United States Patent [19]

Wirz

[11] **3,762,974**

[45] **Oct. 2, 1973**

[54] **METHOD FOR THE MANUFACTURE OF COMPRESSED BOARDS**

[75] Inventor: **Walter Wirz**, Thalwil, Canton of Zurich, Switzerland

[73] Assignee: **Peter Fahrni, Head of Fahrni Institute, Ltd.**, Zurich, Switzerland

[22] Filed: **Oct. 14, 1971**

[21] Appl. No.: **189,223**

[30] **Foreign Application Priority Data**

Oct. 15, 1970 Switzerland 15227/70

[52] **U.S. Cl.** **156/62.2**, 156/62.6, 156/62.8, 264/128

[51] **Int. Cl.** **B29j 5/04**, B29j 5/02

[58] **Field of Search** 156/62.2, 62.4, 62.6, 156/62.8; 264/128

[56] **References Cited**

UNITED STATES PATENTS

3,301,726	1/1967	Matsukata	156/62.2
3,428,505	2/1969	Siempelkamp	156/62.2
3,563,844	2/1971	Brown	156/62.2 X

Primary Examiner—Edward G. Whitby

Attorney—James M. Heilman et al.

[57] **ABSTRACT**

The object of the present invention is a method of producing compressed boards by the hot pressing of board preforms from particles treated with a thermosetting binder. The field of use is primarily for the manufacture of wood chip boards,but other fields are also important.

8 Claims, 3 Drawing Figures

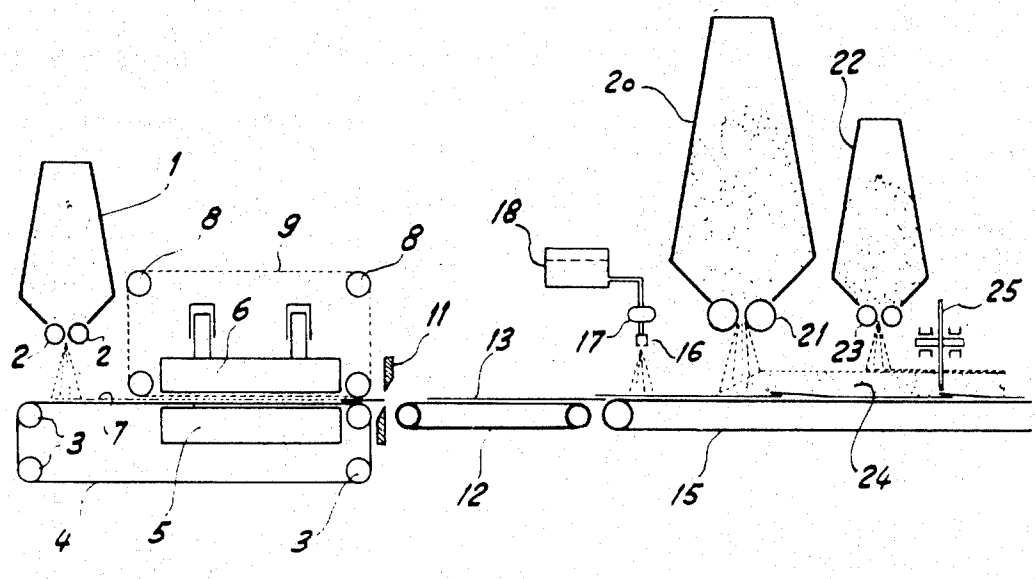
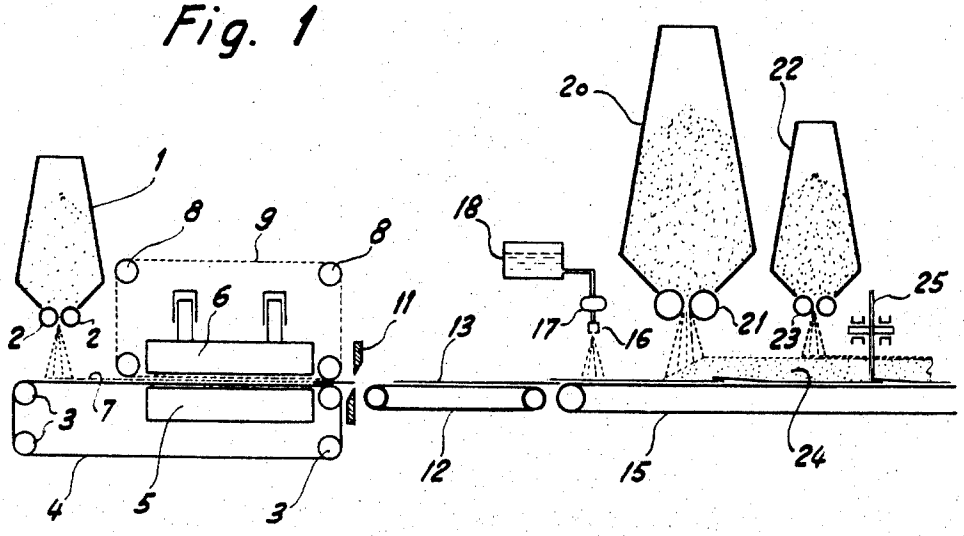


