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(54) **FABRIC ARTICLE TREATING DEVICE AND SYSTEM WITH ANTI-MICROBIAL AGENT**

(76) Inventors: **Thomas Edward Ward**, Oregonia, OH (US); **Barry Patrick McNamara**, Fairfield, OH (US); **Cynthia Maria Bedell**, Cincinnati, OH (US); **Jill Marisa Potter**, Cincinnati, OH (US); **Heidi Lyn Reeb**, Cincinnati, OH (US); **Kofi Ofosu-Asante**, Cincinnati, OH (US); **Dean Larry DuVal**, Lebanon, OH (US); **Trace Wendell de Guzman Trajano**, Mason, OH (US)

Correspondence Address:
The Procter & Gamble Company
IP Division Central Docketing, WHBC - FC Box 161
6110 Center Hill Avenue
Cincinnati, OH 45224 (US)

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(60) Provisional application No. 60/568,771, filed on May 6, 2004. Provisional application No. 60/374,601, filed on Apr. 22, 2002. Provisional application No. 60/426,438, filed on Nov. 14, 2002.

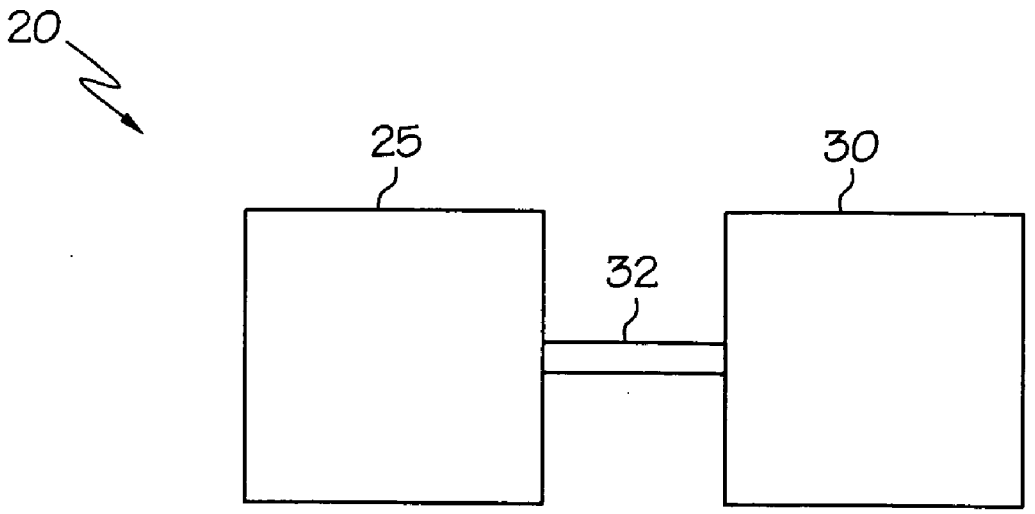
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(57) **ABSTRACT**

A fabric article treating device includes an interior dispenser adapted for location inside of a fabric article drying appliance and a reservoir adapted to contain a benefit composition. The interior dispenser and the reservoir are adapted for fluid communication with one another. At least a portion of the reservoir is formed of a material comprising anti-microbial agent.



