March 6, 1934. A. E. VAN WIRT 1,950,279

PROCESS OF PRODUCING A WATER REPELLENT COATING ON PAPER OR SIMILAR MATERIAL

Filed June 15, 1933 2 Sheets-Sheet 1

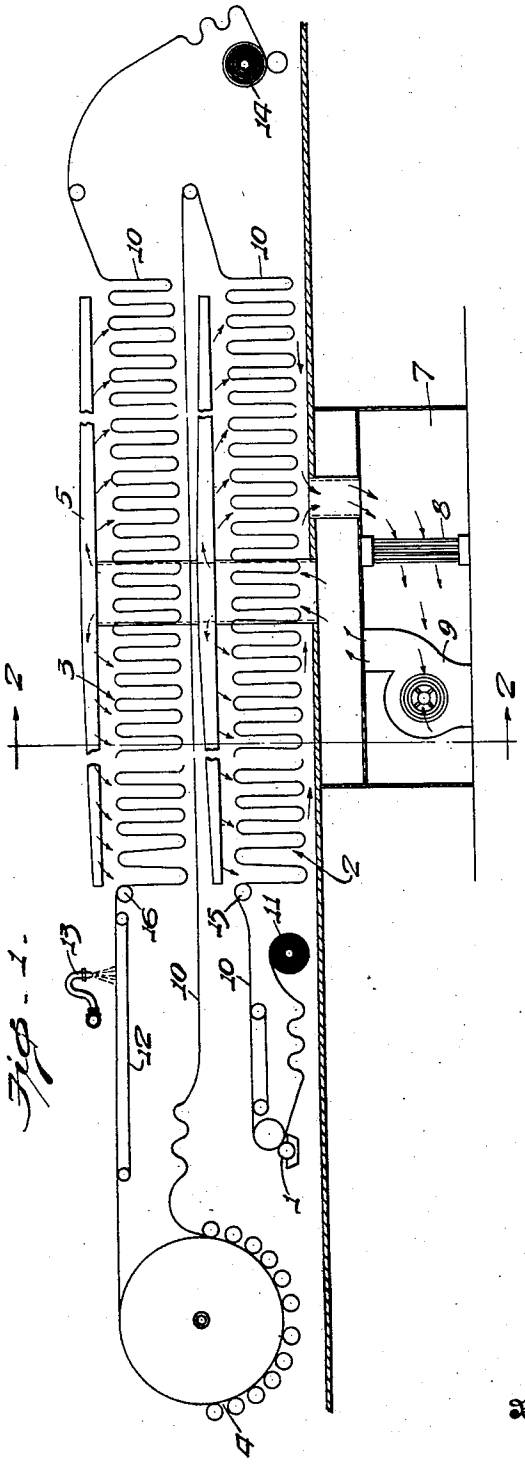


Fig. 1.

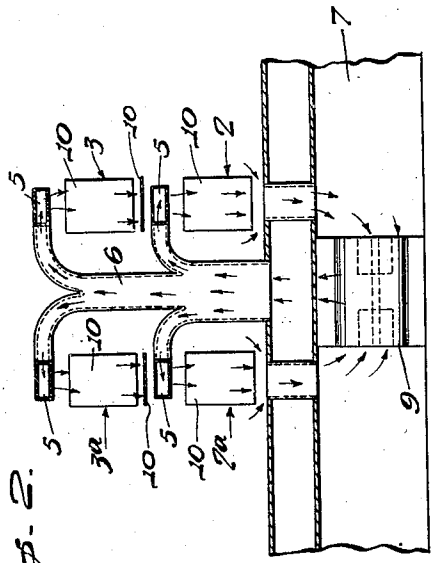


Fig. 2.

