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[54] **METHOD FOR THE IMPREGNATION AND SURFACE TREATMENT OF POROUS BOARD TYPE PRODUCTS**

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[52] **U.S. Cl.** **117/116,** 117/119, 117/148, 117/DIG. 8

[51] **Int. Cl.** **B44d 1/02**

[58] **Field of Search** ..... 117/116, 117, 119, 117/DIG. 8, DIG. 9, 148

[56] **References Cited**

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[57] **ABSTRACT**

The method has been applied on board type products, which have been subjected to low pressure and effecting impregnation rapidly within a few seconds and polymerisation in hot press during 1 – 5 minutes, the impregnating medium generally consisting of a mixture of unsaturated polyester and styrene monomer. By regulating underpressure and viscosity and by using fillers the plastic quantity is regulated. The penetration depth of the impregnation medium is further controlled by regulating the temperature of the impregnating medium and the impregnating time. Improved absorption is achieved by vibrating the impregnating medium or the board.

2 Claims, 3 Drawing Figures

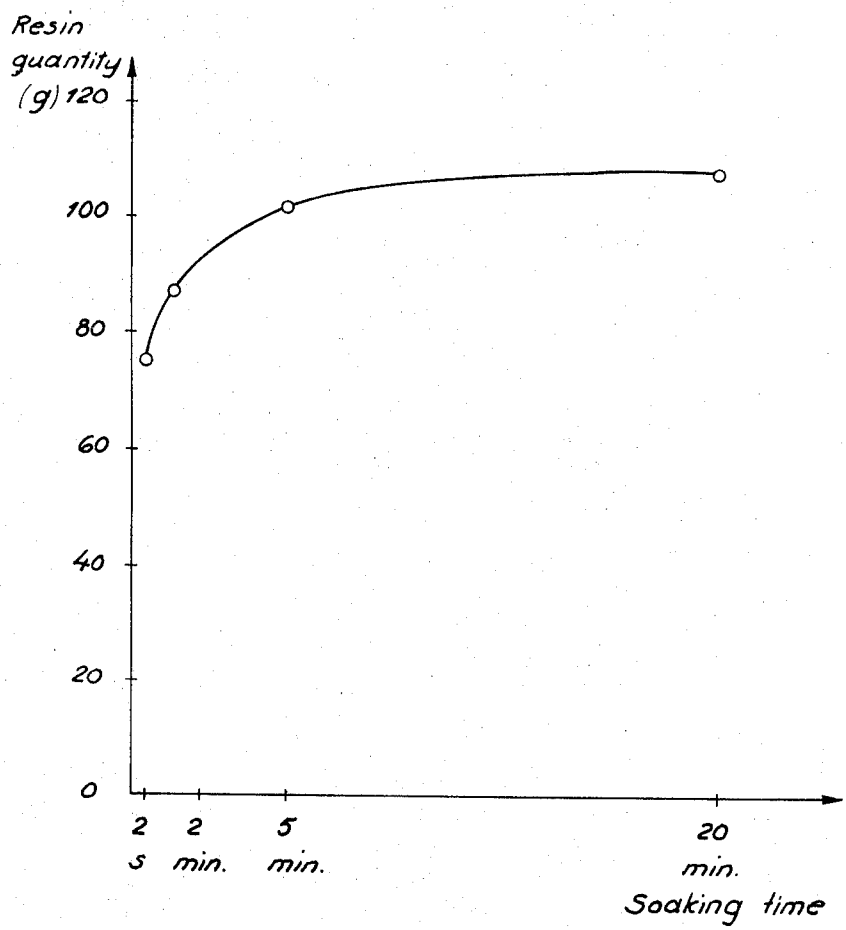

Resin
quantity
(g) 120
100
80
60
40
20
0
2
s
2
min.
5
min.
20
min.
Soaking time

Fig. 1

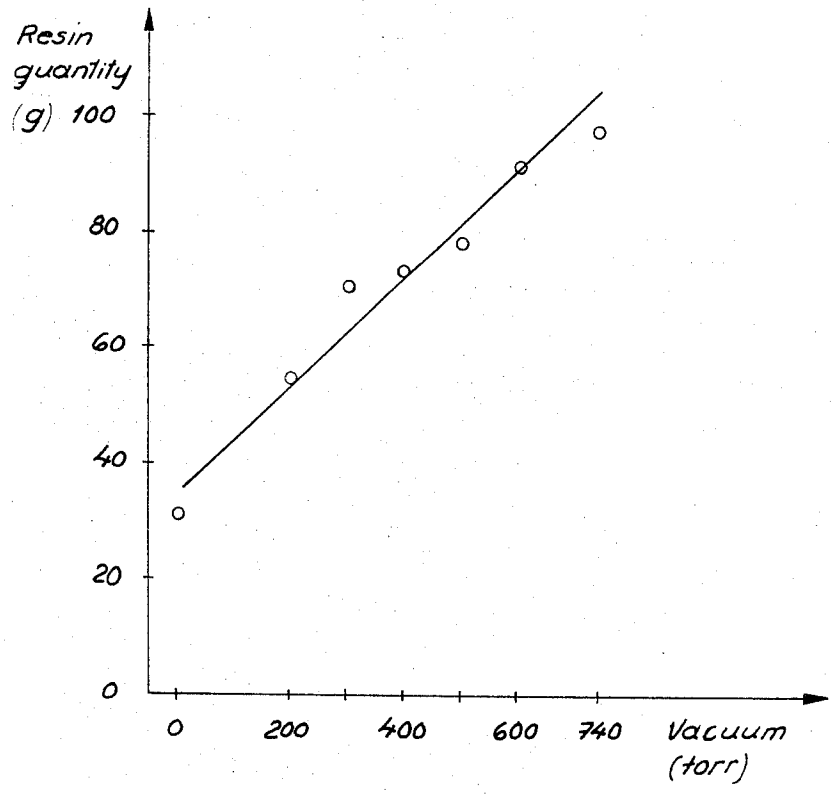


Fig. 2

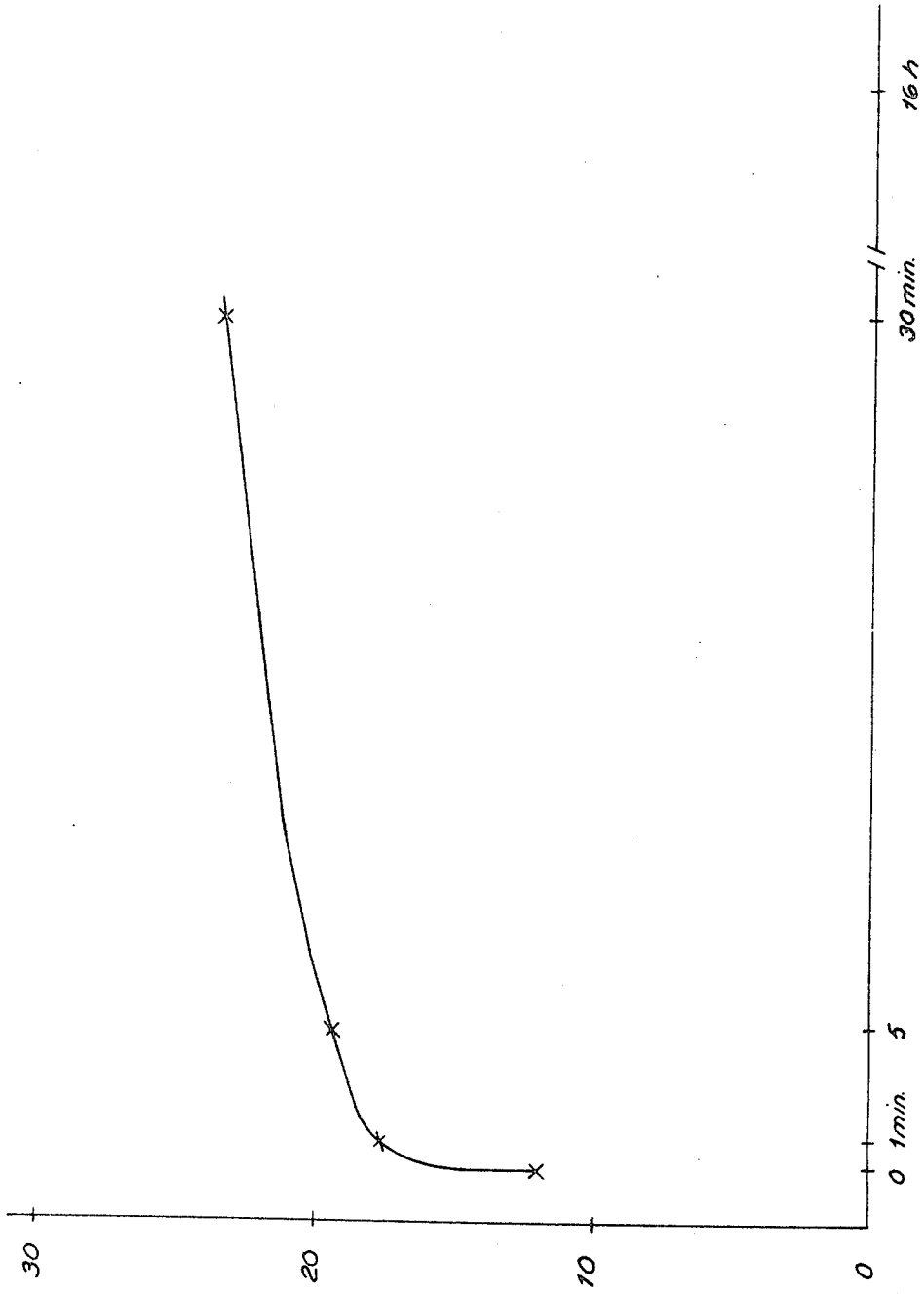


Fig. 3