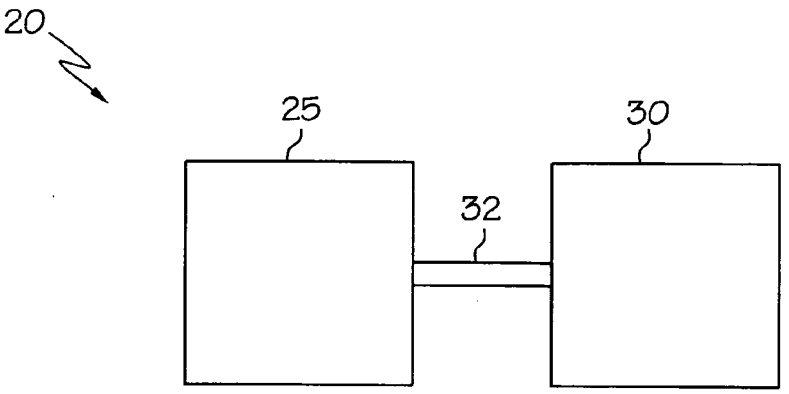


FIG. 1

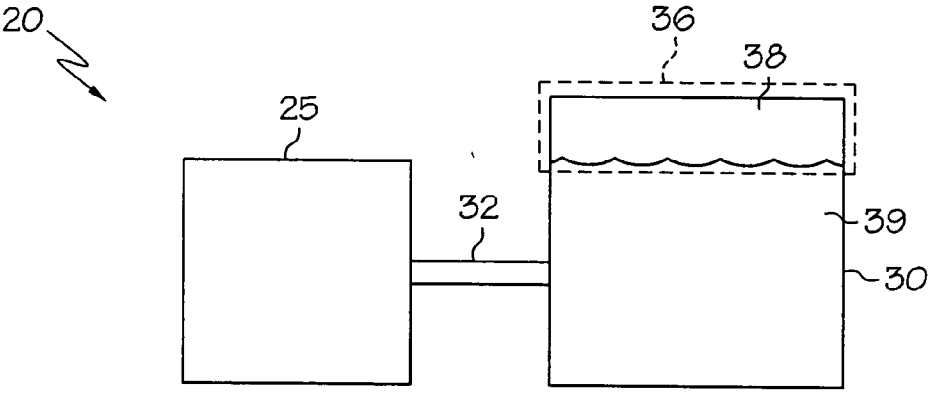


FIG. 2

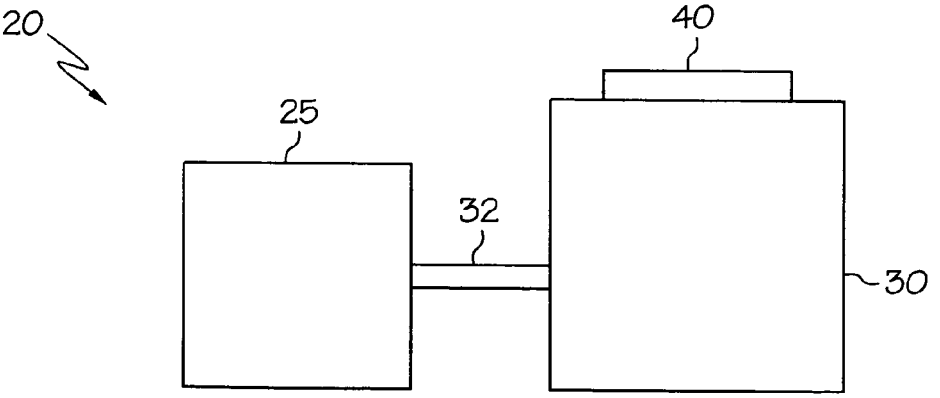


FIG. 3

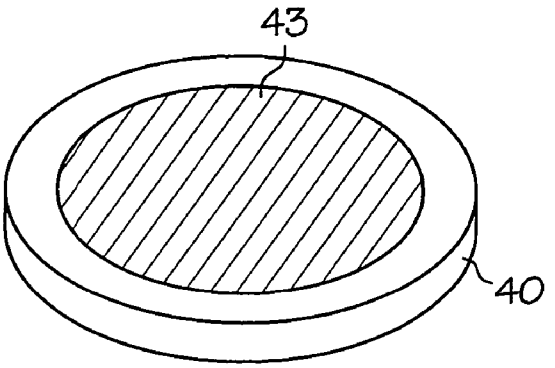


FIG. 4

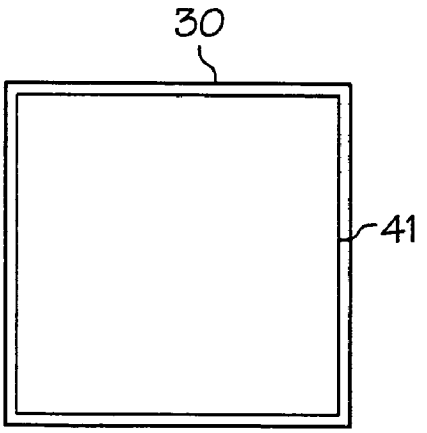
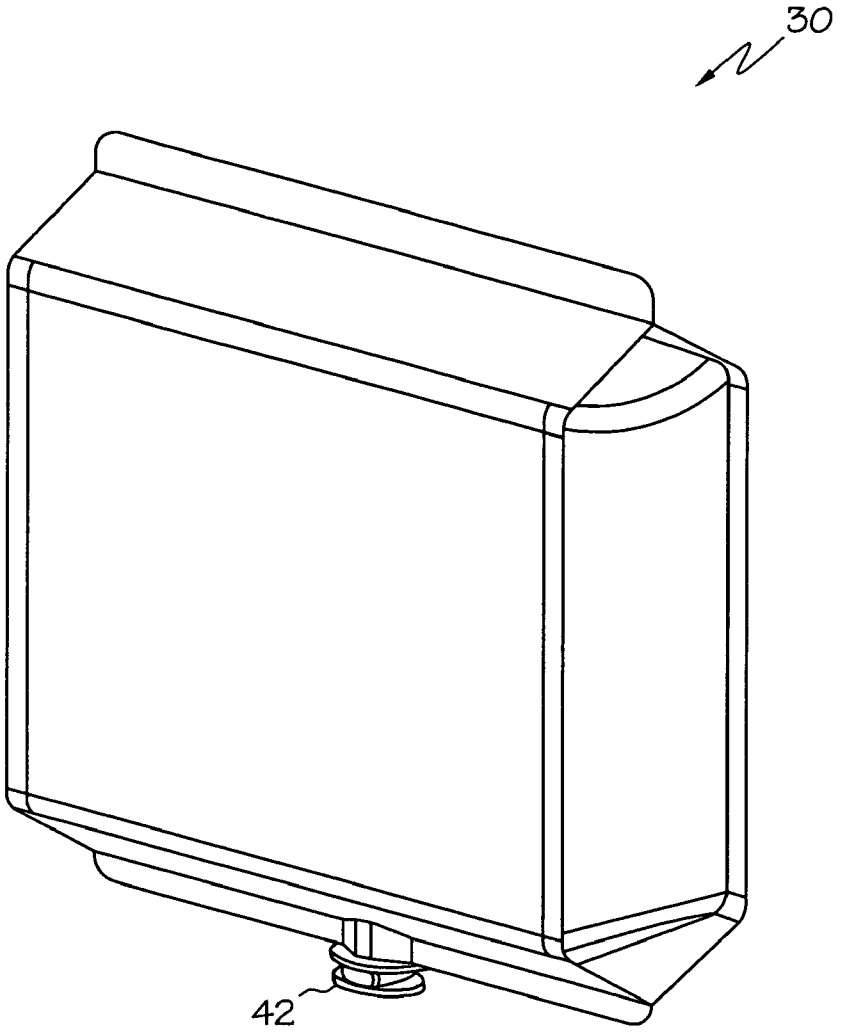


