April 4, 1939. C. G. DREYMANN 2,152,732

METHOD OF PRODUCING LAMINATED PAPERBOARD AND THE LIKE

Filed Sept. 26, 1936

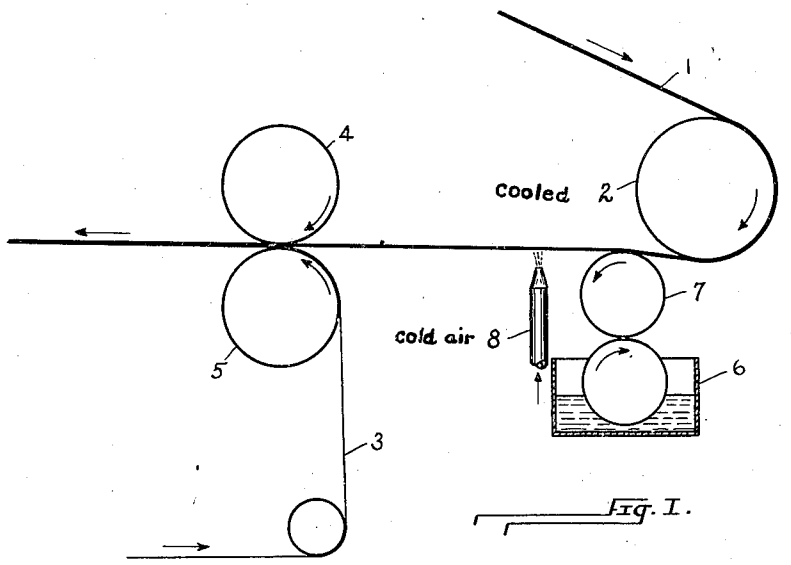


Fig. I.

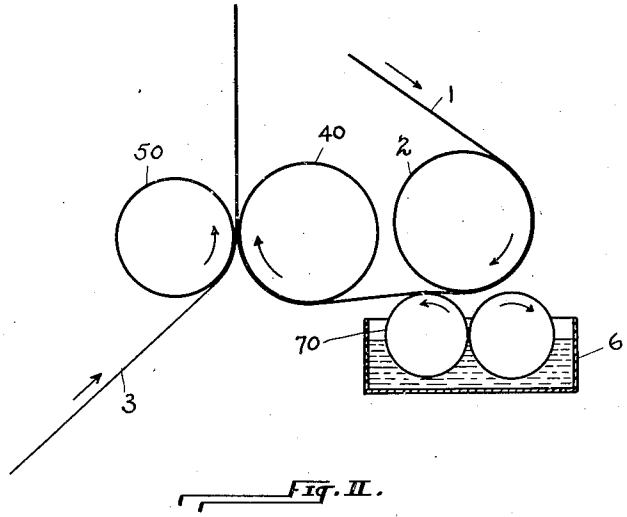


Fig. II.

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Patented Apr. 4, 1939

2,152,732

UNITED STATES PATENT OFFICE

2,152,732

METHOD OF PRODUCING LAMINATED PAPERBOARD AND THE LIKE

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Application September 26, 1936, Serial No. 102,747

2 Claims. (Cl. 154—40)

This invention relates to the production of moistureproof laminated paper, paper-board, cardboard, press-board, and the like, in which webs or layers of cellulosic material (a sheet of paper is an example) are integrated upon a film or layer of thermoplastic material spread or laid between them. The so intercalated layer by its adhesiveness unites the whole, and by its nature and by virtue of the fact that it is present as a continuous and unbroken film it renders the compound article impervious to moisture, and suitable for such uses as the forming of cartons to contain material whose condition in the matter of moisture is to be preserved—as, for example, food materials.

The thermoplastic material chosen is a material otherwise suitable that at a temperature of 210° F. has a viscosity of about 60–100 Saybolt seconds, and which as it cools from molten condition and approaches its solidifying point, gelatinizes. As such a material I may mention amorphous petroleum wax, with or without modifying additions—additions such, for example, as resin. Such material is described in Letters Patent of the United States No. 2,031,036, granted on my application February 18, 1936.

The invention consists in bringing the superposed web of paper fibre and the thermoplastic substance into actual contact when the substance, though still liquid, has cooled to or substantially to or slightly beyond the point of gelatinization. It is then a tacky viscous substance. Under such conditions the thermoplastic substance will penetrate the paper fibre sufficiently to effect adhesion and integration of the whole, but it will not be imbibed by the paper fibre to such degree as to lose its integrity as an integral and continuous film.

Another object of this invention is to cool thin board or paper at the time the liquid film is applied, or just before its application, so as partly to gelatinize the liquid thermoplastic material and thereby prevent its undue penetration into the fibres.

The accompanying drawing illustrates diagrammatically the practice of my invention in building up sheets of moisture-tight cardboard, paper-board, and the like.

