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(54) Titre : COMPOSITIONS DE REVETEMENT PROTECTEUR A BASE DE POLYSACCHARIDES ET PROCEDES D'UTILISATION DE CES COMPOSITIONS
(54) Title: POLYSACCHARIDE-BASED PROTECTIVE COATING COMPOSITIONS AND METHODS OF USE THEREOF

(57) **Abrégé/Abstract:**

This invention provides a vehicle masking material and method of use. The masking material in one embodiment includes a dextrin and a thickener and/or a co-film former, a plasticizer, and water. The masking material may additionally include a surfactant. The masking material is applied to a surface which is to be protected from paint overspray or other coating processes, allowed to dry, and the surface is coated (e.g with paint). After drying of the paint, or other coating, the masking material is removed by water washing.

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(54) Title: POLYSACCHARIDE-BASED PROTECTIVE COATING COMPOSITIONS AND METHODS OF USE THEREOF

(57) Abstract: This invention provides a vehicle masking material and method of use. The masking material in one embodiment includes a dextrin and a thickener and/or a co-film former, a plasticizer, and water. The masking material may additionally include a surfactant. The masking material is applied to a surface which is to be protected from paint overspray or other coating processes, allowed to dry, and the surface is coated (e.g with paint). After drying of the paint, or other coating, the masking material is removed by water washing.

POLYSACCHARIDE-BASED PROTECTIVE COATING COMPOSITIONS AND METHODS OF USE THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

5 This is a continuation-in-part of 09/557,023, filed on April 20, 2000 which is
a continuation-in-part of USSN 09/122,224, filed on July 24, 1998 which is a continuation-
in-part of USSN 08/382,359, filed on February 1, 1995, all of which are incorporated herein
by reference in their entirety for all purposes.

STATEMENT AS TO RIGHTS TO INVENTIONS MADE UNDER FEDERALLY SPONSORED RESEARCH AND DEVELOPMENT

10 [Not Applicable]

FIELD OF THE INVENTION

The present invention relates to the field of protective coatings to be used
during coating operations of various surfaces including surfaces of vehicles or buildings. More
specifically, in one embodiment the invention provides an improved method and composition
15 for masking selected portions of a surface, in particular a vehicle surface, from paint. In
another embodiment, this invention provides methods and compositions for protecting surfaces
(*e.g.* walls and/or floors) of a paint spray booth from paint overspray.

BACKGROUND OF THE INVENTION

It is well known that painting operations often require masking of certain
20 portions of the surface of the painted object to prevent overspray. For example, it is often
necessary to mask trim and windows on a vehicle (*e.g.*, a motor vehicle) from paint overspray.
Also, building stucco must frequently be protected from paint or primer coats. On occasion, it
is necessary to mask painted portions of a vehicle or building from paints of a different color
and overspray of paints of the same color. In addition, it is often desired to protect the surfaces
25 (*e.g.* floors or walls) of the area (*e.g.* paint spray booth) in which the overcoating (*e.g.* painting)
operation is performed.

In practice, masking operations are often one of the most time consuming and,
therefore, expensive parts of the painting process. In spite of attempts to develop suitable
chemical masks for vehicle painting, vehicle painters continue to use primarily masking tape

and paper to cover portions of a vehicle where paint is not desired. To mask the trim on a car, for example, will often require many hours of tedious labor. Furthermore, even when done carefully, defects in such paint masks allow paint to contact surfaces that are desired to be protected.

5 Chemical masking solutions have been proposed to the problem of protecting surfaces during coating processing operations. However, such techniques have often not found extensive use. Some of the proposed chemical masks have been unsuitable for application to portions of a vehicle or building because of damage which would potentially occur to the protected portions of the vehicle or building. Other compositions are not water-soluble which
10 increases the difficulty and expense of removal. In addition, masks that require solvents for removal are problematic in view of the increasing regulation of disposal of solvents as environmental regulation becomes stricter with time. Other compositions are difficult to apply, difficult to remove, excessively costly, or the like.

 From the above it is seen that an improved masking that is easily applied and
15 removed, that provides good surface protection, that is economical, and whose use entails little or no environmental impact is needed.

SUMMARY OF THE INVENTION

 An improved masking composition and method is provided by virtue of the present invention. The method includes the steps of applying a substantially continuous film
20 of a masking material on a vehicle (*e.g.* motor vehicle), building, floor, wall (*e.g.* spray booth floor wall or other spray booth surface) or other surface to be protected during a "coating operation" such as painting. The vehicle, building, or other surface may then be coated with a "coating compound" such as paint or any other compound which is to be applied to the surface. Finally, the masking material may be removed from the surface by washing with water thereby
25 removing any coating compound that may be present on the masking material. These steps may be performed, for example, during an assembly line production of a vehicle or other article of manufacture.

 By "coating operation" or "overcoating" it is desired to include any compound which is applied to a surface. Coating compounds include materials such as paint or other
30 finishing materials such as lacquer, varnish, waxes and the like which adhere to the surface to which they are applied thereby forming a relatively permanent finish. Coating compounds, however, may also include compounds designed for temporary application to surfaces as in

surface preparative treatments such as acids, oils, and antioxidants from which it may be necessary or desired to shield other surfaces.

By "building" it is intended to mean herein a house, warehouse, apartment, garage, store, or the like. By "vehicle" it is intended to mean herein a car, boat, plane, train,
5 railroad car, or the like. By "substantially continuous film" it is intended to mean herein a film lacking pinholes through which paint or other materials generated during a coating operation processing could reach an underlying surface.

The masking material is, in one embodiment, a composition comprising 36. A composition for temporarily protecting a surface, said composition comprising an aqueous
10 solution/suspension of a polysaccharide (*e.g.*, starch, carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, algin, gum arabic, alginic acid, a cellulose gum, *etc.*) typically present in an amount ranging from about 2 to about 90 weight percent of said masking material, wherein said polysaccharide is not a dextrin; and a plasticizer present in an amount sufficient to prevent cracking of the protective film formed when the masking material
15 is dried, where the composition, when applied to a painted automobile surface, dries to a dry, protective coating that protects the underlying surface from paint and that is removable with a water wash. Typically the composition, when applied to a painted automobile surface, dries to a dry continuous film that protects the underlying surface from paint in a painting operation and can readily be removed from the underlying surface with a water wash without marring or
20 disfiguring the underlying surface. In preferred embodiments, the polysaccharide is present in an amount ranging from about 2 to about 50 weight percent of said masking material. In certain embodiments, the polysaccharide is not and does not comprise a cellulose or a cellulose derivative. In particularly preferred embodiments, the plasticizer comprises a simple sugar (*e.g.* glucose, sucrose, and fructose) and/or a material selected from the group consisting of
25 sorbitol, glycerin, sucrose, urea, polyethylene glycol, polypropylene glycol, polyglycerol, and glycerol. In certain embodiments, the plasticizer is present in an amount ranging from about 0.2 to about 12 weight percent of the masking material. The masking material can further comprise a surfactant, preferably in an amount effective to produce a coating that lays out smoothly in a substantially continuous film (*e.g.* typically at an amount up to about 2%, by
30 weight, of the masking composition). Preferred surfactants include, but are not limited to an anionic surfactant, a cationic surfactant, a nonionic surfactant, and an amphoteric surfactant. Particularly preferred surfactants comprise a fluorinated surfactant. The masking material can further comprise an alcohol (*e.g.* a straight chain alcohol such as ethanol, methanol, propanol,

etc.). The alcohol, when present typically ranges from about 0.5 percent to about 12 percent by weight of the masking material. The masking material can further comprises a thickener (*e.g.* a neutralized crosslinked acrylate copolymer, a neutralized crosslinked polyacrylic acid, a neutralized polyacrylic acid, an algin, a carboxy methyl cellulose, a neutralized polymethacrylic acid, a neutralized ethylene-acrylic acid copolymer, methocel, gum arabic, a cellulose gum, a neutralized styrene acrylic acid copolymer, *etc.*). When present the thickener preferably ranges from about 0.1 to about 30 weight percent of the masking material, more preferably from about 0.5 to about 5 or 10 weight percent of the masking material. The masking material can also comprise a preservative.

10 In certain preferred embodiments, the polysaccharide is selected from the group consisting of starch, carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, algin, gum arabic, alginic acid, and a cellulose gum; and the masking material further comprises a surfactant. The masking material can further comprise a thickener (*e.g.* EP-1) and/or an alcohol. In a particularly preferred embodiment, the polysaccharide is present in an amount ranging from about 1 to about 20 weight percent of the masking material; the plasticizer is present in an amount ranging from about 1 to about 15 weight percent of the masking material; the masking material further comprises a thickener ranging from about 0.1 to about 5 weight percent of the masking material, and the masking material, optionally includes a preservative. In another particularly preferred embodiment, the polysaccharide is present in an amount ranging from about 1 to about 20 weight percent of the masking material; the plasticizer is sorbitol ranging from about 3 to about 8 weight percent of the masking material; the thickener ranges from about 0.1 to about 5 weight percent of the masking material, and a preservative is optionally present. In one most preferred embodiment, the polysaccharide is present at about 5 weight percent of the masking material; the plasticizer is sorbitol at about 3.4 weight percent of the masking material; the thickener is present at about 0.72 weight percent of said masking material; and the masking material further comprises a preservative. In certain embodiments, the polysaccharides are not cellulose or cellulose derivatives.

30 In another embodiment, this invention provides masking materials comprising dextrin as a film former. Preferred compositions comprise an aqueous solution/suspension of i) a dextrin present in an amount ranging from about 2 to about 90 weight percent of the composition; a plasticizer present in an amount sufficient to prevent cracking of the film formed when the composition is dried; and a thickener present in an amount ranging from

about 0.5 to about 5 weight percent of said composition. Preferred compositions, when applied to a painted automobile surface, dry to form a dry continuous film that protects the underlying surface (*e.g.* a painted automobile surface) from paint in a painting operation and that can be removed from the underlying surface with a water wash without marring or disfiguring the underlying surface. In certain embodiments, the dextrin (*e.g.*, tapioca dextrin, corn dextrin, potato dextrin, maltodextrin, *etc.*) is present in an amount ranging from about 2 to about 50 weight percent of the composition.