FIG. 5



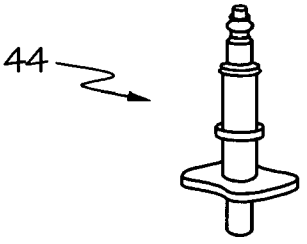


FIG. 6

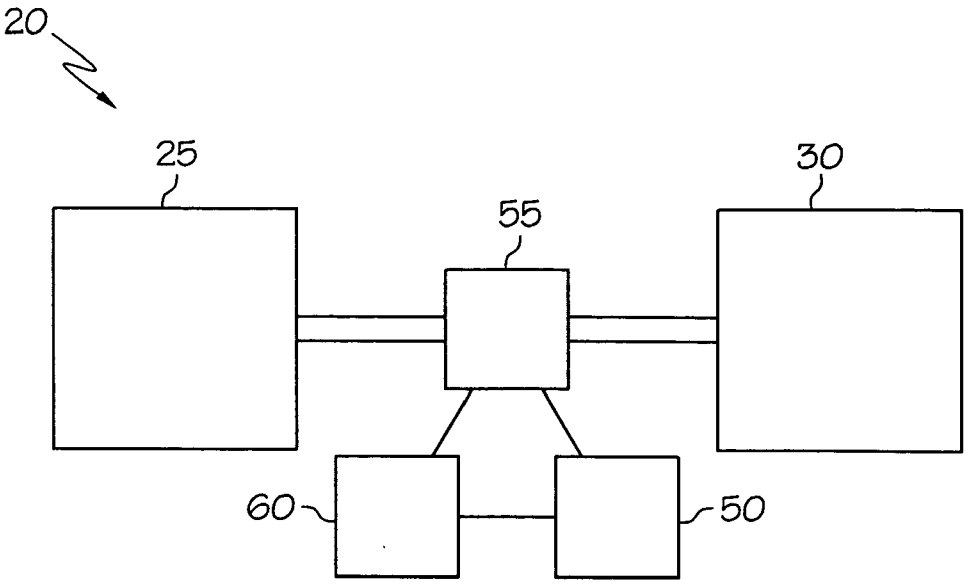


FIG. 7

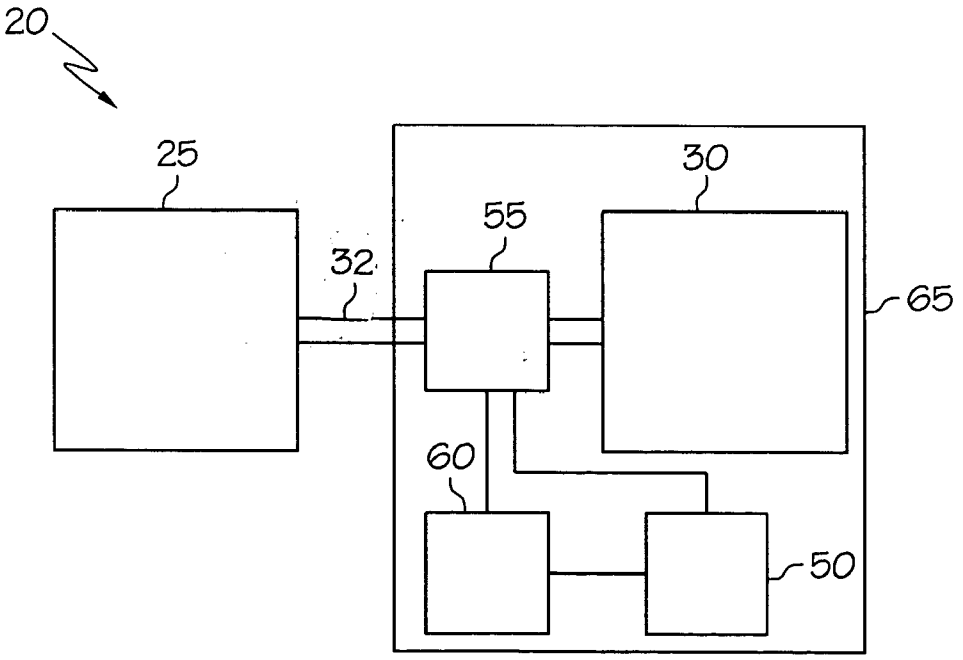


FIG. 8

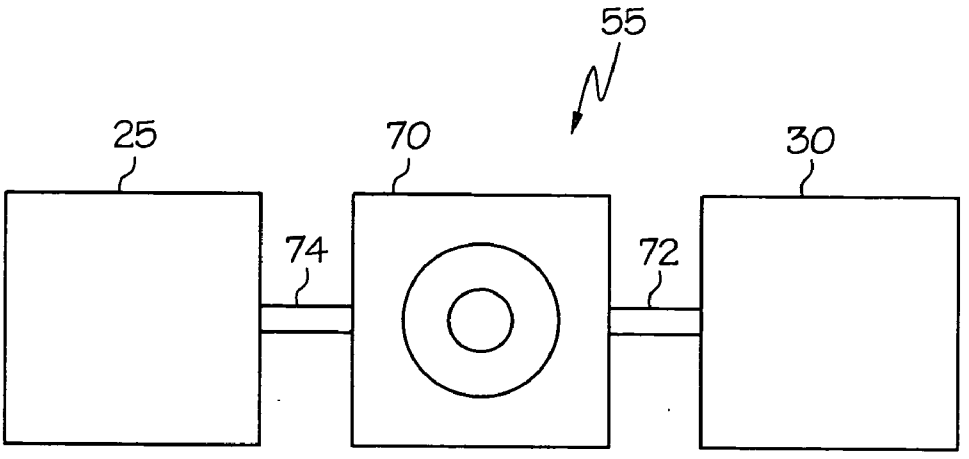


FIG. 9

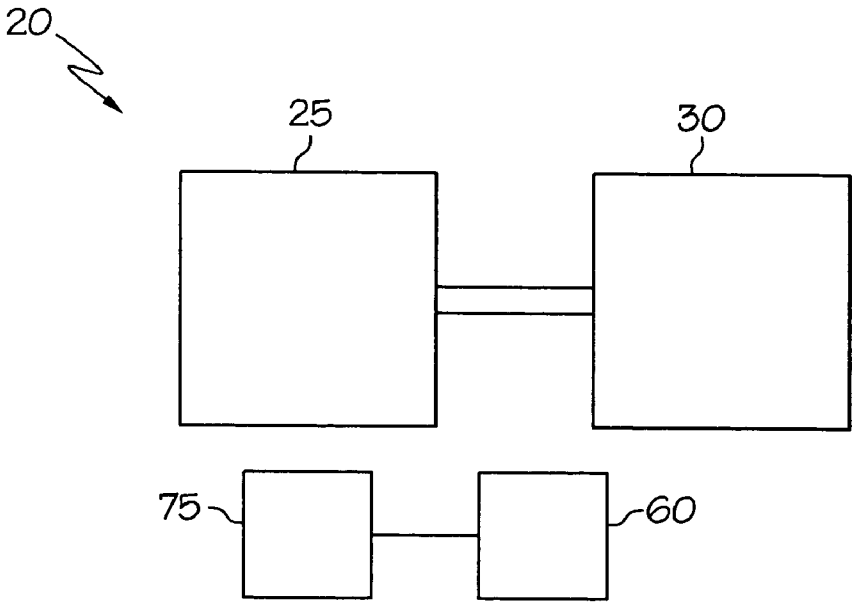


FIG. 10

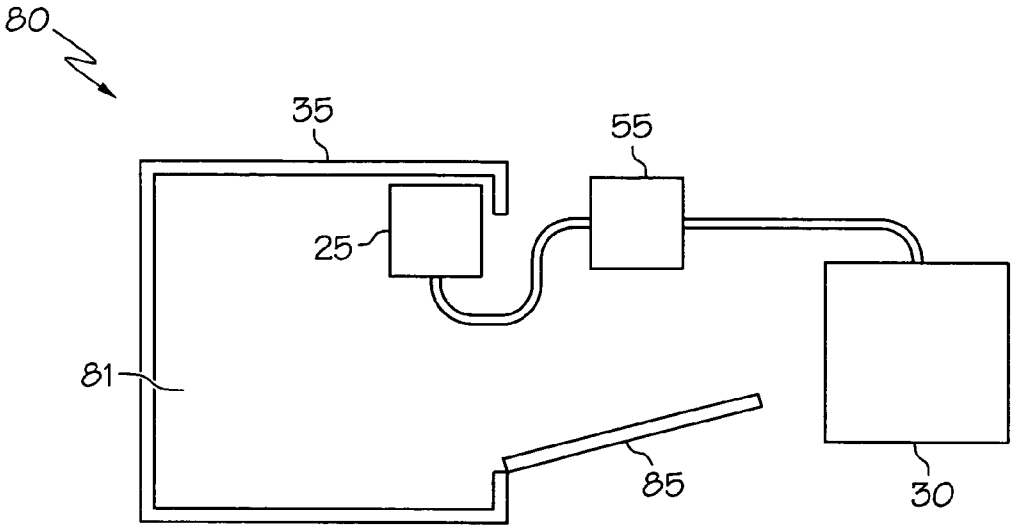


FIG. 11

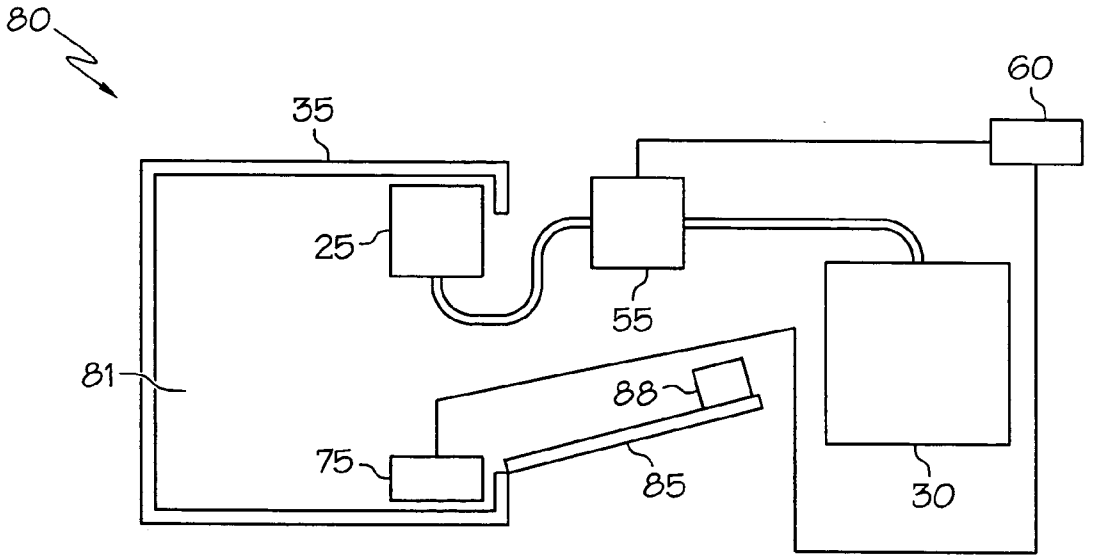


FIG. 12

FABRIC ARTICLE TREATING DEVICE AND SYSTEM WITH ANTI-MICROBIAL AGENT

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of U.S. Provisional Application Ser. No. 60/568,771 entitled "Uniform Delivery of Compositions", filed on May 6, 2004 and is a continuation-in-part of U.S. Ser. No. 10/842,926 entitled "Fabric Article Treating System and Method", filed on May 11, 2004; which is a continuation-in-part of U.S. Ser. No. 10/839,549 entitled "Processes and Apparatuses for Applying a Benefit Composition to One or More Fabric Articles During a Fabric Enhancement Operation", filed on May 5, 2004; which is a continuation-in-part of U.S. Ser. No. 10/762,152, entitled "Volatile Material Delivery Method", filed on Jan. 21, 2004; which is a continuation-in-part of U.S. Ser. No. 10/697,736, entitled "Fabric Article Treating Method and Device Comprising a Heating Means", filed on Oct. 29, 2003; U.S. Ser. No. 10/697,734, entitled "Thermal Protection of Fabric Article Treating Device", filed on Oct. 29, 2003; U.S. Ser. No. 10/697,685, entitled "Fabric Article Treating Device Comprising More Than One Housing", filed on Oct. 29, 2003; and U.S. Ser. No. 10/697,735, entitled "Fabric Article Treating Apparatus with Safety Device and Controller", filed Oct. 29, 2003; each of which is a continuation-in-part of U.S. Ser. No. 10/418,595, entitled "Fabric Article Treating Method and Apparatus", filed on Apr. 17, 2003, which claims the benefit of U.S. Provisional Application Ser. No. 60/374,601, filed Apr. 22, 2002 and U.S. Provisional Application Ser. No. 60/426,438, filed Nov. 14, 2002.

FIELD OF THE INVENTION

[0002] The present invention relates to a fabric article treating device for use with a fabric article drying appliance, and more specifically to a unique fabric article treating device and system for dispensing a benefit composition, which employ antimicrobial agent.

BACKGROUND OF THE INVENTION

[0003] Fabric article treating methods and/or apparatuses have been evolving over the past twenty years. For example, U.S. Pat. No. 4,207,683 describes a conventional automatic clothes dryer that incorporates a spray dispenser capable of dispensing liquids into the drum of the dryer. U.S. Pat. Nos. 4,642,908, 5,771,604 and 6,067,723 describe other variations of conventional clothes drying appliances.

[0004] There exists an ongoing need to develop a fabric article treating method and/or apparatus, especially an in-home fabric article treating method and/or apparatus, that improves/enhances the deposition of fabric article actives or benefit agents on the fabric articles being treated as compared to the currently existing deposition methods and/or apparatuses.

[0005] One particular challenge presented in the delivery of fabric article actives in the fabric article drying environment is the effect of moisture or condensation and heat generated during the drying of the fabric articles. Particularly, storage containers or reservoirs of actives can act as a terrarium, a controlled micro-climate that demonstrates a compact model of the hydrologic cycle. Heat generated by the drying cycle in combination with the aqueous benefit composition may develop an excess of humidity inside an active storage container or reservoir, which can lead to major environmental changes, including 1) evaporation of moisture and 2) condensation of moisture on container or reservoir surfaces, analogous to on the dome of a terrarium. The antimicrobial and/or preservative agents in this benefit composition, typically are not volatile, thus the water that evaporates from the benefit composition and condenses on the container or reservoir surfaces is unprotected and may support microbial growth. This water vapor and subsequent condensation may be problematic especially on headspace surfaces such as lids or caps above the benefit composition. If the reservoir has an aerobic environment with a constant influx of unsterile air, which is expected to be carrying air-born microbial contaminants such as bacteria, and especially yeasts and fungi, aerobic microorganisms are expected to have an increased opportunity to contaminate and populate the container or reservoir, especially in the unprotected water vapor/condensation. These microbial air-born contaminants may consist of: 1) purely vegetative microorganism such as *Staphylococcus, Streptococcus, Enterococcus, Pseudomonas, Burkholderia* as well as other numerous other non-spore forming microbial contaminants, including non-spore forming, potentially pathogenic yeasts such as *Candida*; and 2) spore forming contaminants such as various fungal species (*Aspergillus, Penicillium, Fusarium* and other potentially pathogenic species) are expected to be major air-born microbial contaminants infiltrating the vents and caps of the reservoir during use and refill operations. These potential fungal pathogens are expected to be prevalent in and around the laundry room where adequate moisture, abundant growth substrate (cotton and other lint and debris) and warm temperatures are typically encountered and will encourage active populations of these organisms on surfaces (walls, floors, washer/dryer) and as air-born contaminants.

