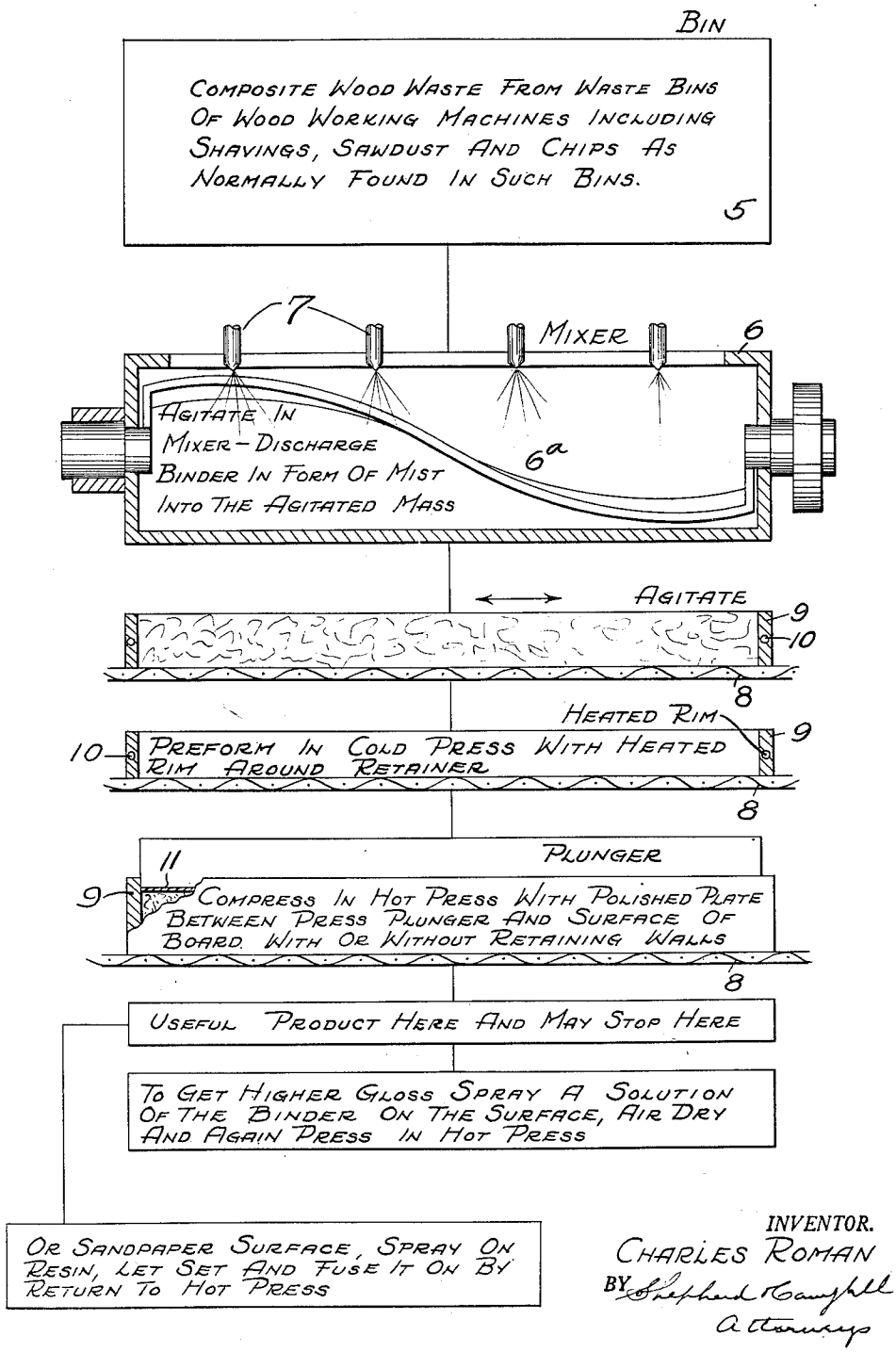
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METHOD OF AND MEANS FOR MAKING ARTIFICIAL WOOD PRODUCTS

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METHOD OF AND MEANS FOR MAKING ARTIFICIAL WOOD PRODUCTS

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My invention relates to a composite board made out of the collective wastes of saw mills, planing mills, veneer mills, flooring mills, furniture factories, and other industries using wood as their raw material, and where, as a residue, they have wood scraps, sawdust and wood shavings. This waste residue material is, by my process, made into a ready finished product that needs no painting or other finish applied to it. It varies in appearance according to the materials used and their judicious combination. The finished product can be used for various purposes such as flooring, wallboard, furniture, counter tops, table tops, desk tops, etc. It may be worked like wood on woodworking machines and will not injure the cutting edges of wood-working tools. It will take nails or screws just as wood will do. In appearance it presents a heretofore not known texture, in an unlimited combination of colors and patterns.

My method consists of the following procedure. First I take the wood wastes as described above (most of it usually carried from the machines by the conventional dust collector into the shavings bin, with the exception of the short wood scraps which can be run through a wood hog or reducer and be then blown into the bin through the dust collecting system) and treat it by the steps indicated in the accompanying drawing.