In particularly preferred embodiments, the plasticizer comprises a simple sugar (*e.g.* glucose, sucrose, and fructose) and/or a material selected from the group consisting of sorbitol, glycerin, sucrose, urea, polyethylene glycol, polypropylene glycol, polyglycerol, and glycerol. In certain embodiments, the plasticizer is present in an amount ranging from about 0.2 to about 12 weight percent of the masking material. The masking material can further comprise a surfactant, preferably in an amount effective to produce a coating that lays out smoothly in a substantially continuous film (*e.g.* typically at an amount up to about 2%, by weight, of the masking composition). Preferred thickeners include, but are not limited to a neutralized crosslinked acrylate copolymer, a neutralized crosslinked polyacrylic acid, a neutralized polyacrylic acid, an algin, a carboxy methyl cellulose, a neutralized polymethacrylic acid, a neutralized ethylene-acrylic acid copolymer, methocel, gum arabic, a cellulose gum, and a neutralized styrene acrylic acid copolymer. The thickener preferably ranges from about 0.5 to about 5 weight percent of the composition and more preferably from about 0.5 to about 1 weight percent and most preferably comprises about 0.72 weight percent of said composition. One particularly preferred thickener is a crosslinked acrylate copolymer (*e.g.* EP-1).

In certain embodiments, the composition further comprises an alcohol (*e.g.* a straight chain alcohol such as ethanol, methanol, propanol, *etc.*). The alcohol, when present, is typically present in a concentration ranging from about 0.5 percent to about 12 percent by weight. The composition can, optionally, further comprise a preservative.

In certain embodiments, the said dextrin is present in an amount ranging from about 1 to about 20 weight percent of the composition; the plasticizer is present in an amount ranging from about 1 to about 15 weight percent of said composition; the thickener is present at about 0.72 weight percent of the composition, and the composition, optionally includes a preservative. In certain particularly preferred embodiments, the dextrin is a maltodextrin ranging from about 1 to about 10 weight percent of the composition; and the

plasticizer is sorbitol ranging from about 1 to about 5 weight percent of the composition. In other particularly preferred embodiments, the dextrin comprises about 5 weight percent of the composition.

This invention also provides methods of use of the compositions (masking materials) described above. In one embodiment, this invention provides a method of temporarily protecting a surface in a coating operation. The method involves a) applying one or more of the masking materials described herein to the surface, whereby the applying resulting in a substantially continuous film of the masking material; b) coating all or a portion of the surface with an overcoating compound (*e.g.* a paint or lacquer), whereby the masking material prevents the coating compound from contacting the underlying surface; and c) removing the masking material from the surface whereby the coating compound applied to the surface covered with the masking material is removed together with the masking material. In certain embodiments, the surface comprises a surface of a motor vehicle (*e.g.* a car, truck, motorcycle, *etc.*). In certain embodiments, the surface comprises a surface of a paint booth (*e.g.* floors, and/or walls, and/or ceiling).

In still another embodiment, this invention provides articles of manufacture comprising a surface coated with a protective "masking" composition as described herein.

This invention also provides a method of storing or transporting a vehicle having a painted surface. The method involves coating the painted surface with a protective "masking" composition described herein, drying the composition to form a dry protective film; storing or transporting the vehicle; and washing the dry protective film from said vehicle with a water wash.

BRIEF DESCRIPTION OF THE DRAWINGS

[Not Applicable]

DETAILED DESCRIPTION

I. Protective coating compositions and their use.

The present invention provides improved methods and compositions for protecting a vehicle (*e.g.* motor vehicle) or other surface subject to a coating operation such as painting, or for protecting a surface of an article manufacture during an assembly operation. For example, in one embodiment, certain regions of an automobile, or other surface, may be

masked using the coating compositions of the present invention to protect those regions from paint overspray in a painting booth. In another embodiment, an article of manufacture (*e.g.* an automobile panel) may be protected from mechanical impact and/or abrasion by the presence of such an overcoating.

5 In addition it is also often desired to protect the surfaces of the area in which an overcoating operation (*e.g.* painting) is performed. In particular, it is desired to protect the walls, floors and other surfaces of such an area (*e.g.* a painting booth) from paint overspray and spills. In addition, it is also desirable to reduce airborne dust in such areas during overcoating operations.

10 This invention provides compositions and methods to meet these needs. In preferred embodiments, the methods entail coating the surface to be protected (*e.g.* surface of a car or truck or the walls and/or floors of a spray booth) with a temporary protective coating composition. One or more coating (*e.g.* painting) operations, and/or mechanical/handling operations are performed and, when desired, the protective composition is removed (*e.g.* by a
15 simple water wash).

 The coating compositions of this invention, when applied to a surface (*e.g.* the surface of an automobile), produce a substantially continuous dry film that adheres well to the underlying surface. By "substantially continuous film" it is intended to mean herein a film generally lacking pinholes through which, oil, paint, dust, or other materials could reach the
20 underlying surface. Further, the material can be removed easily from the surface to be protected after use with a water wash, or by mechanical means such as scraping or peeling, or by combinations of these methods. In addition, because the material is biodegradable, it may be simply disposed of (*e.g.*, washed down a sewer) with no substantial environmental impact.

 In particularly preferred embodiments, the coating compounds of this invention
25 utilize polysaccharides (*e.g.* dextrans, cellulose derivatives, starches, *etc.*) or, more generally, carbohydrates (*e.g.* compounds or molecules typically composed of carbon, oxygen and hydrogen in the ratio of 2H:1C:1O, including, *e.g.*, simple sugars such as sucrose and fructose or complex polysaccharide polymers such as chitin.), optionally in combination with various thickeners, as a film former. When formulated as described herein, the polysaccharide or
30 carbohydrate compositions provide effective protection of an underlying surface against paint spray, mechanical insult, and the like. It was a particularly surprising discovery of this invention that the polysaccharide coatings described herein, can be applied to a painted automobile surface, effectively protect the underlying surface during a commercial painting

operation (*e.g.* spray painting, temperature cycling, *etc.*), and are easily washed off leaving the underlying surface in pristine condition.

It was also a discovery of this invention that the polysaccharide (*e.g.* dextrin) and water based compositions of this invention neutralize the isocyanates typically found in many overcoating compositions (*e.g.* automobile paint). Because the isocyanates are neutralized by contact with the coating composition, they may also be washed away with the protective coating with no substantial environmental impact.

A preferred method of protecting surfaces according to this invention includes steps of applying the coating compositions to the surface to be protected in a substantially continuous film. The compositions are then dried to form a coating that protects the underlying surface from the coating operation (*e.g.* paint overspray). The coating may be subsequently removed from the surface by simply washing with water when it is longer required. In a particularly preferred embodiment, the coatings of the present invention are used to protect components of motor vehicles (*e.g.* automobiles or automobile surface finishes), and the walls and floors of spray booths or other areas or structures that may be contacted with overspray in a coating (*e.g.*, painting) operation.

In one embodiment, the coatings of this invention include a polysaccharide (*e.g.* a dextrin), a plasticizer and water. The polysaccharide comprises from about 2 percent to about 90 percent, preferably from about 5 percent to about 80 percent, more preferably from about 5 percent to about 50 or 60 percent, by weight of the composition before drying. In certain embodiments, the polysaccharide film former (*e.g.* a dextrin) is combined with a thickener and is then preferably present in lower concentrations (*e.g.* about 2 percent to about 80 percent, preferably about 5 percent to about 70 percent, more preferably from about 7 percent, about 10 percent, about 15 percent, or about 20 percent to about 80 percent, about 70 percent, about 60 percent or about 50 percent).

In one preferred embodiment, the polysaccharide is a dextrin which comprises from about 2 percent to about 50 or 60 percent, more preferably from about 2 percent to about 30 or 40 percent, most preferably from about 5 percent to about 20 or 30 percent, by weight, of the composition. In certain high-solids formulations, the polysaccharide comprises about 10 to about 80 percent, preferably about 15 to about 60 percent and most preferably about 20 to about 40 percent, by weight, of the composition. One particularly preferred embodiment comprises about 30 to 40 percent, by weight, dextrin.

II. Polysaccharides as film formers.

In various embodiments, the compositions of this invention utilize one or more polysaccharides as film formers. A wide variety of polysaccharides are suitable for use in the present invention. Such polysaccharides include, but are not limited to
5 hemicelluloses (*e.g.* arabinoxylans, glucomannans), plant gums (*e.g.* guar gum, locust bean gum) cellulose and derivatives thereof (*e.g.* ethyl celluloses, hydroxyethyl celluloses, carboxymethyl celluloses), starch and starch derivatives (*e.g.* hydroxyethyl starch), microbial polysaccharides (*e.g.* xanthan gum, curdlan, pullulan, dextran), algal
10 polysaccharides (*e.g.* agar, carragenans, alginic acid), chitin, chitosan and their derivatives, and the like. Particularly preferred polysaccharides include, but are not limited to starch, carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, algin, dextrin, gum Arabic, alginic acid, or a cellulose gum. In a most preferred embodiment, the polysaccharide is a dextrin (*e.g.*, a tapioca dextrin, corn dextrin, potato dextrin, a maltodextrin, *etc.*).

15 Some polysaccharides are conveniently made into films by precipitation from an aqueous solution under evaporation (*e.g.* locust bean gum, dextran, xanthan). Other polysaccharides must be solubilized in alkaline media (*e.g.* curdlan and other β -1,3-glucans). When neutralized some of these will form supersaturated solutions capable of forming films on evaporation. Some of the polysaccharides will pass over a gel state before
20 forming films.

The concentration of the polysaccharide used in the solution thereof may vary within broad limits and the solutions may contain from about 2 percent up to about 90 percent, with preferred concentrations being as indicated above.

In certain preferred embodiments, the molecular weight of the
25 polysaccharides ranges from about 50 Da to about will be about 10,000 Da, preferably from about 100 Da to about 5,000 Da, more preferably from about 500 Da to about 3000 Da, and most preferably from about 1000 Da to about 3,000 Da.

Mixtures of two or more polysaccharides may, of course, be used if desired, and such combinations of two polysaccharides. In addition, mixtures of two or more
30 polysaccharides in which one is typically regarded as a thickener are also preferred in certain embodiments.

It is important to note that the process of the invention when practically utilized results in a dry, solid, film, in which the polysaccharides are typically present in an essentially amorphous state. As indicated above, preferred polysaccharides include, but are not limited to, various cellulose derivatives, and starch and various starch derivatives, with
5 dextrans being most preferred.

