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**FOOD CONTAINER HAVING SUBSTRATE
IMPREGNATED WITH PARTICULATE MATERIAL**

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FIELD OF THE INVENTION

The present invention relates to food containers, and more particularly to
15 food containers having a user facing surface which provides improved cut
resistance.

BACKGROUND OF THE INVENTION

Disposable food containers are well known in the art. Disposable food
20 containers include common paper plates, bowls, clam shells, trays, cutting
boards, etc.

The art has paid considerable attention to making, molding, and deforming
these food containers out of a single plane. In this latter process a blank is
provided. The blank is inserted between mating platens and pressed. The
25 periphery of the blank may have radial grooves. The radial grooves provide for
accumulation of the material deformed by the platens. Exemplary art includes
U.S. Patents 3,033,434, issued May 8, 1962 to Carson; 4,026,458, issued
May 31, 1977 to Morris et al., the disclosures of which are incorporated herein by
reference; 4,606,496, issued August 19, 1986 to Marx et al.; 4,609,140, issued
30 September 2, 1986 to van Handel et al.; 4,721,500, issued Jan. 26, 1988 to van
Handel et al.; 5,230,939, issued July 27, 1993 to Baum; and 5,326,020, issued
July 5, 1994 to Cheshire et al.

However, these attempts in the art suffer from several drawbacks. As illustrated by the plethora of attempts to improve the rigidity and stability of the food containers, the prior art attempts do not provide food containers of sufficient strength. This lack of strength leads to spillage of food when the food container becomes overloaded, or, alternatively, unduly constrains the amount of foods which can be placed on the food container at a given time.

There have been several attempts in the art to improve the rigidity of such food containers. For example, food containers having a bottom wall, a side wall disposed radially outwardly of and circumjacent the bottom wall, and a rim disposed radially outwardly of and circumjacent the side wall are known in the art. Food containers with densified regions in the side wall have been attempted in the art. Likewise, containers having densified circumferentially spaced regions extending radially through annular portions of the rim are known. Such attempts in the art are alleged to provide resistance to bending throughout the entire structure. Illustrative of such attempts are U.S. Pat. nos. 4,606,496 issued Aug. 19, 1986 to Marx et al. and 4,609,140 issued Sept. 2, 1986 to Van Handel et al.

Food containers according to the prior art have been coated to improve resistance to penetration by liquids, such as grease, etc. Coatings have also been used to attempt to provide cut resistance in the finished product, gloss, ink receptivity, etc. An example of such attempts is U.S. 5,776,619 issued July 7, 1998 to Shanton. Shanton teaches a coated paper board having two coatings, a base coat and a top coat. Each coating consists of a polymer latex and a particulate pigment. The top coat has a blend of about 90 parts kaolin clay, having approximately 80% of the particles less than two microns in size. Furthermore, U.S. 5,709,913 issued Jan. 20, 1998 to Andersen et al. discloses, in Example 112, inorganically filled paper plates which are allegedly more rigid than conventional paper plates.

Another attempt in the art is illustrated by U.S. 5,635,279 issued June 3, 1997 to Ma et al. Ma et al. discloses paperboard having a polymer matrix/wax/pigment mixture applied as an aqueous formation and suited for corrugated box constructions. The coating consists of pigments, including natural and synthetic silicates, bentonite, clay, etc. U.S. 5,494,716 issued Feb.

27, 1996 to Seung et al. discloses a food tray having an aqueous coating with a styrene/acrylic latex and other agents. U.S. 5,334,449 issued Aug. 2, 1994 to Bergmann discloses a paper having a prime coat and a mixture of kaolin, calcium carbonate, casien and butadiene-styrene latex. U.S. 5,100,472 issued
5 Mar. 31, 1992 to Fugitt et al. discloses a paper coating containing dionized clay or calcium carbonate.

