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METHOD OF COATING PAPER

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Fig. 1,

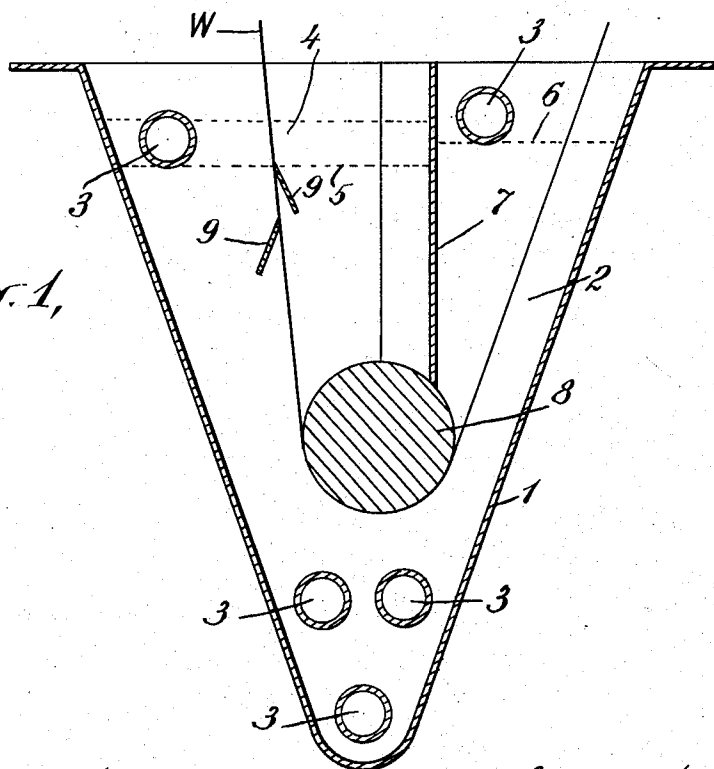
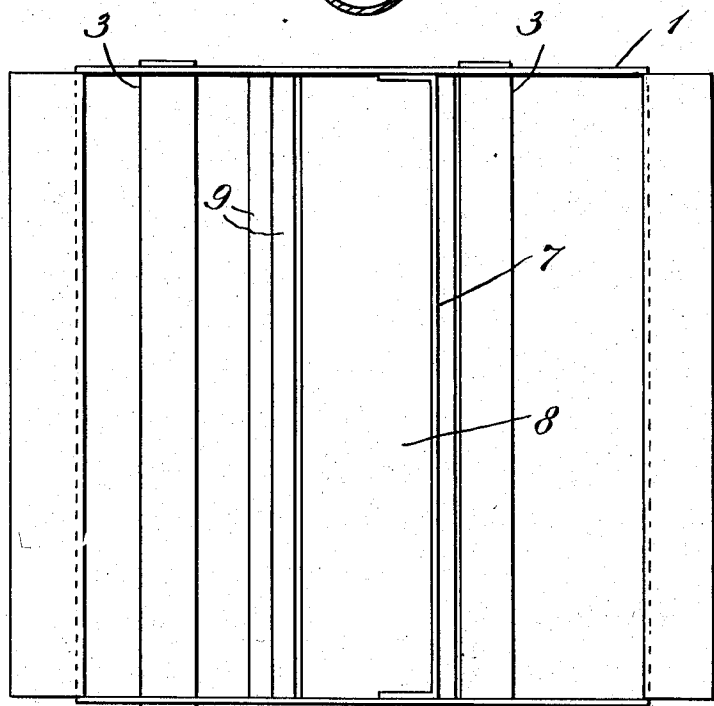


Fig. 2



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METHOD OF COATING PAPER

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6 Claims. (Cl. 117—64)

This invention relates to a method of coating paper, and more particularly to a method of applying a uniform coating of a material capable of being liquefied by heat to both sides of a paper sheet or web.

Various coatings are applied to paper which are capable of being liquefied at temperatures which can be safely employed in the treatment of paper and which are then fluid enough to form uniformly level coatings. The coatings, after hardening, are capable of being remelted on a packaging machine to form a self-sealing covering. One example of such coating material is wax. The application of wax coatings of low melting point to paper presents no particular difficulties. At the temperatures employed in applying the coating the wax is sufficiently fluid to flow on the sheet and form a uniformly level coating.

