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(54) **NAIL CARE SYSTEM**

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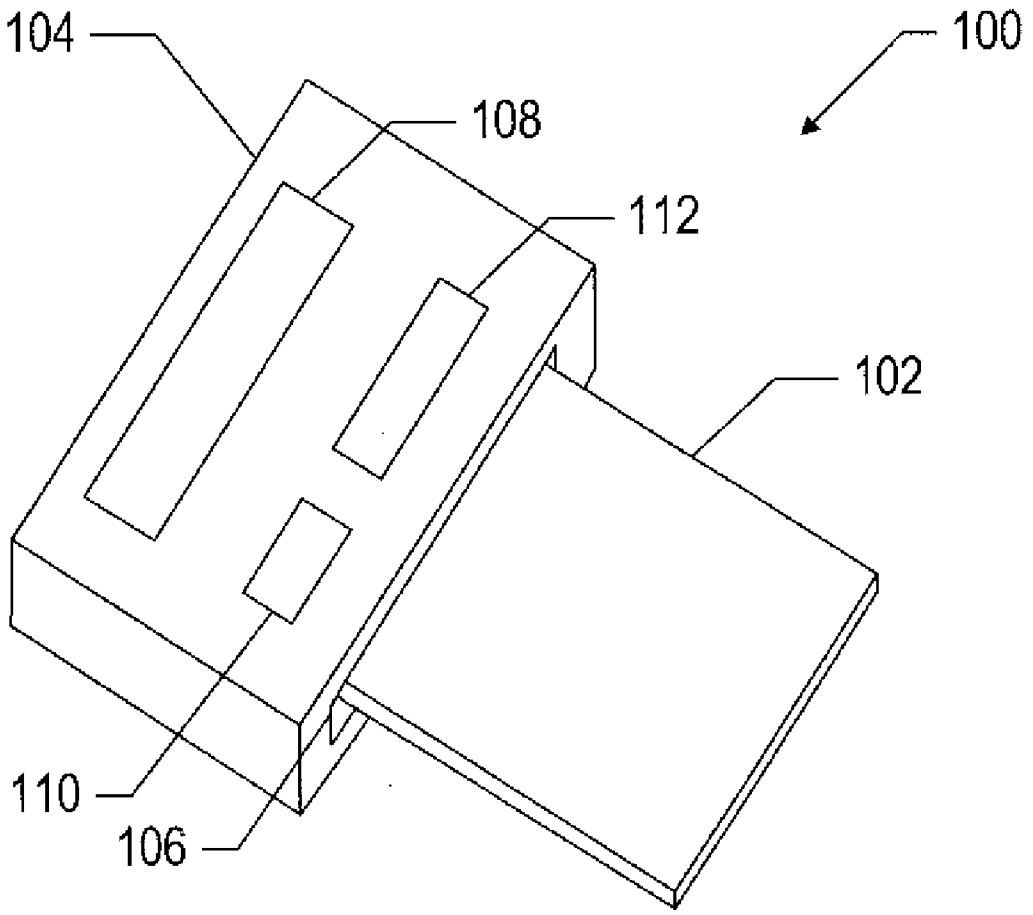
(57) **ABSTRACT**

A nail care system for buffing and polishing fingernails and toenails is disclosed. The system includes a nail care strip that includes a layer of a liquid silicone resin formulation and abrasive grains.



