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W. WADE

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POROUS WRAPPER

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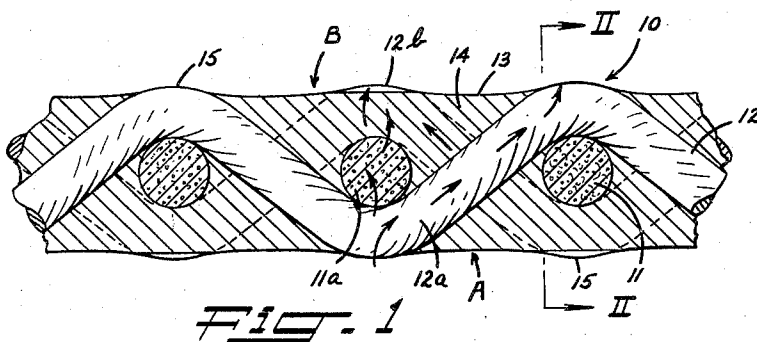
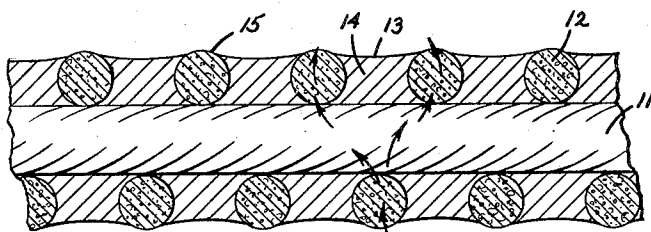


Fig. 2

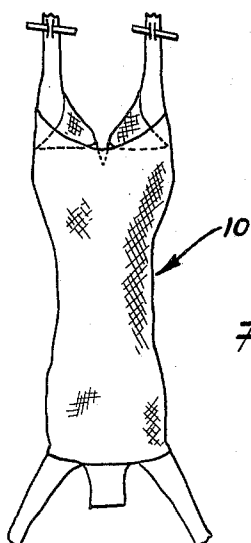


Fig. 3

INVENTOR.
WORTH WADE

BY

BY *Thomas R. Mally*
ATTORNEY.

ATTORNEY.

UNITED STATES PATENT OFFICE

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POROUS WRAPPER

Worth Wade, Rosemont, Pa., assignor to American Viscose Corporation, Wilmington, Del., a corporation of Delaware

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This invention relates in general to preparing materials and in particular to a wrapper for products of the class of meat, tobacco, cheese, fruit, and the like all of which are characterized by requiring the loss of moisture for proper conditioning and processing for the market.

In the processing, aging, and conditioning of products of the above mentioned class the loss of a certain amount of moisture is necessary, but on the other hand, the loss of moisture freely may result in undesired changes in the product. For example, in the meat packing industry, it is customary to enclose a freshly skinned carcass of lamb or veal with a double wrapper, the inner wrapper being formed of greaseproof paper and the outer wrapper comprising an open mesh fabric such as scrim. The paper is first applied to the carcass and the scrim is then drawn tightly over the paper wrapper to press the paper into close contact with the carcass and to mold and shape the fat masses on the carcass. The paper permits a certain amount of moisture to pass through so that the blood serum and water which ooze from the meat may be absorbed, but the paper prevents the passage of grease. However, since the paper is not stretchable, it cannot be made to conform uniformly to the irregularities of the meat mass so that the composite double wrapper is only partially effective. Moreover, such a method of packaging requires two separate wrapping operations. The fabric layer is employed merely to hold the paper in place but is not otherwise functional.

In the packaging of other types of products such as tobacco, processed meats, cheese, and fresh fruits, the passage of a certain amount of moisture from the product is essential to prevent mold growth and for proper aging and processing. However, the loss of all the moisture and the loss of grease is to be avoided.

It is a general object of the present invention to provide a wrapper for packaging products of the above mentioned class which wrapper will be unitary, semi-proof to moisture and gases, and also greaseproof.