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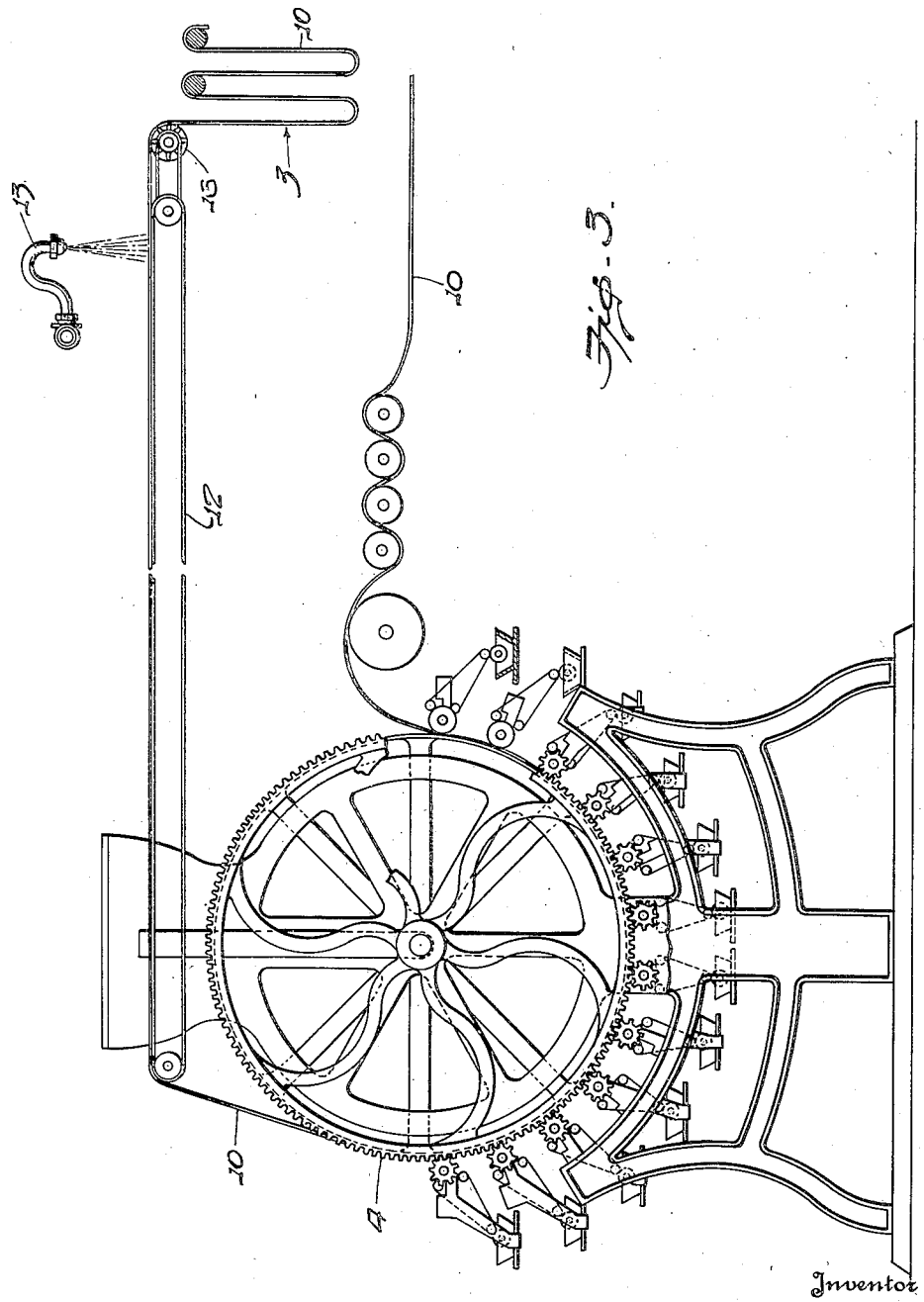


Fig. 3.

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PROCESS OF PRODUCING A WATER-REPELLENT COATING ON PAPER OR SIMILAR MATERIAL

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Application June 15, 1933, Serial No. 675,982

13 Claims. (Cl. 91—67.9)

This invention relates to a process of producing a water-resistant surface on a web, such as wall paper, and has for its principal object to provide a washable wall paper which in appearance and water-resistant qualities will be superior to wall papers made in accordance with the processes heretofore practiced.

According to my process a sizing material, such as casein, animal glue or albumen, is incorporated in the material with which the web of paper or similar material is coated, and, after the application of such coating material to the web, preferably after the coating has been dried, an agent, such as formaldehyde or metallic salts, or a mixture of such metallic salts, capable of converting the sizing material into a form substantially insoluble in water is applied to the coating.

If a figure or the like is to be printed upon the coated web, sizing material of the character just referred to is added to the pigment with which such figure or the like is to be produced and the printing is effected on the coated web, preferably after the coating has dried and before the application thereto of the converting material. After the application of the converting material to the coated or coated and printed web, the web is subjected to heat.

I have found in practice that by the application of the sizing material and the converting material to the web in two steps, a relatively hard film possessing great water repelling qualities is produced upon the surface of the web; and I have found further that the best results can be obtained and that the process can be carried out most expeditiously and economically by spraying the converting agent upon the surface of the coated web, since this makes it possible to apply the coating material to the web, to print a figure or pattern thereon, and to apply the converting agent as a continuous process.

In practicing my process, the web, such as paper, is first coated on one side with a composition preferably comprising clay and a solubilized casein. If a colored or tinted coating is desired, a suitable pigment may be added to the coating material.