Similar attempts have been made in nonanalogous art to utilize particulates for abrasion resistance. For example, U.S. 5,558,906 issued Sept. 24, 1996 to Albrinck et al. discloses a decorative laminate having an abrasion resistant
10 material including alumina particles having particle sizes of about 25 microns and at about 3 microns in a 2-1 ratio.

Additionally, mineral pigments such as titanium dioxide, and water and particulate fillers such as kaolin clay have been used as opacifying agents in nonanalogous arts, such as tissue. Examples include commonly assigned U.S.
15 4,952,278 issued Aug. 28, 1990 to Gregory et al.; U.S. 5,611,890 issued Mar. 18, 1997 to Vinson et al.; and 5,672,249 issued Sept. 30, 1997 to Vinson et al., the disclosures of which are incorporated herein by reference. Additionally, fillers and cationic starch have been taught in nonanalogous arts such as the production of news print as found in U.S. 5,670,021 issued Sept. 23, 1997 to
20 Owens.

Accordingly, this invention provides a food container having a cut resistance surface which is simpler in execution and consumer preferred over the surfaces provided by the attempts in the prior art. Particularly, this invention provides a food container having a cut resistance surface which not only improves
25 resistance to inadvertent cutting and to penetration by liquid such as grease, but also provides a preferred tactile feel, when using common eating utensils such as silverware.

SUMMARY OF THE INVENTION

30 This invention comprises a food container. The food container has a first user-facing surface and a second surface opposed to the first surface. The food container has a cut-resistant particulate material impregnated into the substrate.

The food container may have an optional external facing with particulate material as well. The particulate material has a Mohs hardness of at least 3 and preferably at least 7.

5 The particulate material has a particle size of at least 5 microns, and preferably at least 10 microns.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view of a food container according to the present invention.

10 Fig. 2 is a fragmentary sectional view taken along the lines 2-2 of Fig. 1.

Fig. 3 is a fragmentary sectional view similar to that of Fig. 2 and showing a food container having an intermediate facing.

DETAILED DESCRIPTION OF THE INVENTION

15 Referring to Figs 1-2, the food container 10 according to the present invention may comprise a plate, bowl, tray, clam shell, cutting board, or any other configuration known in the art.

Typically the food container 10 according to the present invention has a concave first surface 11 and a convex second surface 12. The concave first
20 surface 11 of the food container 10 is that side which typically faces the user while in use. The convex side of the food container 10 typically faces away from the user in use and may rest upon a horizontal surface such as a table.

The food container 10 thus comprises a first user-facing surface and a second surface 12 opposed to the first surface 11. The food container 10 further
25 has a cut-resistant external facing 32 juxtaposed with, and preferably coincident, the first surface 11. The cut-resistant external facing 32 comprises particulate material 34 disposed in a single stratum. Particulate material 34 of the cut-resistant external facing 32 is disposed on and carried by a substrate 30.

The food container 10 comprises a central region 14 and a circumjacent
30 periphery 16. The central region 14 and periphery 16 are preferably disposed in two different planes, although a flat food container 10 is contemplated as a less

preferred embodiment. A flat food container 10, may, for example, have utility as a food tray or cutting board.

The central region 14 defines the XY plane of the food container 10. The Z-direction of the food container 10 lies perpendicular to the XY plane. The food container 10 has a transition region 20 from the central region 14 to the periphery 16. The periphery 16 may be spaced apart in the Z-direction from the central region 14, or the food container 10 may be flat, as described above. In normal use, the periphery 16 is raised relative to the central region 14. The central region 14 of the food container 10 defines a first portion of the food container 10. Likewise, the periphery 16 of the food container 10 defines a second portion of the food container 10.

Thus, the food container 10 is preferably multi-planar. By multi-planar, it is meant that the different portions of the food container 10 lie in different planes. An example of the multi-planarity of the food container 10 of the present invention is illustrated by the central region 14 and periphery 16 of the food container 10. The central region 14 and periphery 16 of the food container 10 are spaced apart in the Z-direction, thus rendering the food container 10 multi-planar.

