Patented Feb. 28, 1933 1,899,768

UNITED STATES PATENT OFFICE

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SAWDUST WOOD FIBER BOARD AND METHOD OF MAKING SAME

No Drawing. Application filed December 23, 1930. Serial No. 504,217.

This invention relates to a composition of matter, and to a process of making the same.

The invention relates to a slab, board, block or other article formed from sawdust, or wood fiber, or shredded bark, or any vegetable fibrous material or combination of such materials mixed with and impregnated with a binding material, and passed into a forming mold. This molded material has a high tensile and breaking strength, is readily penetrated with nails, screws and the like, and may be worked with ordinary carpenter tools in the same manner as natural wood.

Other objects and advantages are to provide a composition of matter and a process of making the same, that will be superior in point of simplicity, inexpensiveness of construction, positiveness of operation, and facility and convenience in use and general efficiency.

In this specification the invention is described in the form considered to be the best, but it is to be understood that the invention is not limited to such form, because it may be embodied in other forms; and it is also to be understood that in and by the claims following the description, it is desired to cover the invention in whatsoever form it may be embodied.

The invention contemplates a lumber substitute made from wood waste, particularly coarse sawdust, waste wood shavings and other fibrous materials resulting as waste from the operation of a lumber mill, and the production of a strong, resilient, molded material therefrom which utilizes said waste sawdust, wood fiber, shavings, and other waste, in combination with a binder composed of formic aldehyde, meta-cresylic acid, sodium sulphite, and potassium bromide. I have found that the best results are obtained from the use of re-distilled meta-cresylic acid, but the crude may be used.

The process produces a highly compressed, smooth surfaced, synthetic board. The synthetic board mixture consists of formic aldehyde, 7 parts by weight; meta-cresylic acid, re-distilled, 7 parts by weight; sodium sulphite, 2 parts by weight; potassium bromide, one-half of one part by weight; and sawdust or equivalent material, 100 parts by weight. The above ingredients are placed in a mastication or kneading and mixing machine, and thoroughly blended together. The sawdust or wood fiber, or shredded bark, or the like, must be in a bone dry condition and free of moisture. The ligno cellulose aggregate absorbs, or becomes impregnated with, the materials going to make up the binder compound and holds the same in an inert state. The total mass of ingredients forming the binder compound is relatively small compared with the woody aggregate and hence when the woody aggregate and binder ingredients are thoroughly mixed they are dry to the touch and contain only a negligible amount of moisture. The thoroughly mixed substances are then placed into a heated mold for the purpose of initially molding the material into shape. The material remains in the mold for approximately fifteen seconds under a pressure of from 500 pounds to 1000 pounds per square inch, after which the pressure is released and the initially comprest material is transferred to a hydraulic, multiple platen hot press for a period varying from one to five minutes, where it is heated at a temperature varying from 100° to 200° centigrade, but preferably at 177° C. where it is finally comprest and finished.

In the form of slabs or boards, the molded product may be used to form partitions or walls or ceilings, in the same manner as wall board. The molded product resembles wood, and it will not warp and is sufficiently tough, as well as hard, so that the edges will not readily break off. The product is not inflammable, and possesses a very marked resistance to water. The process may also include other forms or embodiments than those specifically referred to herein, and the exact process may also be slightly varied and still remain within the scope of my invention.

As a more specific embodiment of the invention, I will now describe in greater detail the steps and their sequence, which constitute the process that eventuates the novel product of my invention.

The proper proportions of binder and of aggregate are an important factor in the

successful operation of the present invention. In preparing the binder I use formic aldehyde, meta-cresylic acid, sodium sulphite, and potassium bromide, in the proportions heretofore stated.

The next step in the process consists in drying the sawdust, wood fiber, or other equivalent fibrous material of not too fine dimensions. This is essential for the ordinary wood waste contains varying amounts of moisture, which would render accurate mixing of the aggregate with the binder impossible. The drying may be carried out in any conventional drier, heated in any convenient way. The next step consists in mixing approximately 100 parts of the dried wood waste (or its equivalent other analogous fibrous material) with approximately 7 parts by weight of formic aldehyde, approximately 7 parts by weight of meta-cresylic acid re-distilled, approximately 2 parts by weight of sodium sulphite, and approximately one-half of one part by weight of potassium bromide. The binder ingredients and the wood waste are thoroughly mixed and kneaded together to impregnate the aggregate with the binder. The resulting mixture of aggregate and binder appears quite dry to the touch. The mixture of binder and aggregate of wood waste is then charged into a measuring hopper, where an amount, sufficient to fill a mold in which the product is to be shaped, is measured off. The measured amount is then transferred to a heated mold (which will yield a large slab of the material), and the material is initially compressed in this mold under heat, by means of a hydraulic press. The pressure applied to the product varies between 500 pounds to 1000 pounds per square inch.

The material is allowed to remain in the mold under pressure for fifteen seconds, after which the pressure is released and the molded product is transferred to a multiple hydraulic press and treated under a pressure varying from 500 pounds to 1000 pounds per square inch, and a temperature of approximately 177° C. The formic aldehyde, meta-cresylic acid, sodium sulphite, and potassium bromide, are heated to a temperature varying from 100° C. to 200° C., but preferably 177° C., while under pressure.

