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METHOD OF PRODUCING HARD FIBRE BOARDS

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The present invention relates to a method of producing hard fibre boards smooth at both surfaces.

As is well known hard fibre boards are produced by floating in water a vegetable fibrous material with or without binding agents or by producing a fibrous pulp respectively. Besides the binding agents hydrophobic solutions or emulsions are eventually added to the fibrous pulp so that the finished board will be hydrophobic. By means of a long screen or a rotatable screen or in any other known manner the fibrous pulp is transformed in a wet molded body. This molded body partially is dehydrated and cut into wet boards which are compressed under high pressures and temperatures in a heated press.

This press in most cases is formed as a multiple press having several divisions and in each of the several divisions a smooth metallic insertion, a polished sheet copper or the like, is provided at the top or at the bottom, whereas a screen serves as a counter bearing for the board to be compressed. The wet molded body is arranged between the screen and the sheet copper, whereupon the press is closed and remains closed for a longer period of time during which pressure and a corresponding temperature are applied. The screen is necessary on the one hand to allow the discharge of the water pressed out from the wet molded body, on the other hand to allow steam to escape later on, whereby a drying operation is obtained which otherwise would be so strongly impeded that it could not possibly be carried out in an economical manner or other technical disadvantages, for instance formation of bubbles and the like, might easily occur respectively.

Into one of the surfaces of the hard fibre board the screen is impressed as a net like image.

Now, it has been tried to produce boards smooth at both surfaces by adding a sufficient amount of artificial resin or Chinese wood oil, so-called tung oil, or similar substances flowing at high temperatures and drying later on, the admixture to the fibrous pulp being effected before the preliminary molding of the wet board is carried out, whereupon the substances either in the usual manner are precipitated or otherwise deposited upon the fibre. Then in the ordinary manner the fibrous pulp is dehydrated, molded and when using artificial resins capable of being hardened is dried for instance until the resitol-condition (condition B) is reached, whereby at first no substantial pressures are exerted upon the molded body. Without consideration of the binding agent added such a board after drying usually has a specific weight of 0.2 to 0.4.

This dry molded body into which these binding agents are incorporated then is brought into a press for the final treatment, said press having smooth surfaces at both sides for instance polished sheets. If in this operation the nature of the artificial resin has been considered by maintaining during the drying operation such temperatures that the resitol-condition is reached and if then the dry board is introduced into the heated press described, usually a board both surfaces of which are smooth is obtained if corresponding high pressures (60–120 kg/m²) are applied, whereby, however, the binding agents must duly be considered, because the reaction periods of artificial resins capable of being hardened until the final polymerisation, for instance, (transforming into the so-called C-condition or resite-condition) is effected, as a rule last 14 minutes at least and eventually several hours depending on the composition of the artificial resin and the thickness of the board.

The board smooth at both surfaces and produced in the manner above described, however, has the drawback that:

(1) Rather large amounts of binding agents are required,

(2) That the reaction periods for hardening the binding agents are of very long duration.

It has, moreover, been tried to produce boards smooth at both surfaces by first more or less incompletely drying the boards, then before introducing the boards into a press heating them to a temperature which is equal to or higher than that of the press tools and finally finishing the board by hot compressing the latter. Such a method may have a practical success only if boards are treated which are provided with binding agents which, for developing their activity, must be heated to flow temperature. Only then the screen impressions may be levelled down by the above mentioned high temperatures, because thereby the binding agent is rendered flowing again and, therefore, may fill the screen impressions. Such a method, however, cannot be used in connection with boards produced by the use of artificial resins capable of being hardened as a binding agent which substances, however, are extensively used as binding agent in the hard fibre board industry, because by the previous drying under heating such substances are hardened already to such a degree that their flowing capacity is strongly reduced or completely suppressed.