It may be necessary to accommodate the accumulation of material which occurs when the food container 10 is formed. Pleats or gathers are often used for this purpose, as is known in the art. Pleats and gathers, particularly accumulation pleats having a radial orientation, are contemplated.

It is not necessary that either the central region 14 or the periphery 16 be parallel to the XY plane or generally planar. For example, bowls having a generally concave shaped bottom will be suitable for use with the present invention. The Z-direction distance from the bottom surface of the central region 14 (taken while the food container 10 is in its normal in use and generally horizontal position) to the top surface of the periphery 16 as referred to as the Z-direction depth 19 of the food container 10. If there are different depths at different portions of the food container 10, the Z-direction depth is taken as that greatest Z-direction distance.

The boundary and shape of the periphery 16 are defined by the edge 18 of the food container 10. It is to be recognized that the dimensions and relative proportions of the periphery 16 and central region 14 of the food container 10 will vary according to the exact size and intended use of the food container 10. While
5 a round food container 10 is contemplated, one of ordinary skill will recognize that any suitable shape and depth of food container 10 may be selected for use with the present invention and the invention is not so limited. Other suitable shapes include squares, rectangles, ovals, various polygons, etc.

The substrate 30 of the food container 10 may be comprised of at least two
10 plies, a first ply and a second ply. The second ply may be smaller than the first ply, so that at least part of the food container 10 is free from the second ply. The second ply and the first ply may be concentric. It is to be recognized that an alternative embodiment (not shown) of the food container 10 may comprise three or more plies.

15 In a particularly preferred embodiment, the food container 10 comprises a single ply of a rigid material, particularly a material which provides for carrying the cut-resistant external facing 32 in juxtaposition and preferably coincident with the user-facing surface of the food container 10. Suitable rigid materials include
20 foam, plastic and various other synthetic materials. The food container 10 is preferably made of cellulose and may be made of kraft, solid bleached sulfite (SBS), or layers of various paper fibers including recycled cellulose. The food container 10 may be molded from a pulp slurry or pressed from a blank between mating platens. Both methods of manufacture are well known in the art.

25 The external facing 32 provides resistance to penetration of hot greasy foods into the substrate 30 of the food container 10. Also, the external facing 32 provides a tactile sensation which is not unpleasant when the user touches the first surface 11 of the food container 10, or cuts food thereon with an eating utensil such as a knife.

30 One of ordinary skill will recognize that a particulate material 34 is particularly preferred for the external facing 32. A material having discrete and separate particles allows the facing to be hard and cut resistant without being brittle. This combination allows the food container 10 to be handled, shipped,

etc., during normal transportation and use - without breaking, spalling, delamination or chipping of the external facing 32 surface.

It is important that the first surface 11 of the food container 10 be hard yet flexible - rather than hard and brittle. This arrangement further allows the first surface 11 of the food container 10 to be cut-resistant. As used herein, a surface is considered to be "cut-resistant" if the surface allows the user to exert normal pressures while eating cooked and other prepared foods without ordinarily penetrating through the substrate 30 of the food container 10. It is further important that the first surface 11 provides the proper tactile sensation directly to the fingertips and as transmitted through various eating utensils.

It is preferred that the particulate material 34 comprising the external facing 32 have a Mohs hardness of at least 3, preferably at least 7, and even approaching or greater than 9. A Mohs hardness between 6.5 and 7.5 has been found suitable for use with the food container 10 of the claimed invention. The Mohs hardness scale (measured on a 1 to 10 talc to diamond scale) of the particulate materials 34 of the external facing 32 are well documented in reference handbooks such as pages 4-132 to 4-139, 12-93 to 12-97, and 12-205 to 12-206 of The Handbook of Chemistry and Physics, 78th Edition, 1997-1998 incorporated herein by reference. Of course, the hardness of the particulate material 34 comprising the external facing 32 is determined prior to incorporating the particulate material 34 into or disposing the particulate material 34 on the substrate 30 of the food container 10.