Fig. 1



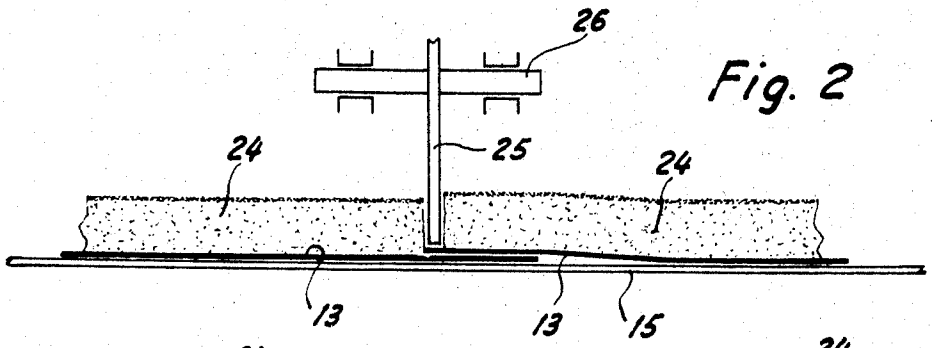


Fig. 2

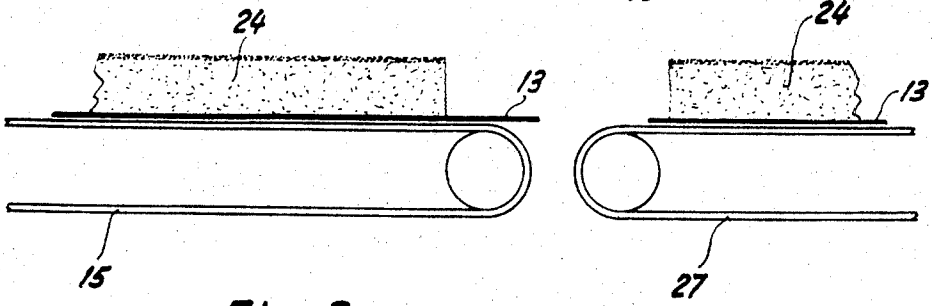


Fig. 3

METHOD FOR THE MANUFACTURE OF COMPRESSED BOARDS

The object of the present invention is a method of producing compressed boards by the hot pressing of board preforms from particles treated with a thermosetting binder. The field of use is primarily for the manufacture of wood chip boards, but other fields are also important.

