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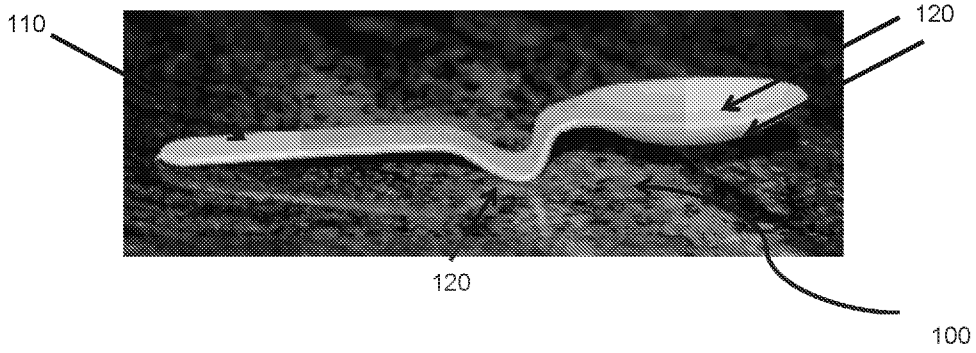
FIG. 1A




(57) Abstract: The invention involves the incorporation and enablement of elements that are incorporated into a consumer product that provide necessary balance, placement, positioning, shape, contour, and geometry that prevent a portion of the product from touching or contacting a surface on which the product is placed. The elements can be readily integrated into high-volume consumable products to increase utility, function and features of the consumable product at minimal incremental cost and adjustment to production and manufacturing processes. The invention further reports processes and compositions that enable consumable products with differentiating features, which products would otherwise be deficient for their intended use and application.

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# SANITARY UTENSILS AND CONSUMER PRODUCTS

## CROSS-REFERENCE TO RELATED APPLICATIONS

Pursuant to 35 U.S.C. § 119(e), this application claims priority to the filing date of United States Provisional Application Serial No. 62/414,577 filed on October 28, 2016; the disclosure of which application is herein incorporated by reference.

## INTRODUCTION

Utensils for manipulating food are relatively well-known and typically include a fork, spoon, knife, spork or other utensil that are employed to manipulate food or for another useful purpose. Food utensils are typically utilized to avoid direct contact between the food and the user's hand, thereby preventing the user's hands from becoming soiled by the food or transmitting germs or other elements from the hand to the food.

## SUMMARY

Sanitary consumable functional and value-added elements are integrated into, laboratory, medical, dental, oral, commercial, quality control, food service, food and beverage utensils such as spoons, baby spoons, knives, forks, sporks (spoon-forks), chopsticks, beverage stoppers, stirrers, straws, thermometers, measuring devices, oral care tools, tooth brushes and other consumable consumer products, such that placement of products on a surface preserves the sanitary nature of the product prior to, intermittently, and use. Structural elements described herein at least reduce, if not inhibit or prevent, the contamination of product elements that come in contact with the mouth, food and/or a beverage during use, thus at least reducing, if not inhibiting or preventing the transfer of contaminating matter, micro-organisms, bacteria, viruses, dirt, chemicals, or other substances from a surface touched by the utensil.

The invention enables affordable consumable products that are convenient to use with multi-functional elements that are integrated into a consumer products providing safety and sanitation, manufacturability, physical balance, practical shape for nested packaging and handling, ease-of-use and geometry that prevent critical portions of the product from touching or contacting a surface the product is placed on. Public safety and sanitation is a major issue in food and other services. Bacterial transfer from table, counter tops, and food serving surfaces can be sigificantly mitigated utilizing the

invention described below. Furthermore, reduction in food transfer from a serving utensil to a surface can be equally reduced. Further, shape directed elements directly integrate both sanitary and ease-of-use features into the products containing them. Elements can be readily incorporated into high-volume consumable products to increase utility, function and features of the consumable product at minimal incremental cost and adjustment to production and manufacturing processes. The invention further reports processes and compositions that enable products with differentiating features which product would otherwise be deficient for their intended use and application.

Aspects of the invention include utensils, such as eating utensils, having a proximal end, a distal end and a connecter between the proximal end and distal end, where the utensil is configured such that the distal end is elevated above a surface of a planar substrate when one or more of the proximal end and the connector is in contact with the surface of the planar substrate. In some instances, the utensil is an eating utensil having a working end and a handle, where the working end and handle are joined to each other by an integrated curvilinear connector that is configured to raise the working end above a planar surface of a support when the eating utensil is placed on the planar surface. Aspects of the invention further include methods of making and using the utensils and consummable products.

## BRIEF DESCRIPTION OF THE FIGURES

FIGS. 1A to 1C provide different views of a spoon according an embodiment of the invention. FIGS. 1D to 1F provide different views of a spoon according to an embodiment of the invention having an inverted elevated connector.

FIG. 2 provides an angled top view of a knife according an embodiment of the invention.

FIGS. 3A and 3B provide different views of a fork according an embodiment of the invention.

FIGS. 4A to 4C provide angle top, bottom and side views, respectively, of a spoon having a contoured handle, according to any embodiment of the invention.

FIG. 5A provides a view of six spoons as shown in FIGS. 4A to 4C arranged in a nested configuration. FIG. 5B provides a view of four spoons as shown in FIGS. 1D to 1E in a nested configuration.

FIG. 6 provides a view of a spoon that includes a wide handle and wide levitating connector for stabilization.

FIG. 7 provides view of a spoon having an elevating connector positioned at the proximal end of a spoon.

FIGS. 8A and 8B provide views of utensils having a living hinge elevating connector.

FIG. 9 provides a view of a metallized fork according to an embodiment of the invention.

FIG. 10 provides an illustration of a coffee stirrer utensil according to an embodiment of the invention.

FIGS. 11A to 11D provide different views of a utensil having both spoon and knife functionalities, in accordance with an embodiment of the invention.

## DETAILED DESCRIPTION

The invention involves the incorporation and enablement of multiple interactive elements into high-volume consumable products to increase utility, function and features of the consumable product at minimal incremental cost and adjustment to production and manufacturing processes. The invention further reports processes and compositions that enable consumable products with differentiating features which product would otherwise be deficient for their intended use and application. Aspects of the invention include utensils, such as eating utensils, having a proximal end, a distal end and a connecter between the proximal end and distal end, where the utensil is configured such that the distal end is elevated above a surface of a planar substrate when one or more of the proximal end and the connector is in contact with the surface of the planar substrate. In some instances, the utensil is an eating utensil having a working end and a handle, where the working end and handle are joined to each other by an integrated curvilinear connector that is configured to raise the working end above a planar surface of a support when the eating utensil is placed on the planar surface. Aspects of the invention further include methods of making and using the utensils and consummable products.

Before the present invention is described in greater detail, it is to be understood that this invention is not limited to particular embodiments described, as such may, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting, since the scope of the present invention will be limited only by the appended claims.

Where a range of values is provided, it is understood that each intervening value, to the tenth of the unit of the lower limit unless the context clearly dictates otherwise, between the upper and lower limit of that range and any other stated or intervening value in that stated range, is encompassed within the invention. The upper and lower limits of these smaller ranges may independently be included in the smaller ranges and are also encompassed within the invention, subject to any specifically excluded limit in the stated range. Where the stated range includes one or both of the limits ranges excluding either or both of those included limits are also included in the invention.

Certain ranges are presented herein with numerical values being preceded by the term "about." The term "about" is used herein to provide literal support for the exact number that it precedes, as well as a number that is near to or approximately the number that the term precedes. In determining whether a number is near to or approximately a specifically recited number, the near or approximating unrecited number may be a number, which, in the context in which it is presented, provides the substantial equivalent of the specifically recited number.

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Although any methods and materials similar or equivalent to those described herein can also be used in the practice or testing of the present invention, representative illustrative methods and materials are now described.

All publications and patents cited in this specification are herein incorporated by reference as if each individual publication or patent were specifically and individually indicated to be incorporated by reference and are incorporated herein by reference to disclose and describe the methods and/or materials in connection with which the publications are cited. The citation of any publication is for its disclosure prior to the filing date and should not be construed as an admission that the present invention is not entitled to antedate such publication by virtue of prior invention. Further, the dates of publication provided may be different from the actual publication dates which may need to be independently confirmed.

It is noted that, as used herein and in the appended claims, the singular forms “a”, “an”, and “the” include plural referents unless the context clearly dictates otherwise. It is further noted that the claims may be drafted to exclude any optional element. As such, this statement is intended to serve as antecedent basis for use of such exclusive

terminology as "solely," "only" and the like in connection with the recitation of claim elements, or use of a "negative" limitation.

As will be apparent to those of skill in the art upon reading this disclosure, each of the individual embodiments described and illustrated herein has discrete components and features which may be readily separated from or combined with the features of any of the other several embodiments without departing from the scope or spirit of the present invention. Any recited method can be carried out in the order of events recited or in any other order which is logically possible.

Described herein is the incorporation and enablement of sanitary elevating-levitating elements into high-volume consumable products, such as utensils, to increase utility, function and features of the consumable products, in some instances at no incremental cost and adjustment to production and manufacturing processes. The invention further reports processes and compositions that enable consumable products with differentiating features which products would otherwise be deficient for their intended use and application.

Sanitary consumable functional and value-added elements are integrated into, laboratory, medical, dental, oral, commercial, quality control, food service, food and beverage utensils such as spoons, baby spoons, knives, forks, sporks (spoon-forks), chopsticks, beverage stoppers, stirrers, straws, thermometers, measuring devices, oral care tools, tooth brushes and other consumable consumer products, such that placement of products on a surface preserves the sanitary nature of the product prior to, intermittently, and use. Structural elements described herein at least reduce, if not inhibit or prevent the contamination of product features that come in contact with the mouth, food and/or a beverage during use, thus at least reducing, if not inhibiting or preventing the transfer of contaminating matter, micro-organisms, bacteria, viruses, dirt, chemicals, or other substances from a surface with which the product has been contacted.

The invention enables affordable consumable products that are convenient to use with multi-functional elements that are integrated into a consumer products providing safety and sanitation, manufacturability, physical balance, practical shape for nested packaging and handling, ease-of-use and geometry that prevent critical portions of the product from touching or contacting a surface the product is placed on. Public safety and sanitation is a major issue in food and other services. Pathogen, e.g., bacterial and/or viral, transfer from table, counter tops, and food serving surfaces can be

sigificantly mitigated utilizing the invention described below. Furthermore, reduction in food transfer from a serving utensil to a surface can be equally reduced. Further, shape directed elements directly integrate both sanitary and ease-of-use features into the products containing them. Elements can be readily incorporated into high-volume consumable products to increase utility, function and features of the consumable product at minimal incremental cost and adjustment to production and manufacturing processes. The invention further reports processes and compositions that enable products with differentiating features which product would otherwise be deficient for their intended use and application.

General places of use:

Utility of applications can include food service, commecaries, restaurant, home use, rest homes, hospitals and hospital food service, food preparers, airlines, trains, busses, various public transportion, yogurt shops, ice cream shops, coffee shops, dental offices, military restaurants, laboratories where sterile elments are required. General configurations are meant for sterile or non-contamination for the utensil to be utilized for eating or other skin or oral contact. For example sanitary utensils can be use for contact with human mouths and maintain sanitation.

Pathogen transfer from surfaces to utensils:

Unfortunately, many consumers are unaware that utensils and other surfaces at home can contribute to the spread of pathogens such as bacteria and viruses as indicated by sources such as the College of Agricultural and Environmental Sciences' department of food science and technology. The transfer of norovirus and hepatitis A between produce and common kitchen utensils--finding that cutting and grating increased the number of contaminated produce items when that utensil had first been used to process a contaminated item. Poor hygiene and improper food preparation practices in a consumer's home can lead to foodborne illnesses, but considering what practices in the kitchen are more likely to lead to contamination has not been examined extensively.

Unlike many other disease-causing bacteria, *E. coli* can cause infection even if only a small amount is consumed, according to the *Mayo Clinic.* Ground beef, unpasteurized milk, and fresh produce are all common carriers and ways people ingest the bacteria, leading to diarrhea, severe stomach cramps, vomiting, and fever. Certain

vegetables, such as spinach and lettuce are highly vulnerable to contamination, and tomatoes are particularly good at cross contaminating through utensils. Transfer of common pathogens to utensils is common from food serving surfaces, counters and tables. Meats, cheese, vegetables and processed foods, cooked and uncooked foods and the like can be sources of contamination.

*Listeria*: Apart from some diarrhea or minor gastrointestinal problems, most people do not get sick when they're exposed to *Listeria*. It is estimated that *Listeria* sickens only about 1,600 people in the U.S. each year, but, if the pathogen gets into the bloodstream, one in five people die, giving it the highest mortality rate of foodborne pathogens. At least 90 percent of people who get *Listeria* infections are pregnant women and their newborns, people 65 or older, or people with weakened immune systems. *Listeria* can contaminate foods that are not usually cooked, such deli meats, sprouts, and soft cheeses. In 1985, *Listeria*-contaminated queso fresco sickened 142 people, killed 10 newborns and 18 adults, and caused 20 miscarriages. In 2011, 147 people were infected with *Listeria* from cantaloupes and 33 people died. Recently, there have been outbreaks linked to new food vehicles — caramel apples and ice cream.

*Salmonella*: Approximately 1 million people are sickened by *Salmonella* in the U.S. each year and approximately 380 of them die from the infection. Children are at the highest risk for *Salmonella* infection. Children younger than 5 have higher rates of *Salmonella* infection than any other age group. Young children, older adults, and people with weakened immune systems are the most likely to have severe infections. *Salmonella* illnesses are commonly associated with poultry and eggs, along with meat, unpasteurized milk or juice, cheese, contaminated raw fruits and vegetables, spices, and nuts. In 2009, 714 people were infected with *Salmonella Typhimurium* linked to peanut butter. Approximately 1,939 *Salmonella Enteritidis* illnesses associated with shell eggs were reported in 2010, and 634 people were sickened by *Salmonella Heidelberg* linked to Foster Farms chicken in 2013 and 2014.