It is another object of the invention to provide a wrapper for moisture-containing products of irregular shape which wrapper will be unitary, flexible, and stretchable so that it can conform closely to the irregularities of the product.

It is a further object to provide a wrapper which will be flexible, strong, semi-permeable to moisture and air, greaseproof, stretchable, unitary and capable of carrying indicia and which may be readily applied to products containing moisture in a simple and efficient manner.

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Other objects of the invention will in part be obvious and will in part appear hereinafter.

According to the present invention there is provided a wrapper for products of the class of meat, tobacco, cheese, fruit and the like which are characterized by requiring the loss of moisture, which wrapper comprises at least one layer of a closely woven or knitted or otherwise formed fabric composed of yarns, the spaces between the yarns being occupied by a mass of a hydrophobic thermoplastic or thermosetting material, the yarns being substantially free of such material and, therefore, porous and with the exposed surfaces of any of the yarns being uncovered by such material so that moisture may pass through the fabric by diffusion through the yarns.

In a preferred embodiment the yarns of such wrapper are impregnated with a hydrophilic colloid to render these yarns greaseproof.

For a more complete understanding of the nature and objects of the invention, reference should be had to the accompanying drawing in which

Figure 1 is a cross section of one embodiment of the wrapper of the present invention taken across the warp yarns of the fabric,

Figure 2 is a cross section of the wrapper of Figure 1 taken across the filling yarns and on the line II—II,

Figure 3 is a representation of an animal carcass enclosed in a wrapper of the invention.

Referring to Figure 1 a layer of closely woven fabric 10 composed of warp yarns 11 and filling yarns 12 is treated as hereinafter described to deposit in the spaces 13 between the yarns, masses of a hydrophobic thermoplastic material 14 leaving the yarns themselves substantially unimpregnated and also leaving the exposed surfaces 15 of the yarns uncovered by such material. By reference to Figures 1 and 2 it will be noted that the masses of thermoplastic material not only fill the spaces between adjacent warp yarns 11 but also between the spaces between the filling yarns 12. If the warp yarns are substantially straight and not undulated, such yarns are in effect surrounded by the thermoplastic material and may be said to be embedded in such material. However, the filling yarns since they are undulated are only partially enclosed by the thermoplastic material. Wherever the filling yarns rise to the surface, the surface areas 15 of the yarns are uncovered and are thus exposed. It is, therefore, possible for gases and moisture to pass completely through the fabric by diffusion from the side A through the filling yarn 12a thence into the warp yarn 11a and finally into the top

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filling yarn 12b and thus to the outside B. Alternatively, moisture or air can travel along the filling yarn 12a from the side A to the other side B as shown by the arrows. As the thermoplastic masses 14 are impervious to moisture and air, the wrapper, as shown in Figures 1 and 2, can be called semi-porous or semi-pervious to air and moisture.

However, since the yarns are not impregnated with the thermoplastic material but are porous, they may absorb and permit the diffusion of substantial quantities of oils, fats, and greases. To provide a wrapper which is also greaseproof, the yarns of the fabric of Figures 1 and 2 may be impregnated with a greaseproof hydrophilic colloid. When the warp yarns are wholly embedded and not exposed, the filling yarns need only be so impregnated with the hydrophilic colloid as hereinafter described. This produces a wrapper which is semi-permeable to air and moisture, but which is greaseproof and, therefore, suitable for wrapping fish, butter, cheese, fresh skinned meat carcasses and the like all of which contain both water and grease. Figure 3 shows an animal carcass which has had the skin removed and which has then been enclosed in the wrapper 10, the wrapper being stretched and drawn to conform to the irregular shape of the carcass and to make direct contact with the meat. When so wrapped, the water and blood serum and the like will be absorbed on the yarns on the wrapper, but the grease will be prevented from passage through the wrapper and excessive loss of moisture will be prevented.

There will now be described certain preferred methods of making the wrapper, but it is to be understood that this is for purposes of illustration, and the invention is not to be limited by such disclosure.