In a particularly preferred embodiment, the protective compositions of this invention utilize dextrans as film formers. Dextrans are widely known as products of the hydrolysis of starch, often by amylases. More specifically, dextrans are polymers of D-glucose, characterized by an $\alpha(1-4)$ linkage, which are intermediate in complexity between
10 starch and maltose. The viscosity of dextrans, in aqueous solution, varies depending on dextrin length and degree of branching. However, compared with the original starch, dextrans produce aqueous solutions of lower viscosity. Commercially available dextrin typically comprises a mixture of higher viscosity and lower viscosity dextrans. As used herein, the term "dextrin" refers to that combination of higher and lower viscosity dextrans as would be obtained in a
15 typical commercial preparation such as Amaizo 1895 (Cerestar C*+08602), 1890 (Cerestar C*+08601), and 1885 (produced by American Maize Products Co., now owned by Cerestar), Amiogum 35 (EmCap06377), and the like. Preferred dextrans have a viscosity ranging from about 12 to about 20 seconds, more preferably from about 12 to about 15 seconds, and most preferably about 12 seconds in an aqueous solution comprising 40 percent solids (dextrans), as
20 measured using a number 3 Zahn cup. When measured as an aqueous solution comprising about 50 percent solids (dextrin) a most preferred dextrin has a viscosity ranging from about 95 to about 100 centipoise. One such preferred dextrin is an off-specification Amaizo 1895 designated Amaizo 2686N dextrin, available from American Maize Products, Co.).

While the "Amaizo" dextrans are derived from maize, dextrans derived from
25 other sources are also suitable. These include native dextrans of any origin, synthetic, natural or hybrid, derived, for example from potatoes, manioc, corn, waxy corn, corn with high amylose content, wheat, rice, and the like. Other preferred embodiments utilize tapioca dextrans (also known as crystal gum, *see e.g.* K4484 from National Starch and Chemical Col, Birdgewater N.J.) and/or maltodextrans (*e.g.*, Star-Dri 180, A.E. Stanley
30 Co.). Preferred maltodextrans are products produced from corn starches. They are classified by "dextrose equivalent" or DE, which is a measure of the reducing sugars present calculated as dextrose and expressed as a percentage of the total dry substance. Preferred maltodextrans have DE values of less than about 20, more preferably less than about 15 and

most preferably have a DE value of about 10. By comparison, dextrose of glucose has a DE of 100.

Dextrin is utilized in the films of the present invention to provide solids and to build film thickness. It was an unexpected discovery of the present invention, that the use of dextrans provides masking compositions that show exceptional coating, film forming, and drying properties. In particular, the use of high concentrations of dextrans allow the buildup of a thick coating which nevertheless shows relatively low viscosity, good coating properties and an extremely rapid drying time. This is in dramatic contrast to starch-based compositions that typically cannot achieve comparable high solids concentration. Starches form highly viscous aqueous solutions that tend to gel at a solids concentration far too low to permit formation of a continuous protective film. Prior to the present invention, it was unknown and unsuspected that the use of dextrans would overcome this limitation and form the basis of an effective paint masking composition.

The quantity and type of dextrin in the coating composition may be optimized for a particular application. This is accomplished empirically. Generally where it is desired that the composition dry to provide a thicker final coating more solids (dextrin) are added to the composition. However, the upper limits to dextrin concentration are dictated by the resulting viscosity of the composition. The viscosity of the wet coating must be low enough to permit application to and continuous coating of the surface. Thus, in order to produce a thick coating one increases the solids concentration, but not beyond a point where the composition becomes difficult or impossible to apply. Conversely, where a thin coating is desired, the solids composition may be decreased, but not to a point where the composition fails to form a continuous protective coating when dried.

It was a discovery of this invention, that where a thicker coating is desired, maltodextrans are particularly effective. Moreover, the maltodextrans dry to form a somewhat tacky coating and help to capture and retain airborne dust particles thereby helping to provide a reduced dust or dust-free environment for the overcoating operation. Because they produce a thick and relatively tough film, maltodextrans are particularly well suited in coating compositions designed for use on floors (*e.g.* floors of paint booths). Maltodextrans typically tend to yellow when subjected to drying cycles (heat). However, discoloration is rarely an issue for protective floor coverings.

In contrast, tapioca dextrins tend to form thinner coatings that dry quickly. The tapioca dextrins do not discolor on repetitive heating and hence are particularly well suited to applications on surfaces such as walls (*e.g.* the walls of a spray booth).

To some extent, the optimal solids content of the mixture is a function of the application method. It is expected that the composition may be applied by a variety of methods known to those of skill in the art. These methods include, but are not limited to painting, dipping, spraying, reverse roller coating, and the use of doctor bars. One of skill in the art will appreciate that application by spraying will generally require a composition of lower viscosity than application by the use of doctor bars. Thus a composition intended for application by spraying may contain a lower solids concentration than a composition applied by dipping or doctoring.

III. Plasticizers.

The coatings of the present invention also include a plasticizer to provide toughness and flexibility and in particular to prevent cracking of the film during drying and subsequent handling. Suitable plasticizers are well known to those of skill in the art and include, but are not limited to glycerine, sorbitol, simple sugars (*e.g.* glucose, sucrose, levulose, dextrose, *etc.*), urea, triethylene glycol, polyethylene glycol, polypropylene glycol, polyglycerol, glycerol, and other water soluble plasticizers. These plasticizers may be used alone, or in combination with each other. A particularly preferred combination of plasticizers is urea in combination with glycerine or glycerine derivatives such as glycerine monostearate or glycerine monooleate. Another particularly preferred combination is glycerin in combination with sorbitol.

Sorbitol, urea and glycerine are most preferred as plasticizers. In one preferred embodiment the plasticizer is simply sorbitol. When expressed as a percentage of the total coating compositions, the coatings utilizing urea as a plasticizer preferably include about 4 percent to about 12 percent urea, more preferably about 6 percent to about 12 percent urea and most preferably about 7 percent to about 12 percent urea, while the coatings utilizing glycerine and/or sorbitol as plasticizer preferably include about 0.8 percent to about 30 percent glycerine and/or sorbitol, more preferably about 3 to about 16 percent glycerine and/or sorbitol, and most preferably about 4% or 5% to about 10% glycerine and/or sorbitol.

In order to prevent cracking, the coatings of the present invention that are force dried typically require a higher plasticizer concentration than the coatings that are simply air dried. Thus, coatings that are simply air-dried may contain plasticizer in concentrations near the lower end of the ranges provided above. Thus, the air-dried coatings contain about 4 percent (10 percent, by weight, of the dextrin) urea or 0.8 percent (2 percent, by weight, of the dextrin) glycerine. Conversely, force dried coatings preferably contain higher concentrations of plasticizer. Thus, the force-dried coatings may contain about 7.2 percent (18 percent, by weight, of the dextrin) urea or about 2 percent (5 percent, by weight, of the dextrin) glycerine. Of course, coatings containing the higher amounts of plasticizer may be air dried as well. In addition, coatings containing the lower amount of plasticizer may often be successfully force-dried.

IV. Surfactants

The coatings of the present invention may additionally contain a surfactant. Suitable surfactants include, but are not limited to anionic surfactants (*e.g.*, alkyl sulfates (*e.g.* RhodaponTM), ether sulfates (*e.g.* RhodapexTM), sulfonates (*e.g.* RhodacalTM), dodecylbenzene sulfonates, alpha-olefin sulfonates, diphenyl oxide disulfonates, phosphate esters (*e.g.* RhodafacTM), carboxylates (*e.g.* MiranateTM), *etc.*), cationic surfactants (*e.g.*, imidazolines (*e.g.* MiramineTM), ethoxylated amines (*e.g.* RhodameenTM, *etc.*), non-ionic surfactants (*e.g.*, nonylphenol ethoxylates (*e.g.* Igepal CO series), octylphenol ethoxylates (*e.g.* Igepal CA series), nonionic esters (*e.g.* AlkamulsTM), oleyl alcohol ethoxylates (*e.g.* RhodasurfTM), ethoxylated mercaptans (*e.g.* AlcodetTM), capped ethoxylates (*e.g.* AntaroxTM), blocked polymers, *etc.*), and amphoteric surfactants (*e.g.*, imidazoline derivatives (MiranolTM), fatty amine derivatives (*e.g.*, MirataineTM), *etc.*). In certain preferred embodiments, the masking composition includes nonionic alkyl aryl surfactants such as Triton CF-10 and CF-12 (Rohm & Haas, Philadelphia, Pennsylvania, U.S.A.). Also suitable is Triton X-100 and surfactants having fluorinated alkyl chains such as "Fluorad" products sold by Minnesota Mining and Manufacturing (St. Paul, Minnesota, U.S.A.) and "Zonyl" products sold by DuPont Company (Wilmington, Delaware, U.S.A.) are also suitable. In addition, many embodiments include polyethoxy adducts or modified (poly)ethoxylates such as Triton DF-12 and DF-16 sold by Union Carbide (Danbury, Connecticut, U.S.A.). Other surfactants include nonylphenoxypolyethanol (such as IGEPAL CO-660 made by GAF), polyoxyalkylene glycol (such as Macol 18 and 19 made

by Mazer Chemicals), acetylenic diol-based surfactants (such as Surfynol 104A made by Air Products), and the like. Preferred compositions include up to 5 percent surfactant. More preferred compositions include less than 2 percent surfactant, and most preferred compositions include about 1 percent, or less, by weight, surfactant.

5 To provide a continuous and level film, the masking composition should adequately wet the surface to be protected. However, many surfaces, in particular, car body finishes, are themselves highly hydrophobic or purposely treated (*e.g.* waxed) to have a low surface free energy so that water will bead. To facilitate wetting and thereby prevent the masking composition from beading, the surface tension of the masking composition may be
10 lowered by the addition of a surfactant.

A primary role of the surfactant in the masking composition is to wet the substrate thereby leading to the formation of a continuous film. A sufficiently continuous protective film could be obtained with little or no surfactant so long as the masking composition contains a very high solids content (*e.g.*, high concentrations of dextrin). Films
15 containing high solids concentrations are often highly viscous and therefore difficult to apply, especially by spraying. While, as explained above, the use of dextrans allows the production of coatings with a high solids content, the use of surfactants or other wetting agents is preferred as coatings containing surfactants show superior film-forming properties in a variety of application methods.

