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WRAPPING MATERIAL HAVING A WAX-TYPE COATING
WITH SPACED PROTRUDING PARTICLES
Filed Nov. 15, 1963

Fig. 1

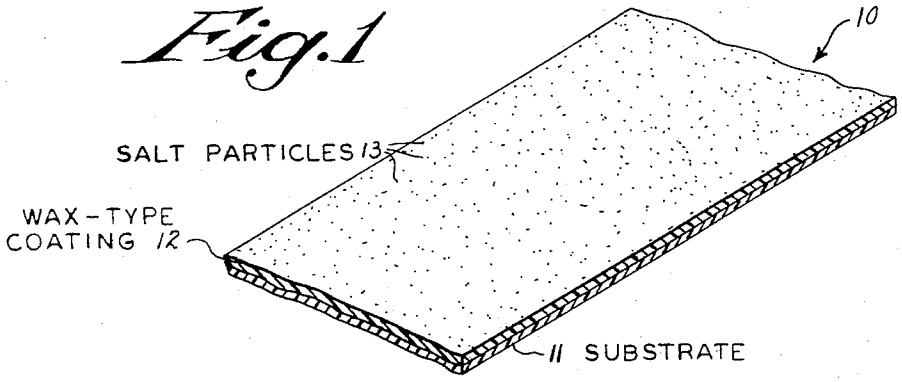


Fig. 2

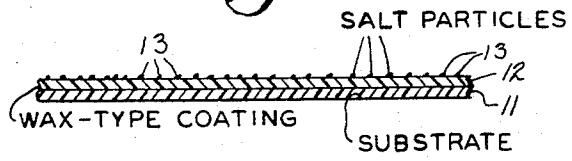


Fig. 3

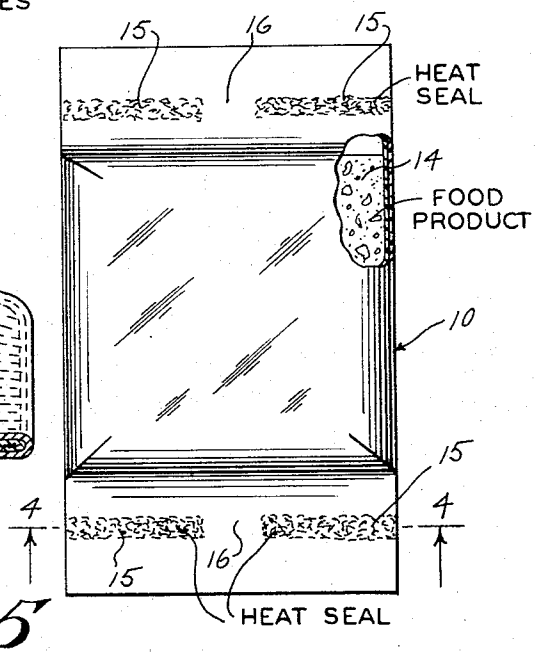


Fig. 4

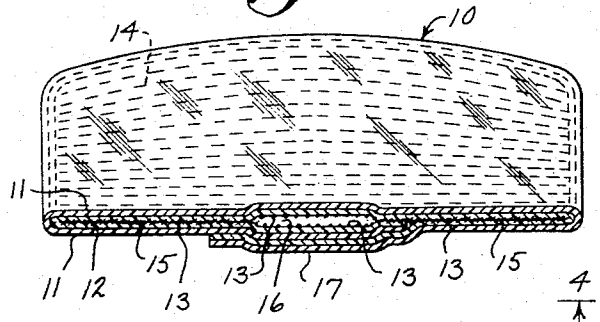
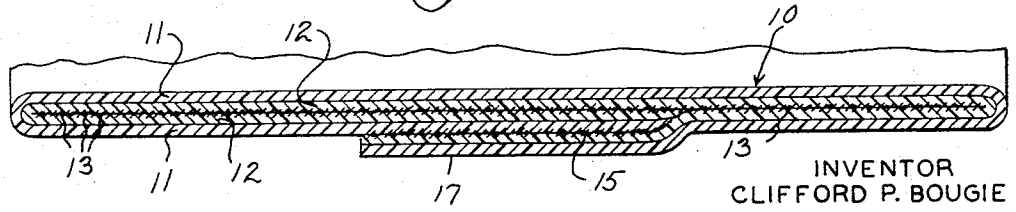


