

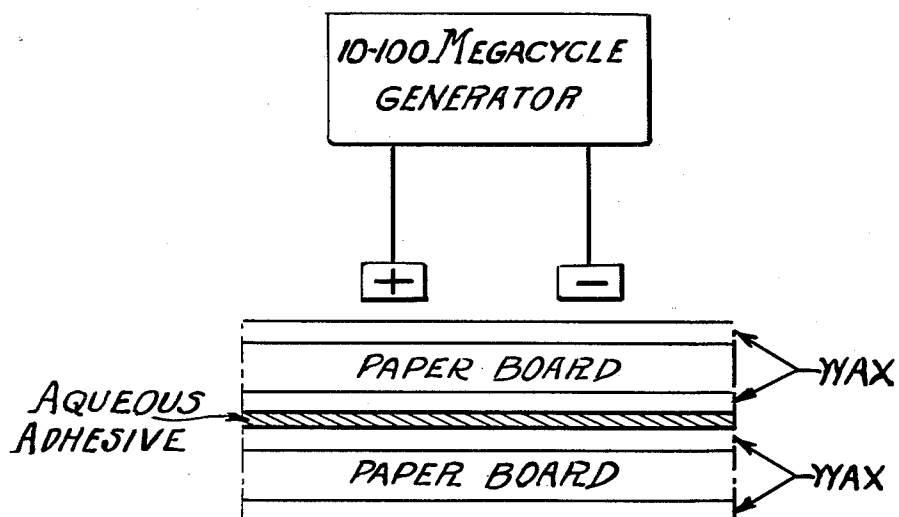
June 8, 1965

M. H. HECHT

3,188,257

UNITING OF WAXED SURFACES

Filed Jan. 8, 1963



Inventor
Myer H. Hecht
by Dawson, Tilton, Kallon
& Livingston Attys

1

3,188,257

UNITING OF WAXED SURFACES

Myer H. Hecht, 1429 Central Ave., Deerfield, Ill.

Filed Jan. 8, 1963, Ser. No. 259,981

10 Claims. (Cl. 156-273)

2

This invention relates to the uniting of waxed surfaces, such as carton and container flaps and folds, and the like, by dielectric heating. More particularly, it is concerned with a process of sealing such surfaces through the operation of "fringe area" or "stray-field" dielectric heating.

This application is a continuation-in-part of my copending application, Serial No. 795,341, filed February 25, 1959, now abandoned.

Exemplary of the problems solved by this invention is the sealing together of the ends of the so-called "seal end" cartons employed for frozen foods. It is generally advantageous for such cartons to be truly "sealed"—they thus possess a more positive barrier against contamination, tampering, etc., than if they are merely lock-closed, particularly if there is no additional protection for the product inside the carton.

In the past, sealing the package has been done in two ways:

(1) Employing a heat-sealed overwrap such as waxed paper, or a heat-sealable transparent plastic film such as cellophane, or a heat-sealable aluminum foil composition, e.g., Reyseal (a tissue-wax-aluminum foil combination), over a lock-closed waxed carton; or

(2) Selectively removing the wax from the carton flap surfaces before applying the adhesive in order to achieve a glue bond in the flap areas.

Both procedures possess a number of drawbacks: The overwrap is expensive; in some instances it does not contribute to the maintenance of the freshness of the product, and in the instance of waxed paper or foil, it effectively obscures any printing that might be placed on the carton so that identifying printing is placed on the overwrap. Such overwrap printing is destroyed with the overwrap, and this results in destruction of the carton identity. The integral wax coating procedure requires elaborate machinery to remove the wax prior to gluing—usually limiting production—raises the possibility of damage to the carton by charring and the goods by thawing, and generally requires expensive refrigeration to bring the carton to a condition capable of being handled in a reasonable time.