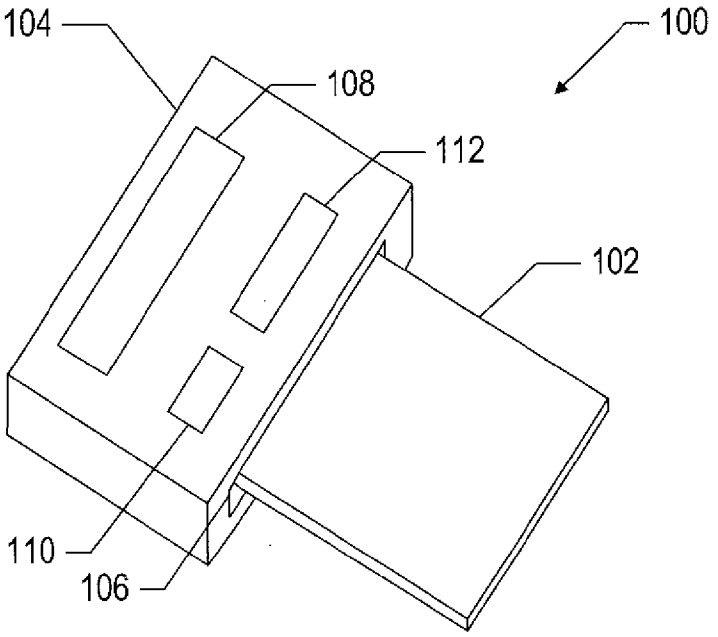


FIG. 1

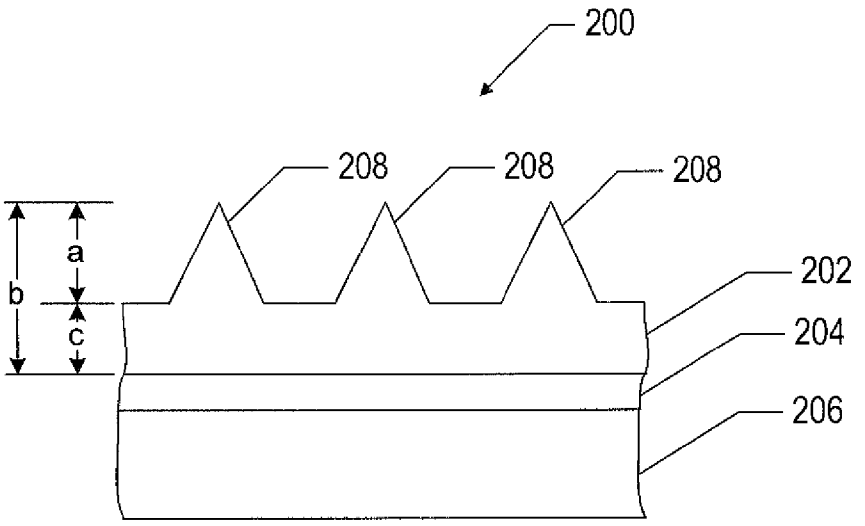


FIG. 2

NAIL CARE SYSTEM

FIELD OF THE DISCLOSURE

[0001] This disclosure, in general, relates to a nail care system for buffing and polishing fingernails and toenails.

BACKGROUND

[0002] In caring for fingernails and toenails, natural and artificial nails are cleaned, filed, smoothed, and polished. Typical nail files are used to smooth both the ends and the tops of the surface of fingernails and toenails. Typically, nail files are long, stiff strips that have the texture of sandpaper.

[0003] Commercially available nail files suffer from a number of drawbacks. After a few uses, the nail files tend to become visibly degraded, non-uniform, and soiled, presenting an unsightly appearance even though the product may still have a significant number of uses remaining. Additionally, many nail files trap in nail particles and bacteria that are filed from the surface of the fingernail and toenail. Accordingly, in spas and nail care facilities, nail files cannot be used by more than one consumer due to the possibility of transferring bacteria and nail particles to other consumers.

[0004] Moreover, many nail files are configured as a generally thick block that is stiff such that it does not conform readily to nail surfaces. Due to the thickness and stiffness of the nail files, attempts to smooth hard to reach areas, such as the contoured area between the skin and the fingernail, may result in excessive pressure applied to the surface of the nail and relatively little polishing of the region.

[0005] As such, an improved nail care system would be desirable.

SUMMARY

[0006] In a particular embodiment, a nail care system for buffing and polishing fingernails and toenails is disclosed. The system includes a nail care strip including a layer of a liquid silicone resin formulation and abrasive grains.

[0007] In another embodiment, a method of buffing a fingernail and a toenail is provided. The method includes cleaning the nail and buffing the nail with a nail care strip. The nail care strip includes a layer of a liquid silicone resin formulation and abrasive grains.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The present disclosure may be better understood, and its numerous features and advantages made apparent to those skilled in the art by referencing the accompanying drawings.

[0009] FIG. **1** includes a diagram illustrating an exemplary nail care system.

[0010] FIG. **2** includes an illustration of a cross-sectional view of an exemplary structured nail care strip.

[0011] The use of the same reference symbols in different drawings indicates similar or identical items.

DESCRIPTION OF THE EMBODIMENTS

[0012] In the specification and in the claims, the terms "including" and "comprising" are open-ended terms and should be interpreted to mean "including, but not limited to . . ." These terms encompass the more restrictive terms "consisting essentially of" and "consisting of."

[0013] A nail care system is provided that can be used to treat the surface of a fingernail, toenail, or combination thereof. For instance, the nail care system includes a nail care strip for sanding, cleaning, buffing, and polishing a fingernail and a toenail. In an exemplary embodiment, the nail care strip includes a layer of a liquid silicone resin and abrasive grains. The nail care strip is a reusable, flexible strip capable of treating the top surface or end surface of the nail. "Nail" as used herein refers to the fingernail, the toenail, or combination thereof.

[0014] In one exemplary embodiment, the nail care system **100** is a merchandised article for commercial sale. FIG. **1** illustrates a nail care system **100** including a nail care strip **102** and packaging **104**. The packaging **104** includes a holding compartment **106** for the nail care strip **102**. The packaging **104** may include a sales message, title or description of the nail care strip **108** and a barcode **110** or other indicator of sales price or facilitator of a sales transaction.

[0015] In addition, the nail care system **100** may include a set of printed instructions **112**. The printed instructions **112** may be printed on the packaging **104** or included as a separate sheet with the packaging **104** and nail care strip **102**. In one exemplary embodiment, the instructions direct a user to place the nail care strip **102** on a fingernail or a toenail surface. In another exemplary embodiment, the instructions **112** direct a user to buff the fingernail and the toenail with the nail care strip. In another exemplary embodiment, the instructions **112** direct a user to polish the fingernail and the toenail with the nail care strip.