By providing a particulate material 34 of the aforementioned hardness, a food container 10 having the proper and preferred tactile sensation is attainable. Such a hardness allows the user to cut foods on the food container 10 with a sharp knife, without experiencing the unpleasant occurrence when the knife cuts through the food container 10, allowing gravy, au jus, etc., to leak through the food container 10.

Furthermore, it has been unexpectedly found that the particulate material 34 has a preferred particle size. The preferred particle size is necessary to impart the tactile sensation of toughness without being unpleasant to the touch.

The, user will not be afraid to cut food disposed on such a food container 10 with a sharp knife or other eating utensil.

The particulate material 34 comprising external the facing 32 has a particle size of at least 5 microns, and preferably 10 microns. The particulate material 34 may range in size from 20 to 200 microns, and possibly range from 50 to 200 microns. Particle size is measured using an L3P Sonic Sifter Separator, ATM available from VWR Scientific Products Corp., catalog number 57353-035.

The particulate material 34 comprising the external facing 32 may be a mixture of or several mixtures of mineral and other types of particulates known in the art and commercially available. For example, various particulates comprising alumina, silica, carbonate, oxides, carbides, nitrides, bromides, hard metals, hard alloys, hard elements. If carbides are selected, suitable carbides include tantalum carbide, tungsten carbide, zirconium carbide, beryllium carbide or silicone carbide (carborundum). If a boride is selected, suitable borides include aluminum boride, tantalum boride, zirconium boride, and titanium boride. Boron may also be used. If a nitride is selected, suitable nitrides include aluminum nitride, zirconium nitride and titanium nitride. Metals, including hard metal alloys, such as iron, steel and chromium may be used for the particulate material 34. Ceramics, such as stoneware and particularly porcelain type ceramic particulate materials 34 have been found suitable. More particularly, aluminum oxide (corundum), silicone dioxide (quartz), calcium carbonate, potassium aluminum silicate and feldspar are suitable. Silicone dioxide, calcium carbonate, and aluminum oxide are available from the J.T. Baker Company, a division of Mallinckroft Baker, Inc., of Phillipsburg, NJ, under catalog numbers JT3405, JT1301, and JT0536, respectively.

The particulate material 34 may further comprise clay. A kaolin clay has been found particularly well suited. Suitable kaolin clay is available from the J.T. Baker Company of Phillipsburg, NJ under catalog number JT2242.

A suitable mixture for the external facing 32 has been found to be 80% kaolin clay and 20% aluminum oxide. Another suitable mixture has been found to be 80% kaolin clay and 20% calcium carbonate. All percentages described herein are weight percentages, unless otherwise specified.

The particulate material 34, including any optional clay, may be added to a water-based resin to form a coating. An acrylic resin is particularly preferred. A suitable coating may have 50 to 90% resin with 10 to 50% particulate material 34 mixed therein.

5 A suitable add-on level for the particulate material 34 comprising the external facing 32 of first surface 11 of the food container 10 is from about 0.5 to 100 grams per square meter, and preferably from about 1 to 50 grams per square meter. A round food container 10 having a finished diameter of about 22.9 centimeters and 0.1 to 2 grams of particulate material 34 comprising the
10 external facing 32 has been found suitable.

It is desired that the particulate material 34, including any resin or other carrier used therewith, be applied to the substrate 30 of the food container 10 as a single stratum. The single stratum provides the benefits over the dual strata teachings of the prior art of more precise control of the add-on levels, a single
15 application operation, and is accommodated by a commercial drying operation. In contrast, the dual strata teachings of the prior art require double the inventory of raw materials and double the machinery to apply the particulate material 34 to the substrate 30.

