Dec. 21, 1954 B. A. GORDON 2,697,254

DRY PROCESS OF MANUFACTURING PRESSBOARD

Filed March 14, 1950

2 Sheets-Sheet 1

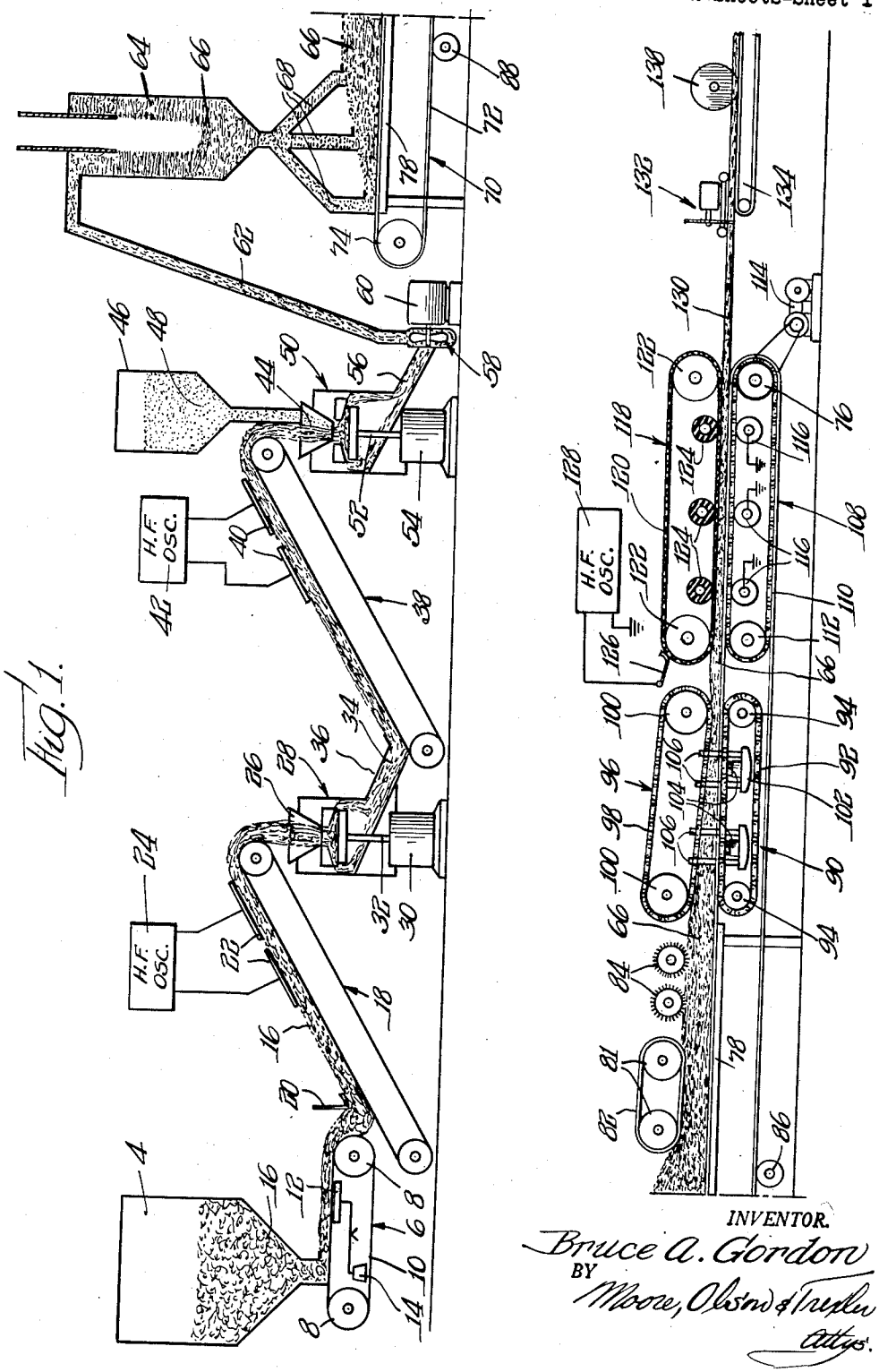


Fig. 1.