The object of the invention is the production of hard boards smooth at both surfaces and free from the above mentioned drawbacks. This substantially is obtained by the fact that the boards first of all are produced in the ordinary manner in a press which upon one of the surfaces of the boards produces the impressions of a screen, grid or the like, whereas the other surface of the board remains smooth. To at least attenuate the impressions of the screen or grid or to substantially prevent them the screen or the grid may be coated with the fabric known in the filter industry, for instance (under consideration of the elevated temperatures) with an asbestos felt so that this surface of the board shows a slight roughening only. In a second stage of the method the fibres at the upper surface of the board showing the screen impression or slight felt roughening are swollen up by liquids or steams. Then the boards are again compressed in a third stage at an increased temperature preferably above 100° C in a press in which smooth metal surfaces are provided for both sides of the board.

Due to the final compression in accordance with the invention lower pressures may be used in the first state than otherwise usual in the manufacture of hard fibre boards so that first a board having a specific weight of about 0,5 is obtained only.

In the second stage of the method the fibres at the rough side of the board are swollen up by spraying liquids for steam upon this side of the board. If the board is to be produced without the addition of special binding agents, water is sufficient as swelling liquid and it is indeed possible to obtain a sufficient swelling effect if the water is sprayed under suitable pressure upon the rough surface of the board. Of course, the swelling effect is accelerated if warm or hot water is used. Furthermore, additions, for instance alcohol or the like which reduce the surface tension may be made to the water to improve the swelling effect. Finally, the well known binding agents or lacquers used in the production of fibre boards may be added to the swelling liquid in form of a solution or an emulsion.

If the board has been produced by the use of a binding agent then preferably a swelling liquid is used having a certain dissolving action on the binding agent. Mainly, alkalis, for instance caustic soda or ammonia, come into consideration for this purpose.

The action of the swelling liquid may be accelerated and the swelling action itself may be improved by mechanically roughening the surface of the board showing the screen impressions before applying the swelling liquid or before the steam comes to action. For the purpose of roughening the upper surface of the board rasp or emery rolls are suitable which simultaneously may be used to render level the upper surface of the board should this be necessary.

In carrying out the method according to the invention it is of utmost importance that after the preliminary compression the fibres at the upper surface of the rough side only are swollen up and not the fibres of the entire board as has several times being proposed. In accordance with the invention the core of the board must have a less amount of moisture than the swollen upper surface, because just by the fact that first of all the plasticity of the fibres arranged at the upper surface is regenerated by the swelling and not the core of the board it is possible to quickly remove the moisture used for rendering plastic the upper surface. If the amount of moisture in the core of the board also would be increased by the swelling up, the removal of the particles of the moisture present in the core without offering resistance would be rendered difficult or impossible at all due to the upper surface of the boards being momentarily rendered hard and horny during the final compression so that then the steam tensions occurring in the board would tear the core of the board to pieces as this often hoppens and is considered to be a dreadful event in the production of hard boards.

The so prepared board is now subjected to final compression between two polished metal surfaces. During this final compression increased temperatures preferably above 100° are used for evaporating the moisture present in the board. The pressures depend on the required strength and specific weight. Specific weights of 1,1 or 1,2 may easily be obtained if the preliminary compressed board had a weight of 0,5 only. This indeed is surprising because if hitherto a board already compressed was subjected to a final compression as a rule the danger of breakage of the board existed and at least the breaking strength on bending of the now heavier board was considerably reduced. In accordance with the method of the present invention besides higher density of the board a considerably higher breaking strength on bending is obtained. This probably is due to the fact that the swelling liquid during the final compression enters between the two metal surfaces into the drier core and cannot escape at once and consequently acts as a lubricant for the fibres.

If artificial resins are used as binding agents care is to be taken that in the first stage compression is effected only until the board is dried and not until final polymerisation of the artificial resin is obtained. The pressures applied are considerably higher than those used in connection with the known method mentioned in the preamble so that in the first press already a board having a specific weight of at least 0,5 is obtained. This board now is subjected to a final compression between smooth metal surfaces during which final polymerisation occurs. Due to the fact that the board subjected to a final compression is already dry and relatively dense, the final polymerisation is carried out rather quickly. Breakage of the board during the later compression is prevented by the sliding action of the binding agent.

According to the method of the invention boards perfectly smooth at both sides may economically be produced which without further treatment may be used as constructional parts which are required to have a pretty appearance.

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