

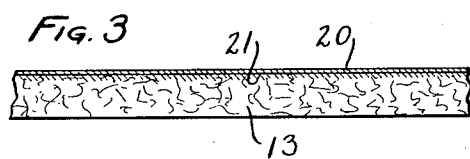
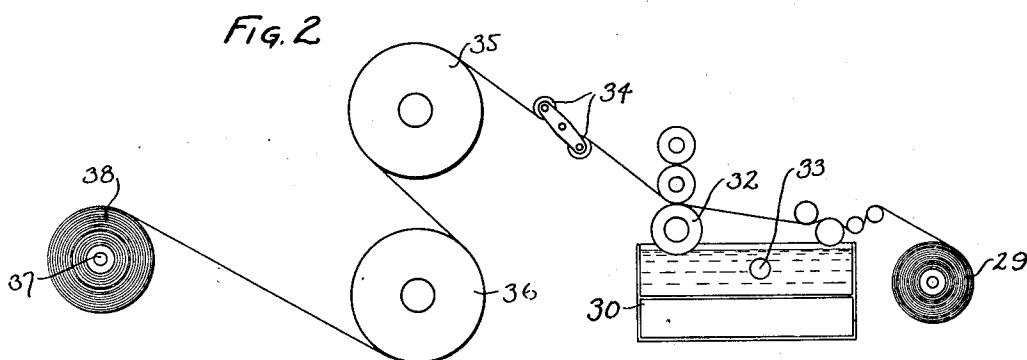
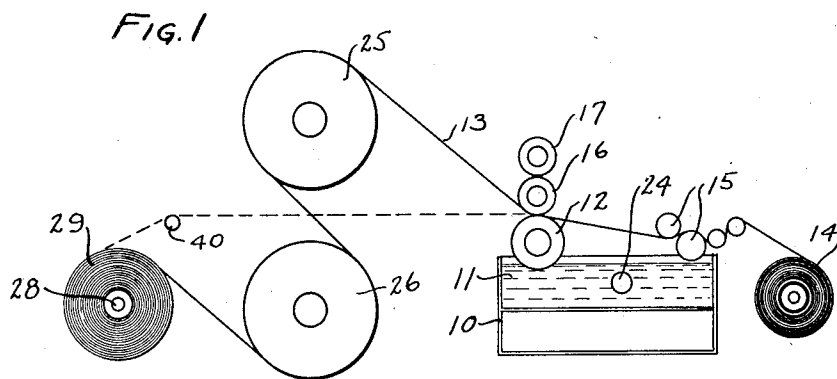
June 12, 1934.

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1,963,058

METHOD OF COATING PAPER

Filed Nov. 20, 1930



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UNITED STATES PATENT OFFICE

1,963,058

METHOD OF COATING PAPER

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Application November 20, 1930, Serial No. 496,892

7 Claims. (Cl. 91-70)

This invention relates to the coating of paper or the like, and more particularly to the application of wax or other coating material in a manner to provide an impregnated product.

One object of the invention is the provision of a method by which paper may be given a coating of wax or the like, the paper then being rolled and permitted to stand for a period of time so that the coating material is thoroughly impregnated into the body of the paper.

Another object of the invention resides in applying a surface coating of material to a traveling web of paper, applying heat for a limited time to the coated paper, winding the paper in roll form before the coated paper is cooled so that the coating is thoroughly impregnated into the body of the paper over a substantial period of time, and then unwinding the paper from such roll form before the wax is cold and hard.

Further objects and advantages of the invention will be apparent from the following description, the appended claims and the accompanying drawing, in which—

Fig. 1 is a diagrammatic illustration showing the application of coating material to a traveling paper web, in accordance with the present invention;

Fig. 2 is a diagrammatic showing of a further step in the method whereby the impregnated paper may be given a surface coating;

Fig. 3 is an enlarged sectional view through a paper strip having a surface coating of material, before the coating is impregnated into the body of the paper;

Fig. 4 is a similar section of the paper after the coating has been thoroughly impregnated into the body of the paper; and

Fig. 5 shows paper, in section, in which the coating material has been impregnated into the body of the paper and which has been given an additional surface coating of material.

Referring more particularly to the drawing by reference numerals, Fig. 1 shows a coating machine, designated generally 10, adapted to apply a coating of wax or other coating material to a traveling web of paper. It embodies a tank adapted to contain a supply 11 of hot melted wax or other coating material to be applied to the paper, the temperature of the wax being maintained at some desired point by suitable heating elements, not shown. Dipping below the surface of the wax in the tank is a waxing roll 12 which is adapted to pick up the wax and apply it to the traveling web of paper or the like 13 as the latter moves through the machine from the supply reel

14. Suitable guide rolls 15 guide the paper web from the supply reel 14 to the waxing roll, and as shown in Fig. 1, the paper moves directly from the guide rolls 15 to the top of the waxing roll 12 without dipping into the wax supply 11 in the tank. Thus only the lower surface of the web of paper is coated with wax, picked up by the waxing roll 12. Suitable squeeze rolls 16 and 17 are provided above the waxing roll as more fully set forth in my prior Patent No. 1,866,689, dated July 12, 1932, entitled Method and apparatus for waxing paper. These rolls 16 and 17 govern the thickness of wax which is applied to the paper, being forced downwardly in a controlled manner by suitable pressure springs or the like. The surface of the waxing roll 12 is preferably of cloth so that a suitable quantity of wax will be picked up from the wax supply and applied to the lower surface of the paper web, the amount thus applied being in excess of that which will be quickly absorbed into the surface of the paper, so that the paper will be given a surface coating 20 as shown in Fig. 3, some of the wax being impregnated a little distance below the surface of the paper as indicated at 21.