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2 Sheets-Sheet 2

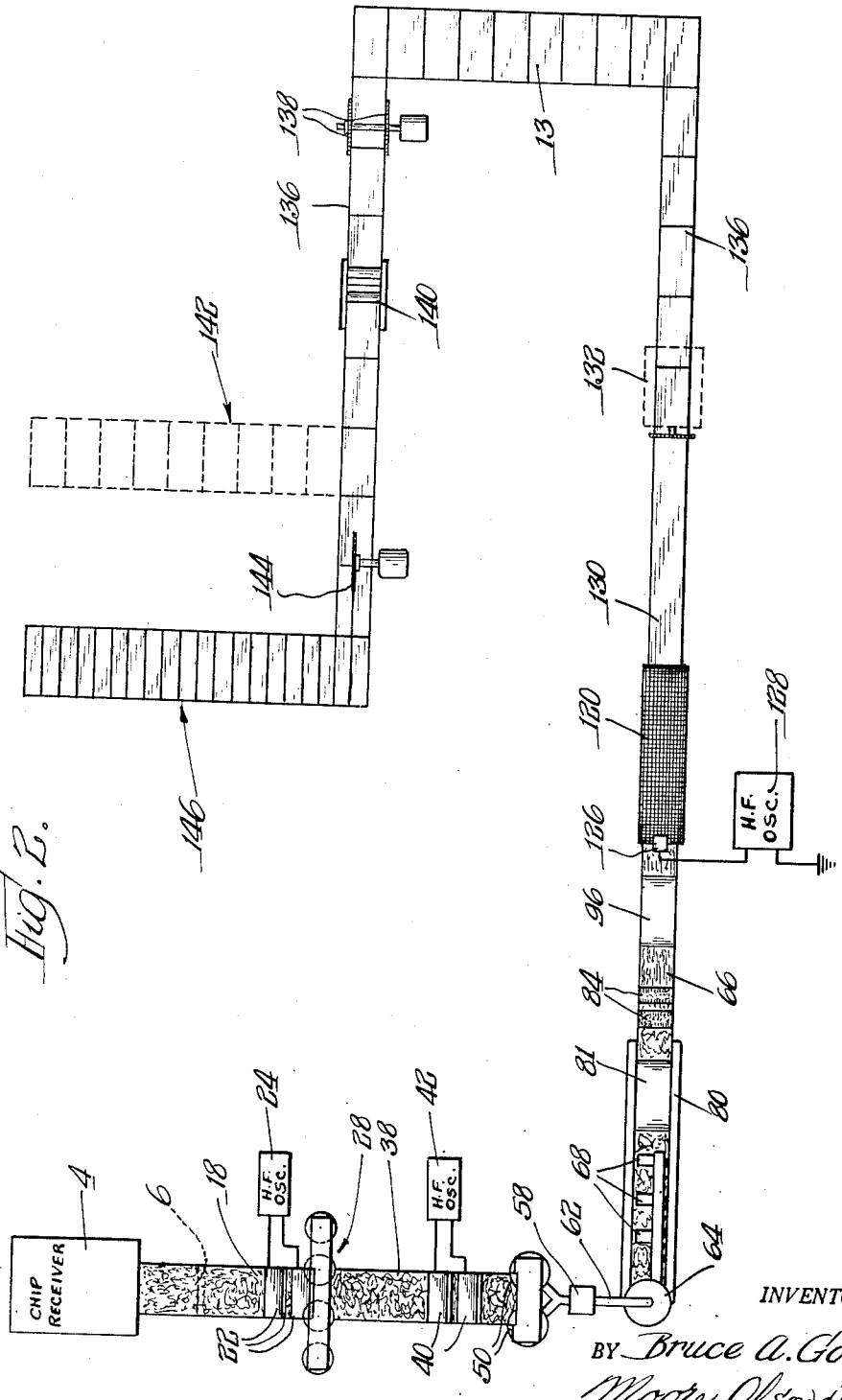


Fig. 2.

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2,697,254

DRY PROCESS OF MANUFACTURING PRESSBOARD

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3 Claims. (Cl. 18—47.5)

This invention relates generally to the manufacture of sheet lumber or pressboard, and more particularly to a continuous process for the manufacture of such material.