Shiga toxin-producing *E. coli*: Most *Escherichia coli* are harmless and an important part of a healthy human intestinal tract, but some are pathogenic. There are six pathotypes of *E.coli* that are associated with diarrhea including Shiga toxin-producing *E.coli* (STEC) – also referred to as Verocytotoxin-producing *E.coli* (VTEC) or enterohemorrhagic E.coli (EHEC). The most commonly identified STEC in North America is *E.coli* O157:H7 (often shortened to *E.coli* O157). Shiga is estimated to cause 265,000 illnesses and 30 deaths each year. It infects people of any age, but young

children and the elderly are more likely to develop severe illness and hemolytic uremic syndrome (HUS), a severe complication in which red blood cells are damaged and can cause kidney damage and kidney failure. Undercooked ground beef, raw milk and juice, soft cheeses made from raw milk, and raw fruits and vegetables have been commonly linked to *E.coli* infections. In 1992-1993, an *E.coli O157* outbreak that sickened more than 700 people was linked to Jack in the Box hamburgers. In 2006, 199 people were sickened by contaminated spinach. And in 2009, raw refrigerated, prepackaged cookie dough sickened 72 people.

*Vibrio vulnificus*: The number of *Vibrio* illnesses and subsequent deaths may be much lower than those for *Salmonella*, *Listeria* or *E. coli*, but *Vibrio* is still a troubling pathogen. An average of 50 culture-confirmed cases, 45 hospitalizations, and 16 deaths are reported each year from the Gulf Coast region (Alabama, Florida, Louisiana, Mississippi and Texas). Recently, Florida has reported 30 confirmed *Vibrio vulnificus* infections this year, including 11 deaths. While not potentially life-threatening to most healthy people, *Vibrio vulnificus* can be very dangerous to immunocompromised people, especially those with chronic liver disease, cancer or diabetes. In these people, the bacterium can infect the bloodstream, causing a severe and life-threatening illness that is fatal about half the time. *Vibrio vulnificus* lives in warm seawater, such as the Gulf of Mexico, and is found in higher concentrations in the summer months as water temperatures rise. It can cause disease in those who eat contaminated shellfish raw or undercooked — particularly raw oysters. Contrary to what some people believe, eating raw oysters with hot sauce or while drinking alcohol does not kill the bacteria. Since 2006-2008, the Foodborne Diseases Active Surveillance Network (FoodNet) has detected a 52-percent increase in *Vibrio* infections, including *V. parahaemolyticus*, *V. alginolyticus* and *V. vulnificus*. The increases may be the result of higher water temperatures lasting more months of the year and reaching further north due to climate change.

*Clostridium botulinum*: Botulism is another rare but serious foodborne illness. It is a paralytic illness caused by a nerve toxin that is produced by the bacterium *Clostridium botulinum*. In the U.S., an average of 145 cases are reported each year. Of these, approximately 15 percent are foodborne, 65 percent are infant botulism and 20 percent are wound-related. Botulism can result in death due to respiratory failure. However, in the past 50 years, the proportion of patients with botulism who die has fallen from about 50 percent to 3-5 percent. Foodborne botulism has often been

linked to home-canned foods with low acid content, such as asparagus, green beans, beets and corn, and is caused by failure to follow proper sanitary handling methods and utilize products that help ensure the reduction of food borne illnesses.

Sanitary disposable utensils serve as practical and cost effective means to reduce the incidence of food borne illnesses through the reduction in cross contamination. Children, infants, the elderly, immune compromised, and those prone to disease will benefit from the practical utility of the sanitary features described below.

Sanitary utensil design considerations:

As summarized above, aspects of the invention include sanitary utensils and other consummable products. In some instances, the utensils include a proximal end, a distal end and a connecter between the proximal end and distal end, where the utensil is configured such that the distal end is elevated above a surface of a planar substrate when one or more of the proximal end and the connector is in contact with the surface of the planar substrate.

In some instances, the utensils are multi-element utensils. Multi-element utensil designs incorporate two or more elements including but not limited to a sanitary element that keeps the eating surface from contacting a placement surface when the utensil is placed on a surface and/or an inverted concave surface along the length of the utensil for increased strength, nesting, and stacking; snap together features so such that nested utensils can be collectively, but temporarily connected for convenient storage; designs that can be injection molded, compression molded, or thermoformed; designs that can be scaled down to taster or sampler product sizes up and through large commercial service sizes; designs can include a spoon, fork, spork (spoon fork), knife, spoon-knife, skewer, chop sticks, scraper or other utensil implement'; designs that can be molded with a single or multiple resins using; forms that can include color change elements such as thermochromic temperature sensitive compositions, photochromic light sensitive compositions, glow-in-the dark compositions, luminescent compositions, or electroluminescent compositions; recycled, virgin or mixed compositions; biodegradable, compostable, wood filler, mineral filler, or other filler compositions; and the like, such as described in greater detail below.

As summarized above, aspects of the invention include sanitary utensils and other consummable products. In some instances, the utensils include a proximal end, a distal end and a connecter between the proximal end and distal end, where the utensil is

configured such that the distal end is elevated above a surface of a planar substrate when one or more of the proximal end and the connector is in contact with the surface of the planar substrate. Of interest as such utensils are eating utensils, where eating utensils of interest include, but are not limited to: spoons, baby spoons, knives, forks, sporks (spoon-forks), chopsticks, etc.

As summarized above, utensils in accordance with embodiments of the invention include a proximal end and a distal end. In some instances, the distal end is configured or dimensioned to be placed into the mouth of a mammal, such as the mouth of a primate, e.g., the the mouth of a human, where the human may be an infant, a juvenile or an adult. By dimensioned to be placed with the mouth of a human is meant that the distal end is sized so that it can easily be introduced into and removed from an open mouth of average size, e.g., of a size averaged among 100 or more, such as 1000 or more different humans, without touching any of the sides of the mouth. In some instances, the distal includes an eating surface.

Without limitation, designs can include: eating utensils, such as spoons and forks, having a shovel or fork head at a distal end that is elevated from 1 to 0.1 inches above a resting surface upon which the eating utensil is placed, so there is no contact of the shovel or fork head with the resting surface. In some instances, the shovel or fork head ranges in height above the resting surface from 0.75 inches to 0.2 inches. In some instances, the spoon shovel or fork head is between 0.5 and 0.25 inches above a resting surface upon which the utensil is placed to ensure non-contact and practical handling.

At the proximal end is a handle. Handle lengths lengths can range from 3 to 8 inches. In some instances, lengths will be in the 3.5 to 7 inch range. In some instances, handle lengths will be in the 4 to 6 inch range. Total handle widths can vary, and in some instances range from 2 inches width at the end to 0.25 inches. In some instances, handle ends range from 1 inch to 0.3 inches. In some instances, handle end widths range from 0.75 inch to 0.4 inches for stability, attractiveness, and cost consideration.

Separating the distal from the proximal end is a connector that provides for the elevating/levitating functionality, e.g., to elevate the distal or working end of the utensil such that such that the distal end is elevated above a surface of a planar substrate when one or more of the proximal end and the connector is in contact with the surface of the planar substrate.

Sanitary levitating features incorporate, but are not limited to elements that keep oral or other hygenic elements of a product away from a contaminating surface, practical

ease of use, ergonomic design, convenience of placement, convenience of pick up and handling, cost-effectiveness and affordability such that inceremental value is added without any or limited cost to produce, branding elements and the like.

Sanitary levitating design features and element features can range in geometry, size, simplicity, location and region on a sanitry product. An element or feature can be from 1% to 80% of the total mass or surface area of a sanitary product. In some instances, the feature is between 2% and 60% of the product. In some instances, the features occupy or consume from 5% to 20% of the product mass or surface area.

Sanitary levitating design features and elements can range from protrusions that are sharp in angle from a pointed blade like design with an edge that is angled at 5 degrees to a wide shallow angle of up to 160 degrees. In some instances, the levitating feature will measure from a tangent angle form 10 to 120 degrees. In some instances for utility, style, stacking, and close packing for optimal costing, the levitating design ranges form 30 to 90 degrees.

The levitating feature can range from being flat, round or curved at the point of contact with a surface, as desired. Sharp angle contacts serve the purpose of encountering precise contact with a surface.

Elevating-levitating stand-off heights can range from elevating the working surface from the placement surface from 1 milimeter to 30 milimeter. In some instances, the elevating levitating curve will elevate the working surface from 2 – 20 milimeters. In some instances, the elevating element will raise the working surface of a product from 5 – 10 millimeters. The desired elevating height will depend on final form and function intended for the product and the product type, for ease of pick up the product, intended design, and practical use. Higher displacement of a product handle off of a surface to be protected against assists a user in easy pick up and handling.

Single to multiple curves or support features ranging from one to more than 10 to 1. In some instances, there is between 1-5 levitating features/unit. Features can be solid, brushed, extensions, continuous or discontunuous, porous, branched, patterned, networked or the like. Sanitary levitating features can be incorporated into a product during molding or production or applied or attached to a product post production depending on the most practical means for implementation. Post injection molding heating or compression stamping can be used to incorporate sanitary feature.

FIGS. 1A to 1C provide different views of a spoon according an embodiment of the invention. FIG. 1A provides a side view of a spoon 100 having a proximal end 110

that is a handle and a distal or working end 120 that is a shovel. Separating the proximal end 110 and the distal end 120 is a curved levitating connector 130 that is structured to lift the distal end 120 a distance above the surface 140 when the spoon is resting on the surface. FIG. 1B provides a bottom view of the spoon shown in FIG. 1A. FIG. 1C provides an angled top view of the spoon shown in FIGS. 1A and 1B.

In some instances, the elevating connector may be inverted. An example of an inverted elevating connector is shownin FIGS. 1D to 1F. As shown in FIGS. 1D and 1E, spoon 150 includes a flat bottomed handle 160 an inverted curved connector 170 that serves to raise the shovel above a surface on which the flat blottom handle rests. FIG. 1F provides various alternative views of the spoon shown in FIGS. 1D and 1E.

FIG. 2 provides an angled top view of a knife according an embodiment of the invention. In FIG. 2, knife 200 includes proximal end, 210, which is a handle and distal or working end 220, which includes cutting side 225. FIGS. 3A and 3B provide different views of a fork according an embodiment of the invention. Separating proximal end 210 from distal end 220 is curved levitating connector 230 that is structured to lift the distal end 220 a distance above the surface 240 when the knife is resting on the surface. As shown, fork 300 includes proximal end 310 which is a handle and distal end 320 which is the working end that includes four tines 325. Separating proximal end 310 from distal end 320 is curved levitating connector 330 that is structured to lift the distal end 320 a distance above the surface 340 when the knife is resting on the surface.

Handles can be hollow and indented, but flat on bottom. Concave hollow handles increase strength compared flat handles and reduce overall weight compared to thicker handle designs. FIGS. 4A to 4C provide angle top, bottom and side-back views, respectively, of a spoon 400 having a contoured handle 410, according to any embodiment of the invention. As illustrated in FIGS. 4A to 4C, the bottom surfaces of the handle 410 and connector 430 are countoured to have raised sides 460 surrounding a flat depressed bottom 470. The neck of a utensil, such as a spoon, may be contoured so that liquid cannot flow back into handle region when used.

The neck of spoons can have a concave shape and be continuous with the handle and shovel. It may be desierable for strength considerations for a continuous radius along the hollow handle neck section that transitions into the shovel. Further strength can be included with a radius on the bottom inside and outside of the hollow handle for smooth handling.

None Surface Contact Lift Structures:

Utensil food (i.e., eating utensil) contact elements such as a spoon shovels, knife blades, fork tynes, chop stick ends, and the like can be elevated off a surface from 0.1 mm to over 20 mm. In some instances, food or oral contact elements are elevated above a surface from 1 to 10 mm. In some instances, food or oral contact elements are elevated from 3-3 to 5 mm above a placement surface such that balance, integrety, ease of placement, ease of pick up and handling and importantly sanitation and none surface contact are maintained.

Sanitary lift structures can be utilized in a variety of convenient and easy to produce forms. By way of example, not limitation, curved, smooth, extended, shallow, rounded, sharp, angled, squared, planar, telescopled, flip up or down, secondarily attached, in-molded, glued, heat steaked, blow molded, injection molded, co-molded, stretched, twisted, punched, thermoformed compression molded, sonically welded, fused or other wise integrated or attached elements can be incorporated into a utensil to provide the elevated lift structure that ensures the food and or oral contact region of the utensil avoids placement surface contact.

Nesting and connecting features:

Design considerations include nestable and stackable features such that each utensil can be conveniently stacked side-by-side or on top of one another. Nestable and stackable features ensure convenient and cost effective packaging, shipping, space savings, and high volume storage. Sanitary curve designs can be optimized for optimal close packing. Likewise, features can be further designed and adapted for convenient connection features so that 2 or more utensils can be snapped and connect together in a continous stack. Connecting features can be utlized for convenient handling of multiple units without individual units scattering or disorganizing.

Nesting and connecting features can provide for from 2 to over a million units to be regularly stacked or arranged. In some instances in packaging, 10 to 100,000 units will be conveniently nested or connected. In some instances in packaging, 100 to 10,000 units will be organized together. In some instances, 1,000 to 5,000 will be case packed or connected post production for shipping and storage. The number of units to be orgainized collectively will dictate design considerations and final features in the end

product.

Designs can include contours allowing utensils to nest when stacked and partially snap together so they can be connected and stacked. An example of a nesting spoon configuration is illustrated in FIG. 5A. As shown in FIG. 5, 6 spoons as shown in FIGS. 4A to 4C can be fit together in a nested configuration. FIG. 5B illustrates four spoons having an inverted curved elevating connector as illustrated in FIGS. 1D to 1F. Where desired, a snap fit functionality may be included to stabilize the nesting structure.

Stabilizing features:

Stable width and elements can be employed to ensure that individual consumble or re-usable sanitary products, when placed on a surface stay in their ntended non-contact position. Options include, but are not limited to: width of contact points, counter balance weight distribution, curvature for stable rocking, localized magnetic inserts, suction elements, combinations there of or the like. The stabilizing feature is intended to provide simplicty of handling and prevent unintended contact between a portion of the sanitary product to be protected and the surface it is intended to be protected against.

Stabilizing features can range in geometry, size, simplicity, location and region on a sanitry product. An element or feature can be from 1% to 80% of the total mass or surface area of a sanitary product. in some instances, the feature will be between 2% and 50% of the product. In some instances, the features will occupy or consume not more than 5% to 20% of the product mass or surface area.

Generally, a wide handle end helps keep spoon stable and balance on a surface. FIG. 6 provides a bottom view of a spoon 600 that includes a wide end 610 and wide connecting levitator 630 which provides for stabilization when the spoon rests on a surface.