The use of higher melting point waxes and other coatings, however, do not produce uniform coatings by the methods heretofore employed and require further treatment. The higher melting point waxes and other materials are not sufficiently fluid to flow on the sheet and form a uniformly level coating, at temperatures which can be safely employed in treating paper, and it has therefore been necessary to smooth or level the coating by means of doctor blades or other similar mechanism. I have found that uniform coatings of materials, which are too viscous to flow at coating temperatures, can be obtained by passing the coated paper through a molten bath of a low melting alloy or metal.

I am aware that coatings of thermo-setting materials have been applied to objects to be coated and then passed through a bath of molten metal or alloy to harden such coatings by heat. It is also known that paper webs may be dried by passing them through a molten bath of low melting point metals or alloys. In practicing the process of the present invention I find that I can obtain uniform coatings of higher melting point waxes and other materials by passing the coated paper through a molten bath of a low melting point metal or alloy without affecting the moisture content of the coated paper.

The process may be practiced in various types of apparatus and the coating may be applied to the paper in a separate machine before the paper is passed into the tank or container containing the molten bath. A simple method of practicing the process is to place a body of wax or other coating material on the top of the bath at the inlet side of the machine whereby the coating

is applied to the paper as it passes through this layer of wax or other coating material and is then smoothed by passing through the molten metal.

In the accompanying drawing I have diagrammatically illustrated one type of apparatus for practicing the process in this manner. In the drawing:

Fig. 1 is a vertical, sectional view of a tank or container; and

Fig. 2 is a plan view.

Referring to the drawing, the reference numeral 1 designates generally the tank or container. While it is illustrated as a V-shaped tank in vertical cross section, any other type of tank in which the paper sheet or web can be carried through the molten bath may be employed. Within the tank I place a suitable quantity of a low melting metal or alloy 2. Suitable heating means 3 may be disposed at various points in the tank to maintain the metal in molten condition. In the drawing I have illustrated a body of high melting point wax 4 on the metal at the inlet side of the machine. The top of the metal at this side of the machine is indicated by the dotted line 5, and the top of the metal at the outlet side of the machine is indicated by the dotted line 6. Due to the greater specific gravity of the metal, the wax or other coating material is maintained in the position shown and the heat employed in maintaining the metal in a molten condition keeps the wax or other coating material liquefied. To prevent the wax from flowing to the outlet side of the machine, I provide a partition 7 extending downwardly from the top of the tank to a roll or smooth cylindrical rod 8. The member 8 may be a smooth stationary rod or may be a rotating roll. The web, indicated by W passes into the machine at the inlet side and is carried downwardly through the liquefied body 4 of high melting point wax or other material. A suitable quantity of wax adheres to the surface of the paper and the paper then passes downwardly over the rod 8 and upwardly to the outlet side of the machine. In passing through the molten metal, the wax or other coating material is converted into a smooth coating of substantially uniform thickness. In some instances I may employ doctor blades 9 secured to the side walls of the tank and engaging the opposite sides of the paper to remove excess coating material from the surfaces of the web.

In practicing the process I preferably employ a metal or alloy having a melting point below

600° F. In a specific instance I have used an alloy consisting of 54 parts bismuth, 26 parts tin and 20 parts cadmium which has a melting point of 220°. I may, however, employ alloys or metals of higher melting points and may employ either tin or lead or other metals or alloys having melting points comparable to the melting points of tin and lead.

As stated, the paper may have a suitable quantity of wax or other coating material applied to it before entering the tank 1 and the layer 4 of liquefied wax or other coating material may be eliminated. I find, however, that the simplest way of practicing the process is that herein illustrated and described. The thickness of the coating may be controlled by adjusting the doctor blades 9. The thickness of the coating may also be regulated by controlling the speed at which the paper is fed through the tank or by varying the depth of the layer 4 of coating material. In describing the process, paper has been used by way of example. The process, however, may be applied to other fibrous webs and to webs of regenerated products, films and the like. By passing such flammable materials through the heated bath of molten metal after the coating material has been applied to the surface, the web is protected from excess heat and the moisture content is maintained without alteration. Any suitable heating means may be employed in the heating elements 3. A heating fluid, such as oil, steam or water, may be employed, or electrical heating units may be placed within the pipes or tubes 3.