The coating is then dried. The desired figures or designs are then printed on the dried coating with a composition comprising the solubilized casein, pigments, clay and the like. After the printing and before the drying of the printing, an agent capable of converting the casein into a form substantially insoluble in water, such as a formaldehyde solution, is sprayed on the coating and printing, and thereafter the coating and printing are dried. The converting agent reacts with the casein in the coating and printing, during the second or final drying, to convert the casein into a relatively hard, water-resistant film.

The manner in which the process is practiced is illustrated in the accompanying drawings, wherein:

Figure 1 is a diagrammatic view of an apparatus suitable for use in carrying out the process;

Figure 2 is a sectional view taken on the vertical plane indicated by the line 2—2 of Figure 1, and

Figure 3 is an enlarged view of printing and spraying elements of the apparatus.

The apparatus shown comprises one or more coating or grounding machines, only one of which is shown and designated 1, lower drying racks 2 and 2^a, upper drying racks 3 and 3^a, and one or more printing machines, only one of the latter machines being shown and designated 4. Ducts 5, which receive hot air from a flue 6, distribute the air throughout the drying racks 2, 2^a, 3 and 3^a. The air, which is warmed in a chamber 7 by a heater 8, is delivered to the flue 6 by a blower 9. The apparatus as thus far described is of well known construction, and is adapted to simultaneously coat, print and dry one or more webs 10.

Each of the webs 10 is passed from a roll 11 to and through one of the coating or grounding machines 1, which completely covers one side of the web with a coating comprising clay and a sizing material, such as solubilized casein, and coloring matter, if a colored coating is desired. This coating is dried by festooning the web on one of the drying racks 2 or 2^a. After the coating has dried, the web is passed between that drying rack 2 or 2^a, on which a portion of it is festooned, and the companion upper rack 3 or 3^a, to and through one of the machines 4, which prints the desired figures or design on the dry coated surface with a composition comprising a sizing material, such as solubilized casein, pigments, clay and the like. The printed web is then passed over an endless belt 12, and, while moving over the belt, is sprayed, through the medium of nozzles 13, with a solution capable of converting the sizing material into a form substantially insoluble in water, such as a formaldehyde solution. The web is then festooned on a second drying rack 3 or 3^a located immediately above the drying rack 2 or 2^a. The web then passes to and is wound on a roller 14. Beater rolls 15 and 16, over which the web passes, aid in festooning the web on the drying racks.

I prefer to use as a sizing material a solution of

casein made by stirring 20 lbs. of dry casein into about 80 lbs. of water heated to about 50° C., to which is added, during the stirring, 4 lbs. of borax dissolved in sufficient water to form a concentrated solution. This mixture is maintained at approximately the temperature just mentioned and the stirring is continued until the casein is dissolved and the mixture is free from lumps. The amount of the borax may be slightly reduced or substantially increased to make slight changes in the properties of the casein sizing material. In place of the borax I may use the chemically equivalent quantity of many other alkaline materials, such as caustic soda, sodium carbonate, ammonia, sodium phosphate, or mixtures of alkaline materials.

The casein sizing material just mentioned is mixed with a sufficient quantity of clay and water, or similar materials, to form a mixture of the proper consistency for application to the web to be coated. If a colored ground or coating is desired, a sufficient quantity of coloring material or pigment may be added to said mixture to produce a coating of the desired tint or color. A quantity of the casein sizing material is mixed with the pigment or coloring material to be used in printing figures or patterns on the web. The proportions of the casein, clay or pigment, and water will depend upon the pigment and the kind of coating or printing desired, and is determined by experience.

I prefer to use as the agent for converting the casein-containing coating or printing material into a form substantially insoluble in water, a formaldehyde solution made by simply diluting with water the commercial forty per cent. solution of formaldehyde. The proportion of water to be added to the solution of formaldehyde will depend upon the rate at which the converting agent is to be delivered by the nozzles 13, the area to be treated per minute by the sprays, and similar factors. It has been found, however, that an aqueous solution containing from ½ to 5 per cent. of formaldehyde solution is most practical.

It will be understood that, in accordance with my process, all materials used in both the coating and printing compositions contain a solution such as casein, capable of being converted into a form which is substantially insoluble in water, that the agent for converting such coating or printing into a form substantially insoluble in water is not used until after the coating and printing compositions have been applied to the paper, and that the converting agent is sprayed on the final coating or printing before the final drying. The converting agent converts the sizing material in the dried ground coating and the sizing material in the wet printing into a relatively hard film which makes the entire surface of the web washable. The reaction between the sizing material and the converting agent to form this film, is accelerated by the heat in the drying rack, through which the paper continuously passes immediately after the spraying of the converting agent on the wet coating or printing while the paper is moving from the printing machine to the rack. This film possesses great water resistant characteristics. The converting agent is sprayed on the final coating or printing at such a rate as not to flow or spread after application to a greater degree than to cover the web. An important feature of the invention is that, owing to the manner in which the converting agent is applied, the final coating or printing is not disturbed, and it is not necessary to dry the final coating or printing before the application of the converting agent.

