June 30, 1964 F. WOMMELSDORF ETAL 3,139,353

METHOD FOR WAXING CONTAINERS OF PAPER, CARDBOARD OR THE LIKE

Filed June 2, 1960 2 Sheets-Sheet 1

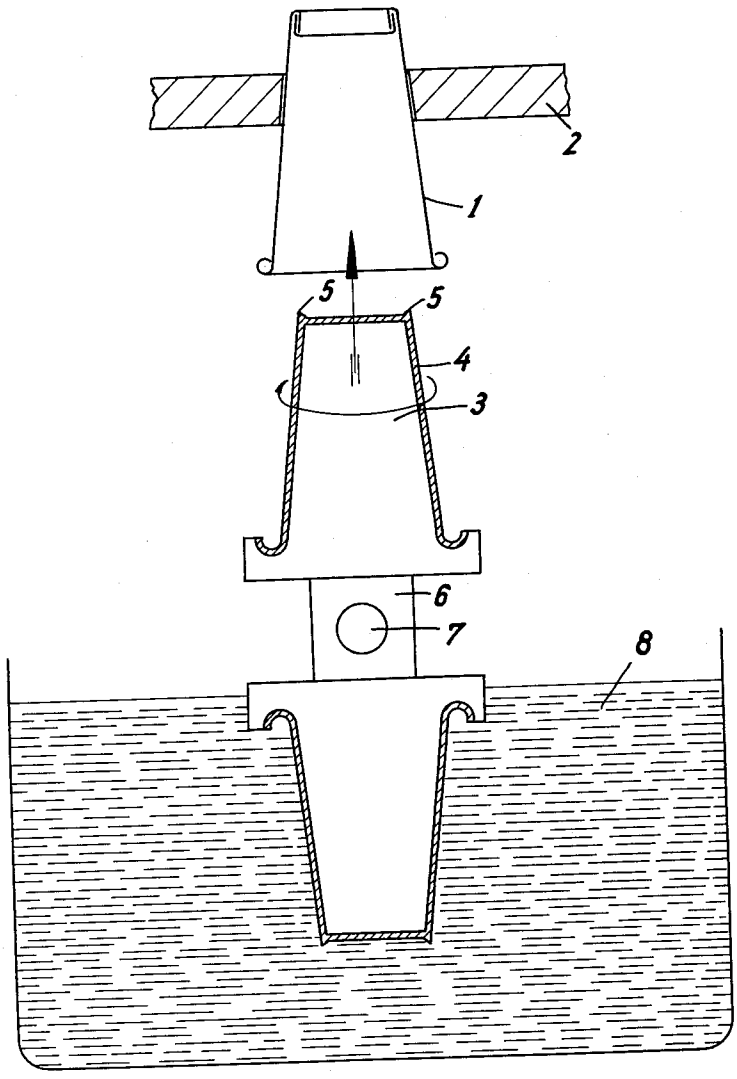


Fig. 1

Inventors
F. Wommelsdorf, J. Zahn & W. Schmidt
by Bierman & Bierman
Attorneys

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Fig. 2

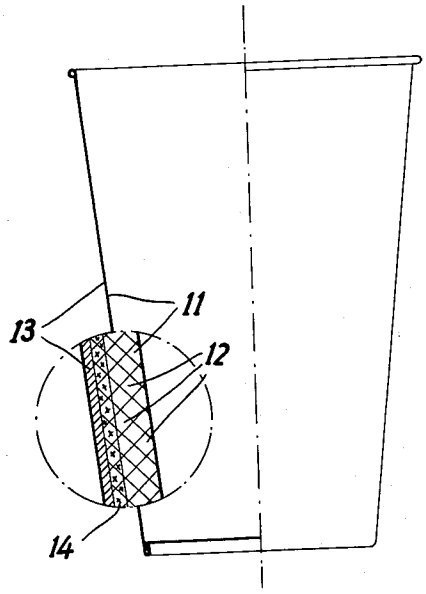


Fig. 3

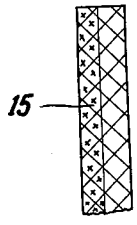
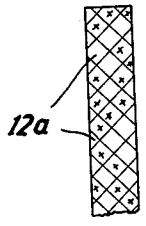


Fig. 4



Inventors
F. Wommelsdorf, J. Zahn & W. Schmidt
by Bierman & Bierman
Attorneys

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METHOD FOR WAXING CONTAINERS OF PAPER, CARDBOARD OR THE LIKE

Fritz Wommelsdorf, Hamburg-Altona, Joachim Zahn, Wedel, Holstein, and Werner Schmidt, Hamburg, Germany, assignors to Maschinenfabrik Rissen G.m.b.H., a body corporate of Germany

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10 Claims. (Cl. 117—95)

The present invention relates to a method of paraffin waxing pre-formed containers of paper, cardboard, or the like, and an arrangement for realizing this method.