[0006] The potential microbial contamination in the water vapor or condensate, is expected to become established, with substantially increased population densities. The most problematic contaminants would be spore forming microorganisms, since they could actively increase in densities, form numerous more spores and result in further and complete microbial contamination of the reservoir, reservoir surfaces and condensation water. As the condensation cools, or increases in size or volume, contaminated water droplets may fall back into the benefit composition, resulting in potential microbial insult to, not only the benefit composition, but also to the treated fabrics in the drying appliance during application of the benefit composition, and more importantly to the consumer who may be exposed to these contaminants via wearing the contaminated clothing or fabric items. Many of these microbial contaminants, especially the non-spore-forming ones, may be eliminated during drying assuming a full (20 to 30 min) and completed drying cycle using the hottest settings. However, the spore-formers, in most cases, even under the hottest settings, would be resistant and could easily survive even these worse case drying conditions. More importantly, if cooler settings or custom fluff settings are used with the benefit composition, most if not all of the microbial contaminants including both non-spore forming and spore-forming contaminants could easily survive the treatment processes.

[0007] The evaporation and condensation cycling can also alter an active composition's solute/solvent concentration. As such, it would be advantageous to provide a fabric article treating device comprising a reservoir which minimizes the potentials for microbial growth.

SUMMARY OF THE INVENTION

[0008] The present invention is directed to fabric article treating devices and fabric article treating systems. More particularly, the invention is directed to fabric article treating devices and systems including a reservoir, at least a portion of which reservoir is formed of a material comprising anti-microbial agent.

[0009] One embodiment of the present invention is a fabric article treating device. The fabric article treating device comprises an interior dispenser adapted for location inside of a fabric article drying appliance, and a reservoir. The interior dispenser and the reservoir are adapted for fluid communication with one another. The reservoir contains a benefit composition, and at least a portion of the reservoir is formed of a material comprising anti-microbial agent.

[0010] Another embodiment of the present invention is a fabric article treating system. The fabric article treating system comprises a fabric article drying appliance having a chamber and a closure structure, the closure structure having a closed position and at least one open position and allowing access to the chamber; a reservoir for containing a benefit composition; a dispenser in communication with the chamber; and a fluid handling system that transports the benefit composition from the reservoir toward the dispenser, thereby dispensing the benefit composition into the chamber. At least a portion of the reservoir is formed of a material comprising anti-microbial agent.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] While the specification concludes with claims particularly pointing out and distinctly claiming the invention, it is believed the same will be better understood from the following description taken in conjunction with the accompanying drawings in which:

[0012] **FIG. 1** is a schematic illustration of an exemplary fabric article treating device according to a first embodiment of the present invention;

[0013] **FIG. 2** is a schematic illustration of an exemplary fabric article treating device according to a second embodiment of the present invention;

[0014] **FIG. 3** is a schematic illustration of an exemplary fabric article treating device according to a third embodiment of the present invention;

[0015] **FIG. 4** is a schematic illustration of an exemplary closure according to a fourth embodiment of the present invention;

[0016] **FIG. 5** is a schematic illustration of an exemplary reservoir according to a fifth embodiment of the present invention;

[0017] **FIG. 6** is a schematic illustration of an exemplary fabric article treating device according to a sixth embodiment of the present invention;

[0018] **FIG. 7** is a schematic illustration of an exemplary fabric article treating device according to a seventh embodiment of the present invention;

[0019] **FIG. 8** is a schematic illustration of an exemplary fabric article treating device according to a eighth embodiment of the present invention;

[0020] **FIG. 9** is a schematic illustration of an exemplary fluid handling system according to a ninth embodiment of the present invention;

[0021] **FIG. 10** is a schematic illustration of an exemplary fabric article treating device according to a tenth embodiment of the present invention;

[0022] **FIG. 11** is a schematic illustration of an exemplary fabric article treating system according to a eleventh embodiment of the present invention; and

[0023] **FIG. 12** is a schematic illustration of an exemplary fabric article treating device according to a twelfth embodiment of the present invention.

