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[54] **METHOD FOR HOT-PRESSING SHEETS OF SUBSTANCES CONTAINING LIGNOCELLULOSE**

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[58] **Field of Search**.....264/109, 120, 123, 82, 83

[56] **References Cited**

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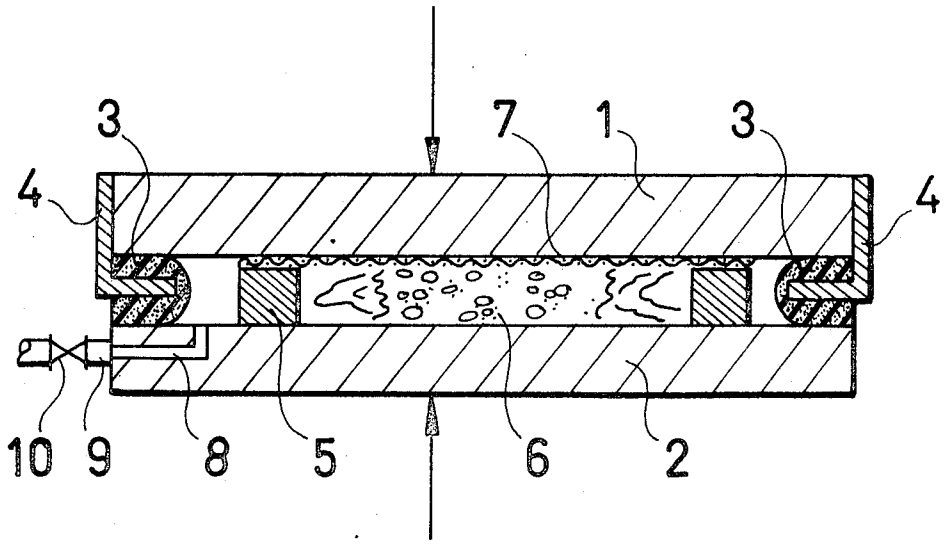
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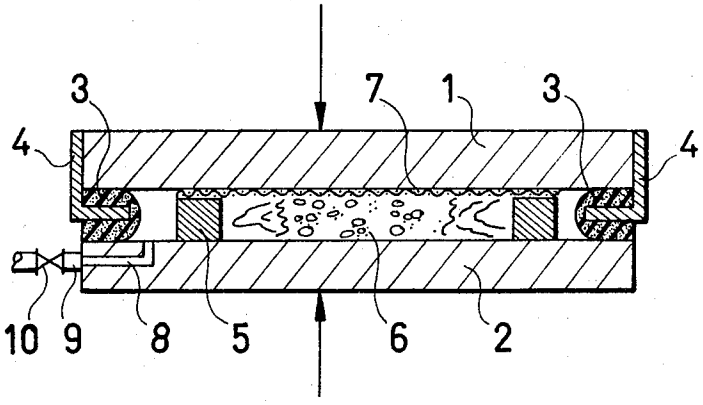
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[57] **ABSTRACT**

A mixture of lignocellulose material in particulate form with spent cellulose liquor is formed into a blank and introduced into a hot press. The blank is subjected to heat and pressure and steam is withdrawn in an initial pressing stage. Then the press gap is enclosed and the spent cellulose liquor gasifies in the enclosed space, causing an increase in temperature and pressure, aiding in the rapid formation of a board. After the pressure has reached a desired level the pressure is controlled by venting any excess gas. The pressing is done in one press and treatment time is greatly reduced in comparison with prior processes.

1 Claim, 1 Drawing Figure




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METHOD FOR HOT-PRESSING SHEETS OF SUBSTANCES CONTAINING LIGNOCELLULOSE

BACKGROUND OF THE INVENTION

1. Field of the invention

This invention relates generally to a method for hot-pressing sheets of substances containing lignocellulose, such as fiber boards or chipboards.

2. Description of the prior art

Previous art includes methods of many kinds for manufacturing sheets of substances containing lignocellulose, and these methods have the feature in common that the sheet blank, which is greatly variable in respect of its moisture as well as bonding agent content, is pressed in a hot press to become a sheet which is known as fiber board or as chipboard, depending on what raw material has been used. When the sheet blank is heated, gases are produced in it, consisting of steam, of gasifiable bonding agents or other chemicals added to the blank, and of reaction products from reactions taking place in the lignocellulose-containing substance itself under effect of heat. There has been little research concerning these gases and vapors that are produced and their influence on the board product-manufacturing process, and no endeavors have been made to utilize them systematically.