In the production of such boards, one basic problem is the transporting of the board preforms or webs which are still loose from the particle strewing device to the main press without damaging their structure. For this reason, so called press sheets have been used heretofore as strewing, transporting and press supports for the preforms developed from particles. These sheet supports must be cooled in each case after the pressing process and be returned again to the beginning of the mold line, whereby a lot of space is taken up and the plant is made complicated in development and operation. Furthermore, the sheets become worn. Their thickness must therefore be checked periodically and they must be replaced from time to time. Finally, the change in the thickness of sheet by wear must be taken into consideration upon the pressing These disadvantages are particularly evident when flexible metal screens are used, in accordance with a previously known method, instead of press sheets.

It has, to be sure, been proposed to strew the particles onto conveyor belts or other supports which are not conducted into the main press and to separate the preforms from said supports for the charging of the main press and conduct them by special carriers into the heated main press. Such a procedure is, to be sure, not entirely without danger for the sensitive preforms. The transfer of the preforms from the conveyor supports to so-called charging trays or the like frequently leads to a change in the structure of the preforms and thus to defective boards.

The above-described disadvantages are, inter alia, eliminated by the present invention. In the method of the invention, this goal is achieved in the manner that first of all webs which are thin with respect to the thickness of the board preforms are formed from particles, whereupon said webs are compacted by hot-pressing to such an extent that the binder is at least partially set, and that thereupon the individual board preforms are formed by strewing the particles onto these thin supporting layers which have been precompacted in this manner and the boards are produced by hot-pressing and combination of supporting layers and board preforms.

It has been found that even very thin support layers which have been subjected merely to a brief hot-pressing have a sufficiently high strength to transport the preforms from the strewing points up into the main press without change in their internal structure. Furthermore, it has been found that the thin, semi-cardboard or cardboard-like support layers combine in the heated main press with the other particle material which is still loose at the start of the pressing process to form compact bodies. This is true in particular when the upper sides of the support layers are strewn with a liquid or powder binder before the strewing on of the particles which form the preforms.

The method also leads to further advantages. Aside from the simplification of the forming line and the gentle treatment of the preforms while they are still loose, it has been found that, for instance, the wear of the conveyor belts is also less since it is no longer necessary to use guide rollers of very small diameter. Furthermore, the tolerances as to thickness are now only dependent on the press-plates. It is also favorable that hardening of the binder of the lowermost layer of the preforms, due to the contact heat of the hot compressed boards, can, for all practical purposes, no longer take place. The support layers which have been very rapidly hot-pressed in a previous stage of the process insulate the board preforms to a certain extent against the transfer of heat until the press is substantially closed.

The present invention also relates to an apparatus for the carrying out of the new method. This apparatus is characterized by a strewing device for the formation of thin webs of particles intended for a surface region of the boards, a hot press for compacting said webs to form thin support layers, further means for the strewing of the actual board preforms and a heated main press for the final pressing of the preforms and the combining thereof with the hot pre-pressed support layers.

There is described below by way of example the carrying out of the method for the production of three-layer wood chip boards and an example of an embodiment of the apparatus, with reference to the drawing, in which:

FIG. **1** is a schematic side view of the installation,

FIG. **2** is a detail on a scale larger than FIG. **1**, and

FIG. **3** is another detail, also on a scale larger than FIG. **1**.

1 is a strewing machine which acts at the same time as supply bin. It is equipped at its lower end with two slinger rollers **2** covered with prongs and rotating in opposite directions. As a result of the rotation of the slinger rollers **2**, fine top-layer chips are strewn onto an intermittently driven steel belt **4** which rotates over rollers **3**. This belt **4** extends through a heated press consisting of a press table **5** and a raisable and lowerable hydraulically driven press plate **6**. The strewing machine **1** also acts intermittently. In fact, the slinger rollers **2** rotate only as long as the belt **4** is driven. The nip present between the two rollers **2** and the speed of rotation of the rollers are so adapted to each other that a thin web of top-layer chips is formed on the belt **4**. In order that the thin support layer produced from the thin web will, in contradistinction to the lower side, not be smooth on its upper surface but will have a certain roughness which facilitates the bonding to the other chips in the main press, there is furthermore provided an endless metal screen **9** which travels in the form of a belt over guide rollers **8**. One additional advantage of this screen resides in the easy possibility of the removal of the steam produced upon the hot pressing.