Other low melting point alloys which may be employed are Rose metal consisting of substantially 27.5 percent lead, 48.9 percent bismuth and 23.6 percent tin; and Wood's metal consisting of substantially 25.85 percent lead, 6.99 percent cadmium, 52.43 percent bismuth and 14.73 percent tin.

As stated above, the process may be advantageously applied to coating materials which, when melted or softened by heat at a temperature which the paper will withstand, are of such viscosity that it will not flow to form substantially uniformly level coatings. Such materials are generally defined in the paper industry as "hot melts." Examples of such materials are high melting point waxes, ethyl cellulose, ester gum, rosin, Pliolite and hydrogenated oils. These materials may be used alone but are frequently employed in admixture with low melting point waxes and in admixture with each other and other materials. Such mixtures frequently do not have a true melting point, and the invention is applicable either to coatings which, when melted at temperatures which can be employed in connection with paper, are too viscous to flow to form a uniformly, level coating, or to mixtures of materials, some of which may have relatively low melting points, but which are too viscous at such temperatures to form uniformly level coatings.

In the claims the expression "high melting point waxes" is intended to include mixtures of wax and other materials which are not sufficiently fluid to form a substantially uniformly level coating at temperatures usually employed in coating paper. These temperatures are usually in the neighborhood of 190° to 200° F., although with some types of paper, higher temperatures may be employed.

I claim:

1. The herein described method which comprises maintaining a molten bath of bismuth, tin

and cadmium in a container, maintaining a layer of high melting point wax on the top of the bath at the inlet end of the container, and passing a web through the layer of wax and the molten bath whereby a coating of wax is first applied to the web and the coating then levelled as the web passes through the molten bath.

2. The herein described method which comprises maintaining a molten bath of a metal having a melting point below 600° F. in a container, maintaining a layer of high melting point wax on the top of the bath at the inlet end of the container, and passing a web through the layer of wax and the molten bath whereby a coating of wax is first applied to the web and the coating then leveled as the web passes through the molten bath, the melting point of the wax being lower than the melting point of the metal.

3. The method of forming substantially uniform level coatings of high melting coating material on fibrous webs in a continuous manner which includes continuously applying to the web a high melting coating material in a viscous state at a temperature at which the coating material will not flow to form substantially uniform level coatings and then passing the coated web through a hot molten metal bath to convert the coating material into a smooth coating of substantially uniform thickness.

4. The method of coating paper with a high melting coating material in a continuous manner which includes continuously applying to both sides of the paper a high melting coating material in a viscous state at a temperature at which it will not flow to form substantially level coatings on the paper and continuously passing the thus coated paper through a hot bath of molten metal with resulting subjection of the coated web to compression by the molten metal and brushing of the coated sheet in its passage through the molten metal to smooth the coatings and form substantially uniform level coatings.

5. The method of coating fibrous webs with a high melting point coating in a continuous manner which includes maintaining a molten layer of a high melting coating material in a viscous condition at a temperature at which the material will not flow to form substantially uniform level coatings superimposed on top of a molten metal bath maintained at a temperature about the melting point of the coating material, continuously passing the fibrous web downwardly through the layer of coating material and thereby coating both sides of the web with the viscous coating material, continuously passing the coated web downwardly into and through the metal bath, whereby the coated web is subjected to compression by the molten metal and to a brushing action thereby and the coating layers are converted into substantially uniform level coatings of the high melting point material, and subsequently cooling the resulting coated web.

6. The method of coating paper in a continuous manner with a high melting wax which includes applying to both sides of the paper in a continuous manner a high melting point wax in a viscous liquid condition at a temperature at which the wax does not form substantially uniform level coatings and continuously passing the thus coated paper into and through a molten metal bath at a temperature above the melting point of the wax to level the wax and form substantially uniform level coatings thereof on the paper and subsequently cooling the coated paper.

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