Any other protein adhesive which is or can be made easily water soluble and which is convertable by formaldehyde or related substances or by metallic salts may be used in place of the casein size. A solution of metallic salts may be used in place of the formaldehyde solution.

It is to be understood that my process may be used in producing a water-resistant surface on substances other than paper, such as fabrics, that, in so treating such other substances the sizing material and the converting agent will be applied in two steps, and that the converting step is to be carried out while the coating or printing is wet, as described.

I claim as my invention:

1. A continuous process of producing a web of material having a water-resistant surface, which comprises applying a solubilized protein material to a surface of the web, printing on the treated surface with a pigment material including a solubilized protein material, and thereafter spraying the treated and printed surface of the web with a liquid capable of reacting with the protein material to form a water-insoluble compound.

2. A continuous process of producing a web of material having a water-resistant surface, which comprises applying a solubilized protein material to a surface of the web, drying the treated surface, printing on the treated and dried surface with a pigment material including a solubilized protein material, and thereafter spraying the treated and printed surface of the web with a liquid capable of reacting with the protein material to form a water-insoluble compound.

3. A continuous process of producing a web of material having a water-resistant surface, which comprises applying a solubilized protein material to a surface of the web, printing on the treated surface with a pigment material including a solubilized protein material, and spraying the treated and printed surface of the web while the printing thereon is still wet with a liquid capable of reacting with the protein material to form a water-insoluble compound.

4. A continuous process of producing a web of material having a water-resistant surface, which comprises applying a solubilized protein material to a surface of the web, printing on the treated surface with a pigment including solubilized protein material and thereafter spraying the treated and printed surface of the web with a formaldehyde solution.

5. A continuous process of producing a web of material having a water-resistant surface, which comprises applying to a surface of the web a composition including solubilized casein, printing on the treated surface of the web with a pigment including a solubilized protein material, and thereafter spraying the treated and printed surface of the web with a liquid capable of reacting with the casein and the protein material of the pigment to form a water-soluble compound.

6. A continuous process of producing a web of material having a water-resistant surface, which comprises applying to a surface of the web a composition including solubilized casein, drying the treated surface, printing on the treated and dried surface with a pigment material including a solubilized casein, and thereafter spraying the treated and printed surface of the web with a formaldehyde solution.

7. A continuous process of producing a web of

material having a water-resistant surface, which comprises applying to a surface of the web a composition including solubilized casein, drying the treated surface, printing on the treated and dried surface with a pigment material including a solubilized casein, and thereafter spraying the treated and printed surface of the web, before the printing has dried, with a formaldehyde solution.

8. A continuous process of producing a web of material having a water-resistant surface, which comprises printing on a dry surface of a web including a solubilized protein material with a pigment material including a solubilized protein material, and thereafter spraying the printed surface of the web with a liquid capable of reacting with the protein material of the web and of the pigment material to form water-insoluble compounds.

9. A continuous process of producing a web of material having a water-resistant surface, which comprises printing on a dry surface of a web including solubilized casein with a pigment material including solubilized casein, and thereafter spraying the printed surface of the web with a formaldehyde solution.

10. A continuous process of producing a web of material which comprises printing a design on a surface of the web with a material containing a solubilized protein, and thereafter spraying the treated surface of the web, before the design has dried, with a liquid capable of reacting with the protein material to form a water-insoluble compound, whereby smearing or smudging of the design is avoided.

11. A continuous process of producing a web of material, printing a design on a surface of the web with a material containing solubilized casein, and thereafter spraying the treated surface of the web, before the design has dried, with a liquid capable of reacting with the protein material to form a water-insoluble compound, whereby smearing or smudging of the design is avoided.

12. A continuous process of producing a web of material which comprises printing a design on a surface of the web with a material containing a solubilized protein, and thereafter spraying the treated surface of the web, before the design has dried, with a formaldehyde solution, whereby smearing or smudging of the design is avoided.

13. A continuous process of producing a web of material which comprises printing a design on a surface of the web with a material containing solubilized casein, and thereafter spraying the treated surface of the web, before the design has dried, with a formaldehyde solution, whereby smearing or smudging of the design is avoided.

ALFRED E. VAN WIRT.