[0016] The nail care strip is formed from an abrasive formulation forming a layer of surface features. In an embodiment, the nail care strip is backless (i.e., free of a structural backing layer), such that the nail care strip is self-supporting. Particularly, the formulation forming the layer of surface features is self-supporting, such that the layer withstands use without structural degradation before the abrasive properties are consumed. The abrasive feature layer includes an assembly of surface protrusions. The assembly of surface protrusions may be random, and in one embodiment, forms a pattern. In addition, the cross-section surface area may vary (generally, increase) during wear of the nail care strip, such as in the case of a sloping-sidewall surface protrusion (pyramidal, conical, prismatic, etc. surface protrusions), or may have generally constant cross-sectional surface area during wear, such as in the case of vertical-walled protrusions (rectangular, square, rod, etc. protrusions). In an exemplary embodiment, the nail care strip may also include an adhesion layer.

[0017] In an exemplary embodiment, the nail care strip includes an abrasive feature layer formed from a silicone resin and abrasive grains. For example, the silicone resin may be formed from a high consistency silicone rubber (HCR) or a liquid silicone rubber (LSR). In an embodiment, the high consistency silicone rubber (HCR) or liquid silicone rubber (LSR) can further include a reinforcing particulate. In a particular example, the silicone resin is formed from an LSR. In general, the silicone rubber, such as the LSR or HCR, crosslinks to form the silicone resin, which forms a matrix in which the abrasive grains may be distributed or dispersed. Such a crosslinked silicone resin serves as a binder for the abrasive grains and is to be contrasted with uncrosslinked silicones that are configured to migrate to the surface of a nail care strip.

[0018] The silicone resin may also be formed from silicone oils, which are generally obtained free of fumed silica. In an

exemplary embodiment, the silicone oils, parts A and B, are blended with a catalyst, reinforcing particulate, such as fumed silica, and abrasive grains, and subsequently cured to form the silicone resin product. In a particular embodiment, the silicone resin is a liquid silicone rubber where parts A and B are blended with a catalyst, reinforcing particulate, such as fumed silica, and abrasive grains, and subsequently cured to form the silicone resin product.

[0019] An exemplary silicone oil or silicone rubber includes a siloxane polymeric backbone to which functional groups may be attached. In an example, a functional group may include an un-reactive functional group such as a halogen group, a phenyl group, or an alkyl group, or any combination thereof. For example, a fluorosilicone may include a fluorine functional group attached to the backbone. In another exemplary embodiment, the siloxane backbone may be attached to a methyl, an ethyl, a propyl group, or any combination thereof. In addition, the siloxane backbone may include reactive functional groups that function to encourage crosslinking. An exemplary reactive functional group includes a hydride group, a hydroxyl group, a vinyl group, or any combination thereof. For example, the siloxane polymer may include a polyfluorosiloxane, a polyphenylsiloxane, a polyalkylsiloxane, or any combination thereof, which have a reactive functional group, such as a vinyl termination. In a particular example, the silicone resin is formed from a base polysiloxane and a cross-linking agent. The base polysiloxane may be a polyalkylsiloxane such as silicone polymers formed of a precursor, such as dimethylsiloxane, diethylsiloxane, dipropylsiloxane, methylethylsiloxane, methylpropylsiloxane, or combinations thereof. In a particular embodiment, the polyalkylsiloxane includes a polydialkylsiloxane, such as polydimethylsiloxane (PDMS). For instance, the silicone resin is a liquid silicone rubber (LSR) wherein the first part includes a vinyl terminated or grafted polyalkylsiloxane.

[0020] In an example, the silicone resin, such as the liquid silicone rubber, further includes a cross-linking agent. In an embodiment, the cross-linking agent may be an organic cross-linking agent. In a particular example, the cross-linking agent is a silicone based cross-linking agent including reactive hydride functional groups. For instance, the crosslinking agent may include a siloxane-based crosslinking agent, having a siloxane backbone attached to reactive functional groups, such as hydride or hydroxyl groups. In a particular embodiment, the crosslinking agent may be polyhydroalkylsiloxane. In an embodiment, the silicone resin is the liquid silicone rubber wherein the second part includes the crosslinking agent.

[0021] In a particular embodiment, the abrasive feature layer may be formed from an uncured formulation including a liquid silicone rubber (LSR). For example, the uncured liquid silicone rubber may have a viscosity not greater than about 600,000 cps when measured using test method DIN 53 019 at a shear rate of about $10s^{-1}$ and a temperature of about 21° C. For example, the viscosity may be not greater than about 450,000 cps, such as not greater than about 400,000 cps. Typically, the viscosity is at least about 50,000 cps, such as at least about 100,000 cps. In a further example, the viscosity of silicone oil absent reinforcing particulate may be about 5 cps to about 165,000 cps.

[0022] In the case of cured formulations, various curing agents, catalysts, and thermal or photoinitiators and sensitizers may be added to the silicone resin prior to curing. In one example, the formulation may be cured using a peroxide catalyst. In another example, the formulation may be cured using a platinum catalyst. In an embodiment, the catalyst may be combination of a peroxide catalyst and a platinum catalyst. In a particular example, the first part of a liquid silicone rubber further includes the catalyst and an inhibitor. For instance, the silicone resin includes a platinum catalyzed two-part liquid silicone rubber (LSR) wherein part A includes a vinyl terminated or grafted polyalkyl siloxane, a catalyst and an inhibitor and part B includes a silicone based cross-linking agent including reactive hydride functional groups.