The waxing machine includes a submerged roll 24 so that the paper may be supplied from the guide rolls 15 to the underside of this submerged roll, before going to the nip of the rolls 12 and 16, to give a surface coating to both sides of the paper. Preferably the paper is supplied with moisture as it leaves the supply roll 14, as more fully described in my prior application herein referred to, to an extent just sufficient to compensate for the moisture driven from the paper during the waxing and heating or impregnating steps.

After the paper leaves the waxing roll 12 it travels to hot rolls 25 and 26. These hot rolls are of large diameter, preferably being three feet or more in diameter and thus several times as large as the waxing rolls. The paper passes over the top heated roll 25 which heats the lower surface of the paper and then passes around the underside of the lower heated roll 26 which heats the other side of the paper. Both of these rolls 25 and 26 are heated internally by steam or by gas flames, the temperature of these rolls being maintained at about 220° or 230° F., which is preferably about 30° or 40° higher than the temperature of the paraffin wax in the supply tank.

The heated rolls 25 and 26 are driven from a suitable source of power, which is also in driving relation with the waxing roll 12 so that these

several rolls are driven at the same peripheral speeds. The driving means is also in driving connection with the spindle 28 upon which the paper is wound after passing in contact with the hot rolls 25 and 26.

As the paper passes in contact with the hot rolls 25 and 26 each portion of the paper is subjected for some limited but substantial time to the action of heat, and since these hot rolls are of large diameter and are maintained at a comparatively high temperature some of the wax on the surface of the paper will be impregnated into the paper. While this heating action causes some impregnation of the wax into the body of the paper, unless the hot rolls 25 and 26 are very large in diameter this impregnating action will not be fully completed during the time the traveling paper web is in contact with the hot rolls especially when paper speed is fast, for example, about 650 feet per minute. It has been found that a superior product is obtained, and at a rather rapid speed of production, by winding the paper as it comes from the hot rolls 25 and 26, into the form of a roll of paper as indicated at 29, before the coated and partially impregnated paper becomes cooled, and before the wax coating is hard. The impregnating step is thus continued over a substantial period of time so that a complete and thorough impregnation of the wax into the body of the paper is obtained, completely from one side to the other, the roll of paper 29 being permitted to stand for some time after all of the paper has been wound up on this roll. As the paper is wound up it is quite warm and the wax has not had time to harden after leaving the hot rolls 25 and 26, so that the heat of the paper is retained as the roll 29 is being formed, and in fifteen minutes or so, depending of course, upon the character of the paper, the size of the roll 29, and the temperature of the outside air, the paper and the wax are still warm, and the temperature is still above the point at which the wax becomes hard. A few outside layers of the roll 29, being exposed to the outside air, may cool more rapidly than the inside of the roll but these outside layers may be cut off and wasted as their wax coatings cause them to adhere together. After removing these few outside layers, however, the roll of paper 29 is then unwound before the wax becomes hard and a second coating of wax may then be given to the paper by passing it through the machine which is shown in Fig. 2.

During the time the warm paper is being wound, after leaving the hot roll 26, the paper is subjected to heat and pressure, the pressure being obtained by the successive layers of the roll, and the heat, of course, being retained by the paper due to the comparatively great bulk of the roll 29. Some of the wax squeezes out slowly at the ends of the roll, but most of the wax on the surface of the paper is caused to pass into the body of the paper, filling the various pores completely, this action taking place comparatively slowly at a substantially lower temperature than that which obtains for a limited time as the paper passes over the hot rolls 25 and 26.

The machine designated generally by the numeral 30, for applying the surface coating of wax to the impregnated paper, is preferably similar in construction to the machine 10 shown in Fig. 1. The roll 29 of waxed and impregnated paper is supported in front of this machine, as shown in Fig. 2, and the paper is supplied over the waxing roll 32 so that a surface coating of wax is

applied to the underside of the traveling sheet of paper. If desired, however, a coating of wax may be applied to both sides of the paper by causing the web to be moved below the surface of the melted wax in the tank and around the submerged roll 33 before passing over the roll 32. After the paper leaves the waxing rolls of this machine, it passes over polishing rolls 34 which are preferably driven at a peripheral speed substantially different from that of the speed of the paper so as to polish the surface of the paper before it travels to the cooling rolls 35 and 36. These cooling rolls, which are preferably quite large in diameter, are cooled by means of brine or in any other suitable manner, and are driven at a speed substantially equal to the speed of the waxing roll 32 and of the rewind reel 37 on which the paper is collected in the form of a roll after being cooled. This cooled paper does not stick together as the surface coating of wax applied to the paper web is hardened before reaching the roll 38 on the rewind reel.