METHOD FOR THE IMPREGNATION AND SURFACE TREATMENT OF POROUS BOARD TYPE PRODUCTS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method for the impregnation and surface treatment of porous board type products such as plywood, particle board, sawn board, various types of wallboard, parquetry and the like.

2. Description of the Prior Art

It is prior known to prepare plastics wood, to rotproof and fireproof timber and to paint, dye, varnish and laminate it.

When preparing plastics wood it is desirable to impregnate the same as thoroughly as possible in order to obtain a homogenous result and because otherwise damage is caused by the "living" of the wood (shrinkage and expansion). When rotproofing wood, the aim similarly is as perfect an impregnation as possible. Said methods are in most cases based on the utilization of vacuum and overpressure. The treatment is carried but in cylindrical vessels. When utilizing vacuum, vessels of rectangular, low cross section have successfully been employed.

It is characteristic of the above-mentioned impregnating methods carried out in vessels, that preferably more than one piece is simultaneously subjected to treatment, because the handling of the lids and doors, as well as of the impregnation liquors requires much time, and by treating great numbers of pieces simultaneously the time per piece can be reduced to a reasonable value.

For the impregnation of board products the treatment has also been as above described.

As far as surface treatment is concerned, to which this invention also relates, various painting, dyeing and varnishing methods are prior known.

Often the air present in the porous piece to be reated presents a problem in these surface treatment methods. Said air causes defects in the treated surface and therefore many methods for removing the same have been suggested. One example of these methods is the one disclosed in Finnish Pat. No. 34,506.

According to one method the surface to be treated is heated before the addition of the surface treatment medium, whereby the surface treatment medium, still in fluid or plastic state, better penetrates the porous surface during cooling. The success of this preheating method shows the importance of air removal from under the surface treatment medium.

SUMMARY OF THE INVENTION

The object of the present invention is to impart to the treated product such physical and chemical properties, in such quantities and within such cost limits that can be considered economically and commercially useful.

The method aims at the improvement of the properties of the product. This can have reference to strength, fire resistance, resistance against dry rot and microorganisms, color, surface quality, surface pattern as to color and structure, etc.