Physical multi-element feature:

Physical multi-element features can include, but are not limited to, sanitary utensil features in combination with convenient stand-off, exhibition, space-saving placement, and/or ancillary elements (holding, stirring, fixturing). By way of example, the sanitary feature can be embodied at the end of a utensil such that the utensil stands virtually upright or vertical with respect to the plane of the surface that the utensil has been placed on. FIG. 7 provides view of a spoon having an elevating connector positioned at the proximal end of a spoon. In FIG. 7, spoon 700 includes proximal end

710 and distal end 720, with elevating curved connector 730 positioned at the proximal end. As such, the handle 740 is positioned between the connector 730 and the distal end 720 which is the shovel.

Bendable molded spoon articles that can be re-shaped to compensate for clearance of the spoon shovel off of the surface that the bendable spoon is placed are provided in some instances. For example, the elevating connector may, in some instances, be a living hing. Living hinges provide for a convenient means to re-shape a plastic utensil handle for an adaptive santiary feature. FIGS. 8A and 8B provide views of utensils having a living hinge elevating connector. In FIG. 8A, spoon 800 includes proximal end 810 having which is a handle and distal end 820 which includes the shovel. connecting the proximal and distal ends is living hinge elevating connector 830. In FIG. 8B, fork 850 includes proximal end 860 having which is a handle and distal end 870 which includes the shovel. connecting the proximal and distal ends is living hinge elevating connector 880. By way of example, but not limitation, the shovel shape can be changed based on gripping handle – 2 or 3 prong handle for upright stance and shovel shape change. In another example, various geometries and designs can be employed to provide an upright placement on a counter-top. The degree to which a tri-pod can be formed will depend on the vertical desplacement of the molded elements in a disposable utensil

Disposable coated and printable utensils:

Generally disposable utensils can be metalized and/or metal coated to render an appealing look and appearance. Disposable sanitary element spoons, knives, forks and the like can be further metallized and further embossed, laser marked or printed to add incremental value to the final product. FIG. 9 provides a view of a metallized fork according to an embodiment of the invention. As shown in FIG. 9, fork 900 includes proximal end 910 and distal end 920 which includes the tines of the fork. Separating the distal and poximal ends is angular connector 930 which serves to raise the distal end 920 above a surface when the fork is resting on the surface (in which case the angled connector and distal end touch the surface).

Self-indicating sterilization features:

UV sterilziation and other sterilization methods find use for ensuring bacterial and viral free contamination. Likewise, sanitary disposable utensils can be sterilized using

UV light or other sterilization means. By way of example and not limitation, photochromic UV color change additives can be used and have the advantage of showing the user that plastic consumable sanitary utensils have been sterilized by UV light. Photochromic or thermochromic additives can be included during manufacturing and production of the sanitary utensil.

Weight and measure feature:

The balance effect of the sanitary elevating-levitating curve can be used between a utensil handle and the utility feature of the utensil to impart a weight measuring feature. By way of example, and not by way of limitation, a spoon with a curved elevating-levitating curve, resting on a surface can act as a miniature scale. A solid or liquid can be added to a spoon shovel until the weight causes the handle of the spoon to lift off of the surface. Longer and heavier spoon handle designs can be used for heavier weight measures. Shorter and lighter weight handles can be used for lighter weight measures. The exact weight measure will depend on the size of the spoon bowl (i.e., shovel) and the capacity thereof, as well as the length and weight of the spoon handle.

Application diversity:

Consumable product with application include, but are not limited to: spoons, knives, forks, chopsticks, beverage stoppers, coffee cup plugs, stirrers, straws, toothpicks, thermometers, tooth brushes and other consumer, commercial, medical, industrial, products. FIG. 10 provides an illustration of a coffee stirrer utensil according to an embodiment of the invention. As shown in FIG. 10, coffee stirrer 1000 includes proximal end 1010 and distal end 1020 separated by angled elevating connector 1030. Any product whether single use, multi-use, and/or re-usable that benefits from maintaining a clean, untouched, sanitized, or sterile utility surface will find application and value when integrating.

In some instances, utensils of the invention include two or more distinct functionalities. FIGS. 11A to 11D provide different views of a utensil having both spoon and knife functionalities, in accordance with an embodiment of the invention. As shown in FIG. 11B, utensil 1100 includes a spoon shovel at the distal end 1120 and a knife at the proximal end 1110. Separating the spoon and knife is curved connecting element 1130, which keeps the shovel raised above a surface when the utensil is placed on a surface, as shown in FIG. 11C. FIG. 11A illustrates how the shovel of the utensil may be

embossed with a design 1150.

Interchangeable sanitary and functional elements:

Interchangeable handle between attachments including spoon shovel, fork tine set, or knife blade are made possible with a universal connecting joint mold in to the end of each said attachment. By way of example, a common handle can be produced with a snap on feature that permits the easy joining of a separate utensil/sanitary element.

Interconnectivity with compatible products:

Sanitary levitating features can be co-designed to consider how the product can be connected with, interact with, contact, or othewise be orgainized with a compatible cousumable or re-usable product. For example, a feature on a spoon, or knife can be designed in advance with a feaure on a bowl, plate or counter so that the eating utensil fits and connects with the container or plate by insertion, placement or contact. The placement of the utensil in the pre-determined position on the container or plate provides incremental stablity so that the paired contact stabilizes the position of the utensil and further ensures non-contact between a surface of the utensil intended for oral contact and a contaminating surface. Likewise, the shape or angled feature on a sanitary utensil can be utilized for insertion of the element into a compliant paper or foamed consumable plate or bowl. Further, a sharp or angled feature of the levitating element may be configured to allow for the element to pierce the eating container or plate so that the sanitary product can be contacted and stabilized on the container or plate at the consumers discretion. Features and elements can be locking, snapping or piercing. The combination of features between two consumable or re-useable products provides alternative assurance of positional integrity between products for sanitation and significantly reduced potential for spreading of bacterial, viral, allergenic or chemical contamination.

Design synergies and contact interactivity between sanitary products can alternatively be incorporated by combining connecting or contact points on two or more utensils or products. For example, a disposalble spoon, fork and knife can each be molded with a contact element that allows the handle of each item to be contacted and/or connected together to provide for balance and position between the items such that the oral surface of each item is kept from contact with the contaminating surface on which it is placed yet the items connect together so that only the apposing end contacts

the surface. In some instances, three distinct units can create a tripode.

Condement/flavor infusing or releasing:

It is often desirable to infuse or release a flavor, spice, condement, sweatener, salt, peper, nutrient, regulating agent or the like into an injestible product. Sanitary utensils can assist in delivering an ingredient to a food or beverage to be consumed either by diffusion from the utensil matrix or by bulk release from a chamber or cavity within the utensil elementary body. In either case, the ingredient may be from 50% to below 0.01% by weight of mass of the utensil. In some instances, the ingredient is from 25% to 0.1% of the utensil mass. In some instances, the ingredient will be from 5% to 0.5% of the utensil mass. Geometries, designs and configurations for ingredient release will be dependent on the application of interest, ingredient composition, and overall utility.

Plastic compositions:

Recycleable plastics find use for sanitary utensils. Plastics can be pure, mixed or filled with wood, starch, glass, carbon, calcium carbonate or other filler additives. Wood plastic addtives can be added to reduce plastic and cost and increase structural strength. Cavitated and holed handles can be employed for plastic reduction. In either case, it is generally important to reduce the plastic consumption world-wide and finding means to reduce plastic while providing desirable products is important.

Plastics include, but are not limited to: biodegradeable plastics, corn-based plastics, PLA, CPLA, starch-based plastics, compostable plastics, land-fill degradeable plastics and the like. Adding a sanitary element to a consumable product also promotes the re-use of a normally disposable plastic utensil. The invention describe herein promotes re-using plastic consumble item rather than thowing it out, recycling it, or otherwise disposing of it.

In general plastics can include, but are not limit to the following list: Number 1 plastics: PET or PETE (polyethylene terephthalate) are found in: soft drink, water and beer bottles; mouthwash bottles; peanut butter containers; salad dressing and vegetable oil containers; ovenable food trays. Recycling: PET or PETE can be picked up through most curbside recycling programs. PET or PETE are often recycled into: Polar fleece, fiber, tote bags, furniture, carpet, paneling, straps, (occasionally) and new containers. PET plastic is the most common for single-use bottled beverages, because it is

inexpensive, lightweight and easy to recycle. It poses low risk of leaching breakdown products. Recycling rates remain relatively low (around 20%), though the material is in high demand by re-manufacturers.

Number 2 Plastics: HDPE (high density polyethylene) is found in: milk jugs, juice bottles; bleach, detergent and household cleaner bottles; shampoo bottles; some trash and shopping bags; motor oil bottles; butter and yogurt tubs; cereal box liners and the like. Recycling: HDPE can be picked up through most curbside recycling programs, although some allow only those containers with necks. HDPE can be recycled into: laundry detergent bottles, oil bottles, pens, recycling containers, floor tile, drainage pipe, lumber, benches, doghouses, picnic tables, fencing, and the like. HDPE is a versatile plastic with many uses, especially for packaging. It carries low risk of leaching and is readily recyclable into many goods.

Number 3 Plastics: V (Vinyl) or PVC is found in: window cleaner and detergent bottles, shampoo bottles, cooking oil bottles, clear food packaging, wire jacketing, medical equipment, siding, windows, piping. V can be recycled by some plastic lumber makers and recycled into: decks, paneling, mud flaps, roadway gutters, flooring, cables, speed bumps, and mats. PVC is tough and weathers well, so it is commonly used for piping, siding and similar applications. PVC contains chlorine, so its manufacture can release highly dangerous dioxins. If you must cook with PVC, don't let the plastic touch food. Also never burn PVC, because it releases toxic side compounds.

Number 4 Plastics: LDPE (low density polyethylene) can be found in: squeezable bottles; bread, frozen food, dry cleaning and shopping bags; tote bags; clothing; furniture; carpets, and the like. LDEP can be recycled through certain: LDPE curbside programs, but only some communities will accept it. Plastic shopping bags made of LDPE can be returned to many stores for recycling. It can be recycled into: trash can liners and cans, compost bins, shipping envelopes, paneling, lumber, landscaping ties, floor tile, and the like. LDPE is a flexible plastic with many applications. Historically it has not been accepted through most American curbside recycling programs, but more and more communities are starting to accept it.

Number 5 plastics: PP (polypropylene) is considered a number 5 plastic and can be found in: Some yogurt containers, syrup bottles, ketchup bottles, caps, straws, and medicine bottles. Recycling: number 5 plastics can be recycled through some curbside programs. PP is most often recycled into: signal lights, battery cables, brooms, brushes, auto battery cases, ice scrapers, landscape borders, bicycle racks, rakes, bins, pallets,

trays, straws, certain cups and the like. Polypropylene has a high melting point, and so is becoming more accepted by recyclers. Polypropylene is the major material used in drinking straw manufacturing and is rapidly becoming the material of choice for producing deep draw cups and lids for the food service industry.

Number 6 Plastics: PS (polystyrene) can be found in: disposable plates and cups, cup lids meat trays, egg cartons, carry-out containers, aspirin bottles, compact disc cases, and the like Recycling: Number 6 plastics can be recycled through some curbside programs. PS can be recycled into: insulation, light switch plates, egg cartons, vents, rulers, foam packing, carry-out containers, and other consumable items. Polystyrene can be made into rigid or foam products -- in the latter case it is popularly known as the trademark Styrofoam. Certain evidence suggests polystyrene can leach potential toxic compounds into foods. The material was long on environmentalists' hit lists for dispersing widely across the landscape, and for being notoriously difficult to recycle. Most communities are gradually increasing acceptances of PS.

Other plastic compositions of interest may include an “elastomeric component” to improve flexibility and functionality compared with native substrate compositions. The term “elastomeric component” refers to any number of various thermal plastic elastomers (TPE’s); such as, but not limited to polyisoprene, polybutadiene, polyisobutylene, polyurethane, polychloroprene, highly elastic silicone, DYNAFLEX, VERSAFLEX, VERSALLOY, VERSOLLAN, and KRATON (GLS Corporation, IL). SANTOPRENE brand thermoplastic vulcanizates (TPVs) are a series of high-performance elastomers which combine the desirable characteristics of vulcanized rubber, such as flexibility and low compression set, with the processing ease of thermoplastics. Fitting into the mid-range performance spectrum of both thermoplastic and thermoset rubbers, SANTOPRENE TPV (Exxon Mobile Corp.) is accepted for a broad range of industrial and consumer product applications for the consumables products presented here.

Further plastic types that can be utilize or added in ratios during manufacture include but are not limited to ethylenechlorotrifluoreethylene (ECTFE), ethylentetrafluorethylene (ETFE), polinvinylidene fluoride (PVDF), ethylene-propylene rubber (EPR), silicone rubber (SI), ALCRYN thermoplastic rubber (TPR), HT thermoplastic rubber (HTPR), SANTOPRENE thermoplastic rubber (TPR), LSOH crosslinked compounds, LSOH thermoplastic compounds, methylvinyletherfluoralkoxy (MFA), perflouroalkoxy (PFA), thermoplastic polyester elastomer (TPE), polyimide

(KAPTON), polyurethane (PUR), polyvinyl chloride 105℃ (PVC), polyvinyl chloride 70℃ (PVC), low temperature polyvinyl chloride (LTPVC), oil resistant Polyvinyl chloride (OR PVC), semi-rigid polyvinyl (SR PVC), polyvinyl chloride polyurethane (PVC PUR), and the like. Additive plastics can be utilized to adjust the characteristics of the base thermo plastic elastomer.

Shape memory composlitions for use with sanitary utensils:

Shape/memory materials with intrinsic optical properties can exhibit a plurality of shape/memory changes combined with single or multiple optical effects including but are not limited to thermochromic, photochromic, combined tactochromic and thermochromic effects, combined holographic and thermochromic effects, combined thermochromic and photochromic effects, combined photo-luminescent and thermochromic effects, various combined thermochromic effects such as liquid crystal effects and intrinsic color change effects from polydiacetylenes or alternative thermochromic materials, mechanochromic and thermochromic effects, pH sensitive color changes alone or in combination with other optical effects, and an assortment of related combined optical effects which exhibit synergy with the shape/memory change process. Particle additives of a variety of shapes and sizes can be combined with the shape/memory material to create attractive and interesting visual affects during the shaping, deformation, reshaping or shape memory process.