In the manufacture of containers of paper, cardboard or the like, for example, paper beakers, cardboard boxes, or the like, the last processing stage frequently includes the impregnating of these containers with paraffin wax.

In known paraffin waxing methods, including also dry waxing, the application is carried out by impregnating the container completely with an excess of paraffin wax, by immersion, by spraying or by sprinkling. The excess wax is then removed by centrifuging, vibrating or dripping in heated chambers, and this process must be continued through to evaporation if a dry waxing effect is to be obtained.

The thickness of the paraffin layer depends upon the application to which the container is to be put, and the following may be regarded as illustrative of the two extremes:

Maximum: The production of a firmly coherent paraffin coating on the inner and/or outer surface of the container;

Minimum: The impregnation of the material whereby the pores are filled completely or partially, leaving no traces of paraffin wax on the surface, so that no wax may be removed by the finger nail.

For this minimum paraffin waxing, the term "Dry Waxing" has become accepted in the U.S.A., and this term will be used in this specification.

A special kind of dry waxing is the waxing with an incomplete saturation of paper. In this process preferably only about 25% to 50% of the paraffin required for the complete saturation or impregnation of the material is used. This incomplete, unsaturated, paraffin waxing has the advantage that, for example, boiling hot beverages may be placed in a beaker waxed in this way without such beakers expelling wax from the walls thereof and thus "sweating," it being appreciated that the melting point of the paraffin wax is 52° C., that is to say, below the temperature of the beverage. This "sweating" must be avoided, since it leads to the occurrence of fat layers on the beverage and imparts a lustrous, fatty, semi-liquid surface to the beaker.

In dry waxing with incomplete saturation, the paraffin must be distributed as uniformly as possible, if the container is to look attractive and without spots.

According to this invention, in order to produce a dry waxing effect, no more paraffin wax is applied to the container than is sufficient to effect complete impregnation or for impregnating to the required degree of saturation. For this purpose, the paraffin wetting time is so reduced that the paper walls are, after the termination of the wetting, saturated so incompletely that, during the subsequent or simultaneous heating, the entire liquid paraffin, which is distributed sufficiently uniformly over the surface owing to its adhesion, is drawn into the paper through capillary action and leaves no residues on the surface thereof.

The required impregnation may be effected, for example, by an appropriate dosage in a spraying chamber, or by passing the beaker very quickly through a chamber

filled with a very finely distributed mist. The accurate dosage necessary in accordance with the invention may be obtained even more satisfactorily if the paraffin is applied by surface contact by means of an application tool, in a way as known per se from the manufacture of tubes. In the manufacture of tubes a felt-covered, hollow, mandrel is introduced into the tube, the wax is applied by surface contact and is rubbed in by the relative movement between mandrel and tube. It is, of course, necessary to adjust the contact time by means of a timing relay or by the mechanically governed timing of an automatic machine. In the case of thin-walled paper beakers, such as are used in automatic beverage vending machines, this time may amount only to fractions of seconds, if we are to practice the method of the present invention, that is to say, if we are to limit the steeping to an incomplete degree of saturation during the application of the paraffin wax.

The saturation during the wetting must also be incomplete if the finished beaker is to have a fully saturated dry waxed finished appearance, since, in this case, the paraffin which adheres after the application to the surface of the container due to its surface tension, must have room to penetrate into the pores.

The advantages of this method are obvious, since it largely eliminates the dripping and sweating times previously required.

If the container is heated after the application of the paraffin, such heating only serves to draw the paraffin into the wall and to distribute it more uniformly. During this time, the container is preferably rotated slowly in order to prevent the paraffin from running along the wall under the effects of gravity, the latter action possibly leading to higher saturations in the lower zones than in the upper zones.

Particularly with lower degrees of saturation (below 50%), the production of a dry waxing effect may also be facilitated by controlling the temperature of the contact tool and of the container to be treated. The temperatures are so selected that, immediately after making contact, the paraffin penetrating into the pores is solidified, thereby preventing any further impenetration. The suction capacity of the pores is only restored by the subsequent heating. In this case, the temperature of the container is below the melting point of the paraffin wax, the temperature of the wax being slightly above such melting point. The amount of heat carried by the paraffin is, in these circumstances, insufficient, to raise the temperature of the container wall to the melting point within the time available. The contact time required according to this invention may thereby be kept within somewhat wider limtis. On the other hand, with the use of higher temperatures, a maximum waxing effect may be produced, in a very short time, such as is available with automatic machines designed for short contact. If, for example, container and paraffin-wax transfer tool have temperatures of the order of 100° C. (using a paraffin wax which melts at a temperature of between 50° C. and 60° C.), a thin-walled container will be fully impregnated during a contact lasting one-tenth of a second or less, so that, after termination of the contact, the paraffin adhering to the surface finds no more room in the pores, and forms a coherent surface layer.