Fig. 5



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WRAPPING MATERIAL HAVING A WAX-TYPE COATING WITH SPACED PROTRUDING PARTICLES

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10 Claims. (Cl. 117—76)

This invention relates to a wrapping material and to packages prepared therefrom. More specifically, this invention relates to a wrapping material comprising a substrate, a heat sealable wax-type coating on at least one surface of the substrate, and a dispersed arrangement of hard particles, such as salt, joined to the wax-type coating.

A number of wax-type coatings are used in the packaging art to provide a thermoplastic, heat sealable coating on various substrate materials. These coatings may comprise paraffin waxes, microcrystalline waxes, or mixtures of paraffin and microcrystalline waxes. Oftentimes, a wax-type coating of the type under consideration will comprise a mixture of paraffin or microcrystalline wax, or both, with a polymeric film former such as polyethylene, and a blending resin; a plasticizer may also be included in the coating. Various types of additives or modifiers can be incorporated in the coatings to impart or enhance specific properties. There may be from about 40 to 95% wax in a wax-type coating of the type with which this invention is to be used.

The waxes to be used in the coatings are petroleum waxes and include both paraffin and microcrystalline waxes. Paraffin waxes are derived from light and medium lubricating oil distillates and are mixtures of straight chain or normal hydrocarbons usually ranging from C_{20} to C_{30} and sometimes higher. Microcrystalline waxes are obtained from heavy lubricating oil distillates and generally range from C_{30} to C_{60}. In general, the microcrystalline waxes have a melting point of from about 140° F. to 195° F. and the paraffin waxes have a melting point of from about 110° F. to as high as about 185° F., although these ranges are not fixed, and comparatively, the paraffin waxes are hard and brittle whereas the microcrystalline waxes are soft, flexible and sticky.

Wax-type coatings of the foregoing nature are often used in the packaging field by reason of their low moisture vapor transmission rates and may be applied to paper or other cellulosic substrates to impart moisture vapor impermeability to the coated material. The coatings can also be heat sealable, exhibit good gloss and transparency and are of relatively low cost. Wax-type coatings can be used in direct contact with food products without affecting their taste and odor. Principally because of these reasons, wax-type coatings enjoy widespread use in packaging applications and they are typically applied to substrates including cellulosic materials such as paper, glassine, cellophane and cellulose acetate and non-cellulosic materials such as synthetic plastic films.

However, in spite of their widespread use, many wax-type coated packaging materials as presently known have some undesirable characteristics and the principal object of this invention is to provide an improved packaging material including a substrate having a wax-type coating on at least one of its surfaces.

Much of the packaging done today involves the use

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of vacuum packaging techniques wherein a commodity may be enclosed in a heat sealable wrapper, a partial or interrupted heat seal formed between adjacent plies of the wrapper, the wrapped commodity is subjected to sub-atmospheric or vacuum conditions to pull air from the interior of the package, and then the partial heat seal is completed to enwrap the commodity. Wrapping materials bearing a wax-type coating are used for this type of packaging operation, but it has been found that they present problems when so used. Specifically, when the initial interrupted heat seal is made in a wrapping material bearing a wax-type coating, it has been found that the coating can become soft enough and flow sufficiently as to sometimes fill in the interruption or opening in the heat seal that is intended to be left clear in order to permit air to escape from the interior of the package. This problem is accentuated since many wax-type coatings have low heat-sealing temperatures in order to have good flow characteristics so as to form around the packaged commodity. Thus it is not unusual to find a substantial percentage of the packages made with this type of material by vacuum packaging techniques to be unsatisfactory since a proper vacuum could not be applied to the interior of the package. An object of this invention is to provide a wrapping material including a substrate and a wax-type coating wherein the wax-type coating carries a spaced disposition of hard, crystalline materials, such as salt, which serve to maintain separation of adjacent plies of the coated material which have been heat sealed together over a portion of their contiguous surfaces in order that air may escape through the separated area for the formation of vacuum packages.