The thin support layers which are produced in sections in endless sequence, which layers are smooth on the one side and rough on the other side, and may correspond with respect to thickness and flexibility approximately to relatively thin cardboard sheets, are now cut by means of an automatic cutter **11** into pieces **13** of equal length. These pieces are then taken over by a conveyor belt **12** and so arranged in a row that their ends overlap over a certain distance. In this connection - as can be noted in particular from FIG. **2** - the overlap is always of such a nature that the rear end of each sup-

port layer lies above the front section of the next following support layer.

Another conveyor belt **15** leads the intermittently fed support layers with uniform speed to the strewing machines **20** and **22.** In front of said strewing machines there is provided a unit for the spraying of a relatively liquid binder onto the upper rough surfaces of the support layers **13.** The spraying apparatus consists essentially of a nozzle **16,** a feed pump **17** and a supply container **18.** The spraying of the precompacted support layers improves the adherence to the rest of the chips. Of course, the wood chips discharged by the strewing machines **1, 20** and **22** have been previously treated in known manner with a thermosetting binder. Furthermore, it should be pointed out that the precompacting of the thin support layers which are active as strewing, transporting and press supports in the example described need not necessarily be effected all the way to complete hardening of the binder. In many cases it is sufficient for the binder to be only partially hardened. The final polymerization can then take place in the main press, which is not shown in the drawing.

The supply container of the strewing machine **20** contains coarser wood chips which are intended for the formation of the center or core layer of the three-layer boards to be produced. At its lower end the said container is closed off by two slinger rollers **21** rotating in opposite direction. These rollers throw the core-layer material onto the endless sequence of precompacted support layer **13** which have been provided with a thin film of glue. Behind the srrewing machine **20** there could, of course, also be provided vertically adjustable dosaging means, such as, for instance, a combing dosaging roller or the like. The supply container of the strewing machine **22** which is equipped with slinger rollers **23** contains top-layer chips of the same type as the container of the strewing machine **1.** These chips are now strewed onto the core-layer chips, whereby an endless board preform **24** is formed.

A longitudinally and transversely movable, automatically acting parting saw **25** whose shaft **26** is driven in a manner not shown in detail cuts the web **24** which has thus been formed into sections of equal length which correspond to the length of the wood chip boards to be produced. In this connection it should be seen to it that on the one hand the precompacted support layers are not cut and on the other hand that the cutting process takes place in each case in the vicinity of the rear edge of each support layer **13** (see FIG. **2**).

From FIG. **3** it can finally be seen how the board preforms are conveyed further by means of a conveyor belt **27** which is periodically driven with a speed which is greater than the speed of the conveyor belt **15.** Upon the taking over by the conveyor **27,** there occurs a separating in space of the board preforms which have been cut to given lengths. The support layers **13** with the preforms **24** lying thereon are now conducted into the heated main press (not shown in the drawing) in which the boards are imparted their final shape by the compressing of the chip material and the combining thereof with the support layers **13** which act as substrates.

Due to the described manner of arranging the support layers **13** one behind the other and a proper selection of the line of cut upon the cutting of the still loose preforms, there is produced in connection with each support layer **13** a front section as seen in the direction of movement which is not covered with particles. In this way one has the possibility of grasping the charged support layers by means of grippers and in this way pulling them over a fixed support. For example, the preforms **24** can be conveyed in this manner into the main press, in which connection the support layers can then themselves be used as actual transportation supports in the same manner as the generally known transportation plates.

