[0086] As such, the arm portions **703** and **705** can have a length, width, and thickness, suitable for carrying large LCD glass substrates between tools and onto stages, wherein the length≧width≧thickness. As such, in one particular embodiment, the length of the arm portions **703** and **705** is not less than about 0.5 m, such as not less than about 1 m, not less than about 1.5 m and within a range between about 0.5 m and about 3 m. Moreover, the thickness of the arm portions **703** and **705** are such that they are particularly thin, despite the weight of the massive LCD glass substrates. In one embodiment, the arm portions **703** and **705** have a thickness that is not greater than about 20 cm, such as not greater than about 15 cm, not greater than about 10. In accordance with certain embodiments, the thickness of the arm portions **703** and **705** are within a range between about 1 cm and about 20 cm, and more particularly within a range between about 2 cm and about 15 cm.

[0087] As mentioned above, the effector illustrated in FIG. **7** is a handler, facilitating the transport of large glass substrates between processing tools and on and off stages, particularly in the context of LCD manufacturing environments. Such effectors are lighter, and particularly designed for operation with sensitive LCD glass substrates, notably having limited particle generation and ESD dissipative capabilities. In accordance with one embodiment, the effector facilitates transport of an LCD glass substrate from a holding surface to a stage for processing of the substrate. Additionally, the effector can be used for additional transport of the LCD glass substrate through the manufacturing process, including after processing the TFT on the LCD glass substrate and positioning of the LCD glass substrates for manufacturing of the final-formed LCD article.

[0088] The effector **700** can be a monolithic LCD processing article having those features and characteristics as described above in accordance with FIG. **3**. For example, the effector body **701** can be made of an electrostatic dissipative material having volume resistivity (R_v) within a range between about 1.0×10^5 Ωcm and about 1.0×10^9 Ωcm. And more particularly, the arm portions **703** and **705** that are used to directly contact the LCD glass substrate, can include an ESD dissipative material.

[0089] Alternatively, the effector **700** can include multiple component layers, such as a substrate **401** and a skin portion **403** formed and having those features and characteristics described herein in accordance with FIG. **4**. In such embodiments, the skin portion **403** can cover the body **701** and include an ESD dissipative material. Certain embodiments may utilize a skin portion **403** on the arm portions, and in particular embodiments, the effector **700** can be formed such that the skin portion **403** is only overlying the arm portions **703** and **705**.

[0090] The working surface of the effector **701**, that being the upper surfaces designed to contact the LCD glass substrate, are primarily the upper surfaces of the arm portions **703** and **705**. As such, the working surface of the effector **700** can have the same geometric characteristics as previously described in accordance with the stage of FIGS. **5** and **6**, including for example surface roughness, flatness, warp, bow, and parallelism. The working surface of the effector **700**, like the stage **500**, also has limited particle generation characteristics suitable for reducing potential contamination to the LCD articles.

EXAMPLES

Example 1

[0091] An electrostatic dissipative monolithic stage for forming LCD articles thereon is made using the following process. Initially, an equal mixture of 12 micron and 4 micron SiC powder is mixed with 20 wt % water to form a slurry which is processed in an attrition mill. The slurry is then treated with an acid solution containing equal parts HNO_3 and HF acids. After 8 hours in the agitated acid treatment tanks, the slurry is diluted with DI water to decant the supernatant and the settled species is filter pressed to remove the water. The resulting filter cake exhibits about 72 wt % solids content.

[0092] The filter cake is refluidized with water such that it has a solids content of about 60 wt %. After refluidizing, an addition of concentrated NH_4OH solution is provided to shift the pH above 8 which facilitates electrostatic dispersion. The slurry is milled, particularly using a vibration mill with 10 mm SiC media, along with a 0.64 wt % addition of submicron B_4C and is milled for a minimum of 8 hours, until a mean particle size of 0.48 microns is achieved.

[0093] The resulting slurry is mixed with 2.8 wt % phenolic resin and 3.0 wt % of both poly-vinyl alcohol and acrylic resin. The mixture is then spray dried to achieve a granules having a target nodule size of approximately 75 microns.

[0094] After spray drying, the granulate is dry pressed and cured at 250° C. for a duration of 2 hours forming a green-state (i.e., unfired) stage. The green-state stage is fired at 2250° C. in a nitrogen atmosphere for a 4 hour soak time. The working surface of the stage were cleaned via grinding or sand blasting to remove excess carbon and provide the geometric features (e.g., surface roughness) described above. Grinding was completed using 320 grit. The density of the resulting is 3.15 g/cc, and the porosity is less than 2.0 vol %, and the volume resistivity is 5.0E9 Ωcm.

Example 2

[0095] An electrostatic dissipative stage having a layered structure for forming LCD articles thereon is made using the following process. A mixture containing 10.5 wt % water, 43.0 wt % 100F SiC (d_{50}=150 microns), and 46.5 wt % fine SiC (d_{50}=3 microns) is blended at pH of 7.8. The pH is adjusted using a 25% solution of NaOH to achieve the pH, and the mixture is processed in a rolling mill for a minimum of 4 hours for suitable dispersion and homogeneous mixing. Latex is then added to the mix at a concentration of 0.2% by weight.

[0096] The resulting bimodal slurry is cast into a Plaster of Paris mold incorporating a cavity having roughly the desired stage dimensions. When consolidation is complete, the part is stripped from the mold and dried at 60° C. for a minimum of 8 hours to form a green article. After drying, the green article is fired at a temperature of 2450° C. in an argon atmosphere with a soak time of 8 hours.

[0097] After firing the green article, the stage is coated with a layer of plasma sprayed Cr_2O_3 which forms a skin layer having an average thickness of 150 microns. This resulted in closing the porosity at the surface, making the article smoother and more dense. The resulting volume resistivity (R_v) of the electrostatic dissipative skin layer is 2.4E7 Ωcm.

Comparative Example 1

[0098] A monolithic stage for forming LCD articles thereon is made using the following process. The process for forming the stage in Example 2 is followed except that after firing the article is not spray coated with a layer of Cr_2O_3. The