Depending on the shape/memory material composition and associated optical/change composition employed, it may be desirable to ensure the comprising composition does not stick or adversely adhere to itself during use. Lubricating agents or surfactants can be employed to facilitate non-stick or adherence properties.

Shape/memory material can be purchased from vendors such as BASF, DuPont, Bay Materials or the like. Shape/memory materials may also comprise polyethylene and/or polypropylene. Composites can be made with shape/memory plastics, vinyl, high and low impact plastics exotic polymers used for various industrial applications, epoxy resins where various ratios between the epoxy and hardener can be utilized, metals and metal alloys, bi-metal materials used in thermometers, comprised with components including rubbers, silicon-based materials, certain ceramic materials, pressure sensitive material, stampable materials, biologically compatible materials, carbohydrate based materials, organic lipophilic materials, waxes, biologically active materials, certain tissues such as muscle, skin or hair, bio-absorbable materials, glass compositions,

ingestible materials, resins, epoxy-based composites and resins, glue and adhesive compositions, polyurethanes and derivatives (Mitsubishi Heavy Industries, Japan), shape memory alloys, shape-memory plastics (mnemoScience, Aachen, Germany), oligo-dimethacrylate, n-butylacrylate and related polymeric plastics, thermoplastic elastomers, networking polymeric systems, classes of polyesters, polymers based on monomers comprised with L,L-dilactide, diglycolide, and p-dioxanone, thermoplastic multi-blockco-polymers, macrodiols, homopolymers of lactide or glycolide compositions, or copolymers of lactide and glycolide groups, chiral and non-chiral polymers, polyvinyl chloride compositions, polyethylene terephthalate and analogs, and related materials possessing shape/memory characteristics.

The absolute shape/memory change setting will depend on the product application of interest. For example products may be prepared which change color and shape/color when warmed to about 100°F. At room temperature or below, the product will have a solid plastic-like feel. The color or hue can be adjusted to correspond to a desired visual attractiveness for the product. When the product is touched, or exposed to temperatures near body temperatures (*e.g.,* 75-90°F) the corresponding color and shape will begin to change. The plastic embodiment will become softened and begin to deform. Likewise, the thermochromic material comprising the composition along with the shape/memory plastic will visually change color corresponding to the rise in temperature. When completely warmed above the softening temperature of the shape/memory material, the product will be completely deformed to whatever configuration desired. When chilled back to room temperature or below, the plastic shape/color change embodiment will harden into its deformed configuration.

The shape/memory material and associated relief layer material can be formulated with 95% relief material to 5% shape/memory material. More usually, they are formulated with 50% relief material and 50% shape/memory material. Typically the shape/memory material will comprise from about 60 to 100% of the composition. The exact ratio of shape/memory material to relief material will depend on the desired final property of the embodiment or application of interest. The configuration, shape/memory composition, relief composition, and method for adjoining each component should be considered when designing the final embodiment.

The shape/memory/optical material can be comprised of an elastomeric material such that the elastic properties of the elastomer can be utilized to create spring or rubber band-like function. An associated elastomer can be stretched along with the entire

comprising composition above the softening temperature of the shape/memory material. A shape can be enforced once the composition is made stiff at below the softening temperature of the shape/memory/optical material. Upon elevating the temperature of the composition above the softening and/or optical change transition temperature, the entire composition will respond elastically to its original configuration and optically visual appearance.

The shape/memory and/or color change materials may vary in amount, and in some instances will comprise from 0.01% t0 100% of the utensil. In some instances, the shape/memory and/or color change materials will comprise from 0.1 to 100% and typically comprise from 1% to 100%.

In a further embodiment, a consumable product may include localized portions of the shape/memory and/or color change comprising material such that hinges, localized deformations, bends, protrusions, bulges, patterns, designs, extensions, and the like can be effected whereas the remaining portion of the final embodiment is unaffected by the shape/memory and/or color change process. Electrically conductive heating elements can be employed where conductive and/or resistive heating inks are printed into various or specific patterns to achieve a desired localized or patterned heating location on the embodiment.

In addition, plural compositions have applications for use with the sanitary utensil products and systems disclosed herein. By “plural composition” is meant a composition that incorporates thermal switching/responsive material in combination with a color-shift reporting element. Such a pleural composition would incorporate various intrinsic capabilities, including changing its physical properties, such as solid to liquid phase transition, viscosity, hardness, and related physical parameters, as well as changing its visual color, such as color hue, color density, opacity, and related optical characteristics.

Printed sanitary utensils:

Instructive and/or promotional printing can be employed on sanitary element utensils and products. Instructional information printed directely on the product provides user benefits and/or value added promotional messages. By way of example, not limitation, laser etching, laser marking, laser ablation of one layer, localized plasma treatment, chemical patterning and imprinting, photo-masking and optical exposure, screen printing, drop-on-demand printing (DOD), continuous ink jet printing (CIJ), pad printing, continuous roller printing, on-the-fly marking, marking directionally with product

production, marking parallel to product production, electron beam marking, localized plasma marking for differential patterning, and the like can be utilized or adapted as manufacturing processes for high-speed messaging on plastics consumable items.

Ink jet printing processes such as drop-on-demand (DOD) and continuous ink jet (CIJ) printing have the advantage of color variety. In addition, DOD and CIJ processes can be integrated into high speed production processes such as extrusion, thermoforming and injection molding. Likewise, DOD and CIJ printing inks can be formulated as standard colors, with thermochromic colorants, photo-chromic colorants and other optically enhanced color systems to generate a range of different optical effects in high volume consumable products. DOD and CIJ systems have the additional advantage of on-line unique digital coding thereby providing the ability to create unique images, symbols, codes, and messages on each item under production under a continuous process.

Laser marking finds application with eliminating the need for a consumable ink to be utilized during the high-speed marking process. Additives can be conveniently added to the resins used for extrusion, thermoforming and injection molding thereby eliminating the need to add inks or dyes to the printing systems since the substrate can be comprised using the marking additive intrinsically. Like DOD and CIJ systems have the additional advantage of on-line unique digital coding thereby providing the ability to create unique images, symbols, codes, and messages on each item under production under a continuous process.

Sanitary spoons, forks and knive handles can be conveniently printed using laser marking with a high-speed 50 watt YAG laser marking system (laser from Keystone Lasers, Nanjing China). Wording and graphics were imprinted using 0.1 to 10 watts power depending on the marking speed utilized and intensity desired. Clear and definitive working, messages, symbols, and logos were printed with irreversible markings. Markings were permanent and maintained without any rub-off during use and during the color change process. Spoons were successfully tested for color appearance at 15°C in cold ice water.

Screen printing processes have the advantage of providing a thick and rich color coating and can utilize a range of inks with additive described herein. Screen printing inks printing can be formulated as standard colors, with thermochromic colorants, photo-chromic colorants and other optically enhanced color systems to generate a range of different optical effects in high volume consumable products. Screen printing does

however require detailed fixtures for printing alignment and the process is not amenable to continuous printing. Highly-automate forms of screen printing find certain advantages when combined and utilized with the additives and applications described below.

Pad printing like screen printing processes have the advantage of providing a thick and rich color coating and can utilize a range of inks with additive described herein. Screen printing inks printing can be formulated as standard colors, with thermochromic colorants, photo-chromic colorants and other optically enhanced color systems to generate a range of different optical effects in high volume consumable products. Pad printing does however require detailed fixtures for printing alignment and the process is not amenable to continuous printing. Highly-automate forms of pad printing find certain advantages when combined and utilized with the additives and applications described below.

Additives to sanitary product resins and matricies:

A wide range of food additives, pharmaceuticals, medications, active compositions, sensitizers, dyes, leuco dyes, diacetylenic monomers, polydiacetylenic materials, polymers in general, pesticides, micro-organisms, flavors, fragrances, stimulants, ingestibles, non-ingestibles, drugs, oxidants, anti-oxidants, and the like can be microencapsulated alone or in combination with the active optical change agents describe herein.

In particular, there is an on-going need to improve the sanitation, capabilities, function, and value of consumable products such as disposable drinking straws, cups, lids, plates, utensils, disposable cooking thermometers, stir sticks, containers, packaging and other related items that are generally used for in relationship with food preparation, service, cooking, fast food restaurants, convenience stores, quick service restaurants, and the like. Product improvements at affordable costs are increasing in demand. Innovation that provide minimal cost impact to customer can include, but are not limited to physical/structural benefits, visual appearances including color intensity and novel color shift or color change properties, new printing methods and technologies that enable digital on-demand information to be rapidly encoded, new ways to customize products on-demand, features that facilitate and enable new promotional and sales options, tactile structural features for improved contact feel and grip, improved insulating features without introducing incremental waste, bio-compatible, biodegradable, and landfill degradable properties aimed at reducing environmental impact, environmental

sensing abilities to add interactive indicating features and the like.

Also important are chemical formulations, compositions, compounds, materials, and additives are required alone or in combinations, that enable the incorporation of novel physical, chemical, and optical properties for multi-element product applications. In addition, new processing, fabrication, on-demand, tooling, in-line production, materials handling, and application methods will be required for incorporating multi-element materials, compositions and additives into final products. Finally, novel packaging, interactive packaging, printed or promotional messages, plastics, compounded materials, packaging methods, marking methods and the like will find application to the presentation, sales, and marketing of products comprising multi-element compositions, and features.

Non-microencapsulated and micro-encapsulated additives can be added to product substrate compositions from between 0.01% to over 90% depending on the application and utility of the multi-element additive. Typically, the additive will be added from between 0.05% and 50% by weight to the product matrix. More often, the additive will be included from between 0.1% and 25% by weight. Most often, the additive will find use at between 1% and 10% by weight.

YAG, YVO4 and UV laser marking pigments provide the necessary conversion of laser light energy to thermal energy for 1064 nm laser marking applications, which facilitates faster marking speeds at low loadings in many polymer systems. In particular, additives are required for marking lead resins such as polypropylene, polyethylene, high density polypropylene, medium density polypropylene, and other key polyolefin based substrates. Marking speeds as high as 190 inches per second have been achieved in some polymer systems.

By way of example, but not limitation we describe the use of antimony-doped tin oxide pigments as an additive that enable the high-speed imaging, messaging, and marking on high-volume low cost plastics consumable items made with PP and PE. Our processes can utilize a range of other commonly used plastics as well. Antimony-doped tin oxide pigments is easily dispersed in polymers as well as liquid colorant systems. Particle size is on the order of 2-3 microns. The appearance of the materials incorporating antimony-doped tin oxide pigments are affected minimally by this low chroma pigment. Typically, antimony-doped tin oxide pigments pigment loading is 0.1% in polyolefins to obtain a high quality mark. Antimony-doped tin oxide pigments is not based on mica or another substrate and, therefore, does not impart a pearlescent,

grainy, or reflective appearance.

Cold activated color change laser markable plastic sanitary utensils:

A multi-element composition was prepared as in examples above for injection molding manufacturing, 100 kg of a multi-element additive/master batch composition was prepared. 5% polypropylene pelleted color change master batch (Segan Industries, Inc., Burlingame CA) containing a 19°C clear to blue, magenta, yellow, green, vermillian, red, purple, black or mixes thereof color change thermochrmomic was admixed with 2% pelleted laser marking additive (antimony-tin oxide), 1.0% standard fluorescent colorant for background contrast and opacity (Food contact approved, Dayglo Inc. Cleve;and OH, West Chicago, IL), and 90% injection molding grade polypropylene (BASF-YPC F401). The composition was mixed thoroughly and added to an injection molding machine equipped with a 12 cavity spoon mold (2.5 gm/spoon, 250 ton Arburg injection molding machine). Examples of laser marking additives may include, but are not limited to those described in International Patent Publication No. WO 2013/049696, the disclosure of which is herein incorporated by reference.

Nestable design that ensures convenient stacking and packaging. The post approach would be limiting since it is not readily nestable. Further, a contoured design with an ergonomic shape will improve handling and utility of eating or manipulating food.

Chromic change additives:

Reversible and irreversible versions of the color change agent can be employed depending on the desired embodiment of interest. Reversible agents can be employed where it is desirable to have a multi-use effect or reuse the color change effect. For example, products with continued and repeated use value will find utility of a reversible color change component comprising the final embodiment. In this case it would be desirable to utilize a reversible thermochromic or luminescent material which can be repeated during usage. In another example, it may be desirable to record a single color change permanently. In this case, it would be desirable to utilize a thermochromically irreversible material which changes from one color to another giving rise to a permanent change and indicating that the composition should be discarded after use.

Non-microencapsulated and micro-encapsulated photochromic or thermochromic additives can be added to product substrate compositions from between 0.01% to over 50% depending on the application and utility of the multi-element additive. Typically, the

additive will be added from between 0.05% and 25% by weight to the product matrix. More often, the additive will be included from between 0.1% and 20% by weight. Most often, the additive will find use at between 1% and 10% by weight.

Thermochromic color to colorless options can include by way of example, but not by limitation: yellow to colorless, orange to color less, red to colorless, pink to colorless, magenta to colorless, purple to colorless, blue to colorless, turquoise to colorless, green to colorless, brown to colorless, black to colorless. Color to color options include but are not limited to: orange to yellow, orange to pink, orange to very light green, orange to peach; red to yellow, red to orange, red to pink, red to light green, red to peach; magenta to yellow, magenta to orange, magenta to pink, magenta to light green, magenta to light blue; purple to red, purple to pink, purple to blue; blue to pink; blue to light green, dark blue to light yellow, dark blue to light green, dark blue to light blue; turquoise to light green, turquoise to light blue, turquoise to light yellow, turquoise to light peach, turquoise to light pink; green to yellow, dark green to orange, dark green to light green, dark green to light pink; brown and black to a variety of assorted colors, and the like. Colors can be deeply enriched using fluorescent and glow-in-the-dark or photo-luminescent pigments as well as related color additives.

Color change multi-temperature effects in consumable consumer products can be accomplished by carefully admixing more than one thermochromic component. Disparity in thermochromic composition transition temperatures in combination with 2 or more thermochromic combinations can be used to achieve a patterned, rainbow, spectral, gradient, or sequential coloration effect.

Non-microencapsulated high-temperature thermochromic additives can be added to product substrate compositions from between 0.001% to over 20% depending on the application and utility of the multi-element additive. Typically, the additive will be added from between 0.01% and 15% by weight to the product matrix. More often, the additive will be included from between 0.1% and 10% by weight. Most often, the additive will find use at between 1% and 10% by weight.