At all events, pressure and temperature are important factors in the utilization of said reactions, and they also have a mutual relationship. The pressure applied in hot presses is primarily intended to produce mutual contact between fibers and fiber groups and between chips in order that compactness of the board product might be achieved. Endeavors have also been made to utilize the gas pressure of the gases which occur, by making the space between plates in the press gas-tight, and this has been accomplished by compressing the near-marginal portion of the fiber board blank with such great force that this portion serves as seal. The gas pressure has then been controlled by changing the press force, whereby gases may be allowed to escape by reducing this force or pressure.

In the practice of making chipboards also a method is known in which the board product is first pressed to compact condition in a common chipboard press, followed by a second phase consisting of heat treatment in an autoclave.

SUMMARY OF THE INVENTION

In accordance with this invention a method for hot-pressing substances containing lignocellulose, wherein the gases produced in the course of pressing and the gases introduced from the outside are utilized and various treatment phases are carried out in one stage, in which connection the gas pressure can be regulated by simple means, comprises the steps of pressing and heating the sheet blank in an enclosed pressing space where there is controllably maintained a desired gas atmosphere either by means of the gases produced in the sheet or with the aid of gases conducted from the outside into the pressing chamber. A device used for embodying said method has a connection with the press plates of the press gap or of each press gap, respectively, a gasket encircling the whole press gap and which has been arranged to seal the press gap when the press is closed, a conduit provided with a regulating member being lead into the part of the press gap between the

margin of the sheet blank placed in the press and said gasket element. Said gasket is advantageously fixed to the edge of the upper press plate, while the conduit is mounted in connection with the lower press plate. In an advantageous embodiment of the invention the gasket consists of a moulding having the cross section of a letter U lying on its side and the open side of which is outwardly directed, and which has been attached by means of a supporting element fixed to the press plate and projecting into the gasket. In a multiple stack press, the conduits from each press gap are advantageously connected to a common header. A press according to the invention may also be provided with an auxiliary device placed in the press gap, and in itself belonging to previous art, for conducting the gases and vapors generated in the sheet blank from the central part of this blank into the space between its margins and said gasket.

BRIEF DESCRIPTION OF THE DRAWING

The drawing shows a section through the press gap defined by one pair of press plates of a hot press according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the drawing the reference numerals **1** and **2** indicate the press plates, of which the plate **1** is movable and the plate **2** is stationary, and which can be pressed against each other, for instance hydraulically, as has been schematically indicated by arrows. To the edge of the movable upper plate **1** there has been fixed, in accordance with the invention, a gasket **3**, which seals the press gap hermetically when the plates **1** and **2** are pressed against the sheet blank. The gasket **3** has been made of an elastically deformable material which tolerates the temperatures that come into use, and it comprises a sealing moulding having the cross section of a letter U lying on its side and running around the entire periphery of the press gap. In the embodiment shown, the gasket **3** has been fixed by means of a supporting member **4** projecting into the gasket and which in its turn has been attached to the edge of the press plate **1**. The supporting member **4** may be continuous or it may consist of sections placed at a given spacing. Since the gasket **3** has been attached to the upper plate **1**, it follows along with this plate when the press gap is opened, whereby it is possible to place the sheet blank into the press gap and to remove from it the pressed board without interference from the gasket.

In the drawing a chip board blank **6** has been shown between the press plates **1** and **2**. Around the blank there are confining laths **5**, which in themselves belong to previous art, but which are not always necessary. In the drawing there has also been shown an auxiliary device previously known in itself, for the purpose of facilitating the escape of gases and vapors from the central part of the sheet blank, namely, a wire **7** placed between the sheet blank and the press plate. This auxiliary device may equally be a combination of a perforated plate and wire, in which instance the perforated plate is turned against the sheet blank, and it may be used on either side of the sheet blank although in the drawing it has only been shown on top of the sheet blank.

The part of the press gap between the gasket **3** and the sheet blank **6** or the confining laths **5**, respectively, constitutes an enclosed space. According to the invention, this space connects with the ambient atmosphere or with a header line or tank (the latter elements are not shown in the drawing but their function and structure are well known to those familiar with the art). This has been accomplished, in the embodiment shown, by providing in the stationary lower plate **2** a duct **8** leading from said enclosed space to the side of the plate, and which has been connected to a pipeline **9** fitted with a regulating valve **10**. It is easy by means of the regulating valve **10** to adjust the gas pressure in the press gap without having to change the press force or pressure, and in a multiple stack press it is possible to render the gas pressure in every press gap exactly equal in magnitude, which obviously is advantageous in view of uniform quality of the final product.

In the following, an example is presented in illustration of the applicability of a method according to the present invention e.g. for the manufacturing of chipboards or of sawdust boards.