Many wax-type coatings exhibit the undesirable property of blocking, by which is meant cohesion or adhesion between contiguous layers of similar or dissimiliar materials in roll or sheet form which prevents their being satisfactorily used. Thus a wrapping material including a substrate and a wax-type coating when wound into roll form can exhibit blocking wherein a coated surface will adhere to a coated or uncoated surface which it contacts and thereby make it difficult to unwind the roll without seriously delaminating the coating. This can also occur in stacks of sheets of the coated material and the ambient temperature and the pressure to which the coated material is subjected will affect the blocking problems. This blocking characteristic of many wax-type coatings has necessitated the use of slip sheets in many instances. A slip sheet may be interleaved with a wax-coated material when wound into a roll so that the coated surfaces contact the slip sheet rather than adjacent surfaces of the same material and the slip sheet is of a material, or includes a suitable coating, to possess a very low adherency to the wax-type coating; slip sheets may also be interleaved between stacks of sheets of wax-coated material. The use of a slip sheet, however, results in added expense in producing and using wax-coated material and is therefore a generally undesirable feature. Another object of this invention is to provide a wrapping material including a wax-type coating which further includes hard particles adherent to the wax-type coating surface of a character such as to prevent blocking of the wax-type coated surface to adjacent layers of the same or similar material.

Many foods, when packaged, require the inclusion of additives for use as preservatives in order to obtain a suitable shelf life; as an example, many types of cheeses

contain a mold inhibitor ingredient for this purpose. However, most materials of this type are considered food additives and limits of the amount that can be included in the food are established by appropriate governmental bodies or agencies. Some wrapping materials for food products may include food additive materials of this type, thereby decreasing the amount that can be added to the food itself since the amount used in the wrapper must be added to the amount used in the food and this total cannot exceed the permissible established limit. Therefore, another object of this invention is to improve the vacuum packaging and blocking characteristics of a wax-type coated wrapping material by means of a non-food additive agent dispersed about the coating so as to enable food additives, especially preservatives, mold inhibitors, etc., to be included in the food to their permissible quantity limits.

The above problems are particularly acute when packaging cheese since many types of materials used for cheese wrappers require the use of a wax-type coating to achieve satisfactory levels of moisture vapor barrier characteristics, and cheese packagers require a material that is readily heat sealable and can still be efficaciously utilized in vacuum packaging machines; in addition, cheese must generally include suitable amounts of mold inhibiting ingredients. Thus a truly high quality cheese package requires a combination of characteristics in the wrapping material which is difficult to attain with known wax-coated wrapping materials and, therefore, a more specific object of this invention is to provide an improved cheese package incorporating a wrapping material having a wax-type coating.

The foregoing and other more specific objects, such as, for example, the types of materials which can be added to the wax-type coated surface to achieve the foregoing advantages and the determination of the amounts of such materials required to achieve the stated objects, will appear in the description to follow. In the description, reference is made to the accompanying drawings which form a part hereof and in which there is shown, by way of illustration, a specific form in which this invention may be practiced. This form will be described in detail to enable those skilled in the art to practice this invention but it is to be understood that other embodiments of the invention may be used and that changes in the embodiment described herein may be made by those skilled in the art without departing from the true scope of this invention. The scope of the present invention is best defined by the appended claims and limitations set out in the following detailed description need not be taken in a limiting sense except insofar as they may be incorporated in the claims.

By way of summary, this invention provides a wrapping material including, in combination, a substrate layer, a wax-type coating on at least one surface of said substrate layer, and a dispersed arrangement of hard, crystalline particles joined to and projecting from the wax-coated surface. The preferred hard, crystalline material is salt, sodium chloride, of a defined size range and within a specified amount. The wax-coated surface is only partially covered by the hard, crystalline material so that the wax coating can be used to form heat seals, but there is to be a sufficient amount of the crystalline material present on said surface in order to render the surface non-blocking and to provide a wrapping material of improved handling for vacuum packaging methods.