Luminescent, glow-in-the dark, security, pearlescent, pigments visible only under UV light, or fluorescent pigments can be used in conjunction with other additive compositions. Non-visible spectrum fluorescent dyes can be obscured by an one color of a diacetylenic composition or other thermochromic dye such that when a temperature triggering event occurs, the fluorescent signal becomes visible when utilizing the corresponding wavelength to reveal the fluorescent dye composition.

Pearlescent or iridescent pigments have become popular in the creation of luster effects in coatings. This has enabled the generation of new and unique color effects for automotive, industrial, cosmetic and pharmaceutical applications. The pearlescent effect is produced by the spectral of light from the many surfaces of the platelets with parallel orientation at various depths within the coating. Light striking the platelets is partially reflected and partially transmitted through the platelets. A pearly luster effect is produced by the dependence of reflection on viewing angle, and the sense of depth is created by reflection from many layers. The platelets must be extremely smooth to maximize reflected light, and any surface roughness diminishes the lustrous effect. Non-fine particles or pigments with rough edges can also negatively affect the lustrous appearance in products.

Non-microencapsulated and micro-encapsulated fluorescent additives can be added to product substrate compositions from between 0.01% to over 90% depending on the application and utility of the multi-element additive. Typically, the additive will be added from between 0.05% and 50% by weight to the product matrix. More often, the additive will be included from between 0.1% and 25% by weight. Most often, the additive will find use at between 1% and 10% by weight.

Pigments, additives, augmenting agents, colorants, and related compositions described can added in powered forms, added in master batch forms, added as dry pseudo master batch forms, liquid master batch forms or the like. The method or choice of addition depends on the process utilized for production and the best method for additive introduction. Pelleted master batch find use with conventional extrusion and injection molding processes. Liquid master batch forms can be utilized with continuous addition processes typically used for plastics extrusion. Powdered forms can find use where equipment can be modified to accommodate fines and powder density.

Color change compositions may also include, but are not limited to those described in United States Patent No. 8,569,208 and International Patent Publication No. WO 2014/144693, filed on March 14, 2014, the disclosure of which is herein incorporated by reference.

Production methods:

Sanitary products described herein can be produced by a variety of conventional production methods including, but not limited to: injection molding, co-injection molding, thermoforming, stamping, compression molding, 3-D printing, casting, vacuum forming

and the like.

Injection molded and co-injection molded temperature indicating/optical change cooking sensors can be prepared using thermochromic colorant can be added directly or indirectly to the article molding resin. Thermochromic colorants can be added as powders, liquid master batch compositions, or plastic pelleted master batch. Thermochromic colorants can be derived from a variety of chemistry classes including leuco dyes, single chain polydiacetylenic compounds, dual chain bis-amide polydiacetylenic compounds, inorganic color change pigments, color shifting fluorescent dyes and pigments, natural color change dyes, glow-in-the-dark colorants and the like.

By way of example, disposable cooking thermometers, spoons, forks, knives or other consumable utensils can be molded with a sanitary feature and be fully injection molded with our high temperature colorant. Since the molded part includes the full thermal mass of plastic, the color indicating hold time is now longer than 5 seconds. Secondly, the tips or shovels of the article can change color the consumable sanitary product can provide for full thermal profiling throughout the cross section of food mass the article comes in contact with.

In some embodiments, the subject utensils are formed by preparing a pseudo-master batch, such as described in International Patent Publication No. WO 2014/144693, filed on March 14, 2014, the disclosure of which is herein incorporated by reference.

Additional Examples of Embodiments of the Invention:

Additional design and product features can include, but are not limited to designs that encourage re-use such as dish washer safe, color change, ergonomic designs; telescopic version that can be extended; are sanitary and easier to clean; are stackable for easier packagaging, storage, and lower freight costs; color change for fun and re-use in combination; molded permanent features; in-mold; secondary flex joint-actuated feature; in-mold snap-down actuated features; secondary molded insert feature, horizontal or stable up-right version for convenience; metallized vapor deposited films for premium features; color change bio-degradable straws and consumables; Clarifying additives to resins used for utensils; color change/shape memory plastics; Integrated service trays and food co-packaging; various thicknesses and interconnections; co-molded products; aser embossed utensiles; emperature indicating utensils; thermometer integrated versions; DOD ink jet printed high-speed messaging versions; vacuum formed

and textured versions, etched and laser cut or modified versions, with or without thermochromic agent; microcapillary pathway infused features; flavor release in utensiles; mess age reveal in version; versions with natural dye chemistry;; Self retracting straws; landfill degradable versions; conductive metal coated utensils; perforated for pressure and delivery regulation; channeled and contoured; glow in the dark versions; straws for medical applications; pH indicating straws; co-packaging integration; meat tray integration; Extruded disposable thermometers; edible plastic composition types; cup or plate integrated versions; in molded labeled; image of only water in selective patterned areas – absorbent ink, etched, with or without thermochromic agent; image due to thermal cooling; high-temperature sensing color change reversible types; stamped types, roll formed an hot staped types; fluorescent nylon molded color indicating in-products; optical high-speed engraving and encoding, plastic lid integrated types; hot insulating, cold insulating, hot indicating, cold indicating, In-line printable, microwave temperature sensint types; 3D flash imaging integrated; multi-element micro encapsulating heat absorbing compositions, writing implements such as pencils and pens can benefit from sanitary feature designs, multi-layer structures, highly perforated or foamed versions; disposable straw clip to counter balance and elevate a drinking straw; varying degrees and heights of off-setting curve functions to levitate the spoon shovel or fork head; thermoformed die-cut version for low cost, high volume, and packaging; disposable sanitary clip for plastic and metal utensiles that do not have the feature in its design, utilizing the curve or displacement element to create a scale or balance out of a spoon; structrual stays, ridges, sidewalls, ribs, struts, supports, cross hatches, joyces, and the like to add strenght, stiffness and integrity; nesting designs that help densly pack disposable sanitary utensils, snaping elements that clip transiently attach disposable sanitary utensils together, disposable and semi-reusable toothbrushes with the sanitary elevating design included; and the like.

The following examples are offered by way illustration and not by way of limitation.

## EXAMPLES

I. Landfill degradable multi-element sanitary cutlery:

For cutlery manufacturing, 100 kg of resin additive/master batch composition was prepared. 2% polypropylene pelleted landfill degradable additive master batch (Segan

Industries, Inc., Burlingame CA) containing a bio-attractant additive was admixed at 2% pelleted laser marking additive (antimony-tin oxide), 1.0% standard white colorant for background contrast and opacity (Clariant, West Chicago, IL), 4% 19C color change master batch (Segan Industries, Inc., Burlingame CA), and 91% injection molding grade polypropylene (PolyOne Corp.). The composition was mixed thoroughly and utilized in a 250 tom injection molding machine with a spoon/fork combination mold (36 cavity). Zone temperatures were maintained between 210-220°C throughout the production run.

Both sanitary cutlery types were successfully tested for color appearance at 15°C in cold ice water and were further laser marked with a high-speed 50 watt YAG laser marking system (laser from Keystone Lasers, Nanjing China). Wording and graphics were imprinted using 0.1 to 10 watts power depending on the marking speed utilized and intensity desired. Clear and definitive working, messages, symbols, and logos were printed with irreversible markings. Markings were permanent and maintained without any rub-off during use.

II. Multi-element plastic sheet forms that can be thermoformed into sanitary utensils:

Interactive plastic sheet for activity and packaging were prepared as above. UV photochromic, thermochromic and laser marking compositions were co-extruded on into sheet forms with a triple extrusion system: a main core-extruder equipped with two side extruders. Compositions were prepared with 6% polypropylene pelleted purple, blue, or yellow photochromic master batch (Segan Industries, Inc., Burlingame CA), 6% 25°C blue, magenta, yellow, red, or green thermochromic pelleted master batch (Segan Industries, Inc., Burlingame CA), and 2 % YAG laser marking additive (Segan Industries, Inc, or PolyOne Corp.) and admixed with 82% (BASF-YPC F401) to either side extruder. Sheet width and thickness were maintained during the extrusion process to ensure wall thickness and profiles met product specifications.

III. Multi-element inks for printing on products incorporated in sanitary products:

Multi-element inks described below have the advantage over inks standard to the printing industry in that they can provide the products with new capabilities and properties including, but not limited to: hot insulating, cold insulating, color change, tactile feel, gripping characteristics, embossed appearances, 3-D visual effects, and related features. Multi-element inks can be utilized in combination with standard flexograpic, screen, printing pad printing and other commonly used printing processes.

A multi-element tactile/embossed, insulating, and color change ink was prepared by adding 12% by weight 60℃ red irreversible BPA-free thermochromic aqueous slurry (from: Segan Industries), 15% wet unexpanded expansion component (Expancel 031 WU 40), and the remainder 73% by weight water base flexographic binding ink vehicle. The composition was thoroughly mixed with a mechanical mixer until the composition was uniform.

Food printed labels can be printed using silk screening with a 156 mesh screen. Labels were dried with forced air prior to use. Raised, colored discrete on-demand patterns were printed using a 50 watt $CO_2$ laser (Keyence Corp.) Labels were highly tactile, insulating to the touch and textured to the touch with excellent coloration and features where exposed to the laser beam.

IV. Multi-element temperature-light sensing inks for sanitary disposable products:

Multi-element inks described below have the advantage over inks standard to the printing industry in that they can provide the products with new capabilities and properties including, but not limited to: hot insulating, cold insulating, color change, tactile feel, gripping characteristics, embossed appearances, 3-D visual effects, and related features. Multi-element inks can be utilized in combination with standard flexograpic, screen, printing pad printing and other commonly used printing processes.

A multi-element tactile/embossed, insulating, and photochromic color change ink was prepared by adding 15% by weight 5℃ blue, red, orange, yellow, green, and purple photochromic aqueous slurries (from: Segan Industries, Inc) 8% wet unexpanded expansion component (Expancel 031 WU 40), and the remainder 77% by weight plastisol screen ink base (10140 clear, Wilflex Corp.). The composition was thoroughly mixed with a mechanical mixer until the composition was uniform.

Various repeat patterns and graphics were printed using silk screen using form 156 mess screens to 90 mesh screens. Typically, 110 to 123 screen messes were used. Labels were printed on lay-flat polyester or vinyl pressure sensitive labels stock. Printing was accomplished using an automated screen printer (ATMA unit). Printed labels were expanded to a raised level of 300 - 500% at 240℉ using a black body radiant conveyor heating source. Expanded multi-element labels were applied to various cups, food jars and other packages. Labels were highly tactile, insulating to the touch and textured to the touch with excellent gripping features. Labels can be directly attached to a handle or convenient location on a sanitary utensil for promotional or instructional purposes.

Labels changed color upon UV and sunlight exposure.

V. Interactive/integrated photochromic retail packaging for sanitary disposable utensils:

UV photochromic stripes were co-extruded on straw walls using a triple extrusion system: a main core-extruder equipped with two side extruders. Polypropylene stripe compositions were prepared with 12% polypropylene pelleted purple, blue, or yellow photochromic master batch (Segan Industries, Inc., Burlingame CAas admixed 88% (BASF-YPC F401) to either side extruder. Strip width and thickness were maintained during the extrusion process to ensure wall thickness and profiles met product specifications.

VI. Color change laser marked sanitary plastic thermometers:

A multi-element composition was prepared as in examples above for injection molding manufacturing, 100 kg of a multi-element additive/master batch composition was prepared. 7% polypropylene pelleted color change master batch (Segan Industries, Inc., Burlingame CA) containing a 82°C clear to blue, magenta, yellow, green, vermillian, red, purple, black or mixes thereof color change thermochrmomic was admixed with 2% pelleted laser marking additive (antimony-tin oxide), 1.0% standard fluorescent colorant for background contrast and opacity (Food contact approved, Dayglo Inc. Cleve;and OH, West Chicago, IL), and 90% injection molding grade polypropylene (BASF-YPC F401). The composition was mixed thoroughly and added to an injection molding machine with a sanitary disposable cooking thermometer mold (72 cavity) in a 250 ton injection molding machine).

The sanitary thermometer handles were further laser marked with a high-speed 50 watt YAG laser marking system (laser from Keystone Lasers, Nanjing China). Wording and graphics were imprinted using 0.1 to 10 watts power depending on the marking speed utilized and intensity desired. Clear and definitive working, messages, symbols, and logos were printed with irreversible markings. Markings were permanent and maintained without any rub-off during use and during the color change process. Consumable thermometers were successfully tested for color appearance at 82°C in cooking meats.

Notwithstanding the appended clauses, the disclosure is also defined by the following clauses:

1. A utensil comprising:

a proximal end;

a distal end; and

a connecter between the proximal end and distal end,

wherein the utensil is configured such that the distal end is elevated above a surface of a planar substrate when one or more of the proximal end and the connector is in contact with the surface of the planar substrate.

2. The utensil according to clause 1, wherein the proximal end and distal end are positioned along the same plane.

3. The utensil according to clause 1, wherein the proximal end and distal end are positioned along a different plane.

4. The utensil according to clause 1, wherein the distal end is positioned at an angle of from 1 degree to 180 degrees with respect to the proximal end.

5. The utensil according to clause 8, wherein the distal end is positioned at an angle of from 5 degrees to 90 degrees with respect to the proximal end.

6. The utensil according to any one of clauses 1-5, wherein the position of one or more of the proximal end and the distal end are adjustable.

7. The utensil according to any one of clauses 1-6, wherein the angle between the proximal end and the distal end are adjustable.

8. The utensil according to any one of clauses 1-7, wherein the connector is configured to position the proximal end and distal end onto different planes.

9. The utensil according to any one of clauses 1-8, wherein the connector comprises one or more of a loop, a hinge, a curvature, a helix or a curl.

10. The utensil according to any one of clauses 1-9, wherein the proximal end further comprises a handle.

11. The utensil according to clause 10, wherein the handle is co-molded with the utensil.

12. The utensil according to clause 10, wherein the handle is coupled to the utensil.

13. The utensil according to any one of clauses 1-12, wherein the distal end comprises an eating surface.

14. The utensil according to any one of clauses 1-13, wherein the utensil is selected from the group consisting of a spoon, knife, fork, chopstick, laddle, stirrer, pick.