[0024] The embodiments set forth in the drawings are illustrative in nature and not intended to be limiting of the invention defined by the claims. Moreover, individual features of the drawings and the invention will be more fully apparent and understood in view of the detailed description.

DETAILED DESCRIPTION OF THE INVENTION

[0025] Reference will now be made in detail to various embodiments of the invention, examples of which are illustrated in the accompanying drawings, wherein like numerals indicate similar elements throughout the views.

[0026] Definitions

[0027] The phrase "fabric article treating system" as used herein means a fabric article drying appliance, a non-limiting example of which includes a conventional clothes dryer and/or modifications thereof. The fabric article treating system also includes a fabric article treating apparatus which may be discrete in relation to the fabric article drying appliance and/or it may be integrated into the fabric article drying appliance. Furthermore, the fabric article treating apparatus may be integrated into a readily replaceable portion of the fabric article drying appliance, a non-limiting example of which includes a closure structure of the drying appliance.

[0028] "Fabric article" or "fabric" as used herein means any article that is customarily cleaned in a conventional laundry process or in a dry cleaning process. The term encompasses articles of fabric including, but not limited to, clothing, linen, drapery, clothing accessories, leather, floor coverings, sheets, towels, rags, canvas, polymer structures, and the like. The term also encompasses other items made in whole or in part of fabric material, such as tote bags, furniture covers, tarpons, shoes, and the like.

[0029] As used herein, the term "benefit composition" refers to a composition used to deliver a benefit to a fabric article. Non-limiting examples of materials and mixtures thereof which can comprise the benefit composition include: water, softening agents, crispening agents, perfume, water/stain repellants, refreshing agents, antistatic agents, antimicrobic agents, durable press agents, wrinkle resistant agents,

odor resistance agents, abrasion resistance agents, solvents, and combinations thereof. The benefit composition may comprise a liquid, a powder, a suspension, or gaseous product, and/or a combination of such. In one embodiment, the benefit composition includes a preservative. Various preservatives which help maintain one or more properties of the benefit composition are generally known in the art and are suitable for use herein. Exemplary preservatives include hydantoins e.g. Dantoguard Plus™ (Dimethylol-5,5-Dimethylhydantoin, DMDMH, and including the fungicide IPBC, iodopropargyl-N-butylcarbamate) commercially available from Lonza; isothiazolinones (e.g. Kathon™ commercially available from Rohm & Haas, or MicroCare ITL from Thor); and Integra 44™ (Sodium hydroxymethylglycinate) commercially available from International Specialty Products (ISP). Other preservatives may include benzisothiazolin-3-ones, BIT (e.g. Proxel GXL™ from Avecia, or Acticide B-20™ from Thor); methylisothiazolin-3-ones, MIT (e.g. Neolone™ from Rohm & Haas or Acticide M20-S™ from Thor); combination preservative systems such as Acticide MBS™ (BIT/MIT mixture from Thor), Acticide IM™ (MIT & IPBC, also from Thor), Dantoserve™ (DMDMH and BIT, from Lonza). This list is designed to be representative, but not all inclusive.

[0030] As used herein "anti-microbial agent" refers to a compound which is effective against bacteria, algae, fungus, mold and/or mildew that may cause odor, stain, discoloration, unsightly texture, decay, or deterioration of physical properties.

[0031] **FIG. 1** illustrates an exemplary fabric article treating device **20** according to one embodiment of the present invention. The fabric article treating device **20** comprises an interior dispenser **25** adapted for location inside of a fabric article drying appliance and a reservoir **30**. The interior dispenser **25** and the reservoir **30** are adapted for fluid communication with one another, for example via fluid line **32**. In one embodiment, the fluid connection between the interior dispenser **25** and the reservoir **30** comprises tubing configured to allow the benefit composition to be transported from the reservoir **30** to the interior dispenser **25**. One exemplary tubing comprises a polymeric tubing with one or more channels or conduits. In one embodiment, the tubing is configured to allow the closure structure on the fabric article drying appliance to maintain a closed position while still permitting dispensing of the benefit composition. The reservoir **30** contains a benefit composition and at least a portion of the reservoir is formed of a material comprising an anti-microbial agent. In one exemplary embodiment, the reservoir **30** is removable. In another exemplary embodiment, the reservoir **30** comprises a sealed pouch.

[0032] The reservoir **30** may be constructed of any material known in the art and at least a portion of the reservoir is formed of a material comprising an anti-microbial agent. Non-limiting examples of such structural materials include polymeric materials including but not limited to polypropylene, polyethylene, styrenics, polyesters, polyethylene terephthalate (PET), polycarbonates, Poly(methyl methacrylate (PMMA), polyvinyls, Nylon, polyurethane, acrylic, epoxies, acetates, acrylonitrile-butadiene-styrene, fluoropolymers, latex, nitrile copolymers, nylons, polychloroprene, polyvinylchloride, Rayon, rubbers (natural and synthetic), silicone, and combinations thereof. Other exemplary materials of construction include a metal, for example aluminum foil. In one embodiment, the reservoir **30** comprises multiple layers of one or more materials. In another embodiment, the reservoir **30** comprises a single or multiple layer barrier film.

[0033] At least a portion of the reservoir is formed of a material comprising an anti-microbial agent. In one exemplary embodiment, the anti-microbial agent of the reservoir is effective to prevent and/or minimize proliferation of anaerobic and/or aerobic bacteria. In another exemplary embodiment, the anti-microbial agent comprises one or more organic or inorganic compounds, or a combination thereof. Non-limiting examples of anti-microbial agents include, but are not limited to, iodine; silver; zinc; 2,4,4'-trichloro-2'-hydroxydiphenyl ether; silver zeolite; silver glass; 4-t-butylamino-6-cyclopropylamino-2-methylthio-s-triazine; thiabenzazole, 2-(4-thiazolyl)benzimidazole; dichloro-octyl-isothiazolone; octyl-isothiazolone; 10,10-oxybisphenoxarsine; tebuconazole; tolnaftate; zinc bis-(2-pyridinethiol-1-oxide); and quaternary compounds such as Bardac, dialkyl dimethyl ammonium chloride, or Barquat, alkyl dimethyl benzyl ammonium chloride, (Lonza, Fairfield, N.J., USA).

[0034] In one embodiment, the anti-microbial agent is either melt processed with the polymer material or is provided as an intimate part of a coating, optionally as a cured coating composition to provide durability. The incorporation of the anti-microbial agent into a polymer product is performed by known methods such as dry blending in the form of a powder or wet mixing in the form of solutions, dispersions or suspensions, optionally in an inert solvent, water or oil. The anti-microbial agent may be added directly into the processing apparatus (extruders, mixers, kneaders, etc.) in an inert atmosphere or ambient atmosphere. The present anti-microbial agent may be added in the form of a master batch or polymer concentrate.