[0023] A silicone matrix formed of the cured silicone resin may exhibit desirable mechanical properties, such that a nail care strip formed from such a silicone resin is self-supporting, enabling formation of a backless nail care strip. In particular, the silicone resin may be used to form the nail care strip that withstands use without structural degradation before the abrasive properties are consumed. For example, the silicone matrix, absent the abrasive grains, may exhibit desirable elongation-at-break, tensile strength, or tensile modulus. For example, the silicone matrix, absent the abrasive grains, may exhibit an elongation-at break of at least about 50%, such as at least about 100%, at least about 200%, at least about 300%, at least about 350%, at least about 450%, or even at least about 500%, as determined using DIN 53 504 S1. In an embodiment, absent abrasive grains, the silicone resin with the reinforcing silica filler may have an elongation-at-break of at least about 350%, such as at least about 450% or even, at least about 500% as determined using DIN 53 504 S1. In another example, the cured silicone resin absent the abrasive grains may have a tensile strength of at least about 10 MPa.

[0024] The formulation further includes abrasive grains. In the case of cured formulations, the silicone resin may be blended with abrasive grains prior to curing. Typically, the abrasive grains are blended to form a homogeneous mixture of the abrasive grains throughout the silicone resin. The abrasive grains may be formed of any one of or a combination of abrasive grains, including silica, alumina (fused or sintered), zirconia, zirconia/alumina oxides, silicon carbide, garnet, diamond, cubic boron nitride, silicon nitride, ceria, titanium dioxide, titanium diboride, boron carbide, tin oxide, tungsten carbide, titanium carbide, iron oxide, chromia, flint, emery, or any combination thereof. For example, the abrasive grains may be selected from a group consisting of silica, alumina, zirconia, silicon carbide, silicon nitride, boron nitride, garnet, diamond, co-fused alumina zirconia, ceria, titanium diboride, boron carbide, flint, emery, alumina nitride, or a blend thereof. In particular, the abrasive grains may be selected from the group consisting of nitrides, oxides, carbides, or any combination thereof. In an example, the nitride may be selected from the group consisting of cubic boron nitride, silicon nitride, or any combination thereof. In another example, the oxide may be selected from the group consisting of silica, alumina, zirconia, zirconia/alumina oxides, ceria, titanium dioxide, tin oxide, iron oxide, chromia, or any combination thereof. In a further example, the carbide may be selected from the group consisting of silicon carbide, boron carbide, tungsten carbide, titanium carbide, or any combination thereof, and in particular may include silicone carbide. Particular embodiments use dense abrasive grains comprised principally of alpha-alumina. In another particular example, the abrasive grains include silicone carbide.

[0025] The abrasive grain may also have a particular shape. An example of such a shape includes a rod, a triangle, a

pyramid, a cone, a solid sphere, a hollow sphere, or the like. Alternatively, the abrasive grain may be randomly shaped.

[0026] The abrasive grains generally have an average grain size not greater than 2000 microns, such as not greater than about 1500 microns. In another example, the abrasive grain size is not greater than about 750 microns, such as not greater than about 350 microns. For example, the abrasive grain size may be at least 0.1 microns, such as about 0.1 microns to about 1500 microns, and more typically about 0.1 microns to about 200 microns or about 1 micron to about 100 microns. The grain size of the abrasive grains is typically specified to be the longest dimension of the abrasive grain. Generally, there is a range distribution of grain sizes. In some instances, the grain size distribution is tightly controlled. In an embodiment, the abrasive grains further include aggregates of the abrasive grains. Typically, the type of abrasive grain and the size of the abrasive grain may be chosen depending upon the level of abrasion desired on the nail surface.

[0027] In an exemplary formulation, the abrasive grains provide about 10% to about 90%, such as from about 30% to about 80%, of the total weight of the formulation. In an exemplary embodiment, the formulation includes at least about 30 wt % of the abrasive grains based on the total weight of the formulation. For example, the formulation may include at least about 45 wt % of the abrasive grains, such as at least about 55 wt % of the abrasive grains. In general, the formulation includes not greater than 90 wt % of the abrasive grains, such as not greater than 85 wt % of the abrasive grains.

[0028] In an exemplary embodiment, the formulation forming the nail care strip may include a reinforcing particulate. In the case of cured formulations, the optional reinforcing particulate is typically added prior to curing. Typically, the reinforcing particulate is blended to form a homogeneous mixture of the reinforcing particulate throughout the silicone resin. For example, the reinforcing particulate may be incorporated in the silicone resin. Alternatively, the reinforcing particulate may be added to the silicone oil in conjunction with preparing the formulation, such as just prior to adding the abrasive grains. An exemplary reinforcing particulate includes a silica particulate, an alumina particulate, or any combination thereof. In a particular example, the reinforcing particulate includes silica, such as fumed silica. An exemplary silica particulate is available from Degussa under the trade name Aerosil, such as Aerosil R812S, or available from Cabot Corporation, such as Cabosil M5 fumed silica. In another exemplary embodiment, the reinforcing silica may be incorporated into a liquid silicone rubber formulation, such as Elastosil 3003 formulations available from Wacker Silicones. In an embodiment, the reinforcing particulate is typically dispersed within the silicone matrix, and is typically monodispersed, being substantially agglomerate free. In another embodiment, the reinforcing particulate is dispersed within the silicone matrix as aggregates and agglomerates.

