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ADHESIVE LAYERS AND THEIR PRODUCTION

Heinrich Prüfer, Vienna, Austria; vested in the Alien Property Custodian

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This invention relates to adhesive layers and the production thereof. It is already known to use artificial or synthetic resin for the glueing together of wood, and more particularly of multiply boards of all kinds. For this purpose paper foil impregnated with synthetic resin is used for intermediate layers inserted between the plies to be stuck together. The manufacturing of such adhesive films is effected in a known manner by steeping paper with a condensation product of phenols and formaldehyde dissolved in a solvent such as alcohol, acetone, or the like, or there is employed for the soaking of the paper an initial condensation product, that is to say a product that has only been condensed to such a point that the formation of two layers is avoided, such product being not diluable to any extent with water. The films thus produced are inserted between the sheets or plies to be united, and the whole pressed together in a hot glueing process.

In order to avoid obtaining spoilt work it is necessary that the air in the rooms in which films of this nature are being used for glueing purposes shall contain a certain amount of moisture.

Such solutions (alcoholic or acetonic) are not however suitable for direction application to the surface to be stuck, for example to a veneer, with the aid of a glue spreading machine. Apart from the fact that, when working with the glue spreading machine, which is commonly used for the application of bone-, casein-, and albumen glue, considerable quantities of expensive solvents go to waste (with the incidental risk of fire and explosion), the solution becomes thickened by this treatment, with the result that the applied layer becomes uneven and material wasted. This procedure cannot be adopted with a solution of an incipient condensation product either, which is not diluable with water, since, apart from the fact that heating must be continued for a long time before the insoluble and infusible condition is reached, the solution is too thick (resulting in uneven application) and it is also impossible to avoid the concurrent use of water in the machine, for washing purposes, as a solvent, and otherwise.

The present invention relates to novel adhesive layers consisting of material that has not as yet been employed for this purpose. In accordance with the invention there are employed for this purpose resin soaps, and more particularly soaps of hardenable synthetic resins. As synthetic resin for this purpose there are employed more particularly condensation products of aldehydes with phenols or their homologues or derivatives, the condensation being necessarily carried to such a point that two layers become formed. Such condensation products readily admit of saponification with alkalies, the resulting product being resin soaps or resin solutions which are unlimitedly diluable with water without becoming turbid or precipitating out. Phenol and aldehyde may be used in equal proportions. If more rapid hardening is desirable the condensation may be carried out with an excess of aldehyde.

Natural resin soaps may also be added to the synthetic resin soap for the purpose of bulking the latter, for the sake of economy.

I have found it to be advantageous to add softeners, such as oils, fats, or glycerine, the former in an emulsified or saponified form, to the resin soap solution.

Soaps of this description, provided they be properly diluted, may be directly applied to the surfaces to be stuck together, just like bone-, casein-, or albumen glue, with the aid of the usual glue spreading machines, or alternatively, foils of various and preferably absorbent material, such as paper or textiles, thin peeled veneers, or even metal foil or the like, may be treated with the said soaps, for example by spreading, steeping, or otherwise, and the thus prepared thin sheets employed as adhesive layers.

When highly absorbent material, such as for example thin veneers of poplar or beech-wood, is employed for the intermediate layers, or when the surfaces to be stuck together are highly absorbent, as in the case of poplar or beech-wood veneers, I have found, that the resin soap solutions, more particularly when directly applied, are for the greater part absorbed by the material and impregnate the same through and through, with the result that the adhesive power, which naturally depends solely upon the adhesive present on the surface, is impaired.

According to a further form of the invention, these drawbacks are obviated by causing the adhesive to collect on the surface of the surfaces to be stuck together, or by preventing the same from penetrating into the underlying material. This result is achieved by precipitating on the surface of the plies to be stuck together precipitation products from the synthetic resin soaps which are diluable to any extent with water and which may if desired be commixed with natural resin soaps. This precipitating out is effected either by first treating the surfaces to be stuck together, with a precipitant, such as for example metal salt solutions (e. g. alum), dilute acids, or solutions of resins not miscible or diluable to any extent with water, the latter being obtainable for example by the condensation of phenols and aldehydes with an excess of alkali. If the solutions of synthetic resins diluable to any extent with water be then at once applied the precipitation products precipitate out on the surface. Or, conversely, the resin soaps unlimitedly dilu-

able with water may be applied first and afterwards the precipitants. The adhesive is thereby effectually prevented from penetrating far into the material. When salts are used the precipitation products may be metallo-resin soaps, when acids are used resins, and when resins are used as precipitants mixtures of resins and resin soaps, since all resins and resin compounds present are caused to precipitate out by nucleus formation or by inoculation action.

