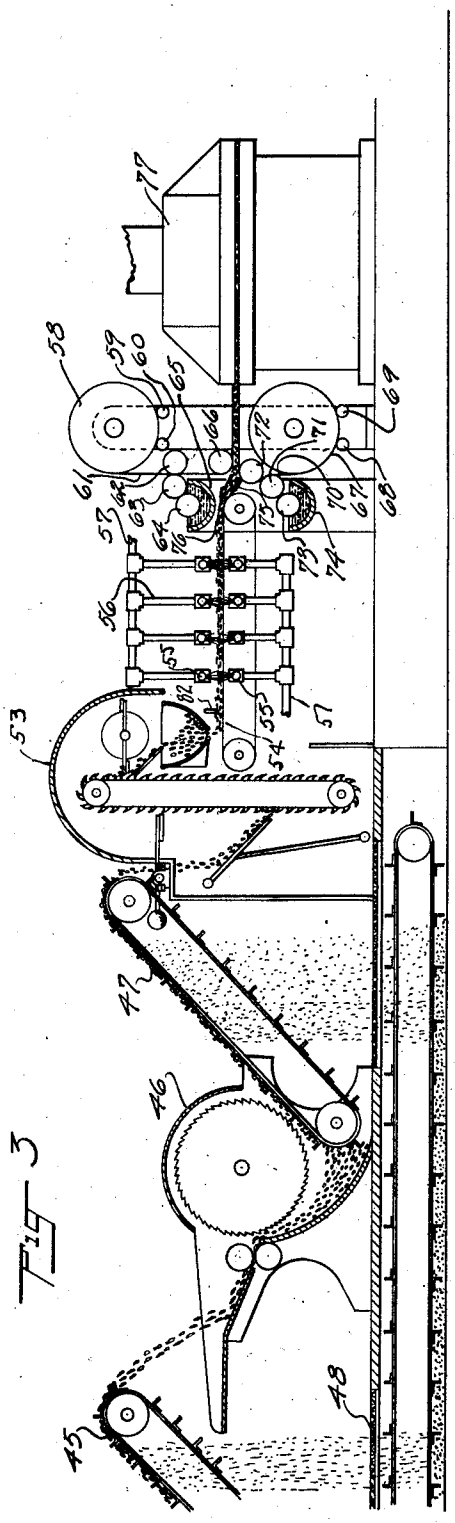


Fig 3

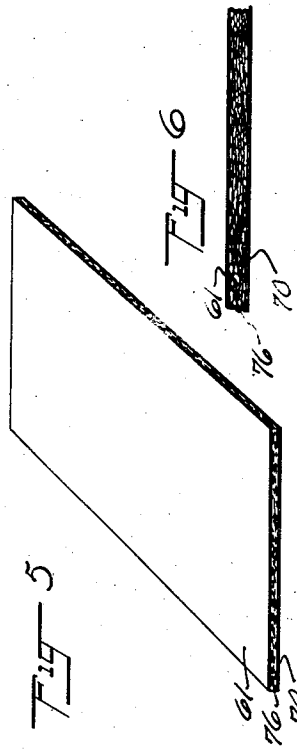


Fig 5

Fig 6

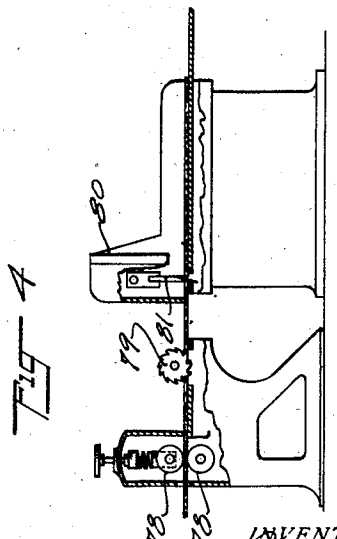


Fig 4

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Patented June 16, 1925. 1,542,559

UNITED STATES PATENT OFFICE.