Wood waste materials such as sawdust, chips, shavings, and the like, have been ground, mixed with a binding material, pressed and heated to form sheet lumber or pressboard heretofore. It has been the practice to make such lumber or pressboard by a batch process. Specifically, a given quantity of wood waste and binding have been mixed and placed in a press where the mixture has been subjected to heat and pressure to produce a compact lumber or board possessed of many desirable qualities, such as resistance to moisture and varying degrees of density from very low to very high, and varying degrees of hardness, depending upon the temperature and pressure employed in the process.

Production of individual slabs of lumber or board in presses as taught by the prior art has been limited and considerable manual labor has been entailed, the two combining to produce a relatively expensive item.

An object of this invention is the provision of a continuous process for the manufacture of sheet lumber or pressboard.

A more specific object of this invention is the provision of a method of mixing ground wood waste and binder and progressively heating and compressing the mixture to produce sheet lumber or pressboard.

A further specific object of this invention is the provision of a continuous process of heating ground wood waste to reduce the moisture content and to soften the lignin therein by high frequency heating, mixing the wood waste with a binder, and further heating the mixture by high frequency electrical currents while subjecting it to progressively increasing pressures to produce sheet lumber or pressboard.

Yet another object of this invention is the provision of a continuous process of heating wood waste by high frequency electrical oscillations, grinding the waste to reduce it to fibre, further heating by high frequency oscillations the waste to a predetermined moisture content, mixing it with a binder, and applying progressively increasing pressure while concurrently heating by high frequency electrical oscillations.

By practicing the methods herein disclosed, I have found that it is possible to triple the rate of production of sheet lumber or pressboard from wood waste materials for a processing installation of given size. The manual labor required has been reduced by my methods from two and one-half man hours per ton to one-half a man hour per ton of finished pressboard. Although I have heretofore referred specifically to sheet lumber or pressboard made of wood waste materials, and will continue to speak of these products by way of example, it is to be understood that my process is applicable to the production of any resin board and can be used with equal facility in the plastics field.

One specific embodiment of means for carrying out my invention is shown in the drawings, wherein:

Figure 1 is a side elevation with a portion offset vertically; and

Figure 2 is a top plan view of the structure shown in Figure 1.

The drawings are largely diagrammatic and certain

parts have been shifted slightly to show them more clearly. By way of example, the apparatus has been straightened out in Figure 1 to provide a continuous side view and the last working stations have been omitted from the view.

Referring to the drawings in particularity, a chip receiver or supply bin 4 is positioned above a weighing conveyor 6. The weighing conveyor includes a pair of rollers 8 over which is passed an endless belt 10. A balance plate 12 bears against the underside of the upper reach of the belt 10 to control the speed of the mechanism (not shown) driving one of the rollers or wheels 8. A weight 14 counterbalances the force on the pressure plate 12 caused by wood waste 16 comprising chips, shavings, sawdust and the like, to maintain a predetermined thickness of waste on the upper reach of the belt 10 by varying the speed of the driving mechanism as required. An elevating conveyor 18 underlies the conveyor 6 at the discharge end thereof and is provided with a spreader or baffle plate 20 to maintain the proper depth or thickness of wood waste on the conveyor 18. Electrode plates 22 are positioned directly above the wood waste 16 on the conveyor 18 and are energized from a high frequency oscillator 24 to dry the waste 16 on the conveyor 18 to a predetermined moisture content, and to soften the lignin therein. The high frequency oscillator 24 is preferably of the type having the positive terminal of the power supply grounded to preclude the possibility of shock should the coupling means between the oscillator and electrodes become shorted out.

Beneath the discharge end of the elevating conveyor 18 there is positioned a hopper 26 to direct the wood waste into a chip grinder 28 which preferably comprises a plurality of inter-plane grinders driven by an electric motor 30 through a shaft 32. In the chip grinder 28 the wood waste 16 is grounded into wood fibers 34 which are discharged through a conduit 36 onto a second elevating conveyor 38. Electrode plates 40 similar to the plates 22 are spaced above the fibers 34 and are energized from a high frequency oscillator 42 similar to the oscillator 24 to dry the fibers to a final predetermined moisture content.