According to the present invention wrapping material is made in general, by applying a pre-formed film of thermoplastic finishing material to a fabric, which film may be either (a) self-sustaining or (b) temporarily supported on a backing or transfer sheet. The film and fabric are pressed together while heat is applied, the heat and pressure being sufficient to disintegrate the film and cause it to penetrate the fabric. In one embodiment (a) the penetration may be sufficient only to give a discontinuous layer of the thermoplastic material on one side of the fabrics, and in a second embodiment (b) the thermoplastic material is caused to distribute itself uniformly through the thickness of the fabric so that the product has substantially the same appearance on both sides. The heat and pressure applied are both elevated sufficiently to cause the thermoplastic material to partly penetrate the yarns or other textile elements of the fabric and to adhere fibers of the yarns together without penetrating the fibers, or the plastic material may be merely deposited on the surface of the yarns within the fabric. In either case the points of intersection of the yarns will be covered by the thermoplastic material so as to adhere these elements together while at the same time the interstices of the fabric will before or less filled so that the porosity of the fabric may be varied as desired. In any case the thermoplastic material is in the form of a continuous film before the application of heat and pressure and is in the form of a discontinuous layer after application.

Various fabrics may be treated in accordance with the process of the present invention, but the fabric, with regard to which the invention finds

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greatest application are fabrics which are closely woven or knitted so that the spaces between the yarns are not substantial in area. The ratio between the space filled by yarns and the space occupied by the thermoplastic material preferably lies between 1 to 4 and 2 to 1.

When it is desired to provide a wrapper which will have a resistance to the absorption and diffusion of fats, oils, and greases as well as a reduced porosity to air and water, such grease resistance is imparted by impregnating the yarns of the fabric with a hydrophilic colloid which is characterized by being inherently grease resistant. For the hydrophilic material there may be employed regenerated cellulose derived from viscose or cuprammonium cellulose or by the denitration of nitrocellulose, carboxy alkyl ethers of cellulose such as carboxy methyl cellulose and its salts, gelatine, casein, poly vinyl alcohol, and water swelling gums, and the like hydrophilic film-forming colloids. The hydrophilic colloids are formed into an aqueous dispersion and the yarns, either the warp or the filling yarns or both in the case of woven fabrics, may be saturated with the dispersion, or the fabric after being woven or knitted may be saturated with the dispersion. The colloid is coagulated and if necessary purified and then dried. By employing dilute solutions of low viscosity and squeezing out the excess colloid dispersion from the fabric, the yarns can be saturated with the hydrophilic colloid without forming a film of such material over the spaces between the yarns. Thus, in the treated fabric only the yarns contain the hydrophilic colloid, and the spaces between the yarns are free of such material. Such a fabric is hereinafter called "a fabric having greaseproof yarns." The fabrics so produced are next treated as hereinafter explained, to fill the spaces between the yarn with a hydrophobic water resistant thermoplastic material.

The thermoplastic material used is a thermoplastic material which can be rendered sufficiently fluid by the application of heat at a temperature below that which adversely affects the textile fabric to cause the thermoplastic material to lose its continuity and to flow into the spaces between the yarns of the fabric. Among the thermoplastic materials which may be so employed are thermoplastic synthetic resins as a class such as polymers of styrene and of vinyl compounds such as vinyl alcohol, vinyl chloride, vinyl acetate, polymers of acrylic acids and methacrylates, polyamide resins, chlorinated biphenyls, polymers of chloroprene, butadiene, polymerized isobutylene, sulfurolefine polymers and the like, as well as copolymers and mixtures of such resins, also thermoplastic cellulose derivatives as a class such for example as the solvent soluble water insoluble cellulose esters and cellulose ethers or mixtures of a synthetic resin with a thermoplastic cellulosic derivative; also thermosetting resins in the thermoplastic state such as for example, urea-formaldehyde or phenol-formaldehyde, glycerol-polybasic acid, and melamine-formaldehyde resin. The thermosetting resin as used is initially in the unhardened thermoplastic state so as to enable the film thereof to be applied to the fabric by heat and pressure and then further polymerized to the infusible or more hardened state by heat with or without the aid of acid curing catalysts.