ROGER S. KOPP, OF DULUTH, MINNESOTA, ASSIGNOR TO INTERCONTINENTAL DEVELOPMENT COMPANY, A CORPORATION OF MARYLAND.

COMPOSITION BOARD AND METHOD FOR MAKING THE SAME.

Application filed July 30, 1921. Serial No. 488,604.

To all whom it may concern:

Be it known that I, ROGER S. KOPP, a citizen of the United States, and resident of Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Composition Boards and Methods for Making the Same, of which the following is a specification.

This invention relates to a composition board and to a method for making the same, and more particularly to a board composed largely of wood bark, hitherto regarded in saw-mills and in the paper making industry as a waste product.

The object of this invention is the production of a fibre composition board that is strong and durable, impervious to moisture, sound-proof, non-warping, a non-conductor of heat and electricity and which will burn only with great difficulty, which is economical to manufacture and which affords use for an otherwise waste product. I have discovered that wood bark, when properly dried, and shredded, and compacted by pressure tends to form a felt-like mass which, because of the great length of its interlaced fibres and the friction between them, possesses a high degree of tensile strength, and which may be formed into a durable sheet of great strength and toughness. Such a sheet is further strengthened and the stiffness thereof greatly increased by the addition of a binding material. The sheet thus formed is further strengthened, and its appearance and moisture resisting qualities are enhanced by pasting tough paper on both sides thereof. By thus making the sheet water proof, warping is prevented, and its strength and durability are increased.

With these and other objects in view, I have devised the method and made the product described in the following specification and illustrated in the accompanying drawings, of which—

Figures 1 to 4 inclusive, when joined end to end in numerical order, constitute a side elevation of the apparatus, said figures being shown separately for convenience.

Figure 5 is a perspective view of the completed board, and

Figure 6 is a cross section of the board.

Referring to the drawing, 1 represents a conveyor upon which the bark received from the tumbler or debarking plant, or other suitable source is dumped. A pair of squeeze rolls, 2 and 3, being upper and lower respectively, are carried in frame 4, roll 2 being mounted in bearings free to move up and down, and normally held against roll 3 by spring 5, the compression of the latter being adjusted by nut 6. Shaker 7, positioned under the delivery end of conveyor 1, is pivoted at 8 to frame 4, and is oscillated by an eccentric cam 9, causing it to throw the pieces of bark between rolls 2 and 3 which have scored surfaces to insure feeding.

A large quantity of water is squeezed out of the bark in its passage between rolls 2 and 3, and drains through perforated cover 10 into trench 11, and thence into the drainage system. The crushed bark, emerging from rolls 2 and 3, falls upon conveyor 12.

Drier 13 comprises shell 14, apron 15, the latter being mounted on pulleys 16 and 17 respectively, intake fans 18, exhaust duct 19, and steam coils 20. The bark is dropped upon one end of apron 15 from conveyor 12, and after passing through drier 13, the bark falls from the opposite end of apron 15 to conveyor 21.

A weighing and feeding device 22 of the type more fully disclosed in the patent to Hill, 592,706, Oct. 26, 1897, receives the dry bark from conveyor 21. The bark is pressed against the rising run of elevating apron 23 by means of a spring pressed slatted presser frame 24, pivotally mounted at 25. Pivoted guide 26 conducts the material to the space between apron 23 and frame 24. As the stock is carried upward by the rising run of apron 23, the surplus is removed therefrom by the action of a vibrating comb-bar 25′ mounted on the inner ends of arms 26′, which are pivotally mounted at 27 and provided with a counter-weight 28. As the stock is carried over and down by apron 23, it is removed from the latter near the beginning of the downward run of the same by beater bars 29, carried by arms 30, which are rotated by shaft 31 so that bars 29 when in close proximity to apron 23 travel in the same direction and at a greater velocity. The detached stock falls upon guide 32, and thence into hopper 33, which is carried upon scale beam 34. The rear plate 35 of hopper 33 is hinged at 36 to scale beam 34, and is actuated by a cam mechanism (not shown) to open hopper

33 at predetermined intervals. Hopper 33 is balanced by weight 37, and connected to scale beam 34 and actuated by the tilting of the same, is a mechanism for stopping the travel of apron 23. Thus a predetermined quantity of stock is released from hopper 33 at predetermined intervals, the same falling upon conveyor 38, which thus furnishes a uniform supply of stock for further operations. Pusher board 82 presses the material forward as the same is released from hopper 33, thus forming a uniform layer.