The coating, which ultimately comprises the external facing 32, may be
20 applied to the substrate 30 of the food container 10 after it is formed. The coating comprising the particulate material 34 may be applied by blade coating, printing, or spraying as are known in the art. If blade coating is used, the hardness of the blade must be at least as hard as the particulate material 34. Preferably, an air knife coating process is used to apply the particulate mixture to
25 the substrate 30. Preferably, the substrate 30 of the food container 10 is not dipped into the coating - so that the second surface 12 of the food container 10 remains uncoated.

One of ordinary skill will recognize that many variations are feasible. For example, the particulate material 34 may be applied in a gradient. The gradient
30 preferably has a greater add-on level near the center of the food container 10 where more cutting typically occurs in use. Less of the particulate material 34 may be applied to the exposed sides and periphery 16 of the food, which typically

function to hold the food within the periphery 16 of food container 10. This allows for conservation of the particulate material 34 as well as concentrating the particulate material 34 in the area which typically receives the greatest wear in use. Such an arrangement provides a Z-direction gradient, with concentration
5 increasing as the center of the food container 10 is approached and decreasing as the edge of the food container 10 is approached.

Alternatively, the particulate material 34 may vary in an XY pattern between regions of the first surface 11 having the particulate material 34 and regions free of the particulate material 34. The particulate material 34 may, for example, be
10 applied in a checkerboard pattern or in stripes. Suitable patterns of stripes include concentric rings, radial lines (either straight or spiral), parallel lines, etc. This arrangement provided the benefit that the food container 10 is flexible in the regions not having the particulate material 34 and yet hard in the regions having the particulate material 34. Thus a food container 10 which has a cut resistant
15 external facing 32 will still result.

Optionally, the external facing 32 may be provided with at least one overcoat (not shown). The overcoat serves to protect the particulate material 34 and the external facing 32 from becoming dislodged from the substrate of the food container 10. Additionally, the overcoat defines and provides a relatively
20 smoother first surface 11. Preferably, the overcoat does not provide a first surface 11 which is too smooth, otherwise the proper tactile sensation may not result.

The overcoat(s) may comprise an acrylic resin. Preferably, the acrylic resin is relatively transparent or translucent, so that an aesthetically pleasing first
25 surface 11 will result. The overcoat may be applied by printing, spraying, dipping, blade coating, air knife coating, etc. as known in the art.

One of ordinary skill will recognize that the external facing 32 may comprise one stratum or plural strata. The external facing 32 may have one or more binder materials 36. Binder materials 36 include clay, resin, and other particulate
30 matter which may or may not have a Mohs hardness greater than 3, but serve to bind the particulate material 34 into a matrix comprising the external facing 32.

Thus, the external facing 32 will be free of clay, free of resin, or free of both while still containing the particulate material 34.

If multiple strata are used for the external facing 32, one stratum may be free of resin while the other stratum may be free of clay. One stratum may be
5 free of both resin and clay.

Of course, one of ordinary skill will recognize that at the interface between the strata, there may be some slight intermingling of the clay and the resin binder materials. Likewise, such intermingling may occur between the external facing 32 and the substrate 30 of the food container 10. However, such intermingling
10 does not prevent either stratum of the external facing 32 from consisting essentially of a particulate material 34 and a single binder material 36. Intermingling at the interface may occur due to migration of the various binder materials 36 between the plural strata of the external facing 32.

The external facing 32 is disposed on the substrate 30. The condition of
15 being "disposed on" includes configurations where the external facing 32 resides directly upon the substrate 30 as well as configurations where the external facing 32 is connected to the substrate 30 through an intermediate member, such as an intermediate facing 40. The intermediate facing 40 may have the same composition as the external facing 32.

Referring to Figure 3, preferably, however, the intermediate facing 40 and the external facing 32 have different compositions. This allows one to tailor the intermediate facing 40 and external facing 32 to the particular desired properties. For example, one of the external facing 32 and intermediate facing 40 may be free of resin. The other of the external facing 32 and intermediate facing 40 may
25 be free of clay. One of the external facing 32 and intermediate facing 40 may be free of both resin and clay. The other may contain clay or resin.