20 In certain embodiments, the wetting properties of the coating compositions may be improved by adding certain surfactant compositions, and/or by adding various water soluble alcohols such as propanol, methanol, or isopropyl alcohol, or by adding aliphatic polyols such as water soluble alcohols up to octanol. In particularly preferred embodiments, surfactants are used in the masking compositions of the present invention.

25 Preferred surfactants for use in the masking compositions of the present invention should have certain beneficial properties. For example, they should reduce the surface tension of the composition to a sufficiently low value that a level film, free of pinholes, is laid down. In most instances the surfactant will reduce the surface tension of the masking composition to at most about 25 dynes per centimeter, and more preferably to at most about 20
30 dyne/cm. To avoid formation of pinholes, the surfactant should not foam. Further, the surfactant should work with a variety of surfaces such as those containing silicones, acrylic waxes, teflon® waxes, clear coats, natural and hydrocarbon waxes, *etc.* Still further preferred surfactants will be relatively inexpensive, will provide a product that does not spot, streak, or

frame (*i.e.*, evaporate faster at edges such as molding and/or trim) on the surface to be protected. Finally, the surfactant should be water soluble and otherwise compatible with the other components of the masking composition so that the composition does not separate and leave pinholes when dry.

5 Because many surfaces to be protected will have unusually low surface free energies, the surfactant should be able to dramatically lower the surface and interfacial tensions of the masking composition. Compositions having very low surface tensions also tend to produce many fewer pinholes in the coating. Thus, any of the known classes of very low surface tension surfactants are preferred for use with this invention. One such class is the
10 alkoxyates of fluorinated alkyl chains. Other functional derivatives (*e.g.*, esters, sulfonates, carboxylates, ammonium compounds, *etc.*) of fluorinated alkyl chains also tend to produce low surface tension aqueous solutions. In general, replacement of hydrogens on an alkyl group by fluorine atoms leads to surfactants of unusually low surface tension. The above mentioned "Fluorads" and "Zonyls" are examples of surfactants having fluorinated alkyl chains.

15 It has been discovered that a particularly preferred embodiment includes 2 percent of a 10 percent aqueous solution of CF-10 or Triton X-100 giving a final concentration of 0.2% surfactant. Another preferred embodiment utilizes a sulfonated surfactant (*e.g.*, D-40 or N-300 from BioSoft, Stepan Company) alone or in conjunction with one or more fluorinated surfactants (*e.g.*, Fluorad FC 171 or FC 430, 3M Corporation). However, any combination of
20 compatible surfactants that produce sufficient leveling on a given surface can be used. Particularly preferred compositions will provide a level film on a variety of different surfaces and will not spot, streak or frame when the film is rewetted.

 The total surfactant in the material may include two or more different surfactants. In some embodiments, a "bulk" surfactant from a different chemical class will
25 be admixed with a fluorinated surfactant to promote low interfacial tension and good rewetting properties. Preferred bulk surfactants will allow the mask to be rinsed off easily without spotting or streaking the underlying protected surface. Preferred bulk surfactants will produce very little or no foam during application or rinsing. They should also be relatively inexpensive. Suitable bulk surfactants include various compounds such as
30 polyethoxylates and, in one case, octylphenoxypolyethoxyethanol. A particularly preferred bulk surfactant for use with Fluorad FC 171 and Fluorad FC 430 is Triton DF-16, a nonionic polyethoxylate or Turkey Red (Actrasol C-75, Climax Co.).

One particularly preferred formulation includes not over 2% total surfactant, but up to about 0.02%, more preferably about 0.01% to about 0.02% and most preferably about 0.01% to 0.02% of one or more fluorinated surfactants. One such surfactant comprises about 0.06% Fluorad FC 171, about 0.04% Fluorad FC 430 and about 1.0% Triton DF-16 or Turkey Red (Acrysol 75). Another preferred formulation comprises about 0.5% sulfonated surfactant (BioSoft N-300) about 0.03% Fluorad FC 171 and about 0.02% Fluorad FC 430. In still another particularly preferred embodiment for use on painted automobile surfaces, the surfactant is a combination of a sulfonated surfactant (*e.g.* Stephan BioSoft N300) and a non-ionic surfactant (*e.g.* an oleyl alcohol ethoxylate *e.g.*, Rhodasurf DA630).

10 V. Thickeners.

Where substantial film build is desired the coating compositions of this invention can additionally include one or more thickeners. The thickener may be utilized to regulate the viscosity and film thickness of the protective coating composition. Thickeners are typically known to render the composition thicker so that it can be more easily applied to a vertical work surface. Thickeners also known to prevent the undesirable phenomenon of "sagging" in which the coating becomes thinner near the top of a vertical work surface.

It was a surprising discovery, however, that thickeners, offer previously unsuspected advantages in the formulation of polysaccharide-based protective coatings for paint overspray (masking coatings). In particular, it was a discovery of this invention that thickeners dramatically increase the resistance of the dry film to incidental contact with moisture. Without thickeners, when the polysaccharide-based film was subjected to incidental moisture, (*e.g.* dew/condensation when the coated automobile is stored outside overnight, incidental condensation on very humid days, incidental splash/misting from washing operations, *etc.*), the moisture would tend to leach the plasticizer out of the coating. This would cause voids, sagging, and localized surface crazing, cracking, or local film removal resulting in paint bleed through.

Without being bound to a particular theory, it is believed that incorporation of a thickener into the paint film results in local swelling of the thickener where the moisture contacts the film. The thickening tends to hold the film in place preventing film wash-down and blocking plasticizer leaching. Thus preferred thickeners for use in this invention include thickeners that thicken in response to water.

In addition, thickeners add some film-forming capability and thereby reinforce the film, and eliminate film cracking.

Preferred thickeners are compatible with water-based solutions and include, but are not limited to, gums (*e.g.* xanthan gum) kelgin, carboxymethylcellulose, hydroxymethyl cellulose, methylcellulose, *etc.* Acrylic thickeners selected for low water sensitivity (*e.g.*, Carbopol® EP1) are also suitable, as are associative thickeners. Alkali-swelling acrylic emulsion thickeners capable of imparting shear-thinning characteristics (*e.g.*, Carbopol® EP1) may also be used this invention.

Particularly preferred thickeners for use in this invention include, but are not limited to crosslinked acrylate copolymers (*e.g.* B.F. Goodrich EP-1), crosslinked polyacrylic acid (*e.g.* B.F. Goodrich EZ-1, EDT2691), polyacrylic acid (*e.g.* B.F. Goodrich K-702), polymethacrylic acid, ethylene-acrylic acid copolymers (*e.g.* Morton 4983), styrene acrylic acid copolymers, acrylic ester copolymers with acrylic acid or methylacrylic (*e.g.* Rohm and Hass ASE 75), all of which are, in preferred embodiments, neutralized. Also included are algin (*e.g.* Nutrasweet Kelzane), carboxymethyl cellulose, carboxyethylcellulose, hydroxypropylcellulose, methocel, gum arabic, and the like.

In certain embodiments, the thickener(s) may be present at about 0.1 to 3 percent, more preferably at about 0.2 percent to about 1 percent, and most preferably at about 0.25 percent, by weight, of the composition.

However, in particularly preferred embodiments, the thickener(s) range from about 0.1 to about 30 weight percent, preferably from about 1 to about 20 weight percent, more preferably from about 1 to about 15 weight percent, and most preferably from about 1 or 2 to about 5 or 10 weight percent of the masking material.

VI. pH Adjustment.

Preferred embodiments may also include components to adjust pH. Means of adjusting pH are well known to those of skill in the art. In particular, where the composition is to be used as a masking composition on an automotive finish, it is often desirable to adjust the composition to a basic pH of about 8 to about 9. This may be accomplished by the addition of one of a number of water soluble bases well known to those of skill in the art. These include, but are not limited to sodium hydroxide, sodium bicarbonate and amine bases such as pyridine and ethylamine and ammonia. In one

particularly preferred embodiment, the pH of the coating composition is adjusted to a slightly basic pH (*e.g.* pH ~ 8.0).

VII. Preservatives.

The constituents of the coating compositions of this invention are largely organic compounds that will readily support the growth of microorganisms such as microbes, fungi, and the like. Thus, in one embodiment, to increase storage life, it is desired to include a preservative. The term "preservative", as used herein, is intended to designate a substance showing antimicrobial properties, in particular bactericidal properties and preferably also antifungal properties. Preservatives are well known to those of skill in the art and include, but are not limited to anti-bacterial agents, anti-fungal agents, bacteriostatic agents, fungistatic agents, and enzyme inhibitors. Suitable preservatives include, but are not limited to benzoic acid, sorbic acid or the salts thereof, thimerosal (or merthiolate), phenyl mercuric acetate, phenyl mercuric nitrate, detergents (*e.g.* benzalkonium chloride), and sodium azide. Preferred preservatives are relatively or completely non-toxic to higher animals (*e.g.* mammals) and, thus, preservatives commonly used in foodstuffs and medical products are suitable. Such preservatives include, but are not limited to ethyl alcohol, chlorhexidine gluconate, sorbic and benzoic acid and their salts, and the like. Other preferred preservatives include Kathon LX (Rohm Haas, Inc.) and BTC 2125 (Stephan Chemical Co., Inc.).

VIII. Other preferred formulations.

In another preferred embodiment, the masking compositions of the present invention may include an aliphatic polyol such as polyvinyl alcohol in addition to the dextrin. When present a polyvinyl alcohol comprises from about 2 percent to about 15 percent, more preferably from about 5 percent to about 12 percent and most preferably about 10 percent, by weight, of the masking composition. One particularly preferred aliphatic polyol is DuPont Corporation's Elvanol 5105 having a molecular weight of about 15,000 to about 27,000 daltons. The aliphatic polyol component may include two different polyols having different molecular weight ranges. For example, DuPont Corporation's Elvanol 5105 (15,000 to 27,000 daltons) and Elvanol 5042 (70,000 to 100,000 daltons) can be used together in some formulations.

It has been found that for general purposes, a superior masking material includes dextrin, a plasticizer, a surfactant and water. According to preferred embodiments, the composition includes about 10 to about 50 percent dextrin, about 5 to about 50 percent plasticizer and not over 2 percent total surfactant. The surfactant may comprise up to about 5 0.05 weight percent fluorinated surfactant.