[0035] Alternatively, or in addition, the anti-microbial agent may be provided in a coating. The application of a coating including the anti-microbial agent is for example performed by applying the dissolved or dispersed agent to a material forming a portion of the reservoir, for example on a polymeric reservoir body structure, with or without subsequent evaporation of the solvent or the suspension/dispersion material. The anti-microbial agent can also be sprayed onto a polymer reservoir body structure. An applied coating may be cured in any conventional manner. In another exemplary embodiment, the anti-microbial agent is impregnated into the material of the reservoir.

[0036] The present polymer products comprise for example about 0.005% to about 3.0% by weight of the active anti-microbial agent. A single anti-microbial agent may be employed or any combination of anti-microbial agents may be employed in order to achieve desired results.

[0037] In one embodiment, as illustrated in **FIG. 2**, at least a portion **36** of the reservoir **30** that is adapted to serve as a headspace **38** during use of the fabric article treating device **20** is formed of a material comprising an anti-microbial agent. The headspace **38** is created in the reservoir **30** as the space between the upper portion of the reservoir and the surface level of the benefit composition. During use of the fabric article treating device **20**, the level of the benefit composition may change, thus resulting in a change in the amount of headspace in the reservoir.

[0038] In another embodiment, as illustrated in **FIG. 3**, the reservoir **30** further comprises a closure **40**. In one exemplary embodiment, the closure **40** is adapted to allow access to the interior of the reservoir **30**. For example, the closure **40** may be removed from the reservoir **30** to allow the user to add a benefit composition to the reservoir **30** and then the closure **40** can be positioned back on the reservoir **30**. In one exemplary embodiment, at least a portion of the closure is formed of a material comprising anti-microbial agent, in any of the manners discussed above. For example, the closure may include an interior coating. The interior coating may be formed of a material comprising an anti-microbial agent.

[0039] In a further embodiment of the present invention, as illustrated in **FIG. 4**, the closure **40** further comprises a closure liner **43**. In one embodiment, at least a portion of the closure liner **41** is formed of a material comprising an anti-microbial agent.

[0040] In another exemplary embodiment, as illustrated in **FIG. 5**, the fabric article treating device **20** further comprises a coating **41** on the interior of the body of the reservoir **30**. In another embodiment of the present invention, at least a portion of the reservoir includes an interior coating **41**. The coating may comprise one or more anti-microbial agents.

[0041] In one exemplary embodiment of the present invention, the reservoir **30** is adapted for location on an interior portion of the fabric article drying appliance **20**. For example, the reservoir may be located in the chamber of the fabric article drying appliance. Alternatively, the reservoir may be located within the fabric article drying appliance, but not within the chamber of the fabric article drying appliance. Further, the reservoir may be adapted for location on an exterior portion of the fabric article drying appliance.

[0042] The interior dispenser **25** may comprise at least one nozzle for the purposes of distributing the benefit composition into the fabric article drying appliance. Misting/atomizing of the benefit composition can be achieved using any suitable spraying device such as a hydraulic nozzle, sonic nebulizer, pressure swirl atomizers, high pressure fog nozzle or the like to deliver target particle size. Non-limiting examples of suitable nozzles include nozzles commercially available from Spray Systems, Inc. of Pomona, Calif. under the Model Nos. 850, 1050, 1250, 1450 and 1650. Another suitable example of a nozzle is a pressure swirl atomizing nozzle made by Seaquist Perfect Dispensing of Cary, Ill. under Model No. DU-3813. In one exemplary embodiment, at least a portion of the interior dispenser is formed of a material comprising an anti-microbial agent.

[0043] In another exemplary embodiment, as illustrated in **FIG. 6**, the fabric article treating device **20** further comprises fitment **44**, which is one of corresponding male and female fitments, and the reservoir **30**, shown as a sealed pouch or carton, comprises the other fitment **42** of the corresponding male and female fitments, wherein the female fitment is configured to receive the male fitment to establish the fluid communication between the interior dispenser **25** and the reservoir **30**. In the embodiment of **FIG. 6**, the fitment **42** on the reservoir **30** is the female fitment, while the corresponding male fitment **44** is adapted for fluid connection with the dispenser **25**, for example via a fluid handling system as described hereafter. Various corresponding male and female fitments which establish fluid communication are generally known in the art and are suitable for use herein. One exemplary fitment that may be utilized is available from IPN USA Corp. of Peachtree City, Ga., available as Clean-Clic® pouch fitments, model SBS-4. As one skilled in the art will appreciate, any fitments can be utilized in the present invention provided the fitments are configured to maintain fluid communication between the reservoir **30** and the interior dispenser **25**.

[0044] In one exemplary embodiment, as illustrated in **FIG. 7**, the fabric article treating device **20** further comprises a fluid handling system **55**, a power source **50** and a controller **60**. In one exemplary embodiment, the fluid handling system **55** is configured to transport the benefit composition from the reservoir **30** to the interior dispenser **25**. The interior dispenser **25** is configured to deliver the benefit composition to one or more fabric articles in the fabric article drying appliance. The power source **50** is configured to provide electrical power as needed by the fluid article treating device, such as the controller **60**, the fluid handling system **55**, sensors, and any electrical needs of a user interface. The controller **60** is configured to regulate the dispensing of the benefit composition. For example, the controller **60** may determine the optimum time to dispense the benefit composition, the quantity of benefit composition to be dispensed and the rate at which to dispense the benefit composition. In one embodiment, the fabric article treating device further comprises a communication link adapted to provide communication between the controller of the fabric article treating device and the fabric article drying appliance. For example, the controller may send and/or receive signals to/from the fabric article drying appliance to determine the optimum benefit composition dispensing conditions such as, time, length, etc.

[0045] Another exemplary embodiment of the present invention is illustrated in **FIG. 8**. In this exemplary embodiment, the fabric article treating device **20** further comprises a housing **65**. The housing **65** is adapted to receive various components of the fabric article treating device, optionally, the housing may substantially enclose and protect the components in their assembled form. For example, as shown in **FIG. 8**, the housing may receive the power source **50**, the fluid handling system **55**, the controller **60** and the reservoir **30**. In another embodiment, the housing may comprise a tubing storage area adapted to contain a quantity of fluid line **32** to allow the user to customize the installation of the fabric article treating device for the user's particular fabric article drying appliance. The housing **65** may be constructed with any materials known to one skilled in the art. Exemplary materials include, but are not limited to, polymers, metals, fabric, wood, and the like. The housing **65** may be located on the exterior or interior of the fabric article drying appliance. In one exemplary embodiment, at least a portion of the housing **65** is formed of a material comprising an anti-microbial agent.

[0046] In one exemplary embodiment as illustrated in **FIG. 9**, the fluid handling system **55** comprises a pump **70**. The pump **70** is in communication with the reservoir **30** and the interior dispenser **25** via fluid lines **72** and **74**, respectively. The pump **70** is configured to transport benefit composition from the reservoir **30** to the interior dispenser **25** for dispensing of the benefit composition. In one embodiment, the pump **70**, comprises an piezo-electric pump. In another embodiment, the pump **70** may comprise a diaphragm pump. As one skilled in the art will appreciate any

pump known to one skilled in the art may be utilized to transport the benefit composition from the exterior reservoir **30** to the interior dispenser **25**. Other exemplary pumps include piston pumps, peristaltic pumps, and bellows-type pumps.

[**0047**] As noted above, one type of pump **70** that can be used in the present invention is an piezo-electric pump. While an piezo-electric pump has certain membranes or laminations which may vibrate in a reciprocating-type fashion, the piezo-electric pumps generally do not have major moving parts, such as rotating shaft and bearings used with a rotator member to displace a fluid or gaseous fluid, that experience wear over time. One commercially available suitable piezo-electric pump usable in the present invention is manufactured by PAR Technologies, LLC, located in Hampton, Va., and marketed as the "LPD-Series" laminated piezo-electric fluid pumps. Pumps which draw a relevantly low current are particularly suitable in certain embodiments.