In the drawings:

FIG. 1 is a perspective view of a portion of a sheet of wrapping material produced in accordance with this invention;

FIG. 2 is an end view of the sheet of wrapping material illustrated in FIG. 1;

FIG. 3 is a top view of a food package wherein cheese enclosed in wrapping material according to this invention is to be vacuum packaged;

FIG. 4 is an end view partly in section, taken along the plane of line 4—4 shown in FIG. 3, looking in the direction of the arrows and showing the package before it has been completely closed; and

FIG. 5 is a view similar to FIG. 4 but on an enlarged scale and showing the package after it has been completely closed.

FIG. 1 illustrates a portion of a sheet of wrapping material **10** embodying the present invention. The wrapping material **10** includes a substrate **11** comprising a flexible film, foil or membrane of sufficient strength for wrapping purposes. Although shown herein as comprising a single layer, the substrate **11** may also consist of more than one layer of the same or dissimilar material joined together, by lamination for example. The substrate can be formed of cellulosic materials such as paper, glassine, cellophane and cellulose acetate or other cellulose esters, and non-cellulosic materials, particularly synthetic polymeric films and metal foils. For most packaging uses, the substrate will be from about 1 to 3 mils thick, although other thicknesses can be used.

The substrate **11** carries a wax-type coating **12** on at least one of its surfaces; generally, the substrate can also be coated on both sides or impregnated with the wax-type coating. The wax-type coating **12** is to comprise either entirely paraffin or microcrystalline petroleum wax, a mixture of paraffin and microcrystalline petroleum waxes, or a coating having a substantial portion (not necessarily a major portion) of paraffin or microcrystalline petroleum waxes, or both, together with other ingredients such as polymeric film-formers and blending resins. Thus the term "wax-type coating" as used herein and in the claims is intended to refer to these classes of coatings in a generic sense. Wax-type coatings of this general nature are melted and then applied in a molten condition to the substrate by kiss coating, knife coating, squeeze roll coating, dip coating, gravure coating and other conventional coating methods. A wax-type coating or this type is also heat sealable and slightly tacky or sticky at room temperatures, which tackiness increases with elevated temperatures on the order of 90 to 100° F. and above.

The wrapping material as described to this point is conventional inasmuch as it includes known substrates and known wax-type coatings. The novel feature of this invention resides in the particles **13** dispersed about the wax-type coating **12**. These particles **13** are to consist of a hard, crystalline material and are spaced about the coating as individual particles or small agglomerations of particles so that the coating **12** is exposed between the particles. As indicated in FIG. 2, the particles **13** project above the surface of the wax-type coating **12** and are not embedded therein. The particles **13** are to be firmly attached to the coating **12** so that they are not easily removed therefrom. With many coatings, this will require the use of a suitable adhesive binder to hold the particles in place.

Salt, sodium chloride, has been found to be an ideal material for the particles **13** since it possesses the hard crystallinity necessary to impart the desired characteristics described hereinbelow, it is not considered a food additive, and because it has a melting point above the heat sealing or softening temperature of the wax-type coating **12**. The salt particles should not be excessively large and should be small enough so that the salt can be kept in suspension when applied to the substrate from a slurry; a particle size ranging from 40 mesh (0.165 inch opening) to 200 mesh (0.0029 inch opening), U.S. Standard Sieve series, has been found effective. As to quantity, the salt should be present at least in the amount of from 1.25 grams per thousand square inches of substrate to 3.5 grams per thousand square inches of substrate. Quantities less than about 1.25 grams per thousand square inches have been found insufficient to provide the desired properties to the material. Particles are spaced about the wax coating **12** so that when activated by heat, the coating can flow around the salt particles in order to form a heat

seal bond with a contacting surface of another layer of the wrapping material.