Both in the case of the first-mentioned procedure of applying the resin soap alone, as also in the modified procedure using precipitants, I have found it to be advantageous to add to the resin soap unlimitedly diluable with water, or in the case of the modified procedure with precipitation, to these resin soaps and to the precipitant solution, or to one of the two, aqueous solutions of such carbohydrates as possess free hydroxyl groups, such as more particularly cane sugar or the like. By such addition to the resin solutions a thickening is obtained, even when the resin content is relatively slight, so that the mixture is better suited for spreading. When large quantities are added the addition must not be given too long before the mixture is to be applied to the material under treatment, since otherwise it may happen that actual congealing or solidification occurs. In the subsequent treatment in the hot gluing press the carbohydrates then presumably polymerize or combine with the remaining substances present, with the formation of viscid bodies which thus likewise serve so adhesive, so that the proportion of resin used may be reduced, and corresponding cheapening effected.

The further working up of the spread sheets of material, or of the treated foils, may take various forms, according to whether wet or dry gluing is desired.

In the case of wet gluing, the spread sheets are placed one upon the other while still in the wet state, and pressed under heat and compression. The treated foils may likewise be laid, while still wet, between non-spread sheets, and compressed together with the latter, thus uniting the whole.

In the case of dry gluing the spread sheets or treated foils are first left to dry. Drying is preferably effected at temperatures of 60–80° C or at ordinary temperature. Only sheets on which the resin coating has already dried, or dried treated foils together with non-spread sheets, are united together in the hot gluing press.

As compared with methods in which films (such as for example paper foils) treated with synthetic resins precipitable by means of water, for example in alcoholic solution, are employed for the gluing that according to the present invention affords the particular advantages, among others, of great cheapness and readier applicability even in extremely dry rooms.

According to the described method it is possible to produce for example multi-ply boards of all kinds, and the like, that is to say it is possible to stick wood to wood, and also wood to metal, or wood to compositions such as for example asbestos-cement compositions, and the like. In this manner it is also possible for example to stick various artificial compositions together or to various natural products.

Practical examples of the application of the method according to the present invention are for instance the following.

Examples

(1) Peeled veneers are spread with a 20% aqueous solution of a synthetic resin saponified with caustic soda, for example of a formaldehyde condensation product, laid one upon the other in the desired number of plies, and pressed with 8–12 kgs/cm² (114–170 lbs/in²) at a temperature of 130–150° C.

(2) As Example (1), except that the spread surfaces are dried before being superposed, at normal temperature or at a temperature not exceeding 80° C.

(3) Rotary press or other paper, or equally cotton fabric or other absorbent material, is steeped with a 24% aqueous solution of an artificial resin, for example a formaldehyde condensation product, saponified with caustic soda, or spread on both sides with the same, and inserted wet between two plies of wood veneer or between a ply of wood veneer and a sheet of asbestos-cement composition or metal, and pressed under 8–12 kgs/cm² (114–170 lbs/in²) at a temperature of 130–150° C.

(4) An absorbent material, such as paper or the like, is soaked or spread on both sides with a 24% aqueous solution of the type specified in Example (1), dried at normal temperature or at a temperature not exceeding 80° C, and then laid in any desired number between two plies to be stuck together, and further treated as given in Example (1).

(5) Tin or other metal foil is spread on both sides with an 18% aqueous solution of the type given in Example (1) to which there is added 6–8% of a natural resin soap, and then further worked up in the manner given in Example (3) or Example (4).

(6) Peeled veneers are treated with a 3% alum solution or with a solution of synthetic resin not unlimitedly diluable with water, and then coated with a 20–24% aqueous solution of an artificial resin condensed at least up to the point of the formation of two layers and then saponified with caustic soda, and diluable to any extent with water. Precipitates immediately become formed at the surface of the veneers, with the result that the resin is prevented from penetrating into the veneers. The veneers thus treated are then dried at ordinary temperature or at a temperature not exceeding 80° C, placed one upon the other in the usual manner and in the required number of plies, and pressed in a hot glueing press under a pressure of 8–12 kgs/cm² (114–170 lbs/in²) at a temperature of 130–150° C.

(7) As Example (6), except that the peeled veneers are treated first with the resin soap diluable to any extent with water, and then with a synthetic resin solution not unlimitedly diluable with water or with a 3% aqueous alum solution.

(8) To 1000 ccs of a 24% solution of resin soap unlimitedly diluable with water there is added 30–50 ccs of a 10–20% aqueous sugar solution. This mixture thickens gradually, until, after having been left to stand for 14–20 days, it sets to a homogeneous gel. For this reason it must be worked up within 10 days of having been prepared.

Products glued in the described manner have the same properties as those glued for example with "Tego film", while the manipulation and handling is simpler, and the expense involved very considerably reduced as a result of dispensing with expensive solvents.

HEINRICH PRÜFER.