Thus, one particularly preferred embodiment, particularly well suited to application to walls comprises about 10% tapioca dextrin, about 3% of a 70% sorbitol solution, about 6% sucrose, about 3% glycerin, about 0.5% sulfonated surfactant, about 0.03% Fluorad FC 171, about 0.02% Fluorad FC430, about 0.25% xanthan gum, and about 50 ppm kathon lx 10 preservative.

Another embodiment well suited to application to walls comprises about 15% tapioca dextrin, about 6% of a 70% sorbitol solution, about 2% sulfonated surfactant, about 0.5% keltone thickener, and about 50 ppm kathon lx preservative.

An embodiment well suited for application to floors comprises about 30% 15 maltodextrin, about 6% of a 70% solution of sorbitol, about 6% glycerin, about 1% of a sulfonated surfactant, about 0.005% triethanolamine, and about 50 ppm kathon lx preservative.

Another preferred embodiment includes about 33 percent dextrin, about 7 percent plasticizer, and about 1.01 percent surfactant comprising about 0.01 percent fluorinated surfactant. The plasticizer may be urea or urea in combination with glycerine or a glycerine 20 derivative such as glycerine monostearate or glycerine monooleate.

In still another preferred embodiment the coating composition may include about 40% dextrin and about 0.2 percent surfactant (*e.g.* Triton CF-10 or Triton X-100 by Rohm and Haas), plasticizer, and the remainder water. Thus one particularly preferred embodiment includes about 40 percent dextrin, 8 percent urea, 2 percent of a 10 percent (w/v) 25 aqueous solution of surfactant (*e.g.* Triton CF-10), and 50% water. In another preferred embodiment, the 8 percent urea or the preceding embodiment is substituted with a combination of urea and glycerine comprising about 2 percent (of the total composition) glycerine and 5 percent (of the total composition) urea. In yet another embodiment, the 8 percent of urea may be replaced with about 2 percent glycerine and the water may be increased 30 to about 56 percent of the total composition. Yet another embodiment, particularly suitable for force drying, includes about 40 percent dextrin, about 20 percent urea, about 2 percent of a 10 percent (w/v) solution of surfactant (*e.g.* Triton X-100), and about 38 percent water.

Finally, one preferred embodiment, including an aliphatic polyol includes about 20 percent dextrin, about 10 percent polyvinyl alcohol (*e.g.* Elvanol 5105), about 3 percent glycerine, about 2 percent of a 10 percent (w/v) of a surfactant (*e.g.* Triton CF-10) and about 65 percent, by weight, water.

5 The mask composition is an aqueous solution and therefore includes a substantial amount of water before drying. A variety of other materials may also be included in the coatings to confer specific additional properties. Thus, for example, the coating compositions may additionally include dyes or colorants, antioxidants or corrosion inhibitors, ultra-violet inhibitors, flash rust inhibitors and the like. Preferred embodiments may include
10 foam reduction or foam control agents such as FoamMaker™, Bubble Breaker™, and 1 and 2 octanol. Antistatic compounds (preferably water soluble antistatics such as Larostat 264A made by Mazer Chemicals) may be added in preferred embodiments prevent dust from being drawn to the surface. Preferred embodiments may also include sequesterants (typically less than 1%).

15 **IX. Coating Preparation.**

The coating solutions are made by conventional means which typically comprise mixing the components of the masking material at substantially atmospheric pressure, so as to form a homogeneous solution. Heat may be applied to speed preparation of the coating solution. After formation of a homogeneous solution, the pH may be adjusted
20 as discussed above. In a particularly preferred embodiment, the pH is adjusted to pH 8-9 by the addition of ammonia or other pH adjusting reagents.

The coating compositions are conveniently formulated as aqueous (water-based) solutions or emulsions. The aqueous formulation generally lacks toxic solvents and is therefore relatively easy to handle and work with and is readily disposed of without
25 adverse environmental impact. Thus, it is generally desirable to avoid the inclusion of any reagents (*e.g.* oil, organic solvents, *etc.*) that impose difficulties in handling and/or disposal. Preferred coating compositions are therefore aqueous compositions substantially or completely oil free and free of organic solvents.

X. Coating Application.

30 The coating (masking) material is applied by one of a variety of techniques known to those of skill in the art. These include painting, dipping, spraying, reverse roller

coating, and the use of doctor bars. Particularly preferred techniques include brushing and spraying of the material. In one preferred embodiment the surface to be protected is blown dry of dust and debris. In some cases, additional water may be added for easier application, such as a 10% dilution. Thereafter, the masking material is applied with a pressure pot sprayer, preferably first in a thin mist and, thereafter, in a flow coat or thicker substantially continuous film. For some applications, the mist coat will not be necessary. The mask material is sprayed primarily on the surface to be protected, although overspray will not pose significant problems since any overspray may be readily removed with, for example, a wet towel or sponge.

10 In preferred embodiments, the resulting masking coating is applied in a wet coating in a thickness ranging from about 1 to about 10 mils, more preferably ranging from about 1 to about 4 mils, and most preferably ranging from about 1 to about 2 mils. This wet coating then dries to form a continuous dry coating ranging from about 0.5 to about 5, more preferably from about 0.5 to about 2 and most preferably from about 0.5 to about 1 mil in
15 thickness.

The masking material is typically permitted to dry at atmospheric temperatures and pressures. For a 1 to 2 mil wet thickness coating, such drying will take about 10 minutes at 70°F and about 50% humidity.

Alternatively, the masking composition may be force-dried. Force drying may
20 be accomplished by means well known to those of skill in the art. These include, but are not limited to the application of heat (*e.g.* radiant heating, oven baking, or hot air blowers), the reduction of air humidity, air movement or any combination of these means. Under forced drying conditions at about 150°F and about 50% humidity, the same coatings will dry in about 2 minutes.

25 After drying of the masking composition, the remaining unprotected surface is then painted or otherwise coated without fear of overspray on the portions of the surface protected by the masking material. If the processing operation includes painting, the paint applied to the surface and allowed to thoroughly dry. Such drying times will vary radically depending upon the particular type of paint utilized.

30 After drying of the paint, the masking material is removed from the protected surface. Such removal operations may include, for example, peeling or scraping of the material off of the protected surface. However, it is most preferred that the masking

composition be removed by normal washing with water. Pressure washing with water may be desired in some instances. The material will be removed readily since it is easily miscible or soluble in water.

5 One of skill in the art will readily appreciate that the steps of applying and drying the masking composition, applying and drying the paint or other subsequent coating, and removing the masking coating may be easily set up for mass production, as in an assembly line.

XI. Stain removal.

10 It has been observed that a number of masking films, when used on painted automobile surfaces, introduce stains into the underlying paint finish. It was a discovery of this invention that such stains are the result of water migration from the masking material into the underlying automotive paint. The masking film thereby locally hydrates the paint surface causing local swelling and resulting discoloration or other patterning. It was a discovery of this invention that such discoloration can be readily eliminated by heating the automobile surface. This is easily accomplished with a heat gun, radiant heater, or by re-baking the automobile.

15 Thus, in one embodiment this invention provides methods of eliminating staining of a painted automobile surface caused by a water soluble protective film. The methods involve exposing the surface of the automobile to a heat source (*e.g.* of sufficient temperature and duration to remove the discoloration, *e.g.* dehydrate the paint surface). Heat can be applied according to any of a variety of methods including, but not limited to the use of a heat lamp, heat gun, or baking of the entire surface.

EXAMPLES

25 The following examples are intended to illustrate the present invention and are not intended to limit the scope of the invention in any way.

Example 1

To produce the various surface protective coatings, designated coating 1 through coating 4, dextrin, a plasticizer, a surfactant and water were combined in the amounts shown in Table 1. The components were combined at room temperature and at atmospheric pressure by slow stirring to form the various surface protective coating

30

compositions shown in Table 1. The homogeneous coating compositions were then adjusted to pH 9 by the addition of ammonia

Table 1. Composition of four dextrin-based masking compositions.

| Ingredient | Weight Percent* | | | |
|---|-----------------|-----------|-----------|-----------|
| | Coating 1 | Coating 2 | Coating 3 | Coating 4 |
| Dextrin Amizo 1895 | 40 | 40 | 40 | 40 |
| Urea Adrich 208884 | 8 | ---- | 6 | 20 |
| Glycerine 96% USP grade, Dow Chemical | ---- | 2 | 2 | ---- |
| Triton CF-10 | 0.2 | 0.2 | 0.2 | ---- |
| Triton X-100 | ---- | ---- | ---- | 0.2 |
| Deionized Water | 51.8 | 57.8 | 51.8 | 39.8 |

5 *Weight percent refers to weight percent of the total wet composition accounted for by the active ingredient.

The coatings were each applied, by spraying, to an automotive body panel test surface thereby masking a portion of the test surface. The coatings were then either air
10 dried or force-dried by heating.

The masked test panel was then sprayed with an automotive body paint and allowed to dry. The coating compositions were then removed from the masked portion of the panel by simply washing the panel with water.

15 The coatings generally provided uniform wetting of the test surface. They dried rapidly, typically a 1 mil layer drying in about 21 minutes at ambient temperature (approximately 60°F and 50% humidity).

The coatings were easily removed by the application of pressurized water and the masked regions showed little or no penetration by the paint.

Example 2

The components illustrated in Table 2 are combined, in the amounts shown, at room temperature and at atmospheric pressure by slow stirring to form a surface protective coating composition. Again, ammonia is added to adjust the pH to pH 9.

5

Table 2. Composition of a dextrin/polyvinyl alcohol based masking composition.

| Ingredient | Weight Percent* |
|------------------------|-----------------|
| Dextrin Amaizo 5985 | 20 |
| Elvanol 5105 | 10 |
| Glycerin | 3 |
| Triton CF-10 | 0.2 |
| Deionized Water | 66.8 |

*Weight percent refers to weight percent of the total composition accounted for by the active ingredient.

10

The composition is applied to a test panel and allowed to dry as described in Example 1. The test panel is then painted and allowed to dry. The masking composition is then washed off of the panel using water to reveal the masked surface.

Example 3

15

Coatings were also prepared using a low viscosity dextrin having a viscosity ranging from about 95 to about 100 centipoise in an aqueous solution comprising about 50% solids. The coating were prepared containing the percentages of dextrin, plasticizer and surfactants as shown in Table 3. Once a homogeneous solution was obtained, the pH was adjusted to 9 by the addition of ammonia.