The upper end of the elevating conveyor 38 is disposed directly above a hopper 44 which receives fibers therefrom. A binder supply bin 46 is also positioned above the hopper 44 to supply binder 48 thereto at a controlled rate. The binder may be of processed lignin, resin or any other suitable wood binder or glue. Such binders are well-known in the prior art, and I do not wish to be restricted to any particular type. The hopper 44 leads directly into a mixer 50 which may comprise a plurality of mixing units driven through shaft or shafts 52 from a motor 54. The mixer 50 empties through a conduit 56 to a blower 58 powered by a motor 60. Conduit 62 leads from the blower 58 to a cyclone collector 64 where the mixed fiber and binder 66 is accumulated in loose or fluffed condition. Discharge conduits 68 deliver the fluffed mixture 66 from the collector 64 by gravity onto a final conveyor 70 comprising an endless belt 72 stretched over an idler wheel or roller 74 and a driven wheel or roller 76.

The belt 72 is made of steel or other suitable conductive material. A table 78 underlies a part of the belt to provide support therefor and is provided with vertically extending structure 80 which may be flanges or endless belts to confine the fluffed fiber and binder mixture 66 on the conveyor belt 72 as it is deposited through the conduits 68. Rubber pressure rolls 81 having an endless belt 82 passed over them and driven by a power source which is not shown compress the fluffed mixture slightly on the belt 78. Trimming brushes 84 reduce the thickness of the fluffed mixture to a predetermined thickness and smooth off the top surface. As a specific example of dimensions, for a finished pressboard of ¾ inch thickness, the layer of fluffed mixture deposited on the belt 72 is about 18 inches thick. This is reduced to about 9 inches by the rollers 80 and to 8½ inches by

the trimming brushes **84**. Prior to receiving the fluffed mixture, the belt is cleaned by a belt cleaner **86** bearing against the lower reach of the belt and is greased by a belt greaser **88** to prevent the finished pressboard from adhering to tne belt.

After leaving the table **78**, the belt **72** is supported by a first caterpillar unit **90** comprising a caterpillar chain **92** passed over sprocket wheels **94**. A high pressure caterpillar unit **96** is positioned above the belt **72** and first caterpillar unit **90** and inclined relatively thereto to apply progressively increasing pressure on the fiber and binder mixer **66**. The high pressure caterpillar unit **96** comprises a caterpillar chain **98** passed over rollers **100**. Hydraulic cylinders **102** are provided with pistons **104** which may be provided with rollers at their top surfaces if so desired. The pistons **104** press upwardly against the caterpillar chain **92** while cooperating structures **106** from the cylinders **102** extend upwardly and overlie the caterpillar chain **98** so that progressively increasing pressure of any desired degree may be applied to the mixture **66**. By way of example the pressure applied may be up to 80 pounds per square inch and the mixture after leaving the caterpillar units may spring back to a thickness of about 3 inches.

After leaving the caterpillar units **90**, **96** the belt **72** is supported from below by a lower caterpillar unit **108** comprising a caterpillar chain **110** passed over the sprocket or wheel **76** carrying the conveyor belt **72** and over a sprocket **112**. The sprocket or wheel **76** is driven by a motor **114** which thus supplies power for the conveyor belt **72**, the caterpillar unit **108**, and the caterpillar units **90** and **96** through suitable linkage. The caterpillar chain **110** is supported intermediate the sprockets **76** and **112** by grounded steel pressure rollers **116**. A heating caterpillar unit **118** is positioned above the belt **72** and above the lower caterpillar unit **108** further to compress the mixture **66** and to concurrently heat the mixture. The heating caterpillar unit **118** comprises a wire mesh belt **120** passed over pulley wheels or sprockets **122** one of which may be powered from the motor **114** by suitable linkage. Rubber covered rollers **124** appear above the upper surface of the lower reach of the wire mesh belt **120** to provide pressure upon the mixture **66**. These rollers may be adjustably positioned if desired so that the pressure may be varied according to the requirements of the finished pressboard. A brush **126** slidingly contacts the wire mesh belt **120** and is connected with one terminal of a high frequency oscillator **128** similar to the oscillator **24** and **42** previously mentioned. The other terminal of the oscillator, preferably the positive terminal, to preclude the possibility of shock, should the coupling means become shorted out, is grounded. A high frequency field is thus established between the wire mesh belt **120** and the steel belt **72** which is grounded through the caterpillar chain **110** and the grounded steel rollers **116** so that the mixture **66** is continuously heated as progressively increasing pressure is applied to it to produce a finished pressboard **130** which, in accordance with the specific examples given heretofore, may be of ¾ inch thickness.