Other methods of gluing a heavily waxed carton suffer disadvantages over the dielectric technique described here. In some instances, elaborate machinery is employed to remove the wax prior to applying the adhesive, a more expensive, slower-setting adhesive and expensive space-consuming refrigeration and pressure sections are generally required to bring the carton to a condition capable of being handled in a reasonable time. Whatever the alternate method, more time and/or space are required to perform the same job, together with greater possibility of damage to the carton by charring and to the goods by thawing.

For the most part, the overwrap procedure has been practiced, even when "overpackaging" resulted, despite desirable attributes and certain inherent advantages of the single container. A distinct advance would be made if the carton could be provided in a sealed condition and equipped with a wax barrier suitably printed and without any overwrap. Then the housewife, after using half a package of frozen food, would no longer have to guess the contents of the package. The provision of a carton overcoming the above-mentioned problems and meeting the desirable requirements set forth, is one of the objects of this invention.

Another object of this invention is the utilization of the waxed seal-end style carton for packaging products nor-

mally stored at room temperature, food and nonfood, which require a certain amount of moisture vapor protection to preserve their quality. Cereals, particularly in the individual size carton, and soap powder are examples of the food and nonfood product. In the former example, an inner bag or overwrap would be eliminated; in the latter, a lamination or an asphalt impregnation would be replaced.

Still another object of this invention is the sealing of end closures of heavily waxed (usually by impregnation) corrugated containers, now beginning to enjoy usage, for example, in the packaging of hydrocooled vegetables and fruit.

Another object of this invention is to provide a method of uniting wax-covered surfaces in which a dielectrically-responsive adhesive is introduced between wax-covered surfaces, the dielectrically-responsive adhesive thereupon being subjected to stray-field dielectric heating while the surfaces are maintained in face-to-face, adjacent relation. Still another object is to provide a method of uniting wax-covered surfaces in which a dielectrically-responsive adhesive simultaneously dewaxes and glues wax-covered surfaces. Yet another object is to provide a method of uniting wax-covered surfaces in which the wax is covered with a dielectrically-responsive adhesive such as an aqueous adhesive and wherein dielectric heating is employed for converting some of the adhesive water into steam to dewax the surface and thereby permitting the adhesive to anchor the two surfaces together.

A further object of this invention is to provide a method of uniting surfaces having therebetween a sealant in the nature of a wax and an adhesive, the sealant and adhesive possessing different qualities when subjected to dielectric heating, whereby two surfaces having both a sealant and an adhesive therebetween can be united in a single heating step. Other objects and advantages of this invention can be seen as this specification proceeds.

The invention will be described in conjunction with the accompanying drawing, which is a schematic representation of the practice of the invention.

In one embodiment of the invention, a pair of wax-covered surfaces are provided. The surfaces may be portions of a carton to be sealed, such as flap portions. The carton itself can be constructed of a wide variety of materials of a cellulosic nature, such as paperboard. Where paperboard is employed, it may be either of cylinder or Fourdrinier manufacture—in the normal caliper range of .007 to .040", although higher or lower calipers are suitable as the occasion and board characteristics may require or permit. The paperboard, single or combined, for example, in the form of corrugated or solid fiber, may be printed or unprinted, and may be waxed in the web (i.e., in roll form), in sheets, or in the form of die-cut carton blanks. If a conventional cold water waxing machine is employed, finishing rolls of felt, steel, rubber, plastic, or like suitable material may be employed. It may also be waxed in the form of a side-sealed, partially set-up, or set-up carton, generally by dipping.

The wax employed may take the form of a paraffin wax or paraffin wax containing such additives as microcrystalline wax, polyethylene, Polymekon (a product of Warwick Wax Co., New York, N.Y., reported to be a reaction product of polyethylene and microcrystalline wax), polyisobutylene, butyl rubber, Parafint (a product of Moore and Munger Co., of New York, N.Y., reported to be a high melt point synthetic paraffin wax, also known as a Fischer-Tropsch wax), and mixtures or combinations of the same. Microcrystalline wax blends of microcrystalline wax, synthetic wax or waxes, may also be used. Also suitable are many wax-like materials of a resinous or polymeric nature characterized by being heat-activated and softened and possessing

a relatively low viscosity at about their melting points. Such materials, when softened or heated to near their flow-points, fuse, and tend to flow off or away from the board surface in the area where the seal is to be effected.