Utilization of the method according to the present invention in connection with surface treatment methods provides a deeper reaching and more effective air removal from under the surface treatment medium.

The principal characteristics of the method according to this invention are that the board-type products are introduced into a vacuum chamber, where they are retained, immersed in the impregnating medium, under vacuum, for a time not exceeding 5 minutes, after which the chamber is subjected to atmospheric pressure, the boards, continuing to be immersed in the impregnating medium, are retained in this condition for a time not exceeding 5 minutes, after which the boards are removed from the chamber and optionally transferred to an after-treatment known per se.

The present invention is based in part on the concept that impregnation of porous board products in vacuum in a suitable manner is more advantageous than impregnation of massive pieces of timber. The basis of this concept is that the impregnation time must, for these relatively thin boards, be comparatively short.

The desirable length of the impregnation time for board products has not been subject to research, obviously because the prior known pressure and vacuum methods have been adequate capacity due to the great number of pieces the apparatuses were capable of holding.

On the other hand the methods for opening, closing, filling and emptying the apparatuses have been slow, so that the minimum impregnation time has been of little interest.

According to this invention the impregnation and product improvement is carried out with a monomer which is characterized by a relatively high price and short useful storage time after the addition of hardener. For this reason an impregnation basin of the smallest possible dimensions is employed.

By virtue of the utilization of a small size impregnating-medium vessel and impregnation chamber, the emptying of the chamber of and filling the same with air or impregnating-medium proceeds rapidly.

By examination of results achieved with the above described short emptying and impregnation times it has been found that the results obtained with impregnation times ranging from 1 sec. to 5 minutes are adequate from a technical and commercial point of view.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 shows a diagram illustrating the effect of soaking time on the final absorbed resin quantity in a five-layered plywood piece of 40cm, with a vacuum of 740 torr,

FIG. 2 shows the effect of the vacuum on the final absorbed resin quantity in a similar plywood piece as in FIG. 1, with a soaking time of 2 minutes, and

FIG. 3 shows the effect of the soaking time on the final resin content in per cent based on the weight of the board, in hard wallboard, when the vacuum value is 740 torr.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Control of the depth of the impregnated surface layer is often not necessary when treating thin wood veneers and, for instance, paper, but when impregnating materials such as chipboard, depth control is essential. In this case it is carried out by adding particles to the impregnation-medium (such as to a monomer) before the impregnation. Said particles, when penetrating the board surface, stop therein and block the pores, thus

preventing the penetration of unnecessarily great quantities of impregnation-medium (monomer) into the board.

This phenomenon can be experimentally verified by means of the apparatus according to the invention, by adding to the monomer titanium oxide, which after polymerization in a hot press can, by color observation, be found to have disappeared in the pores of the board. The quantity of monomer absorbed in the board is, however, found to be fairly small although the surface quality is high.

The depth of penetration has in case of some products successfully been controlled by regulating the viscosity of the impregnation medium.

Occasionally it is advantageous to control the penetration depths of the impregnation medium by regulating the time in vacuum and/or the impregnation time. When utilizing long impregnation times, this, however, leads to an approximation of the traditional impregnation method which is not economical.

The impregnation depth can further be controlled by regulating the vacuum value.

Good results, particularly in respect to improved absorption, are achieved by providing an ultrasonic vibrator in the impregnation basin, as this substantially increases the effectiveness of the process. Other types of movement of the impregnation medium also have importance in this respect.

In various connections the impregnation medium temperature has been found to have a desirable effect on the impregnation method. The effect of the temperature manifests itself on the one hand in connection with viscosity change, and on the other hand in connection with the polymerization process or the catalysis.

During impregnation the penetration depths thus can be controlled by adding pore blocking particles to the impregnation medium, by regulating its viscosity or temperature, by controlling the time in vacuum and/or the impregnation time, the vacuum value, and by bringing the impregnation fluid and/or the board into a state of vibration during the time in vacuum and/or the impregnation time. Each of these means can be utilized separately or one or more of them simultaneously.

The method is applicable for the treatment of porous board type products.