As the paper comes from the warm roll 29 of impregnated paper, after standing for sometime, the wax of the original surface coating is thoroughly impregnated into the body of the paper, as represented in Fig. 4, the lined portions of the figure representing the wax. There is very little surface coating on the outside of the paper as the paper leaves this roll 29, but after passing through the machine 30 a new coating of wax is applied to the surface of the paper giving a smooth surface and providing a waterproof and substantially transparent product. The waxing machines may operate at full efficiency as the wax may be applied at a speed of several hundred feet per minute, the time element necessary for complete impregnation of the paper being satisfied by permitting the roll 29 to stand for the required period.

The first coating of wax that is applied to the paper by the machine 11 may be a coating on either one or both sides of paper, as desired. When the wound-up roll 29 of waxed and impregnated paper is removed from the machine 10 and applied in the supply position to machine 30, the roll may be supported so the paper unwinds from the upper side or from the lower side of the roll, as desired, depending upon whether the same side of the paper is to have the second coating, or whether the second coating is to be applied to the side opposite to that which was originally coated in the machine 10. Both sides of the paper may be originally coated in the machine 10, and then one or both sides subsequently given a surface coating in the machine 30, depending upon the particular characteristics of paper desired.

If desired, the paper after being originally provided with a surface coating in the machine 10 may be wound in roll form as indicated at 29, immediately succeeding the application of wax to the paper and without the intermediate application of heat by the hot rolls 25 and 26. Thus, the paper may be supplied from the waxing roll 12 over the guide roll 40 as shown in dotted lines in Fig. 1 without passing around the hot rolls 25 and 26. As the paper leaves the waxing roll there is very little impregnation of wax into the paper, but the roll 29 is permitted to stand for a substantial time either at room temperature or in a heated oven to cause the thorough impregnation of the wax into the paper. Preferably under such conditions the roll 29, receiving the paper directly from the waxing roll 12, is removed from the

machine after all of the paper web is wound up, and the roll is then placed in an oven where a temperature of about 220° F. is maintained for as long a period as desired in order that the wax may be entirely impregnated into the body of the paper. The roll may then be removed from the oven just before the final surface coating of wax is to be applied, and then mounted on the supply shaft in the position shown in Fig. 2.

While the methods herein described, and the form of apparatus for carrying these methods into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise methods and form of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. The method of applying a coating of wax to paper which comprises applying a hot coating of melted wax to a traveling web of paper, winding the coated paper web in a roll before the coated paper is cooled, permitting the roll to stand for a period of time until the wax is thoroughly impregnated into the body of the paper, unwinding the paper from the roll and applying a second coating of wax to the paper.

2. The method of applying a coating of wax to paper which comprises applying a hot coating of melted wax to a traveling web of paper, winding the coated paper web in a roll before the coated paper is cooled, permitting the roll to stand for a period of time until the wax is thoroughly impregnated into the body of the paper, unwinding the paper from the roll and applying a second coating of wax to the paper, quickly cooling the second coating, and then winding the paper in a roll.

3. The method of applying a coating of wax to paper which comprises applying a hot coating of melted wax to a traveling web of paper, winding the coated paper web in a roll before the coated paper is cooled, permitting the roll to stand for a period of time until the wax is thoroughly impregnated into the body of the paper, unwinding the paper from the roll and applying a second

coating of wax to the paper, and then polishing and cooling the coated impregnated paper and winding it in a roll after being cooled.

4. The method of applying a coating of wax to paper which comprises applying a hot coating of melted wax to a traveling paper web, applying heat to the coated paper web before the coated paper is cooled, winding the coated heated paper in roll form before the coating of wax is hard, and permitting the paper to stand in such roll form for a period of time so that the wax is thoroughly impregnated into the body of the paper, then unwinding the impregnated paper before the wax is hard and applying a second coating of wax to the paper.

5. The method of applying a coating of wax to paper which comprises applying a hot coating of melted wax to a traveling paper web, applying heat to the coated paper web before the coated paper is cooled, winding the coated heated paper in roll form before the coating of wax is hard, and permitting the paper to stand in such roll form for a period of time so that the wax is thoroughly impregnated into the body of the paper, unwinding the paper from the roll before the impregnated paper is cold, applying a coating of wax to the surface of the paper, cooling the coated impregnated paper and winding in rolled form.

6. The method of treating paper which comprises applying a hot coating of melted paraffin to the paper, winding the paper in roll form before the coated paper is cooled, applying heat to the roll of paper for a period of time so that the paraffin coating is thoroughly impregnated into the body of the paper, unwinding the paper from such roll form while the paraffin is soft, and applying a further coating of paraffin to the paper.

7. The method of waxing paper which comprises applying a hot coating of melted wax to a traveling web of paper, winding the coated paper web in a roll before the coated paper is cooled, permitting the roll to stand for a period of time until the wax is thoroughly impregnated into the body of the paper, unwinding the paper from the roll while the wax is soft, and applying a further coating of wax to the paper.

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