The impregnated aggregate under the pressure and heat conditions referred to, causes a reaction to take place between the formic aldehyde and meta-cresylic acid, to form a condensate or precipitate, like a resin, the condensation being hastened or accelerated by the sodium sulphite and potassium bromide, which act as catalytic agents. When the condensation takes place the binder throughout the material, in the aggregate and between the aggregate, is coalesced into a homogeneous mass which is practically insoluble and infusible under heat or pressure. I have found that from 1 to 5 minutes time is sufficient to allow the material to remain in the final press under the temperatures stated, to accomplish the desired reaction. The material is cooled under pressure, by circulating a cooling medium through the heating pipes of the press.

The sodium sulphite and potassium bromide, in the binder, act as catalytic agents for the purpose of hastening or accelerating the reaction between the formic aldehyde and meta-cresylic acid, whereby resin is precipitated from said substances in the presence of the fiber aggregate, which in turn, under heat and pressure, becomes insoluble and infusible. The cooled slab or board is next removed from the press. The product is then thoroughly dry and free from moisture, and possesses a hard smooth surface, which is water resistant and fireproof. The boards made in accordance with the present invention are very tough and strong and resemble natural wood, except that they are devoid of any decided grain. The commercial sizes range from 4 ft. x 12 ft. x $\frac{3}{16}$ in. thick to $\frac{1}{4}$ in. thick, and up to 6 ft. x 12 ft. x $\frac{3}{8}$ in. thick.

Experiments have demonstrated that boards and other lumber articles made in accordance with my invention will not warp or check, and they may be employed in place of lumber. The product may be used for slabbing on the side of a building, as interior wall finish, as plasterboard, or for partitioning, and will take paint and varnish quite readily.

Redwood sawdust yields a particularly fine product and gives the board the natural color of the wood with the above limitations.

Crude wood alcohol may also be used in combination with the other ingredients going to make up the binder, as I have found it improves the quality of the binder. The crude wood alcohol contains certain impurities, such as acetone, aldehydes, etc., which have a certain affinity for the wood aggregate, to thereby increase the coalescing properties of the binder under heat and pressure.

During the period in which heat and pressure is applied to the aggregate to effect the condensation or precipitation of the resinous binder, a certain amount of moisture is given off and said moisture is driven off by the high temperatures involved.

Having thus described this invention, what I claim and desire to secure by Letters Patent is:

1. The method of making composition board and the like which consists in disintegrating woody material into a fibrous state; impregnating the fibers with a resin forming compound; compressing at one point a mass of the thus impregnated fibers into a body denser than the original woody material; transferring the compressed mass to another point for further compression and in the presence of heat, to coalesce the resin forming

compound in the fibers into a body of uniform density throughout; and finally cooling the body while holding it compressed.

2. The process of producing dense and impervious artificial lumber from woodwaste, bark fibers and the like which comprises drying said materials to substantially zero moisture content; then admixing therewith raw materials capable of reacting to form a synthetic resin; homogenizing the resultant mixture and initially compressing the same to form a coherent mass; and thereupon compressing said mass at a temperature and pressure sufficient to cause the formation and hardening of said synthetic resin in situ.

3. The process of producing dense and impervious artificial lumber from woodwaste, bark fibers and the like which comprises drying said materials to substantially zero moisture content; then admixing therewith meta-cresylic acid, formaldehyde and neutral catalysts capable of converting said two products into a hardenable resin; homogenizing the resultant mixture and initially compressing the same to form a coherent mass and thereupon compressing said mass at a temperature and pressure sufficiently high to cause the formation and hardening of the said resin in situ.

4. The process of producing dense and impervious artificial lumber from woodwaste, bark fibers and the like which comprises drying said materials to substantially zero moisture content; then admixing therewith meta-cresylic acid, formaldehyde and neutral catalysts capable of converting said two products into a hardenable resin; homogenizing the resultant mixture and initially compressing the same to form a coherent mass and thereupon compressing said mass at a temperature of from 175° to 200° C. and a pressure of from 500 to 1000 pounds per square inch to cause the formation and hardening of said resin in situ.

5. The process of making sawable and nailable synthetic lumber from fibrous woodwaste, bark and similar ligneous matter which comprises first drying the same and thereupon impregnating the same with a mixture of meta-cresylic acid and formaldehyde together with sodium sulphite and potassium bromide; compacting the thus impregnated material to form a coherent mass and subjecting the latter to a pressure of from 500 to 1000 pounds per square inch at a temperature of substantially 175–180° C. for from one to five minutes; then cooling the mixture while continuing to apply the pressure, and thus forming a hardened set synthetic resin within said matter and between the interstices of the mass whereby a strong homogenous lumber is obtained.

6. Artificial lumber comprising woodwaste and a synthetic resin consisting of the condensation product of meta-cresylic acid and formaldehyde.

7. Artificial lumber consisting of a major portion of fibrous wood and a minor portion of the condensation product of meta-cresylic acid and formaldehyde.

8. A composition board consisting of fibrous wood and the infusible and insoluble condensation product of meta-cresylic acid and formaldehyde; said board containing not less than 80% by weight of said wood.

9. Composition lumber consisting of from 80 to 90% of dry fibrous ligneous matter and from 10 to 20% of the hardened final condensation product of meta-cresylic acid and formaldehyde.

10. Nailable, sawable and flexible synthetic lumber consisting of a large proportion (80–90%) of coarsely fibrous wood and a small proportion (10–20%) of a hardened synthetic resin.

In testimony whereof, I have hereunto set my hand at San Francisco, California, this 4th day of December, 1930.

JAMES V. NEVIN.