From conveyor 38 the stock falls upon conveyor 39 and is thus delivered to shredder 40, wherein it is fed between corrugated rolls 41. Shredder drum 42 rotating at a much greater peripherical velocity than rolls 41, is provided with steel taper pins or teeth which rip the bark into fibre. The shredded stock is then carried by conveyor 43 to a second shredder 44, similar in all respects to the foregoing, but having finer and more closely spaced shredding teeth. From shredder 44 the stock is carried by conveyor 45 to a third shredder 46, adapted to reduce it to a still finer condition. Conveyor 47 receives the stock from shredder 46.

Each of conveyors 39, 43, 45 and 47 permits the fine corky dust released by the crushing and shredding operations to fall through, the fibre being retained. This sifting process is facilitated by the constant vibration of the conveyor. Beneath each of the conveyors is a grid or screen 48, through which the cork-like particles are received by scraper conveyor 49 which conducts them to pit 50. Fan 51 discharging from pit 50 into discharge pipe 52, causes the particles to be conveyed to the boiler room, where they are introduced directly into the furnace and utilized as fuel. Where a more positive screening action is required, conveyors 39, 43, 45 and 47 are of the scraper type, and the stock is thereby carried across screens or grids of predetermined mesh.

From conveyor 47 the stock is received by a second weighing and feeding device 53, similar in all respects to 22 aforementioned. The sifted and finely shredded dry stock is here deposited in a smooth uniform felted layer upon delivery apron 54, pusher board 82 assisting in the intertwining of the fibres. Apron 54 is of mesh or grid formation to permit of spraying the stock from below as well as from above. Spray pipes 55 are positioned above and below the stock on conveyor 54, and are provided with staggered holes through which a solution of water glass or other binding material is forced under pressure. Branch pipes 56 and supply pipes 57 connect pipes 55 with the source of supply.

Upper paper roll 58 is carried upon a pair of cradle rolls 59 and 60, one of which is positively driven. The paper 61 from roll 58 passes between rolls 62 and 63, the latter being the glue transfer roll and receiving its supply of glue from positively driven glue roll 64 with which it contacts. Glue roll 64 is partially immersed in glue contained in trough 65. The sheet of paper 61 then passes around guide roll 66, with its glue covered side downward. Lower paper roll 67 is carried upon cradle rolls 68 and 69, one being positively driven, and the paper 70 is carried between glue transfer roll 71 and guide roll 72 with its glue covered side up. Roll 71 contacts with and is supplied by positively driven glue roll 73 rotating partially immersed in glue contained in trough 74. Guide rolls 66 and 72 are spaced apart vertically a distance about equal to that of the layer of bark on conveyor 54, and are positioned as close to the delivery end of the same as possible. A guide 75 prevents the felted layer 76 from falling after it leaves the conveyor and before reaching rolls 66 and 72.

Hydraulic press 77 compacts the composite sheet of shredded bark and paper emerging from rolls 66 and 72. A pair of adjustable tension rolls 78 draw the board from press 77 after the release of pressure, and a pair of circular saws 79 set at predetermined distance apart trim the edges of the sheet. A cutting machine 80, preferably of the automatic shear type and having a knife 81, cuts the board into desired lengths.

Feeding and weighing devices 22 and 53, and shredders 40, 44 and 46 (excepting drums 42) together with associated conveyors, paper feeding rolls, tension rolls 78 saws 79 and cutter 80 are connected up with chain drives and driven as a single unit through a main drive pulley supported near press 77. The use of a flat press renders the process intermittent, and the above described drive system is synchronized with press 77 by causing the latter, on its releasing movement, to effect the engagement of clutch of the main driving pulley and to lift knife 81 of cutter 80. Shredding drums 42 are continuously driven, and independent drive is provided for squeeze rolls 2 and 3 and their associated conveyors, also for drier 13 and its conveyors.