Introduced between the wax-covered surfaces is a dielectrically-responsive adhesive. The adhesive may be superposed on one or both of the waxed surfaces, it may be interposed between the wax coating and the surface itself—as between the fiberboard and the paraffin wax—or it may be intermixed with the wax coating itself. The wax coating may vary from ½ to 20 pounds per 1,000 square feet of surface, and where the surface is a fiberboard carton, preferably 5 to 8 pounds per 1,000 square feet of wax is distributed over the two surfaces. This may be ½ to one mil thick per side, and may be arranged in patterns, if desired.

Many aqueous glue formulations can be employed where the adhesive is superposed on the wax coating. Suitable are such aqueous board adhesives as a polyvinyl acetate resin emulsion, a polyvinyl alcohol emulsion, a copolymer or blend of polyvinyl acetate and polyvinyl alcohol resin emulsions, with or without tackifiers, plasticizers or other modifiers. Other adhesives may be natural or synthetic latex or such thermosetting resins as urea, phenol or resorcinol formaldehyde. Equally useful are adhesives including silicates, starches, tapioca, dextrin, or vegetable or animal glues.

Where the adhesive is interposed between the surface such as a fiberboard surface and the wax coating, the paperboard may be pre-coated or pre-impregnated, either in its entirety or selectively in the to-be-sealed areas with a thermoplastic or thermosetting resin or other polymeric substance which is heat-sensitive and responsive to fringe area dielectric electrostatic field. Such adhesive is characterized by tackiness at or about its melt-point, so that under compression it anchors itself to the board fibers adjacent the carton surface. At the same time, the interposed adhesive is characterized by a dielectric characteristic such that it develops sufficient heat to melt the wax above it to cause the wax to flow off the areas to be sealed. The interposed adhesive is further characterized by congealing when the heat source is removed, as when the carton moves out of the electrostatic field.

Suitable for use where the wax and adhesive are to be interblended is an adhesive characterized by being responsive to dielectric energy, so that under the dielectric stimulus, a tacky, viscous, bond-producing material capable of sealing the fiberboard surfaces is produced.

The wax-coated surfaces, thus equipped with an adhesive, are thereupon subjected to dielectric heating while being maintained in a face-to-face, adjacent relation, as by squeeze rolls, or the like. The dielectric energy may be applied over a wide range of frequencies. Ordinarily, however, frequencies in the megacycle range are employed, such as from 10 to 100 megacycles, the duration of the application and its power varying with the materials being united. Extremely effective bonds between fiberboard surfaces can be obtained with a 25–35 megacycle current, the speed of travel of the carton and the length of the field and pressure section determining the kw. rating of the generator and the length of time required for sealing. Voltages of 110 (115) or 220 (230) have been employed with successful results, although 440-volt hook-ups, where such voltage lines are available, may be used. Amperages corresponding to 0.1 kw. (100 watts) on experimental machines to 15 kw. on production units (and higher, if necessary) with either 110 or 220 volts may be employed.

Excellent results are obtained in procedures involving filled cartons where the dielectric energy is produced by a grid network wherein electrodes of opposite sign are alternated on the same side of the surfaces to be

sealed. Illustrative of this arrangement is the dielectric heating device seen in Mittelmann U.S. Patent No. 2,723,517, or Richardson, et al., U.S. Patent No. 2,631,642. Dielectric heat sealers of the character just seen provide a concentration of heat immediately adjacent the electrodes which has been referred to as "fringe area" or "stray-field" dielectric heating.