15. The utensil according to any one of clauses 1-13, wherein the utensil is a combination utensil selected from the group consisting of a chopfork, chork, forkchops, knork, pastry fork, spoon straw, sporf, spork, splayd and spife.

16. The utensil according to any one of clauses 1-15, wherein the utensil is disposable.

17. The utensil according to any one of clauses 1-16, wherein the utensil is formed from a polymeric material.

18. The utensil according to any one of clauses 1-17, wherein a first utensil is shaped to fit complimentarily with a second utensil.

19. The utensil according to any one of clauses 1-18, wherein the utensil is stackable.

20. The utensil according to any one of clauses 1-19, wherein a first utensil is shaped to nest within a second utensil.

21. An eating utensil comprising:

a working end; and

a handle;

wherein the working end and handle are joined to each other by an integrated curvilinear connector that is configured to raise the working end above a planar surface of a support when the eating utensil is placed on the planar surface.

22. The eating utensil according to clause 21, wherein the handle and working end are positioned along the same plane.

23. The eating utensil according to clause 21, wherein the handle and working end are positioned along a different plane.

24. The eating utensil according to clause 21, wherein the working end is positioned at an angle of from 1 degree to 180 degrees with respect to the handle.

25. The eating utensil according to clause 21, wherein the working end is positioned at an angle of from 5 degrees to 90 degrees with respect to the handle.

26. The eating utensil according to any one of clauses 21-25, wherein the position of one or more of the handle and the working end are adjustable.

27. The eating utensil according to any one of clauses 21-26, wherein the angle between the handle and the working end are adjustable.

28. The eating utensil according to any one of clauses 21-27, wherein the connector is configured to position the handle and working end onto different planes.

29. The eating utensil according to any one of clauses 21-28, wherein the connector comprises one or more of a loop, a hinge, a curvature, a helix or a curl.

30. The eating utensil according to any one of clauses 21-29, wherein the utensil is selected from the group consisting of a spoon, knife, fork, chopstick, laddle, stirrer, pick.

31. The eating utensil according to any one of clauses 21-29, wherein the utensil is a combination utensil selected from the group consisting of a chopfork, chork, forkchops, knork, pastry fork, spoon straw, sporf, spork, splayd and spife.

32. The eating utensil according to any one of clauses 21-31, wherein the utensil is disposable.

33. The eating utensil according to any one of clauses 21-31, wherein the utensil is formed from a polymeric material.

34. The utensil according to any one of clauses 21-33, wherein a first utensil is shaped to fit complimentarily with a second utensil.

35. The utensil according to any one of clauses 21-33, wherein the utensil is stackable.

36. The utensil according to any one of clauses 21-33, wherein a first utensil is shaped to nest within a second utensil.

37. A method comprising:

positioned the distal end of a utensil according to any of Clauses 1 to 36 into a mouth.

38. The method according to Clause 37, wherein the mouth is a mammalian mouth.

39. The method according to Clause 38, wherein the mammalian mouth is a human mouth.

40. The method according to any of clauses 37 to 39, wherein the method further comprises removing the distal end from the mouth.

41. A method comprising manipulating a utensil according to any of Clauses 1 to 36.

42. A method comprising making a utensil according to any of Clauses 1 to 36.

43. A kit comprising two or more utensils according to any of the Clauses 1 to 36.

44. The kit according to accordin gto Clause 43, wherein the two ore more utensils are in a nested configuration.

Various other modifications and alterations in the structure and method of operation of the present disclosure will be apparent to those skilled in the art without departing from the scope and spirit of the present disclosure. Although the present disclosure has been described in connection with specific embodiments, it should be understood that the present disclosure as claimed should not be unduly limited to such specific embodiments.

Accordingly, the preceding merely illustrates the principles of the invention. It will be appreciated that those skilled in the art will be able to devise various arrangements which, although not explicitly described or shown herein, embody the principles of the invention and are included within its spirit and scope. Furthermore, all examples and conditional language recited herein are principally intended to aid the reader in understanding the principles of the invention and the concepts contributed by the inventors to furthering the art, and are to be construed as being without limitation to such specifically recited examples and conditions. Moreover, all statements herein reciting principles, aspects, and embodiments of the invention as well as specific examples thereof, are intended to encompass both structural and functional equivalents thereof. Additionally, it is intended that such equivalents include both currently known equivalents and equivalents developed in the future, i.e., any elements developed that perform the same function, regardless of structure. The scope of the present invention, therefore, is not intended to be limited to the exemplary embodiments shown and described herein. Rather, the scope and spirit of present invention is embodied by the appended claims.

## CLAIMS

What is claimed is:

1. A utensil comprising:
a proximal end;
a distal end; and
a connecter between the proximal end and distal end,
wherein the utensil is configured such that the distal end is elevated above a surface of a planar substrate when one or more of the proximal end and the connector is in contact with the surface of the planar substrate.

2. The utensil according to Claim 1, wherein the connector is configured to position the proximal end and distal end onto different planes.

3. The utensil according to any one of Claims 1-2, wherein the connector comprises one or more of a loop, a hinge, a curvature, a helix or a curl.

4. The utensil according to any one of Claims 1-3, wherein the proximal end further comprises a handle.

5. The utensil according to Claim 4, wherein the handle is co-molded with the utensil.

6. The utensil according to Claim 10, wherein the handle is coupled to the utensil.

7. The utensil according to any one of Claims 1-6, wherein the distal end comprises an eating surface.

8. The utensil according to any one of Claims 1-7, wherein the utensil is selected from the group consisting of a spoon, knife, fork, chopstick, laddle, stirrer, pick.

9. The utensil according to any one of Claims 1-8, wherein the utensil is disposable.

10. The utensil according to any one of Claims 1-9, wherein the utensil is formed from a polymeric material.

11. The utensil according to any of Claims 1-10, wherein the utensil is an eating utensil comprising:

a working end; and

a handle;

wherein the working end and handle are joined to each other by an integrated curvilinear connector that is configured to raise the working end above a planar surface of a support when the eating utensil is placed on the planar surface.

12. A method comprising:

positioned the distal end of a utensil according to any of Claims 1-11 into a mouth.