In place of a power press 77 of the type shown in the drawing, heavy rolls may be substituted. In such case the process may be made continuous.

The operation of the above described apparatus will be apparent from the description. The bark is first crushed and a large proportion of the liquid content is squeezed out. The remaining moisture is removed by evaporation, and the bark is fed uniformly through a succession of shredders, each reducing the fibre to a further degree of fineness, the corky content of the bark being

sifted out between the several shredding operations. The finely shredded bark is then formed into a uniform sheet with the long tough fibres intertwined then impregnated with a solution of sodium silicate, or similar binding material, which greatly strengthens the bond between the felted fibres. The layer is then fed between sheets of glued paper, preferably waterproof, such as kraft paper, and the composite layer compacted in a press, which forces the fibres into closer union and distributes the sodium silicate throughout the entire mass, also causing the paper to adhere more firmly and giving a smooth surface. The paper being waterproof, prevents the adhesive on its inner surface from oozing through and sticking to the press.

With regard to the corky content of the bark, the presence of the same in the finished product tends to weaken it. Consequently the sifting process should be carried sufficiently far to insure the required strength.

In the following claims, the term "ligneous" is intended to apply to bark fibre as well as to the fibre of wood in its more restricted sense. While the felting of ligneous fibre is ordinarily accomplished by flotation and capillarity, as in the paper making industry, applicant is believed to be the first to effect the separation and the subsequent felting of such fibre in the absence of extraneous liquid.

What I claim is:

1. The method of making a fibre board from wood bark which comprises removing water from the bark, shredding the bark, removing the cork-like impurities from the fibres, arranging them in a layer, applying a binder, and compressing the fibres and binder.

2. The method of making fibre board from wood bark which comprises removing water from the bark, shredding the bark, removing the cork-like impurities from the fibres while dry, and arranging the fibres in a layer.

3. The method of making a fibre board which comprises removing water from the bark, shredding the bark, removing the cork-like impurities from the fibres, further shredding the fibres followed again by removing the cork-like impurities, and arranging the fibres in a layer.

4. The method of separating ligneous fibres and removing cork-like impurities which comprises successively shredding the fibres to separate them, and successively removing the cork-like impurities from the fibres between the shredding operations and while dry.

5. A fibre board comprising a sheet of shredded bark impregnated with binding material and covered on either side with a moisture resisting material.

6. A fibre board, comprising a sheet of shredded and felted bark covered on either side with a tough moisture resisting material.

7. The method of forming a fibre board shredded filling material which comprises dry shredding bark to pulverize the cork-like substances without pulverizing the fibres of the bark, and dry separating said pulverized cork-like substances from the fibres.

8. The process of treating bark to form a fibre board which comprises shredding the bark, felting the shredded material and impregnating the same with a binder by spraying opposite sides of the felted material.

9. The method of making a bark filler for fibre board which comprises crushing and shredding the bark, removing the cork-like pulverized material while dry, and forming the fibrous portion into felted sheets.

10. The method of making a bark filler for fibre board, which comprises drying the bark, shredding the same while dry, and forming the shredded bark into a felted sheet.

11. The method of making a bark filler for fibre board, which comprises passing the bark through rollers to crush the same and to squeeze out a portion of the liquid content, drying and shredding the crushed product, and forming the same into felted sheets.

12. The method of making a bark filler for fibre board, which comprises drying the bark, shredding the same while dry, forming the shredded bark into sheets, impregnating the sheets with binding material, and compacting the sheets by the application of pressure.

13. The method of making a bark filler for fibre board, which comprises shredding the bark, removing therefrom the cork-like substances when dry and without washing, felting the shredded bark, and forming the same into sheets.

Signed at Duluth, in the county of St. Louis and State of Minnesota, this 18th day of July A. D. 1921.

ROGER S. KOPP.