A typical packaging use of the wrapping material **10** is illustrated in FIGS. 3–5. Turning first to FIG. 3, a sheet of wrapping material **10** is shown as being wrapped around a stack of cheese slices **14**. The sheet of wrapping material is overlapped on the underside of the cheese stack and contacting layers heat sealed together to form the back seam of the package, as indicated at **17** in FIG. 4. The ends of the package are squeezed together and heat seals **15** are formed as indicated in FIG. 3 to join the uppermost layer of wrapping material to the lowermost layer by means of the wax-type coating on each layer. The two heat seals **15** at each end of the package do not join one another and an opening **16** is left between them to provide an area wherein there is no heat seal bond. The heat seal formation is shown in FIG. 4, wherein the wax-type coating **12** of the upper layer of wrapping material contacts the wax-type coating **12** of the lower layer of wrapping material along the heat seals **15** and in these heat seal areas the respective coatings **12** fuse together under the action of heat and pressure to form the heat seals. As stated previously, the wax coatings flow around the particles **13** attached to each coating **12**. However, at the opening **16**, the coatings **12** do not heat seal together so that an air passage is formed at each end of the package.

The term "heat sealing" as used herein is meant to define the property of softening or fusing to form a satisfactory bond when subjected to momentary application of heat and pressure. The temperatures employed are above the softening temperature of the coating, the pressures generally vary between less than one pound to fifty pounds per square inch and the dwell time is normally from a fraction of a second to several seconds.

After being formed in the condition described above, the package is placed in a vacuum chamber wherein the air contained inside the package is withdrawn through the openings **16**, heat seals are formed across the openings to complete closure of the package, and the sealed package is removed from the vacuum chamber. Unless the openings **16** can be preserved in the wrapper while the package is in the vacuum chamber and until the package is ready for the final heat seal after being evacuated, it will not be possible to draw the air out of the interior of the package. A difficulty experienced with prior art wrapping materials having a wax-type coating is that the opening often would become entirely closed, or sufficiently closed, to prevent the free passage of air out of the package when the heat seals **15** are initially formed, thereby inhibiting satisfactory application of the vacuum. However, it has been found that the salt particles **13** arranged according to this invention act to preserve the opening between the heat seals so that the packages can be properly evacuated and made ready for final heat sealing and that, consequently, the wrapping materials of this invention are able to provide improvements over prior art wrapping materials having a wax coating in this type of packaging method.

An appreciation of the advantages of the present invention can be had by reference to the following examples, wherein Example 1 illustrates a wrapping material having a wax coating according to the prior art and Example 2 illustrates the same wrapping material further including the dispersed arrangement of salt particles on the wax coating in accordance with this invention.

Example 1

A wax-type coating comprising a blend of 82% microcrystalline wax having a melting point of 140° F., about 3% polyethylene having a molecular weight of 6000, and about 15% butyl rubber was prepared. The coating was applied to one surface of a cellophane substrate at a coating weight of 45 to 50 lbs./ream (3000 square feet) of substrate, consisting of moisture-proof cellophane designated as 210MAD2 that was one mil thick. After the wax coating had cooled and the wrapping material was ready for use, it was observed that the coating had a definite tacky or sticky feeling. The coating was further tested for blocking by folding a coated sheet so that a coated surface was in contact with another similarly coated surface of the sheet and then pressing the overlapped portions together by moderate hand pressure. The overlapped portions were then separated by hand during which it was observed that the two coated surfaces were quite well bonded to one another, that stripping of the coating from the contacting layers occurred, and that the substrate began to tear. Using the same test procedure, a sheet of the wrapping material was folded with the wax coated surface in contact with an uncoated surface of the substrate. Upon separation, it was observed that there was bonding between the coated surface and the uncoated surface and they could be separated only with some difficulty, and that there was stripping of the coating so that some of it was transferred to the uncoated surface of the substrate; no tearing of the substrate was noted as occurred above when the coated surface was folded in contact with another coated surface. Further experience with the wrapping material indicated that it would block at temperatures above room temperature when subjected to very light pressures. These blocking characteristics are rated as severe and a roll of the material could not be satisfactorily unwound. In order to provide a useful packaging material, it was necessary to use a slip sheet comprising a paper bearing a silicone or other type of release coating, when the wrapping material was wound into a roll for shipment to the packager. A web of the slip sheet had to be wound with a web of the wrapping material so as to be interleaved between adjacent plies of the wrapping material to prevent them from adhering to one another during storage and transfer to the user. Since the slip sheet had to be included on the roll, a usual size roll of the material had about 1800 lineal feet of wrapping material.