[0029] In another exemplary embodiment, reinforcing particulate formed via solution-based processes, such as sol-formed and sol-gel formed ceramics, are particularly well suited for use in the formulation. Suitable sols are commercially available. For example, colloidal silicas in aqueous solutions are commercially available under such trade designations as "LUDOX" (E.I. DuPont de Nemours and Co., Inc. Wilmington, Del.), "NYACOL" (Nyacol Co., Ashland, Ma.) or "NALCO" (Nalco Chemical Co., Oak Brook, Ill.). Many commercially available sols are basic, being stabilized by alkali, such as sodium hydroxide, potassium hydroxide, or ammonium hydroxide. Additional examples of suitable colloidal silicas are described in U.S. Pat. No. 5,126,394, incorporated herein by reference. Especially well-suited are sol-formed silica and sol-formed alumina. The sols can be functionalized by reacting one or more appropriate surface-treatment agents with the inorganic oxide substrate particles in the sol.

[0030] In a particular embodiment, the reinforcing particulate is sub-micron sized. The reinforcing particulate may have a surface area in a range of about 50 m^2/g to about 500 m^2/g, such as within a range of about 100 m^2/g to about 400 m^2/g. The reinforcing particulate may be a nano-sized particulate, such as a particulate having an average particle size of about 3 nm to about 500 nm. In an exemplary embodiment, the reinforcing particulate has an average particle size of about 3 nm to about 200 nm, such as about 3 nm to about 100 nm, about 3 nm to about 50 nm, about 8 nm to about 30 nm, or about 10 nm to about 25 nm. In particular embodiments, the average particle size is not greater than about 500 nm, such as not greater than about 200 nm, or not greater than about 150 nm. For the reinforcing particulate, the average particle size may be defined as the particle size corresponding to the peak volume fraction in a small-angle neutron scattering (SANS) distribution curve or the particle size corresponding to 0.5 cumulative volume fraction of the SANS distribution curve.

[0031] The reinforcing particulate may also be characterized by a narrow distribution curve having a half-width not greater than about 2.0 times the average particle size. For example, the half-width may be not greater than about 1.5 or not greater than about 1.0. The half-width of the distribution is the width of the distribution curve at half its maximum height, such as half of the particle fraction at the distribution curve peak. In a particular embodiment, the particle size distribution curve is mono-modal. In an alternative embodiment, the particle size distribution is bi-modal or has more than one peak in the particle size distribution.

[0032] In an example, the reinforcing particulate is included in the formulation in an amount based on the combined weight of the silicone, the reinforcing particulate, and the abrasive grains. For example, the reinforcing particulate may be included in the formulation in an amount of at least about 3 wt % based on the total weight of the formulation, including reinforcing particulate, silicone resin, and abrasive grains. In particular, the formulation may include at least about 5 wt % of the reinforcing particulate or particulate, such as at least about 10 wt % of the reinforcing particulate, or even at least about 13 wt % of the reinforcing particulate. Further, the formulation may include not greater than about 60 wt % of the reinforcing particulate, such as not greater than about 50 wt % of the reinforcing particulate.

[0033] Generally, the formulation, including the silicone resin, the abrasive grains, and optional reinforcing particulate, forms the abrasive feature layer of the nail care strip. The type of abrasive grains and any optional reinforcing particulate may be chosen depending upon the level of abrasion desired on the nail surface. In some embodiments, the nail care strip consists essentially of the liquid silicone rubber and abrasive grains described above. As used herein, the phrase "consists essentially of" used in connection with the nail care strip precludes the presence of polymers that affect the basic and novel characteristics of the nail care strip, although, various curing agents, catalysts, and thermal or photoinitiators, sensitizers, and reinforcing particulates may be used in the nail care strip.

[0034] Once formed into a layer, the formulation exhibits mechanical properties that advantageously enhance the performance of the nail care strip formed of the formulation. In particular, the formulation may exhibit desirable mechanical properties, such as elongation-at-break, hardness, tensile modulus, or tensile strength. In addition, the nail care strip may be evaluated for performance in producing surface characteristics desirable for the surface of the nail such as, for example, smoothness, polish, shine, and the like.

[0035] In an exemplary embodiment, the formulation exhibits an elongation-at-break of at least about 50%, for example, measured using test method ASTMD 412 or test method DIN 53 504 S 1. In particular, the elongation-at-break may be at least about 100%, such as at least about 125%, or even at least about 135%.

[0036] The cured formulation may also have a desirable hardness, such as a hardness in a range of about 50 shore A to about 75 shore D based on testing method DIN53 505. For example, the hardness may be not greater than about 75 shore D, such as not greater than about 60 shore D, or not greater than about 50 shore D. The hardness of the cured formulation indicates a flexible material.

[0037] In another exemplary embodiment, the formulation exhibits a desirable tensile modulus of not greater than about 8.0 MPa at 100% strain based on ASTM D 412. For example, the tensile modulus may be not greater than about 7.6 MPa, such as not greater than about 7.5 MPa. In addition, the cured formulation may have a desirable tensile strength of at least about 7.0 MPa based on ASTM D 412. For example, the cured formulation may have a tensile strength of at least about 7.5 MPa, such as at least about 8.0 MPa. Alternatively, the formulation may exhibit a tensile modulus of at least about 8 MPa, such as at least about 14 MPa, or even at least about 30 MPa. Particular formulations may exhibit a tensile modulus of greater than 100 MPa.