The method according to the invention has been investigated with respect to the treatment of veneer, plywood, staveboard, particle board, porous wallboard, semi-hard wallboard, hard wallboard, cardboard and comparable products.

As impregnation medium in the method according to the invention can be utilized, and have experimentally been utilized various substances such as monomers, resin components, impregnation salt solutions, dyestuffs, paints, oils their mixtures and compositions etc.

The impregnated product can represent a final product immediately after impregnation. An example of this is the treatment of a board product with a water-repellent oily substance. Often it is desirable to subject the impregnated product to a treatment in a hot press. For instance monomer-treated plywood is transferred to a press similar to a plywood press, for polymerization.

In connection with the polymerization carried out in a press, it is possible to obtain a glossy, mat or patterned surface finish, depending on the finish of the press platens.

The polymerization can, of course, be carried out in a cold press, for instance, because of cost considerations.

After the press treatment or other polymerization or drying process, the surface can be polished. It is often considered desirable to give the product a homogenous continuous surface layer, having a considerable thickness and permitting considerable wear and/or imparting, e.g., to plywood in certain cases, the attractive appearance of natural wood. This is obviously advantageous in case of floor boards or table tops.

In some cases it is necessary to treat the impregnated product in a drying plant, for instance, if the treatment has been carried out with water-soluble impregnation salts, when water removal must be effected with the utilization of heat and air flow. A suitable dryer for this purpose is a multistorey dryer, which is applicable for drying board type products.

In case it is desired after impregnation to impart to the board a "freestyle" splash or roller patterned finish and if it is not desired to prepare a sprinkled finish in the press, a drying chamber can similarly be employed, and for this purpose also a multilayer dryer is the most suitable. This is pertinent when the monomer impregnation-medium and the surface treatment medium of a monomer impregnated board are polymerized simultaneously.

This last mentioned polymerization can be effected in a hot press as well, in the case that e.g. a pattern paper is applied to the surface of a monomer impregnated board to obtain a desired pattern, or when polymer-impregnated wood veneers are laminated onto the same. This method can be utilized for coating the board with a pre-impregnated glass fiber polyester web, neither is it generally successful when used for other purposes.

It is a well known fact that attaching a pre-impregnated glass fiber mat to the surface of a board-type product of wood presents difficulties. By utilizing the method of this invention in the above described manner this operation is successful.

The polymerization reaction and other reactions after the impregnation step can be effected not only by the utilization of catalyzers, accelerants and heat, but nautrally also by all other prior known methods such as by the utilization of particle accelerators and electronic or atomic radiation.

EXAMPLES

Example 1

In an experiment with particle board in a vacuum of 740 torr and using a soaking time of 2 seconds and with polyester without additives as the impregnating medium, 16.7 per cent, based on the dry weight of the board, of polyester was absorbed in the board, and in otherwise similar conditions as above, 18 per cent of titanium oxide was added to the polyester, whereby the quantity of absorbed polyester and additive was 4.3 per cent based on the dry weight of the board.

Example 2

In an experiment with sawn boards in a vacuum of 740 torr and using a soaking time of 5 seconds and with polyester without additives as the impregnating medium a composite board was produced after the polymerization, in which composite board thru boards which were originally separate were very tightly stuck together and the surface was very smooth and during

the sawing formed "hair" was fastened to the surface of the boards.

I claim:

1. A method for the impregnation and surface treatment of board-type products with the utilization of vacuum, comprising: introducing the said board-type products into a vacuum chamber, where they are retained, immersed in the impregnating medium under vacuum, for a short period of time, after which the said chamber is subjected to atmospheric pressure, the said boards, continuing to be immersed in the said impregnating medium, being retained in this condition for a short period of time, after which the said board-type products are removed from the said chamber and transferred to an after-treatment, the penetration depth of the said impregnation medium being restricted by adding a finely divided material to the impregnation medium.

2. The method according to claim 1 wherein said vacuum treatment time does not exceed 5 minutes and said short period of continuining immersion does not exceed 5 minutes.

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