Mention should also be made of the fact that in certain cases an uninterruptedly operating, continuous press can suitably be used as press for producing the precompacted support layers. Furthermore, other presses can also be employed, such as suitably heated roller presses, etc. The new method is therefore in principle not dependent on whether the plant operates intermittently or continuously. The expression "board preform" is accordingly to be understood in its broadest sense. It comprises both endless webs and discrete web lengths. Furthermore, the invention can be employed, regardless of whether the board preforms have been subjected to a prior cold-pressing or not. In addition, the method of the invention can be carried out in connection with single-layer and multi-layer boards. In the example described, the pre-compacted support layer forms the bottom outer layer of the board. This need not absolutely be the case. One could possibly also prefabricate support layers which represent merely a part of the lower outside layer. In such case, one would, to be sure, be forced to strew further top-layer material onto the pre-prepared support layers before applying the core-layer material. Finally, the precompacting of the thin webs could be utilized also for other purposes, for instance by the application of fire-retarding addition substances, antifungus agents or the like onto the pre-prepared support layers.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. Method of producing compressed boards by hot pressing of board preforms consisting of particles treated with a thermosetting binder particularly for the manufacture of wood chip boards characterized by the fact that initially webs, which are thin as compared with the thickness of the board preforms, are formed from particles whereupon these webs are compacted by hot pressing to such an extent that the binder is at least partially set, and that thereupon the board preforms proper are formed by the strewing of particles onto these thin support layers which have been precompacted in this manner, and the boards are produced by hot pressing and combining of support layers and of board preforms.

2. Method according to claim **1** characterized by such a hot pressing of the thin support layers that the lower side becomes smooth and the upper side rough.

3. Method according to claim **1** characterized by the fact that the hot pressing of the thin support layers is interrupted before the binder, with which the particles have been treated, has been cured.

4. Method according to claim **1** characterized by the fact that the upper sides of the thin support layers are strewn with a liquid or pulverulent binder before the strewing of the particles intended for the formation of the board preforms.

5. Method according to claim **1** for the manufacture of multi-layer boards with top layers of particles which are thinner than the core layer material characterized

by the fact that for the formation of the precompacted support layers there is used a part of the particles provided for the production of the lower outer layer.

6. Method of producing compressed boards by hot pressing of board preforms consisting of particles treated with a thermosetting binder particularly for the manufacture of wood chip boards characterized by the fact that initially webs, which are thin as compared with the thickness of the board preforms, are formed from particles whereupon these webs are compacted by hot pressing to such an extent that the binder is at least partially set, and that thereupon the board preforms proper are formed by the strewing of particles onto these thin support layers which have been precompacted in this manner, and the boards are produced by hot pressing and combining of support layers and of board preforms, and characterized by the fact that the precompacted support layers serve as strewing, transporting, and pressing supports for the board preforms; and further characterized by the fact that the support layers charged with the board preforms are pulled by means of grippers of a conveyor device over a stationary support. 12

7. Method according to claim 6 characterized by the fact that the precompacted support layers are arranged in a row alongside of each other before the formation of the actual preforms in such a manner that the support layers partially overlap, and that after the strewing of an endless preform the latter is so cut that, after the pulling apart of the support layers, a front section, seen in the direction of movement, of each support layer is not covered with particles.

8. Method of producing compressed boards by hot pressing of board preforms which include particles mixed with a thermosetting binder including the following steps: spreading fine particles mixed with a thermosetting binder on a base at a first position and compacting by hot pressing to partially set the binder, thereby forming a series of support layers; transporting said layers to a second position and producing a partial overlap of the layers adjacent their ends; spreading coarse particles mixed with a thermosetting binder on said layers to produce an endless preform; spreading fine particles on the coarse particles; cutting the coarse and fine layers at a position adjacent the overlap of the base layers; pulling the base layers apart; and hot compacting the separated boards to produce a series of particle boards compacted with a fully set thermosetting binder.

* * * * *