Table 3. Composition of various low viscosity dextrin compositions.

| Ingredient | Weight Percent | | | |
|---|----------------|-----------|-----------|-----------|
| | Coating 1 | Coating 2 | Coating 3 | Coating 4 |
| Low Viscosity Dextrin Amaizo 2686N | 33 | 33 | 33 | 33 |
| Urea Aldrich 208884 | 7 | 7 | 5.6-5.95 | 5.6-5.95 |
| Glycerine monostearate or glycerine monoleate | -- | -- | 1.05-1.4 | 1.05-1.4 |
| DF16 | 1 | -- | -- | -- |
| Turkey Red Actrasol C-75 | -- | 1 | 1 | 1 |
| FC171 3M | 0.06 | 0.06 | 0.06 | 0.06 |
| FC430 3M | 0.04 | 0.04 | 0.04 | 0.04 |
| Deionized Water | 58.9 | 58.9 | 58.9 | 58.9 |

5 *Weight percent refers to weight percent of the total composition accounted for by the active ingredient.

10 The coatings were applied to test panels by spraying. The coatings generally provided uniform wetting of the test surface. They dried rapidly, typically a 10 mil layer drying in about 21 minutes at ambient temperature (approximately 60°F and 50% humidity).

The coatings were easily removed by the application of pressurized water and the masked regions showed little or no penetration by the paint.

Example 4

15 To compare a dextrin-based coating of the present invention with the commercially available polyvinyl alcohol coating SlimePlus™, each half of a test panel bearing an automotive acrylic finish, was respectively coated with SlimePlus™ or with a dextrin coating comprising the components illustrated in Table 3.

Table 4. Test composition for comparison with SlimePlus™.

| Ingredient | Weight Percent * |
|-----------------------------------|------------------|
| Dextrin Amaizo 1895 | 33% |
| Urea Aldrich 208884 | 7% |
| DF-16 surfactant Union Carbide | 1% |
| FC-171 3M | 0.06% |
| FC-430 3M | 0.04% |
| Deionized Water | 58.9% |

*Weight percent refers to weight percent of the total composition (wet formulation) accounted for by the active ingredient.

**After the components listed above were combined to form a heterogeneous solution, the pH was adjusted to pH 9 by the addition of ammonia.

5
10 The two sides of the panel were simultaneously coated; one with the SlimePlus™ composition and the other with the dextrin composition. The wet coatings were applied in a thickness sufficient to provide a uniform continuous dry film about 1 mil thick. This required about a 10 mils wet coating of SlimePlus™, while only a 2-3 mil wet coating of the dextrin compound.

15 Under ambient conditions (about 62°F and 60% humidity), the dextrin composition dried in about 21 minutes, while the SlimePlus™ coating took well over an hour to dry. Both coatings provided a continuous substantially free of pinholes and dry to the touch.

20 The dextrin based coating, however, eliminated a whitening of black paint observed with SlimePlus™. Without being bound to a particular theory, it is believed that SlimePlus™ passes through a gel phase when drying. This gel phase tends to hydrate the automotive paint coating on the underlying surface producing a temporary local whitening. The dextrin coatings of the present invention eliminate paint hydration and the resulting whitening thereby requiring less post rinse-off cleaning of the underlying (protected) surface.

Example 5

Coatings were also formulated using either a tapioca dextrin (for coatings optimized for application to paint booth walls or a maltodextrin (for coatings optimized for application to floors) as shown in Table 5. The coatings were formulated as a homogeneous aqueous solution. When applied to paint booth walls, the "crystal booth" coatings offered good protection, did not discolor through repeated drying cycles, and were easily removed by washing. The "clean room" coating, when applied to the floor showed good build, provided a slightly tacky finish that helped suppress dust, and was readily removed by washing.

10

Table 5. Formulation of coating compositions optimized for application to paint booth walls (crystal booth 1 and crystal booth 2) or to paint booth floors (clean room).

| Components | Range | Preferred Embodiments | | |
|-------------|--|-----------------------|-----------------|------------|
| | | Crystal Booth 1 | Crystal Booth 2 | Clean-Room |
| Film Former | Dextrin: 2%-50% | | | |
| | Crystal Gum (Tapioca Dextrin) (K4484, National Starch) | 10% | 15% | |
| | Star-DRI 180 (maltose dextrin) Star-Dri 180 or Star-Dri100, 1, 5, 200 | | | 30% |
| Plasticizer | Sorbitol (70% Solution) | 0-16% | 3% | 6% |
| | Sugar (sucrose) | 0-16 | 6% | |
| | Glycerin | 0-16 | 3% | 6% |
| Thickener | Xanthan Gum (Kelzan) | 0-1.0% | 0.25% | |
| | Keltone or carboxymethyl cellulose, hydroxymethylcellulose, polyethylene oxide <i>etc.</i> | | | 0.5% |

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| | | | | | |
|---------------|--|--------------------|--------|--------|--------|
| Surfactant | Sulfonated | 0.1-2.0% | | | |
| | Biosoft N-300 (Stepan Chemical Co.) or BioSoft D40, Sulfochem-TLS or Sulfochem-ALS | 0.1-2.0% | 0.5% | 2% | 1% |
| | Fluorinated | | | | |
| | Fluorad FC 171 | 0-0.6% | 0.03% | | |
| | Fluorad FC 430 (3M Corp.) | 0-0.4% | 0.02% | | |
| pH adjustment | triethanolamine | 0.01-1.0 | | | 0.5 |
| 85% solution | or potassium carbonate or sodium carbonate | | | | |
| Preservative | Kathon Lx | 10 ppm- 100 ppm | 50 ppm | 50 ppm | 50 ppm |

Example 6

Coatings were also formulated using a thickener/film former combination. either a tapioca dextrin (for coatings optimized for application to paint booth walls or a maltodextrin (for coatings optimized for application to floors) as shown in Table 5. The coatings were formulated as a homogeneous aqueous solution. When applied to paint booth walls, the "crystal booth" coatings offered good protection, did not discolor through repeated drying cycles, and were easily removed by washing. The "clean room" coating, when applied to the floor showed good build, provided a slightly tacky finish that helped suppress dust, and was readily removed by washing.

Table 5. Formulation of coating compositions optimized for application to paint booth walls (crystal booth 1 and crystal booth 2) or to paint booth floors (clean room).

| Components | | Range | Preferred Embodiments | | |
|------------------|---|----------------------|-----------------------|-----------------|------------|
| | | | Crystal Booth 1 | Crystal Booth 2 | Clear-Room |
| Film Former | Dextrin: Crystal Gum (Tapioca Dextrin) (K4484, National Starch) | 2%-50% | 10% | 15% | 30% |
| | Star-DRI 180 (maltose dextrin) Star-Dri 180 or Star-Dri100, 1, 5, 200 | | | | |
| Plasticizer | Sorbitol (70% Solution) | 0-16% | 3% | 6% | 6% |
| | Sugar (sucrose) | 0-16 | 6% | | |
| | Glycerin | 0-16 | 3% | | 6% |
| Thickener | Xanthan Gum (Kelzan) | 0-1.0% | 0.25% | | |
| | Keltone or carboxymethyl cellulose, hydroxymethylcellulose, polyethylene oxide <i>etc.</i> | | | 0.5% | |
| Surfactant | Sulfonated Biosoft N-300 (Stepan Chemical Co.) or BioSoft D40, Sulfochem-TLS or Sulfochem-ALS | 0.1-2.0% 0.1-2.0% | 0.5% | 2% | 1% |
| | Fluorinated Fluorad FC 171 | 0-0.6% | 0.03% | | |
| | Fluorad FC 430 (3M Corp.) | 0-0.4% | 0.02% | | |
| pH adjustment | triethanolamine | 0.01-1.0 | | | 0.5 |

| | | | | | |
|-----------------|---|--------------------|--------|--------|--------|
| 85% solution | or potassium carbonate or sodium carbonate | | | | |
| Preservative | Kathon Lx | 10 ppm- 100 ppm | 50 ppm | 50 ppm | 50 ppm |

Example 7

Coatings were also formulated using thickener/film former combinations (see, e.g. **Table 6** for a preferred formulation) using a dextrin film former, a sorbitol plasticizer, and a thickener. The coatings were formulated as a homogeneous aqueous solution. When applied to automobile surfaces, the coatings offered good protection, did not discolor through repeated drying cycles, and were easily removed by washing. Moreover, on vehicles stored overnight to permit dew formation on the coated surface or with incidental moisture, the coatings did not leach plasticizer remained intact and provided highly effective protection from paint.

Table 6. Formulation of polysaccharide/thickener coating compositions optimized for application to painted automobile surfaces subjected to incidental moisture.

| Components | Weight Percent | | |
|---|----------------|-----------------|--------------------------------------|
| | Range | Preferred range | Optimized coating |
| Film Former Polysaccharide <i>e.g.</i> dextrin, starch, cellulose derivatives, <i>etc.</i> | 2%-90% | 5%-30% | 7% (Staley Stadex 140 Dextrin) |
| Plasticizer <i>e.g.</i> sorbitol or other sugars, urea, glycerin | 0.8%-30% | 3%-16% | 7% (sorbitol 70% solution) |
| Thickener <i>e.g.</i> , Goodrich EP-1, Goodrich EZ-1, Goodrich K-702, Goodrich EDT2691, Nutrasweet Kelzane (algin), carboxymethylcellulose , Morton 4983, methocel, gum Arabic, Rohm and Haas ASC 75 | 0.1%-30% | 1%-10% | 3.5% (Goodrich EP-1) |

| | | | | |
|---------------|--|-----------------|---------------|---|
| Surfactant | Total: | 0.01-10.0% | 0.1-5% | |
| | Sulfonated | 0.01-10.0% | 0.1-5% | 0.41% (Stephan BioSoft N300) |
| | Non-ionic | 0.01-10.0% | 0.1-5% | 0.25% (Rhodasurf DA630) |
| pH adjustment | <i>e.g.</i> , sodium hydroxide, potassium carbonate, sodium carbonate, triethanolamine | pH 7.5-11 | pH 8-10 | 0.180 % pH = 9-9.5 sodium hydroxide |
| Preservative | <i>e.g.</i> , Kathon Lx | 0.0001 to 0.1 % | 0.001% - 0.1% | 0.005% Kathon Lx-14 |
| Water | <i>e.g.</i> filtered water, distilled water, deionized water | | | remainder |

Example 8

Coatings were also formulated using thickener/film former combinations (*see, e.g. Table 7* for a particularly preferred formulation) using a dextrin film former, a sorbitol plasticizer, and a thickener. The coatings were formulated as a homogeneous aqueous solution. When applied to automobile surfaces, the coatings offered good protection, did not discolor through repeated drying cycles, and were easily removed by washing. Moreover, on vehicles stored overnight to permit dew formation on the coated surface or with incidental moisture, the coatings did not leach plasticizer remained intact and provided highly effective protection from paint.