[**0048**] In another embodiment, the reservoir **30** may be positioned in such a way to provide gravitation flow of the benefit composition to the interior dispenser **25**. For example, the reservoir **30** may be mounted above the fabric article drying appliance to create static head on the benefit composition to allow dispensing of the benefit composition without the utilization of a pump.

[**0049**] Another exemplary embodiment of the present invention is illustrated in **FIG. 10**. In this embodiment, as in previously discussed embodiments, the fabric article treating device **20** comprises an interior dispenser **25** adapted for location inside of a fabric article drying appliance and a reservoir **30** adapted to contain a benefit composition, wherein at least a portion of the reservoir **30** is formed of a material comprising an anti-microbial agent. The interior dispenser **25** and the reservoir **30** are adapted for fluid communication with one another. The device further comprises a controller **60** in electrical communication with a sensor **75**. In one exemplary embodiment, the sensor comprises a temperature sensor. In another exemplary embodiment, the sensor **75** comprises a light sensor. In yet another exemplary embodiment, the sensor **75** comprises a motion sensor. The controller **60** is adapted to send and/or receive signals from the sensor **75** and to determine the dispensing conditions for dispensing the benefit composition.

[**0050**] Another embodiment of the present invention, as illustrated in **FIG. 11**, is a fabric article treating system **80**. The fabric article treating system **80** comprises a fabric article drying appliance **35** having a chamber **81** and a closure structure **85**, for example, a door. The closure structure **85** has a closed position and at least one open position. The closure structure **85** allows access to the chamber **81** of the fabric article drying appliance **35**. The fabric article treating system **80** further comprises a reservoir **30** for containing a benefit composition; a dispenser **25** in communication with the chamber **81**; and a fluid handling system **55** that compels the benefit composition from the reservoir **30** toward the dispenser **25**, thereby dispensing the benefit composition into the chamber **81**. At least a portion of the reservoir **30** is formed of a material comprising an anti-microbial agent, and as discussed above, the reservoir **30** may be removable. In another embodiment, the reservoir **30** comprises a sealed pouch.

[**0051**] Another embodiment of the present invention, as illustrated in **FIG. 12**, is a fabric article treating system **80**. The fabric article treating system **80** comprises a fabric article drying appliance **35** having a chamber **81** and a closure structure **85**. The closure structure **85** has a closed position and at least one open position, wherein the closure structure **85** allows access to the chamber **81**. The fabric article treating system **80** further comprises a reservoir **30** for containing a benefit composition and a dispenser **25** in communication with the chamber **81**; a fluid handling system **55** that compels the benefit composition from the reservoir **30** toward the dispenser **25**, thereby dispensing the benefit composition into the chamber **81**; a closure structure sensor **88**; and a controller **60** that initiates dispensing of the benefit composition. The controller **60** is configured to prevent the benefit composition from being dispensed when the closure structure sensor **88** indicates that the closure structure **85** is not in the closed position. At least a portion of the reservoir **30** is formed of a material comprising an anti-microbial agent. In another embodiment, the fabric article treating system **80** further comprises one or more additional sensors **75** in the chamber in communication with the controller.

[**0052**] The reservoir **30** may be mounted on the exterior portion of the fabric article drying appliance **35**, such as on the fabric article drying appliance closure structure **85**, or a side wall, a top wall, an outer surface of a top-opening lid, or the like, including a stand, wall or other household structure that is separate from the fabric article drying appliance. Moreover, the reservoir **30** may be mounted on any interior portion of the fabric article drying appliance **35**, examples of which include, but are not limited to, the interior surface of the closure structure **85**, the drum of the fabric article drying appliance, the back wall, the inner surface of a top opening lid, or the like.

[**0053**] Optionally, filters and/or filtering techniques can be used to filter the benefit composition, if desired, for example at a point between the reservoir **30** and the outlet of the dispenser **25**. Non-limiting examples of this include: utilizing a filter in the interior dispenser **25** prior to dispensing of the benefit compositions. Alternatively, the benefit composition may be filtered prior to dispensing into the reservoir; or a combination of filtering techniques may be employed.

[**0054**] The interior dispenser **25** and the reservoir **30** are adapted for fluid communication with one another. In one embodiment, the interior dispenser **25** and the reservoir **30** may be in electrical connection with one another. Non-limiting examples of means for connecting the interior dispenser **25** and the reservoir **30** may include utilizing a flat cable (also referred to as a ribbon cable), a wire, a wire or group of wires enclosed in a stealth of woven or nonwoven material, a conduit (a non-limiting example of which is a conduit for the benefit composition), or combination thereof. The woven or nonwoven sheet may be used as a method of attaching the interior dispenser **25** and the reservoir **30**. The interior dispenser **25** and the reservoir **30** may be used to provide a means of gravitational counterbalancing so as to reduce unnecessary tension on the wires and/or the connections.

[**0055**] The power source **50** may comprise chemical batteries, or any electrical power source, including standard household line voltage, or even solar power. Batteries may be utilized, and are particularly suitable when the fabric article treating device **20** is in the form of an add-on device for an existing fabric article drying appliance **35**. However, any appropriate power adapter can be provided to convert an AC power source to the appropriate DC voltages used in any electrical components of the fabric article treating device **20**, such as in the fluid handling system **55**, the controller **60**, and any sensors **75**.

[0056] As noted, the fabric article treating device **20** can include optional sensors **75**. Non-limiting examples of optional sensors include a door (or lid sensor), a motion sensor, a humidity sensor, and/or a temperature sensor. One non-limiting example of a door/lid sensor is an optoelectronic device, such as an optocoupler or an optical input sensor, e.g., a phototransistor or photodiode. When the door/lid of the drying appliance is open, the door sensor will change state, and will output a different voltage or current level along an electrical conductor that leads from the door sensor back to the controller. This can be used as a safety device to immediately interrupt the dispensing of the benefit composition from the interior dispenser **25**. The optional door sensor could be utilized even when a control system is integrated into the overall conventional control system of the drying appliance. For example, a drying appliance typically has its own door sensor which shuts off the rotating drum of the dryer when the door becomes open. In this instant, the optional door sensor can act as a backup or second door sensor to the dryer's internal original sensor that shuts off the rotating drum. One example which could be used as a door/lid sensor is an NPN Phototransistor, Part No. PNA1801L, manufactured by Panasonic, of Osaka, Japan. In another embodiment, a communication link could be established between the drying appliance and the controller, wherein the drying appliance would send the controller a signal relating to the operational state of the drying appliance (e.g., door open/closed, drying cycle, temperature, etc.).

[0057] Another type of optional sensor **75** that can be utilized by the fabric article treating device **20** of the present invention is a motion sensor. For fabric article drying appliances **35** which utilize a moving interior, such as a rotating drum, the motion sensor can detect if a fabric article drying appliance is in use. One example of a motion sensor is a vibration and movement sensing switch manufactured by ASSEM Tech Europe Ltd., of Clifton, N.J., available as Model No. CW1600-3. Another type of optional motion sensor that may be used in the present invention uses a light source to direct (infrared) light at a surface, and the relevant motion of that surface can be detected by the intensity and/or frequency of the returning light. Such sensors can measure the actual speed of rotation, if that information is desired.