The hydrophobic thermoplastic material may be formed into a film in any desired manner, for example, as by spreading or spraying a solution

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of the thermoplastic material in a suitable solvent over a smooth film-forming surface provided by a stone or metal slab, roller, or belt; or by casting it upon a sheet material to which the thermoplastic material does not permanently adhere, such as cellophane, gelatine, casein, and the like, or upon a sheet of waxed paper, glassine paper or highly calendered paper. After evaporation of the solvent by the use of heat and/or air, as desired, the thermoplastic film is stripped from the forming surface and immediately used or stored for future use. The initial film may be self-supporting or non-self-supporting. In the latter case, where extremely thin films are to be employed it is desirable to form the film on a temporary backing sheet or support to which it shows no substantial adhesion, such as a sheet of cellophane or smooth surfaced calendered paper, and allow the film to remain on the support until it is applied to the fabric. The application of the supported film material to the fabric is effected by placing the film and the fabric in contact and then exerting pressure to force the two together, and at the same time heating the composite layer until the plastic melts or flows and thereby disintegrates so that the thermoplastic material is forced into the spaces between the yarns. The pressure and heat may be supplied by any of the well known types of hot plate presses or by the use of cooperating heated rollers, such as a calender and the like or by use of a blanket press, that is, one in which the material is pressed against a heated roll by means of an endless blanket. Following the application of heat and pressure, the transfer sheet is stripped from the fabric so as to leave the thermoplastic material in the spaces between the yarns.

The fabric and/or the thermoplastic material may be suitably preheated prior to bringing the two together.

The thermoplastic material may be suitably colored before and/or after application to the fabric by the use of pigments and/or dyestuffs and may also before application be admixed with suitable fillers.

The wrapper of the invention may be surface decorated as by printing, lithographing or embossing, after application of the plastic to the fabric so as to provide any desired design and/or other configuration on the product.

In general the rate and depth of flow of the thermoplastic material into the spaces between the yarns in the fabric will depend upon several factors: (1) the nature of the thermoplastic material; (2) the temperature; (3) the pressure; (4) the time; and (5) nature and amount of any plasticizer. With highly plasticized cellulose derivatives and resins as the thermoplastic material, it has been found that a temperature of from 100 to 300° C., a pressure of from 1000 to 10,000 pounds per square inch, and a time of from 10 to 60 seconds is sufficient.

The extent of the penetration will also depend upon the amount of plasticizer employed in the thermoplastic film. In general the plasticizer may comprise from 10 to 50% of the total solids in the film-forming composition. Suitable plasticizers for the organic cellulose derivatives and thermoplastic resins are, for example, methyl phthalate ethyl glycolate, dibutyl phthalate, triphenyl phosphate, dicyclohexyl phthalate, tricresyl phosphate, and methyl ether of ethylene glycol acetyl ricinoleate.

Wrappers made in accordance with and comprising the present invention have a porosity such

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that between 100 and 300 grams of water vapor will pass through a square meter of the wrapper in twenty-four hours at a temperature of 70° F. when the humidity in the region adjacent one side of the wrapper to which the water vapor passes is 50% of the humidity in the region adjacent the other side of the wrapper.