In addition to utilizing this invention in connection with automatic packaging machinery, the practice of this invention encompasses its use on fabricating equipment generally found in folding carton converting plants, such as on infold or straight line gluers.

On infold gluers, it is common practice in the folding carton industry to employ heated shoes, usually electrically heated to 500–750° F. to spot dewax those areas that are to be glued on heavily-waxed, tray-style cartons. This dewaxing is done, for example, on 6-corner-glued style cartons near the infold section of the machine prior to application of glue, and greatly reduces the potential speed of the machine, produces much scrap and waste in the form of charred and malodorous cartons, and in general results in a very unsatisfactory operation. Even after the dewaxing operation, fiber-tearing bonds are seldom or rarely produced on cold waxed cartons when the carton leaves the machine. The operator must guess as to the conditions productive of satisfactory cartons, relying on the bond to develop with time as the cartons are packed tightly together in the shipping container. Often 24 hours must pass before the bond develops, and, on occasion, the shipped cartons come apart as they are being filled or after product has been inserted and the product-filled carton frozen.

Utilizing this invention, spot dewaxing is obviated on tray-style waxed cartons, particularly on the six corner-glued carton. The adhesive, generally a vinyl resin emulsion, is applied over the wax in the areas to be glued, the tabs mated to the appropriate body panel, the folds made and the folded carton brought under compression in a dielectric grid field. The water molecules in the glue line are energized, the energy manifesting itself as heat, which causes dewaxing and thus allows the glue to bond the areas desired.

In providing a fiber-tearing bond, much greater speeds are now possible, waste is greatly eliminated, and the manufacturer is assured of the quality of the cartons he has manufactured immediately upon their leaving the machine. Utilizing this invention, a further advantage accrues in that an organic solvent is no longer needed in the adhesive, which generally is employed to the extent of 10–25% in the old method to "bite into" the wax, which is never fully removed from the areas to be glued by the heated shoe. With no organic solvent now in the glue, the chance for taste and odor contamination of the food that is packaged in the carton is greatly minimized.

Also advantageous in the practice of this invention on infold gluers is the substitution of waxed fiberboard infold trays for the more expensive laminated trays currently in vogue for cookies, candies, and the like.

The practice of this invention permits the speed-up of gluing in infold gluers of fiberboard infold trays, including those which have no wax in or on them. Hitherto, the limiting factor on the speed of infold gluers has been the speed of set of the adhesive and/or the length of the pressure section attached to the delivery section of the gluing machine. Utilizing this invention, the limiting factor on gluing speed now is the speed at which the machine gears can be made to turn and the belts, or other advancing means, to travel.

The invention also speeds gluing operations on straight line gluers, especially in the fabrication of modified tube-style cartons having multiple folds. Exemplary of this type are varieties of multipack cartons used for packaging multiple units of beer, soft drinks, dog food, and the like. Some of these cartons have two, or three, or possibly more, glue lines, and a disparity in folds, and

hence thickness across the width of the carton. These multiple folds and transverse unevenness in thickness in the folded carton act as limiting factors in the speed of the operation—for in a pressure section geared to the adhesive in the portion of the carton having the most folds, the adhesive in the portion of the carton having the least folds will set more slowly. The machine speed therefore must be geared to the slowest speed of set of the adhesive. By selective placement of a dielectric grid electrode, the adhesive in the portion of the carton having the least folds can be made to set more rapidly; in fact, practically as rapidly as adhesive in the portion of the carton with the most folds. The limiting factor on gluing speed now becomes the speed at which the machine can convey and fold the carton—a proper limitation, since this is determined by the production desired.