The finished pressboard is of great strength and rigidity and need not be supported for a time. Spaced from the caterpillar units **108** and **118** is a traveling cut-off saw **132** of conventional construction for traveling longitudinally with the pressboard **130** and transversely thereto to cut off the board to suitable length. A conveyor **134** is provided directly below the saw **132** to support the cut off lengths **136** of pressboard. As shown in Fig. 2 the cut off lengths **136** are then transported sidewise by a suitable conveyor and then parallel to but in the opposite direction of their original path where they are encountered by edge trimming saws **138** which trim the edges of the pressboard to form smooth edges thereon. After passing the edge trimming saws **138** the cut off sections or slabs **136** of pressboard are acted upon by a planer or sander **140** to provide a smooth finished surface on the pressboard. Upon leaving the planer or sander **140** the slabs of pressboard may be transported transversely as at **142** to be stacked for transportation or storage or may be moved straight ahead to encounter a rip saw **144** which slits the pressboard slabs longitudinally to provide narrower slabs. These slabs are then conveyed transversely as at **146** for storage or transportation.

The process disclosed herein greatly speeds up the production of pressboard and the like and reduces the cost of manufacture greatly over the batch process heretofor in use which produced pressboard or the like one slab at a time. The particular structure used in carrying out this process may vary from that shown herein and invention is believed to lie principally in the continuous process disclosed.

Although a process has been described for the continuous manufacture of sheet lumber or pressboard it has equal applicability to the production of any resin board or to the production of sheet plastics.

Accordingly, I do not wish to be limited to the specific disclosure herein but intend my invention to include all that which fairly falls within the spirit and scope of the appended claims.

I claim:

1. The continuous method of manufacturing pressboard and the like which comprises continuously advancing woody material at a predetermined uniform rate, heating said woody material with high frequency electrical oscillations to soften the lignin in said material, grinding the heated material to reduce it to a fiber, continuously advancing the resulting fiber, heating said fiber while it is being advanced with high frequency electrical oscillations to reduce it to a predetermined moisture content, mixing the heated fiber with a binder therefor, blowing the resulting mixture to a collection area through air conduit means to effect substantial fluffing thereof, advancing the fluffed mixture so formed as a continuous mass, applying progressively increasing pressure to said mixture as it is advanced, and heating said mixture with high frequency electrical oscillations concurrently with at least a part of the application of pressure.

2. The continuous method of manufacturing pressboard and the like which comprises continuously advancing woody material at a predetermined uniform rate, heating said woody material with high frequency electrical oscillations to soften the lignin in said woody material, grinding the heated woody material to reduce it to a fiber, continuously advancing the resulting fiber, heating said fiber while it is being advanced with high frequency electrical oscillations to reduce it to a predetermined moisture content, mixing the heated fiber with binder therefor, blowing the resulting mixture through air conduit means to effect the fluffing thereof, advancing the fluffed mixture so formed as a continuous mass, increasing the density of the fluffed mixture, applying increasing pressure to said mixture as it is advanced to compact the mixture, releasing the pressure on the mixture for a short interval of its continuous advance, applying further increasing pressure to said mixture as it is advanced, and heating said mixture substantially throughout the last mentioned application of pressure.

3. The continuous dry process of manufacturing pressboard and the like, which consists in continuously advancing woody material at a predetermined rate, heating the woody material while being continuously advanced with high frequency electrical oscillations to soften the lignin therein and to reduce the moisture content thereof, grinding the heated woody material immediately after the aforesaid heating thereof to reduce it to a fiber, continuously advancing the ground fiber as it is continuously received from the aforesaid grinding thereof, heating the ground fiber with high frequency oscillations to reduce it to a predetermined moisture content as it is being continuously advanced, mixing the heated fiber with a binder immediately after the aforesaid heating thereof, blowing the resulting mixture through air conduit means to effect substantially uniform fluffing thereof, continuously collecting and advancing the fluffed mixture as a continuous mass, relatively lightly pressing the mass as it is continuously advanced to increase the density thereof, applying by extended continuous surface contact on the mass progressively increasing pressure thereon as the mass is continuously advanced to compact the same, immediately releasing the aforesaid pressure on the mass for a short length of travel during the continuous advance thereof, applying further increased pressure to the mass at the end of its travel under released pressure and while the mass is continuously advanced, and heating the mass substantially throughout its travel under the final application of increased pressure.

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