[0038] In an exemplary embodiment, the formulation forms the abrasive feature layer of a nail care strip. FIG. **2** includes an illustration of an exemplary structured nail care strip **200**. Alternatively, the formulation may be used in forming other non-structured coated nail care strips or bonded nail care strips. Typically, a structured coated nail care strip includes a coated nail care strip having an assembly of protruding surface structures, typically arranged in a pattern.

[0039] The structured nail care strip, also called an engineered abrasive article, contains a plurality of abrasive grains dispersed in a binder and formed into discrete three-dimensional units either in a pattern or a random array on or throughout the nail care strip. In an embodiment, these nail care strips are designed to wear away, continually exposing fresh abrasive to the grinding interface.

[0040] The exemplary nail care strip **200** illustrated in FIG. **2** includes an abrasive feature layer **202**. The abrasive feature layer **202** includes protruding structures **208**, which may be arranged in a pattern. In the illustrated embodiment, the protruding structures **208** are configured to provide increasing contact area in response to wear, as in the case of protrusions with sloping side surfaces. For example, the structures **208** may have a cross-section that decreases with increased distance from the base of the abrasive feature layer **202**. Typically, the abrasive feature layer **202** is formed from the formulation that includes the liquid silicone rubber formulation, abrasive grains, and optional reinforcing particulate. In particular, the abrasive grains are dispersed throughout the thickness of the abrasive feature layer **202** such that the abrasive feature layer is self-sharpening. "Self-sharpening" as used herein refers to the abrasive feature layer **202** maintaining its abrasive qualities as the cleaning article is used and as the thickness of the abrasive feature layer **202** is decreased during wear. For example, the formulation may be formed into a patterned layer and cured or set to produce the abrasive feature layer **202** having structures **208**.

[0041] In an exemplary embodiment, the abrasive feature layer **202** may be formed with a backing or support layer. The backing is typically directly bonded to and directly contacts the abrasive feature layer **202**. For example, the abrasive feature layer **202** may be extruded onto or calendered onto a backing. The backing or support may include a polymer film, a polymer foam, or a fibrous fabric. In a particular example, the backing or support may include cloth, paper, or any combination thereof. Typically, the backing or support layer is a non-abrasive layer that does not include abrasive grains. In an embodiment, the backing or support layer generally provides additional structural support or imparts mechanical properties to the nail care strip without which the abrasive feature layer **202** would not perform as well.

[0042] Alternatively, the nail care strip **200** may be free of a backing layer. Particular formulations used to form the abrasive feature layer **202** provide desirable mechanical properties and can be self-supporting. That is, the abrasive feature layer **202** can be configured to not have reliance on a backing layer in use or during manufacture. For example, a self-supporting abrasive feature layer **202** may withstand use without structural degradation prior to the abrasive properties being consumed. In particular, the properties of the polymer in the formulation may permit formation of the nail care strip **200** without a backing layer, which may have particular advantages over the state of the art that generally requires use of a backing to carry the abrasive layer through the coating process and to provide mechanical integrity or flexibility during use. In particular, the abrasive feature layer **202** may be self-supporting without the presence of an underlying support or backing layer. Such underlying support or backing layers traditionally have tensile properties, such as a combination of strength and flexibility, that are superior to those of traditional abrasive layers. In this particular embodiment, the nail care strip **200** is free of a layer having tensile properties superior to the tensile properties of the abrasive feature layer **202**.

[0043] In addition to the abrasive feature layer **202**, the nail care strip **200** may include an adhesion layer **204**. In an embodiment, the adhesion layer **204** may include a pressure sensitive adhesive or a cured adhesive. When the adhesive is used to bond the nail care strip to a nail cleaning tool, a release film may cover the abrasive feature layer to prevent premature adhesion. Such release films are typically removed just prior to attachment of nail care strip **200** to the nail cleaning tool. In an embodiment, an adhesion layer may form an underside surface (not shown), such as a pressure sensitive adhesive surface, and the abrasive feature layer may have surface features that form the abrasive upper surface. In a particular embodiment, the adhesion layer is in direct contact, such as without intervening structural layers, with the abrasive feature layer.

[0044] In another exemplary embodiment, the adhesive layer **202** may bond to a fastener sheet **206**. For example, the fastener sheet **206** may be one component of a hook and loop fastening system. Such a fastening system may be used to couple the nail care strip **200** to a nail cleaning tool.

[0045] The structures **208** of the nail care strip **200** may be arranged in a pattern. For example, the abrasive structures may be arranged in a grid pattern. In another exemplary embodiment, abrasive structures may be arranged in parallel lines. Alternatively, the structures may be arranged randomly with no defined pattern, or elements may be offset from one another in alternating rows or columns. In an additional example, the structures may be discrete protrusions having sloped side walls. In another example, the structures may be discrete protrusions having substantially vertical side walls. The structures may be arranged in an array having a pattern or may be arranged in a random array.