13. A method comprising manipulating a utensil according to any of Claims 1-11.

14. A method comprising making a utensil according to any of Claims 1-11.

15. A kit comprising two or more utensils according to any of the Claims 1-11.

FIG. 1A

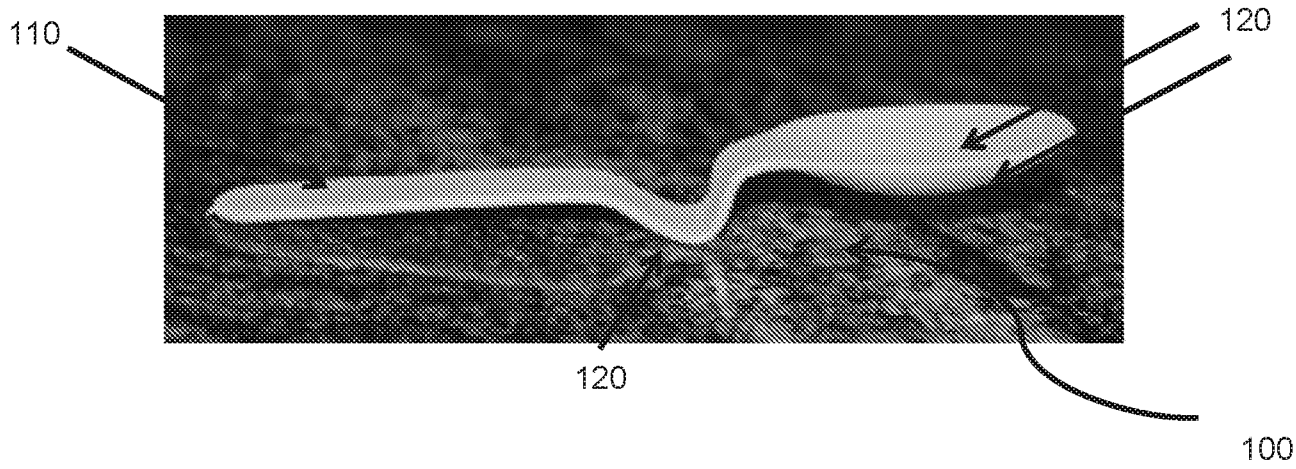



FIG. 1B

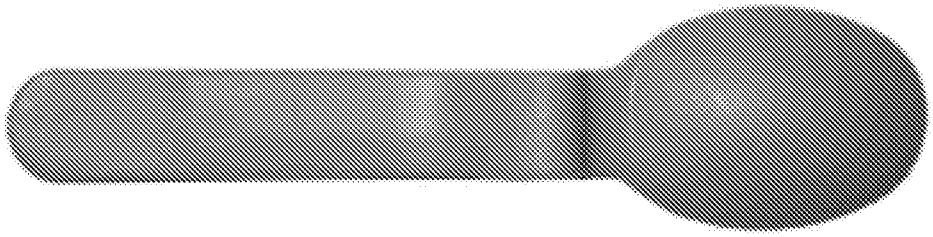


FIG. 1C

FIG. 1D

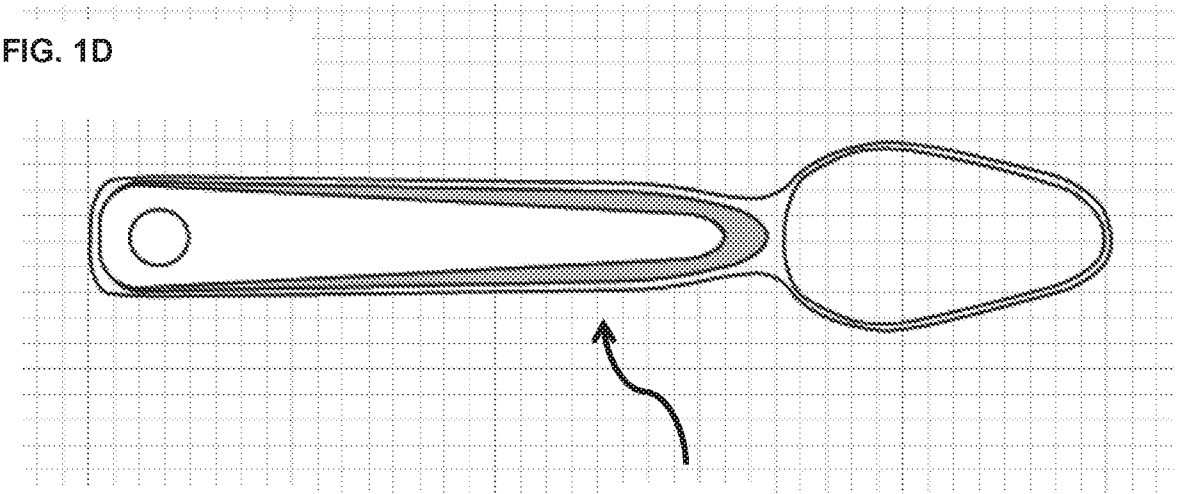



FIG. 1E

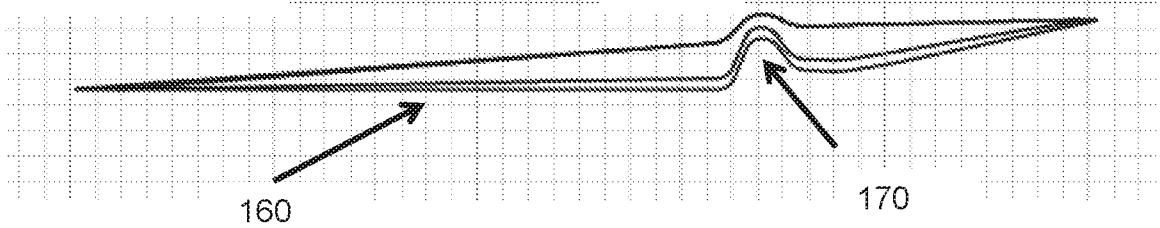



FIG. 1F

FIG. 2

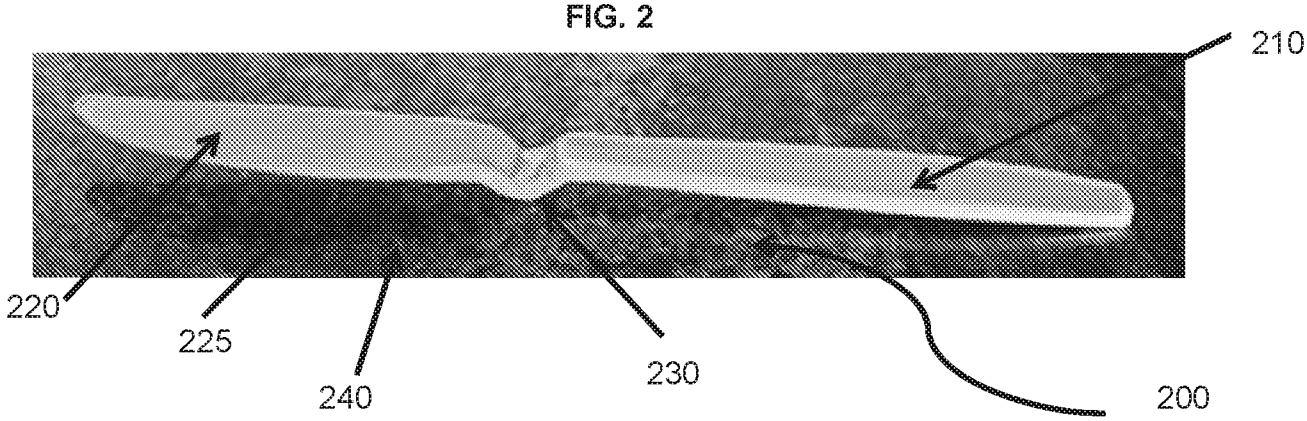



FIG. 3A

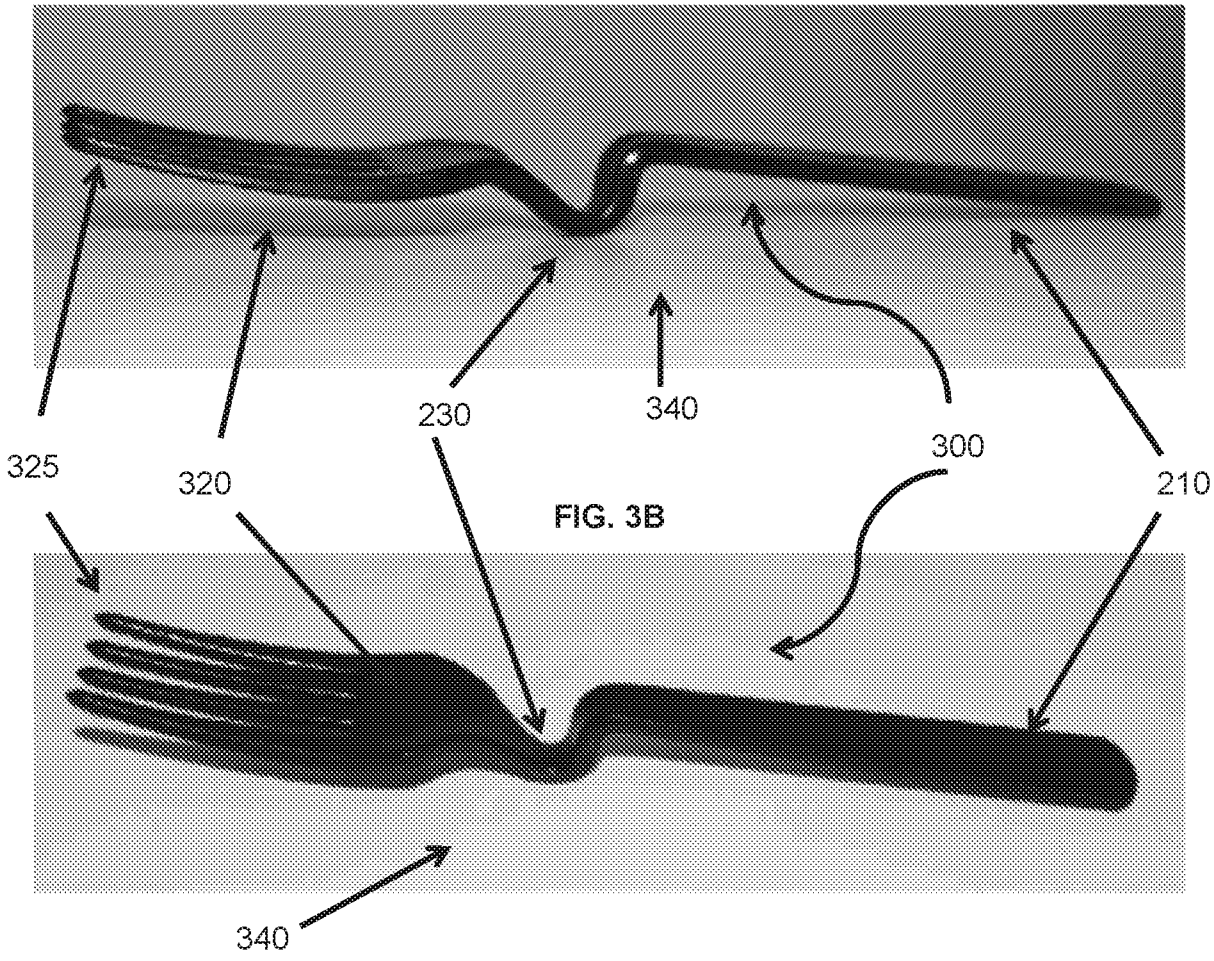



FIG. 3B

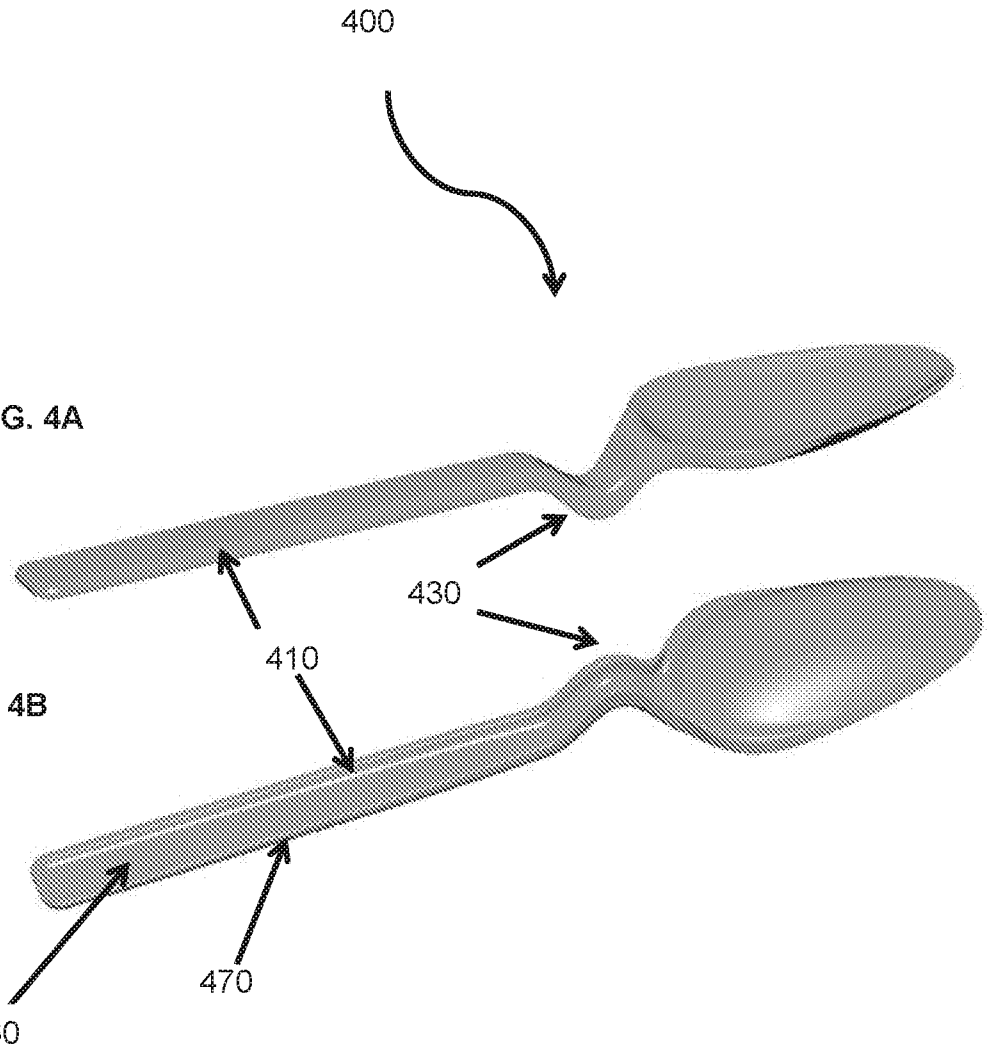



FIG. 4A

FIG. 4B

FIG. 4C

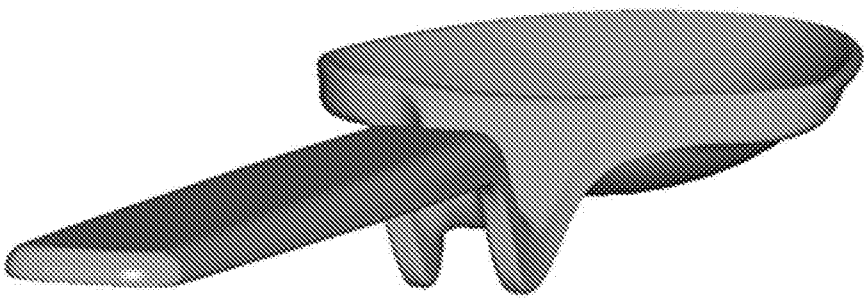


FIG. 5A

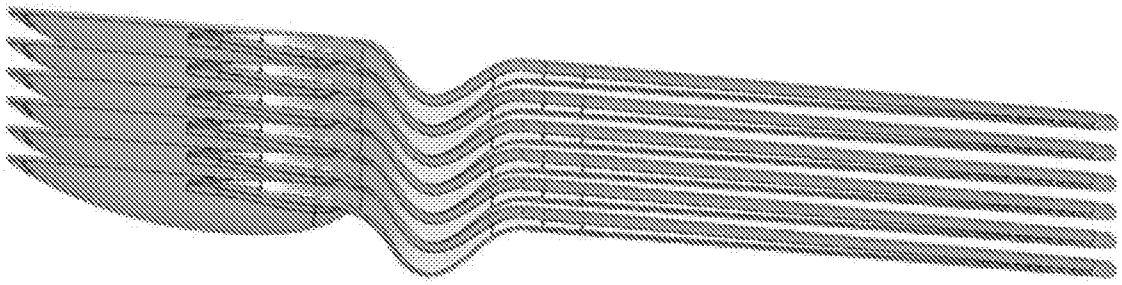


FIG. 5B

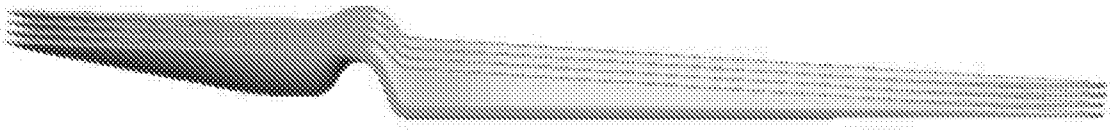


FIG. 6

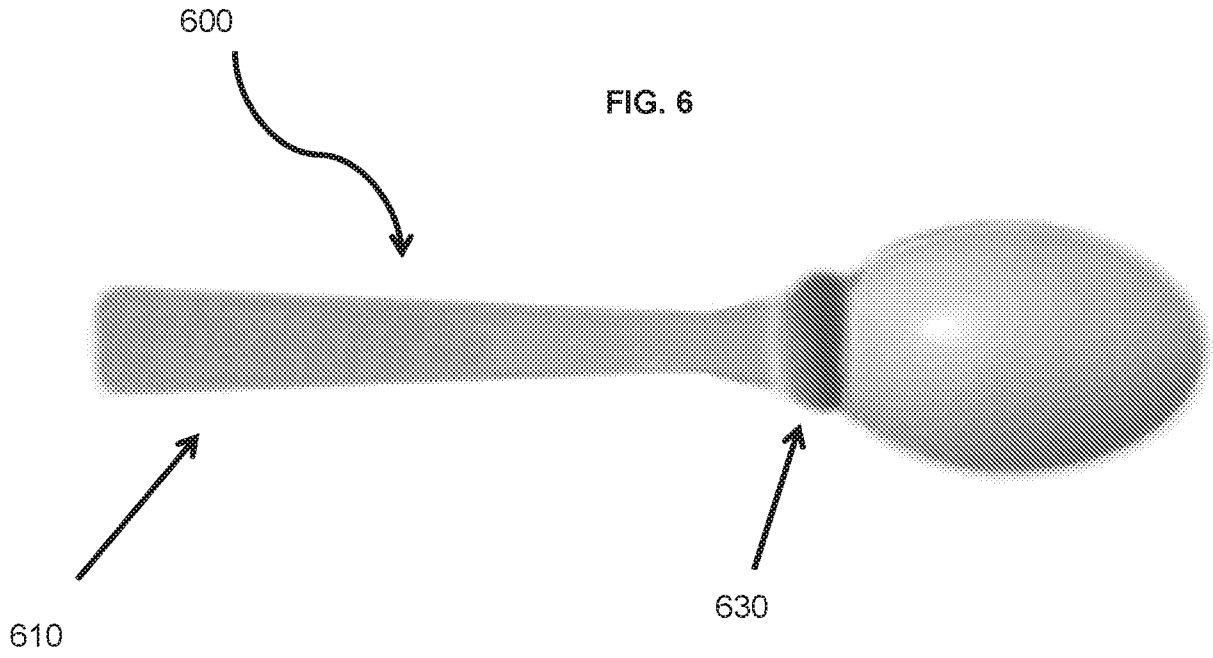


FIG. 7

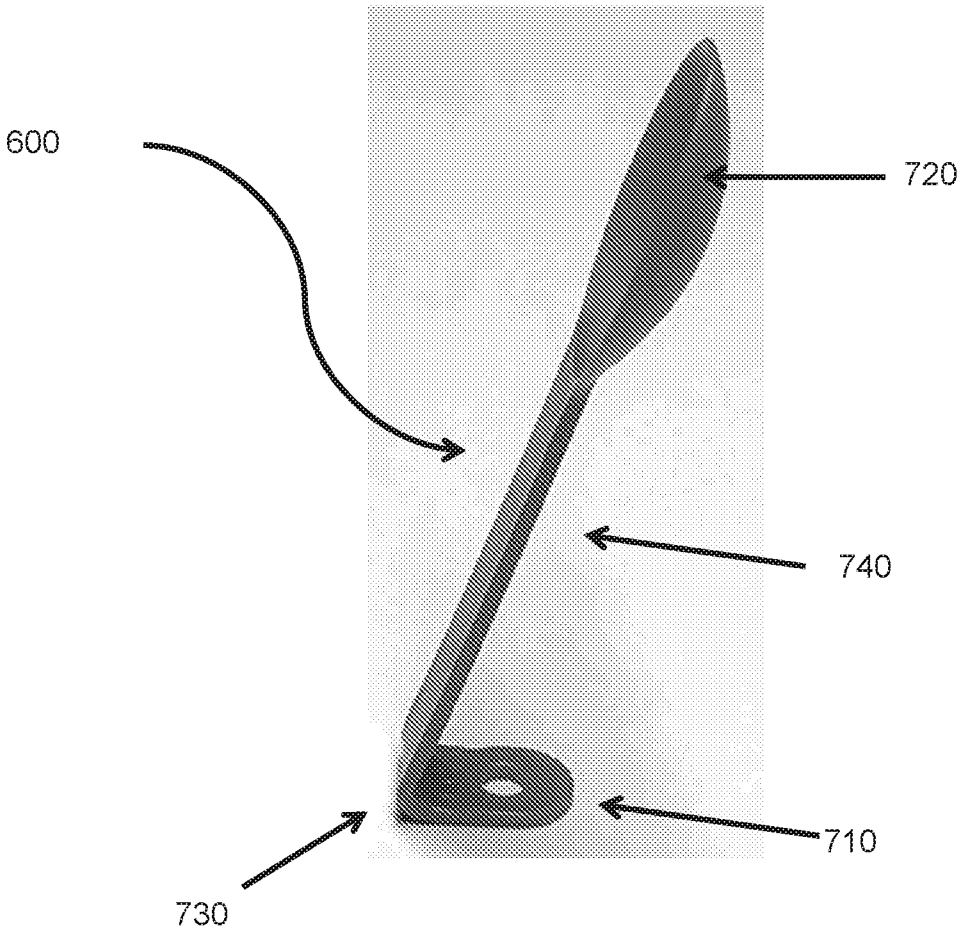


FIG. 8A

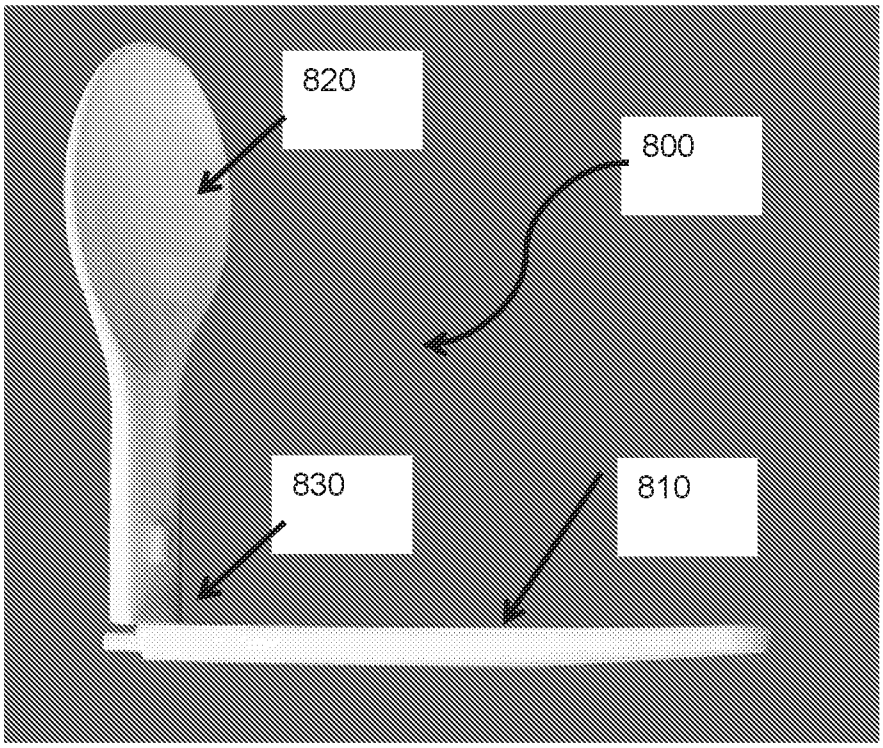



FIG. 8B

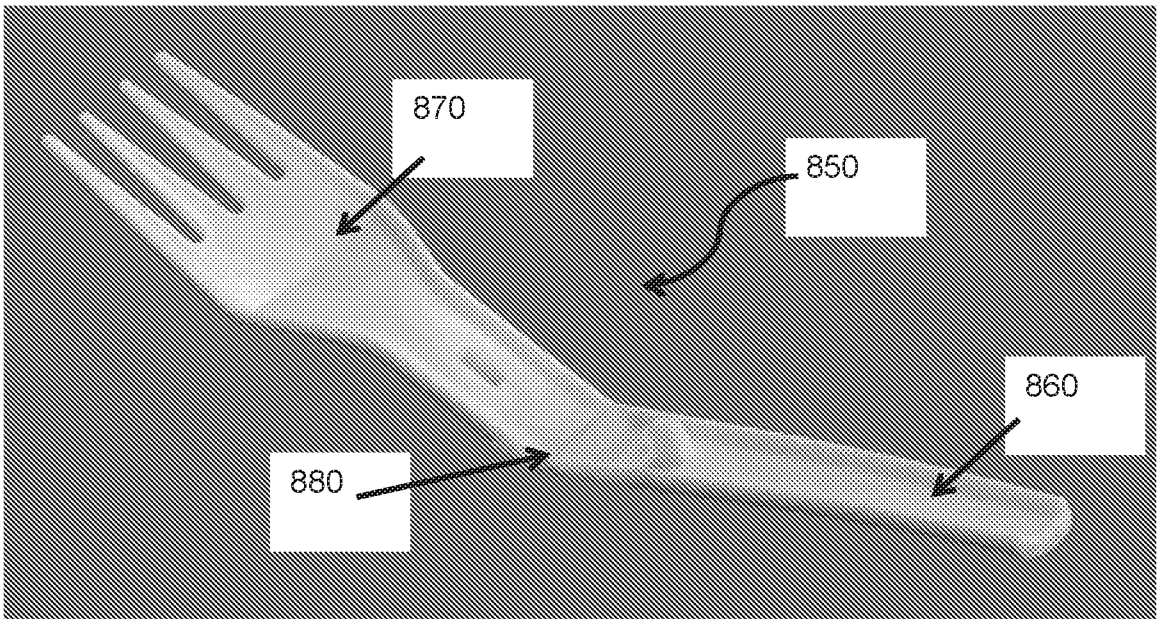


FIG. 9

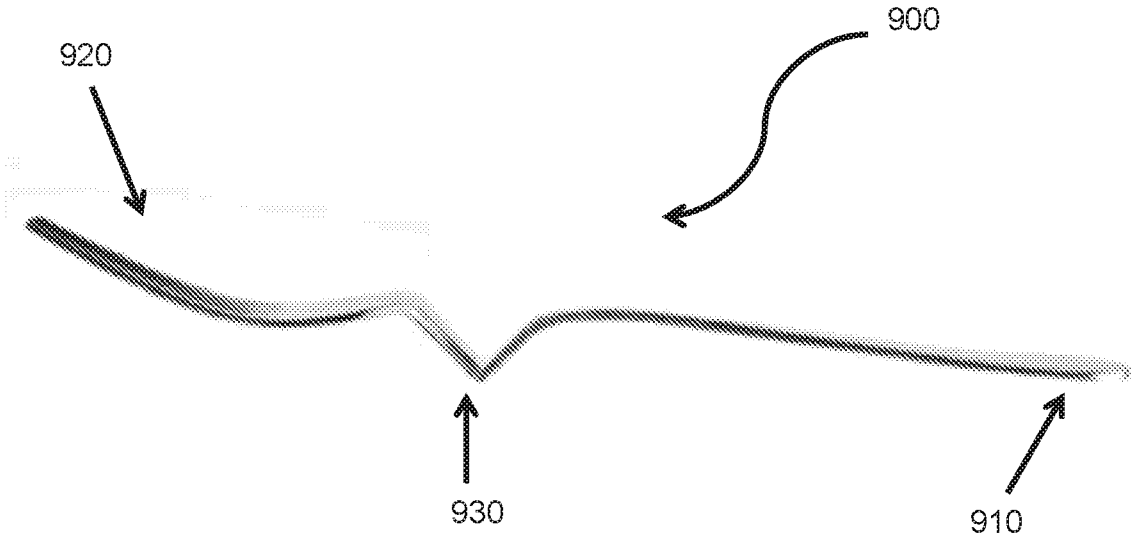



FIG. 10

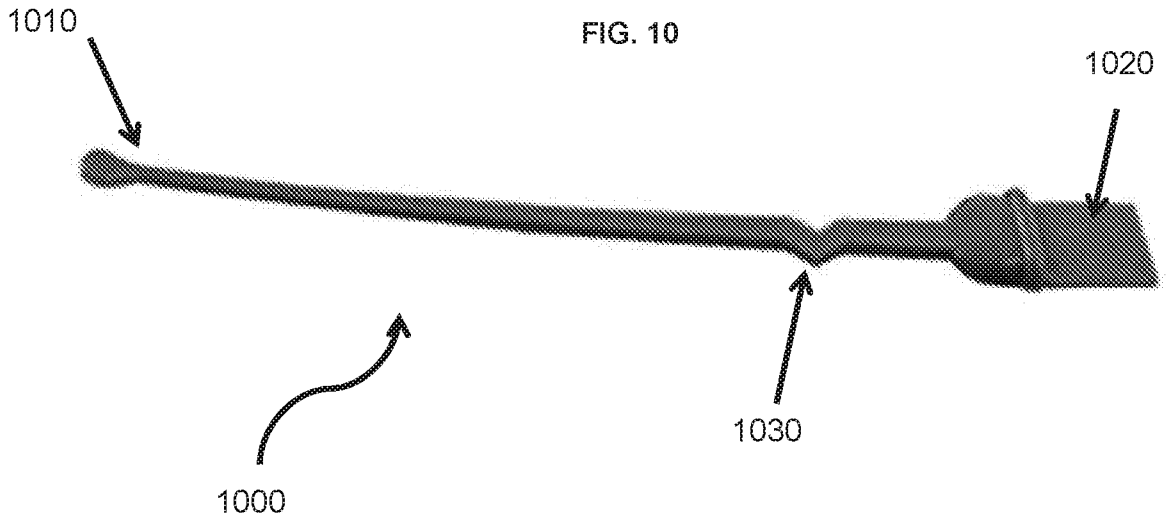
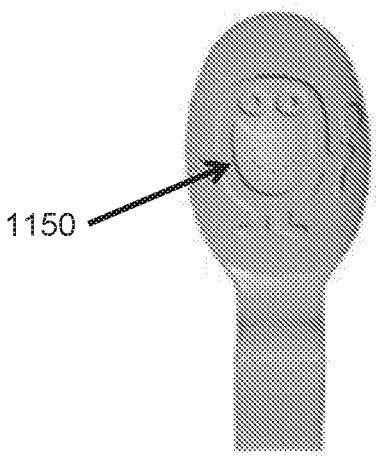


FIG. 11A



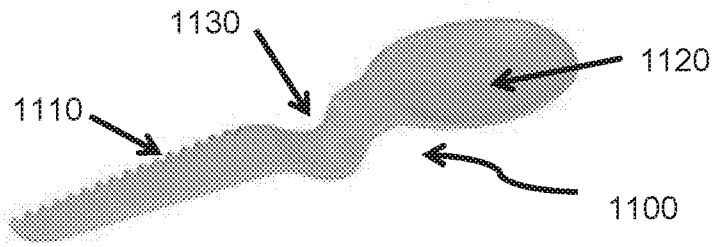




FIG. 11B

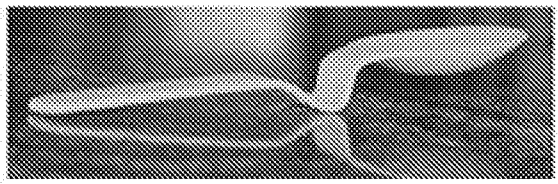


FIG. 11C

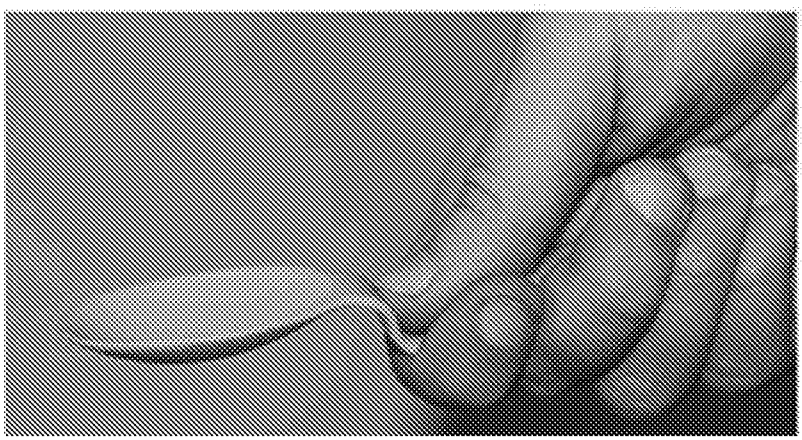


FIG. 11D

**INTERNATIONAL SEARCH REPORT**

International application No.
**PCT/US2017/058779**

**A. CLASSIFICATION OF SUBJECT MATTER**

**A47G 21/00(2006.01)i, A47G 21/04(2006.01)i, A47G 21/02(2006.01)i, A47G 21/06(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)
A47G 21/00; A47J 43/28; A47G 21/04; B32B 9/02; G01F 19/00; A47J 31/44; A47G 21/02; A47G 21/06

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: utensil, proximal, distal, connector, bent, curvature, loop, curl, helix, spoon, fork, knife, handle

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | US 9445691 B1 (JOYNER, MICHAEL) 20 September 2016<br>See column 6, lines 10-50; claim 1; and figures 1-2, 5-6, 11-12. | 1-3 |