In this drawing it is shown that I take this conglomeration of various wood wastes from bin **5**, to a rotary blade mixer **6**, where the mixer blades **6a** will churn and tumble this mass, and while the heterogeneous mass is in motion, I inject a binder through nozzles **7**, preferably in the form of a mist, so as to wet down or thoroughly dampen the whole mass. This dry mass will readily absorb this mist of binder to any degree, while the agitation of the mass and the discharge of the binder in the form of a mist insures that a minimum amount of binder will be sufficient to reach and coat all particles of the wood waste. The binder soaked mass of wood waste is then placed on a forming frame or tray having a screen grid bottom **8** and retaining walls **9** which rest upon the screen grid. By making walls **9** separate from the screen **8**, the screen may function with respect to a large number of the frames. As fast as one molded mass is preformed in a frame it may be removed from the screen and another frame substituted. The setting or "freezing" of the edges of the masses by the heating elements **10** permits the early removal of the masses from the frames, the early reuse of the frames and a general speeding up in the manufacture of the molded shapes. Further since the removal of the frames from the screen permits the ready dislodgement of the shapes from the frames by merely pushing upon the shapes from one side outwardly toward the other side of the frame, unloading of the frames and their quick reuse, is possible.

After the mass is placed in the forming frame constituted by walls **9**, said frame is shaken or agitated so that the small aggregates will sift to the bottom of the frame, leaving the larger aggregates on the surface. This imparts a very pronounced texture to the final finished surface. If a less pronounced textured surface is desired, I omit the sifting motion. If there are many colored wood shavings in the mass, the board will have a vari-colored surface, and if all the mass is of the same species of wood it will give a one color board. For example, I took the waste from one factory that was making oak flooring and secured a nice oak color board, but when I took some white pin shavings and added

them to the oak shavings it gave an entirely different looking board. It looked like "wood marble." Also, I find that when I mix oak and mahogany together the effect is again different and a very beautiful board is had. Or I may use only a small amount of the different color shavings and sprinkle it on the top of the batch. This gives a still further difference in appearance.

After the mass is in the forming frame, I may preform it or I may put it into a hot press to cure under heat and pressure of from 100 to 350 lbs. pressure per square inch, at a temperature of 250°–350° Fahrenheit. However, I preferably preform the shape by placing the forming frame in a cold press to initially compress the mass before it goes to the hot press. While thus preforming the mass, its peripheral edges are heated by inserting in the walls **9**, "Calrod" units **10**. These are electrical heating units and the heating of walls **9**, in turn heats the thermosetting binder (hereinafter more specifically identified) and thus "freezes" an area extending around the perimeter of the shape being formed, so that no spreading of the shape takes place when it is removed from the forming frame. It is sometimes desired to cast ornamental panels having ornamental portions in relief or intaglio and the described method of initially "freezing" or solidifying the peripheral portions ahead of the central portions of the mass aids in confining the material and materially reduces the amount thereof which, under present practice, must be trimmed off as waste.

After the described preforming, the shape is compressed in a hot press, as above stated at pressures of from 150 to 350 lbs. per square inch at temperatures of from 250° to 350° F. During this final compression of the material, a highly polished, stainless steel or nickel-plated sheet **11** is interposed between the hot press head and the material and it is the presence of this plate which imparts a high polish and a perfectly smooth surface to the finished product. The screen grid will serve to let the steam escape freely, and the board will cure fast, as soon as the board is dry (when the steam from the binder stops). The board can now be taken out and is a finished product.

When these boards come out of the press they have a smooth, slightly glossy surface on one side. If still higher gloss is required, I spray a solution of the binder on the surface, let it air dry, then put it back in the hot press again, until cured. By thus coating the surface with a spray solution of the same binder as was used in the initial binding of the particles of woody fibers together, the whole mass is rendered a homogeneous one and the coefficient of expansion of the surface layer is identical with that of the rest of the formed shape. Thus there is no tendency for the surface layer to warp off of, or separate from the base. Also any woody particles which may have penetrated the surface of the base shape are covered over by a highly reflective or polished layer of a substance whose incidence of refraction is the same as that of the base material binder.

Or, after the board is out of the press, I can sandpaper the surface, then spray one coat of solution of any of the named binders, let it set, then fuse it on. This will give a surface that is waterproof as well as fireproof against lighted cigarettes placed thereon.

For the binder I may use different kinds of resins, according to the kind of result desired. I found dimethylolurea very satisfactory. This dimethylolurea is not a glue, but when the wood shavings absorb it the acid content of the wood converts it into resin within the cells of the shavings, wood particles, etc. When heat is applied, under pressure, this material becomes fusible and will set and becomes insoluble in water and when this material, in the flowing state, is in contact with the polished stainless steel surface of the hot press, it will form a glossy film on the surface of the board, making it unnecessary to finish it further for the average use. I am aware of the fact that it is not ordinarily an act of invention to merely substitute one old form of thermosetting resinous binder for another, but the present invention goes materially beyond that, in that, as far as I

am aware, I am the first to use dimethylolurea as a binder to bind together waste wood products from the bins of woodworking plants and especially including shavings. Dimethylolurea differs from practically all of the other synthetic resins in that it does not become a glue like, thermosetting, resinous binder until the acid content of the wood particles converts it into resin within the cells of the shavings, woody particles, etc. Now these woody particles, having been reduced to many small particles before they become waste, present innumerable faces at which the grain of the wood is exposed, in many instances being cut across the grain, so that the dimethylolurea may readily enter the cells and be affected by the acid content of the wood.