Dependent upon the intended application of the container the method may be realized by contact from the outside, or by contact from the inside, or by simultaneous surface contact from both inside and outside. If the dry waxing contact is from only one side, the paraffin wax penetrtaes through the paper layer, and the container wall will have a waxed appearance on both sides. This penetration is prevented at the overlapping

seam by the layer of glue connecting the two paper layers, so that on the side on which no contact is made, the paper is not impregnated at all and has a so-called "white spot." If, however, the container is maintained, for a sufficient length of time after the contact, at a temperature above the melting point of paraffin, the usually 5–10 mm. wide glued seam is also steeped through the paper. If—according to customer's specification—a white spot is acceptable, it may be advantageous that this should be on the inside so that the outside of the beaker is more attractive. However, with paraffin waxing by means of surface contact from the inside, the "white spot" may be located outside, since it may be preferable that that paper layer which comes into contact with the beverage should be fully impregnated.

When dry waxing paper beakers by incomplete saturation, the paraffin does not impregnate the entire wall of the container, so that it may be unevenly distributed in the container wall. In order to obtain a more definite distribution of the paraffin, the following method is proposed according to this invention.

As described above, the paraffin wax is applied at a temperature slightly above its melting point. The wax, therefore, penetrates into the paper to only a small extent, whilst a substantial part remains on the surface. After the application of the wax, the beaker is brought into contact with a heated, paraffin-free surface which produces a thermal shock which in turn causes the wax on the surface of the container to melt and the immediately adjacent part of the container wall to be heated, whilst the outer part of the container wall remains cold. Thus the wax penetrates only into the immediately adjacent layer of the wall, and that part of the wall adjacent to the remote surface remains free from wax. In this manner a uniformly wax-impregnated layer is formed adjacent to a wax-free paper layer.

This embodiment has the particular advantage of producing a layer of coherent paraffin-wax which fully penetrates into the paper without paraffin-free spaces between individual paper fibres. Such a waxing gives a better protection against the passage of liquid than waxing with the same total quantity of paraffin-wax, where the wax is distributed in the paper with the formation of cavities, that is wax-free spots.

In addition, if the wax is not completely and evenly distributed in the entire outer paper layer, the container will have a "spotted" appearance, since the locations where the cavities in the paper fibre are fully filled with wax are more translucent than places where cavities fully impregnated with wax are intermingled with such cavities containing no or little wax.

The container waxed according to the method disclosed herein is not spotty or even translucent from the outside, since nowhere is there a wax-steeped layer passing through the entire thickness of paper, and since at least one side of the paper wall is free from wax.

In addition, it is always expedient to effect the heating, which heating is always required after the application of the wax, in such a way that the container is brought into contact with a heated, paraffin-free surface, because this surface contact represents the quickest means of heat transfer for the temperatures used, and enables the subsequent oven times to be shorted considerably.

The invention will be further described, by way of example only, with reference to the accompanying drawings, showing an arrangement for realizing the method of the invention, and a paper beaker produced thereby, and in which:

FIG. 1 shows the essential parts of the arrangement in cross-section (contact transfer from the inside);

FIG. 2 is an elevational view of a beaker, a portion being broken away and enlarged to show the film of wax applied to the outside thereof;

FIG. 3 shows the thermal shock treated container of FIG. 2;

FIG. 4 shows the container of FIG. 2 heated for a longer period;

FIGURES 2 to 4: contact application from the outside.