Table 7. Formulation of polysaccharide/thickener coating compositions optimized for application to painted automobile surfaces subjected to incidental moisture.

| | | Weight Percent of Final Composition | |
|-------------|---|-------------------------------------|-----------------------------------|
| | | Before Drying. | |
| Components | | Preferred range | Optimized coating |
| Film Former | Polysaccharide <i>e.g.</i> dextrin, starch, cellulose derivatives, <i>etc.</i> | 1%-10% | 5% (Staley Stalex 140 Dextrin) |
| Plasticizer | <i>e.g.</i> sorbitol or other sugars, urea, glycerin | 1%-16% | 3.4% |

| | | | |
|------------------|--|------------------|---|
| Thickener | <i>e.g.</i> , Goodrich EP-1, Goodrich EZ-1, Goodrich K-702, Goodrich EDT2691, Nutrasweet Kelzane (algin), carboxymethylcellulose, Morton 4983, methocel, gum Arabic, Rohm and Haas ASC 75 | 1%-10% | 0.72% (Goodrich EP-1) |
| Surfactant | Total: | 0.1-5% | |
| | Sulfonated | 0-5% | |
| | Non-ionic | 0-5% | 0.5% (Rhodasurf DA630) |
| pH adjustment | <i>e.g.</i> , sodium hydroxide, potassium carbonate, sodium carbonate, triethanolamine | pH 8-10 | 0.134 % pH ~ 9-9.5 sodium hydroxide |
| Preservative | <i>e.g.</i> , Kathon Lx | 0.001% - 0.1% | 0.005% Kathon Lx-14 |
| Water | <i>e.g.</i> filtered water, distilled water deionized water | | remainder |

The above descriptions are illustrative and not restrictive. Many variations of the invention will become apparent to those of skill in the art upon review of this disclosure. Merely by way of example, while the invention is illustrated with regard to particular brands of materials used in the mask, the invention is not so limited. The scope of the invention should, therefore, be determined not with reference to the above description, but instead should be determined with reference to the appended claims along with their full scope of equivalents.

CLAIMS

What is claimed is:

1. A method of temporarily protecting a surface in a coating operation, said method comprising:
 - 5 a) applying a masking material to said surface, said applying resulting in a substantially continuous film of said masking material, said masking material, before drying, comprising an aqueous solution of:
 - 10 i) a polysaccharide present in an amount ranging from about 2 to about 90 weight percent of said masking material, wherein said polysaccharide is not a dextrin; and
 - ii) a plasticizer present in an amount sufficient to prevent cracking of said film when said masking material is dried;
 - b) coating all or a portion of said surface with an overcoating compound, said masking material preventing said coating compound from contacting said
15 surface; and
 - c) removing said masking material from said surface whereby the coating compound applied to the surface covered with the masking material is removed together with the masking material.
2. The method of claim 1, wherein said overcoating compound is paint.
- 20 3. The method of claim 1, wherein said polysaccharide is present in an amount ranging from about 2 to about 50 weight percent of said masking material.
4. The method of claim 1, wherein said polysaccharide is selected from the group consisting of starch, carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, algin, gum Arabic, alginic acid, and a cellulose gum.
- 25 5. The method of claim 1, wherein said plasticizer is a simple sugar.
6. The method of claim 5, wherein said plasticizer is selected from the group consisting of glucose, sucrose, and fructose.

7. The method of claim 1, wherein said plasticizer is selected from the group consisting of sorbitol, glycerin, sucrose, urea, polyethylene glycol, polypropylene glycol, polyglycerol, and glycerol.

8. The method of claim 7, wherein said plasticizer is present in an amount ranging from about 0.2 to about 12 weight percent of said masking material.

9. The method of claim 1, wherein said masking material further comprises a surfactant.

10. The method of claim 9, wherein said surfactant is present in an amount effective to produce a coating that lays out smoothly in a substantially continuous film.

11. The method of claim 9, wherein said surfactant is present at an amount up to about 2%, by weight, of said masking composition.

12. The method of claim 11, wherein said surfactant is selected from the group consisting of an anionic surfactant, a cationic surfactant, a nonionic surfactant, and an amphoteric surfactant.

13. The method of claim 11, wherein said surfactant comprises a fluorinated surfactant.

14. The method of claim 1, wherein said masking material further comprises an alcohol.

15. The method of claim 14, wherein said alcohol comprises a straight chain alcohol.

16. The method of claim 14, wherein said alcohol comprises an alcohol selected from the group consisting of ethanol, methanol, and propanol.

17. The method of claim 14, wherein said alcohol is present in a concentration ranging from about 0.5 percent to about 12 percent by weight.

18. The method of claim 1, wherein said masking material further comprises a thickener.

19. The method of claim 18, wherein said thickener is selected from the group consisting of a neutralized crosslinked acrylate copolymer, a neutralized crosslinked polyacrylic acid, a neutralized polyacrylic acid, an algin, a carboxy methyl cellulose, a
5 neutralized polymethacrylic acid, a neutralized ethylene-acrylic acid copolymer, methocel, gum arabic, a cellulose gum, and a neutralized styrene acrylic acid copolymer.

20. The method of claim 18, wherein said thickener ranges from about 0.1 to about 30 weight percent of said masking material.

10 21. The method of claim 18, wherein said thickener is a crosslinked acrylate copolymer.

22. The method of claim 1, wherein said masking material further comprises a preservative

15 23. The method of claim 1, wherein said surface comprises a surface of a motor vehicle.

24. The method of claim 1, wherein said surface comprises a painted surface of a motor vehicle.

25. The method of claim 1, wherein said surface comprises a surface of a paint booth.

20 26. The method of claim 1, wherein:
said polysaccharide is selected from the group consisting of starch, carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, algin, gum arabic, alginic acid, and a cellulose gum; and
said masking material further comprises a surfactant.

25 27. The method of claim 26, wherein said masking material further comprises a thickener.

28. The method of claim 26, wherein said masking material further comprises an alcohol.

29. The method of claim 26, wherein
said polysaccharide is present in an amount ranging from about 1 to
5 about 20 weight percent of said masking material;
said plasticizer is present in an amount ranging from about 1 to about
15 weight percent of said masking material; and
said masking material further comprises a thickener ranging from
about 0.1 to about 5 weight percent of said masking material.

10 30. The method of claim 29, wherein said masking material further
comprises a preservative.

31. The method of claim 29, wherein
said polysaccharide is present in an amount ranging from about 1 to
about 20 weight percent of said masking material;
15 said plasticizer is sorbitol ranging from about 3 to about 8 weight
percent; and
said thickener ranges from about 0.1 to about 5 weight percent.

32. The method of claim 31, wherein said masking material further
comprises a preservative.

20 33. The method of claim 29, wherein
said polysaccharide is present in at about 5 weight percent of said
masking material;
said plasticizer is sorbitol at about 3.4 weight percent of said masking
material;
25 said thickener is present at about 0.72 weight percent of said masking
material; and
said masking material further comprises a preservative.

34. A composition for temporarily protecting a surface, said composition
comprising an aqueous solution of:

a polysaccharide present in an amount ranging from about 2 to about 90 weight percent of said masking material, wherein said polysaccharide is not a dextrin; and

5 a plasticizer present in an amount sufficient to prevent cracking of a protective film formed when said masking material is dried;

wherein said composition, when applied to a painted automobile surface, dries to a dry, protective coating that protects the underlying surface from paint and that is removable with a water wash.

10 35. The composition of claim 34, wherein said composition, when applied to a painted automobile surface, dries to a dry continuous film that protects the underlying surface from paint in a painting operation and that is removed from the underlying surface with a water wash without marring or disfiguring the underlying surface.

36. The composition of claim 34, wherein said polysaccharide is present in an amount ranging from about 2 to about 50 weight percent of said masking material.

15 37. The composition of claim 34, wherein said polysaccharide is selected from the group consisting of starch, carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, algin, gum Arabic, alginic acid, and a cellulose gum.

38. The composition of claim 34, wherein said plasticizer is a simple sugar.

20 39. The composition of claim 38, wherein said plasticizer is selected from the group consisting of glucose, sucrose, and fructose.

40. The composition of claim 34, wherein said plasticizer is selected from the group consisting of sorbitol, glycerin, sucrose, urea, polyethylene glycol, polypropylene glycol, polyglycerol, and glycerol.

25 41. The composition of claim 34, wherein said plasticizer is present in an amount ranging from about 0.2 to about 12 weight percent of said masking material.

42. The composition of claim 34, wherein said masking material further comprises a surfactant.

43. The composition of claim 42, wherein said surfactant is present in an amount effective to produce a coating that lays out smoothly in a substantially continuous film;

44. The composition of claim 42, wherein said surfactant is present at an amount up to about 2%, by weight, of said masking composition.

45. The composition of claim 44, wherein said surfactant is selected from the group consisting of an anionic surfactant, a cationic surfactant, a nonionic surfactant, and an amphoteric surfactant.

46. The composition of claim 44, wherein said surfactant comprises a fluorinated surfactant.

47. The composition of claim 34, wherein said masking material further comprises an alcohol.

48. The composition of claim 47, wherein said alcohol comprises a straight chain alcohol.

49. The composition of claim 47, wherein said alcohol comprises an alcohol selected from the group consisting of ethanol, methanol, and propanol.

50. The composition of claim 47, wherein said alcohol is present in a concentration ranging from about 0.5 percent to about 12 percent by weight.

51. The composition of claim 34, wherein said masking material further comprises a thickener.

52. The composition of claim 51, wherein said thickener is selected from the group consisting of a neutralized crosslinked acrylate copolymer, a neutralized crosslinked polyacrylic acid, a neutralized polyacrylic acid, an algin, a carboxy methyl cellulose, a neutralized polymethacrylic acid, a neutralized ethylene-acrylic acid copolymer, methocel, gum arabic, a cellulose gum, and a neutralized styrene acrylic acid copolymer.