[0046] In one embodiment, the abrasive structures protruding from the abrasive feature layer are configured to increase in contact area in response to wear. For example, the abrasive structure may have a triangular cross-section. With a first degree of wear, the contact area is less than the contact area resulting from additional wear. Typically with decreasing vertical height, the contact area generally formed in a horizontal plane increases. In another exemplary embodiment, the structure may have a semicircular cross-section. The structures or protrusions may have a vertical cross-section that is regularly shaped or irregularly shaped. If regularly shaped, the protrusions may have a horizontal cross-section, such as a circle or a polygon.

[0047] Returning to FIG. **2**, the formulation described above has been found to be particularly useful in forming particular structured nail care strips, especially those without a support or backing layer, and including thin structures. In an exemplary embodiment, the abrasive feature layer **202** has a total height as denoted by letter "b" not greater than about 500 mils, such as not greater than about 350 mils, not greater than about 200 mils, not greater than about 100 mils, not greater than about 50 mils, or even not greater than about 35 mils. The abrasive structures **208** as denoted by letter "a", may be not greater than about 20 mils, such as not greater than about 15 mils. Further, the width of the abrasive feature layer **202** not including the abrasive structures **208**, as denoted by letter "c" may be not greater than about 15 mils, such as not greater than about 10 mils.

[0048] The nail care strip **200** may be cut and shaped to any reasonable size depending on the use. For instance, the nail care strip may be shaped as a square, a rectangle, a circle, an oval, a triangle, a cylinder, or any other reasonable shape. Further, the nail care strip may be shaped to fit a hand or any reasonable nail cleaning tool. In an embodiment, the nail care strip, tool, or combination thereof can be chosen to change the abrasiveness as needed. In a particulate embodiment, the nail care strip may be removed from the tool for cleaning, sanitization, or combination thereof. Further, the nail care strip **200** has flexibility, which is desirable to clean the shape and contoured surfaces of fingernails and toenail. For instance, the hardness of the cleaning article is in a range of about 50 shore A to about 75 shore D based on testing method DIN53 505. For example, the hardness may be not greater than about 75 shore D, such as not greater than about 60 shore D, or not greater than about 50 shore D.

[0049] In a particular embodiment, a method of buffing a fingernail or toenail is disclosed. An exemplary method of buffing a fingernail and a toenail is provided. In one particular embodiment, a nail care strip is used to facilitate the buffing of a fingernail and a toenail. The method includes cleaning the nail. In an embodiment, the nail is cleaned by any reasonable method envisioned. For instance, the nail is cleaned with water such as tap water, distilled water, deionized water, and combinations thereof. Further, any reasonable soap, detergent, solvent, cleanser, and the like may be used to remove any foreign matter such as dirt, grime, nail polish, nail debris, and the like that may be on the nail to provide a natural, clean nail surface. Typical solvents include any reasonable nail polish remover. In an embodiment, the solvent includes a chemical cleanser. In an embodiment, the nail care strip is free of any additional chemical cleansers. In a particular embodiment, the nail care strip may be used to clean the fingernail or toenail of any nail debris and foreign matter.

[0050] The surface of the fingernail, toenail, or combination thereof is buffed with the nail care strip. Buffing the surface includes abrading the nail surface by wiping, scrubbing, and the like to provide a smooth nail surface. In an embodiment, the fingernail or toenail may be buffed with or without a solvent. A typical solvent may aid in buffing the nail surface. The solvent may be provided prior to buffing the fingernail or toenail, during the abrading of the fingernail or toenail, or any combination thereof. Solvents may include water such as tap water, distilled water, deionized water, and combinations thereof. Solvents may further include any reasonable polishing agent such as waxes, lubricants, buffers, the like, and combinations thereof. For instance, a polishing agent powder is incorporated with the nail care strip. In an exemplary embodiment, the polishing agent powder reacts with water.

[0051] While embodiments of the nail care system are useful for naturally grown fingernails and toenails, other surfaces that may be cleaned include, for example, any artificial nail surface. In an exemplary embodiment, the artificial nail surface is clean of nail debris, foreign matter, and free of any nail polish.

[0052] Particular embodiments of the nail care strip advantageously provide improved surface characteristics when used. For example, use of particular embodiments of the nail care strip may exhibit improvements in roughness and gloss in the fingernail and toenail. In an exemplary embodiment, the nail care strip buffs the fingernail and toenail without leaving deep scratches or surface defects that remain on the fingernail and toenail surface. In a particular embodiment, such nail care strips are useful in instances where no subsequent coating process is used and buffing with the nail care strip may impart dirt or dust resistance to the polished surface. In another embodiment, such nail care strips are useful in instances where the nail is subsequently coated with any reasonable nail polish.

[0053] Further, the nail care strip may be easily cleaned and reused. In a particular embodiment, the nail care strip is cleaned of any remaining nail debris and foreign matter with water. In an exemplary embodiment, the nail care strip does not retain nail debris and foreign matter within its structure and thus, does not spread nail debris and foreign matter to other surfaces. Further, the nail care strip is reusable, i.e. may be reused a multiple number of times without degrading and losing its efficiency as a nail care strip. For instance, the nail care strip can be used at least about 3 to about 5 times, such as at least about 10 times, or even at least about 20 times without visible degradation of the nail care strip. In an embodiment, any reasonable cleansing agent may be used with the nail care strip to kill or remove any germs, bacteria, and the like. Exemplary cleansing agents include an alcohol, an antibacterial agent, and the like. For instance, a cleansing agent may be added to the nail care strip by any reasonable method to kill

or remove any germs, bacteria, and the like. In an embodiment, the nail care strip is soaked in the cleansing agent to kill or remove any germs, bacteria, and the like.