The container 1 to be treated is located in a holder 2 forming part of a chain drive or circular table, which is actuated intermittently or continuously and may contain, for example, twenty such holders. In a certain position, the holder 2 is centrally aligned with a mandrel 3 covered by a felt cover 4. At this moment the mandrel is pushed into the beaker 1, and wets, by means of said felt cover, the beaker on its inner wall, base, and upper rim. The mandrel 3 receives the wax by turning at each step of the machine through an angle of 180°, causing its counterpart, that is the bottommost part in FIG. 1, to be immersed into the paraffin wax 8, so that it is always impregnated with such wax. There is also provided a drive, whereby the cam, by means of which the movement of the mandrel 3 into the beaker 1 is produced, may be so adjusted that the contact time between mandrel and beaker may be finely adjusted to fractions of a second. Furthermore, the mandrel 3 with its felt cover, is rotated at the moment of contact through about 25–30° so as to produce a more uniform distribution of the wax. According to experience, care must be taken that no spots exceeding 5 square millimetres in size, remain unwetted. Within the limits of smaller spots, wetting errors are of no consequence, since, within this range, the liquid paraffin is distributed over the beaker walls uniformly by capillary action. These small spots may be caused by irregularities or faults in the felt cover. In addition, it is proposed to provide the felt with an edge 5, whereby a certain excess quantity is pressed into the corner formed between the base and the side wall of the beaker. This is necessary because the wax requirements are higher by virtue of the presence of several layers of paper. After this wetting operation, the table 2 or the chain with its holders 2 is advanced, passes through a heating zone, then through a quenching zone; then the beaker is removed by hand or by an ejector and is fully waxed. Finally, in some cases where the dry waxing of very thin paper layers is to be carried out, it is possible to omit the porous surface of the wetting component, and to use instead only the natural adhesion of the paraffin to a metal or plastic surface. This is particularly advantageous if a minimum dosage is desired for the waxing of very thin layers of paper.

The entire arrangement may be reversed in that the container to be waxed is applied to the inside of a mandrel, and in that the felt arrangement is adapted to contact the outside of the beaker.

If wax equipment is available in which the container is not immersed or dipped but sprayed, or if such equipment is required for strong waxing processes, whilst being used also for dry waxing, the principle of the invention may be realized by the following means:

Limiting the suction capacity of the paper during the spraying by ensuring that the beaker is not heated to more than 50° C. before entering the spraying chamber.

Stopping the beaker above the spraying nozzle.

Instantaneous actuation of the spraying nozzle by a magnetic valve.

Dimensioning the nozzle in such a way that the inside of the beaker is sprayed after the manner of a fountain in such a way that individual errors do not exceed 5 sq. mm. in size.

Passage through the available, heated, drip chambers, serving in this instance not for the dripping off of excess paraffin but for its uniform distribution within the paper walls.

The container consists of a paper layer 11, having pores 12. The wax is applied to the outer surface of the container and forms here a coherent layer 13 whilst a portion of the wax applied has penetrated into the paper layer 11, forming an impregnated layer 14, as shown in

FIG. 2. If the container is now heated, for example, by being placed in an oven, the wax melts and is evenly distributed over the entire thickness of the paper, as shown in FIG. 4, wax-impregnated pores being marked with a cross. Since the amount of wax applied is insufficient for the complete impregnation of the container material, there remain empty spots **12***a*, where the pores are not filled with paraffin. If, however, the container of FIG. 2 is exposed to a thermal shock, the duration of the liquid state of the wax is so short that it cannot migrate through the entire thickness of the paper. It is then distributed through a zone adjacent to the surface, which zone is completely steeped with the wax. That is to say, all pores in the zone are filled with paraffin, whilst there remains, next to it, a wax-free paper layer. This effect may be increased still further by cooling the wall of the container remote from the application of the thermal shock, for example, by cooling the holder receiving the container for the application of the thermal shock (comparable to the table **2** of FIG. 1) by means of compressed air or water.

We claim:

1. A method of waxing preformed containers of paper, cardboard and the like which comprises providing said container, melting wax at a temperature somewhat higher than that of said container, the amount of heat in said wax being insufficient to raise the temperature of the wall of said container to the melting point of said wax, applying to said wall an amount of melted wax substantially less than that necessary to fully saturate the fibers of said container, whereby a film is formed on the surface of said wall, thereafter applying to said film sufficient heat for a short time to apply a thermal shock to cause said film to melt and only the immediately adjacent part of said wall to be heated, whereby substantially all of said wax enters said wall by capillary action and penetrates only part way through said wall.

2. A method as claimed in claim 1 in which the wax is applied by effecting surface contact between the container and an application tool, such contact being for an adjustable period of time.

3. A method according to claim 1 in which the application of said wax is to the inside of said container.

4. A method according to claim 1 in which said container is rotated during the application of said heat.

5. A method according to claim 1 in which said heat is applied by a hot thermal conductor.

6. A method as claimed in claim 5, in which the contact with the hot thermal conductor is of such short duration that there occurs a thermal shock whereby the wax may completely penetrate one side of the container, whilst leaving the opposite side free from wax.

7. A method as claimed in claim 6, which includes cooling the wall of the container other than that to which the thermal shock is applied.

8. A method according to claim 1 in which the amount of wax is no more than about 50% of that required to effect complete impregnation.

9. A method according to claim 1 in which the melted wax is applied to the wall by a transfer mandrel which is coated with the melted wax and is then brought into contact with said container and a portion of said mandrel holds an excess of wax adapted to be applied to a limited area of said container.

10. A method according to claim 9 in which the coated mandrel is rotated to spread the film of wax on said wall.

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