While dimethylolurea is highly satisfactory, I may also use any thermo-setting resin on the market, such as the phenol-formaldehyde type or urea-formaldehyde type or urea-formaldehyde-melamine type, these being applied in the way above described.

When an exceptionally high glossy surface is required, such as for table tops, I take the board out of the hot press and sandpaper and polish the surface to a very fine state, then spray a coat of highly concentrated resin solution on this surface, let it set, then put the shape back in the hot plate press with the polished plate on the resin side and apply heat and pressure. I find this so satisfactory that even cigarettes will not leave a mark on it. Or I may apply one or more dry films of the above named resins on the board and fuse it onto the surface.

The method of my invention makes it possible to make a one piece product in a very rapid and economical way. In this respect it differs from those products involving the use of relatively thin sheets of resin impregnated material which must thereafter be glued to core board or other backing material. The process described not only yields the desired result with a minimum of the binder but also with a minimum degree of wetness of the mass. This makes for very quick drying with a consequent reduction in the time required to carry a given amount of material to the form of the completed product. As a consequence, I am able to produce a very strong and beautiful board at a very small cost. As an example of the economical proportions which may be employed, I cite the following proportions which I have found satisfactory.

I take 1 pound urea, 3 pounds dimethylolurea and 35 pounds of water. This makes an approximately 25% solution. The water is heated to from 140° to 150° F. Then the crystals of the remaining ingredients are added and the whole agitated until the crystals are dissolved.

I then take 8 pounds of the shavings or other comminuted wood, agitate it and tumble it in a mixer and discsharge one quart of the above solution into it in vapor form through a jet or jets while the mixer is in motion. Then put the dampened mass in the former or mold **9** and cure as previously described.

This formula makes a very attractive and strong board for indoor use. However, for outside use a more waterproof board is desired and I then use a higher concentration of the dimethylolurea and more of it.

While the introduction of the binder in the form of a mist is very economical I may also get very rapid results by soaking the mass of wood waste (shavings, etc.) in the dimethylolurea solution, drawing off the surplus moisture content, drying the mass under a temperature of approximately 200° F. until the remaining moisture content is from 15 to 25% by weight of the mass, and then compressing and curing the mass in the hot press, under heat and pressure as described.

The invention is not limited to the precise steps described but includes within its purview whatever changes fairly come within either the terms or the spirit of the appended claims.

What I claim is:

1. The herein described method of making artificial wood shapes which consists of agitating and tumbling in a mixer a mass of the heterogeneous wood waste from the waste bins of wood working plants and containing shavings, sawdust and small chips, introducing a mist of a thermo-setting binder into the tumbling mass until said mass is thoroughly dampened, introducing the mass to a forming frame having a foraminous bottom and shaking the mass after such introduction to precipitate the smaller particles to the bottom of the frame and bring the larger aggregates to the top, then curing the mass under heat and pressure while the top face of the mass is contacted by a highly polished, metallic surface, the foraminous bottom providing for the escape of steam from the mass during the curing operation.

2. A forming frame for composite board of the character including a thermosetting binder comprising a foraminous bottom plate, a retaining rim loosely resting upon said bottom plate and means for heating said rim to a degree to preset the periphery of the board.

3. The herein described method of making artificial wood shapes which consists of agitating and tumbling in a mixer a mass of the heterogeneous wood waste from the waste bins of wood working plants and containing shavings, sawdust and small chips, introducing a mist of a thermosetting binder into the tumbling mass until said mass is thoroughly dampened thereby, introducing the mass to a forming frame and there subjecting its perimeter to sufficient heat to set the binder therearound to form a mat having its edge at least partially hardened and thereafter subjecting said mat to heat and pressure to set the binder of the whole mat, said initial setting of the perimeter of the mat acting to prevent excessive spreading of said mat under the heat and pressure of the final binder setting action.

4. The herein described method of making artificial wood shapes which consists of agitating and tumbling in a mixer a mass of the heterogeneous wood waste from the waste bins of woodworking plants and containing shavings, sawdust and small chips, introducing an aqueous thermo-setting binder into the tumbling mass until said mass is thoroughly dampened thereby, introducing the dampened mass to a forming frame having a foraminous bottom and shaking the mass after such introduction to precipitate the smaller particles to the bottom of the frame and bring the larger aggregates to the top, then curing the mass under heat and pressure while the top face of the mass is contacted by a highly polished metallic surface, the foraminous bottom providing for the escape of steam from the mass during the curing operation.

5. A method as recited in claim 4 wherein the binder employed consists of, substantially,

	Pounds
Urea	1
Dimethylolurea	3
Water	35

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