Alternatively, the external facing 32 may contain only a single binder material 36 while the intermediate facing 40 contains both (or a single) binder material 36. All such variations are contemplated and within the scope of the
30 claimed invention.

In a particularly preferred embodiment, the intermediate facing 40 is disposed on the substrate 30. The intermediate facing 40 comprises both

particulate material 34 and a clay binder material 36. An external facing 32 is disposed on the intermediate facing 40. The external facing 32 comprises resin binder material 36 as well as particulate material 32. This arrangement provides the advantage that the intermediate facing 40 has clay therein, which adheres well to a cellulosic substrate 30. The external facing 32 has resin therein which provides a less gritty tactile sensation.

The particulate material 34 is impregnated into the substrate 30. By "impregnated" it is meant that the particulate material 34 may be in direct contact with the substrate 30 or, alternatively, the particulate material 34 may be placed on a carrier (not shown) which is joined to the substrate 30.

The carrier may be a generally planar sheet of material capable of existing independently from the substrate 30. The particulate material 34 is incorporated into the carrier which is then joined, adhesively, or by other means known in the art to the substrate 30. The carrier need not be capable of holding the desired shape illustrated in the figures, but only needs to be capable of being joined to the substrate 30 and substantially conforming thereto.

For example, the carrier may be a sheet of tissue or another grade of a light weight paper which is subsequently joined to a single ply SBS substrate 30. The tissue or other grade of light weight paper carrier has the particulate material 34 impregnated therein prior to being joined to the SBS or other substrate 30. The sheet of tissue or other light weight grade carrier may be made according to any of the teachings well known in the art as, for example, illustrated by the commonly assigned patents incorporated herein below.

Alternatively, the carrier may be a single ply of liner board having the particulate material impregnated therein. The single ply of liner board may be joined to the corrugated medium of a single face corrugated substrate 30. The liner board carrier having the particulate material 34 impregnated therein then becomes one of the external faces of a multi-ply corrugated medium as is known in the art.

More preferably, the particulate material 34 is directly incorporated into and impregnated in the substrate 30 during manufacture of the substrate 30. The substrate 30 is preferably formed by a wet laying process as is well known in the

art. In the wet laying process, cellulosic, synthetic and other fibers are deposited from a headbox onto a forming screen by a liquid carrier. The liquid carrier is drained away and the resulting fibrous slurry is dried. The fibers may be cellulose, synthetic, various combinations thereof.

5 The substrate 30 may be of constant basis weight or having regions of multiple basis weights. A constant basis weight substrate 30 may be made according to the teachings of commonly assigned U.S. Patents 3,994,771 issued Nov. 30, 1976 to Morgan, Jr., et al., 4,225,382 issued Sept. 30, 1980 to Kearney et al. or 4,300,981 issued Nov. 17, 1981 to Carstens et al., the disclosures of
10 which are incorporated herein by reference. A multiple basis weight substrate 30 may be made according to the teachings of commonly assigned U.S. Patents, 5,245,025 issued Sept. 14, 1993 to Trokhan et al., 5,503,715 issued April 2, 1996 to Trokhan et al., 5,534,326 issued July 9, 1996 to Trokhan et al., and 5,804,281 issued Sept. 18, 1998 to Phan et al., the disclosures of which are
15 incorporated herein by reference.

 If desired, the substrate 30 may be air laid as is well known in the art. If the substrate 30 is air laid, the binder material 36 and/or the particulate material 34 may be distributed in a gradient, as desired. Suitable apparatus(es) for making the air laid substrate 30 and providing such a distribution of the binder material
20 36 and/or particulate material 34 are disclosed in commonly assigned in U.S. Patent Nos. 5,445,777 issued Aug. 29, 1995 to Noel et al. and 5,558,832 issued Sept. 24, 1996 to Noel et al., the disclosures of which are incorporated herein by reference. Preferably, the substrate 30 has a gradient therethrough, with a greater concentration of the particulate material 34 oriented towards the first
25 surface 11.