The invention also makes possible the use of waxed cartons for multi-packing canned and bottled goods. Currently, multi-pack cartons are generally fabricated from board .020-.030" thick, with .026" usually employed. Thus, these relatively thick-walled cartons have a built-in safety margin to compensate for loss of strength during refrigeration and exposure to the elements. By waxing the carton before fabricating, boxes of lower caliper, and hence more economical cartons, now become possible, for the wax will prevent moisture and water from weakening the carton. Without the application of the dielectric technique as taught by this invention, the fabrication of a waxed multiple-fold carton on straight line gluers is difficult, uneconomical, or virtually impossible. In this connection, use of direct field dielectric heating may be employed in conjunction with the teachings of this invention, the direct field dielectric heating for these purposes being disclosed in my copending application, Serial No. 221,670, filed September 4, 1962. Reference is hereby made to that application.

Illustrative of the practice of this invention on automatic packaging machinery are the following examples:

Example I

A "seal end" carton characterized by having superposed end flaps and a generally rectangular solid configuration was coated with a paraffin wax having a melt point of about 140° F. With the waxed carton at about room temperature, it was filled with a rectangle of frozen food and the open end flaps on their abutting surfaces were coated with a commercial vinyl resin emulsion glue having an aqueous base. The flaps were positioned in face-to-face, adjacent relation and maintained in such relation by a pair of squeeze belts positioned at opposite ends of the carton and traveling in the direction of travel of the carton. The carton was constructed of .015" paperboard and overlaid with a layer of wax having a thickness of about .0005" per side. This was subjected to 35 megacycle current in a device such as was described above for 6 seconds. Approximately 50% of the output of a 5 kw. generator (2.5 kw.) operating on a 220 volt line was employed. The flaps were maintained under pressure for about 12 seconds thereafter, at which time the carton was found to be sealed and cool. Attempts to tear the flap bonds thus provided resulted in a fiber tear rather than a bond rupture.

It is believed that the electrostatic fields thus generated agitate the molecules of water in the water-base adhesive that has been applied and is at the interface of the surfaces to be bonded. This molecular agitation and resultant molecular friction of the water rapidly generates heat precisely at the point where it is needed. This heated water and resultant steam melts the wax on the board surfaces in the heated area. The molten wax, having a comparatively low viscosity at about its melting-point, flows away or into the board beneath the surface, leaving the board fibers exposed to the glue which is in the process of rapidly drying and setting up, due to the evaporation

of water. The dried and set adhesive, thus having the board fibers presented to it, effectively latches onto these fibers and secures itself to them to provide a fiber-tearing bond. In effect, then, the procedure provides practically simultaneous setting of the glue and dewaxing of the surfaces to be glued.

Example II

In place of the "seal end" carton employed in Example I, a Brightwood style carton having a hinged cover was employed with a polyvinyl chloride adhesive layer interposed between the wax and fiberboard surface. Upon subjecting the carton assembly just described to the dielectric heating employed in Example I, corresponding results were obtained in that the carton ruptured in the fiber rather than in the adhesive bond.

In this example, the impulse or stimulus for the dewaxing operation in the electrostatic field comes from a fringe area dielectrically-responsive substance which is positioned intermediate the wax surface and the fiberboard surface. Again, molecular agitation and resultant molecular friction rapidly generates heat precisely at the point where it is needed. This is effective to tackify the adhesive while effectively removing the wax to present a desirable mating surface on the paperboard. When the carton passes out of the electrostatic field but while still under compression, the plastic adhesive begins to congeal, with the resultant production of a fiber-tearing union between the surfaces.

Example III

Another example of the utility of my invention is in the packaging of certain nonfrozen but refrigerated dairy products, where a popular container for the past decade has been a substantially circular, heavily-waxed paperboard container with a separate lid. My invention makes possible the use of a heavily-waxed, modified seal-end style carton approximately rectangular or trapezoidal in shape, with attendant space economies in shipping and storage, along with a top closure integral with the container body. This is often commercially advantageous over a separate lid. The sealing of a heavily-waxed top closure with a dairy product inside (such as cottage cheese) has been either difficult or potentially injurious to both the product and package. In such cases, the product is invariably top-loaded—that is, the carton is in a vertical position when it is in the process of being filled. For reasons of manufacture, the carton supplier may wish to supply the dairy or packaging plant with a tapered carton whose bottom has already been formed and sealed by wax dipping—being shipped to the packer in a nested condition. With this type of carton, which I refer to as a "modified seal-end style carton," only the top closure requires, and would receive, sealing in a packaging plant employing my invention. Here, a wax layer of at least one mil in thickness is provided on each of the top flaps, with the grid network being positioned over the carton to develop the necessary seal.