53. The composition of claim 51, wherein said thickener ranges from about 0.1 to about 30 weight percent of said masking material.

54. The composition of claim 51, wherein said thickener is a crosslinked acrylate copolymer.

55. The composition of claim 34, wherein said masking material further comprises a preservative

5 56. The composition of claim 34, wherein:
said polysaccharide is selected from the group consisting of starch, carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, algin, gum arabic, alginic acid, and a cellulose gum; and
said masking material further comprises a surfactant.

10 57. The composition of claim 56, wherein said masking material further comprises a thickener.

58. The composition of claim 56, wherein said masking material further comprises an alcohol.

15 59. The composition of claim 56, wherein
said polysaccharide is present in an amount ranging from about 1 to about 20 weight percent of said masking material;
said plasticizer is present in an amount ranging from about 1 to about 15 weight percent of said masking material; and
said masking material further comprises a thickener ranging from
20 about 0.1 to about 5 weight percent of said masking material.

60. The composition of claim 59, wherein said masking material further comprises a preservative.

25 61. The composition of claim 59, wherein
said polysaccharide is present in an amount ranging from about 1 to about 20 weight percent of said masking material;
said plasticizer is sorbitol ranging from about 3 to about 8 weight percent; and
said thickener ranges from about 0.1 to about 5 weight percent.

62. The composition of claim 61, wherein said masking material further comprises a preservative.

63. The composition of claim 59, wherein
5 said polysaccharide is present in at about 5 weight percent of said
masking material;
said plasticizer is sorbitol at about 3.4 weight percent of said masking
material;
said thickener is present at about 0.72 weight percent of said masking
material; and
10 said masking material further comprises a preservative.

64. A method of temporarily protecting a surface in an overcoating operation, said method comprising:

a) applying a masking material to said surface, said applying resulting in a substantially continuous film of said masking material, said masking material, before
15 drying, comprising an aqueous solution of:

i) a dextrin present in an amount ranging from about 2 to about 90 weight percent of said masking material;

ii) a plasticizer present in an amount sufficient to prevent cracking of said film when said masking material is dried; and

20 iii) a thickener present in an amount ranging from about 0.5 to about 5 weight percent of said masking material;

b) coating all or a portion of said surface with an overcoating compound, said masking material preventing said coating compound from contacting said surface; and

25 c) removing said masking material from said surface whereby the coating compound applied to the surface covered with the masking material is removed together with the masking material.

65. The method of claim 64, wherein said overcoating compound is paint.

66. The method of claim 64, wherein said dextrin is present in an amount ranging from about 2 to about 50 weight percent of said masking material.

67. The method of claim 64, wherein said dextrin is selected from the group consisting of a tapioca dextrin, corn dextrin, potato dextrin, and a maltodextrin.

5 68. The method of claim 64, wherein said plasticizer is a simple sugar.

69. The method of claim 64, wherein said plasticizer is selected from the group consisting of glucose, sucrose, and fructose.

70. The method of claim 64, wherein said plasticizer is selected from the group consisting of sorbitol, glycerin, sucrose, urea, polyethylene glycol, and polypropylene glycol, polyglycerol, glycerol.
10

71. The method of claim 70, wherein said plasticizer is present in an amount ranging from about 0.2 to about 12 weight percent of said masking material.

72. The method of claim 64, wherein said thickener is selected from the group consisting of a neutralized crosslinked acrylate copolymer, a neutralized crosslinked polyacrylic acid, a neutralized polyacrylic acid, an algin, a carboxy methyl cellulose, a neutralized polymethacrylic acid, a neutralized ethylene-acrylic acid copolymer, methocel, gum arabic, a cellulose gum, and a neutralized styrene acrylic acid copolymer.
15

73. The method of claim 72, wherein said thickener ranges from about 0.5 to about 1 weight percent of said masking material.

20 74. The method of claim 72, wherein said comprises about 0.72 weight percent of said masking material.

75. The method of claim 72, wherein said thickener is a crosslinked acrylate copolymer.

25 76. The method of claim 64, wherein said masking material further comprises a surfactant.

77. The method of claim 76, wherein said surfactant is present in an amount effective to produce a coating that lays out smoothly in a substantially continuous film.

5 78. The method of claim 76, wherein said surfactant is present at an amount up to about 2%, by weight, of said masking composition.

79. The method of claim 76, wherein said surfactant is selected from the group consisting of an anionic surfactant, a cationic surfactant, a nonionic surfactant, and an amphoteric surfactant.

10 80. The method of claim 76, wherein said surfactant comprises a fluorinated surfactant.

81. The method of claim 64, wherein said masking material further comprises an alcohol.

82. The method of claim 81, wherein said alcohol comprises a straight chain alcohol.

15 83. The method of claim 81, wherein said alcohol comprises an alcohol selected from the group consisting of ethanol, methanol, and propanol.

84. The method of claim 81, wherein said alcohol is present in a concentration ranging from about 0.5 percent to about 12 percent by weight.

20 85. The method of claim 64, wherein said masking material further comprises a preservative

86. The method of claim 64, wherein said surface comprises a surface of a motor vehicle.

87. The method of claim 64, wherein said surface comprises a surface of a paint booth.

25 88. The method of claim 64, wherein:
said masking material further comprises a surfactant.

89. The method of claim 88, wherein said masking material further comprises an alcohol.

90. The method of claim 88, wherein
said dextrin is present in an amount ranging from about 1 to about 20
5 weight percent of said masking material;
said plasticizer is present in an amount ranging from about 1 to about
15 weight percent of said masking material; and
said thickener is present at about 0.72 weight percent of said masking
material.

10 91. The method of claim 90, wherein said masking material further
comprises a preservative.

92. The method of claim 90, wherein
said dextrin is a maltodextrin ranging from about 1 to about 10
weight percent; and
15 said plasticizer is sorbitol ranging from about 1 to about 5 weight
percent.

93. The method of claim 92, wherein said masking material further
comprises a preservative.

20 94. The method of claim 93, wherein said dextrin comprises about 5
weight percent of said masking material.

95. A composition for temporarily protecting a surface, said composition
comprising an aqueous solution of:

- i) a dextrin present in an amount ranging from about 2 to
about 90 weight percent of said composition;
- 25 ii) a plasticizer present in an amount sufficient to prevent
cracking of a film formed when said composition is dried; and
- iii) a thickener present in an amount ranging from about 0.5
to about 5 weight percent of said composition.

96. The composition of claim 95, wherein said composition, when applied to a painted automobile surface, dries to a dry continuous film that protects the underlying surface from paint in a painting operation and that is removed from the underlying surface with a water wash without marring or disfiguring the underlying surface.

5

97. The composition of claim 95, wherein said dextrin is present in an amount ranging from about 2 to about 50 weight percent of said masking material.

98. The composition of claim 95, wherein said dextrin is selected from the group consisting of a tapioca dextrin, corn dextrin, potato dextrin, and a maltodextrin.

10 99. The composition of claim 95, wherein said plasticizer is a simple sugar.

100. The composition of claim 95, wherein said plasticizer is selected from the group consisting of glucose, sucrose, and fructose.

15 101. The composition of claim 95, wherein said plasticizer is selected from the group consisting of sorbitol, glycerin, sucrose, urea, polyethylene glycol, and polypropylene glycol, polyglycerol, glycerol.

102. The composition of claim 101, wherein said plasticizer is present in an amount ranging from about 0.2 to about 12 weight percent of said composition.

20 103. The composition of claim 95, wherein said thickener is selected from the group consisting of a neutralized crosslinked acrylate copolymer, a neutralized crosslinked polyacrylic acid, a neutralized polyacrylic acid, an algin, a carboxy methyl cellulose, a neutralized polymethacrylic acid, a neutralized ethylene-acrylic acid copolymer, methocel, gum arabic, a cellulose gum, and a neutralized styrene acrylic acid copolymer.

25 104. The composition of claim 103, wherein said thickener ranges from about 0.5 to about 1 weight percent of said composition.

105. The composition of claim 103, wherein said comprises about 0.72 weight percent of said composition.

106. The composition of claim 103, wherein said thickener is a crosslinked acrylate copolymer.

107. The composition of claim 95, wherein said composition further comprises a surfactant.

5 108. The composition of claim 107, wherein said surfactant is present in an amount effective to produce a coating that lays out smoothly in a substantially continuous film.

109. The composition of claim 107, wherein said surfactant is present at an amount up to about 2%, by weight, of said masking composition.

10 110. The composition of claim 107, wherein said surfactant is selected from the group consisting of an anionic surfactant, a cationic surfactant, a nonionic surfactant, and an amphoteric surfactant.

111. The composition of claim 107, wherein said surfactant comprises a fluorinated surfactant.

15 112. The composition of claim 95, wherein said composition further comprises an alcohol.

113. The composition of claim 112, wherein said alcohol comprises a straight chain alcohol.

20 114. The composition of claim 112, wherein said alcohol comprises an alcohol selected from the group consisting of ethanol, methanol, and propanol.

115. The composition of claim 112, wherein said alcohol is present in a concentration ranging from about 0.5 percent to about 12 percent by weight.

116. The composition of claim 95, wherein said composition further comprises a preservative

25 117. The composition of claim 95, wherein:
said composition further comprises a surfactant.

118. The composition of claim 117, wherein said composition further comprises an alcohol.

119. The composition of claim 117, wherein
said dextrin is present in an amount ranging from about 1 to about 20
5 weight percent of said composition;
said plasticizer is present in an amount ranging from about 1 to about
15 weight percent of said composition; and
said thickener is present at about 0.72 weight percent of said
composition.

10 120. The composition of claim 119, wherein said composition further
comprises a preservative.

121. The composition of claim 120, wherein
said dextrin is a maltodextrin ranging from about 1 to about 10
weight percent; and
15 said plasticizer is sorbitol ranging from about 1 to about 5 weight
percent.

122. The composition of claim 121, wherein said composition further
comprises a preservative.

123. The composition of claim 122, wherein said dextrin comprises about
20 5 weight percent of said composition.

124. As an article of manufacture a surface coated with a composition of
any one of claims 34 through 63 or 95 through 122.

125. A method of storing or transporting a vehicle having a painted
surface said method comprising:
25 coating said painted surface with a composition of any one of claims
34 through 63 or 95 through 122, and drying said composition to form a dry protective film;
storing or transporting said vehicle; and
washing said dry protective film from said vehicle with a water wash.