 The particulate material 34 may be disposed in and deposited from the headbox used in the wet laying operation. Such an arrangement will prophetically produce a food container 10 having a substrate 30 with the particulate material impregnated therein and relatively homogeneously and
30 uniformly distributed throughout. However, in an undesirable execution, the particulate material 34 may drain towards the bottom of the forming wire and become juxtaposed with the second surface 12 of the food container 10. This

arrangement yields a food container 10 having a Z-direction gradient with the particulate material 34 having a lesser concentration at the first surface 11. Such an arrangement is undesirable, since the user desires more particulate material 34, not less, to be juxtaposed with the first surface 11.

5 In order to overcome this predicament, a layered headbox may be utilized for the wet laying operation. In a layered headbox, two or more channels of different materials may be deposited onto the forming wire. The first channel is the channel closest to and deposits the fibers first to contact the forming wire. The second, third, or uppermost channel of the headbox may contain particulate
10 material 34, or, preferably, particulate material 34 disposed in a slurry of fibers and the liquid carrier. This arrangement provides the advantage over that discussed above that the particulate material 34 is disposed in a gradient having a greater Z-direction concentration oriented towards the first surface 11. Thus, more of the particulate material 34 is juxtaposed with the first surface 11 and
15 improves cut resistance and provides a pleasing tactile sensation for the user.

In an alternative embodiment, multiple single channel headboxes may be utilized. In such an arrangement, preferably a first headbox deposits a fibrous slurry and a liquid carrier onto the forming wire. One or more subsequent headboxes deposit particulate material 34 and/or a combination of particulate
20 material 34 and fibers onto the first fibrous slurry. This arrangement allows the fibers deposited from the first headbox occlude the flow of particulate material 34 from the subsequent headbox(es), keeping the particulate material 34 disposed near the surface of the resulting fibrous slurry. The fibrous slurry is subsequently dried by any means well known the art. The dried surface facing outwardly from
25 the forming wire becomes, of course, the first surface 11 of the food container 10.

If desired, a substrate 30 manufactured according to the air laid process may be layered as well. Layering the substrate 30 in an air laying process provides the benefits that the particulate material 34 and/or binder material 36
30 may be disposed in a gradient having a heavier Z-direction concentration juxtaposed towards the first surface 11.

Apparatuses and processes suitable for incorporating the particulate material 34 and/or the binder material 36 are disclosed in commonly assigned U.S. Pat. Nos. 5,661,890 issued Mar. 18, 1997 to Vinson et al. and 5,672,249 issued Sept. 30, 1997 to Vinson et al., the disclosures of which are incorporated
5 herein by reference.

WHAT IS CLAIMED IS:

1. A food container, said food container having a first user facing surface and a second surface opposed thereto, said food container having a substrate characterized in that said substrate comprises a particulate material impregnated therein, that said particulate material having a Mohs hardness of at least about 3.
2. A food container according to Claim 1, further comprising an external facing disposed on said substrate and defining said first surface, said external facing having particulate material disposed therein.
3. A food container according to Claims 1 and 2 wherein said external facing further comprises clay or resin.
4. A food container according to Claims 1 and 2 wherein said external facing is free of clay or resin.
5. A food container according to Claims 1, 2, 3, and 4 wherein said particulate material disposed in said substrate or said external facing has a particle size of at least about 5 microns.
6. A food container according to Claims 1, 2, 3, 4 and 5 further comprising an intermediate facing disposed on said substrate and being between said external facing and said substrate, said intermediate facing comprising particulate material.
7. A food container according to Claim 6 wherein said intermediate layer further comprises a binder material.



8. A food container according to Claims 1, 2, 3, 4, 5, 6, and 7 wherein said substrate is wet laid.
9. A food container according to Claims 1, 2, 3, 4, 5, 6, 7, 8, and 9 wherein said particulate material is disposed in a gradient.
10. A food container according to Claim 15 further comprising an overcoat.