When the above wrapping material was used to package cheese by vacuum packaging procedures as described above with reference to FIGS. 3–5 and the interrupted heat seals **15** were formed in the packages, it was found that an appreciable percentage of the packages could not be properly evacuated of air in the vacuum chamber because the wax-type coating tended to close the opening **16**. It was estimated that about 5 to 10% of the packages had this defect, which is sufficient to substantially increase the cheese packager costs since the defective packages were not suitable for sale without repackaging.

Example 2

A salt slurry was prepared comprising 41.5% salt, 24.5% of a binder consisting of a solution of 20% polyvinyl acetate (Gelva V–100) and 80% denatured alcohol (ethanol), and the balance ethyl alcohol as a vehicle. Other vehicles, such as methyl, propyl and isopropyl alcohols, and other binders, such as polyamides, acrylic polymeric materials, shellac and ethyl cellulose, can be used, and the salt is preferably present in an amount greater than the amount that would ordinarily dissolve in the vehicle. The particle size of the salt was such that 100% of it went through a 40 mesh screen, 21% of which passed through a 60 mesh screen, 58% through a 100 mesh screen, and 21% through a 200 mesh screen, all U.S. Standard Sieve series. The slurry was agitated to keep the salt in suspension and applied to the wax-coated surface of the same wrapping material described above in Example 1. The slurry was applied with a rotogravure coater and the vehicle evaporated by passing the coated web through a drying oven at a speed of 200 ft./min. for a dwell time of about 10 seconds. The finished sheet was as shown in FIG. 1 and had a multitude of salt particles distributed over the wax coating and joined thereto by means of the binder, polyvinyl acetate. The sheet had a slightly rough feeling on the salt coated surface since the

salt particles projected above the wax coating. The coating had a dry feeling and gave no evidence of tackiness or stickiness when rubbed by hand. The coated material was tested for blocking by folding in the manner explained in Example 1 and it was found that the salt bearing wax coated surface would not adhere to a superimposed salt bearing wax coated surface as was true in Example 1 when the wrapping sheet was tested without the salt particles. Further, the salt-coated surface would not adhere to a superimposed uncoated surface of the substrate. It was also found that the material of this example, having the salt particles over the wax coating, could be wound into roll form or stacked as sheets without the use of a slip sheet by reason of its improved blocking characteristics. For these reasons, the salt-coated sheet of this example according to this invention exhibited none of the undesirable blocking characteristics shown by the material of Example 1. Thus a usual size roll, of the same size as described in Example 1, was able to incorporate about 3000 lineal feet of the wrapping material, as opposed to only 1800 feet of wrapping material that had to be slip sheeted as indicated in Example 1; this provides an additional advantage for the wrapping material of this invention in that it reduces the time consumed in changing rolls on a wrapping machine and, hence, lessens the time during which a wrapping machine need be taken out of production to reload with wrapping material.

When the wrapping material of this example was used to package cheese according to the vacuum technique described above with reference to FIGS. 3–5, it was found that there was no tendency for the packages to close the openings **16** before the package could be properly evacuated of air. The salt particles on the wax coating surfaces, being hard, and projecting from the surfaces, kept the opposed surfaces sufficiently far apart to provide an efficient air passage between the heat seals **15**, and it was found that the percentage of defective packages due to an inadequate opening almost entirely disappeared so that it can be considered as zero percent or a negligible percentage. Thus the wrapping material of this invention eliminated one of the problems of vacuum packaging associated with conventional wax-coated sheet materials as discussed above in Example 1.