[0058] Another optional sensor **75** that can be used in a fabric article treating device **20** of the present invention is a humidity sensor. The optional humidity sensor, together with the controller, may be used to control the amount of composition being dispensed by the interior dispenser **25**, and also may be utilized to determine the proper environmental conditions during an operational cycle in which the dispensing event should take place. Additionally, this humidity sensor may be used to maintain a specific humidity by controlling the dispensing the benefit composition such that optimal de-wrinkling and/or other benefits are achieved. Many different types of humidity sensors could be used in conjunction with the present invention, including variable conductivity sensors. One such sensor is manufactured by Honeywell, of Freeport, Ill. under the Model No. HIH-3610-001, although any of the HIH-3610 series, or other available sensors may be used.

[0059] A further optional sensor **75** that can be useful in the fabric article treating device **20** of the present invention is a temperature sensor, such as one that outputs an analog or digital signal along the electrical conductor that leads back to the controller.

[0060] As noted above, the fabric article treating device **20** may comprise a controller **60**. In one embodiment, the controller may be a microcontroller. A suitable microcontroller is manufactured by MicroChip, of Chandler, Ariz. under the Part No. PIC16LS876-04/P. However, other microcontrollers made by different manufacturers could also easily be used. In one exemplary embodiment, the microcontroller includes on-board random access memory (RAM), on-board read only memory (ROM), which comprises electrically programmable non-volatile memory elements, as well as on-board input and output lines for analog and digital signals. The controller may also be used with a crystal clock oscillator, although a RC circuit could be used instead as a clock circuit, if desired. The clock circuit provides the timing of the clock as necessary to operate the controller. In one embodiment, the controller comprises a port that can be interfaced to an optional programmable interface using a communication link, such as RS-232 communication link. The port allows a user to alter the program information of the controller, such as dispensing options, etc.

[0061] One skilled in the art will appreciate that the controller can be any type of microprocessor or microcontroller circuit commercially available, either with or without on-board RAM, RAM, or digital and analog input/output (I/O). Moreover, a sequential processor may be used to control the fabric article treating device **20**, or alternatively a parallel processor architecture or a logic state machine architecture could be used. Furthermore, the controller **60** may be integrated into an Application Specific Integrated Circuit (ASIC) containing many other logic elements that could be used for various functions, as desired, such functions being optional depending upon the model of the fabric article treating device **20** that will be sold to a consumer. To change model features, the manufacturer need only program the ASIC or the on-board RAM of the controller according to the special parameters of that particular model, while using the same hardware for each of the units.

[0062] It will also be understood that discrete digital logic could be used instead of any type of microprocessor microcontroller unit, or analog control circuitry could be used along with voltage comparators and analog timers, to control the timing events and to make decisions based on input levels of the various sensors that are provided with the fabric article treating device **20**.

[0063] It will be understood that the present invention can be readily used in other types of fabric "treating" devices, and is not limited solely to clothes "dryers". In the context of this patent document, the terms "dryer" or "drying apparatus" or "fabric article drying appliance" include devices that may or may not perform a true drying function, but may involve treating fabric without attempting to literally dry the fabric itself. As noted above, the terms "dryer" or "drying apparatus" or "fabric article drying appliance" may include a "dry cleaning" process or apparatus, which may or may not literally involve a step of drying. The term "fabric article drying appliance" as used herein, also refers to any fabric treating device that utilizes moving air directed upon one or more fabric articles, a non-limiting example of which includes a clothes dryer, and modifications thereof. Such devices include both domestic and commercial drying units used in dwellings, laundromats, hotels, and/or industrial settings. In addition, it should be noted that some drying appliances include a drying chamber (or "drum") that does not literally move or rotate while the drying appliance is operating in the drying cycle. Some such dryers use moving

air that passes through the drying chamber, and the chamber does not move while the drying cycle occurs. Such an example dryer has a door or other type of access cover that allows a person to insert the clothing to be dried into the chamber. In many cases, the person hangs the clothes on some type of upper rod within the drying chamber. Once that has been done, the door (or access cover) is closed, and the dryer can begin its drying function. Dispensing of a benefit composition can take place within such a unit, however, care should be taken to ensure that the benefit composition becomes well dispersed within the drying chamber, so that certain fabric items do not receive a very large concentration of the benefit composition while other fabric items receive very little of the benefit composition.

[0064] Exemplary fabric article treating devices and systems include those described in co-pending U.S. application Ser. No. 10/697,735 filed on Oct. 29, 2003; U.S. application Ser. No. 10/697,685 filed on Oct. 29, 2003; U.S. application Ser. No. 10/697,734 filed on Oct. 29, 2003; U.S. application Ser. No. 10/697,736 filed on Oct. 29, 2003; and U.S. application Ser. No. 10/762,152 filed on 10/762,152.

[0065] All documents cited in the detailed description of the invention are, in relevant part, incorporated herein by reference; a citation of any document is not to be construed as an admission that it is prior art with respect to the present invention.

[0066] While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

What is claimed is:

1. A fabric article treating device, comprising:

an interior dispenser adapted for location inside of a fabric article drying appliance;

a reservoir;

wherein the interior dispenser and the reservoir are adapted for fluid communication with one another;

wherein the reservoir is adapted to contain a benefit composition; and

wherein at least a portion of the reservoir is formed of a material comprising anti-microbial agent.

2. The fabric article treating device of claim 1, wherein the portion includes an interior coating.

3. The fabric article treating device of claim 1, wherein the portion comprises a closure.

4. The fabric article treating device of claim 1, wherein the reservoir comprises a closure and the portion comprises a closure liner.

5. The fabric article treating device of claim 1, wherein the reservoir comprises a closure and the portion comprises a closure coating.

6. The fabric article treating device of claim 1, wherein the portion comprises a reservoir body.

7. The fabric article treating device of claim 1, wherein the portion comprises an internal surface of the reservoir adapted to serve as headspace during use of the fabric article treating device.

8. The fabric article treating device of claim 2, wherein the reservoir comprises a material impregnated with an antimicrobial agent.

9. The fabric article treating device of claim 2, wherein the reservoir comprises an antimicrobial coating.

10. The fabric article treating device of claim 1, wherein the anti-microbial agent comprises one or more organic or inorganic compounds, or a combination thereof.

11. The fabric article treating device of claim 10, wherein the anti-microbial agent comprises iodine, silver, zinc or a combination thereof.

12. The fabric article treating device of claim 1, wherein the reservoir is adapted for location on an interior portion of the fabric article drying appliance.

13. The fabric article treating device of claim 1, wherein the reservoir is adapted for location on an exterior portion of the fabric article drying appliance.

14. The fabric article treating device of claim 1, wherein the portion is molded from a composition comprising thermoplastic material.

15. The fabric article treating device of claim 14, wherein the portion is molded from a composition comprising thermoplastic material impregnated with the anti-microbial agent.

16. The fabric article treating device of claim 1, wherein the reservoir is configured to be removable.

17. The fabric article treating device of claim 1, wherein the benefit composition further comprises a preservative.

18. The fabric article treating device of claim 17, wherein the preservative comprises one or more preservatives selected from the group consisting of hydantoins, isothiazolinones, methyl isothiazolinones, benzisothiazolinones, sodium hydroxymethylglycinate, and carbamates, and combinations thereof.

19. A fabric article treating system, comprising:

a fabric article drying appliance having a chamber and a closure structure, the closure structure having a closed position and at least one open position, the closure structure allowing access to the chamber;

a reservoir for containing a benefit composition;

a dispenser in communication with the chamber; and

a fluid handling system that transports the benefit composition from the reservoir toward the dispenser, thereby dispensing the benefit composition into the chamber;

wherein at least a portion of the reservoir is formed of a material comprising anti-microbial agent.

20. The fabric article treating system of claim 19, wherein the reservoir is removable.

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