[0054] Further details of the construction of the nail care strip may be found in US Patent Application Publication No. US 2008/0014840A1 (US '840), incorporated herein by reference. It is noted that the US '840 is generally directed to abrasive structures utilized in the context of automotive paint repair, not in the context of nail care strips, and methods of buffing a fingernail and toenail incorporating same.

[0055] The above-disclosed subject matter is to be considered illustrative, and not restrictive, and the appended claims are intended to cover all such modifications, enhancements, and other embodiments, which fall within the true scope of the present invention. Thus, to the maximum extent allowed by law, the scope of the present invention is to be determined by the broadest permissible interpretation of the following claims and their equivalents, and shall not be restricted or limited by the foregoing detailed description.

1. A nail care system for buffing and polishing fingernails and toenails, the system comprising a nail care strip comprising a layer of a liquid silicone resin formulation and abrasive grains.

2. The nail care system of claim **1**, further including a package having a holding compartment for the nail care strip, the packaging providing a sale message associated with the abrasive strip.

3. (canceled)

4. (canceled)

5. (canceled)

6. The nail care system of claim **1**, wherein the liquid silicone resin is formed of a two-part silicone rubber, wherein one part includes a crosslinking agent.

7. The nail care system of claim **1**, wherein the nail care strip includes at least about 30 wt % of the abrasive grains based on the total weight of the formulation.

8. The nail care system of claim **1**, wherein the abrasive grains are selected from a group consisting of nitrides, carbides, oxides, and a blend thereof.

9. The nail care system of claim **1**, wherein the abrasive grains is selected from a group consisting of silica, alumina, zirconia, zirconia/alumina oxides, silicon carbide, garnet, diamond, cubic boron nitride, silicon nitride, ceria, titanium dioxide, titanium diboride, boron carbide, tin oxide, tungsten carbide, titanium carbide, iron oxide, chromia, flint, emery, and any combination thereof.

10. The nail care system of claim **1**, wherein the abrasive grains are in the form of aggregates.

11. The nail care system of claim **1**, wherein the nail care strip further includes a reinforcing particulate.

12. (canceled)

13. The nail care system of claim **11**, wherein the reinforcing particulate includes silica.

14. The nail care system of claim **1**, wherein the nail care strip is in the form of an abrasive sheet and wherein the nail care strip is free of a backing layer.

15. The nail care system of claim **1**, wherein the nail care strip is in the form of a sheet having a major surface, wherein the major surface has an assembly of surface protrusions.

16. The nail care system of claim **15**, wherein the assembly of surface protrusions is arranged in a pattern.

17. The nail care system of claim **15**, wherein the surface protrusions are sloping side-wall surface protrusions.

18. The nail care system of claim **15**, wherein the surface protrusions are vertical walled surface protrusions.

19. The nail care system of claim **1**, wherein the nail care strip further includes a polishing agent.

20. (canceled)

21. (canceled)

22. A method of buffing a fingernail and toenail, the method comprising:

cleaning the fingernail, toenail, or combination thereof; and

buffing the fingernail, toenail, or combination thereof with a nail care strip comprising a layer of a liquid silicone resin formulation and abrasive grains.

23. The method of claim **22**, wherein the liquid silicone resin is formed of a two-part silicone rubber, wherein one part includes a crosslinking agent.

24. The method of claim **22**, wherein the nail care strip includes at least about 30 wt % of the abrasive grains based on the total weight of the formulation.

25. The method of claim **22**, wherein the abrasive grains is selected from a group consisting of nitrides, carbides, oxides, and a blend thereof.

26. (canceled)

27. (canceled)

28. (canceled)

29. (canceled)

30. (canceled)

31. (canceled)

32. (canceled)

33. The method of claim **22**, wherein the abrasive grains is selected from a group consisting of silica, alumina, zirconia, zirconia/alumina oxides, silicon carbide, garnet, diamond, cubic boron nitride, silicon nitride, ceria, titanium dioxide, titanium diboride, boron carbide, tin oxide, tungsten carbide, titanium carbide, iron oxide, chromia, flint, emery, and any combination thereof.

34. (canceled)

35. The method of claim **22**, wherein the nail care strip further includes a reinforcing particulate.

36. (canceled)

37. The method of claim **35**, wherein the reinforcing particulate includes silica.

38. (canceled)

39. (canceled)

40. (canceled)

41. The method of claim **22**, wherein the nail care strip includes a major surface having a set of protrusions.

42. (canceled)

43. (canceled)

44. (canceled)

45. (canceled)

46. The method of claim **22**, further comprising providing a solvent to the nail prior to buffing, during buffing, or combination thereof.

47. (canceled)

48. The method of claim **22**, further comprising adding a cleansing agent to the nail care strip to remove any germs from the nail care strip.

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