| A | US 2010-0304005 A1 (BEALE, JAMES M.) 02 December 2010<br>See paragraphs [0026]-[0028]; and figures 1-3, 6. | 1-3 |
| A | US 2012-0198930 A1 (HOOD et al.) 09 August 2012<br>See paragraph [0023]; and figure 5. | 1-3 |
| A | US 2012-0222482 A1 (KERN et al.) 06 September 2012<br>See paragraphs [0029]-[0030], [0034]-[0035]; and figures 1, 8. | 1-3 |
| A | WO 2007-070415 A2 (WHEATWAREUSA, INC. DBA WHEATWARE.COM) 21 June 2007<br>See pages 11-12; and figures 12-15. | 1-3 |

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 19 February 2018 (19.02.2018) | **20 February 2018 (20.02.2018)** |

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# INTERNATIONAL SEARCH REPORT

International application No.
**PCT/US2017/058779**

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 5-6
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
Claims 5-6 are not clear because they refer to claims 4, 10 respectively, which do not comply with PCT Rule 6.4(a).

3. ☒ Claims Nos.: 4, 7-15
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required addtional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of any additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
☐ No protest accompanied the payment of additional search fees.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.
**PCT/US2017/058779**

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| US 9445691 B1 | 20/09/2016 | US 8769832 B1 | 08/07/2014 |
| | | US 9259111 B1 | 16/02/2016 |
| US 2010-0304005 A1 | 02/12/2010 | None | |
| US 2012-0198930 A1 | 09/08/2012 | US 2012-0273380 A1 | 01/11/2012 |
| | | US 8714011 B2 | 06/05/2014 |
| | | US 8806935 B2 | 19/08/2014 |
| US 2012-0222482 A1 | 06/09/2012 | CA 2762242 A1 | 07/03/2012 |
| | | CA 2762242 C | 13/11/2012 |
| | | US 8650951 B2 | 18/02/2014 |
| WO 2007-070415 A2 | 21/06/2007 | US 2009-0126204 A1 | 21/05/2009 |
| | | WO 2007-070415 A3 | 31/01/2008 |