In the preceding examples, the butyl rubber in the wax coatings was an isobutylene-isoprene copolymer having 0.7% unsaturation, a specific gravity of 0.92 and a Mooney ML–8 at 212° F. in the range of 60 to 80. The polyethylene had a molecular weight of 6000 The microcrystalline wax had an ASTM melting point of 140° F., needle penetration of 40 at 77° F., and a Saybolt viscosity of 79 at 200° F. The wax coating formula is exemplary and the three ingredients can be varied within a wide range; e.g., the wax can be from 40 to 95%, the rubber from 4 to 35%, and the polyethylene from 2 to 25%. Also, one or more of these ingredients can be omitted or substituted so that the coating can consist entirely of wax or of wax blended with other ingredients. For the purpose of this invention, a "wax-type coating" is defined as one containing from about 40 to 100% wax. The wax coating in the examples can be heat sealed at from 80° F. to 250° F., depending on the dwell time and the pressure; at the lower temperatures, an increased dwell time and/or increased pressure are required. In normal packaging uses, the material is heat sealed with equipment set at a heat seal jaw temperature of 225° F., dwell time of 1/30 second and a jaw pressure of from 20–50 p.s.i.; with these machine conditions the actual interfacial temperature in the area of the contiguous coatings is in the range of 140 to 160° F.

While salt is shown as the material for the particles to be distributed over the wax surface of a wax-coated substrate the materials of this invention, other materials can also be used. The material for the particles should be hard and crystalline; materials such as starch, talc, and chalk are soft and amorphous and have been found generally unsatisfactory for the present invention and incapable of providing the vacuum packaging advantages in particular. The particles should also have a sufficiently high melting point so that they do not melt when the material is heat sealed, i.e., when the wax-type coating is softened or activated by heat. Further, the particles should be a non-food additive when the wrapping material is used to package food; when used for packaging cheese the particles should be of a material that is considered a non-food additive in accordance with the appropriate standards that have been established by government agencies such as the FDA. Examples of other useful materials include calcium and potassium chlorides; sodium, calcium and potassium salts of tartaric, lactic, acetic and phosphoric acid; the sugars glucose and sucrose; and organic hard resins having a softening point of 104° C. to 300° C. (ball and ring method).

There has thus been described a wrapping material utilizing a wax-type coated substrate and which is further altered in accordance with this invention to achieve novel results, particularly with reference to vacuum packaging capabilities and blocking, not heretofore attainable with this general class of wrapping materials. Is to be understood that it is intended to cover all changes and modifications of the example of this invention herein chosen for the purpose of illustration which do not constitute a departure from the spirit and scope of this invention.

I claim:

1. In a wrapping material of the type including a substrate of flexible packaging material and a wax-type coating on at least one surface of the substrate, said wax-type coating comprising at least about 40% petroleum wax and being heat sealable, the improvement consisting of a plurality of particles attached to the wax-type coating, said particles comprising hard, crystalline material with a melting point above the heat sealing temperature of the wax-type coating selected from the group consisting of sodium chloride, calcium chloride and potassium chloride; and said particles being arranged to project from the wax-type coating and spaced to expose said coating between the particles so that the coating can be heat sealed

2. Wrapping material according to claim **1** wherein the particles are fine enough to pass through a 40-mesh screen and a major portion are large enough to be retained on a 200-mesh screen.

3. Wrapping material according to claim **1** further including adhesive binder material joining the particles to the wax-type coating.

4. Wrapping material according to claim **1** wherein the particles attached to the wax-type coating are sodium chloride salt particles arranged to project from the wax-type coating and spaced to expose said coating between the salt particles so that the coating can be heat sealed.

5. Wrapping material according to claim **4** wherein there is at least 1.25 grams of salt per 1,000 square inches of coated substrate.

6. Wrapping material according to claim **4** wherein the salt particles are fine enough to pass through a 40-mesh screen and a major portion are large enough to be retained on a 200-mesh screen.

7. Wrapping material according to claim **6** wherein there is at least 1.25 grams of salt per 1,000 square inches of coated substrate.

8. Wrapping material according to claim **4** further including adhesive binder material joining the salt particles to the wax-type coating.

9. Wrapping material according to claim **8** wherein there is at least 1.25 grams of salt per 1,000 square inches of coated substrate.

10. Wrapping material according to claim **9** wherein the salt particles are fine enough to pass through a 40-mesh screen and a major portion are large enough to be retained on a 200-mesh screen.

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