To chips containing lignocellulose or to sawdust there is added, in some manner belonging to previous art, spent cellulose liquor or a fraction obtained from it. To this substance employed as a bonding agent one may add in comparatively small quantities additives with catalytic action, and acidity can be adjusted as desired.

From the mixture of chips or sawdust and bonding agents thus obtained, blanks are formed, which are pressed in a hot press according to the invention at a temperature which is higher than 165° C. and with a pressure which is in excess of 20 kp/cm² in the press gap, which has been so closed outside the edges of the blank that the pressure of the gas entrapped in the press gap is uniformly distributed in the blank and that gas may be conducted through a valve away from the blank and in this manner adjustment of the acting gas pressure within desired limits is possible.

If required, gases which are useful in the process may be introduced into this system from outside the press through the afore-mentioned valve.

It is often appropriate to create a vacuum in the blank to be pressed before gases of the above-mentioned kind are conducted into the press gap. This facilitates their penetration, and the depth of penetration of the gas into the blank can be controlled by this means.

To conventional chips as used for manufacturing chipboards, there is admixed in a manner known in the chipboard industry, spent liquor with 50 percent dry matter content, in the amount of 12 percent of the weight of the chips.

From the mixture a sheet blank is formed, which need not be laminated.

The blank is pressed in the hot press with 35 kp/cm² pressure, at the temperature of 200° C.

If the thickness of the finished board is 18 mm, the press time is about 18 minutes.

During this period a major part of the water in the blank escapes from it in the form of steam.

The press autoclave is here understood to be the autoclave which is formed when the press is closed and the press gap becomes a space which is enclosed at least in certain degree, and in which space the amount of gas and its pressure may be controlled according to the invention with the aid of a valve.

When the said press time of 18 minutes has passed, the valve of the press autoclave is closed.

Upon closure of the valve, the pressure in the press autoclave begins to increase. The gas pressure in the press autoclave increases in 11 minutes to 10 kp/cm².

When the above-mentioned gas pressure has been reached, the board is kept for another 9 minutes under the said pressure of 10 kp/cm² in order that the board might attain the desired properties.

This kind of board has good transversal tensile strength, compared to traditional chipboard.

Low water uptake.

Small swelling (only about 2–6 percent).

Very high weather resistance.

Board of the kind described above can be produced according to the British Pat. No. 993,693, but in this method of previous art the sheet blank is transferred, after the press period of **18** minutes, as disclosed by the said patent from the press to another heat treatment, which according to present information takes about 100 minutes.

According to the press autoclave method described here, the autoclave period is only 20 minutes.

The method according to the present invention has proved to be particularly advantageous when board products are made from timber barking residue and spent sulphite liquor.

EXAMPLE

In a laboratory experiment, to a mixture of ground spruce and pine bark there was added 50 percent spent sulphite liquor in the amount of 10 percent in previously known manner. The chips treated in this manner were formed into a sheet blank in a manner like that in which the blank for a chipboard is made. The sheet blank was formed upon a wire and was placed in the hot press. The press was closed and the sheet product pressed at 220° C. for 20 minutes in such manner that the gas which is produced and which mainly consists of steam can freely escape. After this pressing phase, the valve of the press autoclave was closed and the pressure in it is allowed to build up to 10 kp/cm². The board was kept for another 9 minutes under this pressure, adjusting the height of pressure with the aid of the valve of the press autoclave. The board was then removed from the press, cooled, and milled.

When using various brands of bark and different spent liquors, the process conditions and durations of the different phases have to be modified.

The product thus obtained has presented moisture tolerance properties superior to those of boards manufactured with bonding agents belonging to previous art.

When the board was treated in the press autoclave instead of treatment in a separate autoclave, higher board quality was achieved, and it is not necessary in the milling operation to remove already completed board material from the surface of the board in equally large quantity as must be removed when a separate autoclave was employed.

What is claimed is:

1. A method of forming boards comprising:

a. mixing lignocellulose containing material in particulate form with a gasifiable bonding agent comprising spent cellulose liquor to produce a mixture suitable for use in forming a board;
b. forming a sheet blank of said mixture;
c. subjecting the sheet blank to heat and mechanical pressure in a space while withdrawing steam in an initial stage of hot-pressing;
d. enclosing said space after said initial hot-pressing stage and permitting reaction product gases evolving from the gasifiable bonding agent to cause an increase in temperature and pressure within the enclosed space;
e. controlling the pressure of the gas atmosphere in the space within desired limits by conducting gas away from said space after a desired pressure has been reached; and
f. performing steps c–e in a period of time not exceeding about 38 minutes.

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