The invention can be employed advantageously with other packaging forms than the specific cartons hereinbefore described. Tube-style cartons, for example, lend themselves to sealing by the disclosed procedure. The cartons completed by the inventive process may contain a wide variety of products, both food and nonfood, such as soap or detergents.

While, in the foregoing specification, I have set forth detailed descriptions of embodiments of the invention, it will be understood that those skilled in the art may perceive many variations therein without departing from the spirit and scope of the invention.

I claim:

1. In a method of uniting two wax-covered paperboard surfaces, the steps of interposing between the wax-covered surfaces a water-based adhesive, and, in the presence of the water in said adhesive, subjecting the surfaces with

the included adhesive to stray field dielectric heating to convert the water in said adhesive to steam to purge the surfaces being mated of the wax thereon and to promote the setting of the said adhesive while maintaining the two surfaces in direct face-to-face relationship.

2. In a method of uniting waxed paperboard surfaces, the steps of positioning an aqueous adhesive between and in direct face-to-face contact with the said waxed paperboard surfaces, and in the presence of the water in the said adhesive, subjecting the said waxed paperboard surfaces with the included aqueous adhesive to pressure while simultaneously applying thereto fringe-area dielectric heating, said heating being sufficient to convert the water in the included aqueous adhesive to steam to purge said paperboard surfaces of wax and to enable said included adhesive to effect union between said paperboard surfaces, the while utilizing essentially only the heat generated within the adhesive by the dielectric field.

3. The method of claim 2 in which said aqueous adhesive contains dextrin.

4. The method of claim 2 in which the frequency employed is between 10 and 100 megacycles.

5. The method of claim 2 in which the frequency employed is between 25 and 35 megacycles.

6. The method of claim 2 where the amperage employed is between 0.1 and 15 kw.

7. The method of claim 2 where the voltage employed is between 110 and 440 volts.

8. In a method of uniting opposed, confronting paperboard layers, at least one of which is equipped with a wax coating on a surface being united, and another of which is equipped with a wax coating on a surface not being united, with the another paperboard wax coating being closer to the heat source than any paperboard, the

steps of positioning an aqueous adhesive in direct face-to-face contact with the one paperboard wax-coated surface, and, in the presence of the water in said aqueous adhesive, subjecting the one paperboard waxed surface and the another paperboard surface with the included adhesive therebetween to pressure while simultaneously applying thereto fringe-area dielectric heating, said heating being sufficient to convert the water in the aqueous adhesive to steam to purge the paperboard surface being united of wax, and to enable said included adhesive to effect union between the two paperboard surfaces being united, the while utilizing substantially only the heat generated within the adhesive by the dielectric field to effect said union, and the while not substantially disturbing the wax closer to the heat source than any paperboard.

9. The method of claim 8 in which all surfaces of the paperboard layers in the plane being united are waxed.

10. The method of claim 8 in which the paperboard surface closest the heat source has been printed before being waxed, and in which the ink, like the wax on it, is closer to the heat source than the paperboard, and in which said ink remains substantially intact and unsmeared.

References Cited by the Examiner

UNITED STATES PATENTS

1,408,746	3/22	Kick	156—314
2,228,136	1/41	Hart	156—273
2,631,642	3/53	Richardson et al.	156—69
2,889,297	6/57	Brandner.	
2,992,958	7/61	Yamaguchi	156—307

EARL M. BERGERT, *Primary Examiner.*

DOUGLAS J. DRUMMOND, *Examiner.*