In Fig. I a web of cardboard 1 is drawn from a suitable source of supply and caused to advance over the surface of a cooling roll 2. To the surface of the web as it leaves roll 2 a coating of the thermoplastic substance is applied, and then the coated web is drawn, together with a web of paper 3 that meets the coated surface, between rolls 4 and 5 where, under suitable pressure, the whole is integrated.

The thermoplastic material is carried from a reservoir 6 and spread upon the face of a roll 7; the web 1 advancing from roll 2 to the pass between rolls 4 and 5 passes over roll 7, and roll 7 is so placed as slightly to deflect the web from a straightaway course, and so to cause the advancing web to bear upon it with some pressure. The web in so passing over roll 7 picks up from its face the outspread film of the fluid, thermoplastic material. The pressure rolls 4 and 5 are positively driven. Nozzle 8 is arranged to deliver a blast of cooling air directly on the film that has been transferred to web 1, immediately after the web leaves roll 7 on its advance to the pass between rolls 4 and 5.

The thermoplastic material in the reservoir 6 is maintained at proper elevated temperature.

Temperatures are so maintained that the film of thermoplastic material is picked up by the web 1 from the face of roll 7 while the material is in fluid condition. The temperature will preferably be within a range of about 20°–50° F. above the melting-point. Contact with the preferably cooled web 1 will so far gelatinize the material that, while permitting adhesion of the tacky substance, will prevent imbibition. Immediately the effect of the cooling blast of air from nozzle 8 will be to gelatinize the film from its opposite surface; and when the two webs meet in the pass between rolls 4 and 5, the viscous, tacky films has been brought near to its point of solidification. Adhesion will be effected but the integrity and continuity of the film itself will not be broken.

In Fig. II the nozzle 8 is omitted; the space interval through which the coated web advances from the coating roll 70 to the pass between rolls 40 and 50 is reduced; the parts are so reorganized that the coated web 1 advances over the surface of roll 40 to the roll pass; and it will be understood that the body of the roll 40 may be cooled.

Several expedients will be recognized to be present in the apparatus described, for reducing temperatures through critical intervals. These are—

(a) The advance of the coated web 1 while exposed to the cooling effect of the air; as, in Fig. I, from roll 7 to the pass between rolls 4 and 5, whether the cooling blast of air be applied or not,

(b) The blast of cooling air, as from nozzle 8, Fig. I,

(c) Passing the web over a cooled roll (the roll

2 of Figs. I and II) as it approaches the point where it picks up the film of liquid thermoplastic material, and

(*d*) Passing the coated web over a seoond cooled roll (the roll 40, Fig. II) as it approaches the pass in which it meets the second web.

Of these the first (*a*) is advantageous when the film is to be applied to a relatively heavy board; the second (*b*) is advantageous when the thermoplastic is relatively hot or when the surrounding air is warm; the third (*c*) is of advantage when a thin board is to be coated; the combined use of (*c*) and (*d*) is particularly advantageous when two webs of sulphite paper are to be laminated, for sulphite paper is very avid in taking up the thermoplastic material. It will be understood that these various cooling expedients may be used severally or in such association as is best suited to the absorptive condition of the webs to be united.

The invention is peculiarly valuable in the use of thermoplastic material of the general nature indicated whose melting-point is relatively low, say 150°–180° F., and whose viscosity is correspondingly low—for example, between 50 and 90 Saybolt seconds at 210° F.

I claim as my invention:

1. The method herein described of producing laminated paper-board and the like in which a moisture-impervious layer of continuous and unbroken integrity is intercalated, which consists in applying in molten condition to a web of cellulosic material capable of imbibing it a film of amorphous petroleum wax that at a temperature of 210° F. has a viscosity of 60–100 Saybolt seconds and that on cooling from molten condition toward its point of solidification gelatinizes, arresting imbibition by cooling the applied film beyond the point of gelatination while still the applied film extends in unbroken continuity, and, before the point of solidification is reached, superposing upon the film-covered web a second, uncoated web of cellulosic material and effecting integration of the whole without breaking of continuity of the film so intercalated.

2. The method herein described of producing laminated paper-board and the like, in which a moisture-impervious layer of continuous and unbroken integrity is intercalated, which consists in applying in molten condition in outspread form and under pressure to a web of cellulosic material capable of imbibing it a film of amorphous petroleum wax that at a temperature of 210° F. has the viscosity of 60–100 Saybolt seconds, and that on cooling from molten condition toward its point of solidification gelatinizes, arresting inbibition by cooling the applied film to a point below the point of gelation while still the applied film extends in unbroken continuity, and, before the point of solidification is reached superposing upon the film-covered web a second uncoated web of cellulosic material, and effecting integration of the whole under pressure without breaking of continuity of the film so intercalated.

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