By way of illustration but not by way of limiting the invention, there will be given the following specific examples:

Example I

A wrapper for freshly killed lamb carcasses made in the following manner. A composition is prepared comprising 90 parts of vinyl chloride vinyl acetate resin and 10 parts of methyl methacrylate and 15 parts of a plasticizer (comprising 50% tricresyl phosphate and 50% methyl ether of ethylene glycol acetyl ricinoleate). Ten parts of these solids are dissolved in 90 parts of ethylene dichloride and the composition applied to a smooth-surfaced paper coated with a thermoset infusible urea-formaldehyde resin, and the solvent evaporated to leave a film about .0017 inch thick on the urea resin coating. The coated side of the paper is passed continuously into contact with one surface of a closely woven cotton fabric and the assembly subjected to a temperature of 160° C. under 5000 pounds pressure per square inch for 60 seconds, after which the paper backing is stripped from the fabric. Under such heat and pressure the thermoplastic film disintegrates and the resin flows into and fills the spaces between the yarns, leaving the yarns unimpregnated and the surface free of any continuous film. The product is characterized by having a dimensional stability, by being non-shrinking, having less nap than the unfinished material and by being substantially water-repellant. However, because there is no continuous coating on the fabric and the yarns are unimpregnated, the fabric is porous. Air and water vapor can diffuse through the yarns of the fabric. Thus, the wrapper can absorb the excess moisture, blood, and fat fluids from the surface of the carcass.

Example II

The process of Example I is repeated using a composition comprising 100 parts of polyvinyl acetate resin (Gelva V60), 25 parts of the same plasticizer used in Example I, and 10 parts of methyl methacrylate resin, and the solution made with 15% of the solids in acetone. This composition gives an extremely flexible and elastic film which is able to follow the expansion and contraction of the yarns in the fabric when the wrapper is wrinkled or stretched during wearing.

The present invention makes it possible to produce a wrapping material having a definite and readily predetermined rate of absorption and permeability to both water and fats, oils and grease and a substantial and uniform stiffness throughout its area and which at the same time is permanently improved in regard to tensile strength, breaking elongation, and dimensional stability both when wet and dry. Since there is no continuous film left on the surface of the wrapper, the wrapper retains its general textile character and appearance.

While preferred embodiments of the invention have been shown and described, it is to be understood that changes and variations may be made without departing from the spirit and

scope of the invention as defined in the appended claims.

I claim:

1. A wrapper for products of the class of meat, fish, tobacco, cheese, fruit and the like which require the loss of moisture for proper conditioning during processing, packaging and storage, comprising a textile fabric composed of yarns, the spaces between the yarns in said fabric being occupied by a mass of a hydrophobic thermoplastic material, the yarns being at least partially embedded throughout their lengths in the thermoplastic material, the yarns being substantially unimpregnated by said material and having exposed surfaces on both sides of the fabric, the exposed surfaces of the yarns being uncovered by said material so that air and moisture can pass through the wrapper by diffusion through said yarns, the yarns being impregnated with a hydrophilic colloid and being resistant to the absorption and diffusion of grease.

2. A wrapper as recited in claim 1 in which the thermoplastic material is a hydrophobic synthetic resin.

3. A wrapper as recited in claim 1 in which yarns in said fabric are impregnated with a cellulosic material that is resistant to the absorption and diffusion of grease.

4. A wrapper as recited in claim 1 having a porosity such that between 100 and 300 grams of water vapor will pass through a square meter of the wrapper in a twenty-four hour period at a temperature of 70° F. when the humidity in the region adjacent one side of the wrapper to which the water vapor passes is 50% of the humidity in the region adjacent the other side of the wrapper.

5. A wrapper for products of the class of meat, fish, tobacco, cheese, fruit and the like which require the loss of moisture for proper conditioning during processing, packaging and storage, comprising a woven textile fabric composed of yarns, the spaces between the yarns in said fabric being occupied by a mass of hydrophobic thermoplastic material the yarns being at least partially embedded throughout their lengths in the thermoplastic material, the yarns being substantially unimpregnated by said material and having exposed surfaces on both sides of the fabric, the exposed surfaces of the yarns being uncovered by said material so that air and moisture can pass through the wrapper by diffusion through said yarns, the yarns being impregnated with a hydrophilic colloid and being resistant to the absorption and diffusion of grease and the wrap yarns being substantially surrounded and embedded in said thermoplastic material.

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